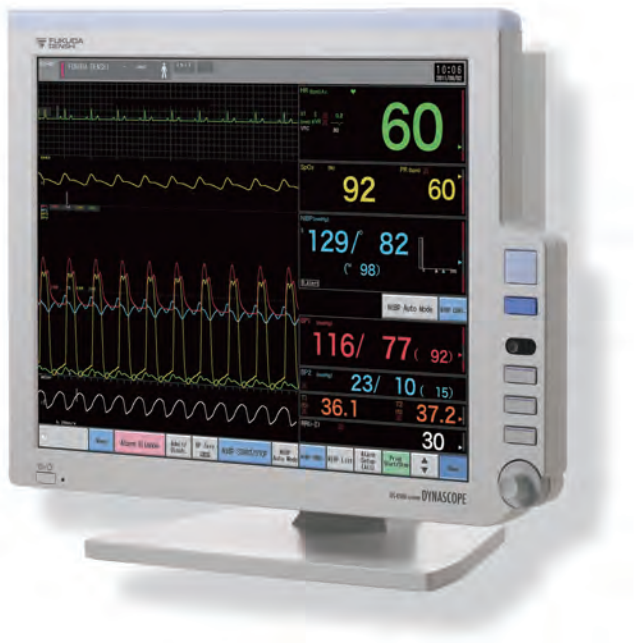
CE 0086

DYNASCOPE 8000 Series
Patient Monitor

DS-8500 System

Ver. 13

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-8500 System Version 13.

CE 0086

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 Fukuda Denshi UK
Unit 7, Genesis Business Park, Albert Drive, Woking, Surrey GU21 5RW, United Kingdom

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.

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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>

This equipment is intended for measuring parameters such as ECG, respiration, NIBP, pulse rate, SpO_2, SpCO, SpMet, pulse wave, temperature, BP, CO, respiration gas (concentration of CO_2, N_2O, volatile anesthetic agent, O_2), spirometry, BIS, brain wave, and monitors patient condition by displaying/printing the measurement data on this equipment or central monitor and generates alarm as required.

This equipment is intended for monitoring one patient. It is not intended for monitoring multiple patients.
The 12-lead ECG analysis function is intended for adult and pediatric patients.

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

This equipment is intended to be used by healthcare professionals. Users should have a thorough knowledge of the function and operation before using this equipment. The maintenance of this equipment should be performed by skilled personnel who received a training of possible hazards and measures to avoid those hazards. 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-8500 System is available from your local Fukuda Denshi sales representative.

Contact

If you need more detailed information, please contact following.

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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, mouse connection
2.Network System Construction	Network connection and setup
3.Using the CF card	Procedure to use the CF card
4.Connection to the External Devices	External equipment connection and setup
5.Initial Settings	Initial setup, administrator setup, alarm/measurement setup, user I/F, user mode registration
6.Setup Item/Default Value	Default and backup of setup items
7.Replacement Parts	Precautions about the periodic replacement parts, consumable parts
8.Cleaning/Disinfecting/Storing	Procedure to handle, clean, store this equipment
9. Maintenance Check	Daily and periodic checks, self-diagnosis function, software version software install

Safety

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.

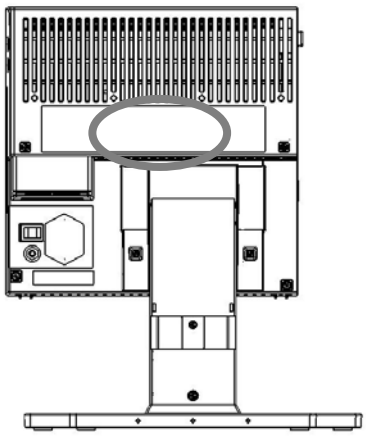
Warning Labels Attached to the Unit

Make sure to read the warning labels attached to the unit and comply with these requirements while operating the unit.

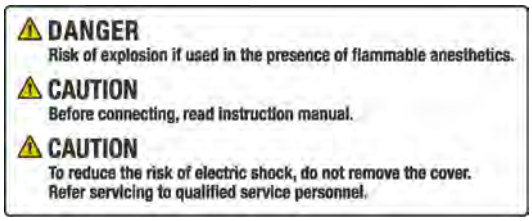
⚠ CAUTION

- Do not damage or erase the warning labels attached to the unit.
  These warning labels contain important descriptions for handling and operating the unit properly and safely. A damaged label may compromise safe operation.

❑DS-8500 System Main Unit (DSC-8500 Series)

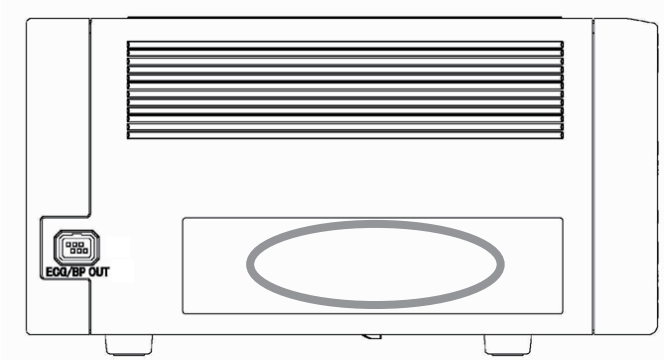


Warning Labels Attached to the Unit

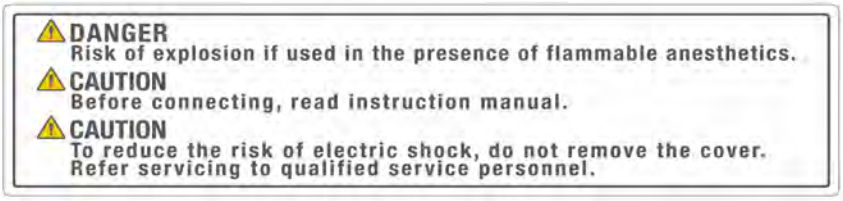


Warning Label

❑DS-8500 System Super Unit (HS-8000 Series)



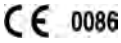
Warning Labels Attached to the Unit (HS-8312)



Warning Label

Graphic Symbols

Refer following for the meaning of the symbols 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.
	Caution, refer to accompanying documents. Indicates the need to refer to the related accompanying documents before operation.
	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)
	Power ON Indicates that the main power switch is in the ON position.
	Power OFF Indicates that the main power switch is in the OFF position.
	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
	TCP/IP Network Connector
	RS-232C Connector
	Eject: Indicates the switch to remove the recorder paper cassette.
	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.
	Indicates that this device bears the CE label in accordance with the provisions of Medical Device Directive 93/42/EEC. The 0086 represents the number of the notified body.
	Alarm Silence Key: Silences the alarm.
	NIBP Start/Stop Key Starts/stops the NIBP measurement.Stops the measurement if pressed while measurement is in progress.

Symbol	Description
	Home Key: Displays the home display.
	Menu Key: Displays the menu screen.
	Previous Display: Displays the previous display.

Precautions for Safe Operation of Medical Electrical Equipment

⚠ CAUTION

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

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

- Do not install or store in an area where the unit will be subject to splashing water.
- Do not install or store in an area where the environmental conditions, such as atmospheric pressure, temperature, humidity, ventilation, sunlight, dust, sodium, sulfur, will adversely affect the equipment.
- 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.
- Do not install the equipment in a location where it is difficult to unplug the power cable.

❑Precautions Before Using the Equipment

- Verify the power voltage.
- Check the cable connection and polarity to ensure proper operation of the unit.
- Make sure the power system has adequate earth ground.
- Ensure that all cables are firmly and safely connected.
- Pay special attention when the device is used in conjunction with other equipment as it may cause erroneous judgment 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. Also, the operator should not contact the patient and the equipment at the same time.
- 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, do not apply excessive force by pulling on the cable. Pull from the connector part

of the cable.

- 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.
- Danger such as electric shock may result to the patient and operator.

❑Precautions about Maintenance Check

- Make sure to periodically check the equipment, accessories and cables.
- Before reusing the equipment that has been left unused for a while, make sure that the equipment works normally and safely.

❑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 proper ground is selected.

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-8500 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 unspecified or damaged unit, cable, or sensor 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.
- 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 specified 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 connecting, do not use a multiple portable socket-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 all patient cables to reduce the possibility of patient entanglement or strangulation.
- When lifting this equipment, hold the bottom part of the main unit and not the display unit.
- When attaching the display unit to the main unit, place the display unit facing down and slowly attach the main unit using the guide on the side of the display unit. Then, secure it with the specified screws.

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 system alarm is set to [ON]. Pay attention when setting them [OFF].
- Objective and constant arrhythmia detection is possible through the fixed algorithm incorporated in this monitor. However, excessive waveform morphology change, motion artifact, or the inability to determine the waveform pattern may cause an error, or fail to make adequate detection. Therefore, physicians should make final decisions using manual 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.
- The oxygenator mode is intended to prevent alarms during cardiopulmonary bypass surgery. Pay special attention when using this mode as the alarm generation will not be the same as to the standard monitoring mode.
- If the "Alarm Setting" under the Oxygenator Mode Setup is set to [All OFF], all vital alarm will not generate regardless of the alarm setting of each parameter. Also, if [Sel. Parameter] is set, vital alarm for unselected parameter will not generate. Pay attention to not miss any significant change of the patient's vital sign as the alarms will not be generated during the Oxygenator Mode.
- Once the cardiopulmonary bypass is finished, make sure to cancel the Oxygenator Mode and return to the standard monitoring mode.

WARNING Warnings about the SpO_2 Monitoring (HS-8312M or HG-810)

- 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-800/HCP-810, HPD-800/HPD-810)

- Only one of either HCP-800/HCP-810/HPD-800/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-800/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-800/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-800/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 Gas Monitoring (MGU-800/810)

- Make sure to use only the specified Mindray Medical Sweden AB product.
  (☞"Anesthetic Gas Concentration Measurement (Manufactured by Mindray Medical Sweden AB)" P13-7)

- Be careful not to damage the water trap during operation as bacteria and/or mucus may contaminate the MGU-800/810 series.
- The airway adapter, sampling line, flow sensor are disposable products that are intended for single patient use only. Do not reuse them on other patients as it may cause cross-infection.
- To prevent cross-infection, do not allow the sampling gas to return to the breathing system.
- 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.
- Do not use the MGU-800/810 series with the flammable anesthetic agents.
- To protect the hospital staffs from unnecessary anesthetic agent, it is strongly recommended to connect the exhaust hole to the gas exhaust system in the hospital.
- The sampling line may get clogged by internal condensation.
- The contents of the water trap should be handled as a potential infection hazard.
- Do not use adult/pediatric type water traps and/or sampling lines with neonates to avoid high sampling flow.
- Connect only DRYLINE gas sampling lines to the water trap. Note that there may be other compatible tubing present, e.g. IV-lines.
- Do not use DRYLINE neonatal sampling lines (blue luer lock nuts) with DRYLINE adult water traps as this could result in incorrect measurement data.
- Do not use DRYLINE adult sampling lines (colorless luer lock nuts) with DRYLINE neonatal water traps as this could result in incorrect measurement data.
- Only combine the SPIRIT Flow Sensors and DRYLINE Water Traps as specified. Other combinations might lead to incorrect measurements.
  (☞"Connecting to the Respiration Circuit" P7-82)
- Use the adult flow sensor for a patient whose tidal volume is above 150 mL.
- Use the pediatric flow sensor for a patient whose tidal volume is below 300 mL.
- Make sure to use the correct flow sensor depending on the patient conditions, adult or pediatric and the tidal volume.
- Do not confuse the gas sampling line with other compatible tubing, e.g. IV-lines.

⚠ 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.

⚠ WARNING Warnings about the BIS Monitoring (HBX-800)

- Clinical judgment should always be used when interpreting BIS in conjunction with other available clinical signs. Reliance on BIS alone for intra-operative anesthetic management is not recommended.
- BIS values should also be interpreted cautiously with certain anesthetic combinations, such as those relying primarily on either ketamine or nitrous oxide/narcotics to produce unconsciousness.
- As with any monitored parameter, artifacts and poor signal quality may lead to inappropriate BIS values. Potential artifacts may be caused by poor skin contact (high impedance), muscle activity or rigidity, head and body motion, sustained eye movements, improper sensor placement and unusual or excessive electrical interference.

⚠ CAUTION Precautions about the System

- Use only the accessories specified for this system. 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.
- When adjusting the angle of the display unit, pay attention not to have your hands get caught in between.
- 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 not using for a long period, make sure to turn OFF the power of the main unit.

⚠ 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 or HG-810)

- 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-800/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-800/HCP-810.
- Do not disconnect the sampling tube during calibration. If disconnected, calibration will cease.
- Dispose of calibration gas according to the regulation of each medical institution.
- Microstream® $EtCO_2$ 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_2Monitoring (HPD-800/HPD-810 Gas Unit I/F)

- The disposable airway adapter should be opened just before use.
- Do not reuse the disposable airway adapter. If sterilized, it will become unusable.
- 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 BIS Monitoring (HBX-800 BISx I/F Unit)

- The conductive parts of sensors and connectors should not contact other conductive parts, including earth.
- To reduce the hazard of burns in the high-frequency surgical neutral electrode connection, the BIS sensor should not be located between the surgical site and the electrosurgical unit return electrode.
- The BIS sensor must not be located between defibrillator pads when a defibrillator is used on a patient connected to the patient monitor.
- Continuous impedance checking may need to be disabled if the 1 nA, 128 Hz impedance check signal interferes with other equipment (e.g., evoked potential monitors).
- Considerations when using Electro-Convulsive Therapy (ECT) equipment during BIS monitoring: Place ECT electrodes as far as possible from the BIS sensor to minimize the effect of interference. Certain ECT equipment may interfere with the proper function of the BIS monitoring system.

⚠ 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 level, the alarm message for the newer alarm will be displayed.

- The arrhythmia alarm message other than Tachy, Brady, Ext Tachy, Ext Brady will continue to be displayed for 30 seconds after the alarm is resolved.
- When "LEAD OFF", "Check Electrodes" is displayed, HR alarm or arrhythmia alarm will not function. 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.
- 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 100 mmHg/13.4 kPa and above as the measurement range is 0 to 99 mmHg / 0 to 13.3 kPa.
- 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 NIBP alarm is turned OFF under the Oxygenator Mode, NIBP auto mode measurement and NIBP measurement at alarm occurrence will not be performed.
- 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.
- If the RR source is set to [CO_2/GAS], and if GAS waveform/numeric data is set to [Disp. OFF], the RR value will not be displayed.
- Do not set the same remote control ID to multiple monitors in the same floor. Otherwise, the remote control operation may control multiple monitors 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 printing, trend, NIBP list data, and age calculation from the birth date.
- If the time/date is changed, the time/date for all the saved patient data (trend, list, recall, etc.) will also change. The printed time/date before changing and the displayed time/date after changing will differ.Also, the data transmitted to the central monitor before the time/date is changed will be displayed on the central monitor with the previous time/date.

⚠ CAUTION Precautions about the Multigas Unit Data Monitoring (MGU-800/MGU-810 Series)

- When the multigas unit (MGU-800/MGU-810 series) and HPD-800/HPD-810, HCP-800/HCP-810 are simultaneously used, the CO_2 concentration measurement will be performed by the equipment selected for the "CO_2 Source Priority" under ([Menu] > "Parameter" [CO_2]) .
- The MGU-800/MGU-810 series require warm up of about 10 minutes to correctly measure the data.
- If the power supply is interrupted due to power failure, etc., MGU-800/810 series multigas unit will initialize and enter into warm-up mode even if the power interruption is within 30 seconds.
- About the Gas Calibration

The gas calibration will automatically start when the MGU-800/810 series multigas unit is connected.
After the warm-up completes, gas calibration will be performed every 4 hours during stable operation.
During warm-up, gas calibration interval will become shorter than during normal operation.
During gas calibration, measurement data will not be updated.
Calibration gas is not required during gas calibration.

- Dispose of calibration gas according to the regulation of each medical institution.
- Make sure the sampling line and flow sensor is securely connected to prevent any leakage.
- The gas leakage inside or outside the equipment will cause measurement error. Make sure to check for leakage before usage.
- An environment with alcoholic vapor may adversely affect the measurement readings.
- CO_2, N_2O or anesthetic agent in the atmosphere around the MGU-800/810 series may adversely affect the measurement readings.
- SPIRO and ventilator cannot be used simultaneously.
- During the warming up process, the date of the last measurement accuracy check cannot be updated. Perform the measurement accuracy check after the warming up process is completed.
- If the accuracy check is performed using a low pressure gas, the accuracy of gas measurement will be reduced. Make sure to perform the accuracy check using the specified calibration gas before its expiration date.
- If the error persists, refer to your nearest service representative.
- About the MGU-810 Series
  - The adult flow sensor dead space is 6.9 mL and the flow resistance is 1.8 cmH_2O at 60 L/min.
    The pediatric flow sensor dead space is 0.75 mL and the flow resistance is 0.9 cmH_2O at 10 L/min.
    Adjust ventilation accordingly.
  - To prevent condensation, the patient breathing circuit, flow sensor and pressure tubing should not be directly exposed to cooling equipment such as fans or cooling blankets.
  - Leakage of gas from the patient breathing system may occur if the pressure or gas sampling lines are not connected to the MGU-810.
  - The pressure tube and gas sampling lines of the flow sensor should always be routed from the patient circuit to the MGU-810 such a way as to avoid kinking.
  - Flow sensors that have suffered damage to sensor head, tubing or tubing connector must not be used.
  - If liquid has entered the pressure tubes, it can be removed by gently tapping or shaking the flow sensor.

⚠ 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

- If performing 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" .
- The alarms that can be notified to the central monitor depend on the model type and software version of the central monitor. For details, refer to the operation manual of the central monitor.
- There are following restrictions when connecting the DS-8500 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 the DS-LAN II network, waveform, numeric data, and alarm of BP7, BP8, TEMP3 to 8 will not be transmitted. (These can be transmitted on the DS-LAN III network). Also, the displayable waveform, numeric data, and alarm will differ depending on the central monitor model type. Refer also to the operation manual for the respective central monitor.
- The PR_IBP alarm will not be transmitted to the central monitor.
- If the "RR/APNEA alarm source" is other than [Impedance] (or, if [Auto] selects a setting other than [Impedance]), the RESP waveform will not be transmitted on a wired network.
- If the "RR/APNEA alarm source" is other than [CO_2/GAS] (Or, if [Auto] selects a setting other than [CO_2/GAS]), 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 [99mmHg] is selected for "Upper Limit of CO_2 (mmHg) Transmission" ([Initial Settings]>[System]>[DS-LAN]), the CO_2 value of 100 mmHg or above will be transmitted as 99 mmHg.

- As the DS-8500 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 the wired network, the time/date will synchronize with the central monitor. Even if the time/date is changed on the DS-8500 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-8500 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-8500 System will be displayed. The monitored RR and APNEA will be the same for the central monitor and the DS-8500 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 Fukuda Denshi service representative for replacing the battery.
- To protect the data during voltage dip, short interruptions and voltage variations on power supply input lines or during short duration of power turned OFF, this equipment performs 5-minute (approx.) data backup using the secondary battery. The data may not be protected if the power is turned OFF within 30 minutes from power ON.

Precautions about the Ventilator Monitoring

⚠ WARNING

- The ventilator alarm sound is set to OFF at factory default setting.
  The alarm sound can be turned ON on the Tone/Volume setup screen.
- If the DS-8500 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-8500 System, cable, and replace the cable if necessary. If the malfunction persists, stop using the equipment.
- The alarm generation on the DS-8500 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.

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

To Prepare for Emergency Use

Accessories/Optional Accessories

- The ECG electrodes are consumable products. Always prepare extra supplies of electrodes.
- Check once a week that there is no wire break on the patient cable.

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.

⚠ 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.

⚠ WARNING Lightning

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

- Use the uninterruptible power supply system.

⚠ 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 device complies with the Safety Standard 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-8500 System is intended for use in the electromagnetic environment specified below. The customer or the user of the DS-8500 System should assure that it is used in such an environment.

Guidance and Manufacturer's Declaration - Electromagnetic Emissions		
Emissions Test	Compliance	Electromagnetic Environment - Guidance
RF Emissions CISPR 11	Group 1	The DS-8500 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-8500 System is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network which supplies buildings used for domestic purposes.
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-8500 System is intended for use in the electromagnetic environment specified below. The customer or the user of the DS-8500 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-8500 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-8500 System is intended for use in the electromagnetic environment specified below. The customer or the user of the DS-8500 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-8500 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-8500 System is used exceeds the applicable RF compliance level above, the DS-8500 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-8500 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-8500 System

The customer or the user of the DS-8500 System can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the DS-8500 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-8500 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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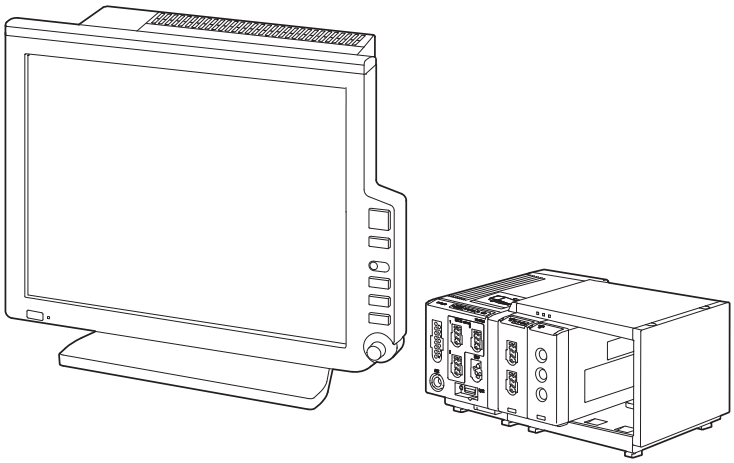
Composition of the System

The DS-8500 system is composed of a Main Unit (DSC-8500 series), Display Unit, Super Unit (HS-8000 series), Multigas Unit (MGU-800/810 series), Recorder Unit (HR-800), expansion modules and Input Box (IB-8004).

REFERENCE

- When connecting the DS-8007, refer also to the DS-8007 operation manual.



Composition of DSC-8510 (LC-8019T), HS-8312, IB-8004 and expansion modules

Lineup of Main Unit

Model Type	External Monitor Output	Extended Display Unit Output	LAN (TCP/IP)
DSC-8510	○	x	x
DSC-8530 (with extended board)	○	2 ch	1 ch

Lineup of Display Unit

Model Type	Display Size	Circular Polarizing Filter
LC-8015T	15 inch	x
LC-8015TC	15 inch	○
LC-8019T	19 inch	x
LC-8019TC	19 inch	○

Lineup of Super Unit

Model Type	Fixed Parameter	SpO_2 Unit	Multiparameter Measuring Items	CO_2 Measurement (Optional)	BIS Measurement (Optional)
HS-8312N	ECG (Max.12 leads), RESPx1, NIBPx1 SpO_2x1	Nellcor	3 ports TEMPx6 (maximum) BPx6 (maximum) CO Measurement x1 (maximum)	○	○
HS-8312M	ECG (Max.12 leads), RESPx1, NIBPx1, SpO_2x1, SpCO x1*, SpMet x1*, SpHb x1, PIx1, PVIx1	Masimo		○	○

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

Lineup of Multigas Unit

Model Type	CO_2/N_2O Measurement	Anesthetic Agent Measurement	O_2 Measurement	Spirometry Function Assessment
MGU-801P	○	○	○ Paramagnetic	x
MGU-802	○	○	x	x
MGU-803	○	x	x	x
MGU-811P	○	○	○ Paramagnetic	○
MGU-812	○	○	x	○
MGU-813	○	x	x	○

Lineup of Input Box

Model Type	Number of Slots
IB-8004	4

Lineup of Expansion Module

Model	Module	Measuring Parameters
HM-800	Multi Module	(IBP, TEMP, CO) x 2
HP-800	Multiport Module	Serial Communication 2ch, Analog Communication 1ch
HG-810	SpO_2 Module M (Masimo)	SpO_2, SpCO*, SpMet*, SpHb*, PR
HG-820	SpO_2 Module N (Nellcor)	SpO_2, PR

*: SpCO, SpMet, and SpHb measurements are optional functions.

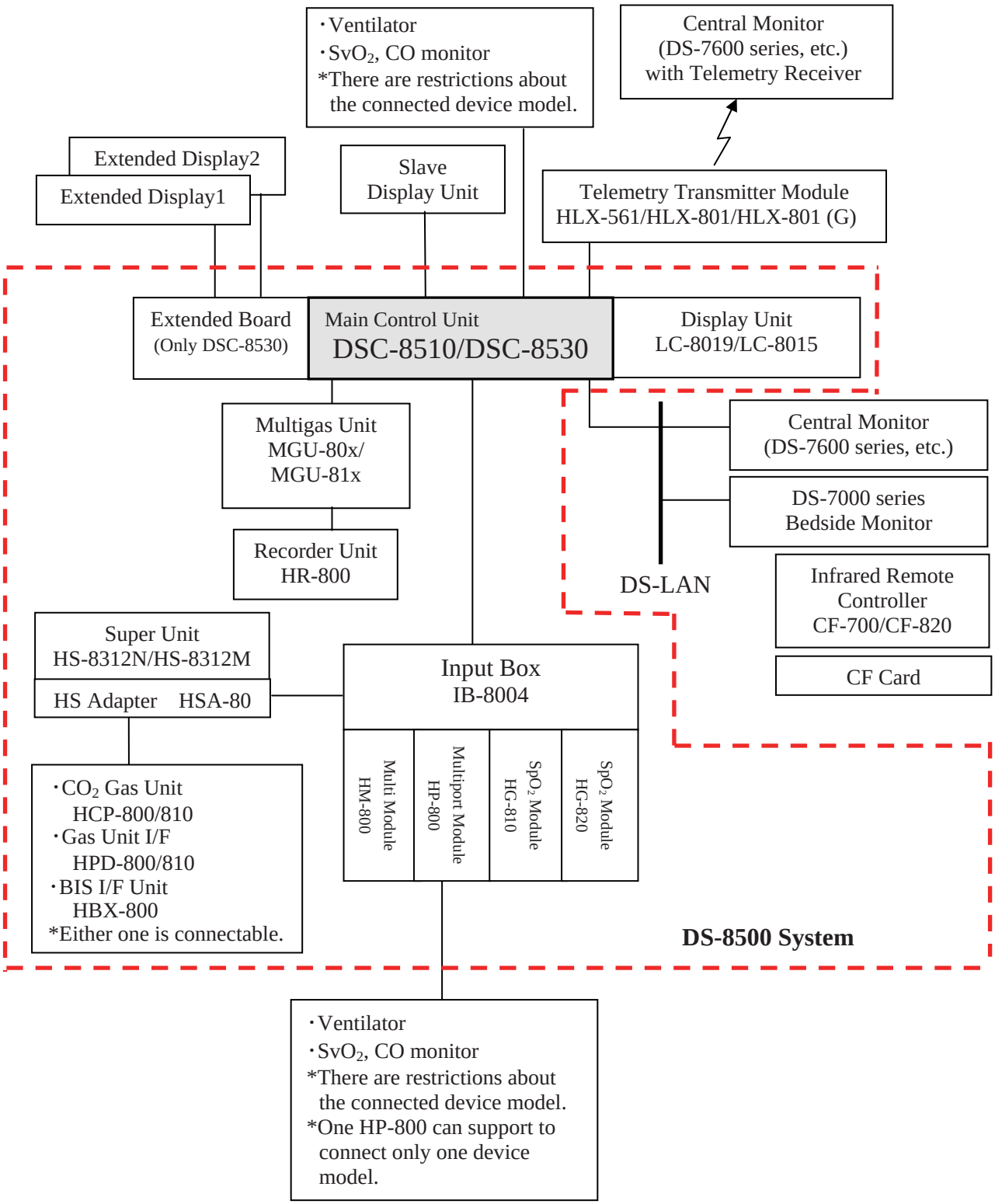
Lineup of Gas Module

Model	Module	Measuring Parameters
HPD-800	Gas Unit I/F	CO_2 measurement by Mainstream method with a connection to Capnostat 5 (Philips).
HPD-810		
HCP-800	CO_2 Unit	Incorporates Microstream technology developed by Covidien Sidestream Method
HCP-810		

BIS I/F Unit

Model	Module	Measuring Parameters
HBX-800	BIS I/F Unit	BIS, SR, EMG, SQI, SEF, TOTPOW, IMP, EEG (measured with a connection to BISx)

Outline of System Configuration Diagram



Features

- This equipment is a detachable type patient monitor which consists of a main unit, touch panel display unit and Super Unit.
- The display unit (LC-8019T/LC-8019TC) can display maximum of 28 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 jog dial and touch panel. Also, frequently used keys can be programmed as user key.
- The display unit can be tilted 25 degrees upward, and 10 degrees downward.
- For the main unit with built-in extended board, it is possible to connect two types of display units in addition to the main display unit to extend the display.
- An optional mouse can be connected allowing mouse operation.
- 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.
- Remote control function is available.
  Using the CF-820 IR Remote Control Unit allows to remotely control the patient monitor.
- By using the multiparameter amplifier, the HS-8000 series Super Unit is capable of monitoring parameters in combination of BP (maximum 6 channels), temperature (maximum 6 channels), and CO (maximum 1channel). In addition to ECG, respiration, SpO_2 (pulse wave), BP, NIBP, temperature and CO, CO_2 measurement is also available as optional function.
- By using the optional SpO_2 Module (HG-810/HG-820), arterial oxygen saturation can be also measured. By using the system with the Super Unit, arterial oxygen saturation measured at 2 different sites can be monitored as additional parameter.
- This system uses pulse oximetry to measure and display functional oxygen saturation in the blood. There are two model types with different built-in SpO_2 modules, which are Covidien/Nellcor and Masimo.
- SpCO, SpMet, SpHb, PVI measurement are optional function available when using the HS-8312M, HG-810, and DS-8007M with built-in Masimo SpO_2 module.
- By using the optional HP-800 Multiport Module, or connecting the ventilator to Status II port on the main 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 wireless and wired network. The following ventilators can be connected.
  - SV-900C/900D/900E
  - SV-300/300A
  - SERVO-i/SERVO-s/SERVO-U/SERVO-n/SERVO-air
  - PURITAN-BENNETT Ventilator 740/760, 840
  - Evita 4/Evita XL/Evita 2 dura
  - VELIA, ASTRAL, VS ULTRA
- Wired network (DS-LANII/DS-LANIII) is possible via the Ethernet LAN cable.
  DS-LAN II is a network based on 10BASE-T with transmission speed of 10 Mbps and maximum transmission distance of 100 m. DS-LANIII is a network based on 100BASE-TX with transmission speed of 100 Mbps and maximum transmission distance of 100 m.
- Wireless network construction is possible using the optional telemetry transmitter module (HLX-801 (FA), HLX-801 (G)).
- By using the optional Multi Module (HM-800), the monitoring parameters can be added. To use the expansion module, optional IB-8004 Input Box is required.
- By using the optional Recorder Unit (HR-800), the measurement data can be printed.
- By connecting the optional Multigas Unit (MGU-800/810 series), CO_2 concentration, anesthetic gas

concentration, O_2 measurement, N_2O concentration can be measured. The following anesthetic agents can be measured.

- Halothane
- Isoflurane
- Sevoflurane
- Enflurane
- Desflurane

- By connecting the Gas Unit I/F (HPD-800/HPD-810) or CO_2 Gas Unit (HCP-800/HCP-810), CO_2 concentration can be measured.
- By using the HP-800 Multiport Module, or by connecting the FLOW-i Anesthesia Delivery System to Status II port or to COM1 to COM4 port on the main unit, CO_2 concentration, anesthetic gas concentration (ISO, SEV, DES), O_2 concentration, N_2O concentration, airway flow, airway pressure waveform, minute ventilation, airway resistance, etc. can be monitored.
- By using the HP-800 Multiport Module, or connecting the Oximeter to Status II port or to COM 1 to 4 port on the main unit, SvO_2, CO, etc. can be monitored. The following Oximeter/CCO measurement device can be connected.
  - Vigilance
  - Vigilance CEDV
  - Vigilance II
  - Vigileo (Edwards Lifesciences)
  - PiCCO2
  - PulsioFlex (connects to COM1 to COM4 port)
- By using the HP-800 Multiport Module, or by connecting the A-2000 BIS Monitor/A-3000 BIS Vista (Covidien) to Status II port or to COM1 to COM4 port on the main unit, the patient's wakeful state can be monitored.
- By using the HP-800 Multiport Module, or by connecting the INVOS 5100C Cerebral Oximeter (Covidien) to Status II port or to COM1 to COM4 port on the main unit, regional cerebral oxygen saturation data can be monitored.
- By connecting the BISx (Covidien) using the HBX-800 BIS I/F Unit, 2 channels of EEG waveforms, and BIS, SQI, SR, EMG data can be monitored.
- By connecting the following transcutaneous blood gas monitors to COM1 to COM4 ports, transcutaneous blood gas partial pressure can be monitored.
  - TCM4
  - TCM5 FLEX

Menu Configurations

The menu configuration of this equipment 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	Initial settings menu will be displayed.
Maintenance	Maintenance menu will be displayed.

REFERENCE

- Other than the "Initial Settings", the items to be displayed on the menu screen can be customized by groups.
  (☞Maintenance Manual "Menu Setup" P5-20)

❑Admit/Discharge

Admit/Discharge	Mode Selection
	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., Waveform (Sweep Speed), Waveform (Zoom), Short Trend, User Key
Manual Printing	Basic (Printer, Waveform, Print Duration, Delay Time), 12-Lead (12-Lead Waveform Format, 12-Lead Analysis Result Format, Position, Wave Format, Print Calibration, Printer Auto Scale, Lead Boundary), Other Setup (Graphic Printing, Recall Printing), Common (QRS Classific., Speed, Calibration: Print Calibration, Print 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)
Tone/Volume	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, All Auto
Circulatory	Alarms for HR, Ext Tachy, Ext Brady, PR, SpO_2, Ext SpO_2, NIBP, BP,TEMP can be set.
	Alarm Suspend, Mode Select, Print, All Auto
Respiratory/Gas	Alarm for RR, APNEA and gas can be set.
	Alarm Suspend, Mode Select, Print, All Auto
Arrhythmia	Arrhythmia Alarm, Detail Setup
ST	ST Alarm, Waveform Review (ST), Update Ref. Wave
List	List of alarm ON/OFF setting and lower/upper limits, Meas. List/All List, Print Setup, Recall Setup
Detail Setup	Alarm Suspend Time, Alarm Silence Time, Alarm Silence, Alarm Sound Suspend, Status Alarm Control, Alarm Limit Display

❑Parameter

ECG		Arrhy., Arrhy. Alarm Setup, ST Setup, HR
		Size, Lead, Optimize Size, Alarm Assist, Disp. ON/OFF
		Detail Setup (Filter, Synchronized Mark/Tone, Pacemaker, Pacemaker Pulse, Pace Pulse Mask Time, HR Average, HR Delay, 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 Synchronized Mark, RR/APNEA Alarm Source), Impedance Setup (CVA Detect, Impedance Measurement, Impedance Detection Lead, RR, APNEA, Alarm Assist, Disp. ON/OFF
NIBP		Patient Classification, Dyna Alert, Oscillograph, 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, Periodic Measurement Starting Time, Alarm Assist, Cancel Error, Oscill. Print
BP		BP Zero (BP1 to BP8)
		Scale Selection, Label, Detail Setup (Synchronized Mark/Tone, Display Type, Wave Filter, Mean Wave, Respiration Filter, IBP Analog Output, Alarm during NIBP, ART Catheter Check Message), Alarm Assist, Disp. ON/OFF
SpO_2		Size, Label, Alarm Assist, Disp. ON/OFF
	HS-83xxN/HG-820	Detail Setup (Alarm during NIBP, Synchronized Mark/Tone, Second Alarm)
	HS-83xxM/HG-810	Detail Setup (Alarm during NIBP, Synchronized Mark/Tone, SpO_2 Averaging, Pulse Sensitivity, FAST SAT, PI Display, Signal IQ Wave)
Sp*		SpCO, SpMet, SpHb Setup
TEMP		Label, ΔT Setting, Alarm Assist, T1 to T8 Disp. ON/OFF
GAS		Scale, Gas Calibration, Detail Setup (Flow Rate, Wave Clip, CO_2 Source Priority)
CO_2		Cal Airway Adpt, Scale, Detail Setup($EtCO_2$ Peak Duration, N_2O Comp., Atmos. Pressure, O_2 Comp., Anesthetic Comp, CO_2 Source Priority), Alarm Assist, Disp. ON
BIS		Scale, Common Setup (Short Trend 2nd Parameter, Smoothing Rate, Continuous Impedance Check, EEG Filter), Trend E
External Device		SvO_2/CCO, VENT, INVOS

❑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, Setup, Delete Sel.
OCRG	Latest Data, Resp. Wave, Impedance, Resp. Wave Size, Print
Alarm History	Latest Data, Display Selection, Print

❑Waveform Review

Zoom Wave	Latest Data, Alarm Review, Meas., Print, Delete
ST	ST Waveform, Reference Waveform, Setup, Slide Show, Size, Latest Data, Print
12-lead	Latest Data, Review, Start Analyze, Setup, Print
Full Disclosure Waveform	Latest Data, Alarm Review, Slide Show, Time Search, Size/Scale, Setup, Alarm Display, Print

❑Calculation

Hemodynamics	Input Data, Edit, calculation results list, New Regist., Index Display, Print
Lung Function	Input Data, Edit, calculation results list, New Regist., Index Display, Print
CO	Meas., Edit, Setup, Hemodynamics, Average CO Input, Delete Sel.
Drug Calculation	Drug, Drug Amount, Diluent Amount, Flow Rate, Weight

❑Other Bed

Other Bed List	Area Selection (Area 1 to 5), Other Bed Alarm Sound, Alarm Display, Area Setup (Area 1 to 5), Bed List
Other Bed Display	Area Selection (Area 1 to 5), Other Bed Alarm Silence, ON/OFF of menu title display, Waveform Selection

❑Initial Settings

Alarm	-	Alarm System, Basic Alarm Parameter, Asystole, VF, VT Alarm, Oxygenator Mode Setup, Buzzer Tone at Speaker Failure, Suspend Arrhy. Analysis during Noise Interference, Lower Limit for Alarm Volume, Alarm Indicator, Alarm Level, HR/PR Lower Limit during Alarm Auto Setting
Measurement	User Label	BP User Label, TEMP User Label
	Unit	CO_2, BP, CVP, TEMP, ST, Height/Weight
	Other	NIBP Start 5min. early, MAP Calc.(ART, NIBP), Arrhythmia Analysis Filter, Synchronized Mark/Tone Priority, HR/PR Source Priority, Gas Display during Undetected Breath, Catheter Manufacturer for CC Input
User I/F	Display/Print	Date Format, BP Alarm Increment, Trend Clip, BP Printing Scale, Night Mode Cancel, ST Display Lead Setup, VENT Display Parameters, Hemo/ etc. Display Parameters, Auto Display Configuration, Dim All Data Other than Numeric, All Window Opaque, Printer Message Display, Message Icon, Operation Guide Display, Notification when Changing Equipment Configuration, Sync wave size/scale of extended display with main unit, 12-lead Analysis Filter Display, Waveform Size Display, Shift Time (Day Shift, Twilight Shift, Night Shift), Key Group Setup, Event Label Setup, RR Alarm Increment, Patient Name on the Information Display Area, External Device Numeric Data Box Operation, Drug Calculation
	Power ON/ Discharge	Check Discharge at Power ON, Discharge Mode, NIBP Resume Auto Mode by Manual Meas., Backup Setting at Power ON/Discharge
	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	Mouse, Auto Erase Window, Auto Minimize
External Device	Main Unit Port HP-800	COM, Status II, U-LINK, COM5, Numbering of HP-800 Ventilator (SV-900, SV-300, SERVO-i/s, SERVO-U/n/air, PB, Evita) , SvO_2/CCO (Vigilance, PiCCO, PulsioFlex), GAS/SPIRO (MGU-800, MGU-810), Other (PC Comm., HLX, Barcode Reader, Magnetic Card Reader, BIS, INVOS, FLOW-i, TCM4/TCM5, PC Comm. (DS-5000)), Trend Data Setup
	Magnetic Card Reader	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)
	Status Output	Alarm Output
	Analog Output	Analog Output Setup, Sync. Signal Output
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	Tele. ON/OFF, Channel/Group ID, Telemetry Wave, CO_2(mmHg) Upper Limit of Transmission
	Unit Module	Multiparameter connector setup of HS-8000, HM-800, channel setup of SpO_2
	Other	AC filter, Extended Display Unit, Search Patient ID, Data Transfer, Data for Transfer, Numeric Data External Output
User Mode Registration	-	Register, change or initialize the setting of user mode
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, CF Card/SD Card, GAS Accuracy Check, Parts Usage Time, Install, Module Install, Test Menu

Chapter 2 Name of Parts and Their Functions

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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.

Main Unit: DSC-8500 series

*The illustration is DS-8500 attached to the optional DS-8500 Main Unit Stand (OAO-44A).

❑Front Side

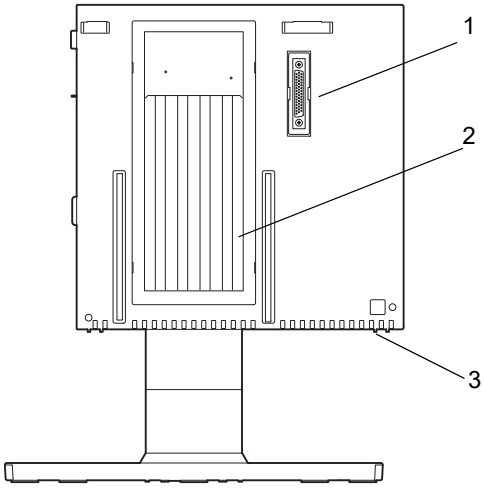
1 Display Unit Connector

Connects the display unit.

2 Display Unit Attaching Position

Attach the display unit (LC-8019T/LC-8019TC/LC-8015T/LC-8015TC).

3 Speaker



❑Rear Side

1 Power Supply Connector (with fuse holder)

Connects the power supply cable.
(Fuse is installed inside the holder.)

2 Power Supply Switch

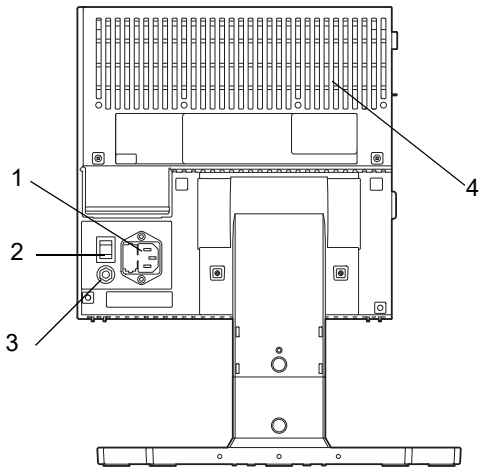
Turns ON/OFF the monitor power.

3 Potential Equalization Terminal

Used for equipotential connection.

4 HLX Fixing Position

Fixes the Telemetry Transmitter Module.



❑Right Side

1 Serial Connector (COM5)

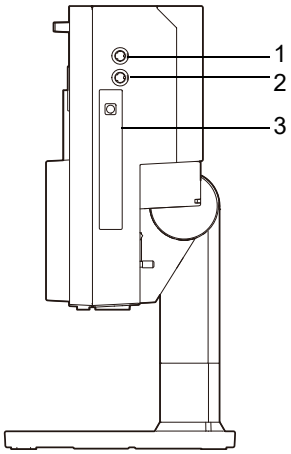
Connects the specified equipment.

2 External Equipment Connector (AUX)

Connects the specified equipment.

3 Battery Cover

Stores the battery for the backup memory.



❑Left Side

1 Serial Connector (COM1 to 4)

Connects the specified equipment.

2 Status Input/Output Connector

Connects the specified equipment.

3 I/O Connector (ALARM)
(DSC-8530 only, otherwise optional)

Connects the specified equipment.

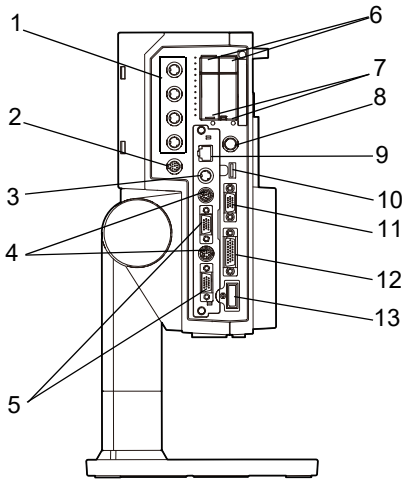
4 Serial Connector (COM A, B)
(DSC-8530 only, otherwise optional)

Connects the specified equipment.

5 Extended Display Unit Connector
(DSC-8530 only, otherwise optional)

Connects the specified equipment.

6 CF Card Slot



Insert the specified CF memory card here.

7 CF Card Access Indicator

Indicates CF card access status.

8 DS-LAN Connector

Connects to the wired network using the Branch Cable (CJ-522).

9 LAN (TCP/IP) Connector
(DSC-8530 only, otherwise optional)

Connects the specified equipment.

10 I/O Connector

Connects the specified equipment.

11 External Monitor Connector

Connects the external monitor.

12 U-LINK Connector

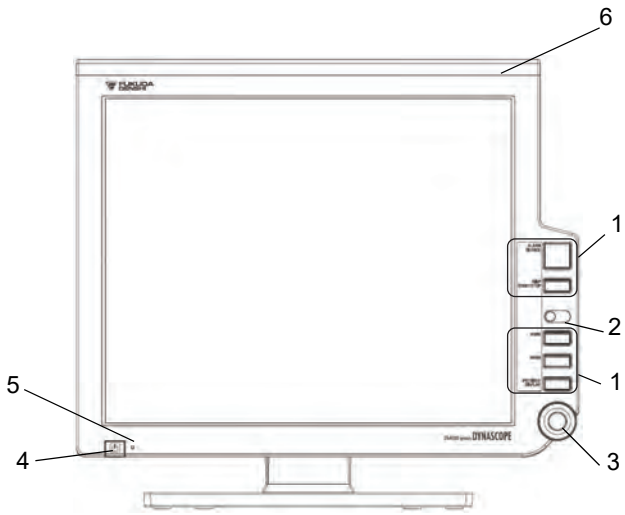
Connects the HR-800 Recorder Unit and MGU-800/810 series Multigas Unit.

13 module-LAN Connector

Connects the HSA-80 HS Adapter or the IB-8004 Input Box.

Display Unit: LC-8019T/8019TC (19 inch) LC-8015T/8015TC (15 inch)

❑Front Side



1 Fixed Keys

(☞"Fixed Keys" P3-1)

2 IR Remote Control Sensor

Receives the signal from the specified IR remote control.

3 Jog Dial

Allows key control.

4 Standby Switch

Sets ON/OFF the Standby Mode.

5 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: In standby mode
- Green: In normal operation
- Red: Operation error

Extinguishes when the AC power is not supplied to the main unit.

6 Alarm Indicator

❑Rear Side

1 Main Unit Connector

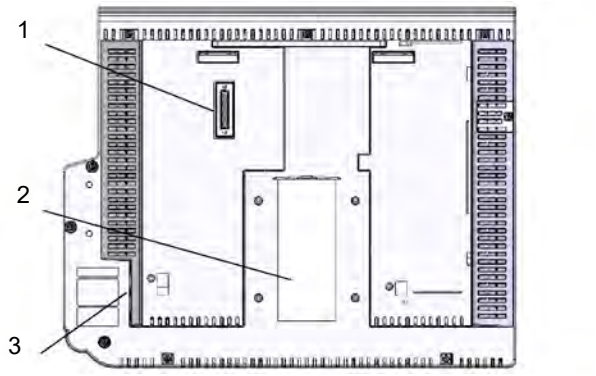
Connects to the DSC-8500 series Main Unit.

2 Display Unit Attaching Position

Fixates the display unit to the main unit.

3 Mouse/Keyboard Connection Connector

Connects the optional mouse (PS2).

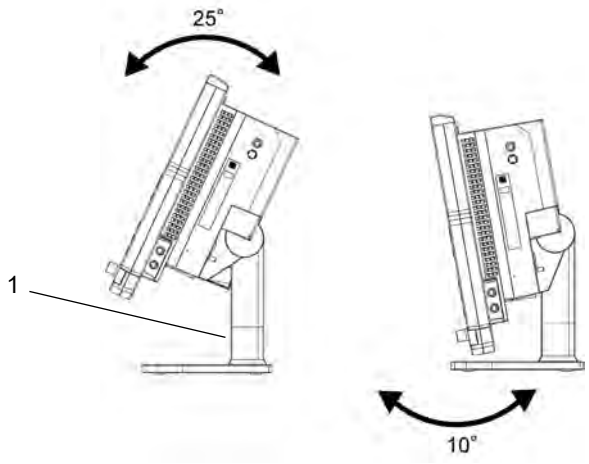


❑Adjusting the angle of the display unit

⚠ CAUTION

- When adjusting the angle of the display unit, pay attention not to have your hands get caught in between.

The display unit angle can be adjusted with the optional DS-8500 Main Unit Stand (OAO-44A). The adjustment range is 25 ° upward and 10° downward.



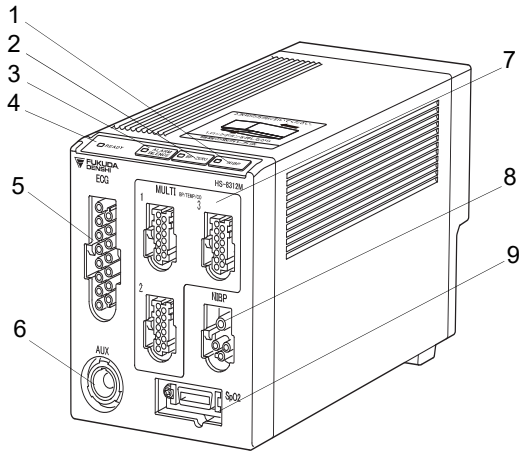
1 DS-8500 Main Unit Stand (OAO-44A: option)

⚠ 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 your nearest service representative.

Super Unit: HS-8000 Series

❑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), CO_2 Gas Unit (HCP-800/HCP-810), or BISx I/F Unit (HBX-800).

7 Multiparameter Connector

Connects the input cables for BP, TEMP or CO.

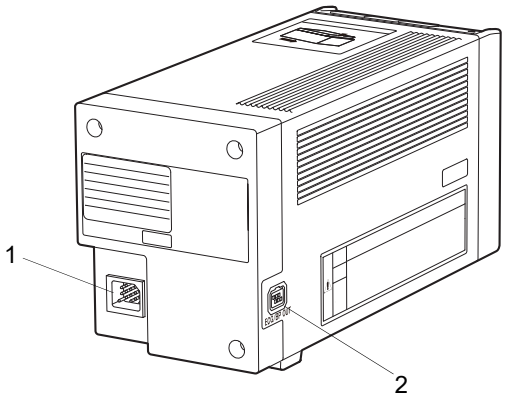
8 NIBP Connector

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 HSA-80 HS Adapter.

2 Analog Output Connector

Outputs the ECG and BP waveforms.

HS Adapter: HSA-80

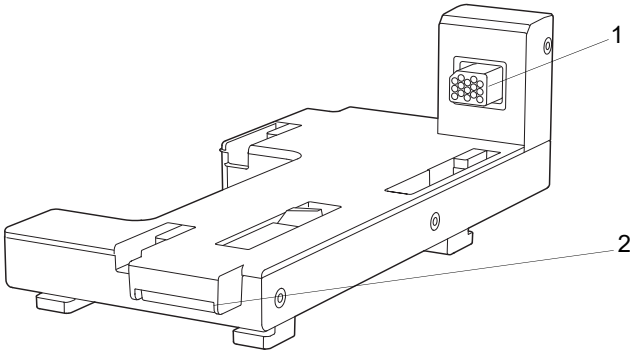
❑Front Side

1 Super Unit Connector

Connects the HS-8000 series.

2 Release Lever

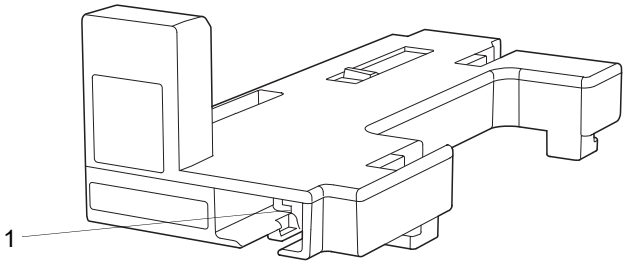
Releases the HS-8000 series from the HS Adapter.



❑Rear Side

1 module-LAN Connector

Connects the Main Unit (DSC-8500 Series) or IB-8004.



Adapter for DS-8007: DSA-82

1 DS I/F Connector

Connects the DSA-82 to the DS-8007.

2 DS-8007/HS-8000 Switch

This is a switch to change between DS-8007 and HS-8000.The selected unit and the host monitor will communicate.The LED for the selected unit will light in green.Switching to the left will communicate with the DS-8007.Switching to the right will communicate with the HS-8000.

3 Lock Lever

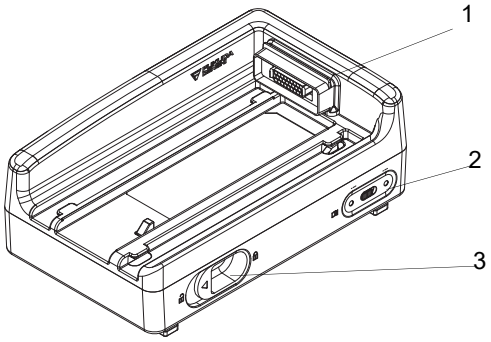
Lever to release the DS-8007 series from the DSA-82

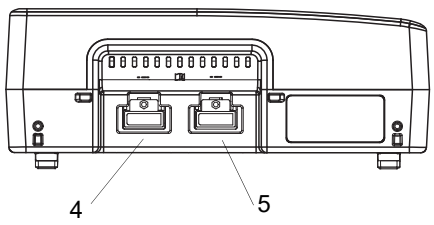
4 Host Monitor Connector

Connects the host monitor.

5 HS-8000 Connector

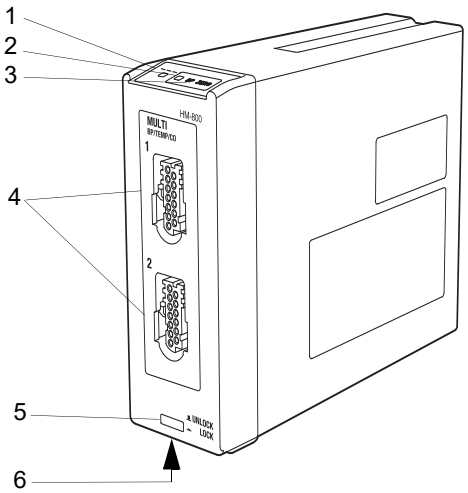
Connects the HS-8000 via HSA-80.





Multi Module: HM-800

❑Front Side



1 Power Supply Indicator

Indicates the power status.

2 BP Zero Balance Indicator

Lights during BP zero balancing.

3 BP Zero Balance Key

Starts BP zero balance.

4 Multiparameter Connector

Connects the relay cables for BP, TEMP or CO.

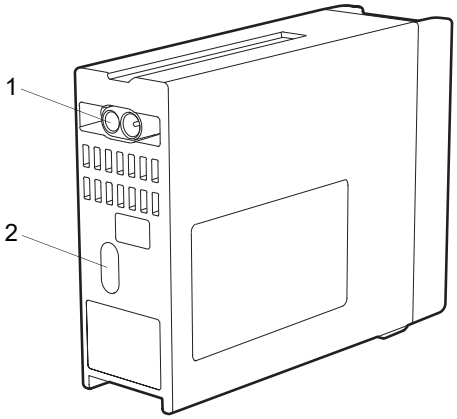
5 Release Lock Button

Press to lock the release lever.

6 Release Lever

Press here to remove the expansion modules from the Input Box.

❑Rear Side



1 Power Input Connector

Supplies power while connecting to the Input Box.

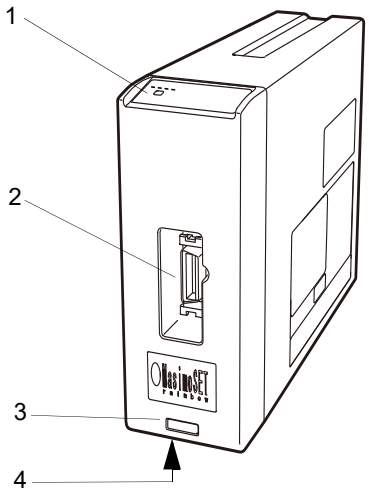
2 Infrared Communication Port

Communicates with the Input Box via IrDA.

SpO_2 Module (HG-810/HG-820)

There are HG-810 (Masimo model) and HG-820 (Nellcor model) for the SpO_2 modules. The following shows the example of HG-810.

❑Front Side



1 Power Supply LED

Indicates the power ON/OFF status.

2 SpO_2 Connector

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

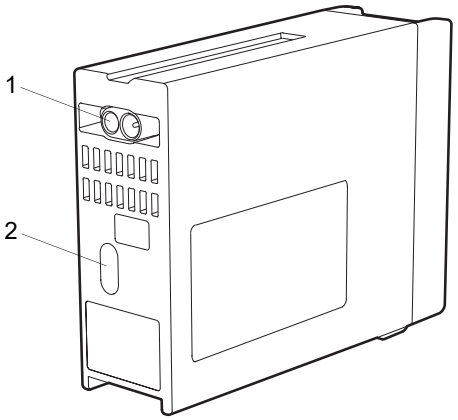
3 Release Lock Button

Press to lock the release lever.

4 Release Lever

Press here to remove the expansion modules from the input box.

❑Rear Side



1 Power Input Connector

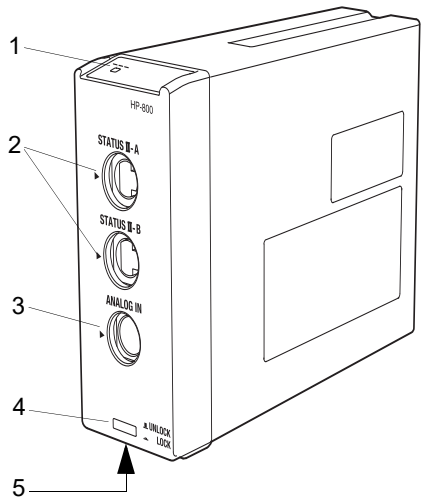
Supplies power while connecting to the input box.

2 Infrared Communication Port

Communicates with the input box via IrDA.

Multiport Module: HP-800

❑Front Side



1 Power Supply Indicator

Indicates the power status.

2 Status Input/Output Connector

Performs serial communication with the external device, and inputs the alarm status of the external device.

3 Analog Input Connector

Inputs analog signal of the external device.

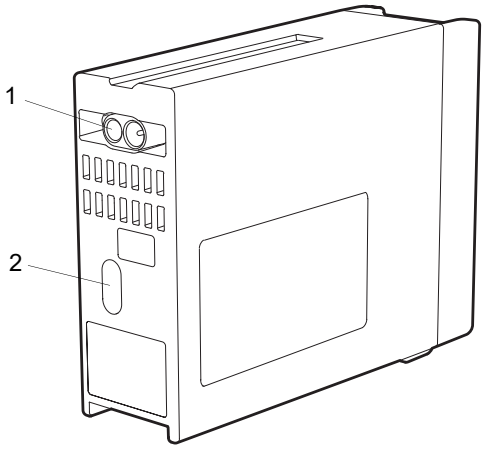
4 Release Lock Button

Press to lock the release lever.

5 Release Lever

Press here to remove the expansion modules from the Input Box.

❑Rear Side



1 Power Input Connector

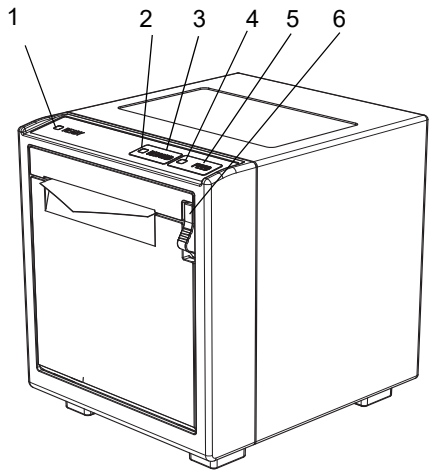
Supplies power while connecting to the Input Box.

2 Infrared Communication Port

Communicates with the Input Box via IrDA.

Recorder Unit: HR-800

❑Front Side



1 Power Supply Indicator
Indicates the power status.

2 Printing Indicator
Lights during printing.

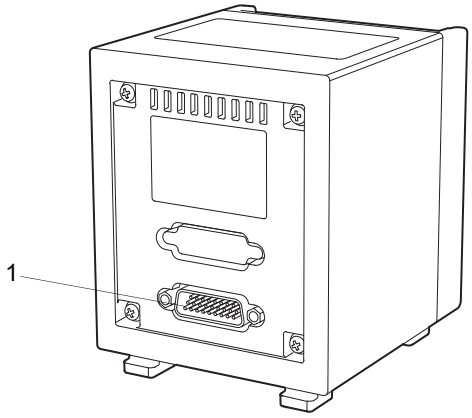
3 Print Key
Starts/stops the printing.

4 Paper Feed Indicator
Lights during paper feeding.

5 Paper Feed Key
Feeds the paper.

6 Open/Close Lever
Press to open the paper holder.

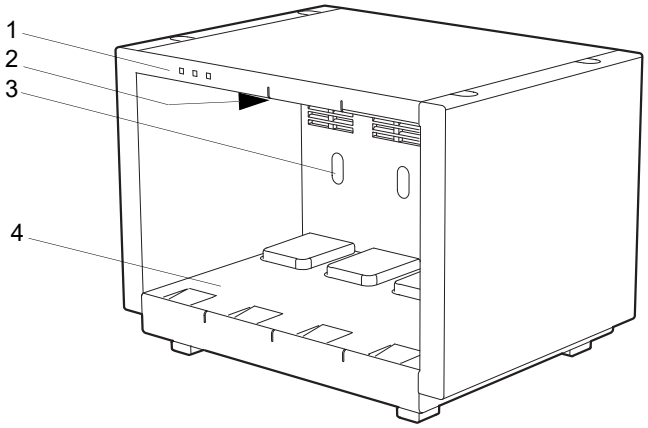
❑Rear Side



1 U-LINK Connector
Connects to the MGU-800/810 series Multigas Unit or Main Unit (DSC-8500 Series).

Input Box: IB-8004

❑Front Side



1 LAN-ID Setting Indicator
Indicates the assigned LAN-ID.

2 Power Output Connector
Supplies power to the expansion module.

3 Infrared Communication Port
Communicates with the expansion module via IrDA.

4 Expansion Module Connection Slot
Connects maximum of 4 expansion modules to slot 1 to 4.

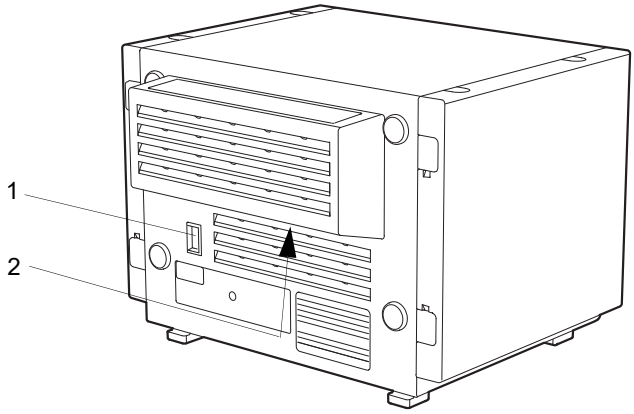
❑Rear Side

1 LAN ID Setting Dial

Sets the LAN ID to 1 or 2.

2 module-LAN Connector x3

Connects the Main Unit (DSC-8500 Series), IB-8004, or HSA-80 HS Adapter.



REFERENCE

- For the connection procedure, refer to the operation manual of the IB-8004.

CO_2 Gas Unit: HCP-800

❑Front Side

1 Power Supply LED

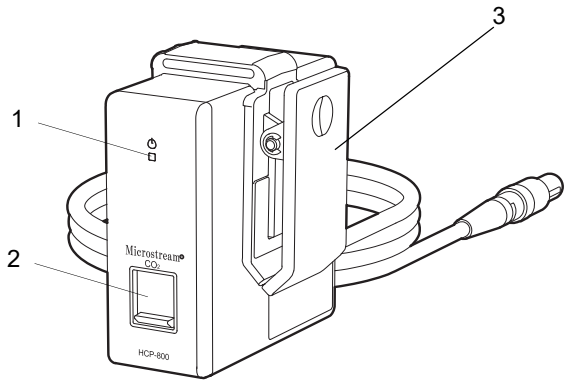
Indicates the power ON/OFF status. It will light in green while the power is ON.

2 Sampling Tube Connector

Connects the sampling tube manufactured by Covidien.

3 Clip

Attaches to the bedside rail or headboard for bedside use.



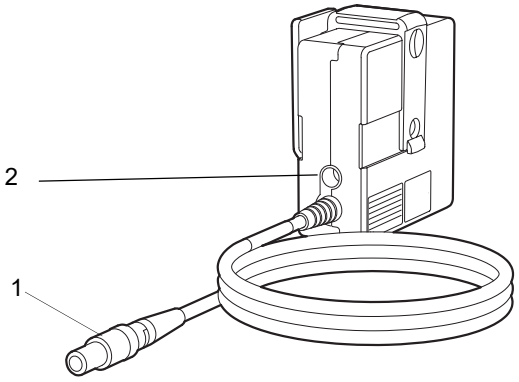
❑Rear Side

1 AUX connection cable

Connects to the AUX connector of the HS-8000.

2 Exhaust Hole

Connects the gas exhaust system and exhausts sampling gas.



⚠ CAUTION

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

CO_2 Gas Unit: HCP-810

❑Front Side

1 Power Supply LED

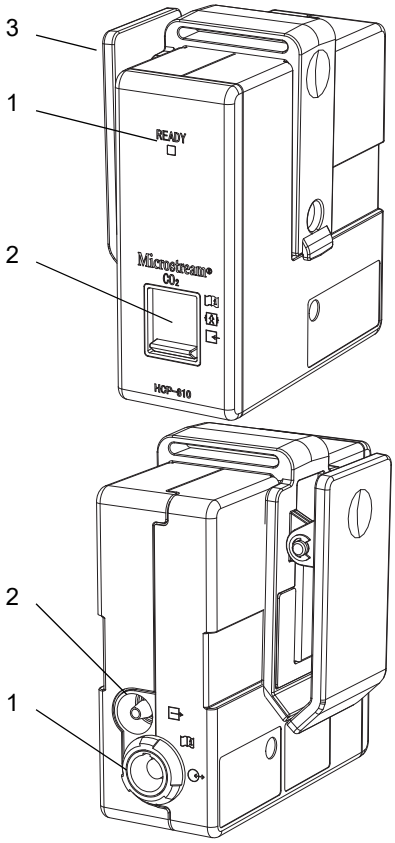
Indicates the power ON/OFF status. It will light in green while the power is ON.

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

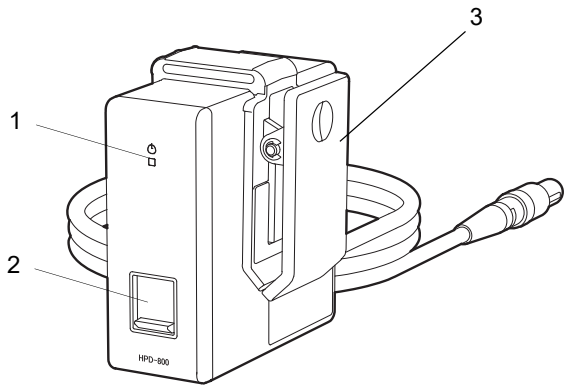
- The usable AUX connection cable differs depending on the connecting equipment. For the combination of the AUX connection cable and the connecting equipment, refer to the section on "Optional Accessories".

⚠ CAUTION

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

Gas Unit I/F: HPD-800

❑Front Side



1 Power Supply LED

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

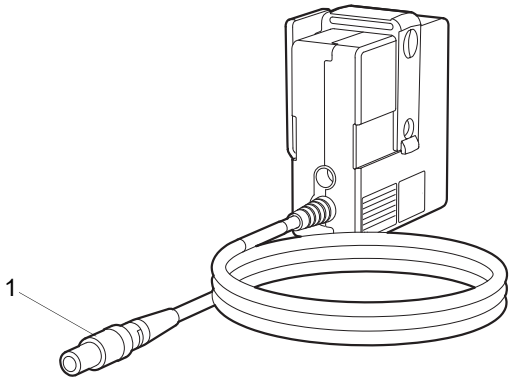
2 CO_2 Connector

Connects to the Capnostat 5 (Philips).

3 Clip

Attaches to the bedside rail or headboard for bedside use.

❑Rear Side

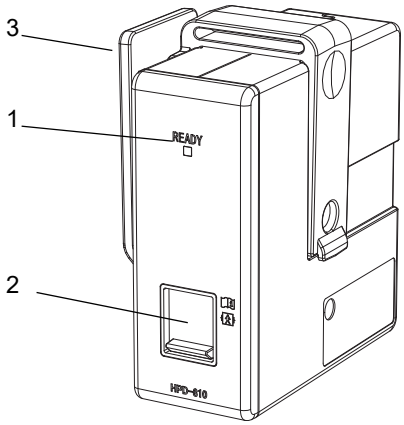


1 AUX Connection Cable

Connects to the AUX connector of the HS-8000.

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).

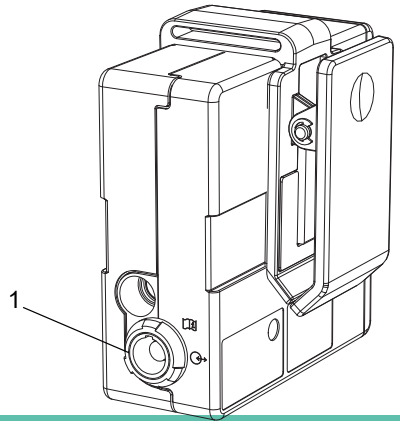
3 Clip

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".

BISx I/F Unit: HBX-800

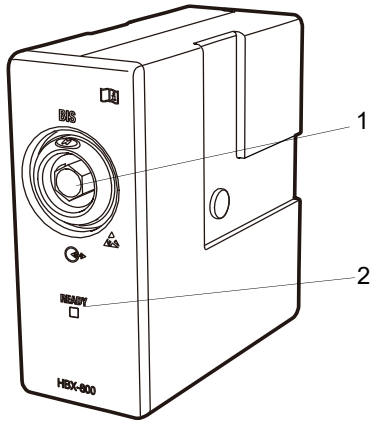
❑Front Side

1 BISx Module Connector

Connects the BISx (Covidien).

2 Power Supply LED

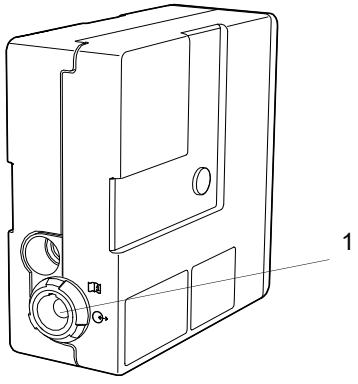
Indicates the power ON/OFF status.
Lights in orange when the power is ON, and BISx is not connected.Lights in green when the BISx is connected.



❑Rear Side

1 AUX Connector

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

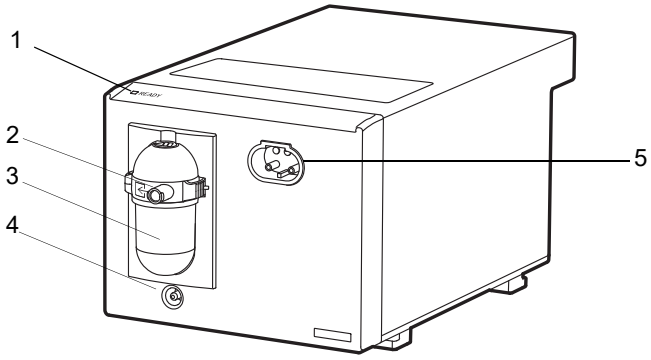


NOTE

- 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".

Multigas Unit: MGU-800/810 Series

❑Front Side (MGU-801P/MGU-802/MGU-803/MGU-811P/MGU-812/MGU-813)



1 Power Supply LED

Indicates the power ON/OFF status.

2 Inhale Port

Connects the sampling tube to inhale sampling gas.

3 Water Trap with Reservoir

Removes the water from the sampling tube connected to the patient. When the reservoir is more than half full with water, empty the water. (☞Maintenance Manual "Water Trap (Multigas Unit)" P8-5)

4 Exhaust Hole

Connects gas exhaust system and exhausts sampling gas.

⚠ WARNING

- To protect the hospital staffs from unnecessary anesthetic agent, it is strongly recommended to connect the exhaust hole to the gas exhaust system in the hospital.

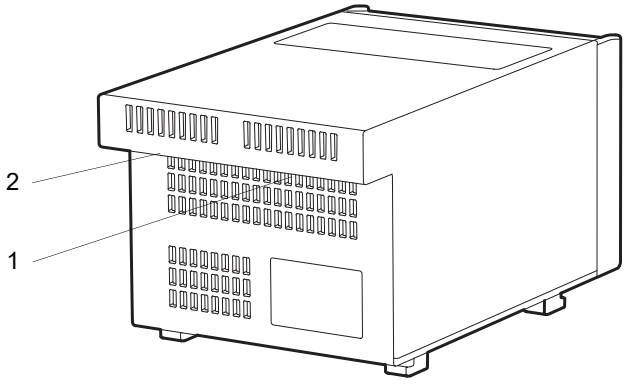
⚠ CAUTION

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

5 Flow Sensor Connector (For MGU-810 series only)

Connects the flow sensor cable.

❑Rear Side



1 External Equipment Connector 1

Connects the main unit.

2 External Equipment Connector 2

Connects the Recorder Unit (HR-800).

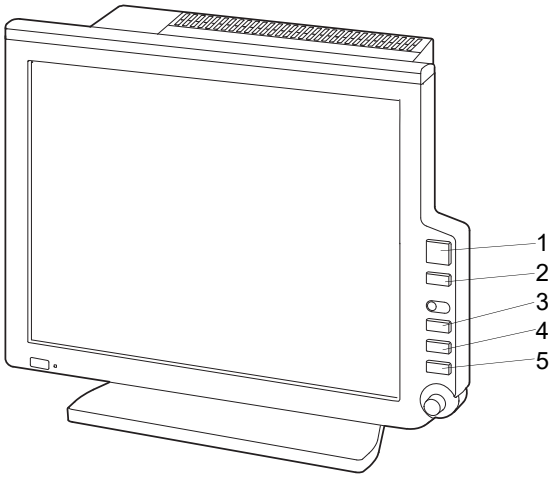
Chapter 3 Operation Procedure and Screen Examples

Chapter 3 Operation Procedure and Screen Examples

Operation Procedure

All operation of this equipment is performed using fixed keys, touch screen, jog dial and mouse (optional). Remote control is also possible using the remote control unit (optional).

Fixed Keys



1 Alarm Silence Key

Uses to silence the alarm.

2 NIBP Start/Stop Key

Starts/stops the NIBP measurement.

Stops the measurement if pressed while measurement is in progress.

3 Home Key

The home display will be displayed.

4 Menu Key

The menu screen will be displayed.

5 Previous Display

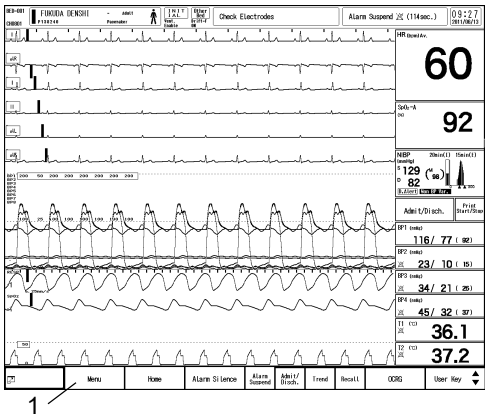
Displays the previous display.

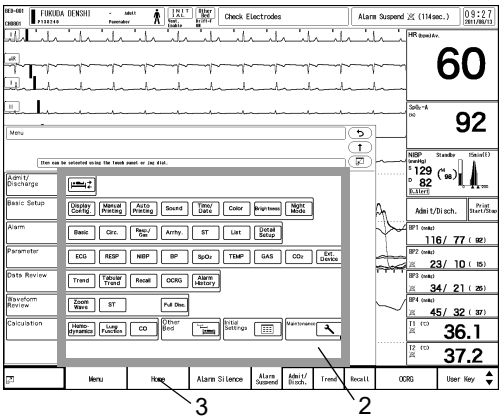
Touch Key

CAUTION

- Do not use the touch panel with the film attached. It may cause malfunction or damage the touch panel.
- 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] or the fixed key will switch the screen with a pip sound.

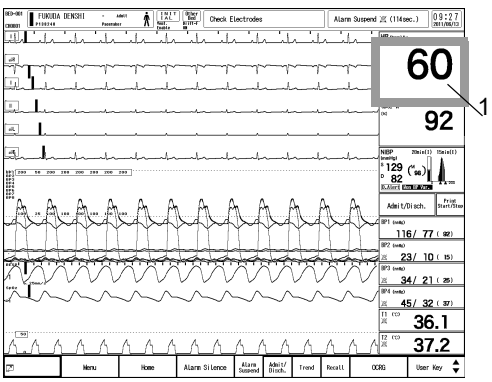
2 The touch key will respond by pressing any part of the key.

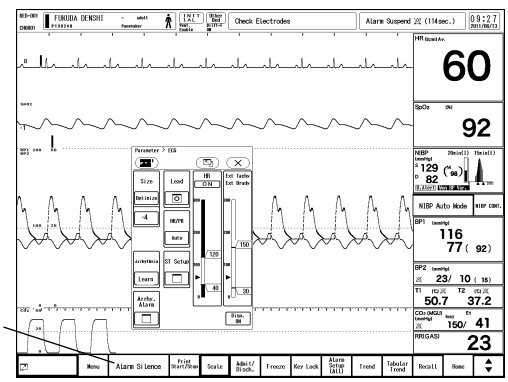
3 Pressing the [Home] key (fixed key or user key) at any time will return the display to the home display.

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" P10-7)

❑Key Control for Each Parameter





1 Press the numeric data box area.
The touch key will respond by pressing any part of the numeric data box.

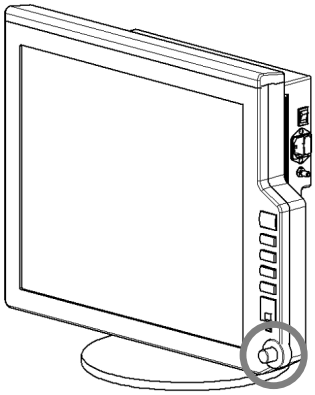
2 Pressing the [Home] key (fixed key or user key) at any time will return the display to the home display.

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" P3-30)

Jog Dial

The jog dial can be used for menu operation.



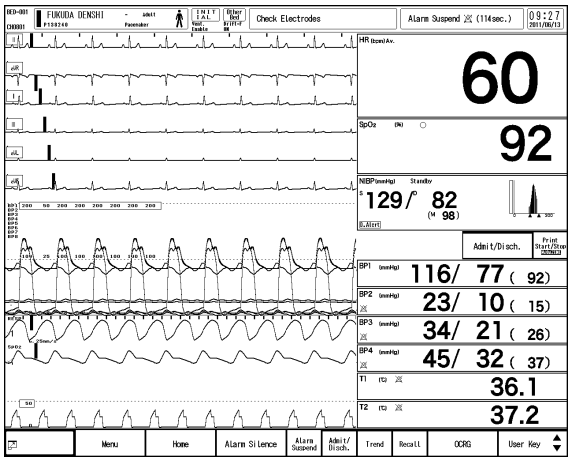
When the home display is displayed, the jog dial marker (i.e. a blue frame indicating the operation target of the jog dial) will not be displayed.

Turning or pressing the jog dial while the jog dial marker is hidden will make the jog dial marker appear on the screen.

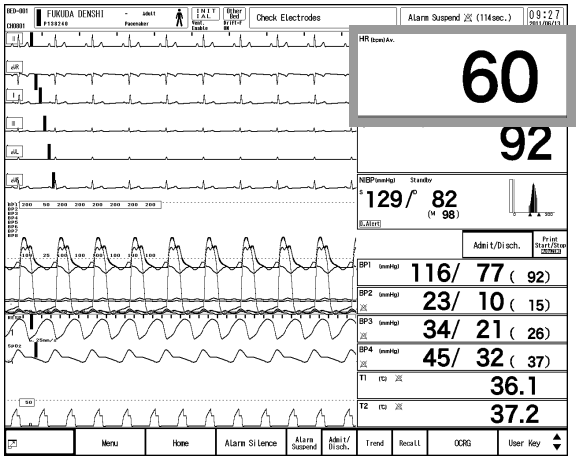
Pressing the jog dial while the jog dial marker is visible will perform the same operation as pressing the marker on the display.

The jog dial marker on the home display will be hidden if no operation is performed for 30 seconds.

❑Home Display

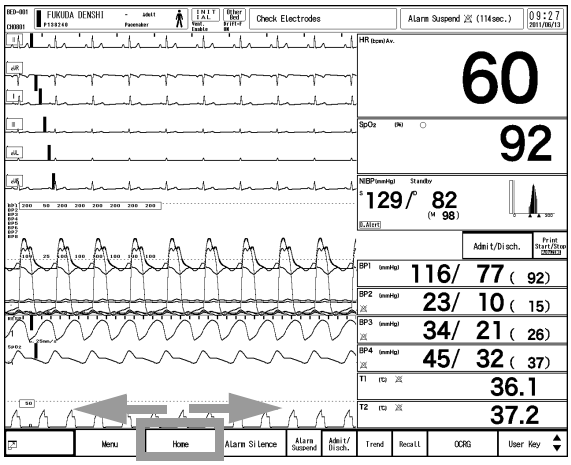


Jog dial marker is hidden



Jog dial marker is visible

Turning the jog dial while the jog dial marker is visible will cause the jog dial marker to move to left and right.

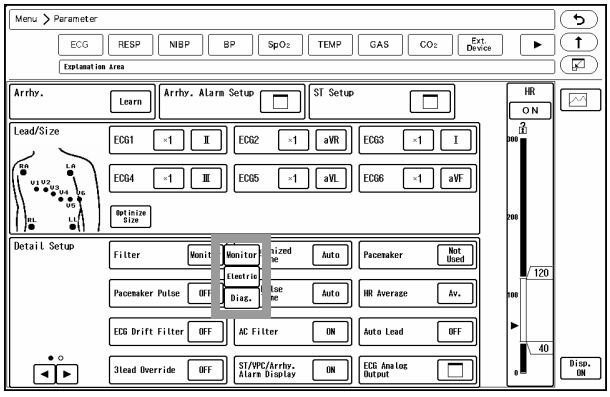


Turning the jog dial will perform operations such as changing the selection in the dropdown list or increasing/ decreasing the alarm threshold.

REFERENCE

- The jog dial on the CF-820 IR Remote Control will function the same as the jog dial on the main unit.

❑Example of Item Selection Operation



1 Set the jog dial marker to [Monitor] on the "Filter mode".

2 Press the jog dial.

▸ The filter mode dropdown list will be displayed and the jog dial marker will move into the selection list.

3 Turn the jog dial to set the jog dial marker on the mode to be set.

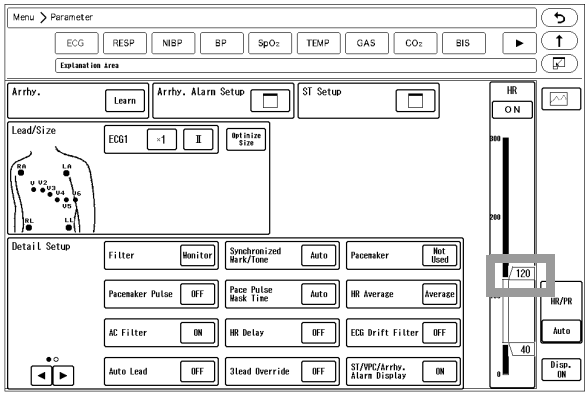
4 Press the jog dial.

▸ The dropdown list will be closed and the filter mode will be switched.

CAUTION

- Note that moving the jog dial marker in the dropdown list does not select any setup item. To select an item, press the jog dial.
- Pressing the other key while the dropdown list is displayed will close the list.

❑Example of Alarm Threshold Changing Operation



1 Set the jog dial marker to the upper limit "120".

2 Press the jog dial.

▸ The display will switch to threshold setting mode.

3 Turn the jog dial to change the upper threshold limit.

4 Press the jog dial.

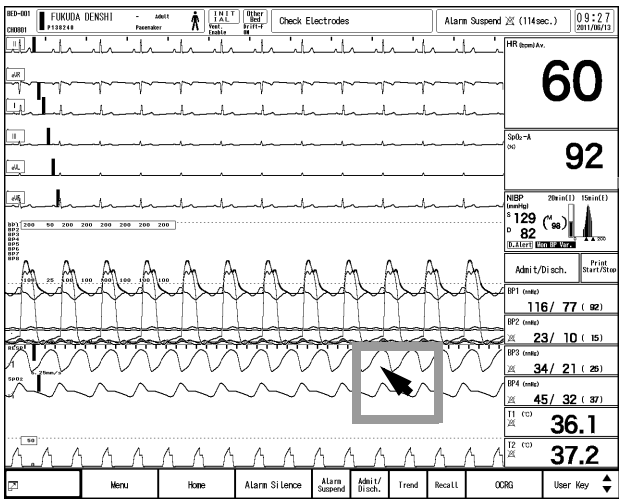
▸ The screen will return to the mode in which the jog dial marker can be moved.

⚠ CAUTION

- The alarm limit changed by turning the jog dial will become effective without pressing the jog dial.

Mouse

An optional mouse can be connected allowing touch key control using the mouse.
By moving the pointer on the displayed keys, and left-clicking the mouse, the operation can be performed just the same as by directly touching the displayed keys.



The pointer will be hidden if the mouse is not used for 5 minutes. (default operation)
The hidden mouse pointer will be displayed again by moving the mouse.

NOTE

- It is necessary to set the mouse function (ON/OFF, pointer shape, moving speed) in advance.
  (☞Maintenance Manual "Operation Related Setup" P5-25)

Home Display

About the Home Display

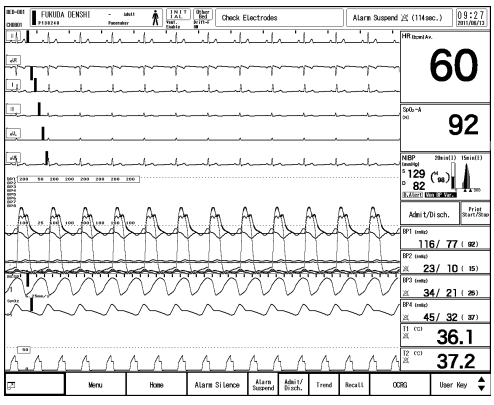
The display can be configured according to the monitoring purpose.

There are 4 types of basic display layout, which are "Standard", "Large", "12-Lead", and "Bottom".
"Standard" is the most basic layout.
"Large" is the layout with enlarged numeric data box which will be enlarged twice the size compared to "Standard" layout.
"12-Lead" is the layout for monitoring the 12-lead ECG. 12-lead ECG and other waveforms will be displayed.
"Bottom" is the layout with numeric data box at the bottom, which allows large waveform display area.
The numeric data box area can be selected from "Right", "Right&Bottom", "Left", "Left&Bottom", "Bottom".

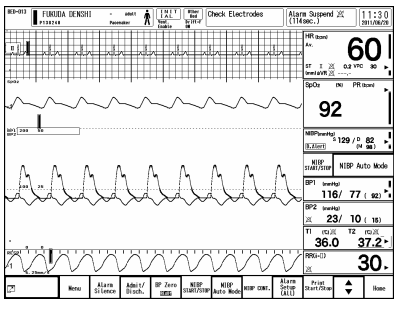
Display Location of Numeric Data	Numeric Data Box Size	Features
Right/Left Right/Left+Bottom	Right/Left: Standard/Large ("Large" can be selected only when 19 inch display unit is used.) Bottom: 1 row/2 rows	The numerical data and waveform can be displayed next to each other. The 12-lead ECG can be displayed in the waveform display area.
Bottom	1 row/2 rows	The waveform display area or numeric data can be enlarged.

If extended board (optional) is equipped, up to 2 extended displays can be used. (extended display function)

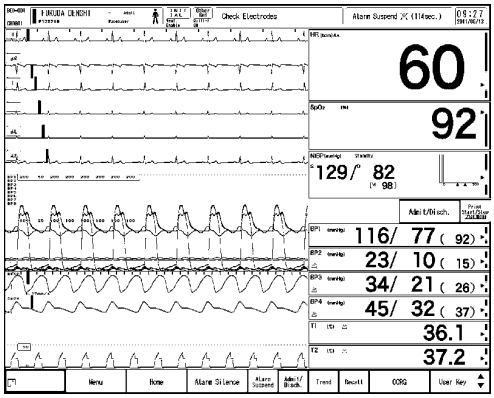
Display Example:



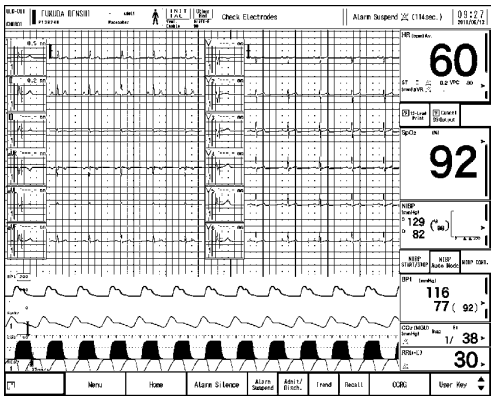
Layout: Standard, Numeric Data: Right (LC-8019T)



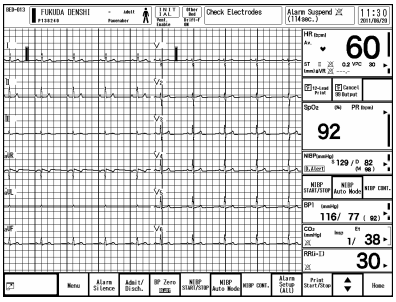
Layout: Standard, Numeric Data: Right (LC-8015T)



Layout: Large, Numeric Data: Right (LC-8019T)



Layout: 12-Lead , Numeric Data: Right (LC-8019T)



Layout: 12-Lead , Numeric Data: Right (LC-8015T)

REFERENCE

- The display layout can be configured/registered according to the monitoring waveform and numeric data as necessary.
  (☞"To Configure the Display" P10-7)

NOTE

- When LC-8015T is used, the layout for enlarged numeric data ("Large") cannot be selected.
- When "12-Lead" is selected for display layout, bottom 2 rows for "Right (Left) & Bottom" cannot be selected. And when bottom 2 rows for "Right (Left) & Bottom" is selected for display layout, "12-Lead" cannot be selected.

❑Oxygenator Mode

⚠ WARNING

- The oxygenator mode is intended to prevent alarms during cardiopulmonary bypass surgery. Pay special attention when using this mode as the alarm generation will not be the same as to the standard monitoring mode.
- If the "Alarm Setting" under the Oxygenator Mode Setup is set to [All OFF], all vital alarm will not generate regardless of the alarm setting of each parameter. Also, if [Sel. Parameter] is set, vital alarm for unselected parameter will not generate. Pay attention to not miss any significant change of the patient's vital sign as the alarms will not be generated during the Oxygenator Mode.
- Once the cardiopulmonary bypass is finished, make sure to cancel the Oxygenator Mode

and return to the standard monitoring mode.

⚠ CAUTION

- If the NIBP alarm is turned OFF under the Oxygenator Mode, NIBP auto mode measurement and NIBP measurement at alarm occurrence will not be performed.

Oxygenator mode can be used to prevent frequent alarm generation when oxygenator is used for extracorporeal circulation during cardiac surgery.
During oxygenator mode, "Oxygenator Mode" will be displayed on the screen, alarm generation will be stopped, and low priority parameter will be displayed with decreased brightness.

The main difference of standard monitoring mode and oxygenator mode is as follows.

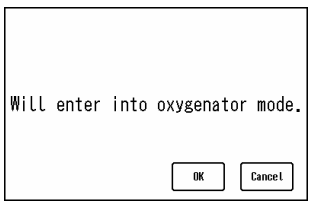
	Standard Monitoring Mode	Oxygenator Mode
Vital Alarm	will be generated.	will not be generated, or only the alarm for specified parameter will be generated.*
Equipment Status Alarm	will be generated.	will be generated for specified parameter.
NIBP Periodic Measurement	will be performed.	If [NIBP] is not selected on Oxygenator Mode Setup, periodic measurement will not be performed. It will not be performed even if NIBP measurement is requested from the central monitor.
Night Mode	Night mode can be used.	Night mode cannot be used.
*It is also possible to set the same alarm function with the standard monitoring mode.		

REFERENCE

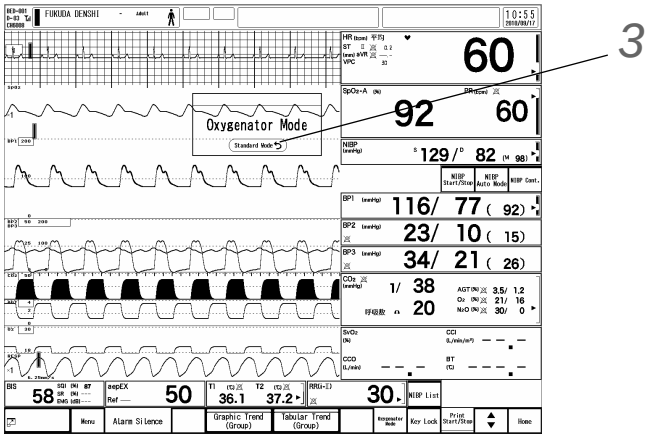
- The oxygenator mode setup can be performed on the "Alarm" screen under "Initial Settings". (☞Maintenance Manual "Alarm Related Setup" P5-5)

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

▸ The confirmation screen will be displayed.



2 Press the [OK] key to change the monitoring mode to oxygenator mode.



3 Press the [Standard Mode] inside the message window to return to the standard monitoring mode.

REFERENCE

- The message window can be dragged to any position within the waveform area.
- The message window will not be displayed by selecting [OFF] for "Oxygenator Mode Message" (Menu>Initial Settings>Oxygenator Mode Setup).

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.

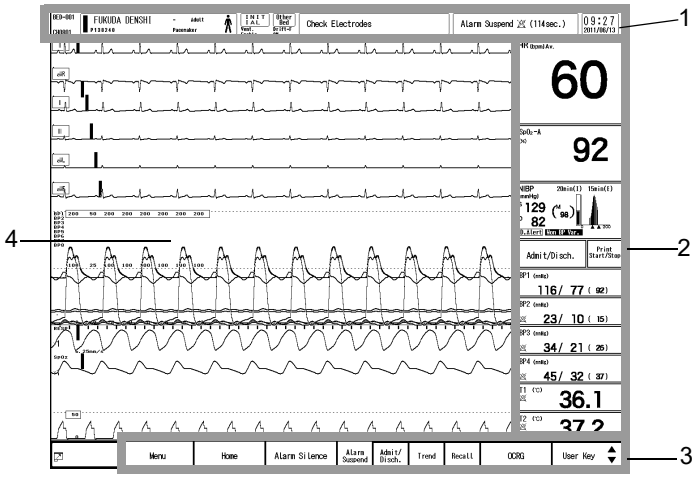
1 Information Display Area

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

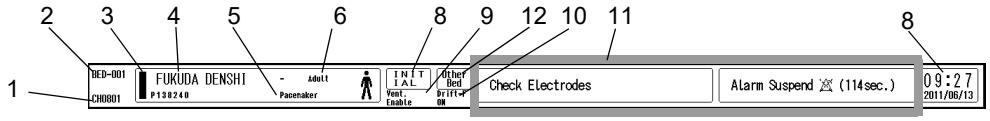
2 Numeric Data Area

3 User Key Area

4 Waveform Area



❑Information Display Area



1 Telemetry Channel (When HLX-801 (FA), HLX-801 (G) is connected)

Displays the telemetry channel ID.

2 Room/Bed ID

Displays the 4-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

The patient name set on the "Admit/Discharge" menu will be displayed.

REFERENCE

- The patient name can be hidden from the display area by selecting [OFF] for "Patient Name on the Information Display Area" (Menu>Initial Settings>User I/F>Display/Print).

5 Pacemaker Usage

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

6 Patient Classification

The patient classification (Adult, Child, Neonate) set on the "Admit/Discharge" menu will be displayed.

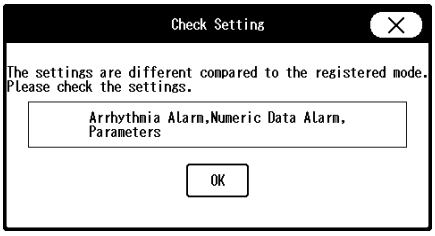
7 Date/Time

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

8 Set Mode

The currently selected user mode will be displayed. Sub mode will be also displayed if selected.

When using the data transfer function with the Super Unit, alarm settings and parameter settings can be also transferred. When the settings are changed by the data transfer function, the mode name will be highlighted to notify that the setting has been changed. Pressing the highlighted mode name will display the confirmation message window (shown on right). Pressing the [OK] key will clear the highlight.



When the alarm settings are changed, the alarm settings list will be displayed.

9 Ventilator Connection Status

Displays the connection status of 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.
No display: Ventilator is not set for "External Device" setting.

10 Drift Filter

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

11 Message Area

When an alarm generates, a message will be displayed.

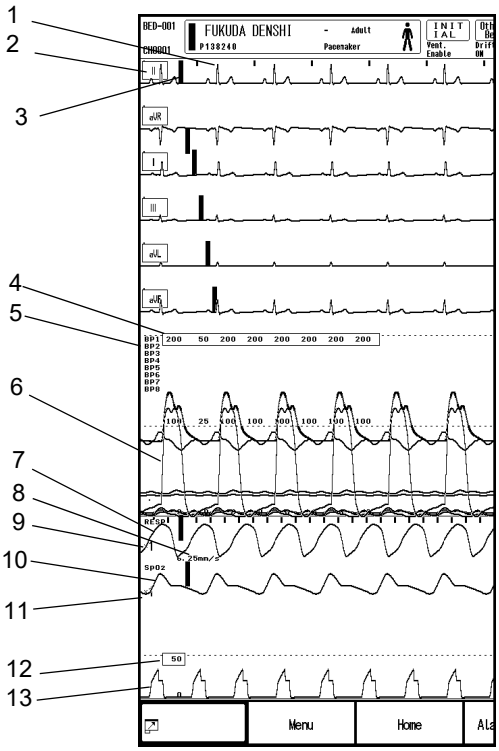
By pressing the message display area, the alarm message history can be verified.

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 display of ECG, RESP, SpO_2 can be selected from [Numeric]/[Bar]/[Bar (10 mm)].
[Initial Settings > User I/F > Display/Print > Waveform Size Display]
(☞Maintenance Manual "Display/Print Setup" P5-14)

4 BP Scale

5 BP Label

6 BP Waveform

7 Respiration Waveform

8 Respiratory Sweep Speed

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

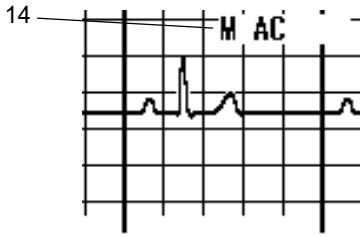
9 Respiration Waveform Size

10 SpO_2 Waveform

11 SpO_2Waveform Size

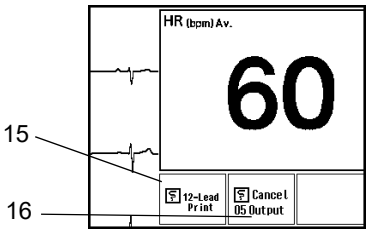
12 CO_2 Scale

13 CO_2 Waveform



14 ECG Drift Filter/AC Filter Display

AC: AC Filter ON, DF: Drift Filter ON
M: Monitor Mode, E: ESIS Mode, D: Diagnosis Mode



15 [12-Lead Print] Key

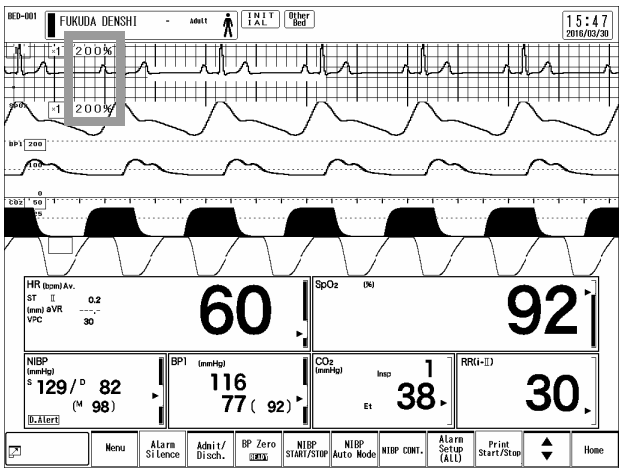
Displayed when ECG 12-lead waveform is displayed. The 12-lead waveform will be output to the bedside monitor printer.
(☞"12-lead Waveform Printing" P9-11)

16 [Cancel Printing] Key

If laser printer is set for the 12-lead waveform output, the printing in progress/standby will be cancelled.

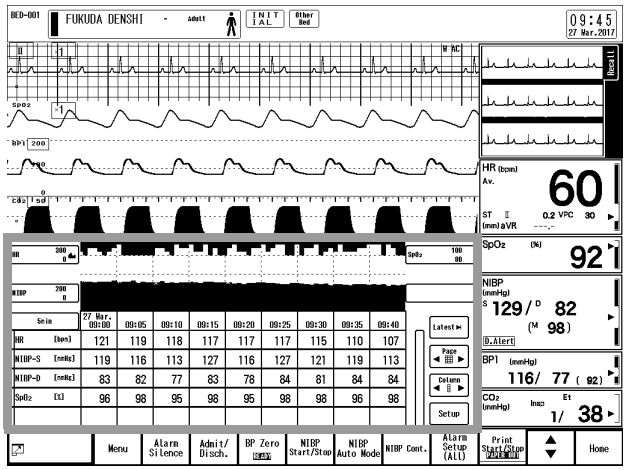
❑Enlarged Waveform

By selecting [ON] for "Zoom" under [Menu>Basic Setup>Display Config.], the waveform display can be enlarged. The waveform display can be enlarged for ECG, pulse wave, and respiration waveforms. <200%> will be displayed for the enlarged waveform. Also, the sweep speed will be doubled.

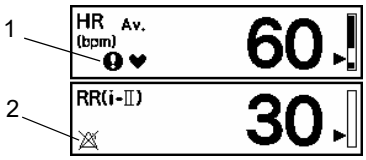


❑Graphic/Tabular Trend Display

By selecting [ON] for "Graphic/Tabular Trend" under [Menu>Basic Setup>Display Config.>Detail Setup], graphic/tabular trend can be displayed below the waveform display area. It cannot be displayed if "Bottom" is set for the display layout.
(☞"Review Function" P8-1)

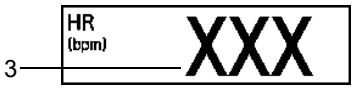


❑Numeric Data Box Display (for all parameters)



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" P5-14)

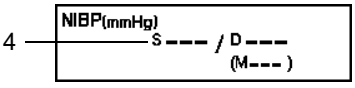


2 Alarm OFF Mark

Indicates that the alarm is set to OFF.

3 Out of Measurement Range (XXX)

Indicates that the measurement is out of range.



4 Measurement Error (---)

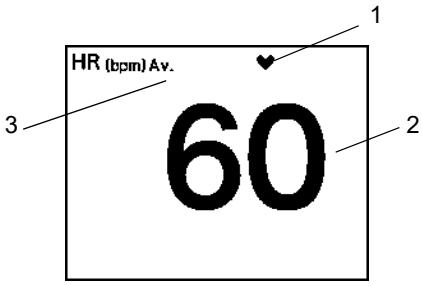
Indicates that the NIBP measurement ended erroneously.

❑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" P10-5)

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.

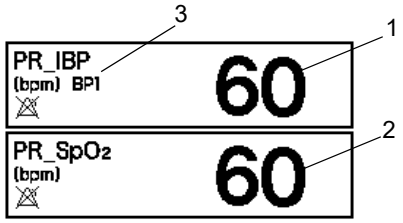
2 HR/PR Value

The HR/PR value will be displayed. When the value exceeds the measurable range, "xxx" will be displayed.

3 HR Average (Instant / Average, or no display)

Displays the averaging method of HR. ("HR Average" setting on ECG setup.)
When the patient classification is [Adult] or [Child], and "HR Delay" is set to [ON], "Inst." or "Av." will not be displayed.

PR, HR/PR

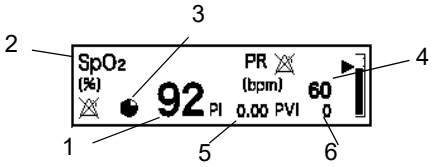


1 Pulse Rate (BP)

2 Pulse Rate (SpO_2)

3 PR_IBP Source

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 function is available on only HS-8312N or HG-820 equipped with SpO_2 Unit manufactured by Nellcor^{TM}.

4 Pulse Rate

The pulse rate is displayed. When the value exceeds the measurable range, "xxx" will be displayed.

5 PI Value (Masimo only)

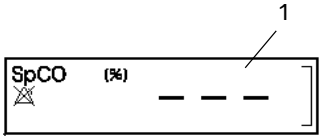
The perfusion index will be displayed.

6 PVI Value (Masimo only, optional)

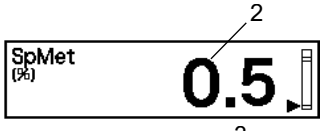
The pleth variability index will be displayed.

SpCO/SpMet/SpHb (Masimo only, optional)

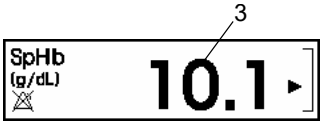
1 SpCO Value: The carboxyhemoglobin concentration will be displayed.



2 SpMet Value: The methemoglobin concentration will be displayed.



3 SpHb Value: The total hemoglobin concentration will be displayed.



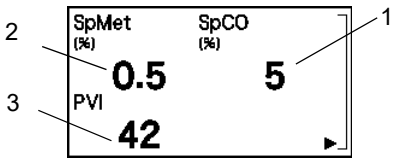
Sp* (Masimo only, optional)

SpCO (or SpHb), SpMet, PVI value will be displayed in one numeric data box.

1 SpCO or SpHb Value

2 SpMet Value

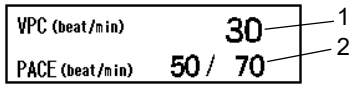
3 PVI Value



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)

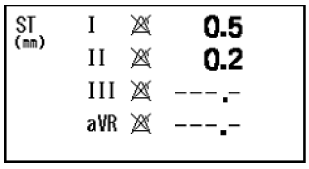
Pace beats and total beats for the last 1 minute will be displayed. <---> will be displayed during arrhythmia learning.

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 learning
- 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.



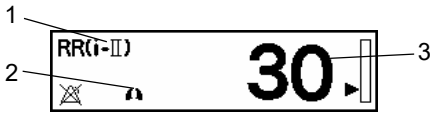
REFERENCE

- The leads displayed inside the ST level box can be changed.
  (☞Maintenance Manual "Display/Print Setup" P5-14)

Respiration

1 RR Source

The RR measurement source will be displayed in accordance with the "RR/APNEA Alarm Source" setting. "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 Synchronized Mark

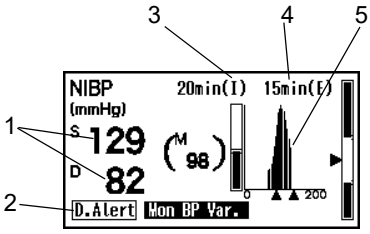
When the respiration of the set RR source is detected, a synchronized mark will be displayed inside the corresponding numeric data box.

3 Respiration Rate

The impedance RR, CO_2 RR, and 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.

The mean NIBP display can be set to ON or OFF on the NIBP setup menu. 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.
The display can be selected under [Menu>Parameter>NIBP>Detail Setup>Time Display].

4 Elapsed Time/Measured Time

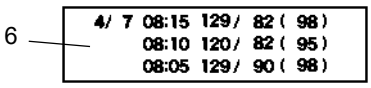
The elapsed time or measured time will be displayed.

5 Oscillation Graph

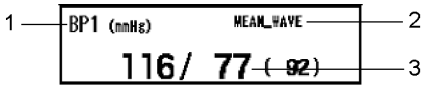
The horizontal axis in the graph shows the cuff pressure, and vertical axis shows the pulse amplitude with reference to maximum pulse amplitude.

6 NIBP List

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



Blood Pressure



1 BP Label

The label set for the blood pressure will be displayed.

2 <MEAN_WAVE>

<MEAN_WAVE> is displayed when [ON] is set for "Mean Wave" under [Menu>Parameter>BP>Detail Setup].

3 Blood Pressure

The BP measurement value (SYS/DIA/MEAN) will be displayed. On the BP setup menu, 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.

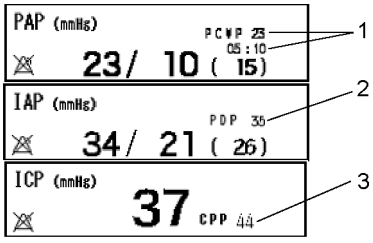
PAP/ IAP/ ICP

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

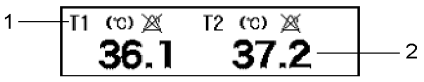
When the BP label is IAP, PDP (Peak Diastolic Pressure) of IABP can be measured. Note that Systolic Pressure (SYS) = Peak Systolic Pressure (PSP).



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. Also, alarm cannot be set for CPP.

Temperature



1 TEMP Label

The label set for the temperature will be displayed.

2 TEMP Value

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

Blood Temperature

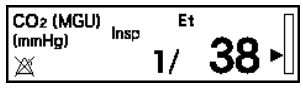
By using the thermodilution catheter for the CO measurement, blood temperature can be displayed. When the value exceeds the measurable range, "xxx" will be displayed.

$EtCO_2$/ $InspCO_2$

$EtCO_2$ Value/ $InspCO_2$ Value

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

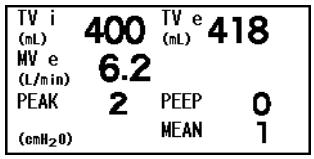
The measurement unit can be selected from mmHg / kPa / % under the "Initial Settings" menu.



Ventilator

Ventilator Data

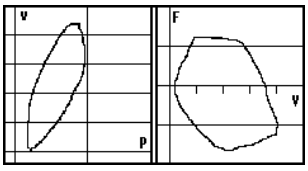
When ventilator is connected, the ventilator measurement data will be displayed.



P-V, F-V

P-V, F-V Loop

By connecting the ventilator, multigas unit (MGU-810 with SPIRO unit), or FLOW-i, P-V loop (airway pressure / ventilation) and F-V loop (airway flow / ventilation) can be monitored on the ventilator display.



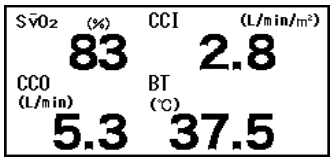
⚠ CAUTION

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

SvO_2/CCO Measurement Device

SvO_2/CCO Data

When SvO_2/CCO Measurement Device (Vigilance/Vigilance CEDV/ VigilanceII/Vigileo/PiCCO2/PulsioFlex) is connected, the measurement data (SvO_2, CO, etc.) acquired from these devices will be displayed. The displayed data will differ depending on the used SvO_2/CCO Measurement Device and measurement mode.

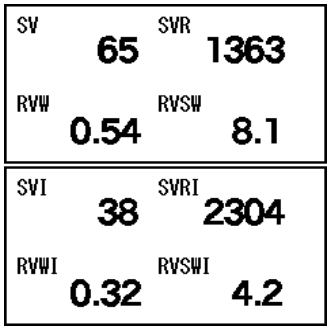


Oximeter/CCO Measurement Device	Displayed Data			
Vigilance (CCO mode/STAT OFF/Index OFF)	SvO_2 ($ScvO_2$)	CCO	EDV	BT
Vigilance (CCO mode/STAT ON/Index OFF)	SvO_2 ($ScvO_2$)	CCO STAT	EDV STAT	BT
Vigilance (CCO mode/STAT OFF/Index ON)	SvO_2 ($ScvO_2$)	CCI	EDVI	BT

Oximeter/CCO Measurement Device	Displayed Data			
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	-
PiCCO2/PulsioFlex	$ScvO_2$	CCO	CCI	BT

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.)

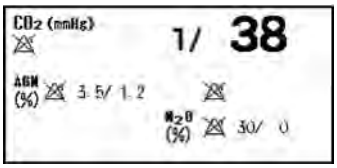
Data	Description	Formula
SV	Stroke Volume (mL/beat)	$\frac{CCO \times 1000}{HR}$
SVR	Systemic Vascular Resistance (dynes*sec*cm^{-5})	$\frac{(MAP - CVP) \times 79.90}{CCO}$
RVW	Right Ventricular Work (kg*m)	CCOx(MPAP-CVP)x0.0136
RVSW	Right Ventricular Stroke Work (g*m)	SVx(MPAP-CVP)x0.0136
SVI	Stroke 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.

Multigas Unit Data

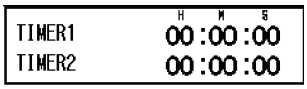
Multigas Unit Data



When multigas unit or mainstream module is connected, the numeric data measured by the connected unit or module (CO_2 /anesthetic gas/O_2 /N_2O concentration) will be displayed.

TIMER

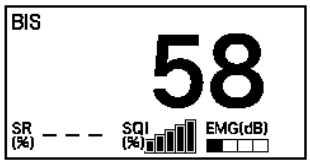
Stopwatch Key



Functions as stopwatch.

BIS

BIS Value



By connecting the BISx using the HBX-800, or by connecting the BIS monitor to the multiport module, BIS data (BIS, SQI, EMG, SR) will be displayed.

If SQI value is below 50%, the BIS value will be displayed in gray.
If SQI value is below 15%, the BIS value and SR value will disappear.

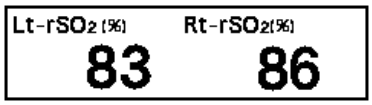
EMG and SQI will be displayed in bar graph.

Bar Graph	SQI (0 to 100) [%]	EMG (30 to 55) [dB]
1	1 to 20	30 to 38
2	21 to 40	39 to 47
3	41 to 60	48 to 55
4	61 to 80	55 and above
5	81 to 100	-

The alarm bar will be displayed only when measurement is performed on BISx using the HBX-800.

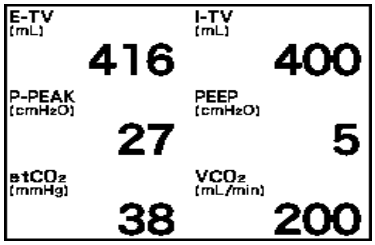
INVOS

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.

❑User Selectable Numeric Data (Ventilator, Hemodynamics, Transcutaneous Blood Gas)



For the following numeric data, the data to be displayed in the numeric data box are selectable by the users.

- Ventilator Data
- Hemodynamics Data
- Transcutaneous Blood Gas Partial Pressure Data

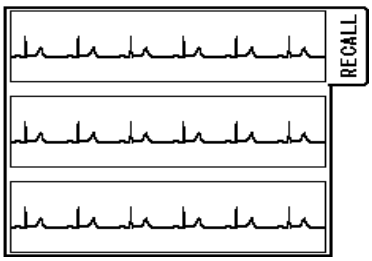
The number of displaying data depends on the size of numeric data box.Small: 2Medium: 4Large: 6Two types of user selectable numeric data (A, B) can be set

REFERENCE

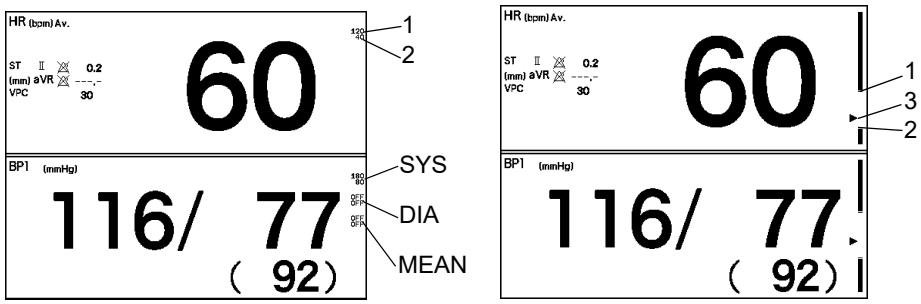
- The parameters to be displayed can be set under [Initial Settings>User I/F>Display Print] for [VENT Display Parameters] or [Hemo/etc Display Parameters].

❑Extended Function (Recall List)

The recall data will be displayed in a list format.
By selecting a data from the list, an enlarged waveform of the corresponding data will be displayed.



❑Alarm Limit Display



The alarm limit can be displayed beside each numeric data. The display type can be selected from [Graph]/[Numeric]/[OFF] for "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

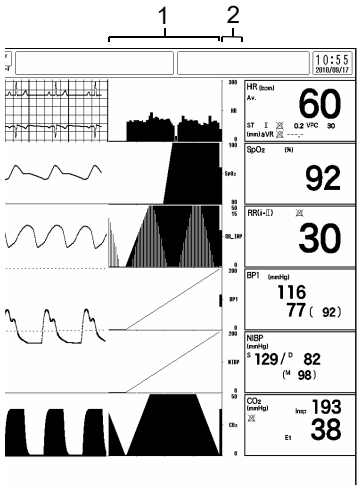
2 Lower Alarm Limit

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

On the waveform display area, short trend can be displayed.

The parameters to be displayed for short trend can be set under [Menu>Basic Setup>Display Config.].

The short trend display width can be selected from 7 levels by pressing the waveform display area.

The graph displayed in red indicates the alarm occurrence point. Pressing the short trend of an alarm generated parameter 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.

For the following parameters, the short trend scale can be synchronized with the corresponding waveform scale by selecting [Waveform] for "Short Trend Scale" under [Menu>Display Config.>Detail Setup].

▸ BP, PEAK, TV, CO_2, O_2, Agent

For operation procedure on the short trend display, refer to ☞"Short Trend" P8-10.

❑Number of Displayed Waveform and Numeric Data (For LC-8019T)

Display	Maximum Displayed Waveforms	Display Duration (25 mm/s)	Maximum Displayed Boxes
Standard (Right/Left)	28	About 12 sec.	28
Large (Right/Left)	28	About 9 sec.	28
12-Lead (Right/Left)	ECG 12-Lead+8	ECG 12-Lead: About 4.7 sec.	21
Standard (Right/Left 1 column & Bottom 1 row)	20	About 12 sec.	15
Standard (Right/Left 1 column & Bottom 2 rows)	18	About 12 sec.	19
Standard (Right/Left 2 columns & Bottom 1 row)	20	About 9 sec.	25
Standard (Right/Left 2 columns & Bottom 2 rows)	18	About 9 sec.	28
12-Lead (Right/Left & Bottom)	ECG 12-Lead+6	ECG 12-Lead: About 4.7 sec.	29
Bottom (1 row)	22	About 15 sec.	5
Bottom (2 rows)	16	About 15 sec.	10

NOTE

- The maximum number of displayed boxes differ based on the waveforms 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.)

❑Number of Displayed Waveform and Numeric Data (For LC-8015T)

Screen	Maximum Waves Displayed	Display Duration (25mm/s)	Maximum Displayed Boxes
Standard (Right/Left)	20	About 9 sec.	20
Large (Right & Bottom/Left & Bottom)	18	About 9 sec.	26
12-Lead (Right/Left)	ECG12 Lead	ECG 12-Lead: About 4.5 sec.	15
Lower (1 row)	16	About 12 sec.	4
Lower (2 rows)	12	About 12 sec.	8

Description of the Display

The following symbols are used for this 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 Indicates that an alarm message is present for that parameter. Whether or not to display this icon can be selected under "Initial Settings".
	Key Lock Mark Indicates that the item requires a password to change the setting.
	Key Unlocked Mark Indicates that the key is unlocked

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.

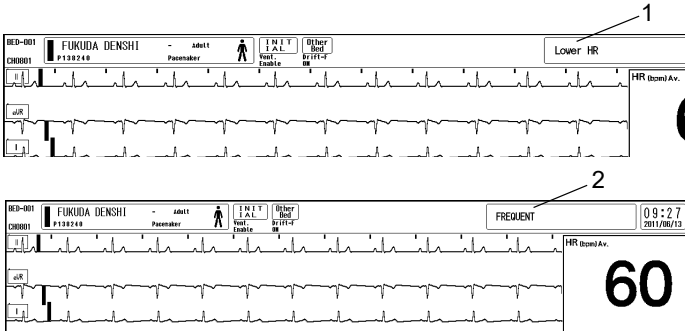
Alarm Priority, Level		Description	Tone/Volume	Displayed Color
Top Priority	S	Top Priority Alarm	Continuous	Red/White
High Priority	H	Life Threatening Alarm	Continuous	Red
Medium Priority	M	Cautionary Alarm	5 seconds interval	Yellow
Low Priority	L	Status Alarm	15 seconds interval	Blue
Notification	N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

⚠ CAUTION

- When more than one 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

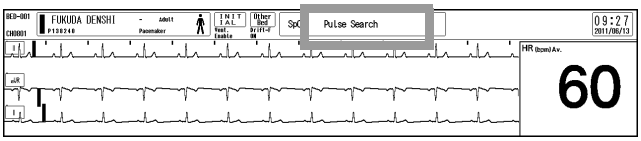
There are 2 types of vital alarm messages; numeric data alarm and arrhythmia alarm. If both alarms occur at the same time, the numeric alarm message and arrhythmia alarm message will be displayed alternately in 2 seconds interval. The alarm messages will be displayed according to the priority. If the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

⚠ CAUTION

- The arrhythmia alarm messages other than Tachy, Brady, Ext Tachy, Ext Brady will continue to be displayed for 30 seconds after the alarm is resolved.

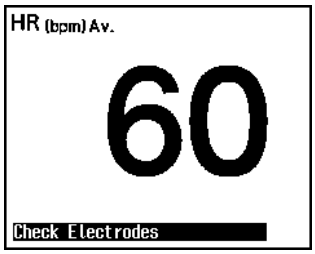
❑Equipment Status Alarm Message

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



❑Numeric Data Box Message

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

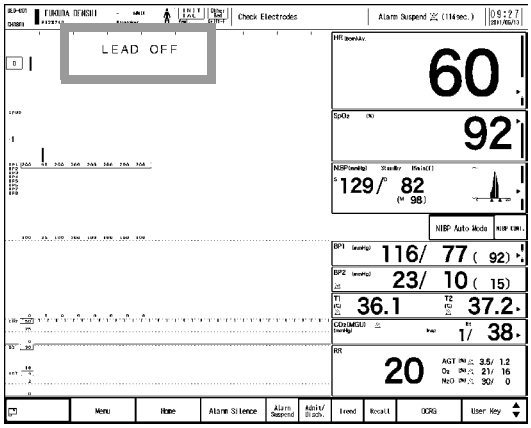


❑Lead-Off Message

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

⚠ WARNING

- 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.



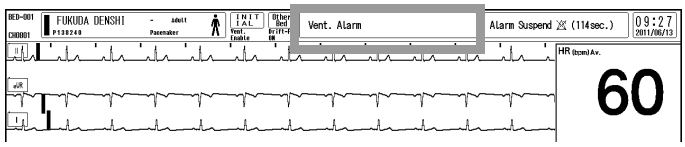
❑Ventilator Alarm Message

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" P10-22)



❑Ventilator Alarm Factor Message

For the SV-300, SERVO-i, SERVO-s, SERVO-U, SERVO-n, SERVO-air, 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-8500 System.

⚠ CAUTION

- For the SV-900, VELIA, ASTRAL, VS ULTRA, 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.
- On the DS-LAN II network, ventilator alarm factors of the SERVO-U/n/air will not be notified to the central monitor.

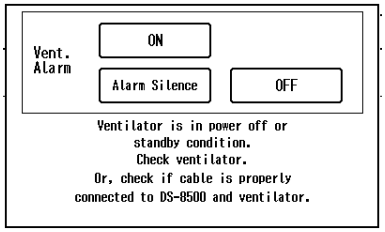
❑Ventilator Disconnected Confirmation Window

A confirmation window will be displayed when a ventilator cable is disconnected from the DS-8500, or when the power of the ventilator is turned OFF.

[ON] will continue communication with the ventilator during ventilator alarm condition. Check the ventilator power and cable connection.

[Alarm Silence] will silence the ventilator alarm for 2 minutes.
If the ventilator alarm condition remains after 2 minutes, the alarm will generate again.

[OFF] will disable the ventilator alarm until the ventilator connection status recovers.



⚠ CAUTION

- Check occasionally the communication status of this equipment and the ventilator.
- Verify that a ventilator alarm is not generated, and that the <Vent. Comm.> message is displayed.
  This confirmation window will be displayed until the displayed key is pressed or proper communication with the ventilator is resumed. When the communication is resumed, the window will automatically close.
  When disconnecting the ventilator and this equipment, make sure to select [OFF] on the confirmation window which will be displayed when the power of the ventilator is turned OFF, or when the cable is disconnected.

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

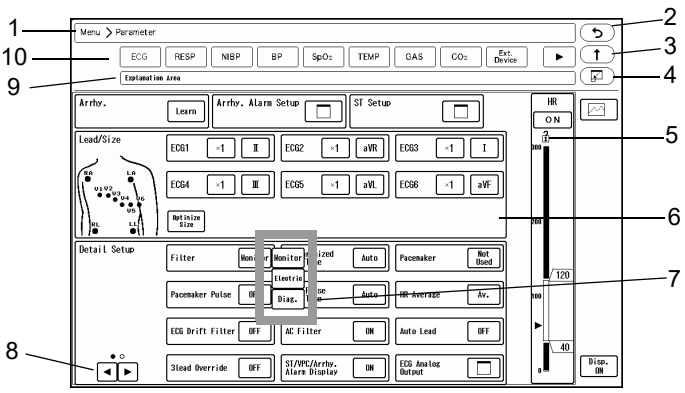
The hierarchical level of the current window is displayed. The level is expressed using the ">" symbol.

This area also functions as keys, making it possible to return from the lowermost to topmost window in a one-touch operation.

2 Previous Display

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

3 Up One Level Key



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

4 Minimize Key

Pressing this key will minimize the currently displayed window and store in the user key.

To restore the minimized window, press the Restore key in the user key and select the window to restore.

5 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.

Unlocked items will remain unlocked until the window is closed.

- :Locked item
- :Unlocked item

NOTE

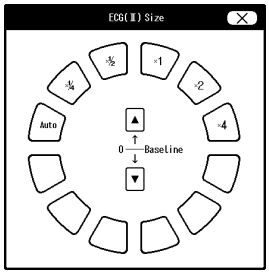
- The color of each key lock icon indicates its administrative level, and a higher level password must be entered to unlock it.

6 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.

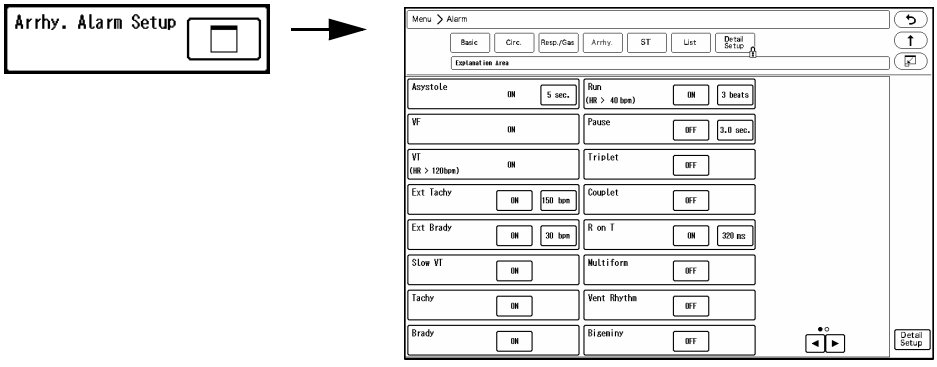
Some items will show a sub window in which the setup operation is performed.
To close the sub window, press either the (X) key, [Home] or (↩) key.

- <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.

- Example of screens which make a transition to another screen



7 Dropdown List

Select one from the displayed selection list.

8 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 "●".

9 Operation Guide Message

Displays the operation guide message of the item which the jog dial marker points.

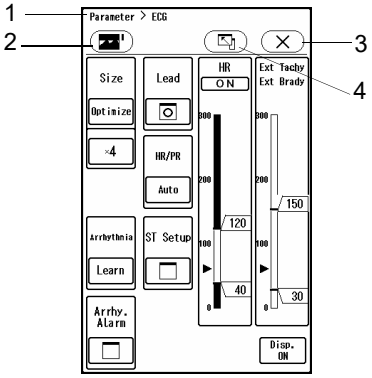
10 Tab Display Area

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 graph or table format, or check their waveforms in a one-touch operation.

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

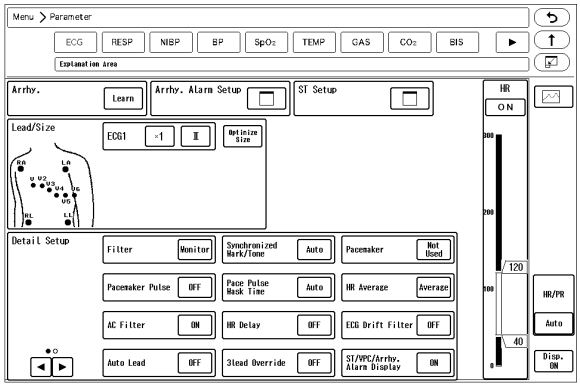
The alarm assist screen will be displayed.On the alarm assist screen, maximum of 24 hours of trend data for the corresponding parameter will be displayed, and alarm threshold can be adjusted by checking the trend data.
(☞"Alarm Assist Screen" P6-13)

3 Close Key

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

4 Detail Key

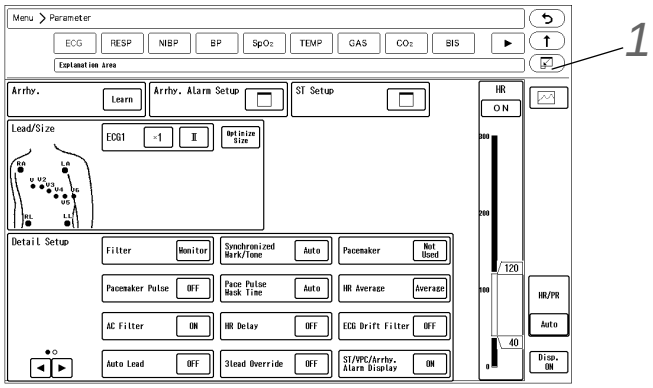
On the floating window, minimum items are displayed. Press the (▭) key to display more detailed items.



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.

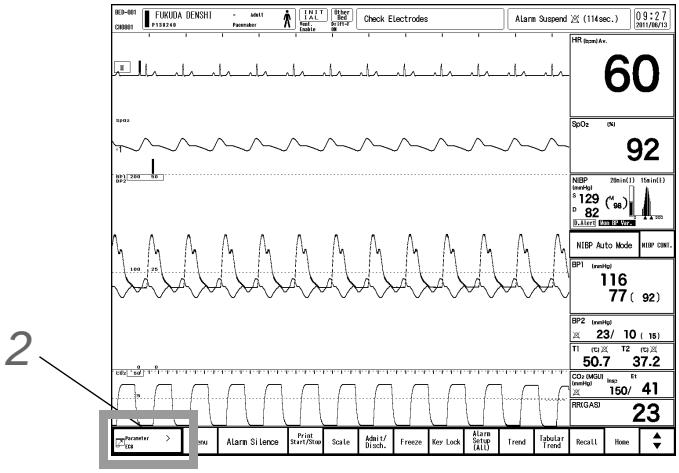
1 Press the icon.



▸ The window will be minimized.

2 Press the minimized window.

▸ The original window will be displayed again.



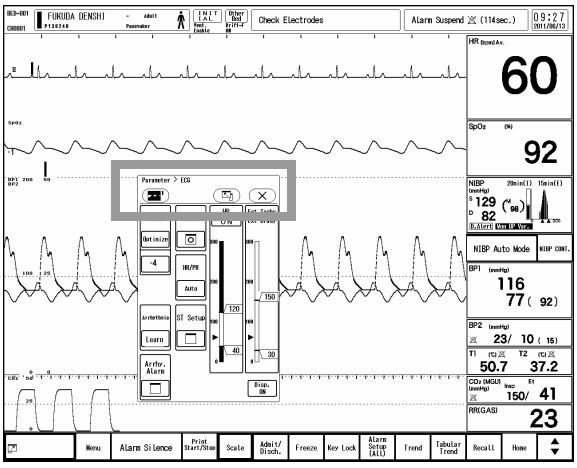
NOTE

- Maximum of 8 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]).

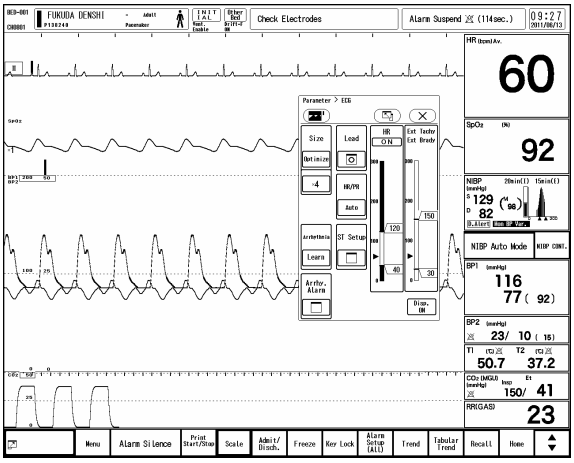
Transfer Window

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

1 Place the finger on the window title bar.



2 Drag to the desired position.

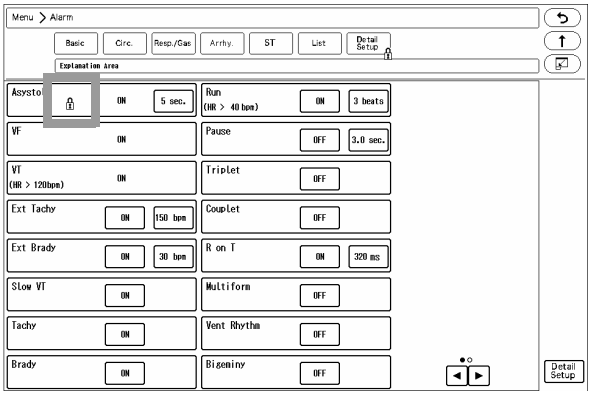


NOTE

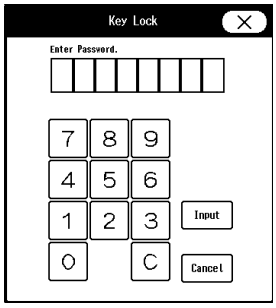
- The floating window cannot be overlapped to the numeric data area or information display area.
- The window which is displayed from "Menu" cannot be moved.
- The displayed position of the floating window will be stored until the power is turned OFF.

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

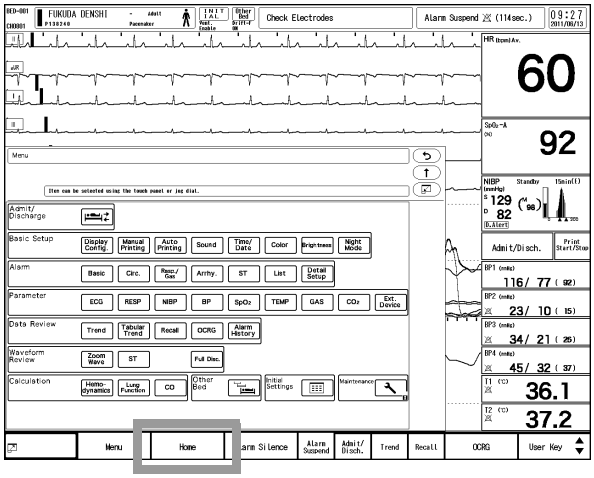
NOTE

- 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

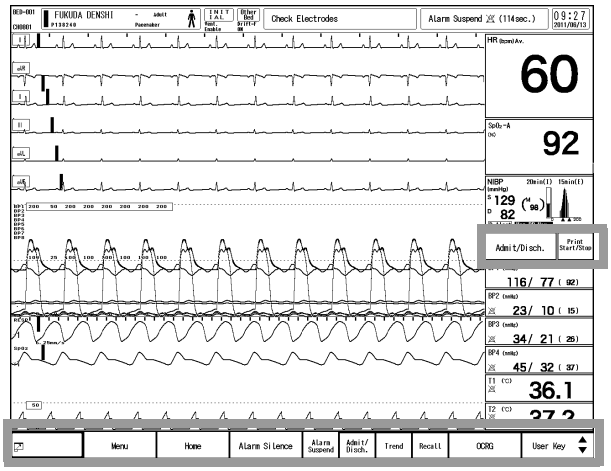
The user keys and menu can be customized according to the monitoring purpose.

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" P5-29)

User Key

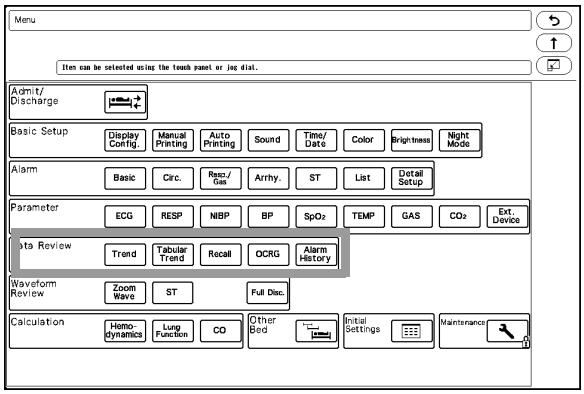
The user keys can be customized according to the monitoring purpose.
(☞"To Configure the Display" P10-7)

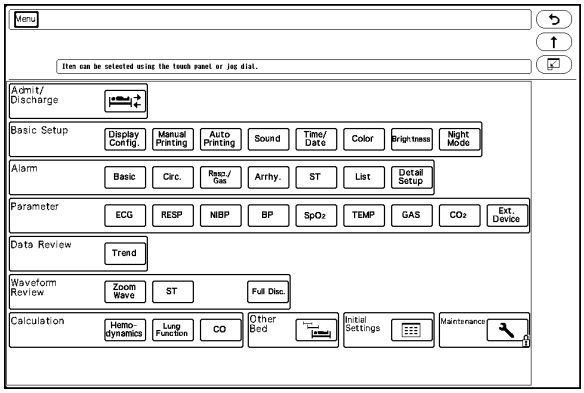


By assigning the [User Key ▲▼] to the user key area, 2 pages of user keys can be registered. Press the [User Key ▲▼] to switch the pages. The user key can be displayed large by using 2 display areas.
The user key can be also assigned to the numeric data area. It is useful if the key related to numeric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

Menu Screen

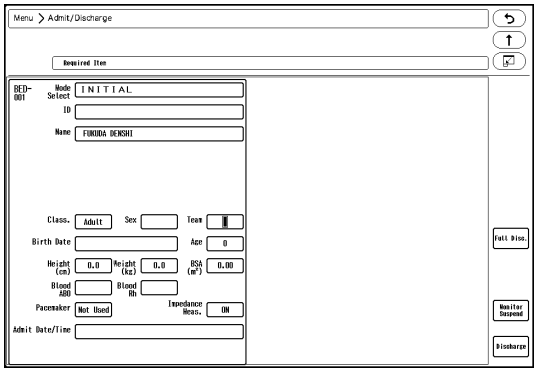
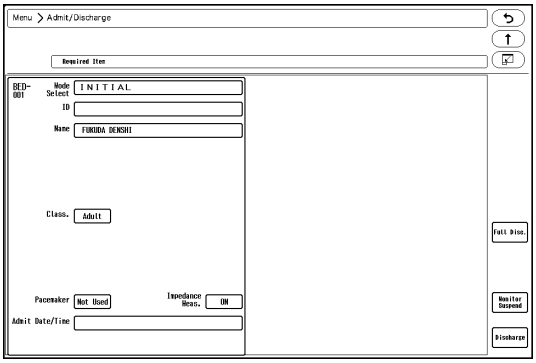
The key position can be changed and unnecessary keys can be deleted on the "Menu" screen.
(☞Maintenance Manual "Display/Print Setup" P5-14)



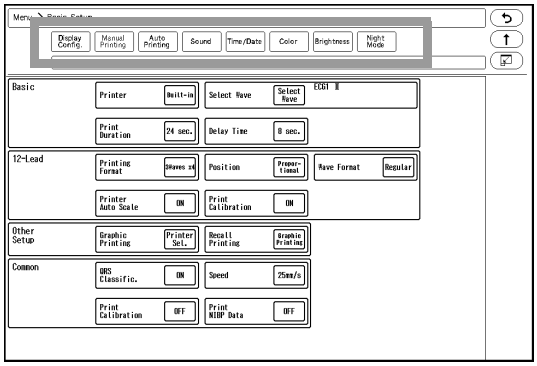
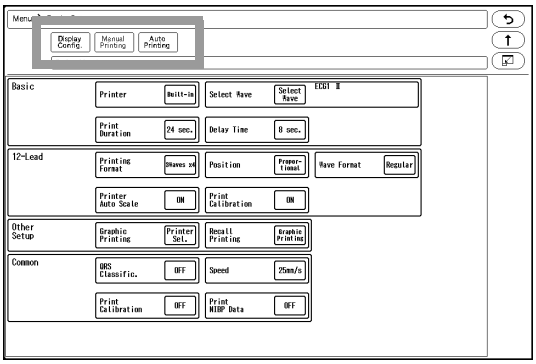


To Delete the Unnecessary Keys (Key Mask)

Unnecessary keys, items, tabs can be deleted.
(☞Maintenance Manual "Key Mask" P5-21)

Example on "Admit/Discharge" Screen

Example on Tab Display

Display on the External Monitor and Extended Display Unit

For the DS-8500 system, in addition to the main display, another display unit can be used for extended display.

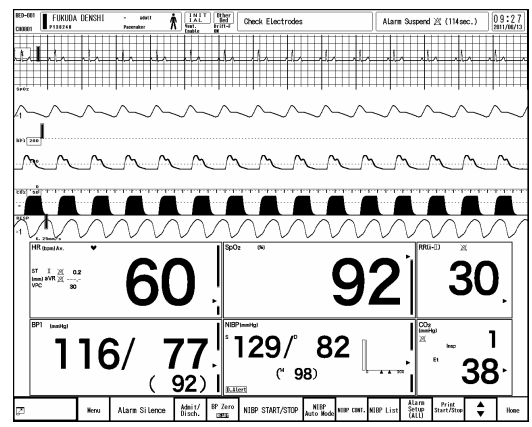
⚠ CAUTION

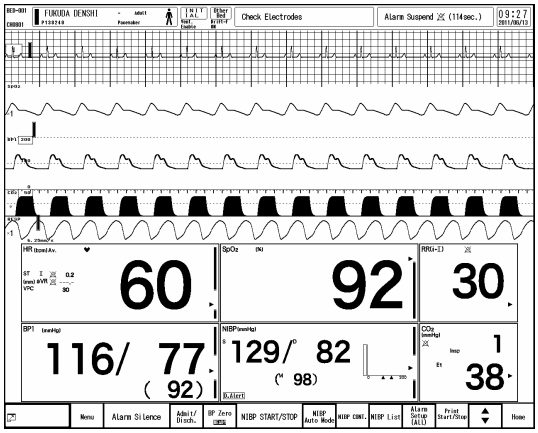
- Use only the specified 19-inch display unit. For details, refer to our service representative.

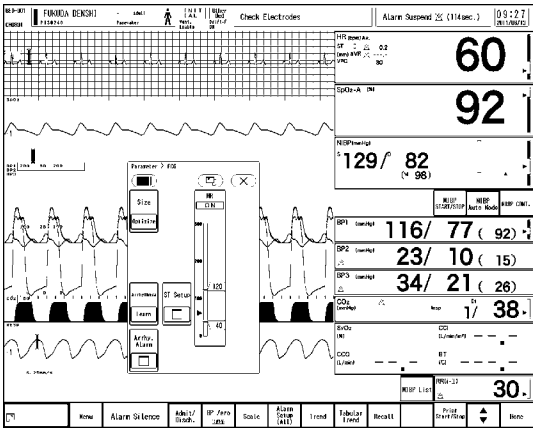
Model	Displayable Screen Yes: Can be displayed No: Cannot be displayed.		
	External Monitor Display	Extended Display 1	Extended Display 2
DSC-8510	Yes	No	No
DSC-8530	Yes	Yes	Yes

External Monitor Display

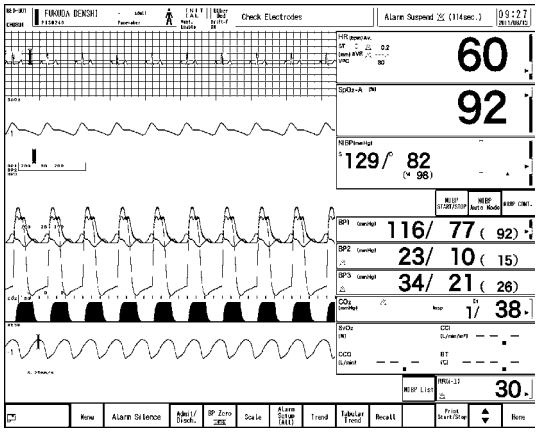
The same display with the main display unit can be displayed on another display unit.
However, only arrhythmia alarm messages will be displayed on the external monitor. Other messages, menu, and setup window will not be displayed. Operation is not possible on the external monitor.







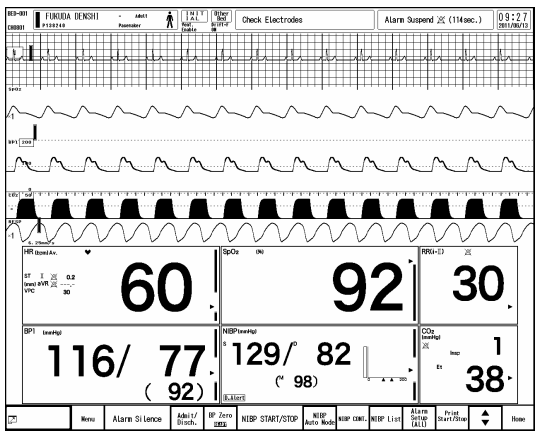
Display on the Main Display



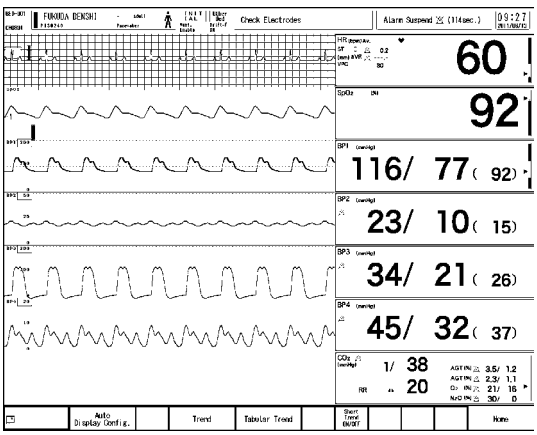
Display on the External Monitor

Extended Display 1

On the extended display 1, the independent display from the main display can be displayed.



Display on the Main Display



Display on the Extended Display 1

On the extended display 1, the following operations are possible on the touch panel.

- Selection of Preprogrammed Display Layout (3 Types)
- Trend Display
- Tabular Trend Display
- ON/OFF Selection of Short Trend Display
- ON/OFF Selection of Enlarged Display
- Display Configuration Setup for Extended Display 1, 2
- Waveform Size Selection
- Alarm Silence
- Alarm Suspend
- NIBP Start/Stop
- NIBP Auto Mode Selection
- Print Start/Stop
- HR/PR Source Selection
- BP Zero Balance
- Lead Selection
- ON/OFF Selection of Oxygenator Mode
- Alarm Setup
- Parameter Setup

⚠ CAUTION

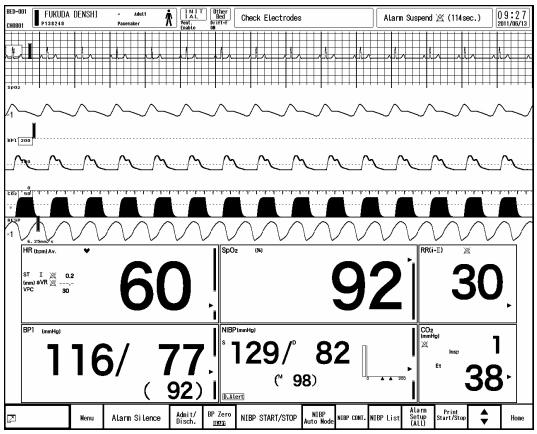
- As a speaker is not equipped for the extended display unit, key sound and alarm sound will not be generated. Alarm sound will be generated from the main display.
- The same setup window cannot be opened simultaneously on the main display and the extended display. If the same setup window is opened, the previously opened window on the other display will close.

REFERENCE

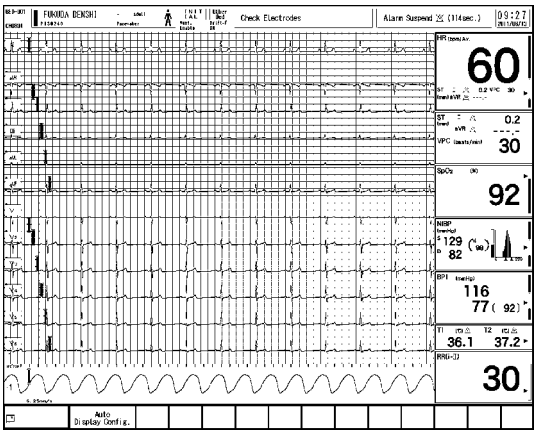
- The waveform size for the main display and the extended display is independent.
  On the "Initial Settings" menu, whether or not to synchronize the waveform size/scale of extended display with the main unit can be selected.
  (☞Maintenance Manual "Display/Print Setup" P5-14)
- The waveform size for the extended display 1 and 2 is common.
- By setting the [Scale (Extended Display)] key as user key, the waveform scale on the extended display can be changed on the main unit.
  (☞"User Key Selection" P10-18)
- The display configuration for the extended display 1 can be also changed on the main display.
  ([Menu]>[Initial Settings]>[User Mode Regist.]>Select mode for "Extended Display 1">Change the setting)
- Key Mask, Key Lock, Auto Hide Window functions cannot be used.

Extended Display 2

On the extended display 2, the independent display from the main display can be displayed.



Display on the Main Display



Display on the Extended Display 2

On the extended display 2, the following operations are possible on the touch panel.

- Selection of Preprogrammed Display Layout (3 Types)
- ON/OFF Selection of Short Trend Display
- ON/OFF Selection of Enlarged Display
- Waveform Size Selection
- Alarm Silence
- Alarm Suspend
- NIBP Start/Stop
- Print Start/Stop
- HR/PR Source Selection
- BP Zero Balance

⚠ CAUTION

- As a speaker is not equipped for the extended display unit, key sound and alarm sound will not be generated. Alarm sound will be generated from the main display.

REFERENCE

- On the extended display unit 2, operation such as alarm setup is not possible.
- The waveform size for the main display and the extended display is independent.
  On the "Initial Settings" menu, whether or not to synchronize the waveform size/scale of extended display with the main unit can be selected.
  (☞Maintenance Manual "Display/Print Setup" P5-14)
- The waveform size for the extended display 1 and 2 is common.
- By setting the [Scale (Extended Display)] key as user key, the waveform scale on the extended display can be changed on the main unit.
  (☞"User Key Selection" P10-18)
- The display configuration for the extended display 2 can be changed on the main display.
  ([Menu]>[Initial Settings]>[User Mode Regist.]>Select mode for "Extended Display 2">Change the setting)

Chapter 4 Preparation

Chapter 4 Preparation

Daily Check

Before using the equipment, perform the daily check.
Take necessary measures for the items with the "NG" judgment, and use the equipment only if the judgments for all the items are "OK".

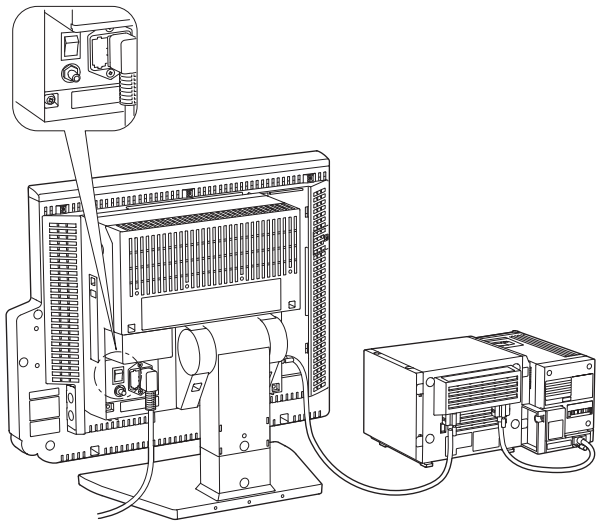
To Start Monitoring

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

⚠ CAUTION

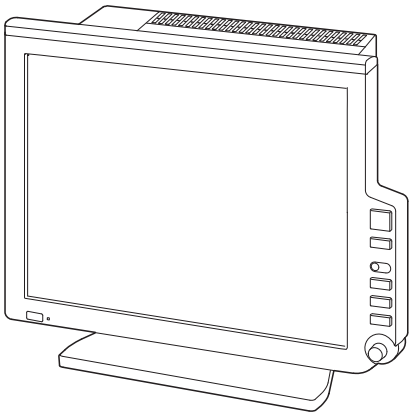
- If the system will be unused for a long period, make sure to turn OFF the power of the main unit.

1 Check that the power supply switch at the rear side of the main unit is turned ON.



2 Turn ON the standby switch on the display unit.

▸ The system will turn ON and monitoring will start.



NOTE

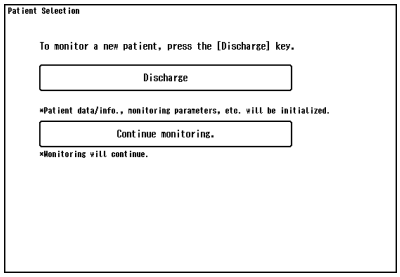
- The operation after the power is turned ON will be according to the setting made on [Initial Settings]>[User I/F]>[Power ON/Discharge]. However, if the power was turned OFF for less than 30 seconds, the setting before the power was turned OFF will remain.

REFERENCE

- The power of the main unit, super unit, expansion units, expansion modules and Input Box links with the power supply switch operation (ON/OFF) on the display unit.
- During normal operation, the power supply switch on the main unit should be left ON.

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)

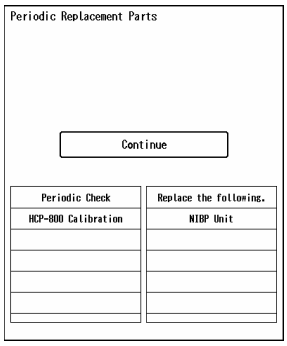
- To start monitoring a new patient, select [Discharge] and enter the new patient information on the "Admit/Discharge" screen.

REFERENCE

- Whether or not to display the discharge confirmation screen can be selected. (☞Maintenance Manual "Power ON/Discharge" P5-17)

❑Periodic Replacement Message

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



REFERENCE

- The parts which the replacement period will be notified are the short-term backup battery in the DSC-8500, NIBP unit in the Super Unit and the CO_2 unit in the HCP-800/HCP-810. (☞Maintenance Manual "Periodic Replacement" P7-1)
- Even if it is set not to display the discharge confirmation screen, the confirmation message for parts replacement will be displayed when the replacement period approaches.

Data Transfer Function Using the Super Unit and DS-8100

The patient data and settings are stored in the HS-8000 Series Super Unit and the DS-8100.
When transferring the patient to another bed, the same monitoring condition such as patient data and settings can be used on new bed by transferring the Super Unit along with the patient.

1 Turn OFF the power of the DS-8500 system.

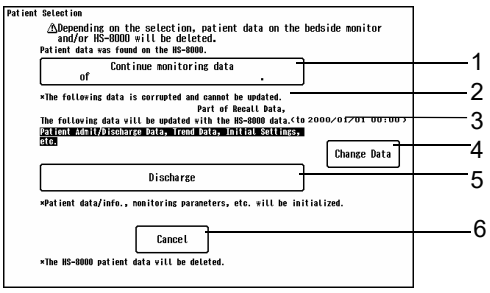
2 Connect the Super Unit or DS-8100 to the DS-8500 system of the new bed, and turn ON the power of the DS-8500 system.

▸ 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 main 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 main unit will be overwritten with that of the Super Unit or DS-8100.
  If central monitor is connected, the data on the central monitor will be also deleted.
  The alarm settings and parameter settings can be also transferred. When the settings are changed by the data transfer function, the mode name will be highlighted to notify that the setting has been changed. Pressing the highlighted mode name will display the confirmation message window, and pressing the [OK] key will clear the highlight. When the alarm settings are changed, the alarm settings list will be displayed.
- When [Discharge] is selected, both data on the main unit and the Super Unit will be deleted/initialized. The data of the DS-8100 will not be initialized.
- When [Cancel] is selected, the stored data on the Super Unit will be overwritten with that of the main unit. The data of the DS-8100 will not be overwritten.
- 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 of the Super Unit 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.
- Do not disconnect the Super Unit while setting up the extended display.

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" P5-27)
- For the setting procedure of DS-8100 data transfer, please refer to the operation manual of the DS-8100.

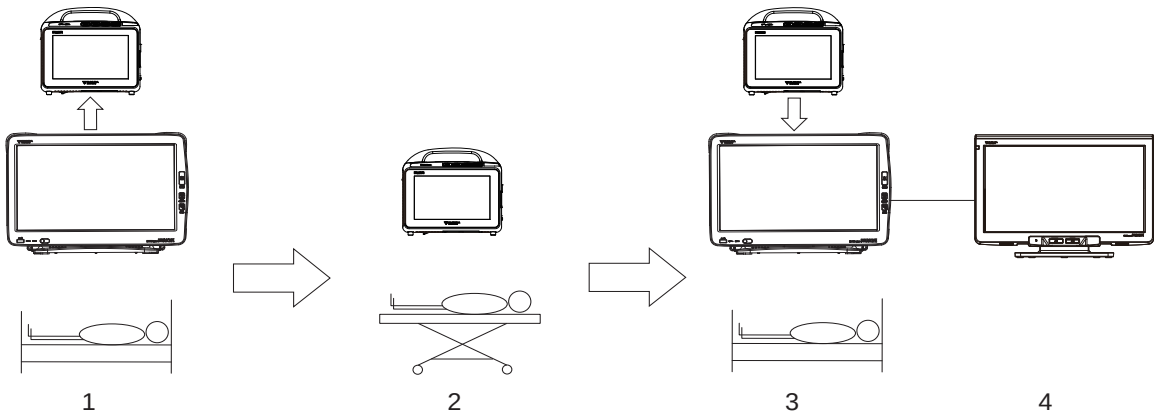
Data Transfer Function Using the Transport Monitor (DS-8007)

The DS-8007 system can be used as a transport monitor by using the stored patient data and settings.
For the monitoring system using the DS-8007, DS-8400, DS-8500, DS-8900, the data during transport (when not connected to the central monitor) can be transferred between the monitors using the transport monitor (DS-8007).

⚠ CAUTION

- This function can be used only when the monitoring system is constructed with the DS-8007, DS-8400, DS-8500, DS-8900. To use this function, refer also to the DS-8900 Operation Manual.

<General Description of Data Transfer Function>



1 While Monitoring on the Bedside Monitor
Remove the DS-8007 from the DS-8400/DS-8500.
When the confirmation window is displayed, select [Monitor Suspend] or [Discharge].

2 While Leaving the Bed
During transfer or examination, monitoring on the DS-8007 will continue. The monitoring data will be saved on the DS-8007.

3 Resume Monitoring on the Bedside Monitor
When the patient returns to bed, attach the DS-8007 to the DS-8400/DS-8500.
By selecting [Monitor Patient of the Transport Monitor] on the patient selection window, the saved data on the DS-8007 while in transfer will be uploaded to the DS-8400/DS-8500.

4 Uploading to the Central Monitor
The data will be automatically uploaded to the central monitor.

❑Condition to Use the Data Transfer Function

To use the data transfer function, the following conditions need to be satisfied.

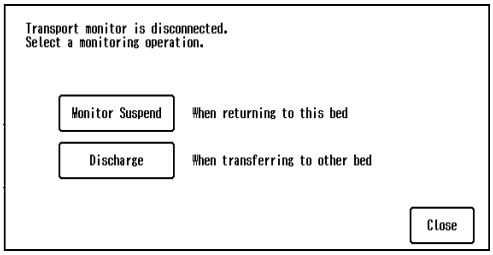
- On the DS-8007, full disclosure waveform recording on the SD card is required.
- The software version of the DS-8007 should be V03-01 and newer.
- On the DS-8400/DS-8500, the data transfer function needs to be enabled.
  Select [Transport] for "Data Transfer" under [Menu > Initial Settings > System > Other].
- To transfer the DS-8007 data (full disclosure waveform, trend, recall) to the DS-8400/DS-8500, full disclosure waveform recording on the CF Card is required.
- To transfer the setup data (alarm, parameter), the data transfer function needs to be enabled and the setup data to be transferred needs to be selected on the DS-8400/DS-8500.
  Select [ON] for "Alarm Setup" and "Parameters" under [Menu > Initial Settings > System > Other > Data Selection for Transfer].

For uploading to the central monitor, the following additional conditions needs to be satisfied.

- The central monitor needs to be compatible with the data transfer function.
- The bed is registered on the central monitor.

❑When the DS-8007 is disconnected from the DS-8500

1 When the DS-8007 is disconnected from the DS-8500, a confirmation window will be automatically displayed.



- [Monitor Suspend]: The confirmation window will close, and monitoring will be suspended.
  This is to be selected when returning to the same bed after transferring.
- [Discharge]: The patient will be discharged on the DS-8500, DS-8900. The monitoring condition after discharge will be according to the "Discharge Mode" setting. (☞Maintenance Manual "Power ON/ Discharge" P5-17)
  This is to be selected when returning to the other bed after transferring.
- [Close]: A confirmation window will close.

❑When the DS-8007 is connected to the DS-8500

The operation will differ depending on the patient information (patient name, patient ID, patient identification code) saved separately on the DS-8500 and DS-8007.

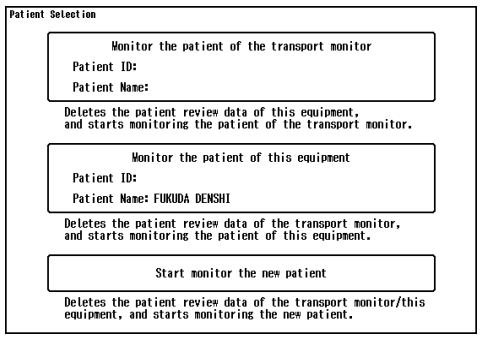
NOTE

- The patient identification code will be updated when the patient is discharged.If the patient information such as patient name, ID is changed without performing the discharge process, the patient identification code will not be updated, and the patient will be treated as the same patient.
- When the EMR link function is used, the patient selection window shown below will not be displayed.

1 When the patient information matches between the DS-8500 and DS-8007

- When the patient information matches between the DS-8500 and DS-8007, the patient selection window will not be displayed, and monitoring will continue.

2 When the patient information does not match between the DS-8500 and DS-8007



- The patient selection window will be automatically displayed. Select the monitoring patient.
- [Monitor Patient of the Transport Monitor]
  Starts monitoring the patient of the DS-8007 by discharging the patient of the DS-8500.
  All data on the DS-8500 will be deleted. If a central monitor is connected, the data on the central monitor will be also deleted.Part of the patient information, review data will be overwritten with the data of the DS-8007.
- [Monitor Patient of This Equipment]
  Starts monitoring the patient of the DS-8500 by discharging the patient of the DS-8007.
  All data on the DS-8007 will be deleted.Only the patient information will be overwritten with the data of the DS-8500.
- [Monitor New Patient]: Starts monitoring a new patient by discharging the patients for both DS-8500 and DS-8007.

Both data on the DS-8500 and DS-8007 will be deleted/initialized.

- During data transfer, <Uploading> will be displayed.

CAUTION

- After the data transfer process, make sure that the patient information is correct.

REFERENCE

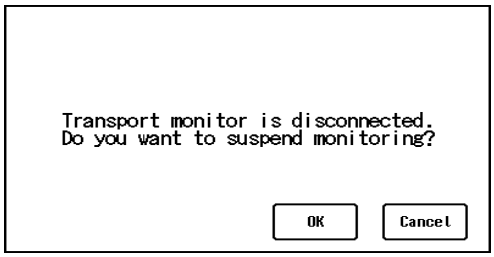
- To transfer the alarm settings and parameter settings when [Monitor Patient of the Transport Monitor] or [Monitor Patient of This Equipment] is selected, it is necessary to set [Transport] for "Data Transfer" under [Menu > Initial Settings > System > Other], and set [ON] for "Alarm Setup" and "Parameters" under [Menu > Initial Settings > System > Other > Data Selection for Transfer].
- To transfer the patient review data, refer to ☞"Transferring the Patient Review Data" P4-8.

❑When EMR Link Function is Used

When the EMR link function is used on the central monitor, the patient admit/discharge process will be performed through the EMR.

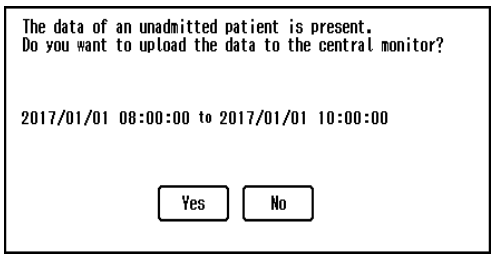
1 When Starting the DS-8007 Transfer

- As the discharge process is performed through the EMR, monitor suspend confirmation window will be displayed when starting the DS-8007 transfer.
- To start the DS-8007 transfer, press the [Yes] key.



2 When Ending the DS-8007 Transfer

- When the transport monitor (DS-8007) with the patient unadmitted is connected to the host monitor (DS-8500) which is connected to the central monitor with the EMR link function, a confirmation window to upload to the central monitor will be displayed.
- When a patient is admitted to the transport monitor, uploading to the DS-8900 will automatically start.



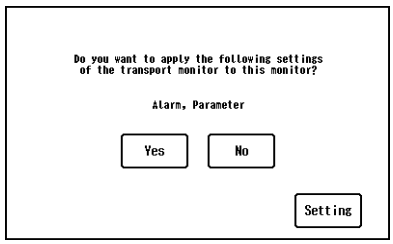
❑Data Transfer of Patient Data, Alarm Settings, Parameter Settings

By selecting [Transport] for "Data Transfer" (Menu > Initial Settings > System > Other), alarm settings, parameter settings, patient review data can be transferred.
Also, the patient data while in transfer can be transmitted to the DS-8900.
While the data is transmitted from the DS-8007, <Uploading > will be displayed on the central monitor and DS-8500.

CAUTION

- Do not disconnect the DS-8007 while <Uploading> is displayed. Otherwise, upload process cannot be completed.

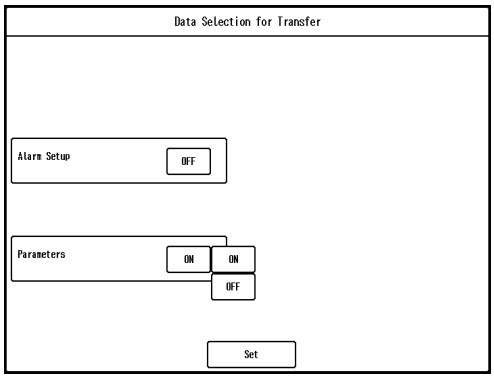
1 Transferring the Alarm Setting, Parameter Setting



1 For the following case, a confirmation window to transfer the settings will be displayed.

- When the patient information matches between the DS-8500 and DS-8007
- When [Monitor Patient of the Transport Monitor] is selected on the confirmation window

2 [Yes]: Alarm settings, parameter settings will be transmitted according to the settings made on "Data Selection for Transfer" screen ([Menu > Initial Settings > System > Other]).
[No]: Alarm settings, parameter settings will not be transmitted.
When [No] is selected, alarm settings, parameter settings will not be transmitted until the DS-8007 is disconnected and reconnected to the DS-8500.
[Change Setting]: "Data Selection for Transfer" screen will be displayed to change the settings.



⚠ CAUTION

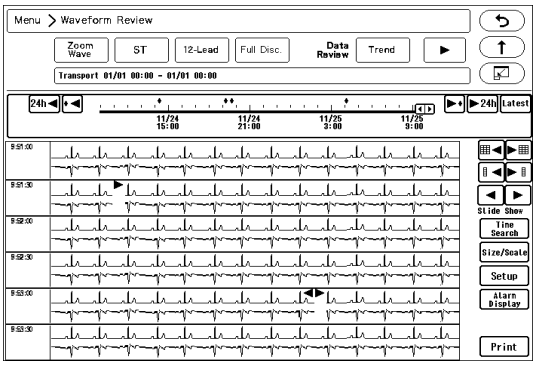
- If [OFF] is set for alarm setting and parameter setting on the "Data Selection for Transfer" screen, a confirmation window to transfer the settings will not be displayed, and the settings will not be transferred.
- When the alarm settings and parameter settings are transferred, make sure the settings are properly transferred to the DS-8500.

2 Transferring the Patient Review Data

1 For the following case, the review data of the DS-8007 will be saved to the DS-8500.

- When the patient information matches between the DS-8500 and DS-8007
  Trend, recall, full disclosure waveform, numeric data of the latest transferring data
- When [Monitor Patient of the Transport Monitor] is selected on the confirmation window
  Trend, recall, full disclosure waveform, numeric data for the selected patient from admittance
- When the bed is transferred using the EMR link function
  Trend, recall, full disclosure waveform, numeric data while the patient has been transferred
- When the EMR link function is used, and the DS-8007 is temporarily disconnected
  Trend, recall, full disclosure waveform, numeric data of the latest transferring data

2 The saved waveform data will be displayed on the full disclosure waveform screen as shown below. On the explanation area on the review screen, the starting and ending time of transfer will be displayed.



- ▶ (Orange): Indicates the starting time (▶) and ending time (◀) of transfer. For starting point and ending point, one (1) second blank display is shown.
- ▶ (Purple): Indicates the starting time (▶) and ending time (◀) of data while the patient was monitored on another bed.

NOTE

- To transfer the patient review data, it is necessary to use the CF Card to save the full disclosure waveform data. If the CF Card is not used, the patient review data will not be transferred.

❑Precautions when Starting the Data Transfer

- The data transfer process will not start for approximately 10 seconds after the DS-8007 is connected to the DS-8500. Do not disconnect the DS-8007 or turn OFF the power of the DS-8500 during this time.
- When the DS-8007 in standby mode is connected to the DS-8500, the data transfer process will not start for approximately one (1) minute after the DS-8007 is started. Do not disconnect the DS-8007 or turn OFF the power of the DS-8500 during this time.
- When a patient is discharged while DS-8500 and DS-8007 are connected, it will take approximately 10 seconds to synchronize the discharge information between the DS-8500 and DS-8007. Do not disconnect the DS-8007 or turn OFF the power of the DS-8500 for 10 seconds after the discharge process.
- When a patient is admitted/discharged on the DS-8500 while the DS-8007 is transferred, patient selection window will be displayed when the DS-8007 is connected.
  When [Monitor Patient of the Transport Monitor] is selected, the patient on the DS-8500 will be discharged which will delete all data.
  When [Monitor Patient of This Equipment] is selected, the patient on the DS-8007 will be discharged which will delete all data.
  When [Monitor New Patient] is selected, both patients on the DS-8007 and DS-8500 will be discharged which will delete all data.

❑Cancellation of Uploading

The uploading will be canceled under the following condition.Once canceled, the uploading will not resume. To upload, disconnect and reconnect the DS-8007 to the DS-8500, and manually upload the data by selecting the corresponding data on the central monitor. For procedure, refer to the operation manual of the central monitor.

<Cancellation of Uploading to the Central Monitor>

- The DS-8007 was disconnected from DS-8500 during uploading.
- The patient of the DS-8500 was discharged during uploading.
- On the central monitor, discharge process or bed transfer was performed, or bed registration was canceled for the uploading bed.
- The power of the DS-8500 or central monitor was turned OFF.

- DS-LAN cable was disconnected.

<Cancellation of Uploading to the Host Monitor (DS-8500)>

- The DS-8007 was disconnected from DS-8500 during uploading.
- The patient of the DS-8500 was discharged during uploading.
- The power of the DS-8500 was turned OFF.
- Uploading to the central monitor was canceled.

❑About the Uploading Process

- The uploading will be performed in the order of central monitor and DS-8500. During the process, <Uploading> will be displayed on the central monitor and DS-8500.
- The uploading process is performed one at a time within one DS-LAN network. If the DS-8007 is connected while uploading for other bed is in process, <Upload Standby> will be displayed until the uploading can be started. When the uploading completes for the other bed, uploading for the connected bed starts, and the displayed message will change to <Uploading>. If the DS-8007 is disconnected, or a patient is discharged on the DS-8500, or bed transfer/exchange is performed on the central monitor during the standby condition, uploading will not be performed.
- If the MPDR function of the DS-8007 is used, and uploading data to the central monitor is selected, the data will be uploaded in the following order.
  - Selected data on the MPDR data list (Upload 1) (Upload to the central monitor)
  - Selected data on the MPDR data list (Upload 2) (Upload to the central monitor)
  - Transferring data (Upload to the central monitor)
  - Transferring data (Upload to the bedside monitor)
  - Other bed data (Upload to the bedside monitor)

REFERENCE

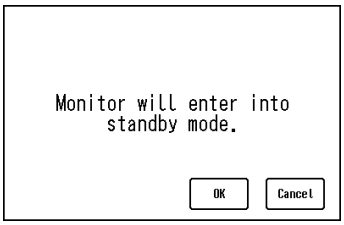
- For details of the MPDR function of the DS-8007, refer to the DS-8007 System Operation Manual.

To Stop Monitoring

This section explains about the procedure to stop monitoring.

1 Turn OFF the standby switch on the display unit.

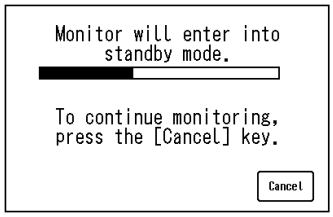
▸ A standby confirmation message will appear.



2 Press [OK] to enter into standby mode.

▸ A 10-seconds progress bar will be displayed.

▸ Press the [Cancel] key to stop entering into standby mode. Only the [Cancel] key will be effective while the progress bar is displayed.



3 When 10 seconds has elapsed without pressing the [Cancel] key, the display will turn OFF and monitoring will stop.

▸ The operation of the Super Unit and the Input Box will also stop.

▸ Using the standby switch to stop monitoring will allow to easily resume monitoring by turning ON the standby switch again.

⚠ CAUTION

- If not using the system for a long period, make sure to turn OFF the power of the main unit.
- When the power of the main unit is turned OFF while the power of the DS-8007 is turned ON, monitoring on the DS-8007 can continue with battery operation. However if the standby switch on the DS-8500 is turned OFF, the DS-8007 will also enter into standby mode.

NOTE

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

Clock Setup

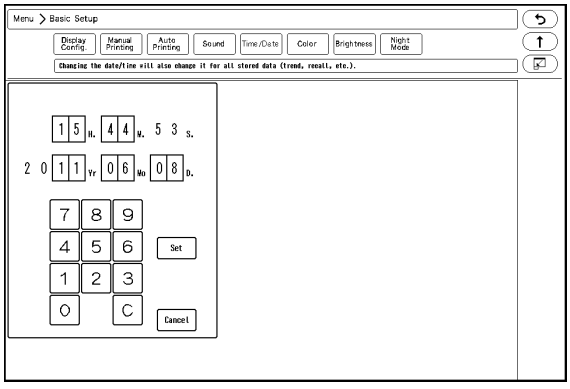
This section explains about the time/date setup procedure.

⚠ CAUTION

- If the time/date is not correctly set, or changed during monitoring, malfunction may occur to NIBP measurement, periodic printing, 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 time/date is changed, the time/date for all the patient data stored such as trend, NIBP list, recall data will also change. The printed time/date before changing and the displayed time/date after changing will differ. Also, the data transmitted to the central monitor before the time/date is changed will be displayed on the central monitor with the previous time/date.

1 Press the [Menu], [Time/Date] ("Basic Setup") keys.
Or, press on the time/date on the information display area on the upper part of the screen.

▸ The "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.

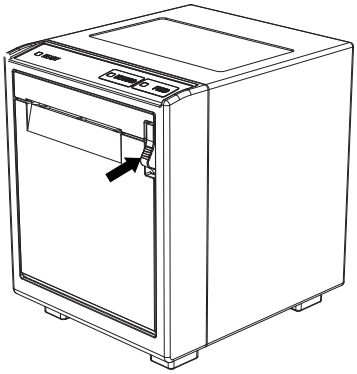
Installing the Recording Paper

⚠ CAUTION

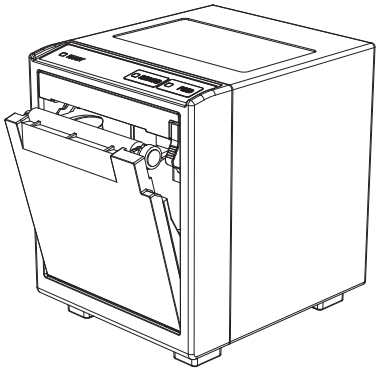
- About the Recording Paper
  - Use only "OP050-01TDR" for the recording paper.
    If the surface treatment and thickness of the recording paper are different, it may result in poor print quality.
- Storing the Recording Paper
  Since the recording paper is thermal type, inappropriate storage may change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

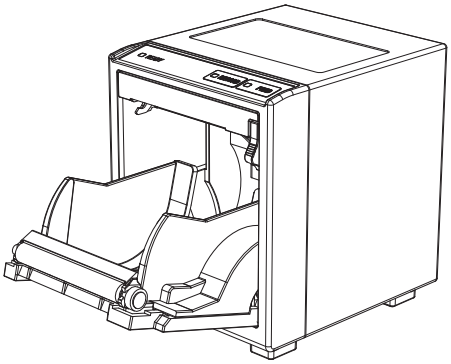
Install the recording paper with the following procedure.

1 Press the Open/Close Lever.



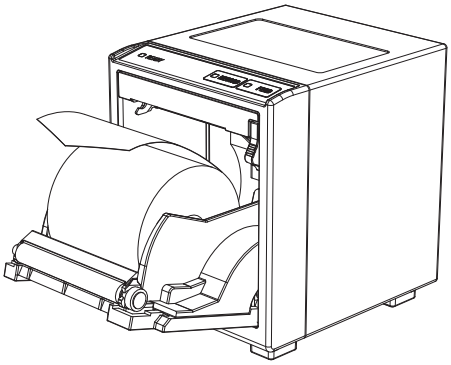
▸ The paper holder will open.





2 Set the Paper.

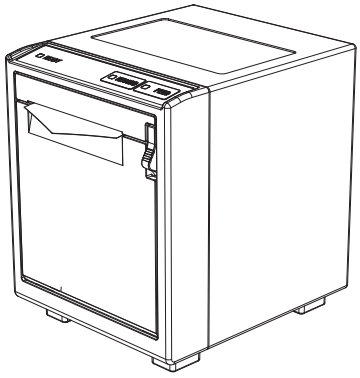
The outside surface of the paper is heat-sensitive. Make sure to place the outside surface of the paper facing up.



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.

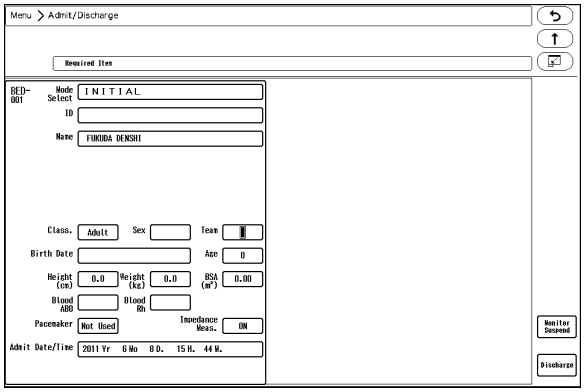
⚠ CAUTION

- 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.

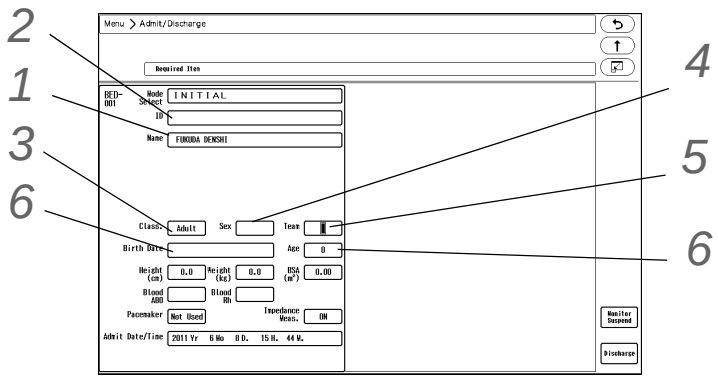
▸ The "Admit/Discharge" screen will be displayed.



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



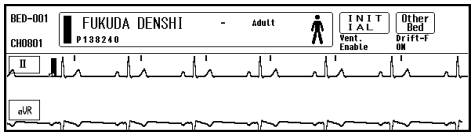
1 Enter the patient name.

1 Press the entering space for "Name".

▸ "Name" window will be displayed.

2 Enter the patient name.

▸ 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)

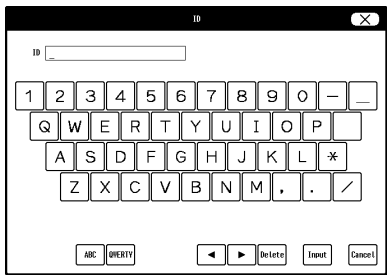
REFERENCE

- 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 alphabets, numerics, or symbols.



NOTE

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

3 Enter the patient classification.

- The patient classification affects the accuracy of NIBP measurement, HR measurement, and RR measurement. It also affects the delay time to generate the measurement data alarm.
- The alarm delay time is the function to prevent frequent generation of the measurement data alarm by holding the alarm generation for the duration of each delay time.
  The alarm delay functions for HR/PR, BP, RR, SpO_2, TEMP, $EtCO_2$/$InspCO_2$, Tachy, Brady, Ext Tachy, Ext Brady.

		Adult	Child	Neonate
NIBP Measurement Range	SYS	30 mmHg to 280 mmHg	30 mmHg to 180 mmHg	30 mmHg to 130 mmHg
	MAP	15 mmHg to 235 mmHg	15 to 160mmHg	15 mmHg to 100 mmHg
	DIA	10 mmHg to 200 mmHg	10 mmHg to 150 mmHg	10 mmHg to 90 mmHg
HR		0 bpm, 12 bpm to 300 bpm		0 bpm, 30 bpm to 300 bpm
Filter Mode	Monitor	0.5 Hz to 40 Hz		1.6 Hz to 40 Hz
	ESIS	1.6 Hz to 15 Hz		1.6 Hz to 15 Hz
	Diagnosis (When HS-8000 is used)	3 electrodes: 0.05 Hz to 100 Hz		
		4, 5, 10 electrodes: 0.05 Hz to 150 Hz		
Impedance Respiration		1.5 Hz		2.5Hz
Alarm delay time		5 sec.		0 sec.

WARNING

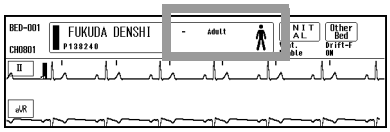
- The patient classification selection influences the precision of the QRS detection and NIBP measurement. Make sure the correct selection is made.
- The NIBP air hose corresponded to the set patient classification must be used to perform NIBP measurement. (However, if the patient classification is child,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

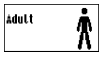
1 Press the key for "Class.".

▸ The patient classification dropdown list will be displayed.

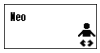
2 Select from [Adult] / [Child] / [Neonate].

▸ 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.

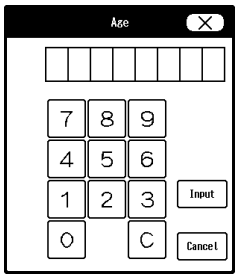
REFERENCE

- 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 classification, age will be displayed in days.

To Manually Enter the Age:

1 Press the key for "Age".

▸ "Age" window will be displayed.



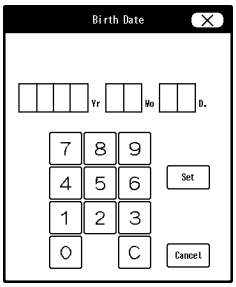
2 Enter the age using the numeric keys.

3 Press the [Set] 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.

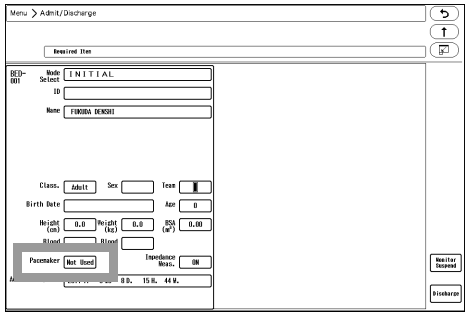
REFERENCE

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

❑When Pacemaker is Used

⚠ WARNING

- The pacemaker usage setting 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.

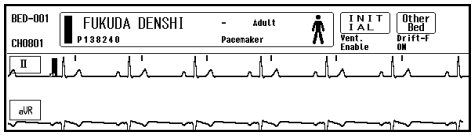
- The artificial pacemaker pulse will be displayed.
- When pacing waveform does not appear (pacing failure), erroneously detecting the pacemaker pulse as QRS will be prevented.
- The arrhythmia analysis will detect pacing beat as P (Pacemaker Beat) or F (Fusion Beat) to prevent erroneous judgment of 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" P4-24)

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.

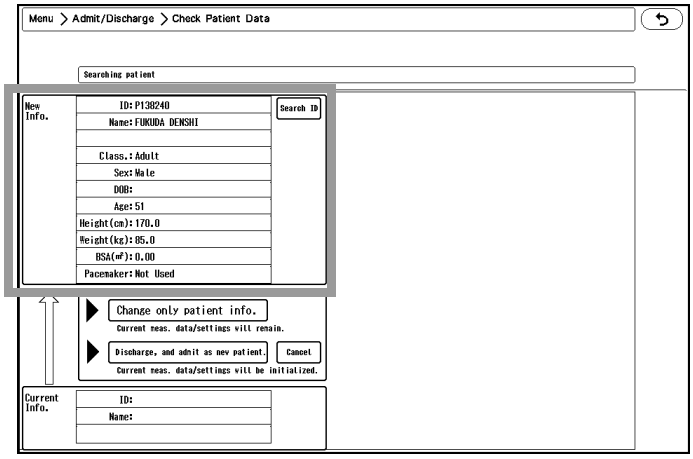
❑When Using the Patient Data Server and Magnetic Card Reader (or Barcode Reader)

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" P4-24)

1 Read the data from the magnetic card or barcode.

2 The searched patient data 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.

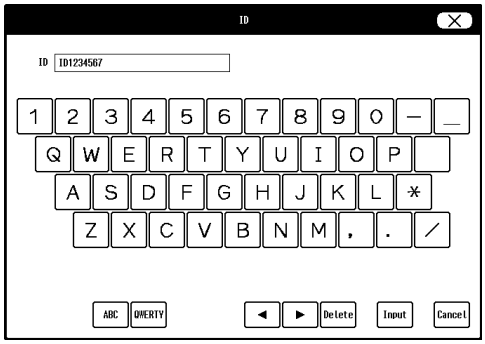
NOTE

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

1 Press the [Menu], "Admit/Discharge" icon, [ID].
"ID" window will be displayed.

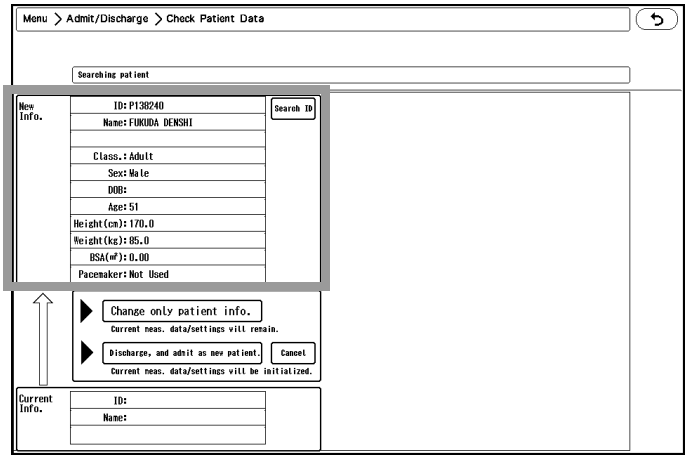
2 Enter the patient ID.

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 under "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 input 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 input 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

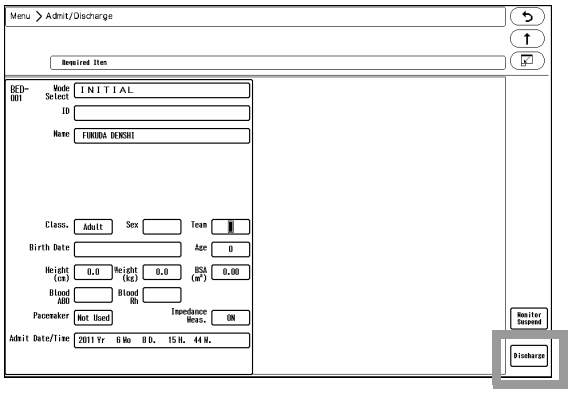
- If monitoring of new patient is started without discharging the previous patient, the measurement data of the previous and new patient will become mixed up on the recall and trend data.
- When the discharge process is performed, patient data such as recall and trend will be initialized. The parameter 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).
  (☞Maintenance Manual "Power ON/Discharge" P5-17)
- If the power is turned OFF or if the system enters into standby mode soon after the discharge procedure, the patient may not be discharged on the central monitor.
  If it is necessary to turn OFF the power or enter into standby mode after the discharge procedure, select [Standby] for "Discharge Mode" under [Initial Settings>User I/F>Power ON/Discharge].

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" P5-17)
- If the discharge procedure is performed during stopwatch operation, the counting will stop and will be reset to "00:00:00" .
- The monitoring condition after discharge can be set on "Discharge Mode"under [Initial Settings>User I/F>Power ON/Discharge].

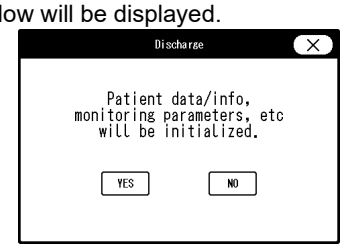
1 Press the [Menu], "Admit/Discharge" icon.

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



2 Press the [Discharge] key.

- The discharge confirmation window will be displayed.



REFERENCE

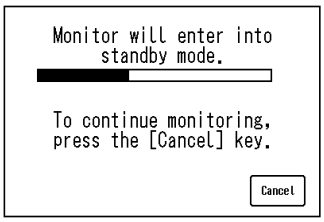
- To cancel the discharge process, press the [No] key or close the discharge confirmation window.

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, full disclosure waveform (optional) 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.

- If [Standby] is selected for "Discharge Mode" under [Initial Settings>User I/F>Power ON/Discharge], standby progress window will be displayed. Pressing the [Cancel] key will cancel the process to enter into standby mode.
  After 10 seconds, discharge procedure will be performed and the system will enter into standby mode.



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" P5-29)

NOTE

- The extended display is the function for the DSC-8530.

REFERENCE

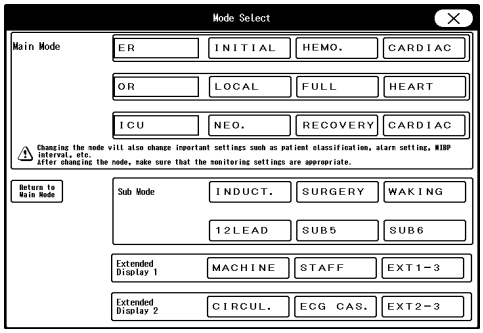
- For the user mode, up to 9 main modes of display configuration and alarm settings can be

registered according to the patient's age and monitoring purpose.
Also, for temporarily changing the display configuration (ex. when checking the 12-lead ECG), 6 sub modes of display configuration can be registered.
For the extended display, 3 modes for each extended display (1, 2) can be registered.
(☞Maintenance Manual "User Mode Registration" P5-29)

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 main mode is changed, patient classification, alarm settings, etc. will be changed.

2 Select the main mode or sub mode appropriate for the patient.

3 When the extended display is used, select the mode for the extended display.

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 [Initial Settings>User I/F>Power ON/Discharge].
- To change from the sub mode to the main mode, press [Return to Main Mode].
- Refer to "Setup Item/Default Value" for the default setting of each mode.
(☞Maintenance Manual "User Mode Registration" P5-29)

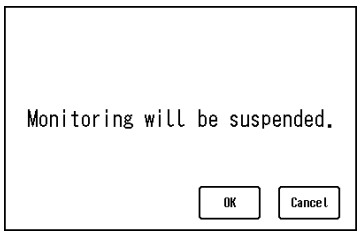
Suspend Monitoring

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.



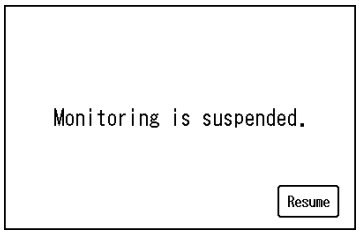
REFERENCE

- 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

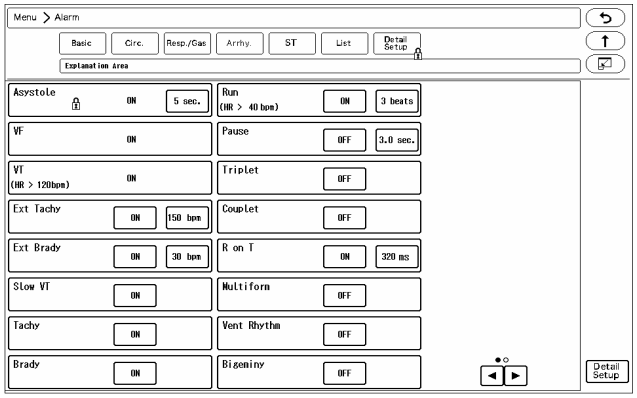
The arrhythmia alarm can be turned ON or OFF, and arrhythmia detection level can be set.

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

- <Arrhythmia alarm OFF> 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)
- If [Check when OFF] is selected for "Asystole, VF, VT Alarm" under "Initial Settings", a confirmation window will be displayed when the Asystole, VF, VT alarm is set to OFF.

REFERENCE

- The arrhythmia detection level for tachycardia (Tachy), bradycardia (Brady), extreme

tachycardia (Ext Tachy), extreme bradycardia (Ext Brady) alarm links with the upper and lower alarm limit for HR/PR as described below.

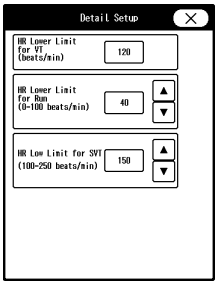
- The tachycardia (Tachy) alarm generates when the value exceeds the HR/PR upper alarm limit. When the upper alarm limit is OFF, alarm will not generate.
- For the Ext Tachy alarm, the alarm threshold level cannot be set below that of Tachy alarm.
- The bradycardia (Brady) alarm generates when the value 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 Press the [Detail Setup] key, and set the HR Lower Limit for VT, RUN and SVT.



1 "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.

2 "HR Lower Limit for RUN"

- If the HR is same or above the selected value, RUN will generate.

3 "HR Lower Limit for SVT"

- If the HR is same or above the set value, SVT alarm will generate.

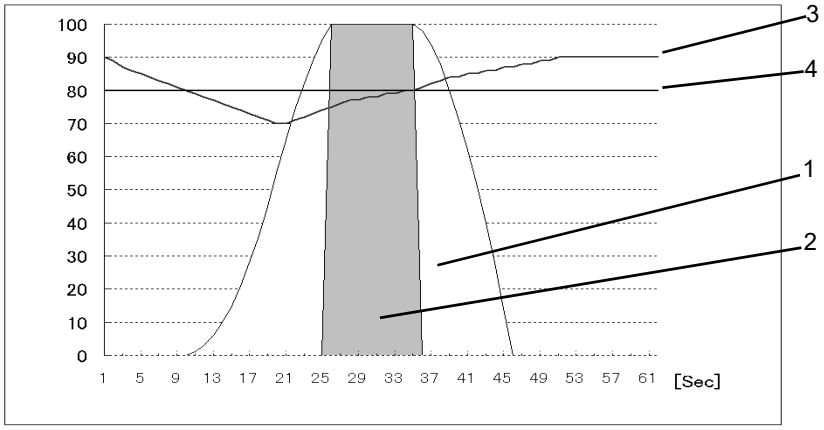
SpO_2 Second Alarm Setup

The SpO_2 second alarm function is available when the HS-8312N Super Unit 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.

NOTE

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

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.

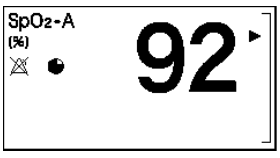
1 Press the [Menu], [SpO_2] ("Parameter") keys.

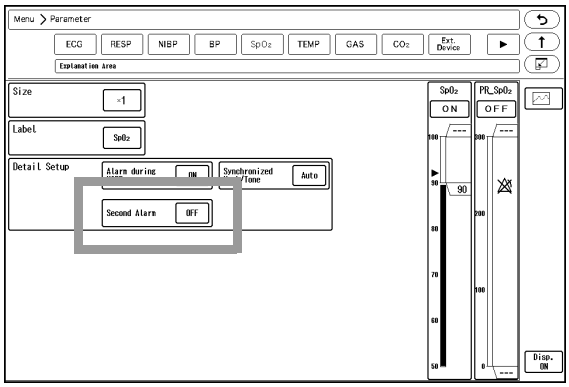
▸ The SpO_2 setup screen will be displayed.

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.

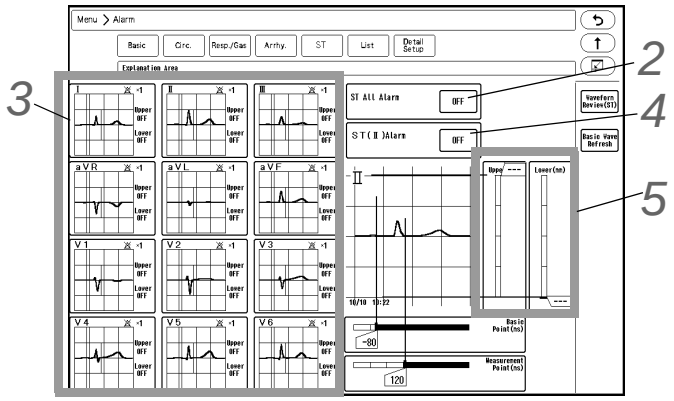
- [OFF]: Second alarm indicator will not be displayed.
- As the integral value increases, the indicator will begin to fill, and when it is completely filled, an alarm will be generated.

ST Alarm Setup

The ST upper value and lower value compared with the reference waveform will be set.
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).

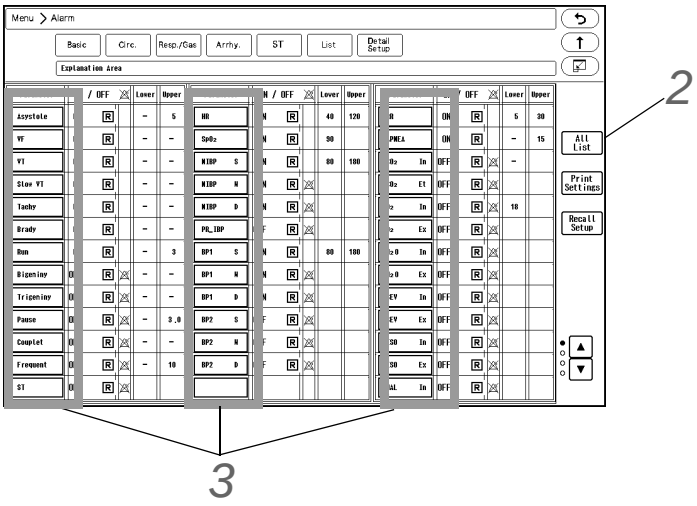
- Alarm will be set to OFF if the value –20mm / –2.0mV or lower is selected.
- Alarm will be set to OFF if the value +20mm / +2.0mV or above is selected.

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].

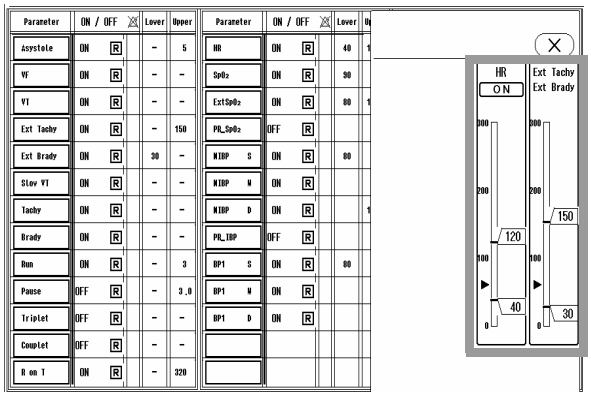
▸ [All List]: The settings for all the parameters will be displayed.

▸ [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.



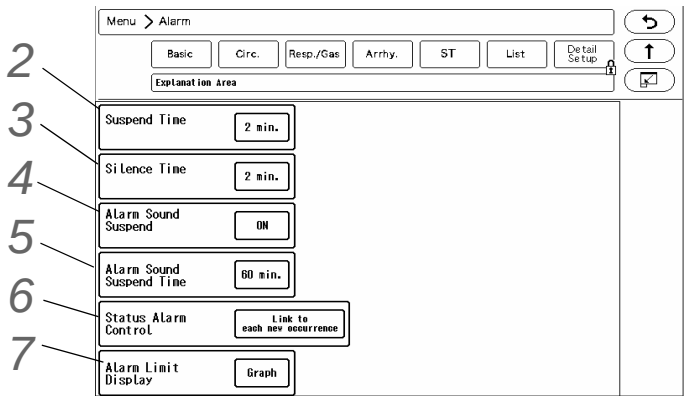
2 Press /XXX/\XXX to set the threshold level.

Detail Setup

The alarm-related setup such as alarm suspend time and alarm silence time 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".

▸ The dropdown list will be displayed.

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

3 Press the key for "Silence Time".

▸ 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".

▸ The dropdown list will be displayed.

1 Select from [1min.]/[2min.]/[5min.]/[10min.]/[30min.]/[60min.]/[90min.]/[120min.]/[240min.]/[360min]..

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.

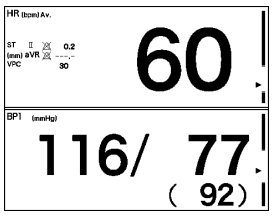
- [Link to each new occurrence]: When the [Alarm Silence] key is pressed at occurrence of equipment status alarm, the alarm will be silenced as long as the alarm factor remains regardless of the "Silence Time" setting.
  While the same equipment status alarm is generated, the alarm will remain silenced.
  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".

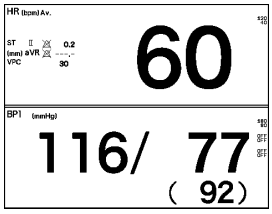
- The dropdown list will be displayed.

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

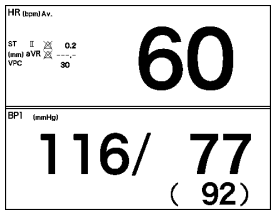
- The upper and lower alarm limit will be displayed on the home display.



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 to enable/suspend the system alarm, and to set the upper/lower alarm limit for each parameter.
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.

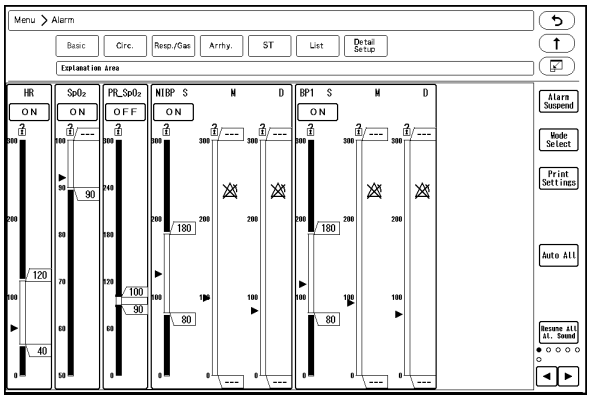
⚠ WARNING

- 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.

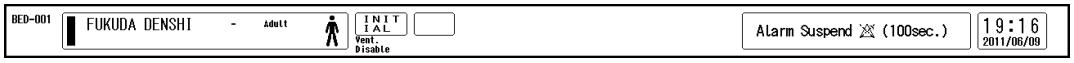
To Suspend the Alarm

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 System 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

The alarm sound can be suspended for fixed amount of time. There are two ways to suspend the alarm sound, which are "Alarm Silence" and "Alarm Sound Suspend".
The "Alarm Silence" function suspends the alarm sound for fixed amount of time (1 min. / 2 min.).
The "Alarm Sound Suspend" function suspends the alarm generation in advance such as during surgery when the alarm generation is expected. Alarm monitoring will continue even while the alarm sound is suspended. The alarm sound suspend duration can be selected from 1min./2min./5min./10min./30min./60min./90min./120min./240min./360min.

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

- The alarm sound will be silenced for fixed amount of time.
- If the alarm factor still remains at completion of silence time, the alarm sound will generate again.
- The [Alarm Silence] can also be operated on user keys or remote control.

2 To suspend the alarm sound, press the Alarm Silence key (fixed key) for more than 3 seconds.

- The alarm sound will be suspended for fixed amount of time.
- During the alarm sound suspended duration, 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

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

When [Fukuda Tone] is set for "Alarm System" under [Menu>Setup>Initial Settings], 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, the alarm sound will generate.

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

The alarm silence condition for all parameters will be canceled for the following case.

- When the power is turned ON.
- When the system alarm status (enable/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 canceled for the following case.

- 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.

If [Link to each new occurrence] is set for "Status Alarm Control" (Menu>Alarm>Detail Setup), the alarm sound will not generate until the alarm condition changes even the set alarm silence duration completes.

❑Precautions about Suspending the Alarm Sound

During the alarm sound suspended duration, recall and alarm printing will function.
The alarm sound suspended condition will cease in the event of any of the following.

- Discharge
- When OFF is set for "Alarm Sound Suspend".
- When the ventilator alarm is generated.
- When resumed from monitor suspend condition.
- When the [Alarm Silence] key is pressed.

Alarm Limit Setup for Each Parameter

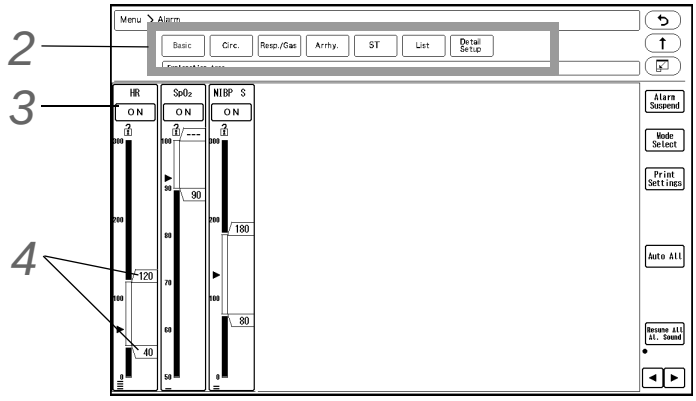
The alarm for each parameter can be turned ON or OFF, and upper and lower alarm limit can be set.

⚠ WARNING

- Set the appropriate upper and lower alarm limit for each parameter according to the monitoring condition.
- When the system alarm is suspended, all the alarm will be suspended even if the parameter alarm is set to ON. Also, the alarms will not be stored as recall events.
- If the upper/lower alarm limit of the parameter is set to OFF, or arrhythmia alarm is set to OFF, alarm will not function even if the system alarm is set to ON. Pay attention when setting them OFF.
- When the numeric data acquired from FLOW-i is displayed, the following alarms cannot be set. Also, these alarms will not generate.
  $InspCO_2$/$EtCO_2$, $InspO_2$/$ExpO_2$, $InspN_2O$/$ExpN_2O$, InspAgent/ExpAgent, MAC, ExpMV, PEAK, PEEP

1 Press the [Menu], then [Alarm] key.

▸ The alarm setup screen will be displayed.



2 Select the parameter group from the tab.

REFERENCE

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

3 Select ON/ OFF for the individual alarm.

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

4 Set the upper/ lower limit.

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" P5-14)

Numeric Data Alarm Adjustable Range

Item	Description	
HR/PR/BPR	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 BP8	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 TEMP8	ON, OFF	30-45°C
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 0.1-13.3%
$InspCO_2$ (upper limit)*	ON, OFF	1 mmHg to 4 mmHg 0.1 kPa to 0.4 kPa 0.1-0.4%
SpCO	ON, OFF	1%SpCO to 40%SpCO
SpMet	ON, OFF	1%SpMet to 15%SpMet
SpHb	ON, OFF	1.0 g/dL to 24.5 g/dL
ExpMV (Adult) ExpMV (Child/Neonate)*	ON, OFF	2.0 L/min to 20.0 L/min 0.5 L/min to 5.0 L/min
PEAK*	ON, OFF	8 cmH_2O to 100 cmH_2O
PEEP*	ON, OFF	2 cmH_2O to 50 cmH_2O
BIS	ON, OFF	1-99

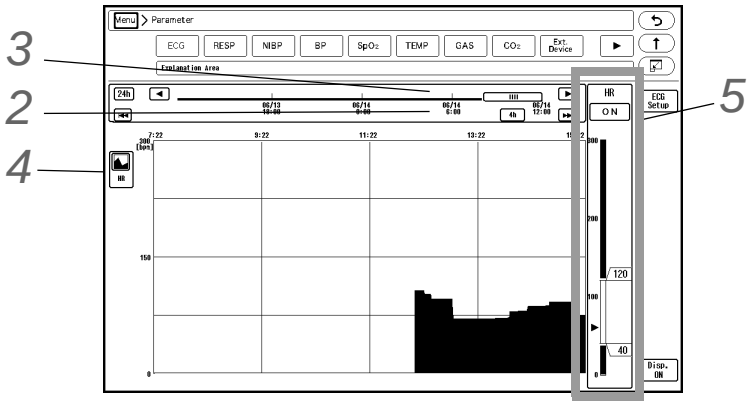
*: When the numeric data acquired from FLOW-i is displayed, alarms cannot be set. Also, these alarms will not generate.

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 [ ] on the corresponding parameter setup screen.
Or, press the numeric data box on the home display, and press [ ] 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]/[20min] for LC-8019T/TC, and [24h]/[16h]/[12h]/[8h]/[4h]/[2h]/[1h]/[10min] for LC-8015T/TC.

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 half page.

4 Select the trend display format.

1 Press the key for display format selection.

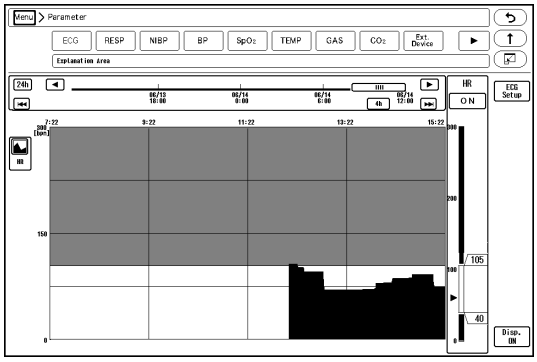
▸ The dropdown list will be displayed.

2 Select the display format from [●], [▙], [Y], 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

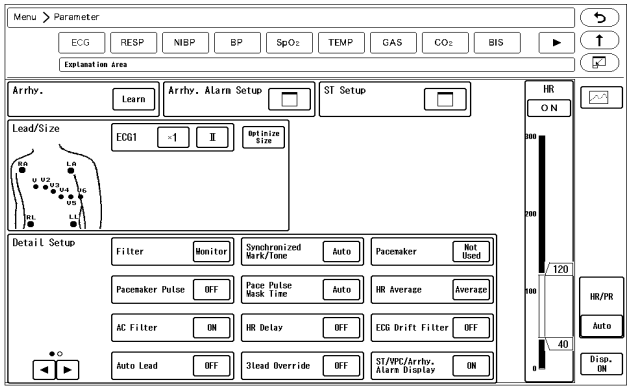
Chapter 7 Monitoring

To Display the Parameter Setup Screen

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

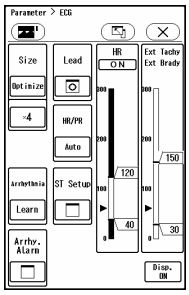
1 Press the [Menu], and then select the parameter to perform the setup.
Or, press the numeric data box on the home display, and press (⊡) on the corresponding parameter setup screen.

▸ The "Parameter" 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" screen for detailed setup, press (⊡).



ECG

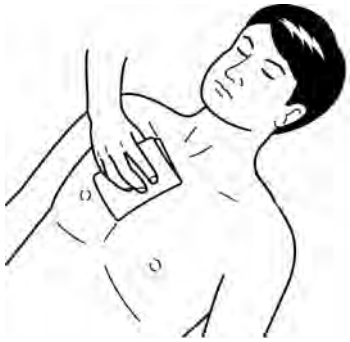
This section explains the procedure for ECG measurement preparation and monitoring condition setup.

Before Attaching the Electrodes

⚠ CAUTION

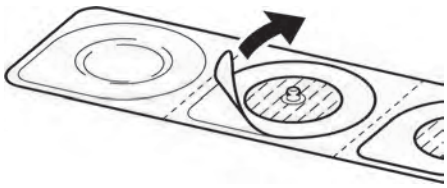
- Make sure to use electrodes of the same type.
  If different types of electrodes are used at the same time, the difference between the polarization potential from each electrode may interfere monitoring.
- ECG measurement part is Type CF applied part, but it is not intended to directly apply on patient's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

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



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

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



NOTE

- Pay attention not to touch the electrode gel.

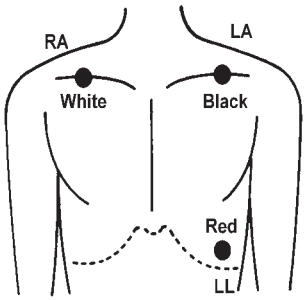
Electrode Placement

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

❑For 3-electrode lead cable (1 waveform monitoring)

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

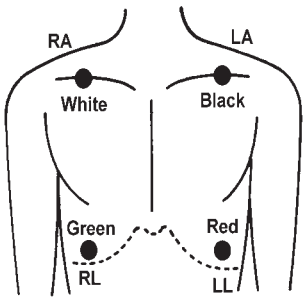
Symbol	Color	Electrode Site
RA	White	On the right infraclavicular fossa
LA	Black	On the left infraclavicular fossa
LL	Red	On the left midclavicular line, near the supracrestal line.



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

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

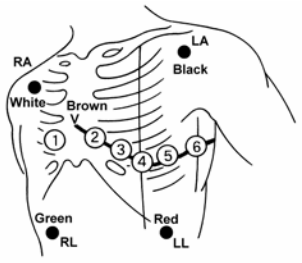
Symbol	Color	Electrode Site
RA	White	On the right infraclavicular fossa
LA	Black	On the left infraclavicular fossa
LL	Red	On the left midclavicular line, near the supracrestal line.
RL	Green	On the right midclavicular line at the same height as LL.



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

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

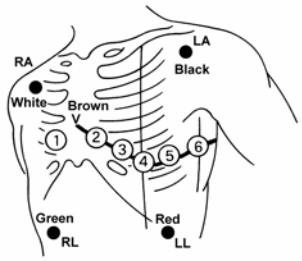
Symbol	Color	Electrode Site
RA	White	On the right infraclavicular fossa
LA	Black	On the left infraclavicular fossa
LL	Red	On the left midclavicular line, near the supracrestal line.
RL	Green	On the right midclavicular line at the same height as LL.
V	Red/Brown	Chest electrodes (V1 to V6)



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

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

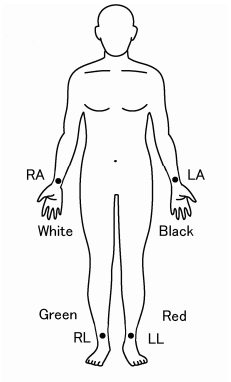
Symbol	Color	Electrode Site
RA	White	On the right infraclavicular fossa
LA	Black	On the left infraclavicular fossa
LL	Red	On the left midclavicular line, near the supracrestal line.
RL	Green	On the right midclavicular line at the same height as LL.
V	Red/Brown	The fourth intercostal space at the right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

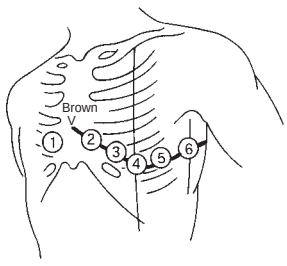


NOTE

- 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

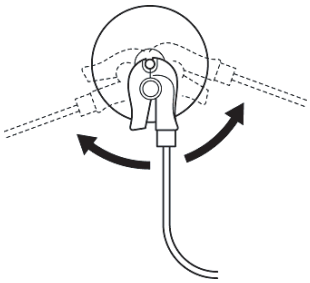
- The indication for continuous use of the electrode is about one day.
- Replace the electrode if the skin contact gets loosen due to perspiring, etc.
- When an electrode is attached to the same location for a long period, some patients may develop skin irritation. Check the patient's skin condition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

NOTE

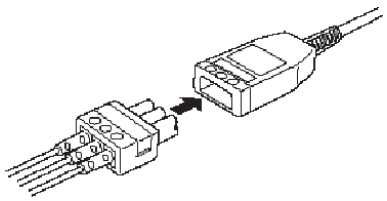
- Use only the specified relay cables, lead cables, and electrodes.
- The conductive parts of electrodes and associated connectors for applied parts, including the neutral electrode, should not contact other conductive parts including earth.

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

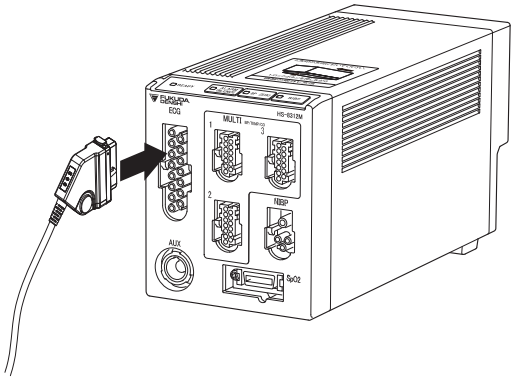
2 Turn to right and left and verify that it is securely connected.



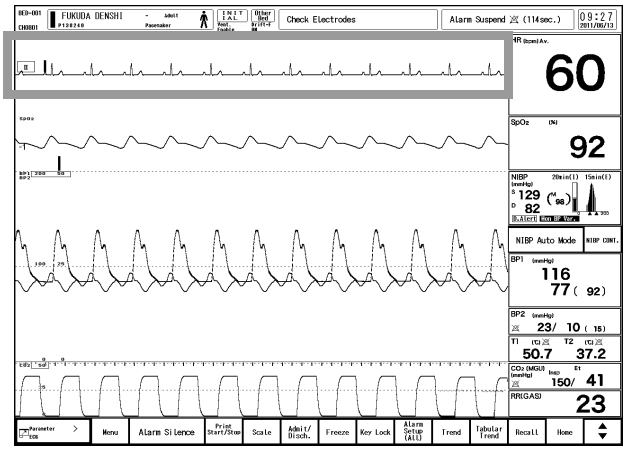
3 Connect the lead cable to the relay cable.



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



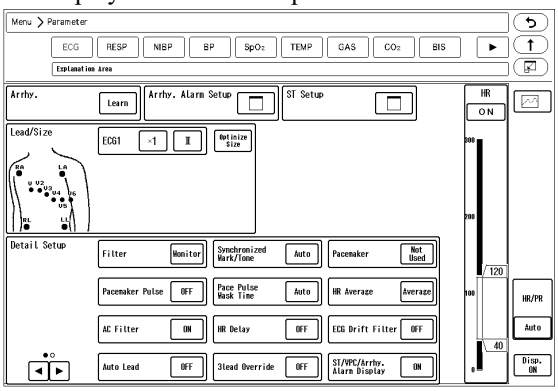
▸ ECG waveform and HR data will be displayed on the monitor.



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

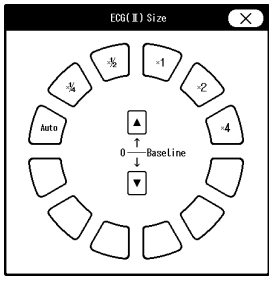
- The threshold level for arrhythmia detection changes with ECG waveform size. Set a proper waveform size for monitoring. When the ECG waveform size is x1/4, x1/2, or x1, the arrhythmia detection level is 250 µV.When the ECG waveform size is x2 or x4, the arrhythmia detection level is 150 µV.
- Automatic size/position of the ECG is effective only at the time the [Auto] key is pressed. This does not continuously adjust the size and position.
- The waveform size and position cannot be set if the waveform is not displayed. Refer to "To Configure the Display" P10-7, 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" P10-13)

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

▸ The "Size" menu 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/printing.

▸ [Auto]: ECG amplitude will be automatically adjusted to 10 mm.
The automatic adjustment is effective only when the [Auto] key is pressed.

Waveform Size	x1/4	x1/2	x1	x2	x4
Voltage (10 mm)	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 0 mV. The baseline position for the waveform display and printing will be adjusted.
- When the display layout is set to "12-Lead", the baseline position cannot be changed.

❑Lead Selection

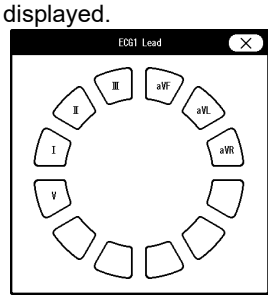
Set the monitoring lead.

⚠ 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.
- The alarms for HR, Tachy, Brady will not be generated when the electrode for ECG1 or ECG2 lead is detached, and for 30 seconds after the electrode is reattached.

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

▸ The "Lead" selection window will be displayed.



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

2 Select the ECG monitoring lead.

❑HR Alarm Setup

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

NOTE

- Set the upper limit in the range of 22 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.
- Ext Tachy alarm threshold cannot be set below HR upper alarm limit, and Ext Brady alarm threshold cannot be set above HR lower alarm limit.

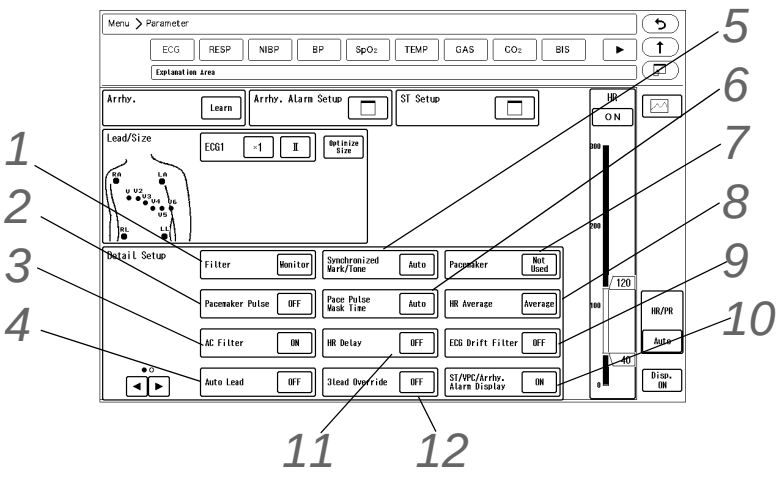
REFERENCE

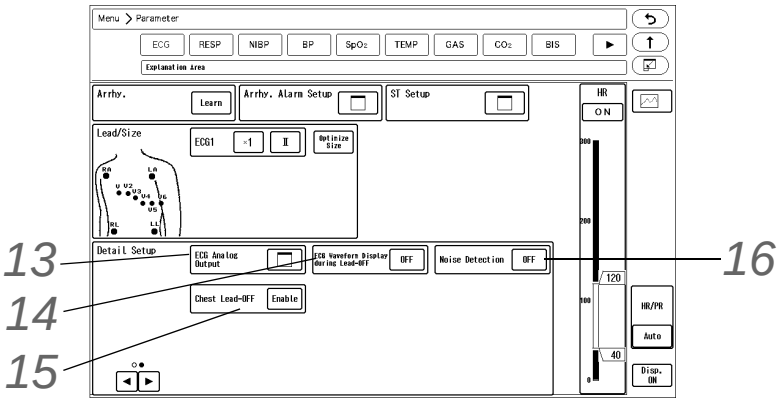
- When [Auto] is set, the upper and lower limit will be automatically set to +40 bpm and -40 bpm to the current value respectively. The lower limit will be clipped to the setting made for "HR/PR Lower Limit during Alarm Auto Setting" (Menu>Initial Settings>Alarm).
- Ext Tachy will be set to HR upper limit+10 bpm, Ext Brady will be set to HR lower limit-10 bpm. When the set value exceeds 300 bpm for the upper limit and 20 bpm for the lower limit, the setting will be clipped to 300 bpm and 20 bpm respectively
- When [Auto] is set for Ext Tachy, Ext Brady, the same setting, HR upper limit+10 bpm, HR lower limit-10 bpm, will be set respectively.

❑Arrhythmia Alarm Setup

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

❑Detail Setup





1 Set the filter mode.

- Select from [Monitor]/[ESIS]/[Diag.]. Each mode has different frequency characteristic.
- The selected filter mode will be printed along with other data.
- On the waveform area, "M" (Monitor), "E" (ESIS), or "D" (Diagnosis) will be displayed.

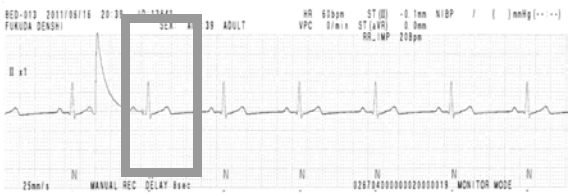
⚠ CAUTION

- The ESIS mode cannot completely reduce the electrical noise, and may erroneously detect the pacemaker spike.
- The ESIS mode should be selected only when a high frequency noise largely affects the HR measurement.
- 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.

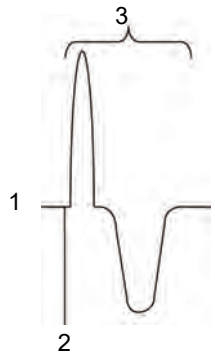
Monitor Mode (Frequency Characteristic: Adult/Child 0.5 Hz to 40 Hz, Neonate 1.6 Hz to 40 Hz)	This is the standard mode for ECG monitoring. The highest frequency is set to 40 Hz to reduce the artifact caused by EMG, etc.
ESIS Mode (Frequency Characteristic: Adult/Child/Neonate 1.6 Hz to 15 Hz)	By selecting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

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 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 Canceling of Arrhythmia Detection
Arrhythmia detection of the waveform following the pacemaker pulse will be canceled.

⚠ CAUTION

- Precautions about Pacemaker Pulse Detection
  - 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.

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.

3 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. "AC" will be displayed in the waveform area.

▸ [OFF]: AC filter will not be set.

4 Set the "Auto Lead".

REFERENCE

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

During Lead OFF

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

1 Press the key for "Auto Lead".

▸ The dropdown list will be displayed.

2 Select from [ON] or [OFF].

▸ [ON]: When lead-off condition occurs, the lead will automatically switch.
Also, <Check Electrodes> will be displayed.

▸ [OFF]: The lead will not automatically switch even when lead-off condition occurs.

5 Set the "Synchronized Mark/Tone".

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

- The dropdown list will be displayed.

2 Select from [Auto]/ [ECG]/ [SpO_2-1]/ [SpO_2-2]/ [BP]/ [OFF].

- [OFF]: Synchronized mark will not be displayed.
- [Auto]: The priority will be according to the setting of "Synchronized Mark/Tone Priority" [Menu>Initial Settings>Meas.>Other].
  (☞Maintenance Manual "Other Setup" P5-12)
  [ECG]: The synchronizing priority will be set in the order of ECG>SpO_2-1>SpO_2-2>BP. The synchronized tone will be set to [ON].
  [SpO_2]: The synchronizing priority will be set in the order of SpO_2-1>SpO_2-2>ECG>BP. The synchronized tone will be set to [ON].
- [ECG]: HR synchronized mark will be displayed.The synchronized tone will turn ON.
- [SpO_2-1]/[SpO_2-2]: SpO_2 synchronized mark will be displayed.
  The synchronized tone will turn ON.
- [BP]: BP synchronized mark will be displayed.The synchronized tone will turn ON.

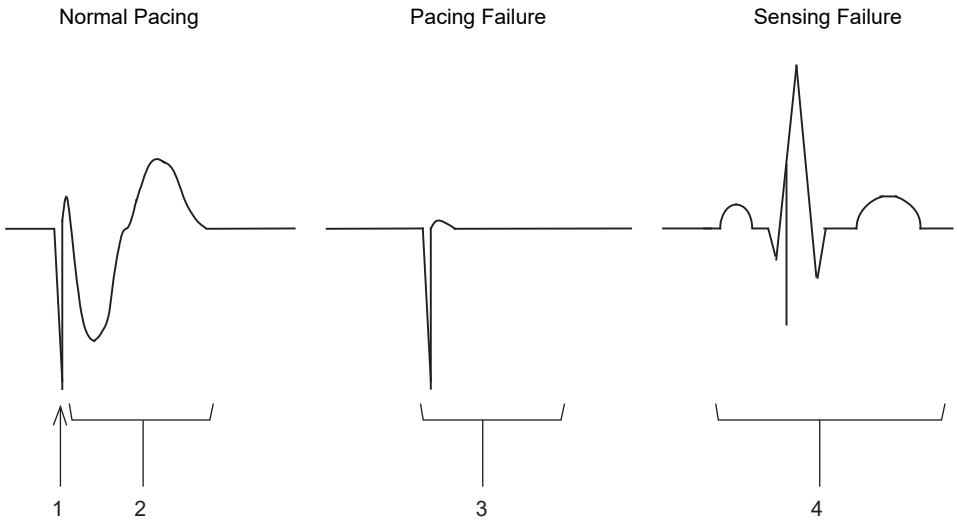
6 Set the "Pace Pulse Mask Time".

WARNING

- If the QRS pace mask function is set to [OFF]/[10ms]/[20ms]/[40ms], the pace pulse may be erroneously be 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]/[40ms] 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

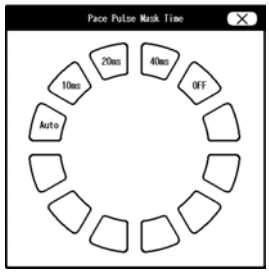
2 Pacing waveform caused by pacemaker pulse

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 0 ms.

7 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.

8 Set the "HR Average".

1 Press the key for "HR Average".

- The dropdown list will be displayed.

2 Select from [Instant]/[Average].

- [Instant]: HR measured from RR interval of each heartbeat will be displayed.

- [Average]: HR measured from 6 seconds of heartbeat for adult and child, and 3 seconds of heartbeat for neonate will be displayed.

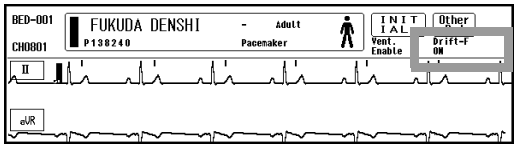
9 Set the Drift Filter.

1 Press the key for "ECG Drift Filter".

- The dropdown list will be displayed.

2 Select from [ON] or [OFF].

- [ON]: Only the amplitude with frequency component under 1 Hz will be attenuated to prevent the ECG baseline drift.
  The patient signal display will delay about 0.5 seconds.
  On the home display, "Drift-F ON" will be displayed in the information area, and "DF" will be displayed in the waveform area.



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

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

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

- The dropdown list will be displayed.

2 Select from [ON] or [OFF].

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

11 Set the "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.

12 Set the "3lead Override".

NOTE

- When a relay cable for 5-lead or 10-lead is used with a 3-lead cable, it will be judged as lead-off condition and <LEAD OFF> message will be displayed.
  If a 3-lead cable is intentionally used, select [ON] for "3lead Override" to avoid displaying the <LEAD OFF> message.

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

1 Press the key for "3lead Override".

▸ The dropdown list will be displayed.

2 Select from [ON] or [OFF].

13 Display the next page and 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.

14 .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.

15 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.

NOTE

- If chest lead is set for ECG1/ECG2, chest lead OFF condition will be notified by an alarm generation even if [Disable] is set for "Chest Lead-OFF".

16 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

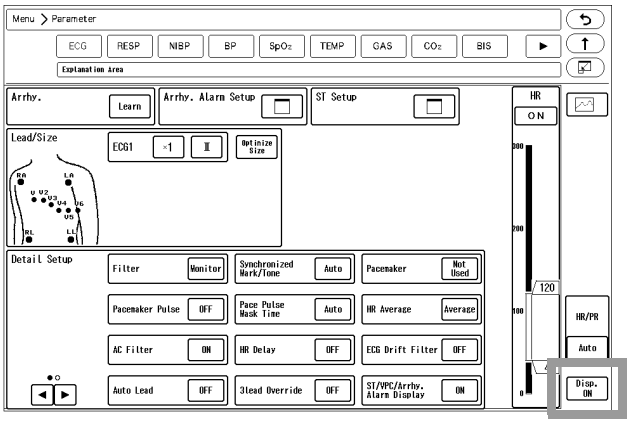
- Even if the synchronizing source is switched to SpO_2, the ECG tone will remain and not change.

❑ON/OFF of Parameter Display

Select ON/OFF for parameter display.

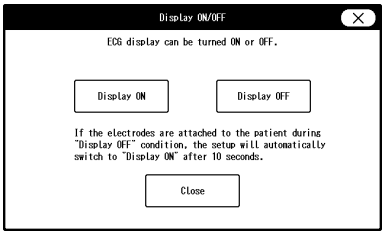
⚠ CAUTION

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



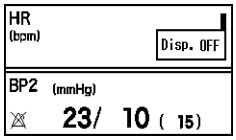
1 Press the [Disp. ON] key.

- 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

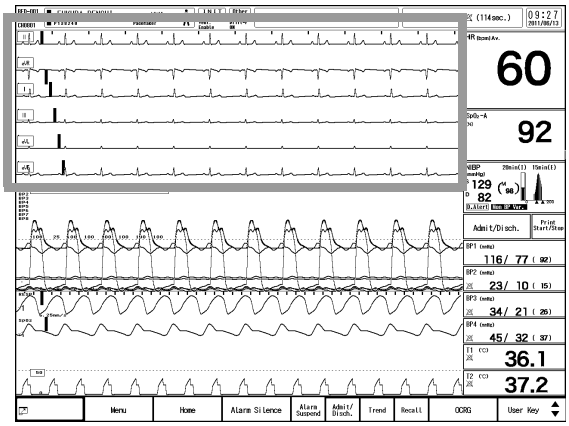
This section explains about the respiration measurement by the impedance, CO_2, or ventilator method and the measurement condition settings.

⚠ 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)

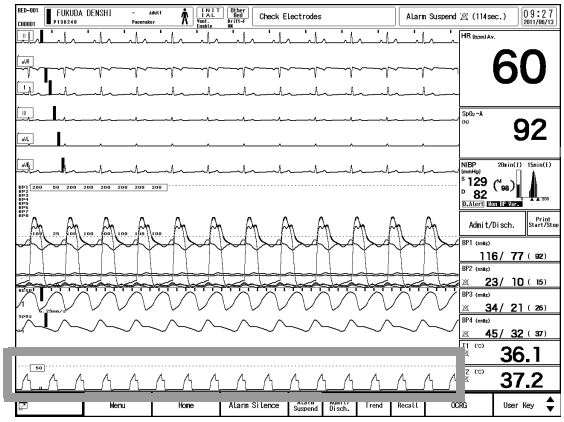
1 Check that the displayed ECG waveform is stable.



REFERENCE

- The respiration waveform is detected from ECG II or ECGI 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.

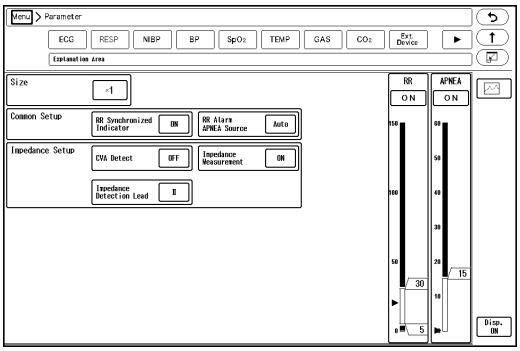


NOTE

- Adjust the waveform size, baseline position and sweep speed as necessary. (☞"To Configure the Display" P10-7)

RESP Parameter Setup

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

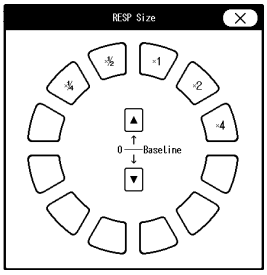


Display Example when using the Super Unit

1 Set the waveform size.

1 Press the key for "Size".

▸ The "RESP Size" screen will be displayed.



2 Select from[1/4]/[x1/2]/[x1]/[x2]/[x4].

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

REFERENCE

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

2 Set the RR alarm.

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

NOTE

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

- Set the upper limit within the following range for each patient classification.
  Adult: 10 to 150Bpm
  Child/Neonate: 4 to 150Bpm
  The upper limit alarm will turn OFF if the value above 150Bpm is set.
- Set the lower limit within the following range for each patient classification.
  Adult: 5 to 145Bpm
  Child/Neonate: 2 to 148Bpm
  If a value below 5Bpm/2Bpm is set, the lower alarm will turn OFF.
- For the impedance respiration, RR alarm will not generate when the electrode of detection lead is detached and for 30 seconds after the electrode is reattached.
- When Capnostat 5 is used, RR alarm will not generate unless 2 or more respiration is detected after completion of the airway adapter calibration.

REFERENCE

- When [Auto] is set, the upper and lower limit will be automatically set to +20Bpm and -20Bpm to the current value respectively.
- The adjustable increment for RR alarm depends on the patient classification and "RR Alarm Increment" setting. (Initial Settings>User I/F).

	RR Alarm Increment	
	Normal	Small
Adult	5Bpm increment	1Bpm increment
Child/Neonate	2Bpm increment	1Bpm increment

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

⚠ WARNING

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

NOTE

- The same apnea alarm setting will be applied for impedance, CO_2, and ventilator measurement.
- For apnea measured from CO_2 waveform, apnea alarm will not generate unless 2 or more respiration is detected within 30 seconds after the power is turned ON, monitoring is resumed, CO_2 unit is connected, or a patient is discharged.
- Set the upper limit in the range of 10 to 60 sec. If a value above 60 sec. is set, the upper alarm will turn OFF.
- For the impedance respiration, apnea alarm will not generate when the electrode of detection lead is detached and for 30 seconds after the electrode is reattached.
- When Capnostat 5 is used, apnea alarm will not generate unless 2 or more respiration is detected after completion of the airway adapter calibration.

REFERENCE

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

4 Set the "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) 30Bpm, for 20 seconds or over (10 seconds or over for neonates) and if the "CVA Detect" is set to [ON], the <CVA detected> message will be displayed, and an alarm sound will be generated.

1 Press the key for "CVA Detect".

▸ The dropdown list will be displayed.

2 Select from [ON] or [OFF].

▸ [ON]: When CVA is detected, alarm will generate and message will be displayed.

▸ [OFF]: CVA detection will not be performed.

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 source is displayed. Make sure to display the numeric data box for the RR/APNEA source.

CAUTION

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

REFERENCE

- The RR parameter to display the RR synchronized mark and to generate the RR/APNEA alarm can be selected from impedance, CO_2/multigas unit, and ventilator.

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

▸ The dropdown list will be displayed.

2 Select a parameter.

▸ [Impedance]: RR alarm will be generated based on the impedance respiration curve. The RR

synchronized mark based on impedance respiration will be displayed.

- [CO_2/GAS]: When multigas unit/FLOW-i is used, RR alarm will be generated based on the RR measured by the multigas unit/FLOW-i.
  If multigas unit is not used, RR alarm will be generated based on the RR measured by the HPD-800/HPD-810 (Capnostat 5) or HCP-800/HCP-810. The RR synchronized mark based on 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 selected in the priority of CO_2/GAS or FLOW-i >ventilator>impedance, and generates the alarm if the corresponded numeric data box is displayed on the home display.

6 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.

7 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.

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

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 8 measurement preparation and measurement condition setup.

⚠ CAUTION

- Do not reuse / re-sterilize the disposable type transducers.
- If using a reusable blood pressure transducer, disinfect it according to the manufacturer's guidelines.
- The long-term use of the blood pressure transducer, tube and catheter may increase the risk of infection. Perform periodic replacement with new one. The guidelines of the CDC (Disease Control and Prevention) recommend replacing within 96 hours.
- If the ambient temperature of the blood pressure transducer has changed greatly, the zero balance may cause the drift. Perform the zero balance again.
- An operator must not get away from a patient during the BP measurement. However, when getting away from the patient is necessary, do not activate the Alarm Suspend and Silence functions in order not to miss any sudden changes in the patient's condition.
(☞"To Set the System Alarm (ON or Suspend)" P6-7)
(☞"To Silence or Suspend the System Alarm Sound" P6-9)
- 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

The 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.
The measurement is also possible using the HM-800 Multi Module inserted to the input box.
(☞"Multiparameter Connector Setup for BP, TEMP, CO Measurement" P7-109)

1 Connect the 2ch BP interface cable to the Super Unit.

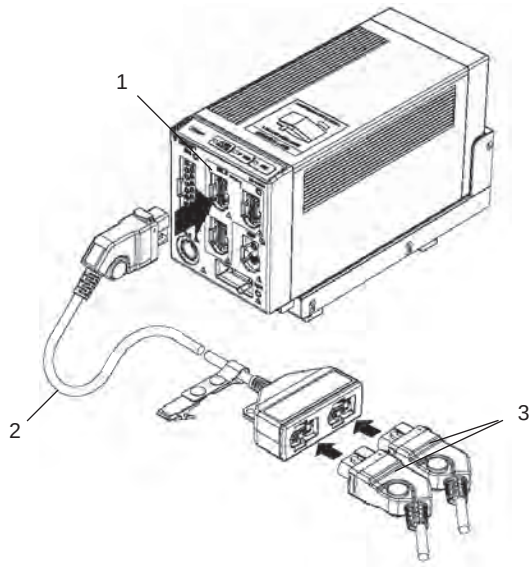
For Connection via 2ch BP Conversion Cable (CJO-P01B-DJ0.5):

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

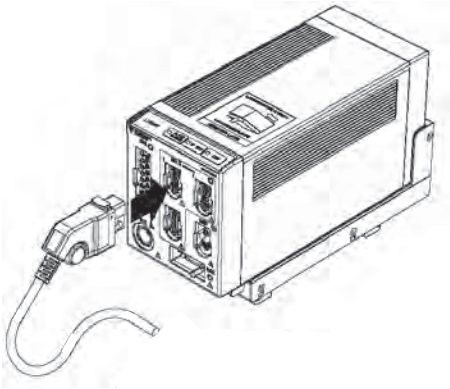
3 1ch BP Relay Cable
CJO-P01B-S**



For Direct Connection:

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

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



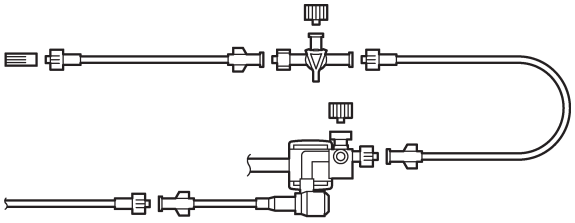
2 Assemble the BP measurement device.

REFERENCE

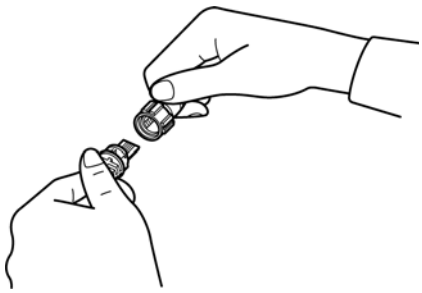
- The following procedure explains the case when a BP transducer (LS575 series) is used. If using other transducers, refer to the operation manual for the corresponding transducer.

1 Inspect transducer packaging for damage prior to opening.

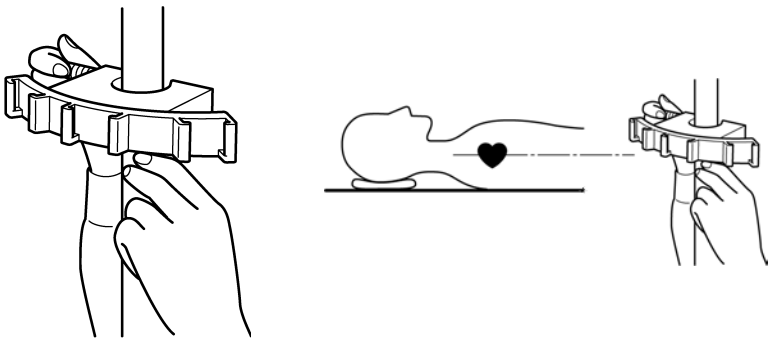
2 Verify that each connector is securely connected.



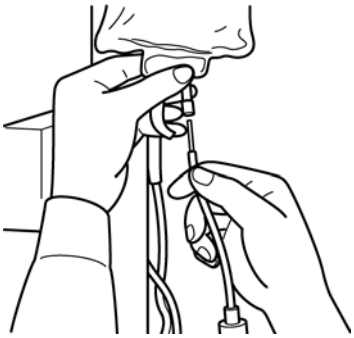
3 Connect the BP relay cable to the transducer.



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

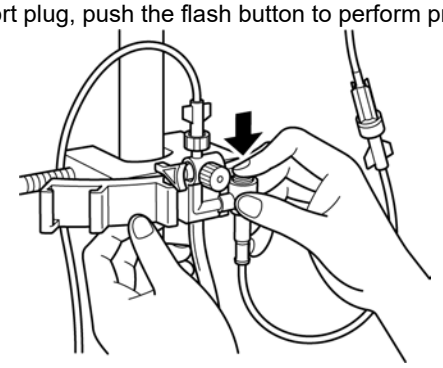


5 Inject 1000 units of heparin into the saline bag, mix thoroughly and puncture the infusion line through the same hole.



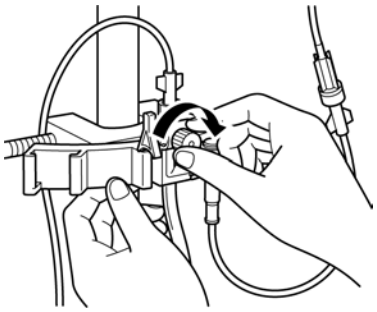
6 Set the saline bag to pressure bag, and hang from the infusion device. Fill saline to about 1/3 of the drip.

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

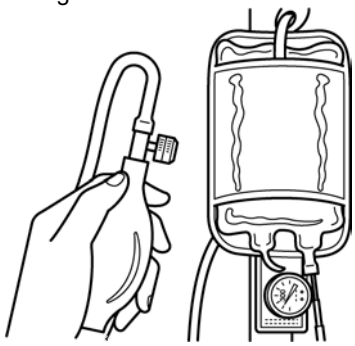


8 Verify that all air bubbles are removed, and tighten the zero-port plug. Turn on the zero-port plug side of

the open-air three-way valve.



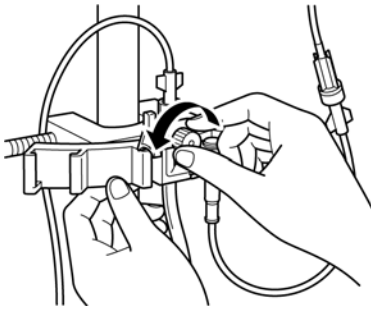
9 Inflate the pressure bag to 300 mmHg.



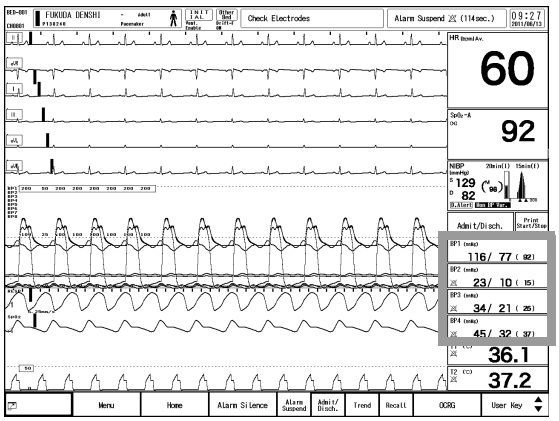
10 Set the BP device and wait for about 5 minutes.

3 Perform zero balance.

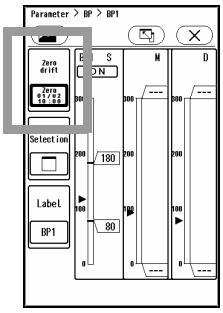
1 Loosen the zero-port plug on open-air three-way valve one-half turn.



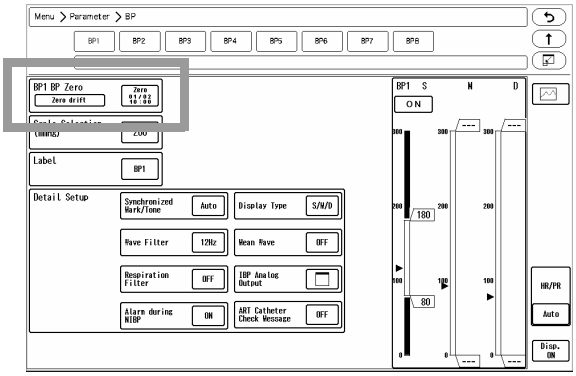
2 Press the BP numeric data box (parameter key) on the home display.



▸ The BP floating window will be displayed.



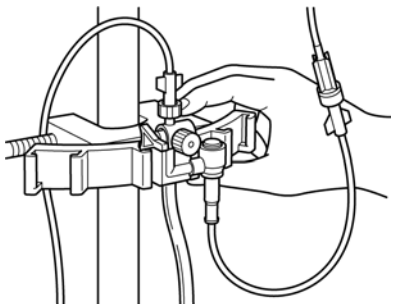
3 Press the [Zero] key on the BP floating window or BP parameter setup screen.



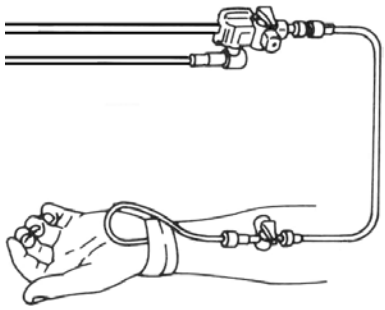
▸ Zero balance will start.

▸ When the BP zero balance is complete, the completed date/time will be displayed inside the [Zero] key.

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



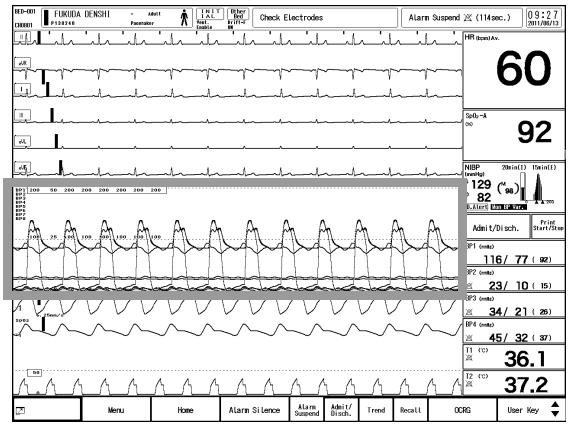
5 Connect the catheter to the end of monitoring line.



▸ The measurement preparation is completed, and BP measurement will start.

4 Press the [Home] key on user key or fixed key.

5 Verify that the BP waveform and numeric data is displayed on the home display.

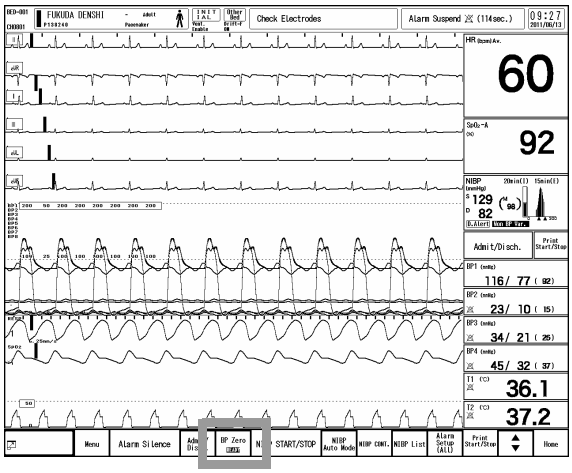


CAUTION

- 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.

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

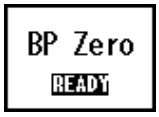
- If a message, "FAILED" is displayed, the three-way valve may not be opened to air, artifact is present, or the transducer may be defective. Check the cause and try the zero balance procedure again.
- If a message, "DRIFT" is displayed, verify that all the connections are secure.

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	:BP zero failed
COMPLETE	:BP zero complete
DRIFT	:BP zero drift

Zero Balance of All Pressure Lines ([BP Zero] Key)

By using the [BP Zero] key on the Super Unit or Multi Module, zero balance can be performed for all the BP 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 BP8, 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.
  When the BP zero balance is complete, the completed date/time will be displayed at the lower part of the [Zero] key.
- 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.

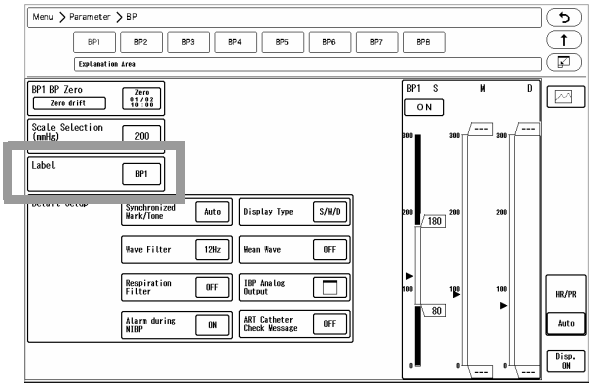
NOTE

- 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.

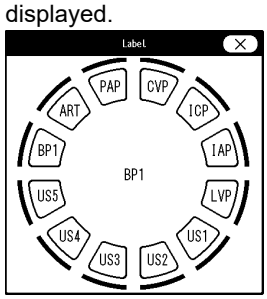
BP Parameter Setup

❑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" P5-11)

NOTE

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

❑When the BP Label is ART

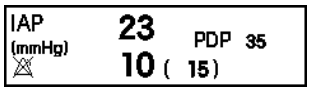
By selecting [ON] for "ART Catheter Check Message" [Menu>Parameter>BP1 (ART)>Detail Setup], an alarm will be generated when the catheter is disconnected.
(☞"Set the "ART Catheter Check Message"." P7-34)

⚠ CAUTION

- The default setting of "ART Catheter Check Message" is [OFF].
- When "ART Catheter Check Message" is set to [ON], alarm will generate when the transducers are opened to air.

❑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).

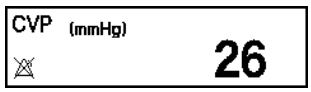


⚠ CAUTION

- 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.

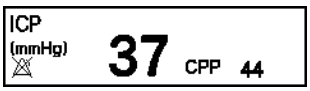
❑When the BP Label is CVP

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" P5-12)

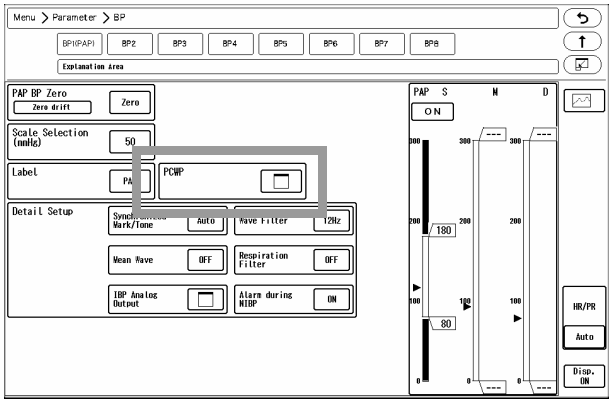


❑When the BP Label is ICP

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

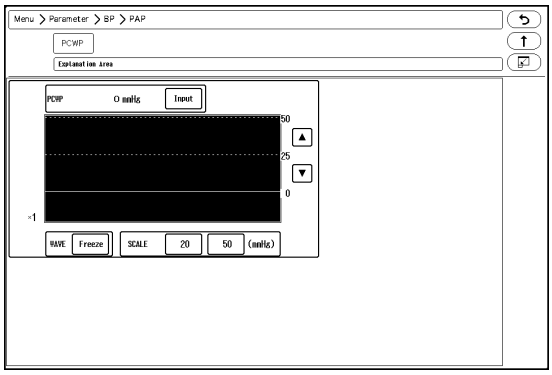


REFERENCE

- 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 Select the waveform scale from [20]/[50] as necessary.

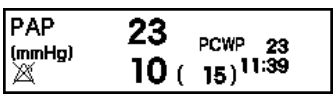
3 Press the [Freeze] key.

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

4 Use the [↑] / [↓] keys to set the PCWP value.

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 BP8 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 Settings

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

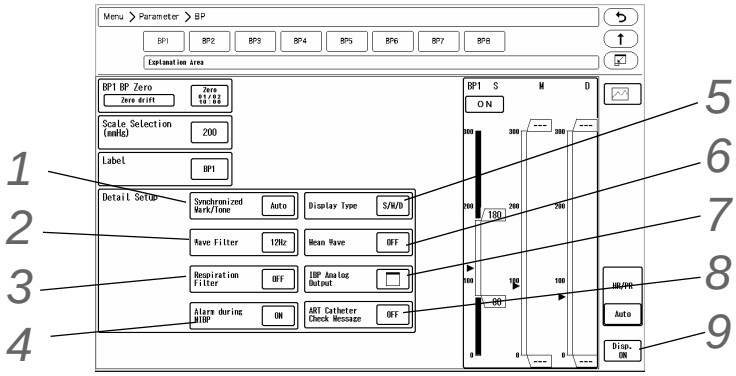
- Select ON/OFF of BP alarm and set the upper and lower alarm limit for systolic (S), diastolic (D), and mean (M) BP.

- 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" P5-14)
- 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:

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

- 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.
- [Auto]: The synchronized mark will be displayed in the priority of "ECG > SpO_2-1 > SpO_2-2 > BP".
- [ECG]: HR synchronized mark will be displayed.
- [SpO_2-1]/[SpO_2-2]: SpO_2 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 "Wave Filter".

- Select from [6Hz]/[8Hz]/[12Hz]/[40Hz].
- 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.

3 Set the "Respiration Filter".

- The BP waveform baseline drift caused by the respiration influence can be prevented by setting ON the respiration filter.
- [ON]: Respiration Filter will turn ON.
- [OFF]: Respiration Filter will turn OFF.

4 Set the "Alarm during NIBP".

- [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.

5 Set the "Display Type".

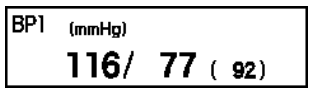
⚠ CAUTION

- 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.

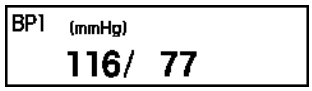
NOTE

- 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.

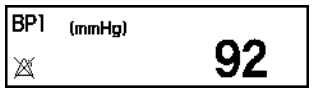
- [S/M/D]: The systolic/mean/diastolic BP value will be displayed.



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

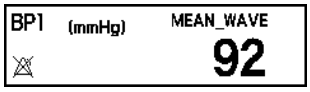


- [M]: The mean BP value will be displayed.



6 Select [ON]/[OFF] for "Mean Wave".

- [ON]: The mean BP waveform will be displayed and <MEAN_WAVE> will be displayed inside the numeric data box.



7 Set the "IBP Analog Output".

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 8.
- The default setting of "ART Catheter Check Message" is [OFF].
- When "ART Catheter Check Message" is set to [ON], alarm will generate when the transducers are opened to air.

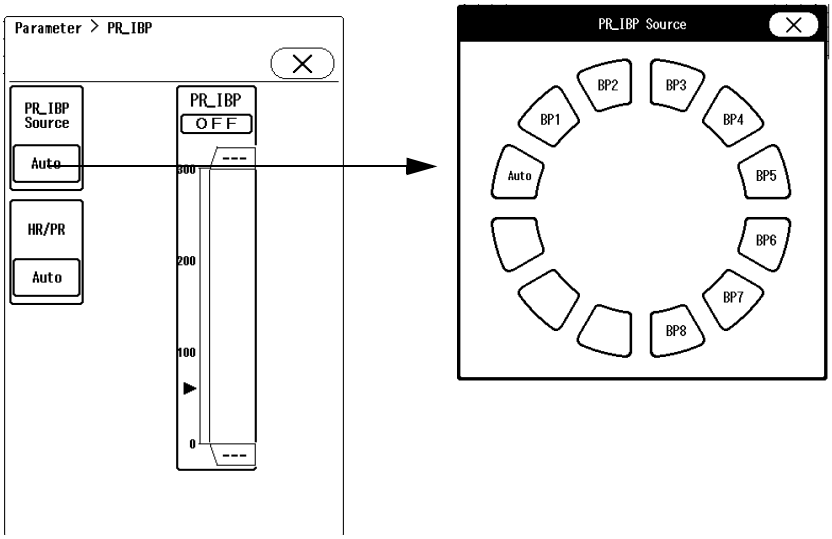
9 Select ON/OFF for parameter display.
(☞"ECG Parameter Setup" P7-6)

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.

❑BP Source Selection for PR_IBP

Select the BP source for the pulse rate measurement.
The PR_IBP source can be set by displaying the PR_IBP floating window, and pressing the key for "PR_IBP Source".



Selecting [Auto] will measure the pulse rate from ART or BP1.

Pulse Oximetry

This section explains the procedure and settings of SpO_2 monitoring when the SpO_2 Unit (HS-8312N/HS-8312M/HG-810/HG-820) manufactured by Nellcor or Masimo is used.

When using the HG-810/HG-820, it is necessary to set the SpO_2 channel manually.
(☞Maintenance Manual "Unit Module Setup" P4-17)

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.

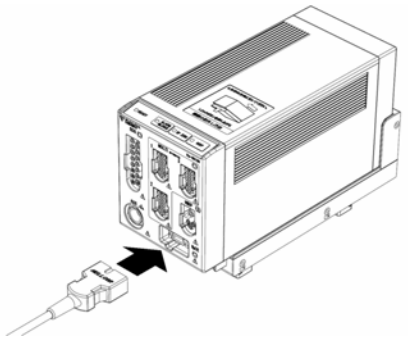
- Check the sensor attachment site constantly in every 4 hours when probes or reusable sensor are used, and at least every 8 hours when single patient use sensors are used.Be especially careful of a patient with bad perfusion. If the sensor attachment position is not changed constantly, skin irritation 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)

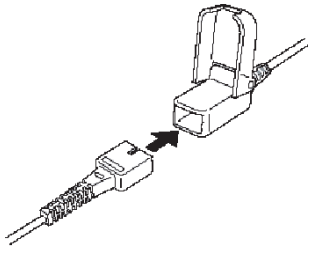
2 Connect the sensor to Super Unit or Module.

In Case of Nellcor™ Unit:

1 Connect the DOC-10 SpO_2 Relay Cable to the SpO_2 connector on the HS-8312N or HG-820.
The illustration is example of connection with HS-8312.



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 or HG-810.

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 or HG-810. Otherwise, the equipment will not properly function.

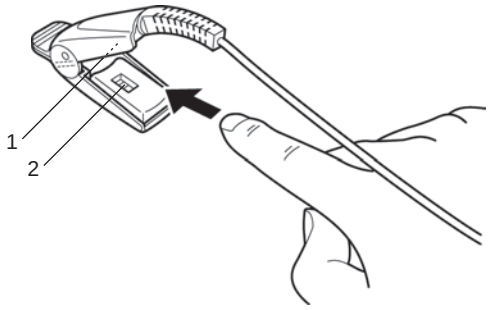
NOTE

- Pull the connector slowly to ensure it is securely connected.
- If necessary, secure the cable to the patient.

Probe Type

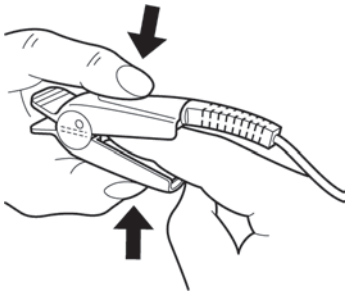
1 As shown below, the probe cable should be on the nail side.

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.

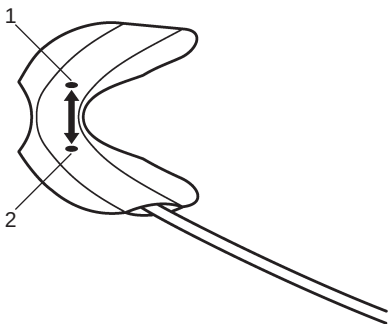
Single-Patient-Use Type

1 Clean the attachment site with alcohol, etc.

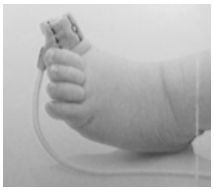
2 Align the light emitting element and light receiving element of the sensor with the measuring site in between when attaching the sensor to patient.

1 Light Emitting Element

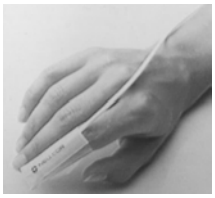
2 Light Receiving Element



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

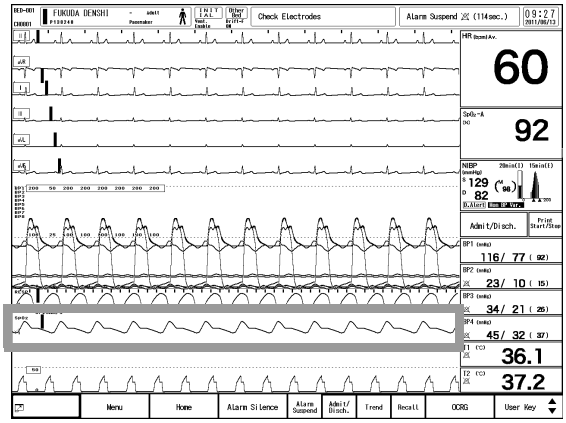


Attachment to the toe



Attachment to the finger

3 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 or HG-810.

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.
  (☞"SpO2 Parameter Setup (Masimo)" P7-45)

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.
(☞"SpO2 Monitoring" P7-36)

Precautions about the Masimo Sensors and Cables

A technology called X-Cal for patient safety and reinforcement of efficiency in a clinical site is implemented for Masimo sensors and cables.
X-Cal is designed to address the following three common factors that can impact measurement accuracy and patient safety due to reliability risks.

1 Imitation Masimo sensors and cables

2 Cables and sensors used far beyond their expected life

3 Third-party reprocessed pulse oximetry sensors

If a sensor or cable that does not support X-Cal is used with an X-Cal enabled device, SpO_2 measurement will not be available.
Even if Masimo sensors or specified sensors and cables are used, SpO_2 measurement may not be available if the sensors and cables are used beyond their expected life.

❑About the Expected Life of Sensors and Cables

- The X-Cal function automatically monitors the Active Monitoring Time (actual time of SpO_2 monitoring) for each sensor and cable.If the sensors and cables are used beyond the expected life, the message, <Replace Cable> or <Replace Sensor> will be displayed.
- The measurement will not cease until it is completed even if the cable or sensor has reached end of life during the measurement.
- When a measurement with cable or sensor that has reached end of life is suspended for certain amount of time, and resumed with the same cable or sensor, a message to replace the sensor or cable will be displayed.
- The sensor or cable that has reached end of life needs to be replaced before resuming monitoring.
- The following table shows the expected life of cable and sensor. The indication of usage hours per day (24 hours/12 hours/8 hours) are also shown.

Active Monitoring Time (actual time of monitoring)

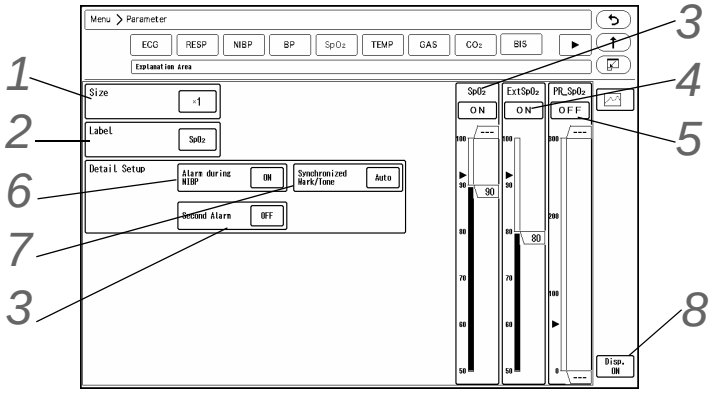
Sensors or Cables	Expected Life	When monitoring 24 hours/day	When monitoring 12 hours/day	When monitoring 8 hours/day
Single Patient Use SpO_2 "L" Sensor with replaceable tape	336 hours	14 days	28 days	42 days
Single Patient Use SpO_2 Sensor	168 hours	7 days	14 days	21 days
Reusable SpO_2 Sensor (DCI, DCIP, YI, TF-I, DBI)	8,760 hours	12 months	2 years	3 years
Patient Cable	17,280 hours	24 months	4 years	6 years

SpO_2 Parameter Setup (Nellcor)

REFERENCE

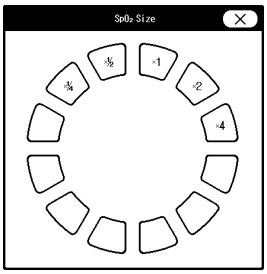
- The advanced signal processing of the OxiMax algorithm automatically extends the amount of data required for measuring SpO_2 and pulse rate depending on the measurement conditions.The OxiMax algorithm automatically extends the dynamic averaging time required beyond seven (7) seconds during degraded or difficult measurement conditions caused by low perfusion, signal artifact, ambient light, electrocautery, other interference, or a combination of these factors, which results in an increase in the dynamic averaging.If the resulting dynamic averaging time exceeds 20 seconds for SpO_2, the algorithm sets the pulse search bit while continuing to update SpO_2 and pulse rate values every second.As such measurement conditions extend, the amount of data required may continue to increase.The dynamic averaging time reaches 40 seconds, and/ or 50 seconds for pulse rate. When the time exceeds 30 seconds, a low priority alarm state results.

This section explains the measurement procedure when using the HS-8312N or HG-820.
Press the [Menu], [SpO_2] keys to display the "SpO_2" setup screen.



When Using the HS-8312N

1 Select the waveform size from [x1/4]/ [x1/2]/ [x1]/ [x2]/ [x4]. (shown on right)



2 Set the label.

- Select from [None]/ [Auto]/ [RH]/ [LH]/ [RF]/ [LF]/ [OT].
- When [Auto] is selected, the label will be automatically assigned depending on the SpO_2 unit type and channel number.
  Nellcor1ch: N1, 2ch: N2
  Masimo 1ch: M1, 2ch: M2

3 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.
  (☞"SpO2 Second Alarm Setup" P6-2)
- 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.

4 Set the Ext SpO_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 Ext SpO_2 cannot be set above the lower limit of SpO_2.

REFERENCE

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

	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.

5 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.

6 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.

▸ [ON]: Alarm will be generated even during NIBP measurement.

▸ [OFF]: will not generate the SpO_2/ PR alarm during NIBP measurement.

7 Set the "Synchronized Mark/Tone".
(☞"BP Parameter Setup" P7-29)

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

⚠ CAUTION

- When the waveform and numeric data display is set to OFF, the alarm generation and tabular/graphic trend input will also cease.
- When the waveform and numeric data display is set to OFF, the pulse rate measured by SpO_2 will not be displayed either.

REFERENCE

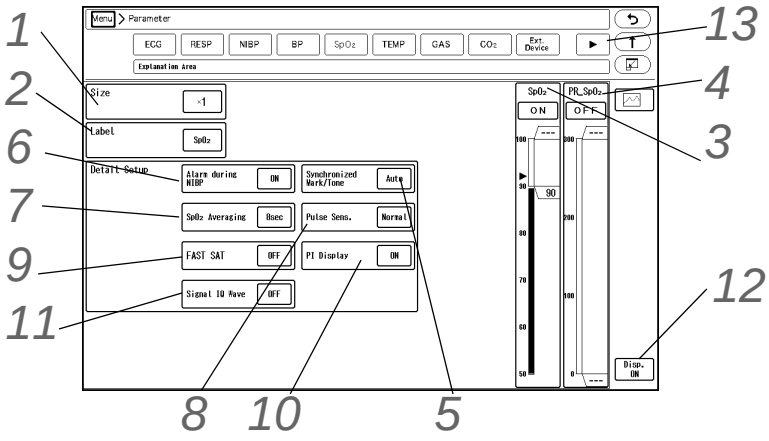
- When SpO_2 sensor is attached to the patient with the SpO_2 display set to OFF, and SpO_2 is measured for 10 seconds, the pulse wave and numeric data will be automatically displayed.

SpO_2 Parameter Setup (Masimo)

This section explains the measurement procedure when using the HS-8312M or HG-810. Press the [Menu], [SpO_2] keys to display the "SpO_2" setup screen.

REFERENCE

- This setting is available when using the HS-8312M or HG-810. PVI, SpCO, SpMet, SpHb measurements are optional function.



When Using the HS-8312M

1 Select the waveform size.
(☞"SpO2 Parameter Setup (Nellcor)" P7-42)

2 Set the label.
(☞"SpO2 Parameter Setup (Nellcor)" P7-42)

3 Set the SpO_2 alarm.
(☞"SpO2 Parameter Setup (Nellcor)" P7-42)

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 sec. to 9 sec.	About 7 sec. to 9 sec.
SpO_2 Alarm Signal Delay	For all settings	About 5 sec.	0 sec.

4 Set the PR alarm.

(☞"SpO2 Parameter Setup (Nellcor)" P7-42)

REFERENCE

- The following delay occurs for the PR alarm depending on the patient classification. (For Masimo)
  - PR Alarm Status Delay: <Adult/Child> About 8 sec. to 10 sec. <Neonate> About 7 sec. to 9 sec.
  - PR Alarm Signal Delay: <Adult/Child> About 5 sec., <Neonate> 0 sec.

5 Set the "Synchronized Mark/Tone".

(☞"BP Parameter Setup" P7-29)

6 Set the "Alarm during NIBP".

(☞"SpO2 Parameter Setup (Nellcor)" P7-42)

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.

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

8 Set the pulse detection sensitivity.

▸ 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].
- If there is a high possibility of sensor getting disconnected, select [APOD]. (APOD: Adaptive Probe-Off Detection)

[APOD] is supported from V05-07 for the HS-8000, and from V01-04 for the HG-810. For prior version, [Normal] will be set if [APOD] is selected.

- For standard use, select [Normal].

9 Set the "FAST SAT".

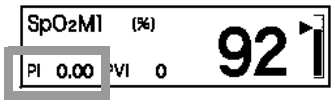
- [ON]: Abrupt change of the SpO_2 value can be monitored.
- [OFF]: FAST SAT mode will turn OFF.

10 Set the "PI (Perfusion Index) Display".

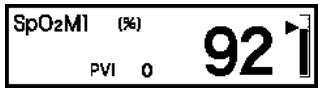
NOTE

- The perfusion index is calculated by pulsatile signal divided by apulsatile signal times 100, and indicates patient's circulation condition at the monitoring site.
- 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.

- [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%.

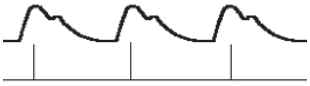
11 Set the "Signal IQ Wave".

NOTE

- The signal IQ wave cannot be printed.

REFERENCE

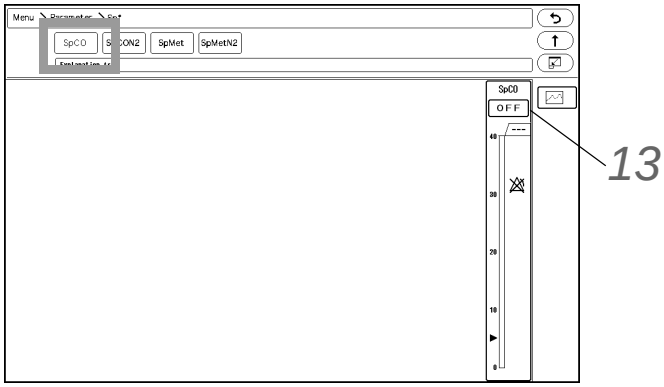
- The signal IQ wave indicates the signal confidence and pulse beat. The vertical length indicates the signal confidence. A low vertical line indicates a lower signal confidence.



- Select from [ON] or [OFF].

12 Select ON/OFF for parameter display.
(☞"SpO2 Parameter Setup (Nellcor)" P7-42)

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



⚠ CAUTION

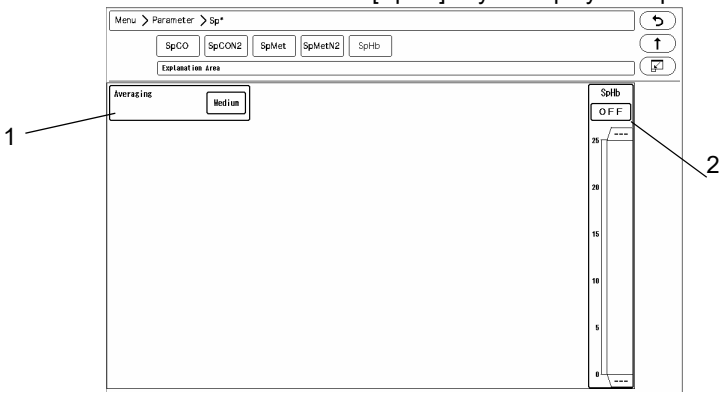
- Set the upper limit in the range of 1%SpCO to 40%SpCO. If a value above 40%SpCO is set, the upper alarm will turn OFF.
- The lower limit cannot be set.
- The automatic alarm cannot be set.

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.

⚠ CAUTION

- Set the upper limit in the range of 1%SpMet to 15%SpMet. If a value above 15%SpMet is set, the upper alarm will turn OFF.
- The lower limit cannot be set.
- The automatic alarm cannot be set.

15 Set the SpHb measurement condition. Press the [SpHb] key to display the SpHb setup screen.



1 Select the SpHb averaging duration from [Short] / [Medium] / [Long].

2 Set the SpHb alarm.

⚠ CAUTION

- Set the upper limit in between 2.0 g/dL to 24.5 g/dL. The upper limit alarm will turn OFF if the value above 24.5 g/dL is set.
- Set the lower limit in between 1.0 g/dL to 24.0 g/dL. The lower limit alarm will turn OFF if the value below 1.0 g/dL is set.
- 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.

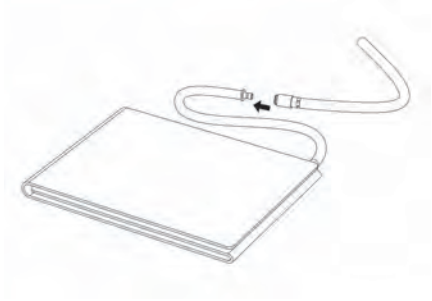
(☞"Non-Invasive Blood Pressure Measurement (Manufactured by Fukuda Denshi)" P13-2)

CAUTION

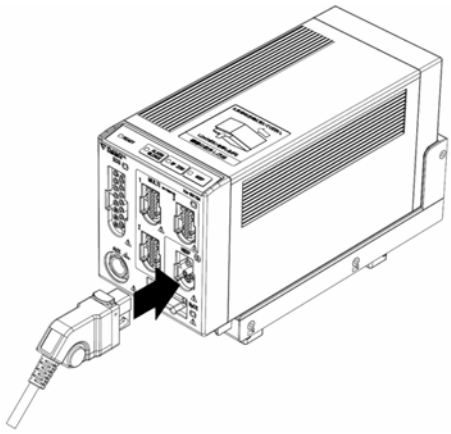
- Select the appropriate cuff size which best fits the arm circumference.
  If the cuff size is inappropriate, it may cause measurement error.

- 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 or Module.



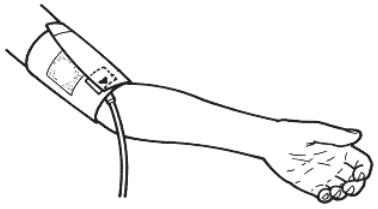
⚠ CAUTION

- 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 connector, the measurement will not start.

4 Apply cuff to the patient.



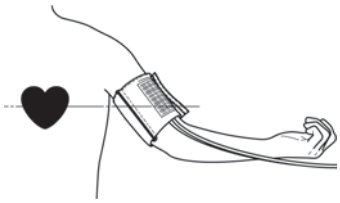
NOTE

- Position the ARTERY▼ mark over the artery on the patient's arm and wrap the cuff around.

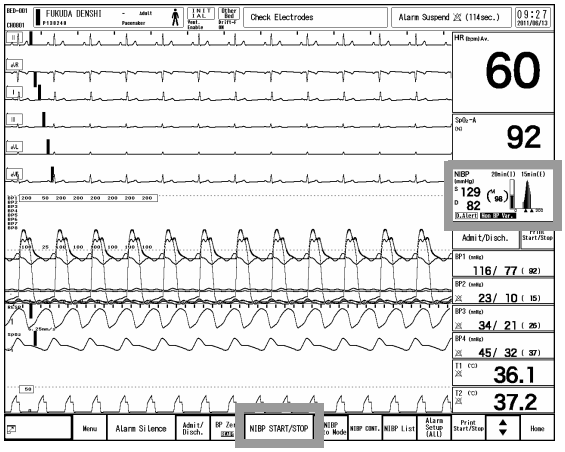
- One or two fingers should just fit in between the cuff and arm.

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.



5 Press the [NIBP Start/Stop] key (user key or fixed 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 (fixed key or 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.

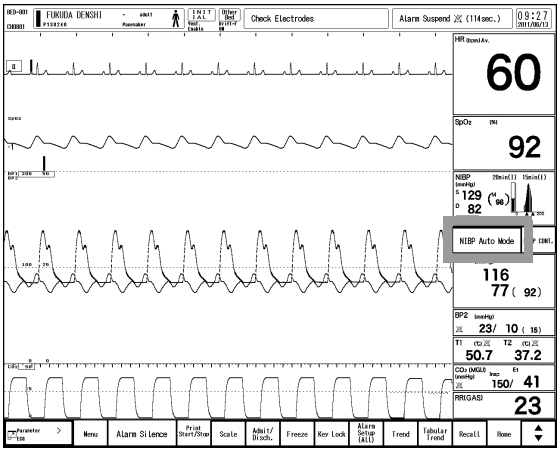
The NIBP measurement on this equipment is provided with forced exhaust system for safety purpose. When the maximum inflation value is reached or when the fixed measurement duration is exceeded, the system will automatically start to exhaust. The maximum inflation value, maximum measurement duration, 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

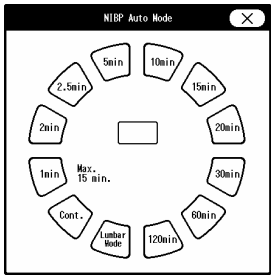
Non-invasive blood pressure can be measured automatically at selected time intervals.

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

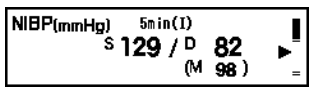
- When [1min] is selected, the 1-minute interval measurement will start from the time the selection is made.
- The 1-minute interval measurement will automatically stop after 12 minutes (maximum of 15 minutes when re-measured), and 2.5-minutes interval measurement will start.
- The continuous mode will continuously measure for 12 minutes (maximum of 15 minutes when re-measured). When the measurement completes, 2.5 minute interval measurement will start.
- 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" P7-55)
- The Lumbar mode should be used with sufficient safety measures.
- When the DS-8007 is connected via DSA-82, the NIBP auto mode setting of the DS-8007 will be displayed on the DS-8007, but the actual measurement will be performed according to the NIBP auto mode setting of the DS-8400.

NOTE

- 1-minute interval measurement cannot be stopped by pressing the [NIBP Start/Stop] key (fixed key or 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.

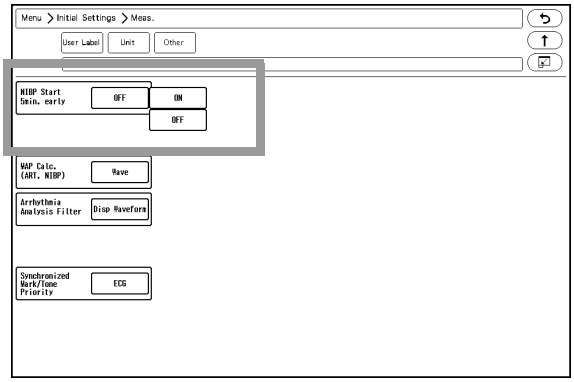


REFERENCE

- Select [OFF] if not performing the auto mode measurement.
- The measurement starting point can be selected from [Time] (start from 0 min.) or [Meas.] (start from actual measured time).
  (☞"NIBP Parameter Setup" P7-58)
- 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]

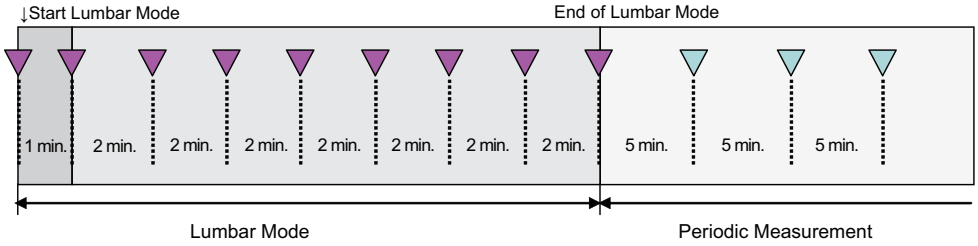


- On the "Initial Settings", whether or not to backup the NIBP measurement interval at discharge/power ON can be selected. (OFF/Backup/OFF→2.5min./OFF→5min.)

❑About the Lumbar Mode

The Lumbar mode is intended for use during spinal anesthesia.

The Lumbar mode performs the measurement as follows.



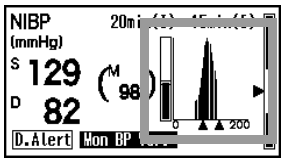
If [Lumbar] is selected when the measurement is not performed, the first measurement will start.
If [Lumbar] is selected during the measurement, the current measurement will be counted as the first measurement. The second measurement will start after 1 minute, and after 7 times of 2-minute interval measurement, 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" P7-58)



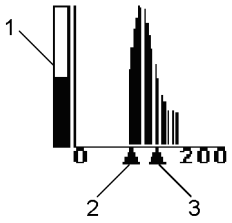
The description of the oscillation graph is as follows.

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.

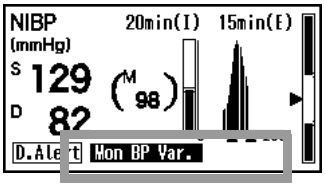
When [ON] is selected for "Dyna Alert", NIBP measurement will automatically start when the Dyna Alert estimated value exceeds the alarm limit. The function will activate with the following condition.
(☞"Dyna Alert" P7-59)

- 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
Green	PTG Low Perfusion	PTG amplitude is 200 unit or above, and below 800 unit.	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.

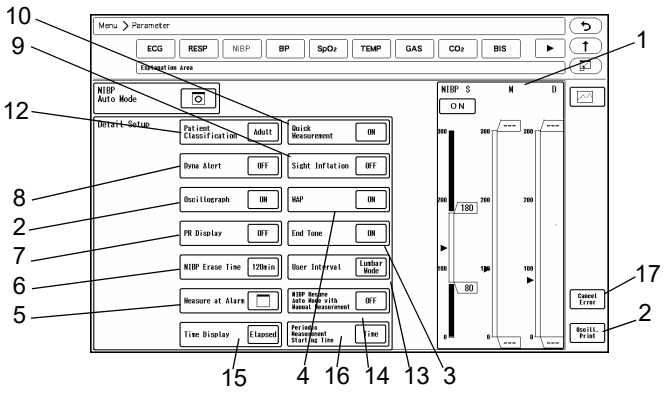
⚠ CAUTION

- 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 screen.



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 Oscillograph

[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.

[OFF]: Oscillation graph will not be displayed.

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

NOTE

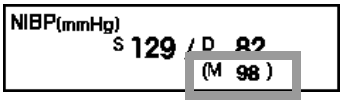
- The oscillation graph can be displayed when the NIBP numeric data box size is 2-box size or larger, and "Oscillograph" is set to [ON] on the "NIBP" setup screen.

3 End Tone

[ON]: A buzzer tone will be generated when the NIBP measurement completes.

4 Mean BP (MAP) Display

[ON]: Mean BP (MAP) value will be displayed.



⚠ CAUTION

- If the mean BP (MAP) value is not displayed, the mean BP (MAP) alarm will not be generated.

5 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

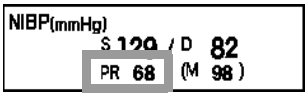
- Multiple parameters can be selected.

6 NIBP Erase Time

NIBP data will be erased after the set duration (60min/120min).

7 PR Display

[ON]: PR will be displayed.

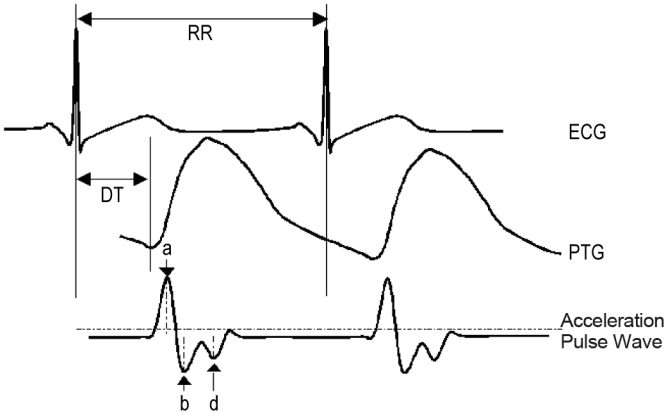


NOTE

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

8 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.

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.
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.

[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.

10 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.

11 NIBP Auto Mode

NIBP measurement will be performed automatically at selected time intervals.

(☞"NIBP Auto Mode Setup" P7-53)

12 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" P7-53)

⚠ 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.

13 User Interval

The interval is fixed as "Lumbar Mode".

(☞"About the Lumbar Mode" P7-55)

14 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.

NOTE

- If the power OFF duration was within 30 seconds, the NIBP auto mode will resume at power ON even when the above setting is [ON].

15 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.

16 Periodic Measurement Starting Time

The starting time of periodic measurement can be set.

- [Time]: The periodic measurement will start from the integral multiple of the selected interval starting from 0min.
- [Meas.]: The periodic measurement will start from the actual starting time.

	Measurement time when [Time] is selected:	Measurement time when [Meas.] is selected:
When the interval is [15min.] and the measurement is started on 15:11:15	15:11:15 15:15:00 15:30:00 15:45:00	15:11:15 15:26:15 15:41:15 15:56:15
When the interval is changed to [30min.] on 15:58	16:00:00 16:30:00 17:00:00	16:26:15 16:56:15 17:26:15

17 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" P11-36)

Temperature

This section explains the measurement procedure and measurement condition setup of temperature (T1 to T8).

TEMP Monitoring

1 Select the appropriate probe for the patient.

Probe Type

Reusable Type	
	Rectal Temperature Probe (for adult): 401
	Rectal Temperature Probe (for child): 402
	Body Surface Probe: 409B

NOTE

- 700 temperature probe cannot be used.

2 Connect the probe to the Super Unit or Module.

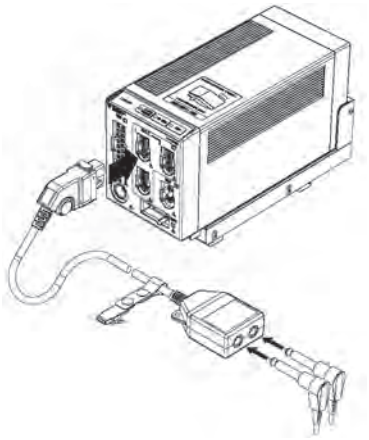
REFERENCE

- The Super Unit or Module 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.

The measurement is also possible using the HM-800 Multi Module inserted to the input box.

1 Connect the 2ch temperature relay cable (CJO-P01T-DA**) to the multiconnector of the Super Unit.

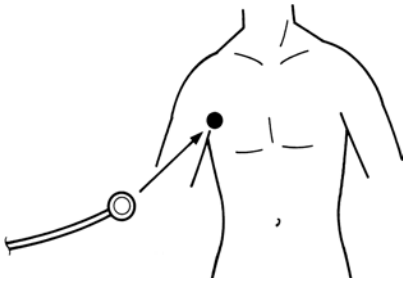
2 Connect the temperature probe to the 2ch temperature relay cable.



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

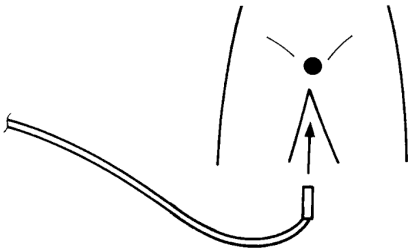
- The probe location shown above is an example. Adjust the probe location according to the patient's condition.

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.

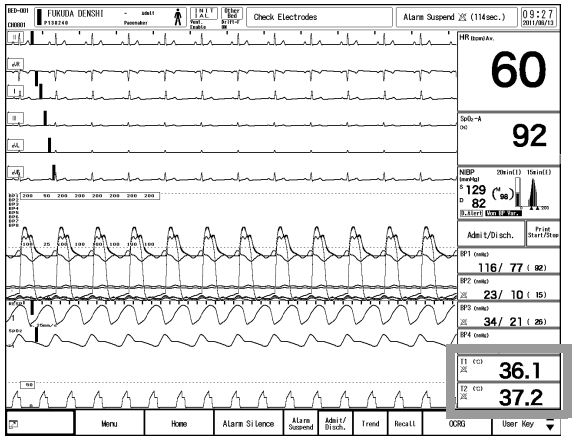
3 Secure the probe to inner thigh with surgical tape.



4 Check that the temperature is displayed.

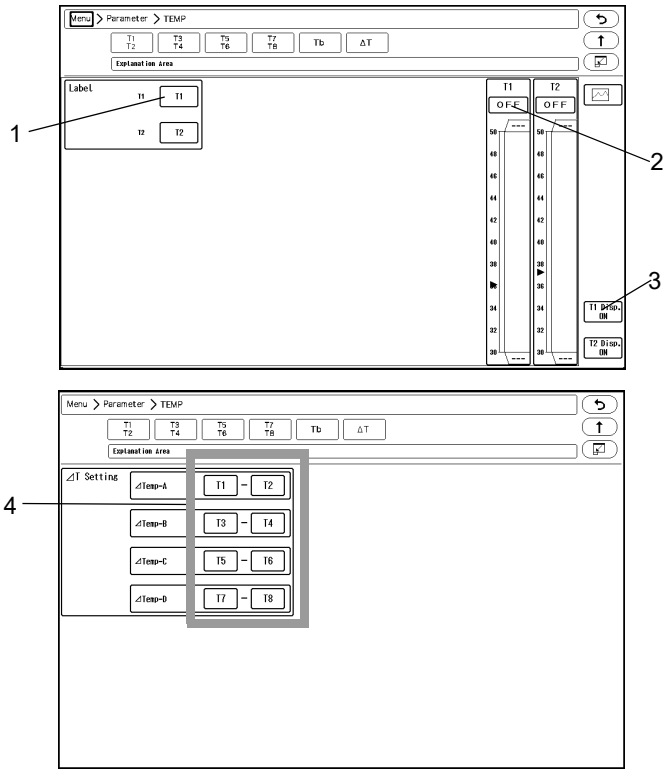
1 Press the [Home] key on user key or fixed key.

2 Verify that the temperature measurement is displayed on the home display. If the 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 data is displayed.



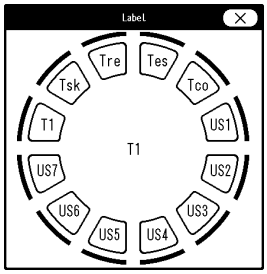
TEMP Parameter Setup

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-T8 (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" P5-11)

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°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.

3 Display ON/OFF

(☞"ECG Parameter Setup" P7-6)

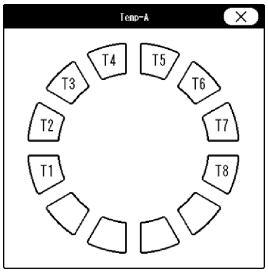
⚠ CAUTION

- 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 4 types of ΔT (ΔTemp-A to D) can be registered and displayed.

NOTE

- To display on the home display, the setup on the "Display Config." is necessary. (☞"To Configure the Display" P10-7)
- 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 or Module. The measurement is also possible using the HM-800 Multi Module inserted to the input box. (☞"Cardiac Output (CO)" P8-50)

Connecting the Super Unit

1 Select the catheter relay cable.

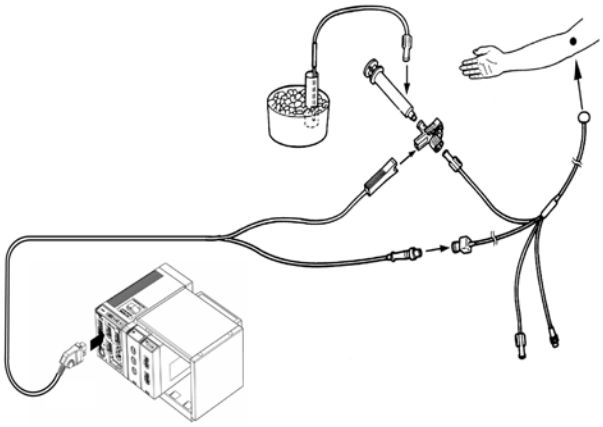
NOTE

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

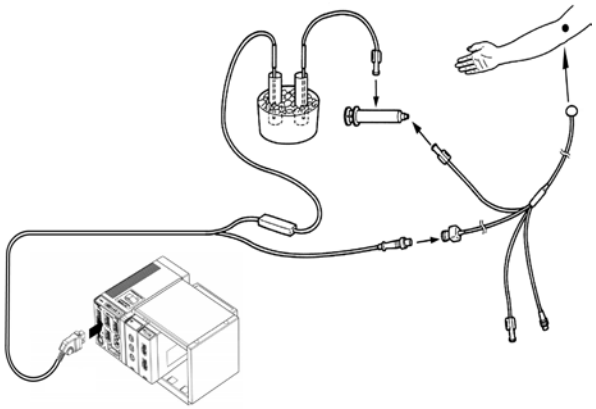
Injectate Temperature Measurement Method	Catheter Relay Cable
0°C/24°C Temperature	CJO-P01C-C2.4
Flow-through Sensor	CJO-P01C-F2.4
Example of In-line Sensor	CJO-P01C-L2.4
Injectate Temperature Probe	CJO-P01C-T2.4

2 Connect the catheter relay cable to the multiconnector on the HS-8000 Super Unit or HM-800 Multi Module, and connect the catheter to the catheter relay cable.

Example of In-line Sensor



Example of Injectate Probe

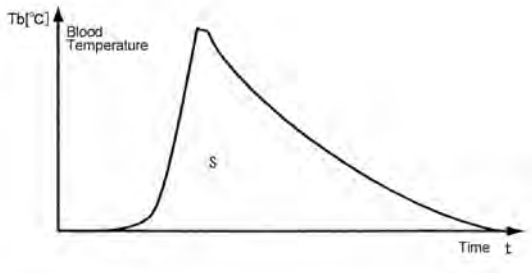


Cardiac Output Measurement Algorithm

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.

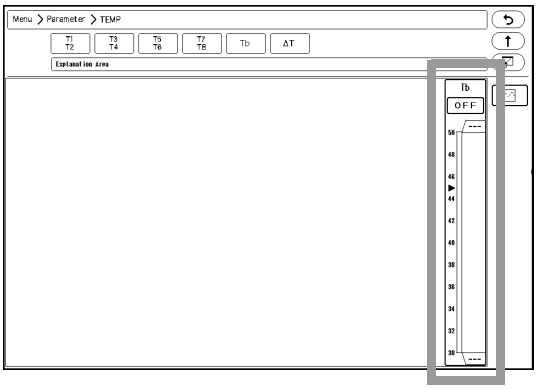
NOTE

- 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-800/HPD-810) .

⚠ CAUTION

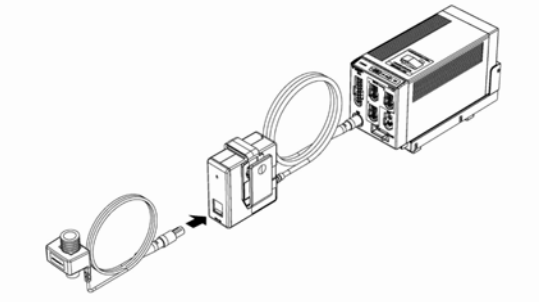
- When the multigas unit (MGU-800/MGU-810 series) and HPD-800/HPD-810 are simultaneously used, the CO_2 concentration measurement will be performed by the equipment selected for the "CO_2 Source Priority" under ([Menu] > "Parameter" [CO_2]) .

Patient Application and Display

By using the HPD-800/HPD-810 CO_2 Gas Unit I/F, CO_2 measurement by the Philips Capnostat 5 (Mainstream Method) can be performed.

1 Connect the HPD-800/HPD-810 CO_2 Gas Unit I/F to the AUX connector on the HS-8000 Super Unit.

2 Connect the CO_2 sensor (Capnostat5) to the CO_2 connector on the HPD-800/HPD-810.



- The CO_2 sensor will automatically begin warming up. The CO_2 sensor requires a warming up process to achieve stable operating temperature. Warm up process will require minimum of 2 minutes.
- During the warm up period, <CO_2 Warm Up> message will be displayed on the monitor.
- When the warm up completes, the message will disappear.

3 Prepare an airway adapter suitable for the patient.

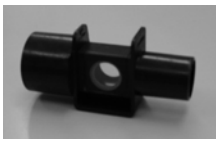
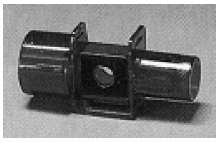
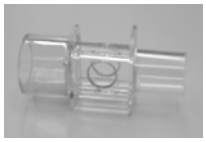
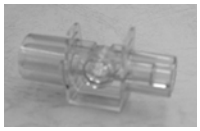
⚠ CAUTION

- The disposable airway adapter should be opened just before use.
- Do not reuse the disposable airway adapter.Do not disassemble, clean, disinfect, or

sterilize it.

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

REFERENCE

- For cleaning procedure of the airway adapter, refer to ☞Maintenance Manual "Airway Adapter for Capnostat 5" P8-5.

4 Verify that the warm up is complete, and attach the CO_2 sensor to the airway adapter until a click sound is heard.

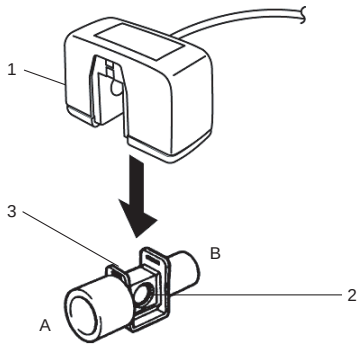
1 Capnostat 5 CO_2 Sensor

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.

5 Perform the setting for the O_2 compensation, N_2O compensation, anesthetic gas compensation, atmospheric pressure Set these items each time the condition changes.
(☞"CO2 Parameter Setup" P7-73)

6 Press the [Menu], [CO_2] ("Parameter"), [Calibrate Airway Adapter] keys to calibrate the airway adapter.

- Calibration will start.
- During calibration, <Zeroing> will be displayed.
- Upon completion of calibration, a tone will be generated and <Cal. complete> will be displayed.
- If the calibration fails, an error tone will be generated and <Cal. error> 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.> 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 "---". The measurement data during calibration 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 20 seconds and perform the calibration again.
- When <Cal. error> is displayed, perform the airway adapter calibration again.
- 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 100 Hz.
- Quantitative effects of humidity and condensation: Full accuracy specifications will be maintained for all non-condensing humidity levels.
- The CO_2 measurement accuracy is tested at 35°C.
- The respiration rate accuracy was verified by using a solenoid test setup to deliver a square wave of known CO_2 concentration to the device. 5% and 10% CO_2 concentrations were used and respiration rate was varied over the range of the device. Pass/Fail criteria was comparison of the respiratory rate output from the sensor to the frequency of the square wave. $EtCO_2$ measurements at those rates were compared to the CO_2 readings under static flow conditions.

7 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.

8 Connect the CO_2 sensor to the airway adapter.

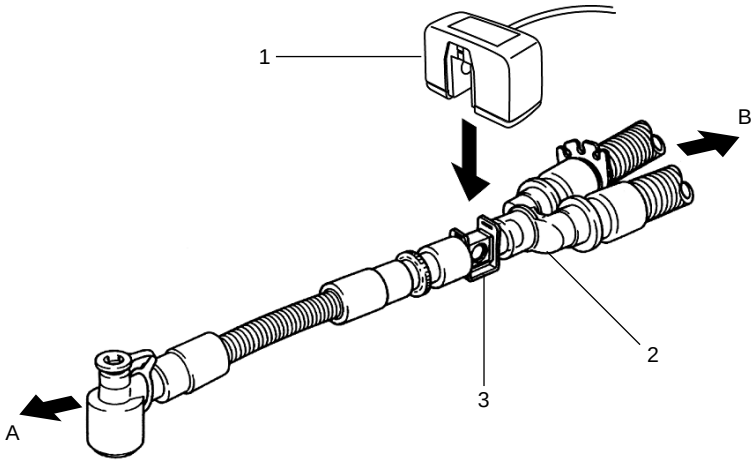
1 Capnostat 5 CO_2 Sensor

2 Y-Piece

3 Airway Adapter for Adult

A: Patient Side

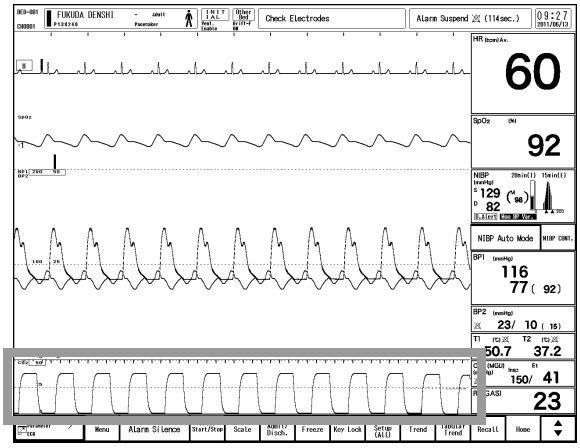
B: Equipment Side



NOTE

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

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

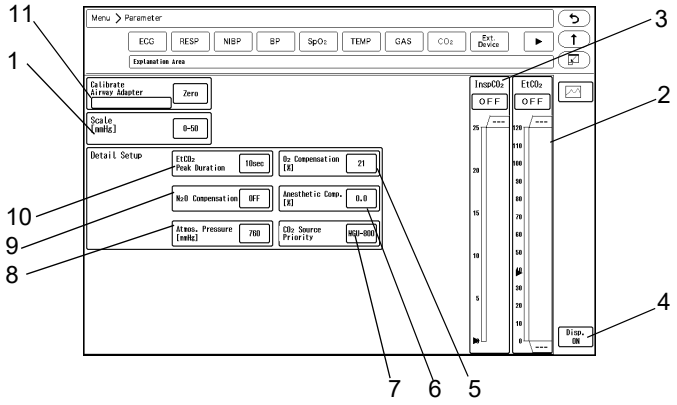


NOTE

- 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 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 CO_2)

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

NOTE

- The $EtCO_2$ 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 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.
- When Capnostat 5 is used, $EtCO_2$ alarm will not generate unless 2 or more respiration is detected after completion of the airway adapter calibration.

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 CO_2)

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

NOTE

- The $InspCO_2$ 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 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.

- When Capnostat 5 is used, InspCO_2 alarm will not generate unless 2 or more respiration is detected after completion of the airway adapter calibration.

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 Display ON/OFF

(☞"ECG Parameter Setup" P7-6)

⚠ CAUTION

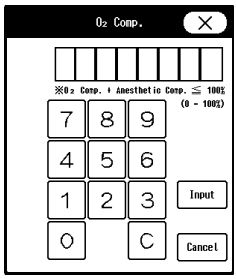
- When the waveform and numeric data display is set to OFF, the alarm generation and tabular trend input will also cease.
- When the waveform and numeric data display is set to OFF, the respiration rate measured by CO_2 will not be displayed either.

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.

5 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.



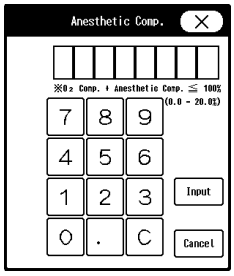
NOTE

- 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.

6 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.

7 CO_2 Source Priority

REFERENCE

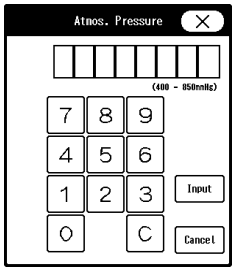
- When the MGU-800/MGU-810 and HS-8000 are connected simultaneously, the CO_2 source to prioritize the measurement can be set.

▸ [MGU-800]: CO_2 value measured by the MGU-800/810 Multigas Unit will be prioritized.

▸ [HS-8000]: CO_2 value measured by the HS-8000 Super Unit will be prioritized.

8 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.



9 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.

10 $EtCO_2$ 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.

11 Calibrate Airway Adapter

The airway adapter will be calibrated.

☞"Patient Application and Display" P7-69

CO_2 Concentration (Sidestream Method)

The HCP-800/HCP-810 is a CO_2 Gas Unit which measures CO_2 concentration by connecting it to the AUX connector on the HS8000. The HCP-800/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-800/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-800/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

- When the multigas unit (MGU-800/MGU-810 series) and HCP-800/HCP-810 are simultaneously used, the CO_2 concentration measurement will be performed by the equipment selected for the "CO_2 Source Priority" under ([Menu] > "Parameter" [CO_2]) .
- 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.

NOTE

- During nebulization or suction for intubated patient, remove the sampling line from the HCP-800/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.
- When connecting a sampling line to the HCP-800/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-800/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-800/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.
- The minimum value and maximum value of the CO_2 waveform are used for the $InspCO_2$ value and $EtCO_2$ value respectively.
- When using with a ventilator, under high over pressures close to 10 kPa (100 cmH_2O), the HCP-800/HCP-810 may enter into a blockage mode in order to protect the module from damage.
- The respiration rate test simulates breaths for use in respiration rate measurement with a system which uses a tank of N2 (representing no CO_2 for inhalation) and a tank of CO_2 (of the $\%CO_2$ required for the particular test). A control board, which is triggered by a computer, uses solenoids to switch the module input between the 2 tanks of gas, creating a gas CO_2 square wave. This system can create simulated breaths over the full required range of specified respiration rates.

Patient Application and Display

The CO_2 concentration can be measured by using the HCP-800/HCP-810 CO_2 Gas Unit.

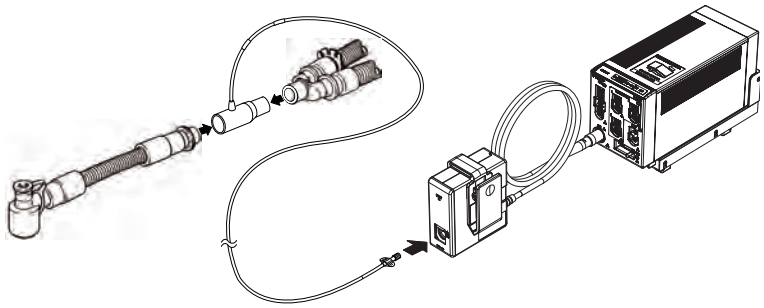
NOTE

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

1 Connect the HCP-800/HCP-810 CO_2 Gas Unit to the AUX connector on the HS-8000 Super Unit.

2 Attach the airway adapter, oral/nasal sampling line or nasal sampling line to the patient.

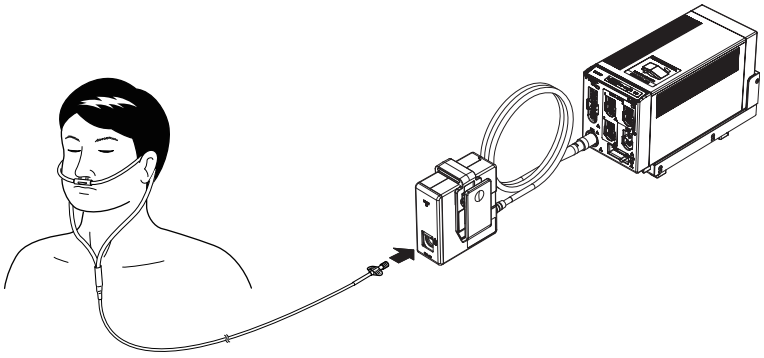
For intubated patient



1 Attach the airway adapter to respiration circuit.

2 Connect one end of the sampling line to the connector on the HCP-800/HCP-810. Verify that all the tubes are properly connected.

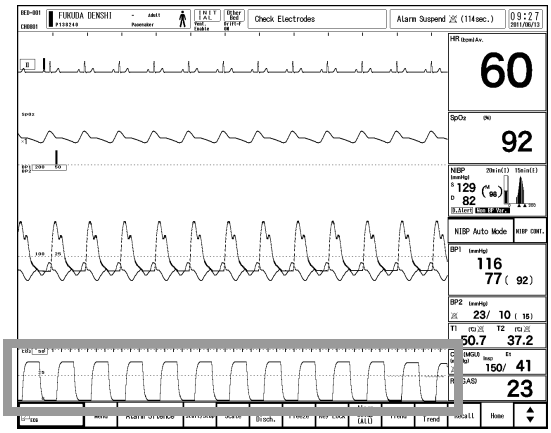
For patient using the nasal prong



1 Attach the nasal or oral/nasal patient interface of the sampling line to the patient as described in the sampling line directions for use.

2 Connect the sampling line to the connector on the HCP-800/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.

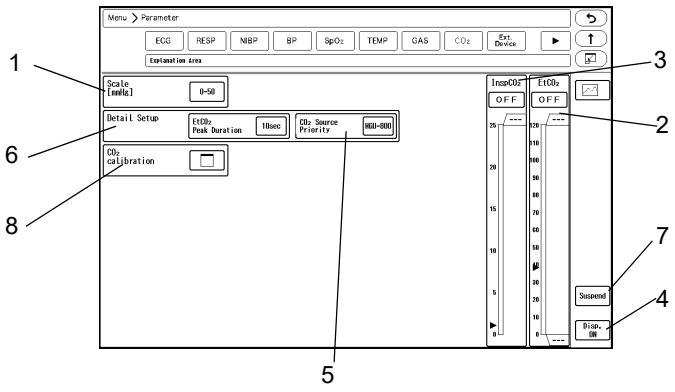
CAUTION

- If the power supply is interrupted due to power failure, etc., HCP-800/HCP-810 will be initialized even if the power interruption was within 30 seconds.

NOTE

- Connecting a sampling line or nasal prong to the HCP-800/HCP-810 will automatically start the sampling pump.To prevent the pump from deteriorating, disconnect the sampling line and nasal prong from the HCP-800/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-800/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

- The $EtCO_2$ 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 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

- The $InspCO_2$ 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 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%.

4 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.

5 CO_2 Source Priority

REFERENCE

- When the MGU-800/MGU-810 and HS-8000 are connected simultaneously, the CO_2 source to prioritize the measurement can be set.

▸ [MGU-800]: CO_2 value measured by the MGU-800/810 Multigas Unit will be prioritized.

▸ [HS-8000]: CO_2 value measured by the HS-8000 Super Unit will be prioritized.

6 $EtCO_2$ 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.

7 Suspend CO_2

[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.

8 CO_2 Calibration

CO_2 calibration can be performed.

(☞Maintenance Manual "CO2 Calibration (HCP-800/HCP-810)" P9-10)

Multigas Unit/SPIRO

The MGU-800/810 series multigas unit can be connected to the DS-8500 system via U-LINK port.
(☞Maintenance Manual "Connection of Multigas Unit" P1-12)
When the multigas unit is connected, monitoring conditions for CO_2 concentration, anesthetic gas concentration, O_2 concentration, and N_2O concentration, respiration (SPIRO) can be set.
The MGU-800/810 series have an internal barometer and thermistor that allow compensation for changes over a range of temperature and atmospheric pressures.

⚠ WARNING

- Make sure to use only the specified Mindray Medical Sweden AB product. (☞"Anesthetic Gas Concentration Measurement (Manufactured by Mindray Medical Sweden AB)" P13-7)
- Be careful not to damage the water trap during operation as bacteria and/or mucus may contaminate the MGU-800/810 series.
- The airway adapter, sampling line, flow sensor are disposable products that are intended for single patient use only. Do not reuse them on other patients as it may cause cross-infection.
- Do not use the MGU-800/810 series with the flammable anesthetic agents.
- To protect the hospital staffs from unnecessary anesthetic agent, it is strongly recommended to connect the exhaust hole to the gas exhaust system in the hospital.
- The sampling line may get clogged by internal condensation.

⚠ CAUTION

- When the multigas unit (MGU-800/MGU-810 series) and HPD-800/HPD-810, HCP-800/HCP-810 are simultaneously used, the CO_2 concentration measurement will be performed by the equipment selected for the "CO_2 Source Priority" under ([Menu] > "Parameter" [CO_2]) .
- The MGU-800/MGU-810 series require warm up of about 10 minutes to correctly measure the data.
- If the power supply is interrupted due to power failure, etc., MGU-800/810 series multigas unit will initialize and enter into warm-up mode even if the power interruption is within 30 seconds.
- Zero Calibration:
  The zero calibration will automatically start when the MGU-800/810 series multigas unit is connected.
  After the warm-up completes, zero calibration will be performed every 4 hours during stable operation.
  During warm-up, zero calibration interval will become shorter than during normal operation.
  During zero calibration, measurement data will not be updated.
  Calibration gas is not required during zero calibration.
- Make sure the sampling line and flow sensor is securely connected to prevent any leakage.
- An environment with alcoholic vapor may adversely affect the measurement readings.
- CO_2, N_2O or anesthetic agent in the atmosphere around the MGU-800/810 series may adversely affect the measurement readings.
- SPIRO and ventilator cannot be used simultaneously.

NOTE

- The MGU-800/810 series uses a fixed correction of 11hPa (22ºC@40% RH) to compensate for the influence of water vapor in the gas sample, when converting the gas readings to ATPD. An increase in the ambient H_20 partial pressure to 30 hPa (28ºC@80% RH or

33ºC@60% RH) will cause a general error for all gases of only -2% REL.

- 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) under the condition of 60 Bpm and below with I:E ratio of 1:1.
- When the RR exceeds 60 Bpm, the $EtCO_2$ accuracy cannot be specified. (Depends on the I:E ratio.)
- The data sampling rate is 25 Hz.
- The minimum value and maximum value of the CO_2 waveform are used for the $InspCO_2$ value and $EtCO_2$ value respectively.
- For the gas measurement data, "0" will be displayed if the value becomes below the following threshold for 3 seconds or more. (Full Accuracy/during warm-up)
  CO_2: 0.1/0.3[vol%]
  N_2O: 3/3[vol%]
  O_2: 0/0[vol%]
  Volatile Anesthetic: 0.15/0.3[vol%]
- The ability to properly resolve end-tidal values can be measured by using the set-up described in ISO 80601-2-55: 2011, figure 201. 101.
  In short, the method consists of sampling gas from two different sources connected to an electrically controlled pneumatic valve to permit rapid switching between the two sources. During the test, the valve is set to switch gas source at a number of frequencies (simulating the range of specified breath rates) and for each frequency, the end-tidal value presented by the gas analyzer is noted. From a diagram of end-tidal value over frequency, the frequency at which the gas analyzer is no longer able to resolve end-tidal values according to specification is identified.

Connecting to the Respiration Circuit

❑Multigas Concentration Measurement (MGU-800 Series)

⚠ WARNING

- Do not use adult/pediatric type water traps and/or sampling lines with neonates to avoid high sampling flow.
- Connect only DRYLINE gas sampling lines to the water trap. Note that there may be other compatible tubing present, e.g. IV-lines.
- Do not use DRYLINE neonatal sampling lines (blue luer lock nuts) with DRYLINE adult water traps as this could result in incorrect measurement data.
- Do not use DRYLINE adult sampling lines (colorless luer lock nuts) with DRYLINE neonatal water traps as this could result in incorrect measurement data.

NOTE

- If [Adult] or [Child] is selected as patient classification on the "Admit/Discharge" screen, install the DRYLINE Adult/Child Water Trap (60-13100-0).
  If [Neonate] is selected as patient classification on the "Admit/Discharge" screen, install the DRYLINE Neonatal Water Trap (60-13200-0).
  If the used water trap and the set patient classification does not match, <GAS Check Water Trap Class> will be displayed.

1 Install the DRYLINE Water Trap (Adult/Child: 60-13100-00, Neonate: 60-13200-00) aligning the lugs with the corresponding holes in the receptacle and pushing gently into place. (See below.)
Make sure that both barbs on the lugs are fully engaged by pulling the water trap, which should be firmly seated.

2 Connect the DRYLINE Airway Adapter (Straight: 60-14100-00, or Elbow: 60-14200-00) to the patient breathing system.

3 Remove the protective cap from the airway adapter and connect it to the sampling line (for adult/child: 60-15200-00, for neonate: 60-15300-00).

4 Connect the other side of the sampling line to the inhale port of the water trap. When the water trap is half full, empty the water trap's reservoir.
(☞Maintenance Manual "Water Trap (Multigas Unit)" P8-5)

⚠ WARNING

- The contents of the water trap should be handled as a potential infection hazard.

❑Multigas Concentration/Spirometry Measurement (MGU-810 Series)

⚠ WARNING

- Only combine the SPIRIT Flow Sensors and DRYLINE Water Traps as described in the table below. Other combinations might lead to incorrect measurements.

Patient Category	Patient Classification Selection on "Admit/ Discharge" Screen	SPIRIT Flow Sensor	DRYLINE Water Tap
Adult	Adult	Adult (60-16100-00)	Adult/Child (60-13100-00)
Child	Child	Child (60-16200-00)	Neonate (60-13200-00)
Neonate	Neonate	Child (60-16200-00)	Neonate (60-13200-00)

- Use the adult flow sensor for a patient whose tidal volume is above 150 mL.
- Use the pediatric flow sensor for a patient whose tidal volume is below 300 mL.
- Make sure to use the correct flow sensor depending on the patient conditions, adult or pediatric and the tidal volume.
- Do not confuse the gas sampling line with other compatible tubing, e.g. IV-lines.

1 Install the DRYLINE Water Trap.

2 Connect the end (for adult: 22/15 mm, pediatric: 15 mm) of the flow sensor, marked  to the patient tracheal tube or similar.

3 Connect the end of the flow sensor to the patient breathing system. For best results, a heat and moisture exchanger (HME) or similar should be put between the flow sensor and the breathing system.

4 Connect the pressure line of the flow sensor to the flow sensor connector on the MGU-810.

5 Connect the gas sampling line of the flow sensor (for adult: colorless, for pediatric: blue) to the gas inlet of the water trap. When the water trap is half full, empty the water trap's reservoir.
(☞Maintenance Manual "Water Trap (Multigas Unit)" P8-5)

⚠ WARNING

- The contents of the water trap should be handled as a potential infection hazard.

6 To prevent accumulation of condensed fluid, the flow sensor shall be always be positioned a few degrees off the horizontal level towards the ventilator side. For the same reason, the pressure tubes shall exit the flow sensor upwards.

7 The pressure tubes should be routed in such a way that a water lock is formed by a section of tubing being positioned lower than the flow sensor connector on the MGU-810.

8 A patient breathing system leakage test shall be performed according to the recommendations of the ventilator manufacturer.

⚠ CAUTION

- The adult flow sensor dead space is 6.9 mL and the flow resistance is 1.8 cmH_2O at 60 L/min.
  The pediatric flow sensor dead space is 0.75 mL and the flow resistance is 0.9 cmH_2O at 10 L/min.
  Adjust ventilation accordingly.
- To prevent condensation, the patient breathing circuit, flow sensor and pressure tubing should not be directly exposed to cooling equipment such as fans or cooling blankets.
- Leakage of gas from the patient breathing system may occur if the pressure or gas sampling lines are not connected to the MGU-810.
- The pressure tube and gas sampling lines of the flow sensor should always be routed from the patient circuit to the MGU-810 such a way as to avoid kinking.
- Flow sensors that have suffered damage to sensor head, tubing or tubing connector must not be used.
- If liquid has entered the pressure tubes, it can be removed by gently tapping or shaking the flow sensor.

CO_2 Measurement Unit Setup

NOTE

- Even though the CO_2 measurement can be done in several units or modules, setups for the alarm limit, measurement unit and scale are common for all the units and modules.

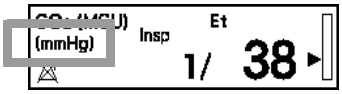
- When a measurement unit is changed, make sure to set the alarm condition for that unit. Set the alarm for each measurement unit.

1 Press the [Menu], [Initial Settings], [Meas.], [Unit] key.

▸ The "Unit" setup screen will be displayed.

2 Press the [mmHg]/[kPa]/[%]key.

▸ The unit currently set will be displayed on the graphic/ tabular trend.

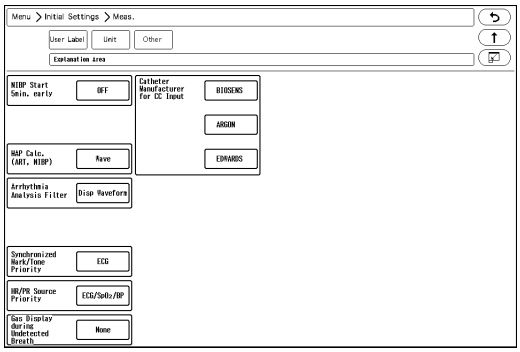


GAS Display during Undetected Breath

Gas data display when a respiration is not detected can be selected from [None] (bar display) or [Insp. Only] (displays only the inspiratory data).

1 Press the [Menu], [Initial Settings], [Meas.], [Other] keys.

▸ "Other" setup screen will be displayed.



2 Press the [None]/[Insp. Only] key.

[None]: When a respiration is not detected, inspiratory and expiratory data will become invalid and bar marks will be displayed instead.

[Insp. Only] : When a respiration is not detected, only the inspiratory data will become valid and bar marks will be displayed for expiratory data.

NOTE

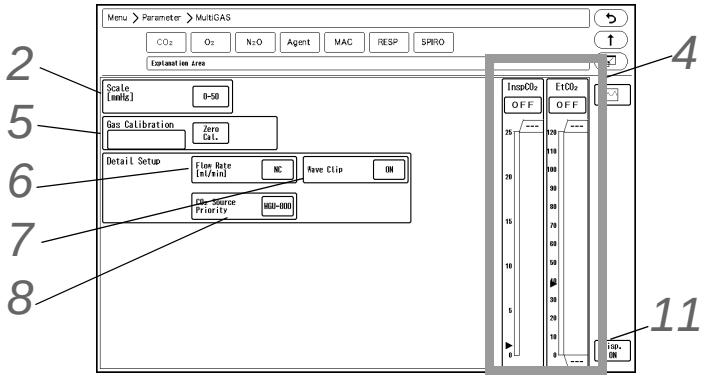
- When [Insp. Only] is selected for "GAS Display during Undetected Breath" and if only inspiratory data is displayed, inspiratory and expiratory data display on the central monitor will become invalid.

- When [Insp. Only] is selected for "GAS Display during Undetected Breath" and if only inspiratory data is displayed, the GAS alarm will not be generated.

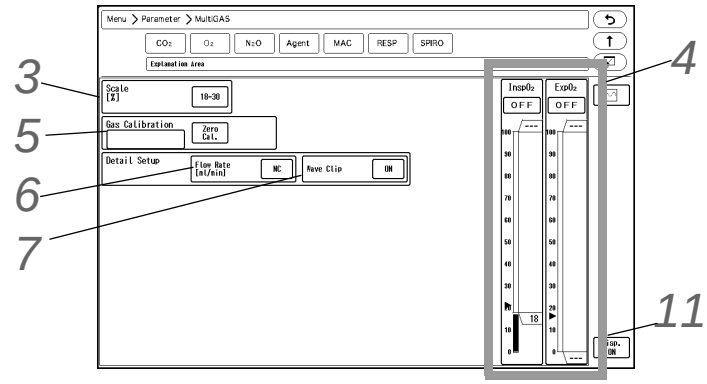
Multigas Unit Data Setup (Multigas Concentration/Spirometry)

1 Press the [Menu], [GAS] "Parameter" keys.

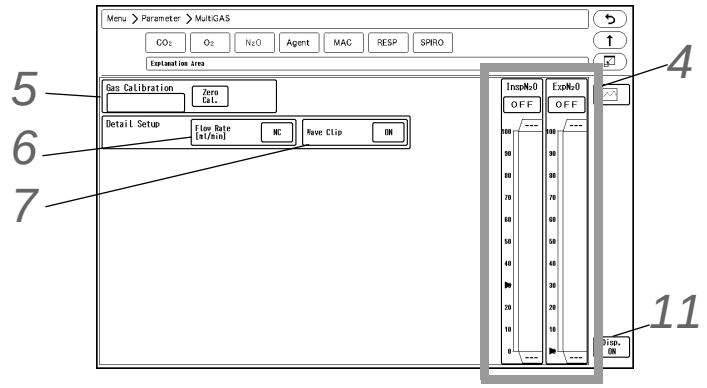
▸ The Multigas setup screen will be displayed.



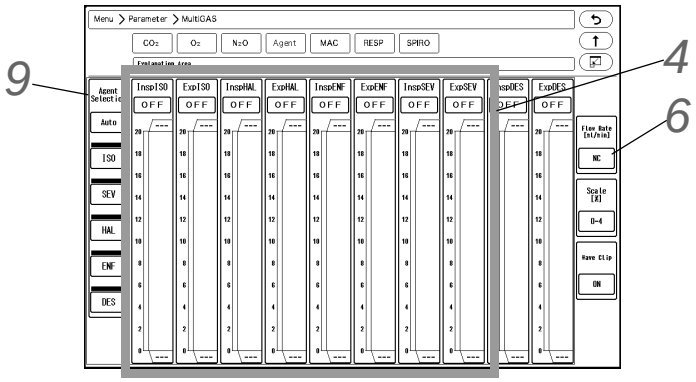
GAS_CO_2 Screen (MGU-800 series)



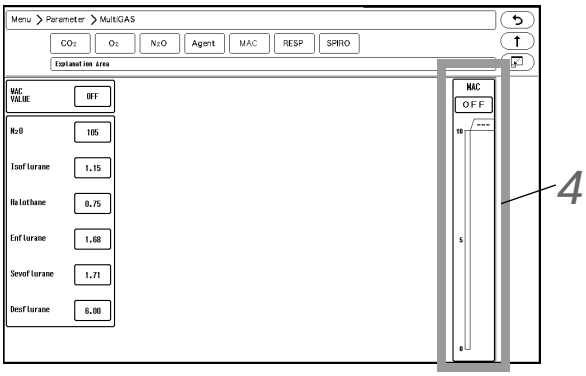
GAS_O_2 Screen (MGU-800 series)



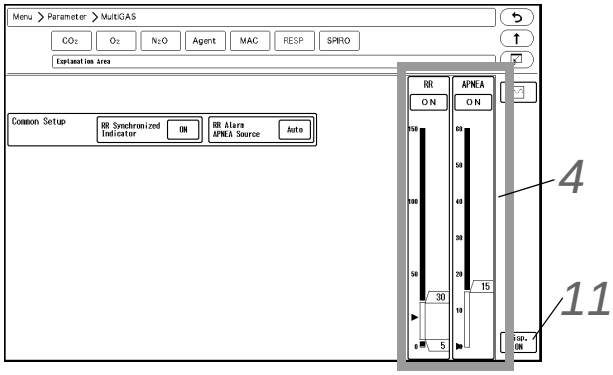
GAS_N_2O Screen (MGU-800 series)



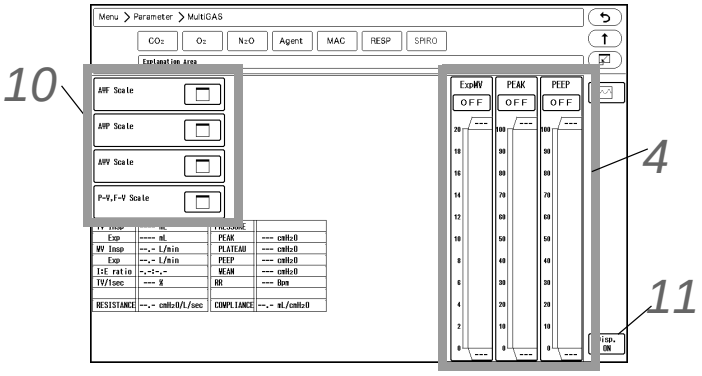
GAS_AGT Screen (MGU-800 series)



GAS_MAC Screen (MGU-800 series)



GAS_RESP Screen (MGU-800 series)



GAS_SPIRO Screen (MGU-810 series)

2 Set the CO_2 waveform scale.

1 Press the key for "Scale".

▸ The dropdown list will be displayed.

2 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 Set the O_2 waveform scale.

1 Press the key for "Scale".

▸ The dropdown list will be displayed.

2 Select from [18-30]/[18-60]/[18-100]/[0-30]/[0-60]/[0-100].

4 Set the alarm.

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

NOTE

- The following alarm will not generate unless 2 or more respiration is detected within 30 seconds after the power is turned ON, monitoring is resumed, multigas unit is connected, or a patient is discharged.

$EtCO_2$ Alarm

NOTE

- 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.

$InspCO_2$ Alarm

NOTE

- 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/lower limit can be set in 1 mmHg/0.1 kPa/0.1% increment.

$ExpO_2$ Alarm

NOTE

- Set the upper limit in the range of 18% to 100%.
  The alarm will turn OFF if a value above 100% is set.

- Set the lower limit in the range of 18% to 100%.
  The alarm will turn OFF if a value below 18% is set.

REFERENCE

- The upper/lower limit can be set in 2% increment.

$InspO_2$ Alarm

NOTE

- Set the upper limit in the range of 18% to 100%.
  The alarm will turn OFF if a value above 100% is set.
- Set the lower limit in the range of 18% to 100%.
  The alarm will turn OFF if a value below 18% is set.

REFERENCE

- The upper/lower limit can be set in 2% increment.

$ExpN_2O$/ $InspN_2O$ Alarm

NOTE

- Set the upper/lower limit in the range of 0% to 100%.
  The upper limit and lower limit will turn OFF if a value above 100% and below 0% is set respectively.

REFERENCE

- The upper/lower limit can be set in 2% increment.

AGT-E/AGT-I Alarm (MGU-810 series)

NOTE

- The adjustable range of the upper limit differs depending on the anesthetic gas label.
  ISO, HAL, ENF: 0.5% to 6.0%
  SEV: 0.5% to 8.0%
  DES: 0.5% to 18.0%
  The alarm will turn OFF if a value above the range is set.
- The adjustable range of the lower limit differs depending on the anesthetic gas label.
  ISO, HAL, ENF: 0.5% to 6.0%
  SEV: 0.5% to 8.0%
  DES: 0.5% to 18.0%
  The alarm will turn OFF if a value below the range is set.

REFERENCE

- The upper/lower limit can be set in 0.5% increment.

MAC Alarm

NOTE

- Set the upper limit in the range of 0.1 to 9.9.
  The upper limit alarm will turn OFF if a value below 9.9 is set.

REFERENCE

- The upper limit can be set in 0.1 increments.

RR/APNEA Alarm

NOTE

- Set the upper limit of RR alarm in the range of 10 Bpm to 150 Bpm. If a value above 150 Bpm is set, the upper alarm will turn OFF.
  Set the upper limit of apnea alarm in the range of 10 sec. to 60 sec. If a value above 60 sec. is set, the upper alarm will turn OFF.
- Set the lower limit of RR alarm in the range of 5 Bpm to 145 Bpm. If a value below 5 Bpm is set, the lower alarm will turn OFF.

REFERENCE

- The adjustable increment for RR alarm depends on the patient classification and "RR Alarm Increment" setting. (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

- The apnea alarm can be set in 1 second increment.

ExpMV/PEAK/PEEP Alarm

NOTE

- Set the upper/lower limit of ExpMV alarm in the range of 2.0 L/minute to 20 L/minute for Adult, 0.5 L/minute to 5.0 L/minute for Child/Neonate.
- Set the upper/lower limit of PEAK alarm in the range of 8 cmH_2O to 100 cmH_2O.
- Set the upper/lower limit of PEEP alarm in the range of 2 cmH_2O to 50 cmH_2O.

REFERENCE

- The upper/lower limit can be set as followings.
  ExpMV alarm can be set in 0.5 L/minute increment.
  PEAK/PEEP alarm can be set in 1 cmH_2O increment.

5 Perform the zero calibration.

NOTE

- While performing the zero calibration, the baseline waveform is displayed.

REFERENCE

- On the patient monitor, a zeroing (zero calibration) of the multigas unit is periodically performed, but it can also be performed manually when necessary.

1 Press the [Zero Cal.] key.

▸ The zero calibration will start.

6 Set the "Flow Rate".

The selectable "Flow Rate" value differs depending on the type of used water trap and sampling line.

REFERENCE

- The sampling flow rate for the multigas unit can be set.
- The selectable flow rate differs depending on the type of water trap (for adult/child or for neonate).

▸ When using a water trap for adult/child, select from [120]/[150]/[200].

▸ When using a water trap for neonate, select from [70]/[100]/[120].

NOTE

- If the used water trap and the set patient classification does not match, <GAS Check Water Trap Class> will be displayed.
- If <GAS Pump Regulating> is displayed, the gas sampling flow rate may be insufficient. Check the sample line for any blockage or bent. If the message is still displayed, adjust the flow rate.
- Select the appropriate water trap, sampling line, or flow sensor from 2 types according to the patient classification.
- User water trap and sampling line for MGU-800, water trap and flow sensor for MGU-810.
- Refer to "Chapter 13 Accessories" for the usable water trap, sampling line, or flow sensor. (☞"Anesthetic Gas Concentration Measurement (Manufactured by Mindray Medical Sweden AB)" P13-7)

7 Set the "Wave Clip".

REFERENCE

- If the gas waveform amplitude exceeds the waveform display area, whether or not to clip the exceeded part can be selected.

▸ [ON]: The exceeded part of the waveform will be displayed in straight line at the upper or lower scale limit.

▸ [OFF]: The whole part of the waveform will be displayed even if it exceeds the scale. However, the exceeded part may not be displayed depending on the sweep speed of the waveform displayed above or below the gas waveform.

8 Set the "CO_2 Source Priority".

REFERENCE

- When the MGU-800/MGU-810 and HS-8000 are used simultaneously, the CO_2 source to prioritize the measurement can be set.

▸ [MGU-800]: CO_2 value measured by the MGU-800/810 Multigas Unit will be prioritized.

▸ [HS-8000]: CO_2 value measured by the HS-8000 Super Unit will be prioritized.

9 Set the agent gas label.

1 Select from [Auto]/[ISO]/[SEV]/[HAL]/[ENF]/[DES].

▸ [Auto]: The label will be automatically set according to the detected anesthetic gas.

10 When the MGU-810 series is used, set the respiratory waveform scale.

1 Press the "Scale" key of each waveform.

▸ The scale selection window will be displayed.

2 Select one from the displayed scales.

11 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 respiration rate measured by the multigas unit will not be displayed either.

❑MAC Value Display

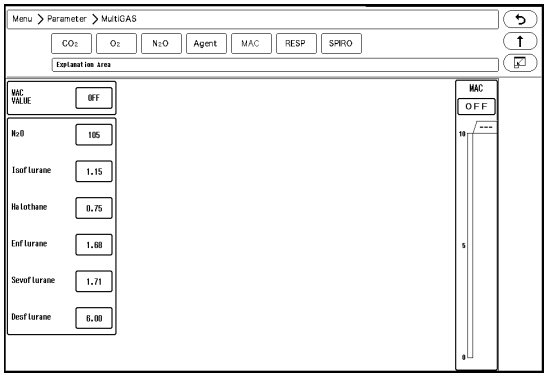
The MAC value can be displayed inside the numeric data display area.

NOTE

- The MAC value will not be displayed unless ON is selected for "MAC VALUE". Perform the setup as necessary.

1 Press the [Menu], [GAS] "Parameter", [MAC] keys.

▸ The MAC value setup screen will be displayed.



GAS_MAC Screen (MGU-800 series)

2 Select On or OFF for "MAC VALUE".

- [ON]: MAC value will be displayed inside the numeric data display area.
- [OFF]: MAC value will not be displayed inside the numeric data display area.

REFERENCE

- If you want to change the displayed default value, input the numbers using the numeric keypad. Then, press the key for the corresponding constant.

The MAC value is calculated from the following formula.

$$MAC = \frac{ExN_2O}{x(N_2O)} + \frac{ExPAGT}{x(PAGT)} + \frac{ExSAGT}{x(SAGT)}$$

- Ex N_2O: Exp N_2O (%)
- Ex PAGT: Exp Primary Agent (%)
- Ex SAGT: Exp Secondary Agent (%)
- X(N_2O): N_2O Constant
- X(PAGT): Primary Agent Constant
- X(SAGT): Secondary Agent Constant

BIS Data (HBX-800 with BISx)

This section explains about the BIS measurement and setup procedure when using the BISx with the BIS I/F Unit, HBX-800.

⚠ WARNING

- Clinical judgment should always be used when interpreting BIS in conjunction with other available clinical signs. Reliance on BIS alone for intra-operative anesthetic management is not recommended.
- BIS values should also be interpreted cautiously with certain anesthetic combinations, such as those relying primarily on either ketamine or nitrous oxide/narcotics to produce unconsciousness.
- As with any monitored parameter, artifacts and poor signal quality may lead to inappropriate BIS values. Potential artifacts may be caused by poor skin contact (high impedance), muscle activity or rigidity, head and body motion, sustained eye movements, improper sensor placement and unusual or excessive electrical interference.

⚠ CAUTION

- Generally, the BIS value decreases with the decrease of brain activity. When a patient is in hypothermia state during cardiac bypass surgery, the suppression of brain wave will cause the BIS value to decrease.
- Pay attention when artifact interferes or signal quality decreases, as it may cause incorrect BIS measurement.
- Pay attention when AC disturbing signal interferes during Filter OFF condition, as it may cause incorrect BIS measurement.

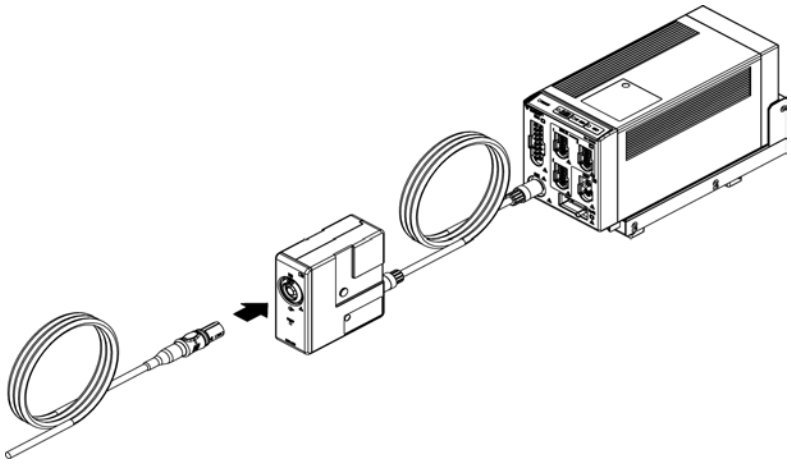
- Pay attention when a pacemaker pulse is displayed in the brain wave, as it may cause incorrect BIS measurement.
- The BIS value tends to increase with the EMG interference. The patient's shivering during recovery from anesthesia increases the EMG and may case the BIS value to increase.
- When attaching the BIS sensor, lightly apply pressure to the electrode part for about 5 seconds to decrease the electrode impedance.

Preparation for Monitoring

By connecting the BISx module using the HBX-800 BIS I/F Unit, BIS data can be monitored.

1 Select the appropriate sensor for the patient.

2 Connect the HBX-800 to the AUX connector on the HS-8000 and the BISx to the serial communication connector on the HBX-800.



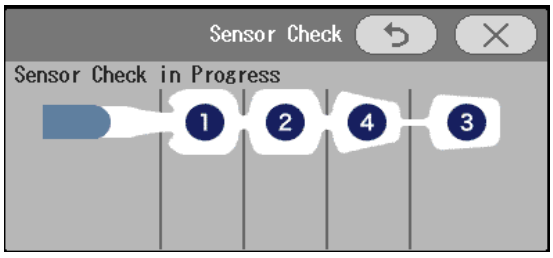
3 Attach the BIS sensor to the patient.

4 When the system detects the sensor, "Sensor Check" window will be displayed, and impedance for all the electrodes will be automatically measured.

REFERENCE

- Pressing the [Sensor Check] key will also start the sensor check process.

▸ The measured results will be displayed on the "Sensor Check" window.



▸ In this display, the impedance value for each electrode, in kilo ohms, appears on the screen along with its status.

- <PASS>: An electrode passes if the impedance for that electrode is less than 7.5 kilo ohms, and the ground electrode (electrode #2) is less than 30 kilo ohms.

- <HIGH>: The impedance value is above 7.5 kilo ohms.
  As long as the combined impedance of electrodes #1 and #3 and the combined impedance of electrodes #1 and #4 are less than 15 kilo ohms, and the ground electrode is less than 30 kilo ohms, the sensor check will be considered successful.
- <LEAD OFF>: The electrode is detached from the patient.
- <NOISE>: The signal from the electrode is outside the measurable range.

NOTE

- During the sensor check process, EEG waveform will become unstable.

5 If the impedance for all the electrodes are within variable range, <Sensor Check Passed> will be displayed on the "Sensor Check" window.

6 Press the [Close] key on the "Sensor Check" window to end the sensor check process.

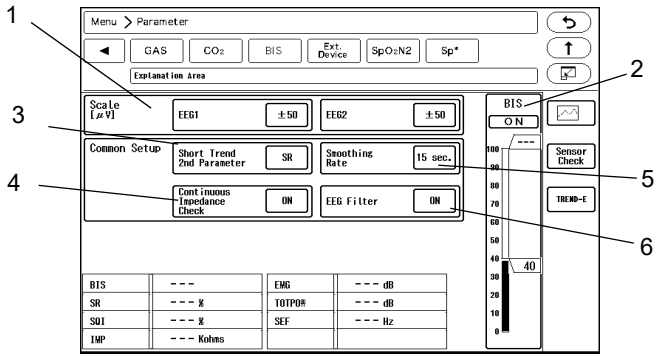
▸ BIS measurement will automatically start when the "Sensor Check" window is closed.

NOTE

- If the "Sensor Check" window is closed before <Sensor Check Passed> is displayed, <BIS Perform "Sensor Check"> will be displayed. Press the [Sensor Check] key and start the sensor check again.

BIS Setup

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



1 Scale

▸ Select the EEG waveform scale from [±25]/[±50]/[±100]/[±250].

2 Alarm

▸ Select ON/OFF of BIS alarm and set the alarm limits.

⚠ CAUTION

- When connected to the DS-LAN network, BIS alarm may not generate depending on the model type and software version of the central monitor.

3 Short Trend 2nd Parameter

▸ Select the second parameter for short trend from [SR]/[EMG]/[SQI].

▸ Selecting [OFF] will not display the second parameter.

4 Continuous Impedance Check

▸ Select whether or not to perform continuous impedance check.
If [ON] is selected, the check process will continue until it passes.
Select [OFF] if it affects other measurements.

⚠ CAUTION

- The conductive parts of sensors and connectors should not contact other conductive parts, including earth.
- To reduce the hazard of burns in the high-frequency surgical neutral electrode connection, the BIS sensor should not be located between the surgical site and the electrosurgical unit return electrode.
- The BIS sensor must not be located between defibrillator pads when a defibrillator is used on a patient connected to the patient monitor.
- Continuous impedance checking may need to be disabled if the 1 nA, 128 Hz impedance check signal interferes with other equipment (e.g., evoked potential monitors).
- Considerations when using Electro-Convulsive Therapy (ECT) equipment during BIS monitoring: Place ECT electrodes as far as possible from the BIS sensor to minimize the effect of interference. Certain ECT equipment may interfere with the proper function of the BIS monitoring system.

NOTE

- During the continuous impedance check, the following impedance will be measured.
- A) Combined Impedance of Signal Electrode and Reference Electrode
  This check process will not affect the EEG waveform. If the impedance value is within the allowable range, the check result will not be notified.
- B) Impedance of Ground Electrode
  This check process will be performed every 10 minutes. During this process, <Ground Check in Progress> will be displayed, as artifact interferes to the EEG waveform.

5 Smoothing Rate

▸ Select the smoothing rate from [10 sec.] / [15 sec.]/ [30 sec.].

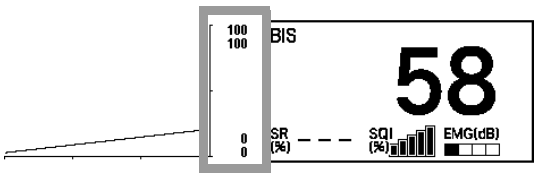
6 EEG Filter

▸ Select from [ON]/[OFF].

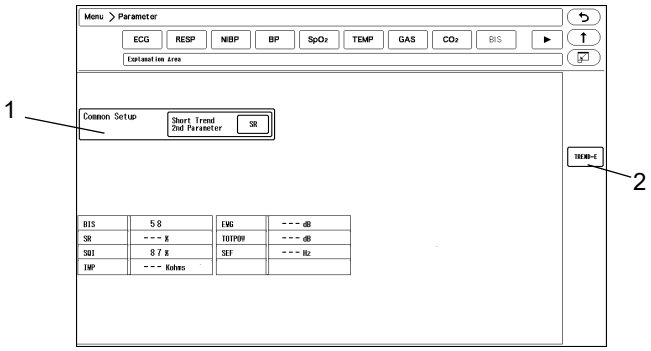
BIS Data (A-2000/A-3000)

This section explains about the BIS setup procedure when using the A-2000 BIS Monitor or A-3000 BIS Vista (Covidien).

On the BIS setup screen, the second parameter to be displayed on the short trend can be selected.
The first parameter is fixed to BIS value.



Press the [Menu], [BIS] ("Parameter") keys to display the BIS setup screen.



1 Short Trend 2nd Parameter

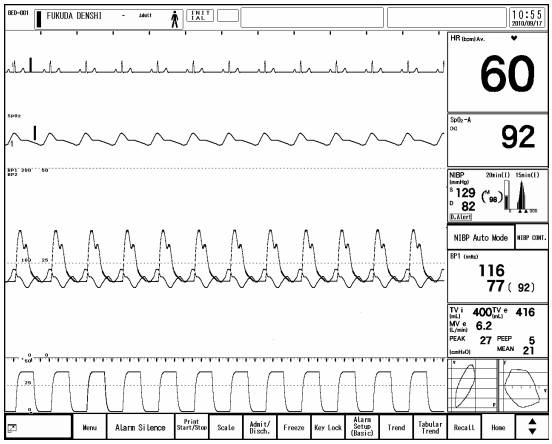
- Select the second parameter for short trend from [SR]/[EMG]/[SQI].
- Selecting [OFF] will not display the second parameter for short trend.

2 TREND-E

- TREND-E screen will be displayed.

Ventilator

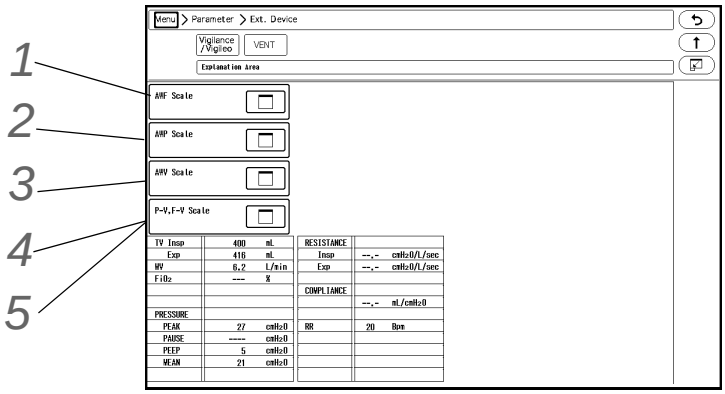
By connecting a ventilator, numeric data and waveform measured by the ventilator can be displayed on the DS-8500 System.
(☞Maintenance Manual "Ventilator Connection" P4-3)
By assigning [P-V/F-V] to numeric data box, P-V (pressure-volume) loop/F-V (flow-volume) loop can be also displayed.



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.



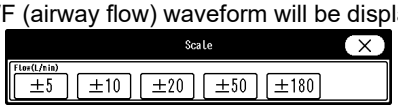
REFERENCE

- 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].

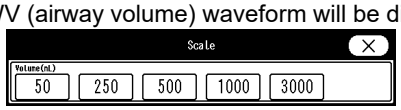
▸ The scale selection for AWP (airway pressure) waveform will be displayed.

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]/[500]/[1000]/[3000](mL).

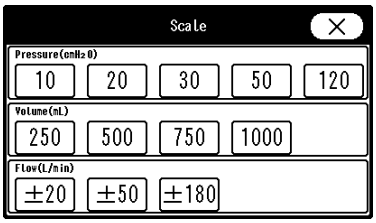
4 Set the P-V Scale.

1 Press the key for [P-V, F-V Scale].

▸ The scale selection for P-V (pressure-volume) loop will be displayed.

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

3 Volume: Select from [250]/[500]/[750]/[1000](mL).



5 Set the F-V Scale.

1 Press the key for [P-V, F-V Scale].

▸ The scale selection for F-V (flow-volume) loop will be displayed.

2 Flow: Select from [±20]/[±50]/[±180](L/min).

3 Volume: Select from [250]/[500]/[750]/[1000](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.
- When FLOW-i is connected, P-V loop, F-V loop display function is not available.

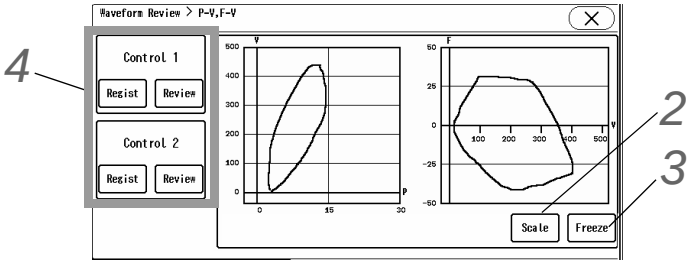
The ventilator data can be displayed in P-V/F-V loop for review.

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.

FLOW-i Data

The FLOW-i can be connected to the serial port, status port of the DS-8500 system or to the HP-800.
(☞Maintenance Manual "Connection with the FLOW-i" P4-13)
When the FLOW-i is connected, monitoring conditions for CO_2 concentration, anesthetic gas concentration, O_2 concentration, N_2O concentration, and respiration can be set.

⚠ WARNING

- When the numeric data acquired from FLOW-i is displayed, the following alarms cannot be set. Also, these alarms will not generate.
  InspCO_2/EtCO_2, InspO_2/ExpO_2, InspN_2O/ExpN_2O, InspAgent/ExpAgent, MAC, ExpMV, PEAK, PEEP

⚠ CAUTION

- The FLOW-i and MGU-800/810 cannot be used simultaneously.
- The FLOW-i and ventilator cannot be used simultaneously.

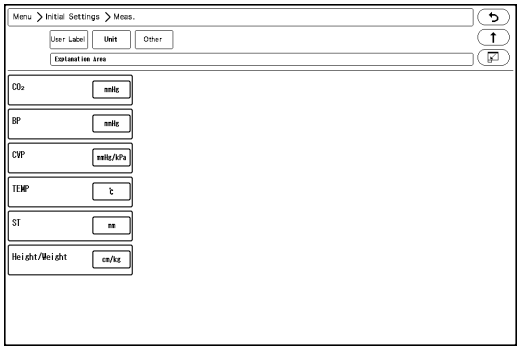
CO_2 Measurement Unit Setup

NOTE

- The CO_2 measurement unit is not linked between the FLOW-i and this equipment.
- When the FLOW-i is connected, CO_2 alarm cannot be set. Also, the alarm will not generate.

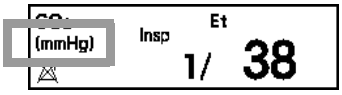
1 Press the [Menu], [Initial Settings], [Meas.], [Unit] keys.

▸ The "Unit" setup screen will be displayed.



2 Press the [mmHg]/ [kPa]/ [%]key.

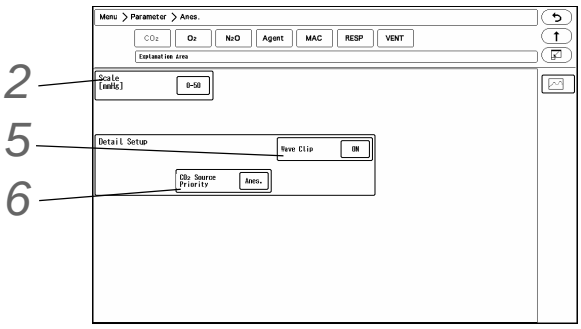
▸ The data of currently set measurement unit will be displayed on the graphic/ tabular trend.



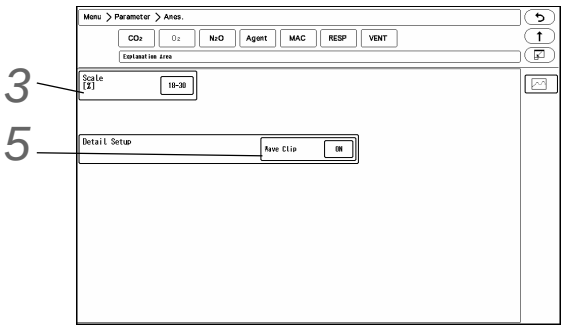
FLOW-i Setup

1 Press the [Menu], [Anes.] "Parameter" keys.

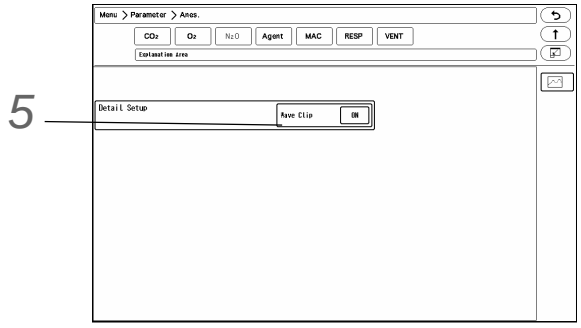
▸ The anesthesia setup menu will be displayed.



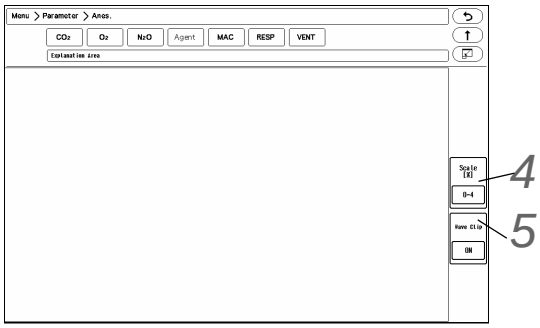
FLOW-i_CO_2 Setup



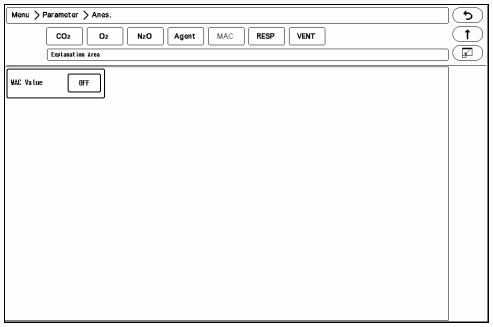
FLOW-i_O_2 Setup



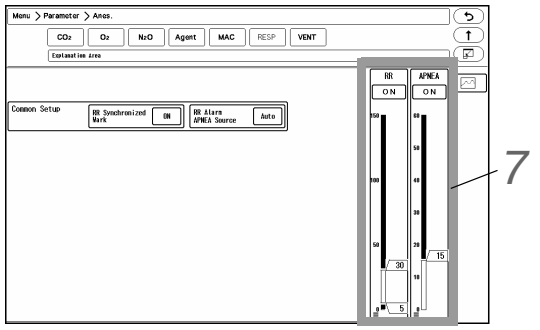
FLOW-i_N_2O Setup



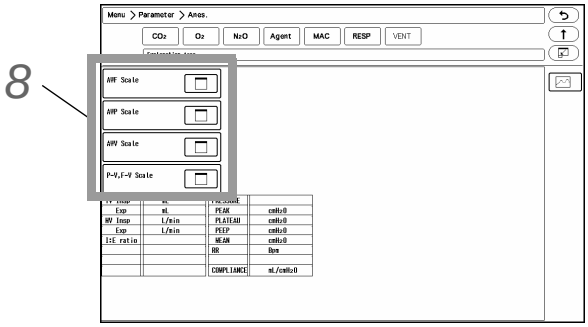
FLOW-i_AGT Setup



FLOW-i_MAC Setup



FLOW-i_RESP Setup



FLOW-i_VENT Setup

2 Set the CO_2 waveform scale.

1 Press the key for "Scale".

▸ The dropdown list will be displayed.

2 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 Set the O_2 waveform scale.

1 Press the key for "Scale".

▸ The dropdown list will be displayed.

2 Select from [18-30]/[18-60]/[18-100]/[0-30]/[0-60]/[0-100].

4 Set the scale for anesthetic gas concentration.

1 Press the key for "Scale".

▸ The dropdown list will be displayed.

2 Select from [0-4]/[0-8]/[0-16].

5 Set the "Wave Clip".

REFERENCE

- If the gas waveform amplitude exceeds the waveform display area, whether or not to clip the exceeded part can be selected.

▸ [ON]: The exceeded part of the waveform will be displayed in straight line at the upper or lower scale limit.

▸ [OFF]: The whole part of the waveform will be displayed even if it exceeds the scale. However, the exceeded part may not be displayed depending on the sweep speed of the waveform displayed above or below the gas waveform.

6 Set the "CO_2 Source Priority".

REFERENCE

- When the FLOW-i and HS-8000 are simultaneously used, the CO_2 source to prioritize the measurement can be set.

▸ [Anesthesia]: CO_2 value measured by the FLOW-i will be prioritized.

▸ [HS-8000]: CO_2 value measured by the HS-8000 Super Unit will be prioritized.

7 Set the RR/APNEA alarm.

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

NOTE

- Only the RR/APNEA alarm can be set. The following alarms cannot be set. Also, these alarms will not generate.
  $InspCO_2/EtCO_2$, $InspO_2/ExpO_2$, $InspN_2O/ExpN_2O$, InspAgent/ExpAgent, MAC, ExpMV, PEAK, PEEP

NOTE

- Set the upper limit of RR alarm in the range of 10 Bpm to 150 Bpm. If a value above 150

Bpm is set, the upper alarm will turn OFF.
Set the upper limit of apnea alarm in the range of 10 sec. to 60 sec. If a value above 60 sec. is set, the upper alarm will turn OFF.

- Set the lower limit of RR alarm in the range of 5 Bpm to 145 Bpm. If a value below 5 Bpm is set, the lower alarm will turn OFF.

REFERENCE

- The adjustable increment for RR alarm depends on the patient classification and "RR Alarm Increment" setting. (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

- The apnea alarm can be set in 1 second increment.

8 Set the respiration waveform scale.

1 Press the "Scale" key of each waveform.

▸ The scale selection window will be displayed.

2 Select one from the displayed scales.

❑MAC Display

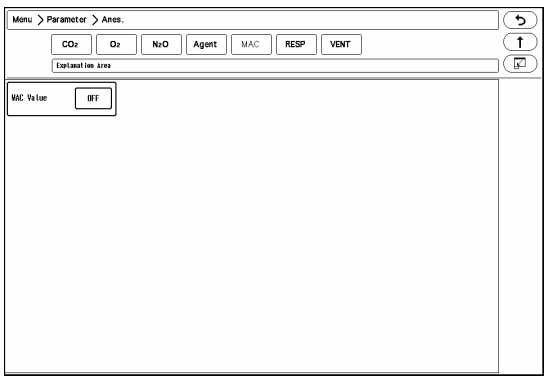
The MAC value can be displayed in the numeric data display area.

NOTE

- The MAC value will be displayed only if [ON] is set for "MAC Value". Perform the setting if necessary.

1 Press the [Menu], [GAS] "Parameter", [MAC] keys.

▸ The MAC value setup screen will be displayed.



2 Select ON/OFF for "MAC Value".

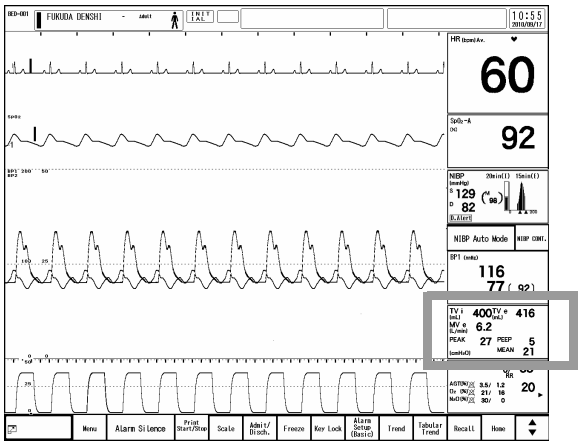
▸ [ON]: The MAC value will be displayed in the numeric data display area.

▸ [OFF]: The MAC value will not be displayed in the numeric data display area.

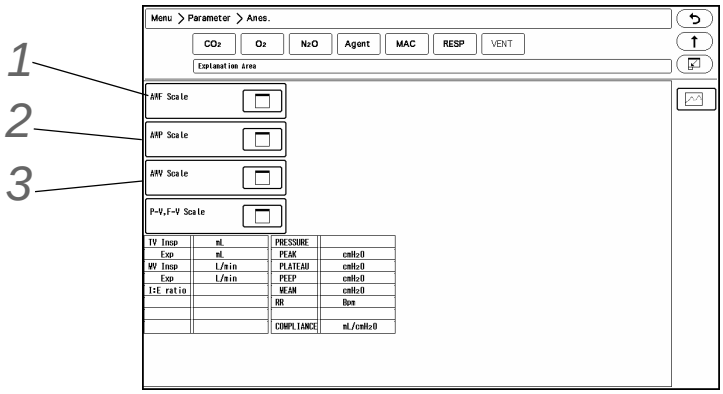
❑Ventilator Data Display and Setup

By connecting the FLOW-i, the numeric data and waveform measured by the ventilator can be displayed.

This section explains about the AWP/AWF/AWV scale setup procedure.



Press the [Menu], [Anes.] ("Parameter), [VENT] key to display the ventilator screen.
The ventilator measurement will be displayed, and AWF / AWP / AWV scale can be set.



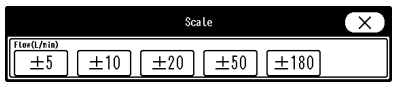
CAUTION

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

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).

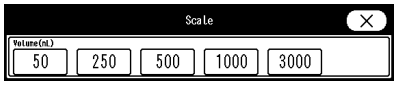
2 AWP Scale

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 AWV Scale



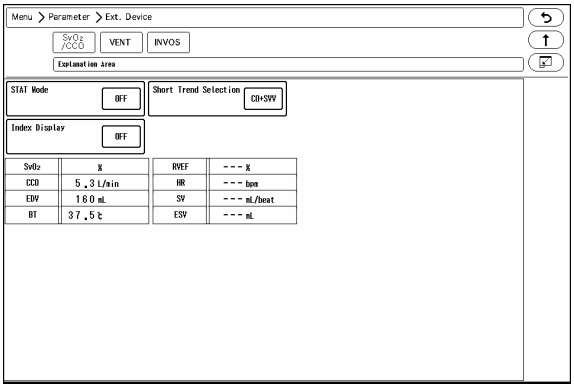
1 Press the key for "AWV Scale".

▸ The scale selection for AWV (airway volume) waveform will be displayed.

2 Select from [50]/ [250]/ [500]/ [1000]/ [3000] (mL).

SvO_2/CCO Data

The DS-8500 System can display the monitoring data of oximeter/CCO measurement device of Edwards Lifesciences (Vigilance, Vigilance CEDV, Vigilance II, Vigileo) or the hemodynamic monitoring device of PULSION Medical Systems (PiCCO2, PulsioFlex).
(☞Maintenance Manual "SvO2/CCO Monitor Connection" P4-7)
On the SvO_2/CCO data screen, the displayed numeric data can be switched.



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.
Short Trend Selection: Select the short trend parameter from [CO+SVV], [CO], [SVV].

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.

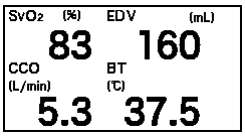
NOTE

- 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.

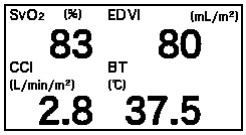
2 Select [ON]/[OFF] for "STAT Mode" and "Index Display".

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

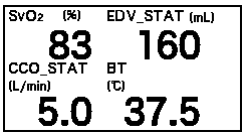
SvO_2+CO numeric data box.



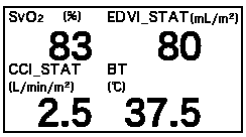
- STAT Mode [OFF], Index Display [ON]: CCI and EDVI will be displayed instead of CCO and EDV.



- 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

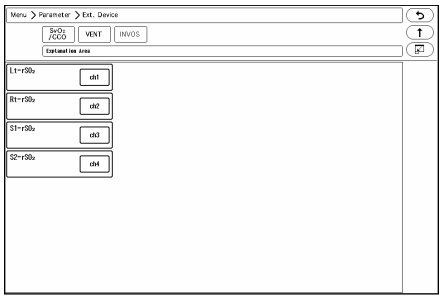
- ON/OFF of STAT mode can be changed only when Vigilance is connected.

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-8500 System.
(☞Maintenance Manual "Connecting to the INVOS" P4-12)
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.

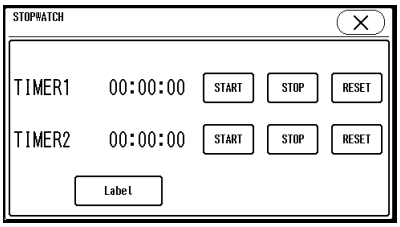
3 Select the channel from [ch1]/[ch2]/[ch3]/[ch4].

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.

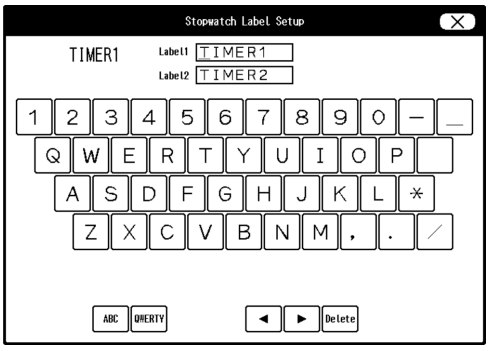
▸ The "Stopwatch" window will be displayed.



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

On the Super Unit or Module and Multi Module, multiparameter connectors are provided. The quantity of multiparameter connectors are as follows.

Multiparameter Connectors	Super Unit
3 ports TEMPx6 (maximum) BPx6 (maximum) COx1 (maximum)	HS-8312N, HS-8312M

Multiparameter Connectors	Transport Monitor
2 ports TEMPx6 (maximum)* BPx4 (maximum) COx1 (maximum)	DS-8007N, DS-8007M

* : TEMPx2 are fixed jacks.

Multiparameter Connectors	Multi Module
2 ports TEMPx4 (maximum) BPx4 (maximum) COx1 (maximum)	HM-800

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.
By using the Multi Module with the Input Box, up to 8 channels of BP, 8 channels of TEMP and 1 channel of CO can be measured.
The multiparameter connector setup can be performed on the "Initial Settings" menu.
(☞Maintenance Manual "Unit Module Setup" P4-17)

❑For HS-8312N, HS-8312M

Combination of BP, TEMP, CO Channels

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

Combination of BP, TEMP, CO Channels

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

* the quantity of channel inside the brackets is the quantity when using the 1ch BP relay cable.

❑In Case of DS-8007/HM-800

Combination of BP, TEMP, CO Channels

2 Ports	Blood Pressure	Temperature	CO
Blood Pressure	4 ch (2ch)	-	-
Blood Pressure			
Blood Pressure	2 ch (1ch)	2 ch	-
Temperature			
Temperature	-	4 ch	-
Temperature			
Blood Pressure	2 ch (1ch)	-	1 ch
CO			
Temperature	-	2 ch	1 ch
CO			

The numbers in parenthesis shows the channels when using the 1ch BP conversion cable.

NOTE

- For the DS-8007, fixed TEMP 2ch is added to the above channels.

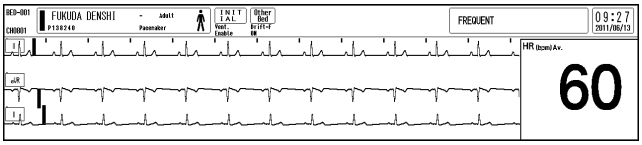
Chapter 8 Review Function

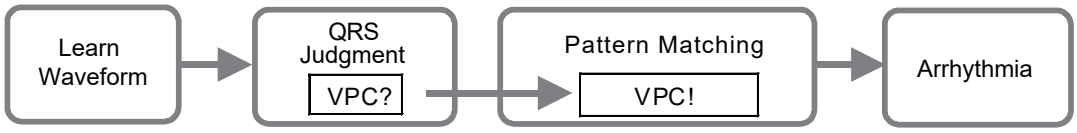
Chapter 8 Review Function

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, it may cause erroneous detection.

❑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 upper alarm limit of extreme tachycardia 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, ?.

NOTE

- To monitor 27 types of arrhythmia alarm using the Super Unit (HS-8000), the software version of the Super Unit (HS-8000) needs to be V06-01 and newer.

Arrhythmia Alarm Setup

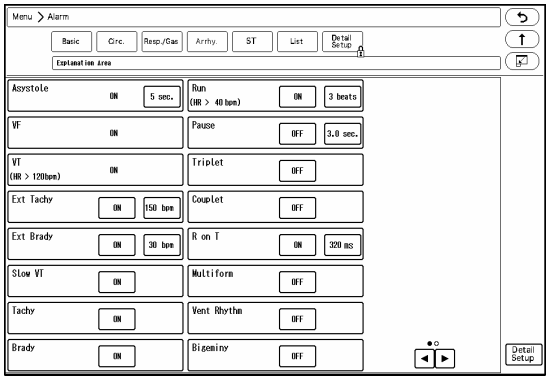
Arrhythmia alarm setup procedure is explained below.
ON/OFF of arrhythmia alarm and arrhythmia detection level can be set.
When the measured value exceeds the set arrhythmia detection level, arrhythmia alarm will generate.

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	22 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	320ms	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 beat 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.

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

NOTE

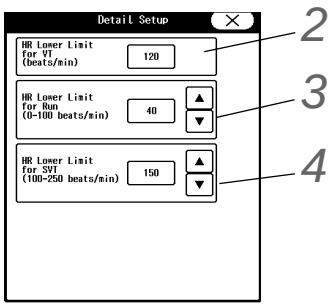
- If the patient classification is "Adult" or "Child", Asystole, VF, VT alarm cannot be turned OFF unless [ON/OFF] is selected for "Asystole, VF, VT Alarm" under "Initial Settings".
- If the patient classification is "Neonate", VF, VT can be turned OFF regardless of the setting for "Asystole, VF, VT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

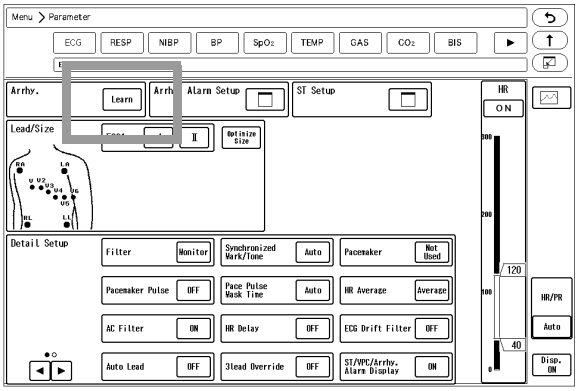
- Set the SVT analyzing condition for the arrhythmia analysis. SVT alarm will generate if the HR is same or above the set value.
- Press the [▲]/[▼] keys for "HR Lower Limit for SVT" to set the HR in the range from 100 bpm to 250 bpm.

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

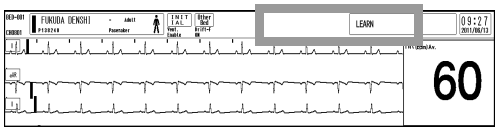
1 Press the [Menu], [ECG] "Parameter" keys.
Or, press the HR numeric data box , and press [↵].

- 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.

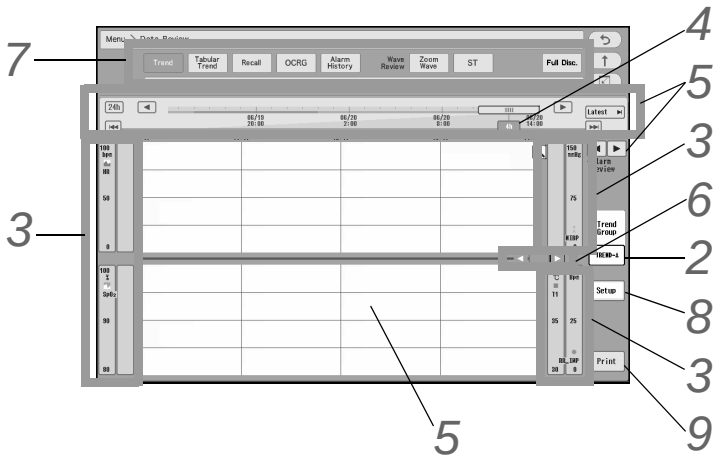
Graphic Trend

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.



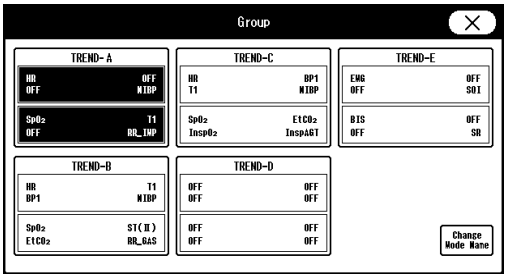
- 2 graphs are displayed on each page, and graphic trend of 4 parameters can be displayed simultaneously on each graph.

2 Change the trend group.

1 Press the [Trend Group] key.

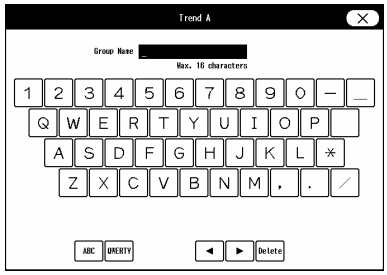
- The "Group" window will be displayed.

2 Select the group.
Maximum of 5 groups with 8 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.

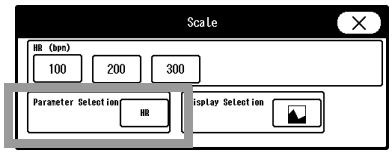


4 After entering the name, press (X) to close the window.

3 Set the parameter, display type, scale.

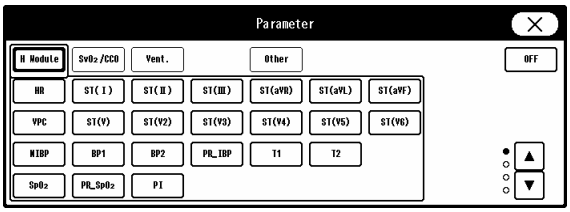
1 Press the scale area for each parameter.

▸ The "Scale" selection window will be displayed.

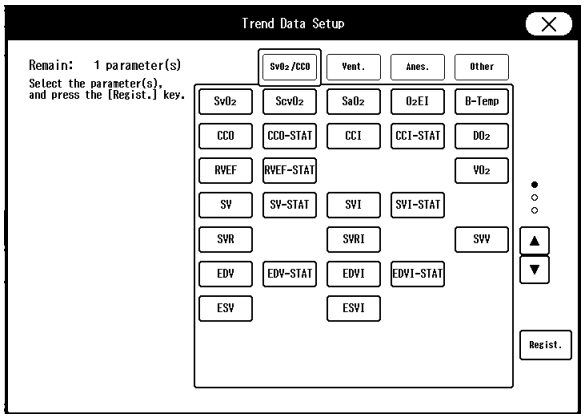


2 Press the key for "Parameter Selection".

▸ 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)".

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.

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
20 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.

1 The time range can be selected from [4h]/[8h]/[12h]/[16h]/[20h]/[24h]/[36h]/[48h] by pressing the key on the left side of the time bar.The displayed time can be shifted by pressing the ◀/▶ on the left and right side of the time bar.

NOTE

- 24 hours of data will be stored regardless of the time bar display range.

2 Pressing the time bar will display the data at pressed time.

3 Drag the slider to left and right.

- Right: Scrolls to the newer data.
- Left: Scrolls to the older data.

4 Press the ⏮/⏭ keys.

- The time display will switch by page.

5 Press Latest ⏭.

▸ The latest data will be displayed.

6 Press ◀/▶ for "Alarm Review".

▸ The cursor will move to the alarm generated time.

7 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 🔍+.

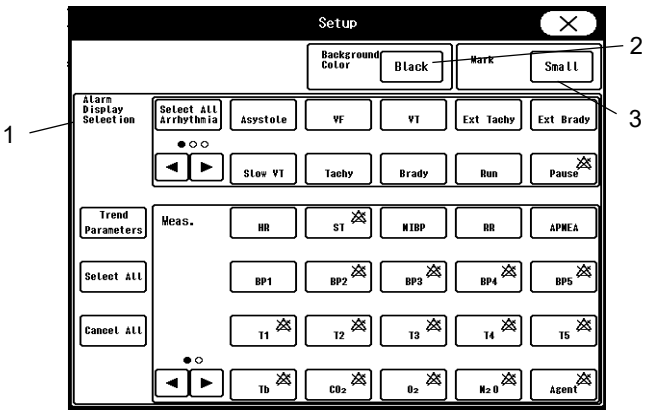
▸ 10-minute trend data before and after the cursor position will be displayed.

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 the graphic trend display.



1 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.

2 Background Color

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

3 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	Description	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_2-1, SpO_2-2	SpO_2 Value	0 to 100, 50 to 100, 80 to 100	%SpO_2
PR_SpO_2-1, PR_SpO_2-2	SpO_2 Pulse Rate	100, 200, 300	bpm
NIBP	NIBP Value (SYS / DIA)	100, 150, 200, 300	mmHg
		16, 20, 24, 40	kPa
BP1~8	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	100, 200, 300	bpm
T1 to 8	Temperature	20 to 45, 30 to 40	°C
Tb	Blood Temperature (Cardiac Output Measurement)	20 to 45, 30 to 40	°C
ΔTEMP-A to D	Temperature Difference	±10, ±25	°C
RR_IMP	Impedance Respiration Rate	50, 100, 150	Bpm
Apnea	Apnea Duration (Impedance, CO_2, Ventilator)	15, 30	s (second)
$EtCO_2$, $InspCO_2$[*1]	Gas Unit CO_2 Concentration	50, 100	mmHg
		4, 8, 10	kPa, %
$ExpO_2$, $InspO_2$[*1]	Gas Unit O_2 Concentration	50, 100	%
$ExpN_2O$, $InspN_2O$[*1]	Gas Unit N_2O Concentration	50, 100	%
RR_GAS[*1]	Gas Unit Respiration Rate	50, 100, 150	Bpm
ΔO_2[*1]	ΔO_2	3, 6, 9	%
ExpAGT, InspAGT[*1]	Gas Unit Agent Concentration	4, 8, 10	%
MAC[*1]	Minimal Alveolar Concentration	5, 10	-
BIS	Bispectral Index (BIS Monitor Measurement)	25, 50, 75, 100	-
SR	Suppression Ratio (BIS Monitor Measurement)	25, 50, 75, 100	%
EMG[*1]	Electromyography (BIS Monitor Measurement)	30 to 80	dB

Numeric Data	Description	Scale	Unit
SQI	Signal Quality Index (BIS Monitor Measurement)	0 to 100	%
SvO_2*2	Mixed Venous Oxygen Saturation	0 to 100, 50 to 100, 80 to 100	%
$ScvO_2$*2	Central Venous Oxygen Saturation	0 to 100, 50 to 100, 80 to 100	%
CCO*2	Continuous Cardiac Output	6, 12, 20	L/min
CCI*2	Continuous Cardiac Index	6, 12, 20	$L/min/m^2$
BT*2	Blood Temperature (SvO_2/CCO Monitor)	20 to 45, 30 to 40	°C
RR_VENT	Ventilator Respiration Rate	50, 100, 150	Bpm
SpCO (1, 2)	Carboxyhemoglobin Concentration	20, 40, 100	%SpCO
SpMet (1, 2)	Methemoglobin Concentration	10, 15, 100	%SpMet
SpHb (1, 2)	Total Hemoglobin Concentration	10 to 20, 0 to 25	g/dL
PI(1,2)	Perfusion Index	10, 20	%
PVI(1,2)	Pleth Variability Index	30, 60, 100	%
ExpMV*1	Expiratory Minute Ventilation Volume	6.0, 12.0, 20.0	L/min
PEAK*1	Peak Airway Pressure	10, 20, 50, 100	cmH_2O
PEEP*1	Peak End Expiratory Pressure	10, 20, 50, 100	cmH_2O
Lt-rSO_2*2	Regional Cerebral Oxygen Saturation	20 to 100	%
Rt-rSO_2*2			
S1-rSO_2*2			
S2-rSO_2*2			

*1: When the FLOW-i Anesthesia Delivery System is used, the measurement by the FLOW-i will be used.

*2: The external device parameters to be displayed on the graphic trend/tabular trend needs to be selected in advance on the "Trend Data Setup" window ([Data Review>Graphic Trend or Tabular Trend] or [Initial Settings>External Device>Main Unit/HP-800]).

NOTE

- 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)".

Short Trend

The trend data can be displayed on the home display.

As the alarm occurrence point on the graph is displayed in red, the alarm data of up to 3 hours can be verified on the home display.

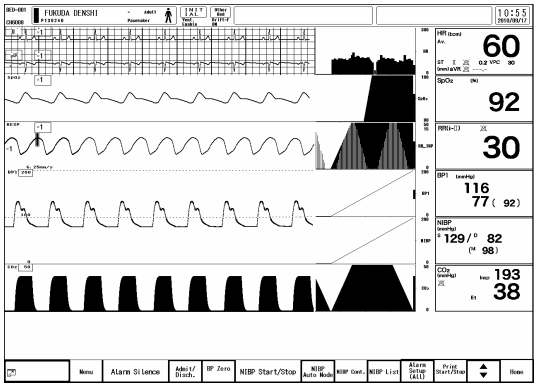
Pressing the short trend of an alarm generated parameter will display the recall screen.

The short trend can be displayed for each display layout.

When 12-lead layout is displayed, ST value of each lead can be displayed in short trend.

The short trend display can be turned ON or OFF using the [Short Trend ON/OFF] user key.

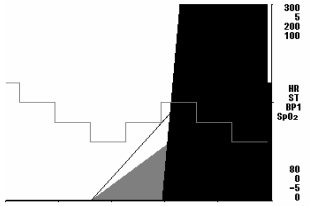
(☞"User Key Selection" P10-18)



NOTE

- When the short trend of multiple parameters are displayed overlapped, only the parameter displayed on top will be displayed in red at alarm occurrence.

❑Selecting the Parameters to be Displayed



The parameters to be displayed can be changed on the "Display Config." menu. (☞"Display Configuration" P10-1)

Also, by setting the auto display configuration, the short trend parameters can be changed automatically according to the displayed waveforms and numeric data. (☞Maintenance Manual "Display/Print Setup" P5-14)

Maximum of 4 parameters can be displayed overlapped in the same short trend display area. (shown on right)

❑Changing the Trend Scale and Display Duration

The short trend scale will be displayed on the right or left side of the short trend.

The displayed scale will be in accordance with the scale set on the "Trend" screen.

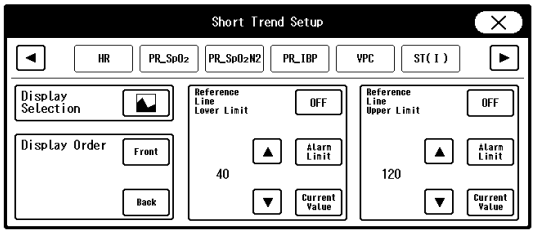
For the following parameters, the short trend scale can be synchronized with the corresponding waveform scale by selecting [Waveform] for "Short Trend Scale" under [Menu>Display Config.>Detail Setup].

BP, PEAK, TV, CO_2, O_2, Agent

The short trend width can be enlarged/reduced to the pressed position on the waveform area.

Also, by setting the "Data Resolution" (5 sec./10 sec./30 sec.) under [Display Config.> Detail Setup], maximum display duration (30 min./1 hr./3 hr.) can be changed. The display width can be selected from 7 levels.

❑Changing the Display for Each Parameter



The graph type and display order can be changed for each parameter.

By pressing the short trend scale area, "Short Trend Setup" window (shown on right) will be displayed.

◆"Display Selection"

Select the graph type.

- For example, there are following graph types.
  - Line
  - Filled in with black color from the baseline
  - Filled in with black color between S-D (For BP)
  - Filled in with black color from the top
- [OFF]: Graph will not be displayed.

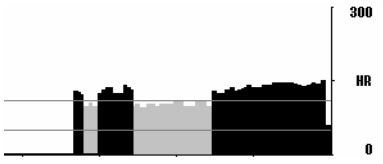
The displayable graph types will differ depending on the parameter.

◆"Display Order"

When the parameters are displayed overlapped (ex. short trend overlap, BP overlap), the display order can be selected.

- [Front]: The display will be on the front side.
- [Back]: The display will be on the back side.

❑Displaying the Reference Line



For the short trend of the following parameters, reference lines can be displayed.

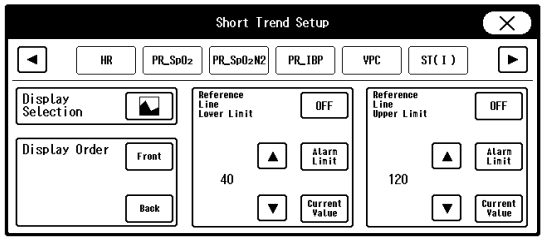
- HR (Upper/Lower Limit)
- ST (Upper/Lower Limit) *Only for the ECG1 lead
- BP1 to 4 (Upper/Lower Limit) *S/D/M can be selected for each limit.
- NIBP (Upper/Lower Limit) *S/D/M can be selected for each limit.
- $EtCO_2$ (Upper/Lower Limit)
- SpO_2 (Lower Limit)
- BIS (Upper/Lower Limit)

The data within the reference lines (including the parameters without the reference line display) will be displayed with lower brightness.
The data outside the reference lines will be displayed with higher brightness.

The reference lines can be displayed by selecting [Enable] for "Reference Line Function". (Menu>Display Config.>Detail Setup)
However, it cannot be displayed for the overlapped short trend. And, when the reference line function is enabled, the function to display the alarm occurrence point on the graph in red cannot be used.

When [Enable] is set for "Reference Line Function", ON/OFF and upper/lower limit of reference line display can be selected on the "Short Trend Setup" window for each parameter.

The "Short Trend Setup" window can be displayed by pressing the short trend scale area.

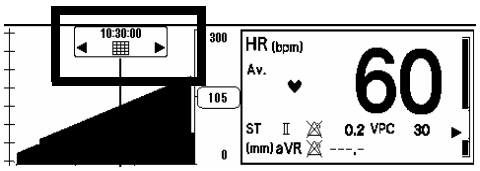


❑Displaying the Cursor

By displaying a cursor, the numeric data and review data at cursor position can be displayed.

The cursor can be displayed by selecting [Enable] for "Cursor Function". (Menu>Display Config.>Detail Setup)

Pressing the short trend display area will display the cursor at the last displayed position (time). If the last displayed position is cleared by scrolling, the cursor will be displayed at the latest data position.



The cursor can be moved by dragging or pressing the short trend display area.

Pressing the center part of 

will display the review data (tabular trend/graphic trend/zoom wave) at the cursor point.
(However, zoom wave can be displayed only when the full disclosure waveform function is enabled.)

The cursor cannot be displayed for the overlapped short trend. And, when the cursor function is enabled, the function to highlight the alarm generated data cannot be used.

When the cursor function is enabled, the function to enlarge/reduce the short trend display area cannot be used.

During the cursor display, the short trend data will not be updated. When the cursor is not used for 10 seconds or when other window is displayed, the cursor will be automatically cleared.

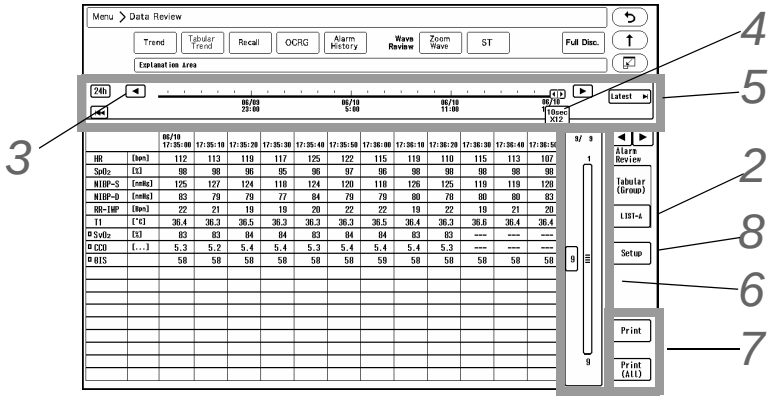
Tabular Trend

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.

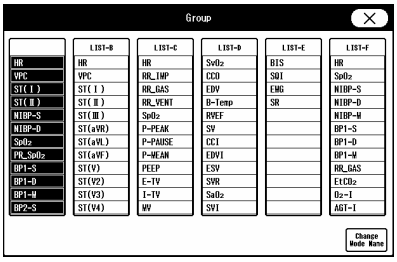
▸ The tabular trend will be displayed.



2 Change the trend group.

1 Press the [Tabular (Group)] key.

▸ The "Group" window will be displayed.



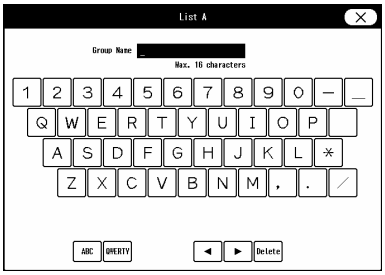
REFERENCE

- Maximum of 6 different groups of parameters can be registered to be selected according to the monitoring purpose.

2 Select a group from [A]/[B]/[C]/[D]/[E]/[F].

3 To change the name of trend group, press the [Change Name] key.

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



4 Enter the name of trend group in alphanumeric characters.

5 After entering the name, press [X] to close the window.

3 Select the time range on the time bar.

1 The time range can be selected from [4h]/[8h]/[12h]/[16h]/[20h]/[24h]/[36h]/[48h] by pressing the key on the left side of the time bar. The displayed time can be shifted by pressing the [◀]/[▶] on the left and right side of the time bar.

4 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

5 Scroll the displayed data.

(☞"Graphic Trend Setup" P8-5 "5. Scroll the displayed data")

6 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.

7 Press the [Print]/[Print (All)] 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.

8 Set the parameters for the tabular trend.

(☞"Parameter Setup for Tabular Trend" P8-15)

The Description of the Display

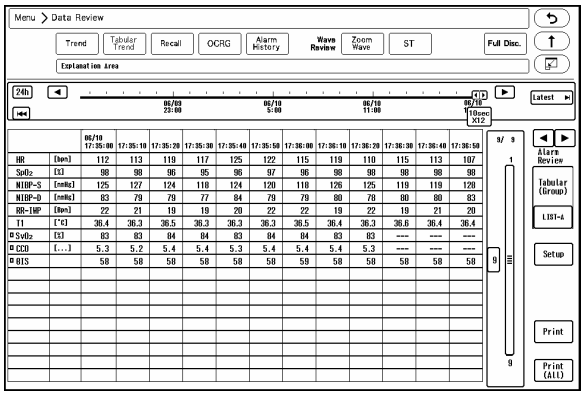
For the data when the measurement was not performed (before admittance) or when the monitoring was suspended, the time will be displayed as " : ".
Also, if the measured data is not displayed on the home display, or BP zero balance is not performed, the data will not be displayed.

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 will be displayed for the alarm generated 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.

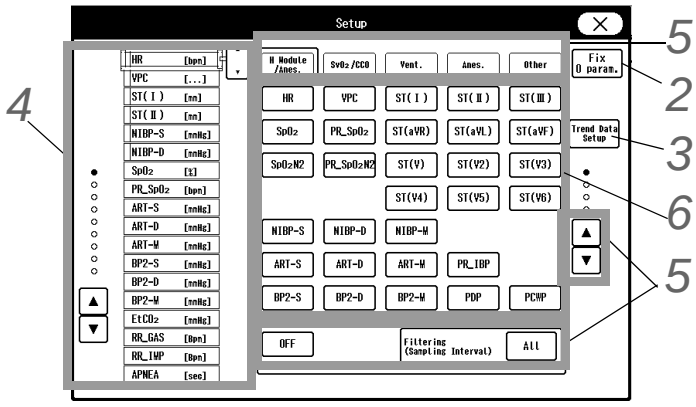


On the left side of the parameter, the color assigned for the corresponding parameter will be displayed.

Parameter Setup for Tabular Trend

1 Press the [Menu], [Tabular Trend] ("Data Review"), [Setup] keys.

- The tabular trend setup screen will be displayed.

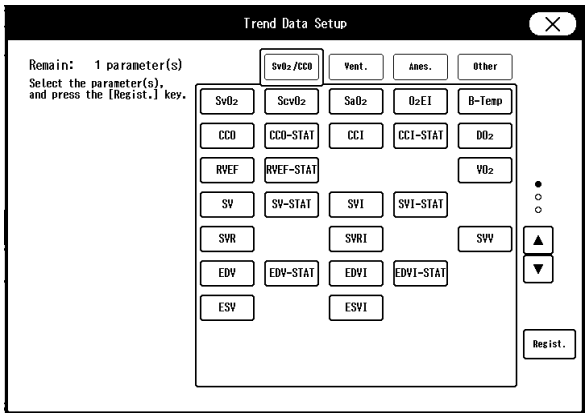


2 Select the fixed parameters from [0 param.] to [6 param.].

- The selected quantity of parameters will be always displayed on the tabular trend, and these data will be remained displayed even when scrolled.

3 Press the [Trend Data Setup] to select the parameters for the connected external device.

- Up to 50 parameters can be selected.



4 Select the display location for the parameter.

- The selected location will be displayed with blue frame and [▲▼] will be displayed at the side.
- To change the location, directly press the desired location or drag the [▲▼] key up or down.
- To change the displayed page, press the [▲]/[▼] keys on the left.

5 Select the parameters.

1 Filter the data by sampling interval.

- [OFF]: The line where [OFF] is selected will not be displayed.
- [10 sec.]: The displayed data will be filtered in 10 seconds sampling interval.
- [All]: All data will be displayed.

2 Select the category and displaying page.

- [H Module] / [SvO_2/CCO] / [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/Anes.	HR, VPC, ST, SpO_2-1, PR_SpO_2-1, SpO_2-2, PR_SpO_2-2, NIBP, BP1 to 8, PR-IBP, PDP, PCWP, CPP, T1 to 8, Tb, CO, $EtCO_2$, $InspCO_2$, RR-GAS, RR-IMP, RR-VENT, APNEA, O_2, N_2O, Agent, E-TV, I-TV, E-MV, I-MV, P-PEAK, P-PAUSE, PEEP, P-MEAN, RES, COMP, TV 1sec, I/E RATIO, PI, PVI, SpCO, SpMet, SpHb
SvO_2/CCO	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, CFI, iCO, iCI, iSV, iSVI, iSVR, iSVRI, GEDV, GEDI, GEF, EVLW, ELWI, PVPI, ITBV, ITBI, VO_2e, VO_2I, VO_2Ie, iB-Temp, SQI, MAP, CVP, HR, PR, SpO_2, iMAP, iCVP, iAvgPR, PO_2I, HGB, dPmx, CO CAL
Ventilator	E-TV, I-TV, MV, SMV, P-PEAK, P-PAUSE, PEEP, P-MEAN, E-RES, I-RES, COMP, FiO_2, P-MIN, S-COMP, D-COMP, S-RR, I/E RATIO, RES, $VTCO_2$, $etCO_2$, VCO_2, Flowee, Ti, Ti/Ttot, PEEPtot, Elastance, Cdyn, D-Chara, Leakage, S-Mve//Mve, Tc, WOBvent, WOBpat, CPAP, P0.1, Edipeak, Edmin, SBI, VT/PBW
Anesthesia Delivery System	Flowee, Ti, Ti/Ttot, Sup.Air, $SupO_2$, $SupN_2O$
Other	BIS, SQI, EMG, SR, SEF, TOTPOW, IMP, Lt-rSO_2, Rt-rSO_2, S1-rSO_2, S2-rSO_2, $tcpO_2$, $tcpCO_2$

NOTE

- 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)".

- The external device parameters to be displayed on the graphic trend/tabular trend needs to be selected in advance on the "Trend Data Setup" window ([Data Review>Graphic Trend or Tabular Trend] or [Initial Settings>External Device>Main Unit/HP-800]).
- The measurement unit of $tcpO_2$, $tcpCO_2$ can be set on the TCM4 or TCM5 FLEX. When the measurement unit is changed, the tabular trend data of $tcpO_2$ and $tcpCO_2$ on the bedside monitor will be deleted.

REFERENCE

- [H Module] is a generic term for HS-8000, HM-800, HP-800, HG-810/HG-820.
- When the FLOW-i Anesthesia Delivery System is connected, the display will change to [H Module/Anes.].

6 Select the parameter to be displayed for the selected location.

▸ The blue frame will move to one row below.

Recall

This section explains about the recall function and the setup procedure.

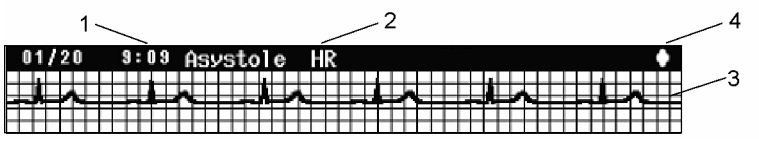
To Display the Recall Waveform

1 Time at Alarm Occurrence

2 Recall Factor

3 Recall Waveform (Compressed: 12 sec.)

4 Diamond Mark



When the alarm for the specified recall factor occurs, maximum of 2 waveforms (12 seconds) and numeric data for each recall factor will be stored for up to 200 data. The recall data to be displayed can be selected. 14 compressed recall waveforms will be displayed. By selecting one of the waveforms, an enlarged waveform will be displayed.
If the recall data exceeds 200, the data will be erased from the oldest one.
The recall waveform will be acquired from the point prior to alarm occurrence so that alarm-generated point will be displayed at 7 to 8 seconds point on the 12-seconds recall waveform.
A diamond mark indicates the alarm generated point.

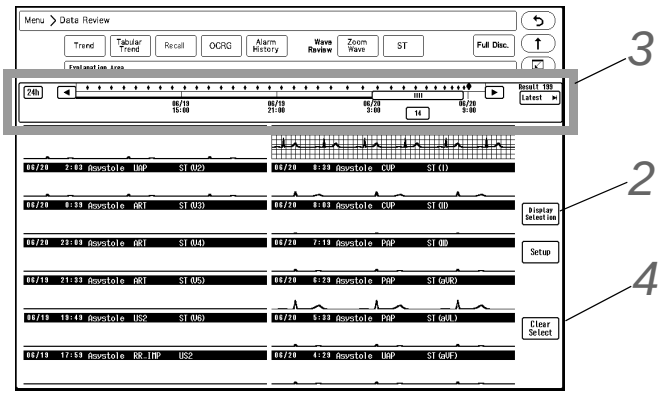
1 Press the [Menu], [Recall] ("Data Review") keys.
Or, press the [Recall] key on the user key area.

▸ Recall screen will be displayed.

▸ 14 compressed waveforms (12 sec. per each waveform) will be displayed.

▸ The alarm occurrence time, the recall factor occurred at the same time, and the compressed waveform of

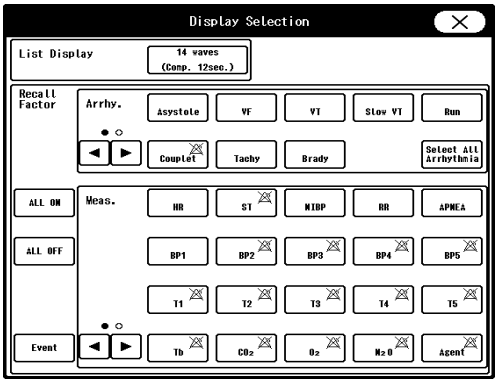
recall waveform 1 will be displayed.



2 Select the recall factor to display on the recall screen.

1 Press the [Display Selection] key.

- The "Display Selection" window will be displayed.



2 Select the recall factor.

- The key will be displayed in blue to indicate that the alarm for the selected parameter will be displayed.
- [Select All]: All parameters including arrhythmia will be selected.
- [Select All Arrhythmia]: All arrhythmia will be selected.
- [Cancel All]: All selections will be cancelled.

3 Switch the displayed data on the recall screen.

1 Scroll the slider left and right.

- Right: Scrolls to the newer data.
- Left: Scrolls to the older data.

2 Press the [⏮] / [⏭] keys.

- The display will switch by page.

3 Press [Latest ⏭].

- The latest data will be displayed.

4 Delete the recall waveform.

1 Press the [Delete Sel.] key.

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

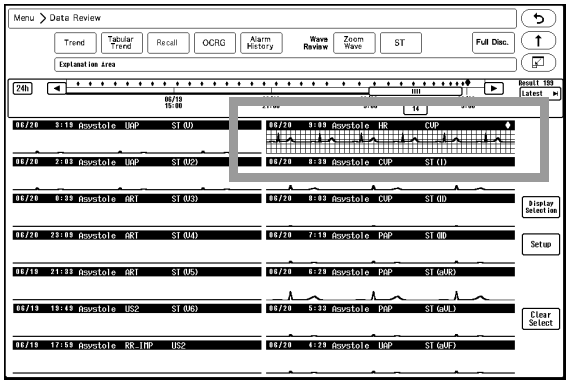
To delete all displayed waveforms, press the [Select All] key.
If the parameter with "x" is selected, "x" will be erased and will be removed from the deleting parameters.

3 Press the [Delete] key, and then the [Delete OK] key to delete the parameters with "x" mark.

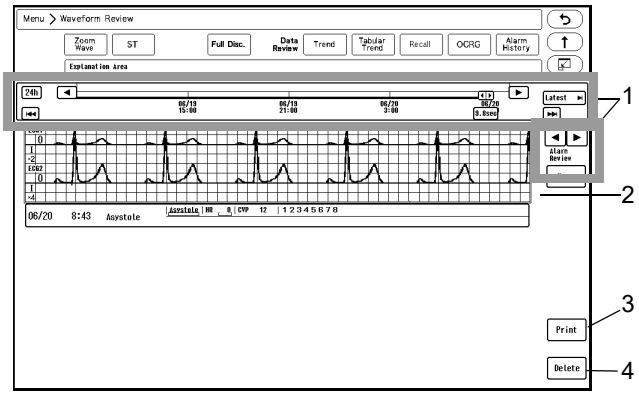
To Display/Print the Enlarged Recall Waveform

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

1 Press the waveform display area on the recall screen.



▸ The enlarged recall waveform will be displayed.



1 Shifts the recall waveform display.

2 Recall Waveform

The waveform can be dragged to left and right.

3 Prints the recall waveform.

The displayed enlarged waveform and numeric data will be printed. The output printer can be selected on the "Manual Printing" setup.
(☞"Printing Setup" P9-1)

4 Deletes the recall waveform.

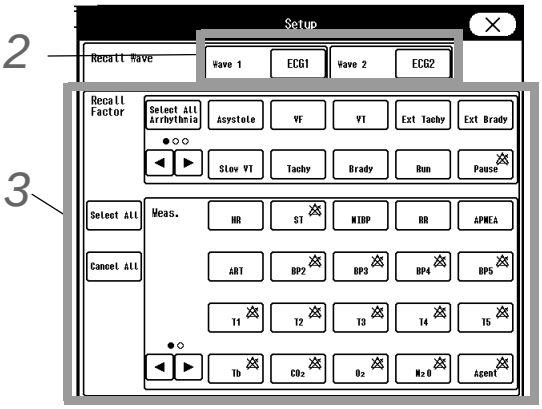
The displayed recall waveform will be deleted.

Recall Setup

The storing condition at alarm occurrence can be set for the recall function.
The recall waveform and recall factor (numeric data, arrhythmia) can be selected.

1 Press the [Setup] key on the recall screen.
(☞"To Display the Recall Waveform" P8-17)

▸ The "Setup" window will be displayed.



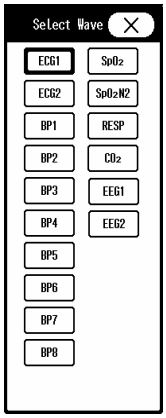
2 Select the recall waveform.

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" P8-17)

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.

- For the parameters measured on the multigas unit, the delay time is 8 seconds.

OCRG

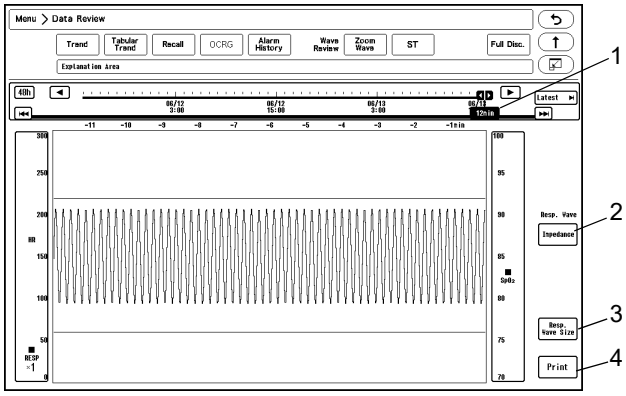
This section explains about the OCRG display.

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 to 300bpm
- SpO_2: 70 to 100%

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

▸ The OCRG screen will be displayed.



1 Display Time

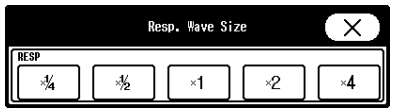
Select from [12min]/[24min].

2 Respiration Waveform

Select from [Impedance]/[CO_2].

3 Respiration Waveform Size

Select the waveform size for the respiration compressed waveform.



Respiration Waveform	Size/Scale
Impedance RESP	[x1/4]/[x1/2]/[x1]/[x2]/[x4]
CO_2	[50]/[100] (unit : mmHg)
	[4]/[8]/[10] (unit : % or kPa)

4 Printing

The currently displayed trend and compressed waveform on the OCRG screen will be printed.

Alarm History

This section explains the alarm history function and printing procedure.
The alarm generation of numeric data, arrhythmia, equipment status and change in alarm settings can be stored as alarm history. Maximum of 1599 data can be stored.

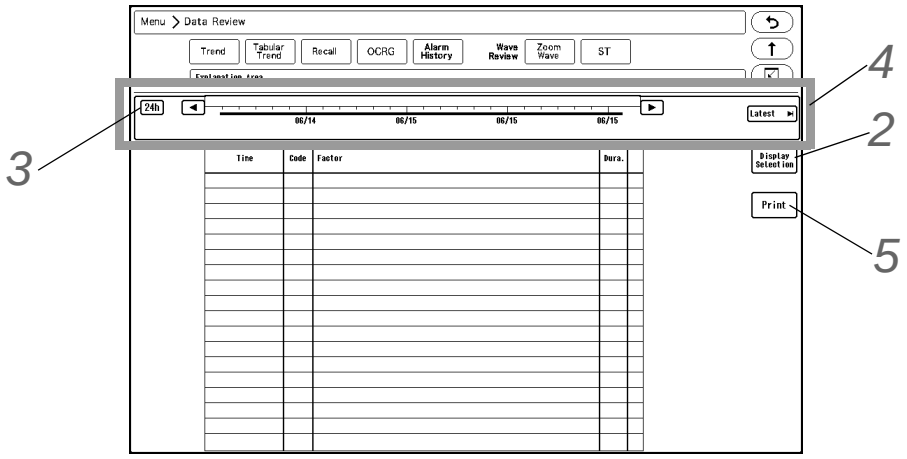
NOTE

- 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.

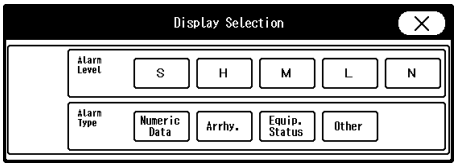
▸ The alarm history screen will be displayed.



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 Select the time range on the time bar.

1 The time range can be selected from [4h]/[8h]/[12h]/[16h]/[20h]/[24h]/[36h]/[48h] by pressing the key on the left side of the time bar.

4 Switch the displayed data on the alarm history screen.

1 Drag the slider to left and right.

▸ [▶]: Scrolls to the newer data.

▸ [◀]: Scrolls to the older data.

2 Press [Latest ⏭].

▸ The latest data will be displayed.

5 Press the [Print] key.

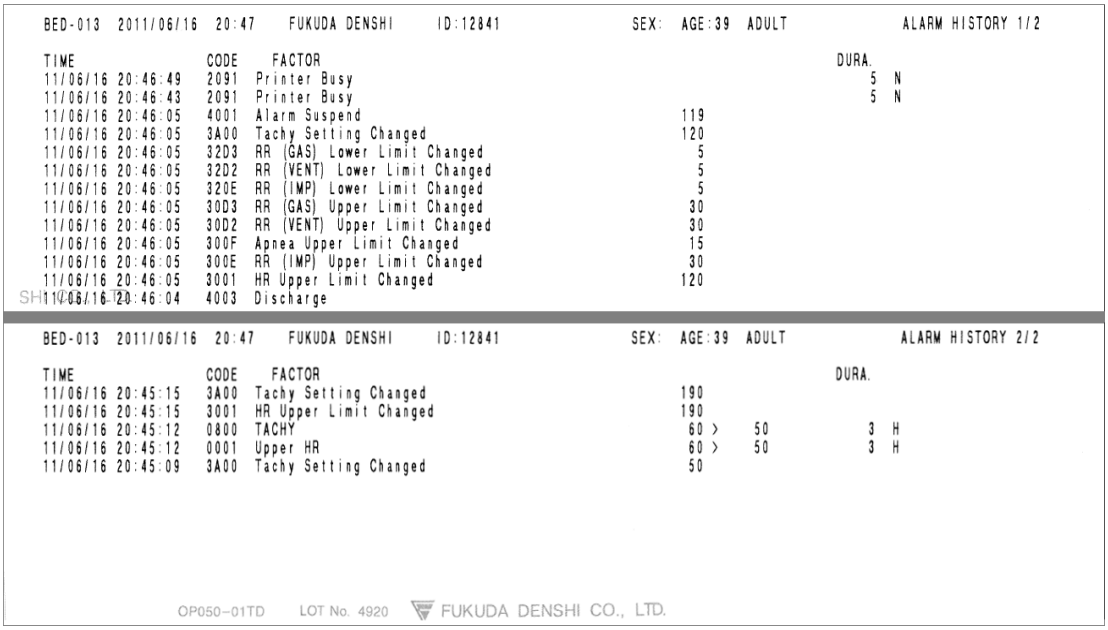
▸ The currently displayed alarm history will be printed.

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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Zoom Wave

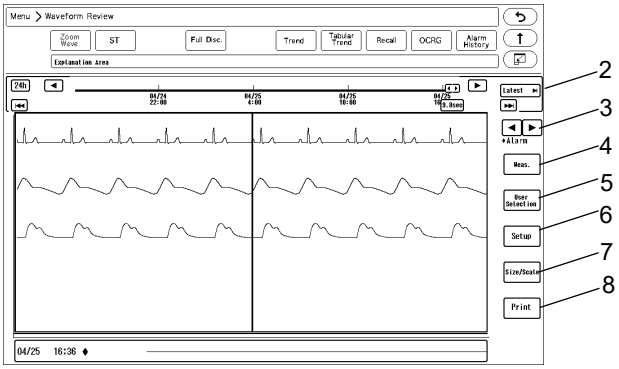
This section explains about the "Zoom Wave" window. (When using the optional CF card)
Maximum of 6 waveforms (9.8 seconds each) can be displayed.

REFERENCE

- The "Zoom Wave" window can be also displayed by pressing the waveform area on the "Full Disc. Wave" window.
- If the optional CF card is not used, the latest recall enlarged display will be displayed.

1 Press the [Menu], [Zoom Wave] ("Waveform Review") key.

▸ The "Zoom Wave" window will be displayed.



2 The time range of the displayed waveform will change.

3 The waveform of previous/next alarm event will be displayed.

4 The numeric data of the displayed time will be displayed.

5 The waveform to be displayed can be selected from the following.
[Limb]: Limb lead ECG waveform will be displayed.
[Chest]: Chest lead ECG waveform will be displayed.
[User Selection]: The waveform selected at procedure 6 will be displayed.

6 The waveform to be displayed for [User Selection] can be selected.

7 The size/scale of the displayed waveform will change.

8 The currently displayed waveform will be output on the printer.
On the HR-800, 12 seconds of waveform will be printed. The printing range starts from 1 second before the left end of the enlarged waveform.
On the laser printer, 10 seconds of waveform will be printed. The printing range starts from the left end of the enlarged waveform.

ST Measurement

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

To Display/Print the ST Measurement

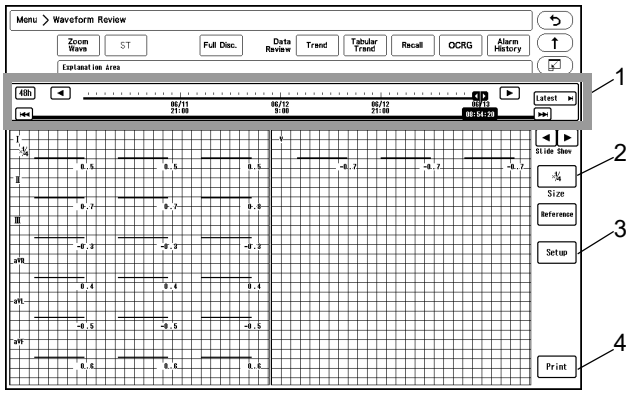
On the ST display, ECG for the selected time duration (10 sec./1 min./5 min./10 min.) will be displayed overlapped in 1 block.
If 3-lead cable is used, maximum of 8 hours of ST waveform will be displayed.

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.

▸ The 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 Select the waveform size for the overlapped waveform.

Select from [x1/4]/[x1/2]/[x1]/[x2]/[x4].
The same waveform size will be applied to all the leads. The selected size will not be applied to the ECG waveform on the home display.

3 Change the time for the displayed block.

The "Setup" window will be displayed and "Slide Show" (1 sec./5 sec./10 sec./20 sec./30 sec.) can be selected.

REFERENCE

- When 3-lead cable is used, 36 blocks will be displayed. When 4, 5, 10-lead cable is used, 3 blocks for each lead will be displayed.
- The duration of each block can be selected from [10 sec.]/[1 min.]/[5 min.]/[10 min.].

For the selections other than [10 sec.], the overlap waveform for the selected duration will be displayed.

4 Print the ST waveform.

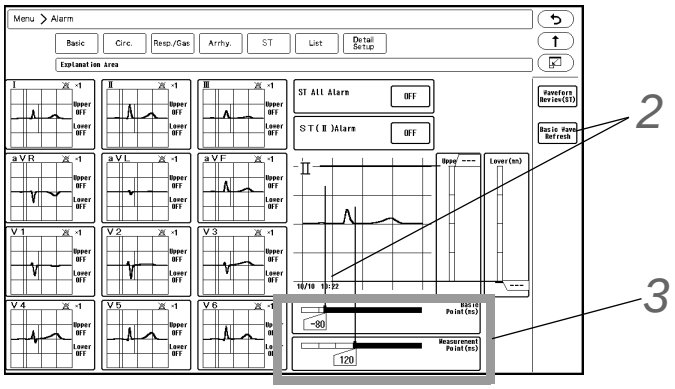
The currently displayed ST waveform will be printed.

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

- For the lead which the electrode is detached, the reference waveform cannot be set.Check if the electrode is correctly 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.
  The averaged waveform at the point when the [Update Ref. Wave] key is pressed will be set as the reference waveform.
- While learning arrhythmia, or until averaged waveform is calculated after 16 beats from completion of arrhythmia learning, 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 electrode quantity 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 reference point to right and left using the key.

2 Slide the measurement point to right and left using the key.

NOTE

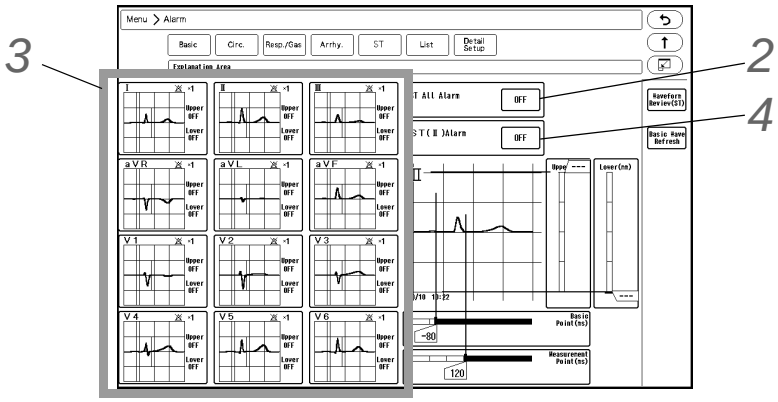
- Set the reference point in the range of –240 ms to 0 ms in increments of 10 ms from the peak of QRS to the P wave direction.
- Set the measurement point in the range of 0 ms to 560 ms in increments of 10 ms from the peak of QRS to the T wave direction.

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."

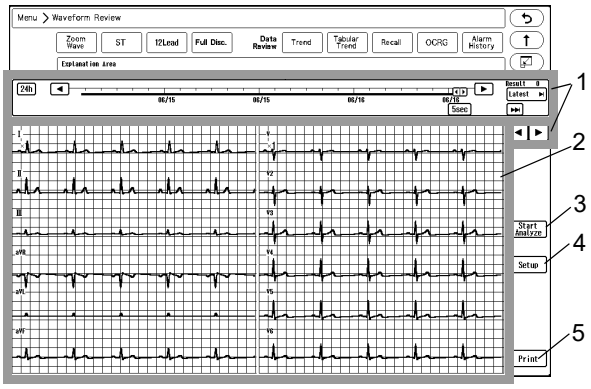
NOTE

- 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" P7-3) 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.)

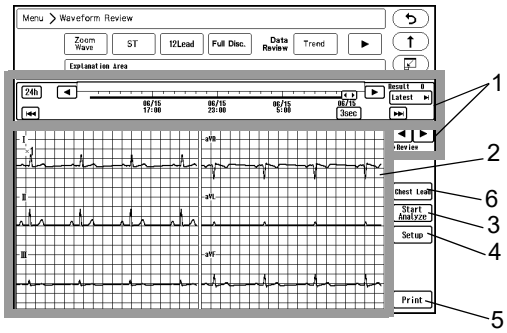
12-Lead ECG Display

1 Press the [Menu], [12-Lead] ("Waveform Review") key.

▸ The 12-lead screen will be displayed.



For LC-8019T



For LC-8015T

1 Analyzed Result Display

▸ The analyzed result can be displayed.
(☞"12-Lead Analyzed Result Display of Past Data" P8-34)

2 The real-time waveforms are displayed.

▸ The 12-lead analysis will be performed based on the displayed waveforms.

REFERENCE

- A pacemaker pulse will not be displayed on the 12-lead analysis screen even if [ON] is set for "Pacemaker Pulse".
- For LC-8015T, 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" P8-32)

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 window will be displayed.
- On the setup screen, 12-lead waveform size, filter, analysis method can be set.
  (☞"12-Lead Analysis Setup" P8-30)

5 Printing

- The currently displayed waveform can be printed.
- The output printer will be according to the setting made for "12-Lead Waveform" ([Bedside]/[Laser]) under [Manual Printing>Printer Sel. (Graphic Printing)].
  (☞"Manual Printing (Other Setup)" P9-6)

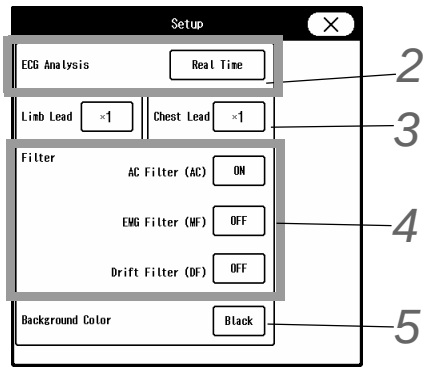
6 Chest Lead/Limb Lead (LC-8015T only)

- The display will switch between chest lead and limb lead.

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

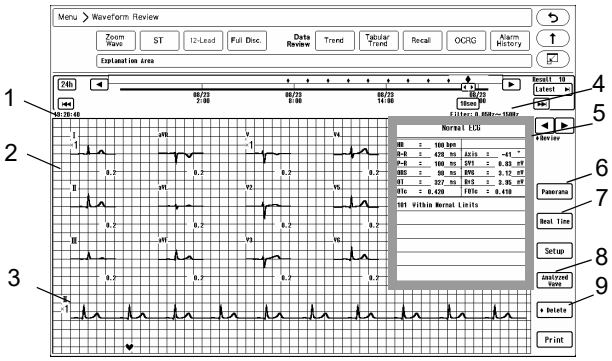
▸ The background color for the 12-lead display can be set.

- [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)

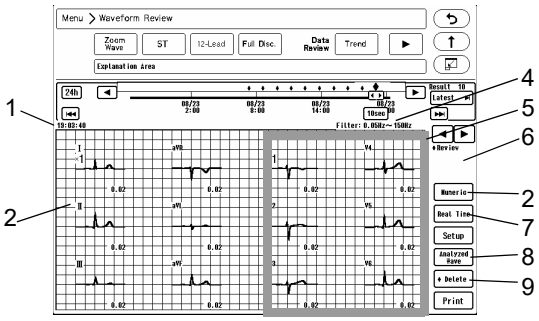
12-Lead ECG Analysis

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, rhythm waveform, analyzed result will be displayed.
- Abnormal region will be indicated by highlight display.



For LC-8019T



For LC-8015T

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. The dominant waveform is the waveform at the point of ♥ mark on the rhythm waveform.
- On the analyzed result, the abnormal lead with the highest grade finding will be highlighted in red.

NOTE

- For the LC-8015T, the dominant waveform display can be switched by pressing the [Chest Lead]/[Limb Lead] keys.

3 Rhythm Waveform

- From the ECG leads used for analysis, the lead selected for "ECG1"on the ECG setup will be displayed.

NOTE

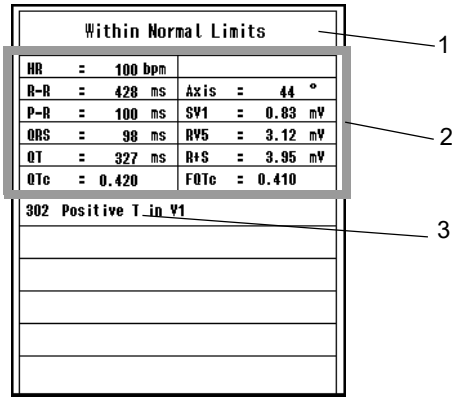
- For LC-8015T, rhythm waveform will not be displayed.
  Press the [Analyzed Wave] key to view the analyzed waveform.

4 Filter Information

- The filter used for analysis will be displayed.
  The filter display can be selected from frequency or type (AC, MF_ST, etc.).
  (☞Maintenance Manual "Display/Print Setup" P5-14)

5 Analyzed Result

- For the analyzed result, overall judgment, numeric data, finding will be displayed.



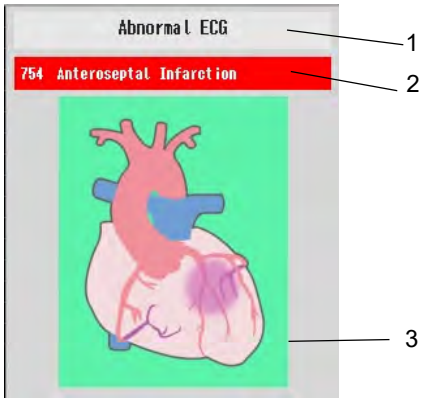
1 Overall Judgement: The highest grade judgement will be displayed.

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.

6 Panorama Display

- 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 Judgement: The highest grade judgement 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.

7 Analyze Real Time Waveform

- (☞"To Analyze the Real Time Waveform" P8-34)

8 Display Analyzed Waveform

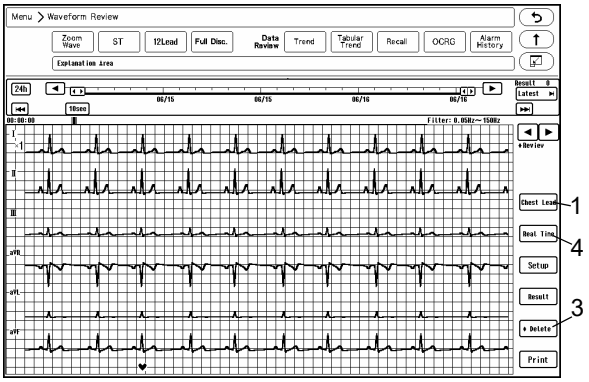
- (☞"To Display the Analyzed Waveform" P8-34)

9 Delete Analyzed Result

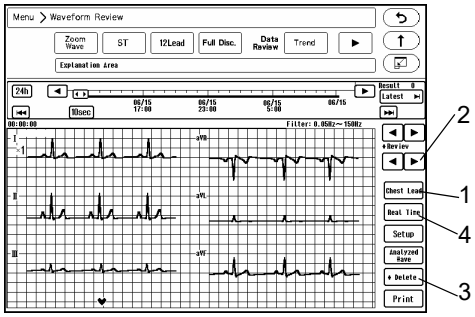
- (☞"To Delete the Analyzed Result" P8-34)

❑To Display the Analyzed Waveform

Press the [Analyzed Wave] key on the analyzed result screen.



For LC-8019T



For LC-8015T

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 For LC-8015T, the analyzed waveform can be scrolled by 2 seconds using the ◀/▶ key below "Review".

❑To Delete the Analyzed Result

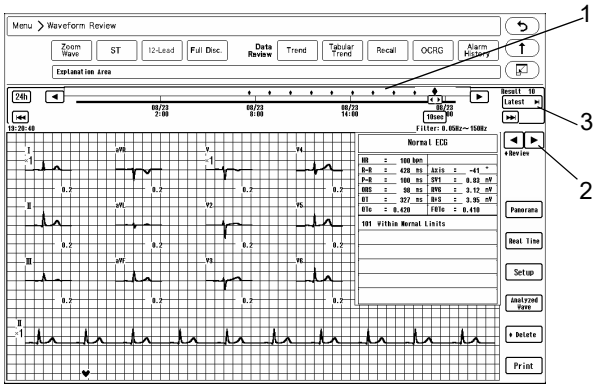
3 Press the [Delete] key to delete the displayed analyzed result.
[Delete OK] will delete the displayed analyzed result data.
[Cancel] will cancel the delete process.

❑To Analyze the Real Time Waveform

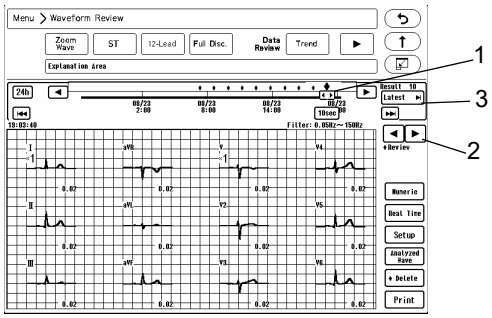
4 Press the [Real Time] key to return to the 12-lead analyzed result screen.
Press the [Start Analyze] key on the 12-lead analyzed result screen.

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.



LC-8019T



LC-8015T

1 Scroll the slider left and right.
Right: Scrolls to the newer data.
Left: Scrolls to the older data.

2 Press the ◀/▶ key for "Review".

The data will be displayed one by one.

3 Press the [Latest] key.
The latest data will be displayed.

12-Lead Analyzed Result Output Example

Press the [Print] key on the analyzed result screen or analyzed waveform screen.
There are following types of analyzed result printing.

Displayed key when [Print] key is pressed	Printer Selection for Manual Printing >Graphic Printing		Key Display	Note
Waveform Report	12-Lead Waveform	Built-in	Yes	12 lead waveform printing Prints the analyzed waveform.
		Laser	Yes	
Panorama Report	12-Lead Analysis Result	Built-in	No	Panorama Report Displayed only when [Laser] is set as the printer for graphic printing.
		Laser	Yes	
Analyzed Report	12-Lead Analysis Result	Built-in	Yes	Analyzed result printing Prints the waveform and analyzed result.
		Laser	Yes	

NOTE

- If no patient information (i.e. Default: "Class.": [Adult], "Sex": undetermined, "Age": [0]) has been entered, "Adult", "35 years old", and "Male" will be printed on the report.
- If the patient classification is set as "Child", and no age (i.e. Default: [0]) and sex (i.e. Default: undetermined) information have been entered, "Child", "2 years old", and "Male" will be printed on the report.

❑Basic Measurement

The basic measurement values provided in the report are as follows.

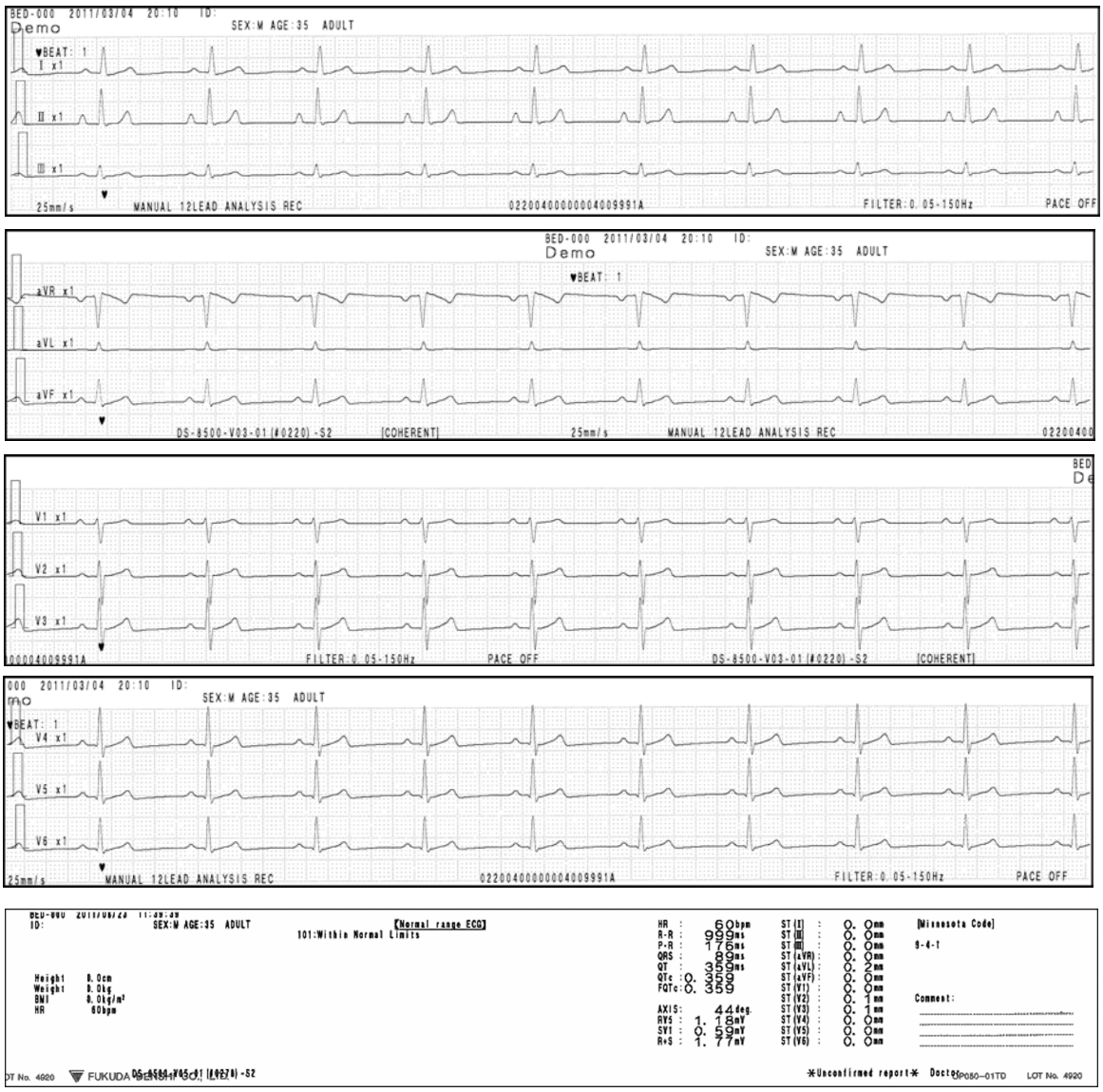
Heart Rate:	Heart rate obtained by basic arrhythmia measurement.
QRS Interval	QRS interval of basic waveform measurement.Average value of measurements of leads I to V6.The equipotential part (I wave) at the beginning of QRS and the equipotential part (K wave) at the end of QRS are not included in QRS interval.
R-R:	R-R time of basic arrhythmia measurement. The average value of heart rates in which one P-wave has been found is calculated first, and then the average value is recalculated based on the R-R time within ±25% of the value calculated first.
P-R:	P-R time of basic waveform measurement. Average value of measurements with leads I to V6.
QT:	QT time of basic waveform measurement. Average value of measurements with leads I to V6.
QTc:	Qtc time of basic arrhythmia measurement. The value is obtained using the following expression: $QTc = \frac{\text{Average waveform QT time}}{\sqrt{\text{Average R-R time of arrhythmia (sec.)}}}$
Axis:	QRS axis of basic waveform measurement.Axis (°)= Tan-1 (√3 (II +III) / (2 × I + II - III)) $\text{Axis}(°) = \text{Tan}^{-1}\left[\frac{\sqrt{3}(\text{Ⅱ}+\text{Ⅲ})}{2\text{Ⅰ}+\text{Ⅱ}-\text{Ⅲ}}\right]$ Where, I, II, and III are the sum of the maximum (signed) value of amplitude of Q, R, S, R', and S' waves.
R V5/V6:	Maximum value of R and R' wave of V5 lead or V6 lead in detailed waveform measurement V5 lead > V6 lead: RV5 V5 lead = V6 lead: RV6
SV1:	Maximum (absolute) value of Q, S, and S' wave of V1 lead in detailed waveform measurement.
R+S:	Sum of the amplitude of "RV5/RV6" and "SV1".

REFERENCE

- For interpretation of these results, refer to "AUTOMATED ECG ANALYSIS SYSTEM PROGRAM GUIDE BOOK PI-20E".

❑Printing on the Bedside Monitor Printer

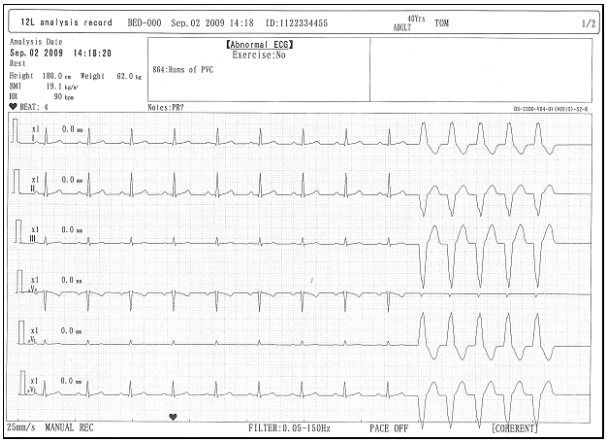
- When [Beside] is set for "12L Analysis Result" under [Manual Printing>Printer Sel.("Graphic Printing")], pressing the [Print] key will display the [Waveform Report]/[Analyzed Report] keys.
- The following is the output example when [Analyzed Report] key is pressed.



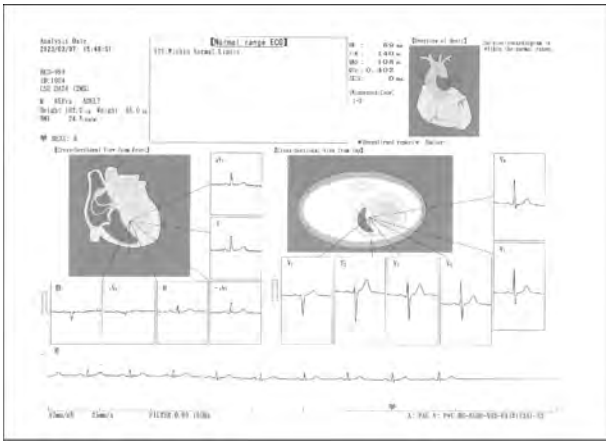
- Pressing the [Waveform Report] key will print the analyzed waveform in a standard format.

❑Laser Printer Output

- 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 when removing the CF card.
- Make sure that the CF card indicator is not lit in red when turning OFF the power of the main unit. When using the CF card for full disclosure waveform, use the standby switch.
- 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-8500 system.
- The CF card for full disclosure waveform can be used by inserting to slot 2. Only one CF card for full disclosure waveform can be inserted.

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

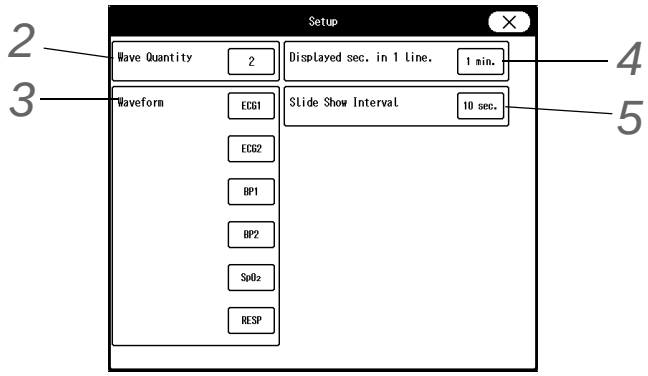
- To save the full disclosure waveform, the CF card needs to be formatted for the full disclosure waveform.
(☞Maintenance Manual "Using the CF card" P3-1)

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].

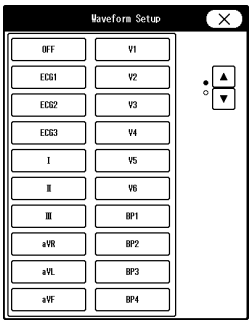
NOTE

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

3 Set the quantity of waveforms to be displayed/printed.

1 Press the key for "Waveform".

▸ The "Waveform Selection" window will be displayed.



2 Select the parameter for the displaying/printing waveform.

4 Set the display duration (sec.) per line.

1 Press the key for "Time per Line".

▸ The dropdown list will be displayed.

2 Select from [10 sec.]/ [30 sec.]/ [1 min].

5 Set the time interval for slide show.

1 Press the key for "Slide Show Interval".

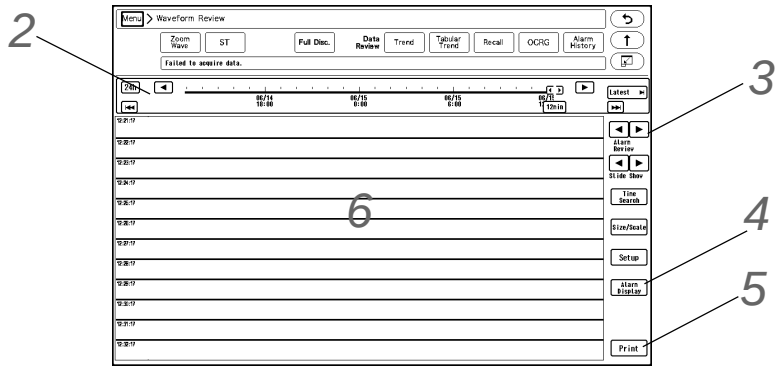
▸ The dropdown list will be displayed.

2 Select from [1 sec.]/ [5 sec.]/ [10 sec.]/ [20 sec.]/ [30 sec.].

Description of the Full Disclosure Waveform Display

1 Press the [Menu], [Full Disc.] ("Waveform Review") key.

▸ The full disclosure waveform will be displayed.



2 Scroll the displayed data.

(☞"Graphic Trend Setup" P8-5)

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.

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.

6 Press the waveform area.

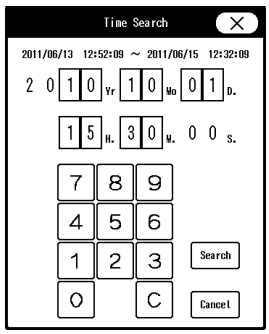
▸ Press the desired waveform area. The Zoom Wave window will be displayed.

To Search by Time

The full disclosure waveform of the specified time can be displayed.

1 Press the [Time Search] key on the full disclosure waveform display.

- The "Time Search" window will be displayed.



2 Enter the searching 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)	$h^{0.725} x w^{0.425} x 71.84 x 10^{-4}$ (Dubois Formula)
CI	Cardiac Index (L/min/m^2)	$\frac{CO}{BSA}$
SV	Stroke Volume (mL/beat)	$\frac{CO \times 1000}{HR}$

Data	Item	Formula
SVI	Stroke Volume Index (mL/beat/m^2)	$\frac{SV}{BSA}$
SVR	Systemic Vascular Resistance (dynes·sec·cm^{-5})	$\frac{(MAP - CVP) \times 79.90}{CO}$
SVRI	Systemic Vascular Resistance Index (dynes·sec·cm^{-5}•m^2)	SVRxBSA
PVR	Pulmonary Vascular Resistance (dyn·sec·cm^{-5})	$\frac{(MPAP - PCWP) \times 79.90}{CO}$
PVRI	Pulmonary Vascular Resistance Index (dyn·sec·cm^{-5}•m^2)	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

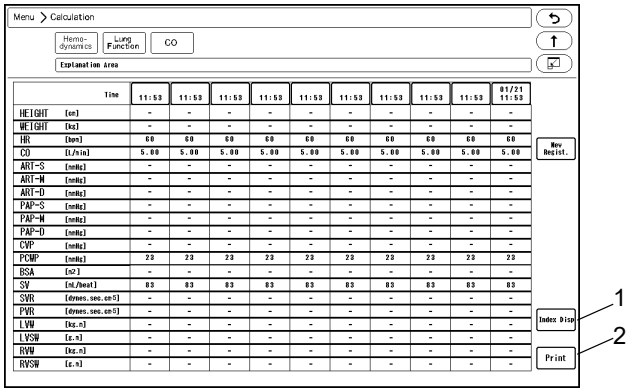
- The blood pressure unit for hemodynamics is "mmHg". If the unit is "kPa" or "cmH_2O", it will be converted to "mmHg" when calculating.

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 of BSA, SV, SVR, PVR, LVW, LVSW, RVW, RVSW will alternately switch with that of CI, SVI, SVRI, PVRI, LVWI, LVSWI, RVWI, RVSWI.

2 [Print] key

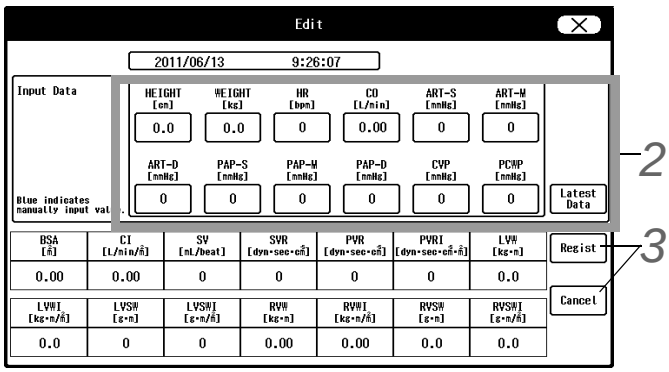
The currently displayed hemodynamic data will be printed.

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 Data] 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 [Set] 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 / in)	0 to 300cm / 0 to 118.1in
WEIGHT	Weight (kg / lb)	0 to 350kg / 0 to 771.6lb

Input Data

Data	Item (Unit)	Editing Range
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

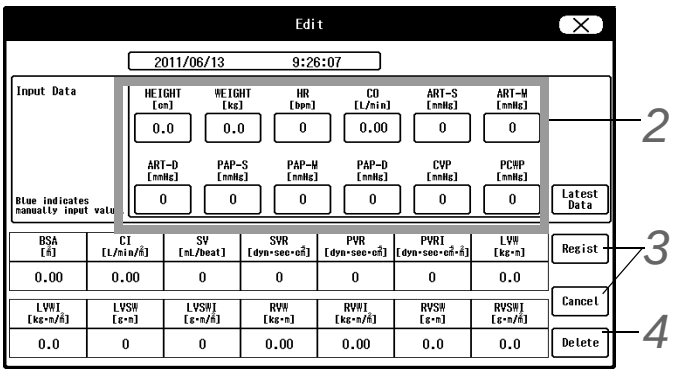
- If the necessary value for calculation is not input, the calculation result will not be displayed.
- Maximum of 10 data can be registered. If exceeded, the oldest data will be deleted.
- The edited data will be also displayed in blue on the list.

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" P8-44)

3 Register the edited data.
(☞"New Input of Hemodynamics Calculation" P8-44)

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)	$DO_2I=CaO_2xCIx10$
$\dot{V}O_2$	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

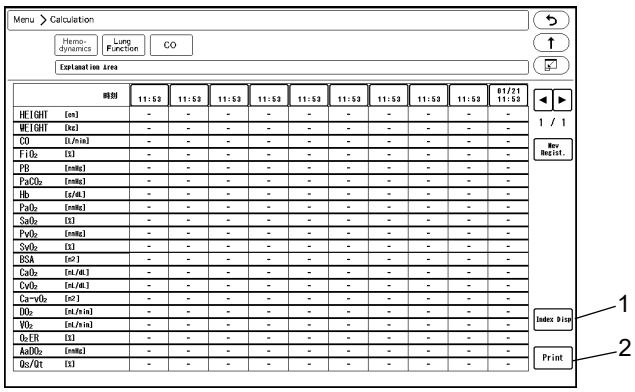
- The blood pressure unit for lung function calculation is "mmHg". If the unit is other than "mmHg", it will be converted to "mmHg" when calculating.

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

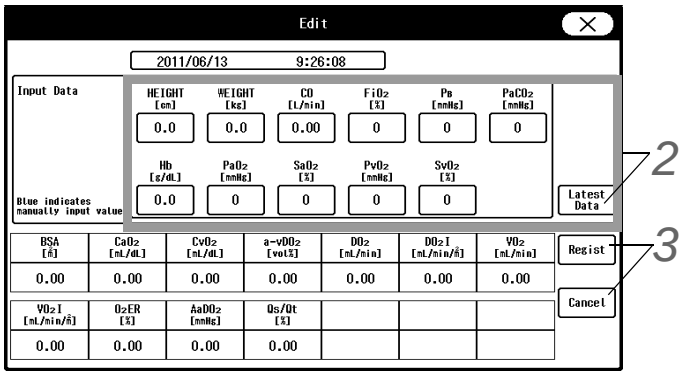
The currently displayed lung function data will be printed.

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 Data] key.

▸ The input data for HEIGHT, WEIGHT, 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 [Set] 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/ in)
WEIGHT	Weight (kg / lb)
BSA	Body Surface Area (m^2)
CO	Cardiac Output (L/min)
FIO_2	Fraction of Inspiratory Oxygen(%)
P_B	Atmospheric Pressure (mmHg)
$PaCO_2$	Partial Pressure of Arterial Carbon Dioxide (mmHg)
Hb	Hemoglobin Concentration (g/dL)
PaO_2	Partial Pressure of Arterial Oxygen (mmHg)
SaO_2	Arterial Oxygen Saturation(%)
$P\bar{v}O_2$	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

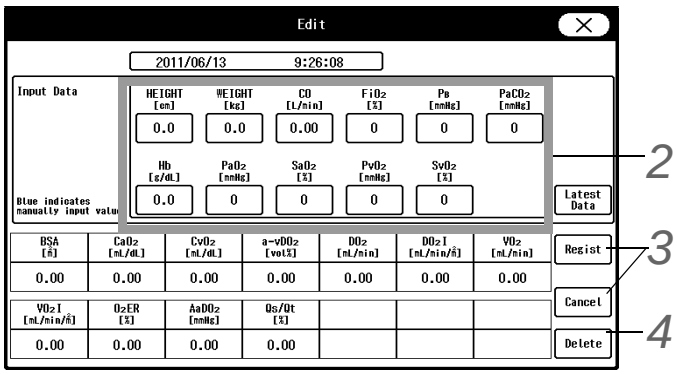
- If the necessary value for calculation is not input, the calculation result will not be displayed.
- Maximum of 256 data can be registered. If exceeded, the oldest data will be deleted.
- The edited data will be also displayed in blue on the list.

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" P8-47)

3 Register the lung function list.

(☞"New Input of Lung Function Calculation" P8-47)

4 Delete the data.

(☞"New Input of Lung Function Calculation" P8-47)

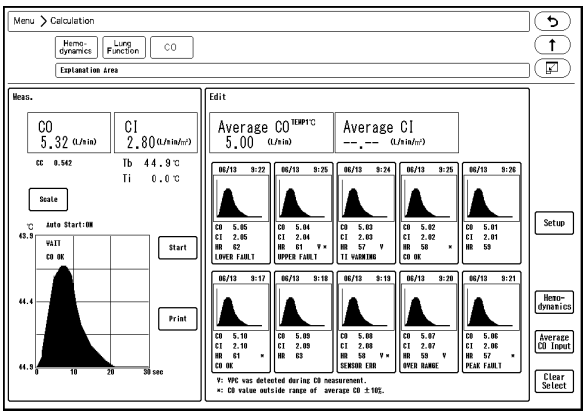
Cardiac Output (CO)

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

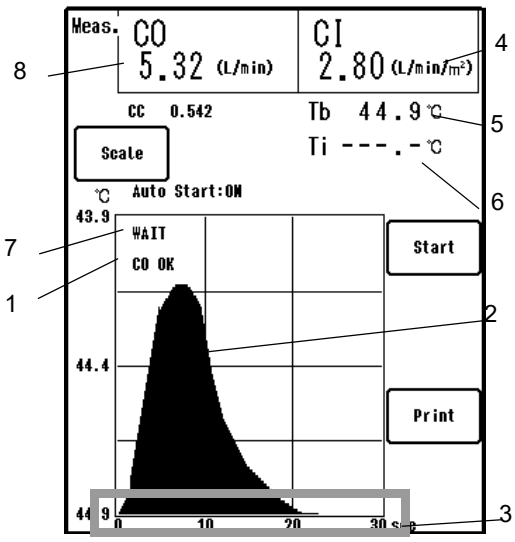
1 Press the [Menu], [CO] ("Calculation") keys.
Or, press the [CO] key on the user key area.

- 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" P11-20)



❑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)

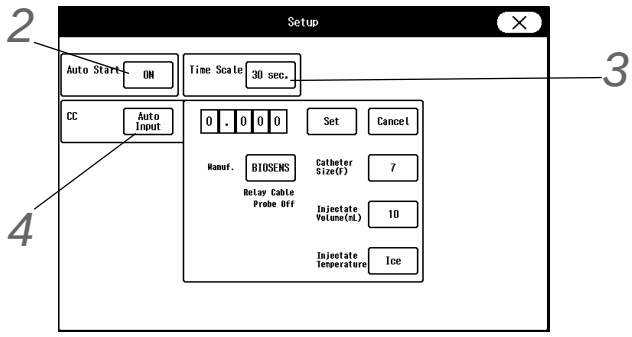


Cardiac Output Setup

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.

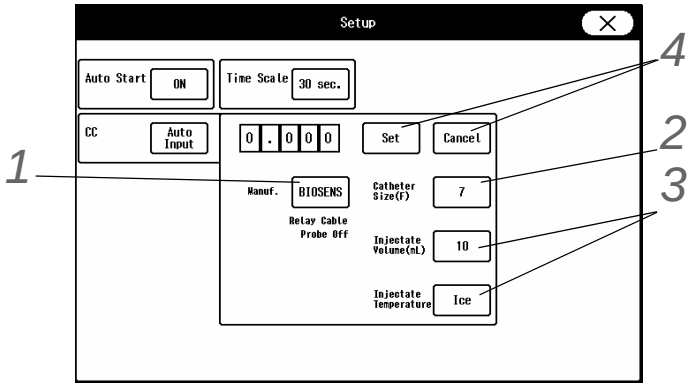
1 Press the key for "CC".

- 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 (former Becton Dickinson)
- The manufacturer name can be changed on "Catheter Manufacturer for CC Input" setting (Menu>Initial Settings>Meas.>Other).

2 Select the "Catheter Size (F) from [5]/[6]/[7]/[7.5].

3 Select the "Injectate Volume (mL)" from [3]/[5]/[10].

▸ When the above items are selected, the computation constant will be automatically set.

When the CJ0-P01C-C2.4 Catheter Relay Cable is used:

1 Select the "Injectate Temperature" from [Ice]/[Room].

▸ [Ice]: The measurement will be performed at 0°C.

▸ [Room]: The measurement will be performed at room temperature.

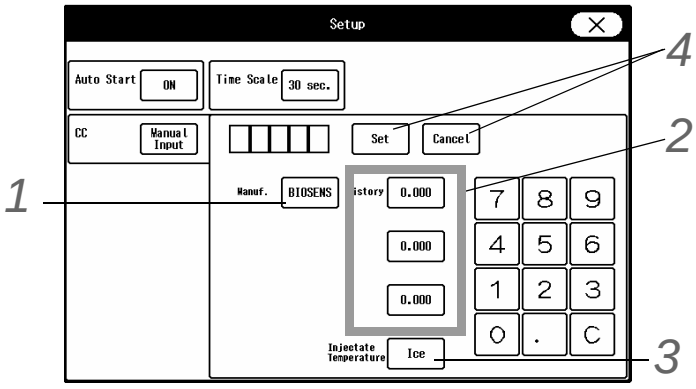
4 Press the [Set]/[Cancel] key.

▸ [Set]: 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" P8-52)

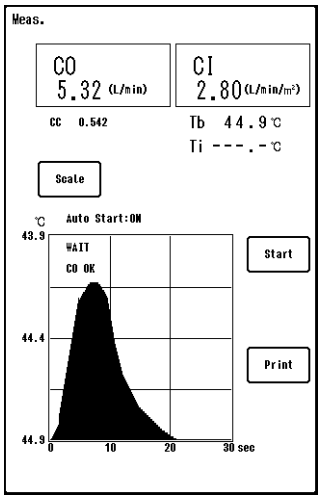
4 Press the [Set]/[Cancel] key.

▸ [Set]: 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

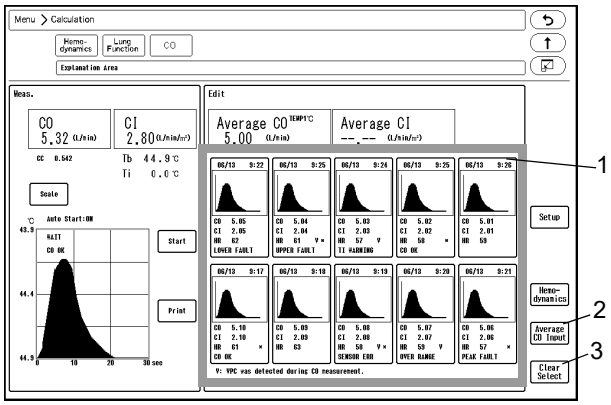
- When "WAIT" message is continuously displayed, verify that catheter relay cable is properly connected to the cardiac output module, and thermodilution catheter is securely connected.
- Before injecting, check that the Ti (injectate temperature) setting is correct.
- When repeatedly performing the measurement, 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.

Drug Calculation

This section explains about the drug calculation function.
The drug calculation function is a function to calculate the flow rate of drug administration to the patient.
Based on the dosing rate, flow rate and dosing duration will be calculated from the weight, drug amount, diluent amount.
It is also possible to calculate the dosing rate and dosing duration from the flow rate.

REFERENCE

- Under the "Initial Settings", the drug name, and default settings for each drug (drug amount/unit, diluent amount, dosing rate/unit) can be set. (☞Maintenance Manual "Drug Calculation" P5-26)

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

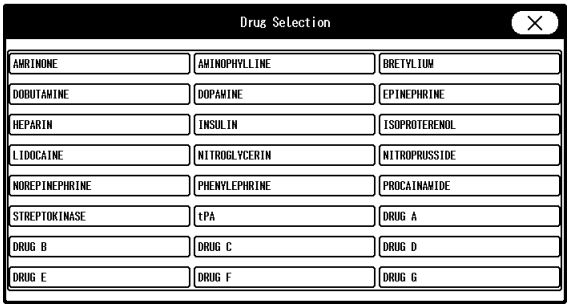
- The drug calculation menu will be displayed.

- If the weight is entered on the "Admit/Discharge" menu, the entered weight will be displayed.

NOTE

- The weight can be changed on this menu, but the changed weight will be used only for the drug calculation and will not be reflected on the "Admit/Discharge" menu.

2 Press the key for "Drug Name".



- The list of registered drugs will be displayed.Select the drug to administer to the patient.
- When a drug is selected, the drug amount, diluent amount, dosing rate/unit preset for that drug under "Initial Settings" will be automatically entered.

NOTE

- The flow rate will be automatically calculated when the value for each item is updated.

- On the initial display of the drug calculation menu, the previous calculation data will be displayed.The calculation data will be cleared when the patient is discharged.

3 Enter the value for each item.

- To change the automatically entered value, press the key for each item and manually enter the value.
- The dosing rate and flow rate can be adjusted by pressing the [+], [-] keys.

NOTE

- If the selected unit for the dosing rate requires weight, the flow rate cannot be calculated if the weight is not entered.

4 Press the [Update "End by"] key to update the estimated time of completion.

- Pressing the [Update "End by"] key will recalculate the time from the pressed time and update the estimated time of completion.

❑Calculation Formula for Flow Rate/Dosing Rate

According to the dosing rate unit, the calculation formula from the following 10 types will be automatically selected for calculation.

Dosing Rate Unit	Flow Rate Calculation Formula
mg/min	$\text{Flow Rate (mL/hr)} = \frac{\text{Dosing Rate (mg/min)} \times \text{Diluent Amount (mL)} \times 60}{\text{Drug Amount (mg)}}$
mg/hr	$\text{Flow Rate (mL/hr)} = \frac{\text{Dosing Rate (mg/hr)} \times \text{Diluent Amount (mL)}}{\text{Drug Amount (mg)}}$
mg/kg/min	$\text{Flow Rate (mL/hr)} = \frac{\text{Dosing Rate (mg/kg/min)} \times \text{Weight (kg)} \times \text{Diluent Amount (mL)} \times 60}{\text{Drug Amount (mg)}}$
mg/kg/hr	$\text{Flow Rate (mL/hr)} = \frac{\text{Dosing Rate (mg/kg/hr)} \times \text{Weight (kg)} \times \text{Diluent Amount (mL)}}{\text{Drug Amount (mg)}}$
µg/min	$\text{Flow Rate (mL/hr)} = \frac{\text{Dosing Rate (µg/min)} \times \text{Diluent Amount (mL)} \times 60}{\text{Drug Amount (mg)} \times 1000}$
µg/hr	$\text{Flow Rate (mL/hr)} = \frac{\text{Dosing Rate (µg/hr)} \times \text{Diluent Amount (mL)}}{\text{Drug Amount (mg)} \times 1000}$
µg/kg/min	$\text{Flow Rate (mL/hr)} = \frac{\text{Dosing Rate (µg/kg/min)} \times \text{Weight (kg)} \times \text{Diluent Amount (mL)} \times 60}{\text{Drug Amount (mg)} \times 1000}$
µg/kg/hr	$\text{Flow Rate (mL/hr)} = \frac{\text{Dosing Rate (µg/kg/hr)} \times \text{Weight (kg)} \times \text{Diluent Amount (mL)}}{\text{Drug Amount (mg)} \times 1000}$
units/hr	$\text{Flow Rate (mL/hr)} = \frac{\text{Dosing Rate (units/hr)} \times \text{Diluent Amount (mL)}}{\text{Drug Amount (units)}}$
IU/hr	$\text{Flow Rate (mL/hr)} = \frac{\text{Dosing Rate (IU/hr)} \times \text{Diluent Amount (mL)}}{\text{Drug Amount (IU)}}$

Dosing Rate Unit	Dosing Rate Calculation Formula
mg/min	$\text{Dosing Rate (mg/min)} = \frac{\text{Flow Rate (mL/hr)} \times \text{Drug Amount (mg)}}{\text{Diluent Amount (mL)} \times 60}$
mg/hr	$\text{Dosing Rate (mg/hr)} = \frac{\text{Flow Rate (mL/hr)} \times \text{Drug Amount (mg)}}{\text{Diluent Amount (mL)}}$
mg/kg/min	$\text{Dosing Rate (mg/kg/min)} = \frac{\text{Flow Rate (mL/hr)} \times \text{Drug Amount (mg)}}{\text{Diluent Amount (mL)} \times \text{Weight (kg)} \times 60}$
mg/kg/hr	$\text{Dosing Rate (mg/kg/hr)} = \frac{\text{Flow Rate (mL/hr)} \times \text{Drug Amount (mg)}}{\text{Diluent Amount (mL)} \times \text{Weight (kg)}}$
µg/min	$\text{Dosing Rate (µg/min)} = \frac{\text{Flow Rate (mL/hr)} \times \text{Drug Amount (mg)} \times 1000}{\text{Diluent Amount (mL)} \times 60}$
µg/hr	$\text{Dosing Rate (µg/hr)} = \frac{\text{Flow Rate (mL/hr)} \times \text{Drug Amount (mg)} \times 1000}{\text{Diluent Amount (mL)}}$

Dosing Rate Unit	Dosing Rate Calculation Formula
µg/kg/min	$\text{Dosing Rate (µg/kg/min)} = \frac{\text{Flow Rate (mL/hr)} \times \text{Drug Amount (mg)} \times 1000}{\text{Diluent Amount (mL)} \times \text{Weight (kg)} \times 60}$
µg/kg/hr	$\text{Dosing Rate (µg/kg/hr)} = \frac{\text{Flow Rate (mL/hr)} \times \text{Drug Amount (mg)} \times 1000}{\text{Diluent Amount (mL)} \times \text{Weight (kg)}}$
units/hr	$\text{Dosing Rate (units/hr)} = \frac{\text{Flow Rate (mL/hr)} \times \text{Drug Amount (units)}}{\text{Diluent Amount (mL)}}$
IU/hr	$\text{Dosing Rate (IU/hr)} = \frac{\text{Flow Rate (mL/hr)} \times \text{Drug Amount (IU)}}{\text{Diluent Amount (mL)}}$

❑Unit and Setting Range (Dosing Rate, Drug Amount, Diluent Amount, Flow Rate, Weight)

Drug	Dosing Rate		Drug Amount	
	Unit (Selectable)	Setting Range	Unit	Setting Range
AMRINONE	mg/min, mg/hr, mg/kg/min, mg/kg/hr, µg/min, µg/hr, µg/kg/min, µg/kg/hr	0.01 to 1500000.00	mg	0.01 to 1500000.00
AMINOPHYLLINE				
BRETYLIUM				
DOBUTAMINE				
DOPAMINE				
EPINEPHRINE				
ISOPROTERENOL				
LIDOCAINE				
NITROGLYCERIN				
NITROPRUSSIDE				
NOREPINEPHRINE				
PHENYLEPHRINE				
PROCAINAMIDE				
tPA				
HEPARIN	units/hr		units	
INSULIN				
STREPTOKINASE	IU/hr		IU	
DRUG-A to G	mg/min, mg/hr, mg/kg/min, mg/kg/hr, µg/min, µg/hr, µg/kg/min, µg/kg/hr		mg	
	units/hr		units	
	IU/hr		IU	

Diluent Amount		Flow Rate		Weight	
Unit	Setting Range	Unit	Setting Range	Unit	Setting Range
mL	1 to 1000	mL/hr	0.1 to 1000.0	kg	0.1 to 449.9

NOTE

- The setting is not possible if it cannot be correctly calculated by the entered value.

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

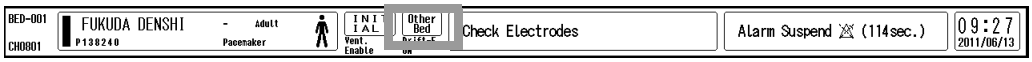
- On the DS-LANII network system, maximum of 3 monitors (including the central monitor) can display the data of this monitor using the other bed display function.
  However, there is no restriction of numbers for the DS-7000 series central monitors and DS-5700. These monitors will be counted as 1 monitor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

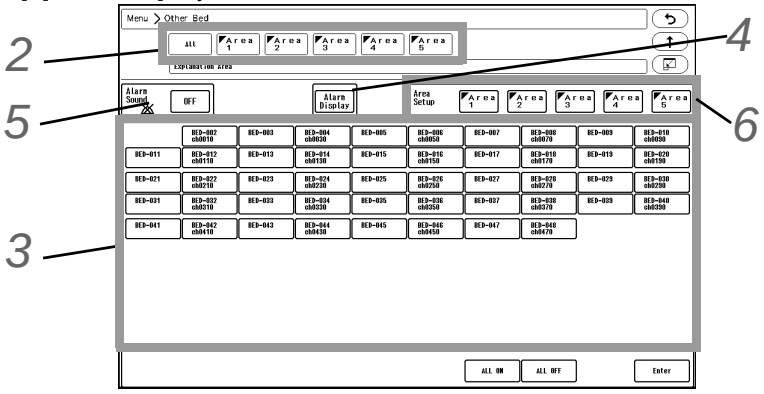
- This equipment cannot connect to a wired network of AU-5500N 8ch Recorder set as the administrator.
  Even if connected, other bed display, printing and other function cannot be used.

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 to [ON], [Other Alarm] 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.

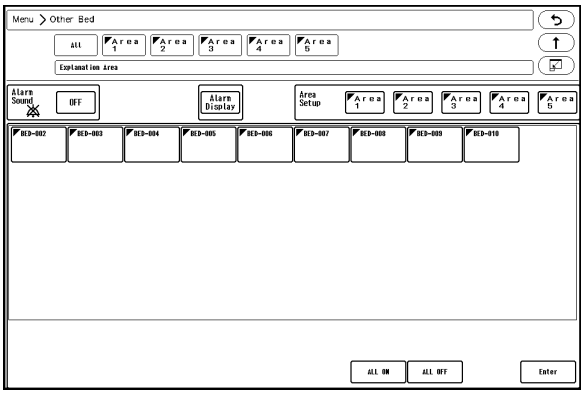


- On the other bed selection menu, select the bed to display from maximum of 100 beds

(in case of DS-LAN III) connected to the wired network. The Room / Bed ID for the alarm generating bed will be displayed in red. The other bed alarm generating bed will be indicated by an icon ⚠ inside the Room/Bed ID key.

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 each area will be displayed.

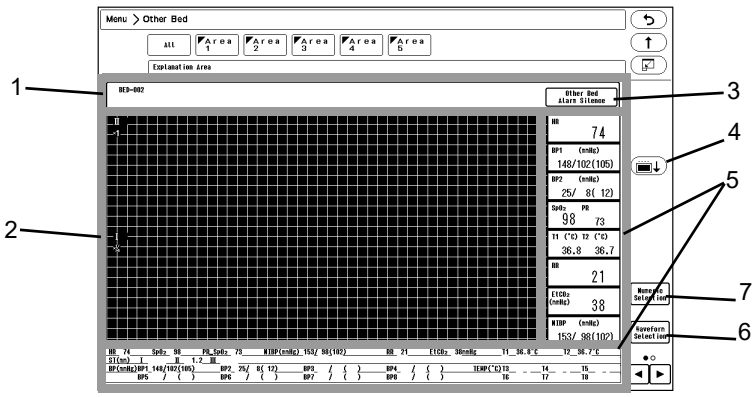


3 Press the Room/Bed ID key to display the other bed.

Waveforms and numeric data for the selected bed will be displayed.If an alarm is generated for this bed, the physiological alarm/arrhythmia alarm message will be displayed.

NOTE

- Depending on the model type/software version of the bedside monitor and DS-LAN setting, the alarm message may be displayed as "Alarm", and may not include the parameter information.



1 Message Area
The message for the other bed will be displayed.

2 Waveform Display Area
Maximum of 6 waveforms for the DS-LAN III network, and maximum of 2 waveforms for the DS-LAN II 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 Pressing this key will switch ON/OFF of menu title display.

5 Numeric Data Area

The numeric data at the bottom of the screen can be switched by using the ◀/▶ keys.

6 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-LAN III network, and maximum of 2 waveforms for the DS-LAN II network can be displayed.
  Select the waveform from the waveform selection window.

7 Press the [Numeric Selection] key to display [Numeric Data Selection] window. The parameters to display on the right side of the screen can be selected.

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.

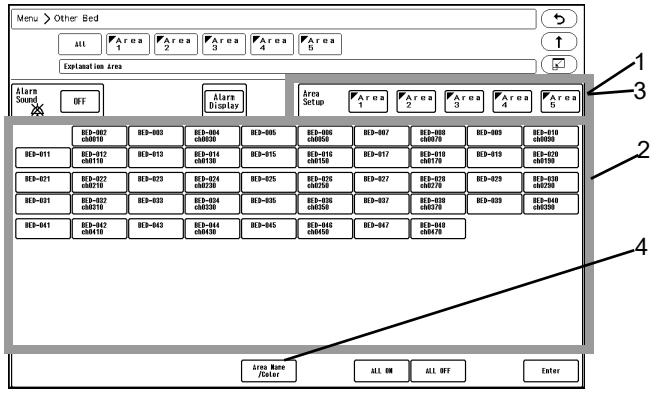
- Select the Room/Bed ID for the bed to generate the alarm. The selected bed will be indicated by blue frame. To cancel the selection, press the key for the bed again.
- [Select All], [Cancel All]: Selection/cancellation for all the beds can be performed at once.
- [Enter]: The selection will be finalized.

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.



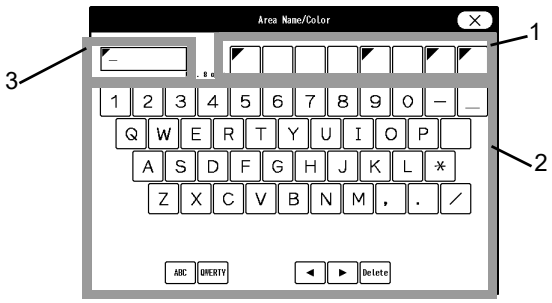
1 Press the key for "Area Setup" to change the screen to area setup mode. When the mode is changed, the key for selected area will be displayed in blue. To return to the original mode, press the key again.

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 screen to 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-8500 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

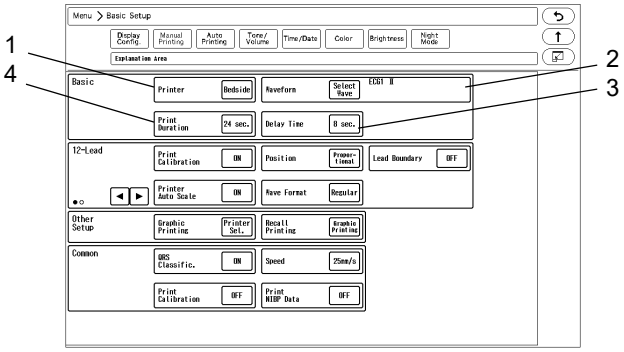
- The printed HR/PR data depends on the ECG/SpO_2/BP selection for "Synchronized Mark/Tone" under [Menu>Parameter>ECG (SpO_2, BP)]. (☞"Synchronized Mark/Tone Setup" P7-11)
- Under the following condition, the amplitude value will be printed for the ECG calibration waveform.
  *[Bar (10mm)] is set for "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 monitor 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.

REFERENCE

- For print duration of recall enlarged waveform, refer to ☞"Zoom Wave" P8-24

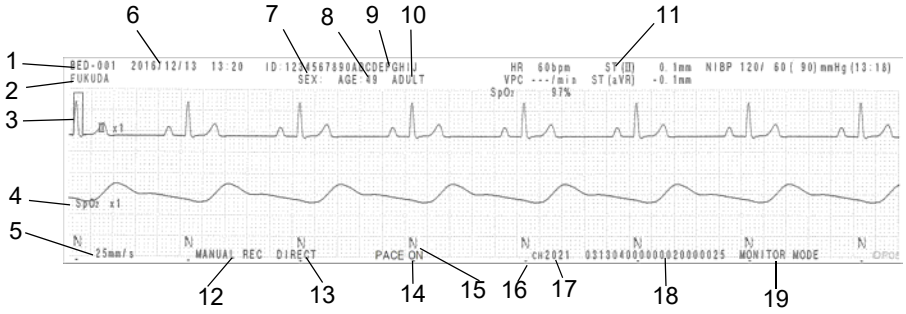
❑To Start/Stop the Printing

1 Press the user key or [Print Start/Stop] key on the HR-800.

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

Message	Details
none	Normal Operation
PAPER OUT	There is no paper.
CASSETTE	Check the cassette.
CHECK?	Other abnormality is found.

❑Example of Manual Printing



1	Bed ID
2	Patient Name
3	Waveform Type, Lead, Size
4	Waveform Type, Scale
5	Paper Speed
6	Print Duration
7	Sex
8	Age
9	Patient ID
10	Patient Classification

11	Numeric Data (Value at the beginning of the waveform)
12	Printing Mode
13	Delay Time
14	Pacemaker
15	QRS Classification
16	R Wave Trigger Mark
17	Telemetry Channel
18	Equipment Setting ID (Refer to the next table.)
19	Filter Mode

The 21-digit number printed at the bottom of the paper indicates the settings of the equipment. At the 14th digit from the left, filter setting (AC filter, drift filter) is printed in hexadecimal number.

0 0 0 0 0 0 0 0 0 0 0 0 0 **0** 0 0 0 0 0 0 0

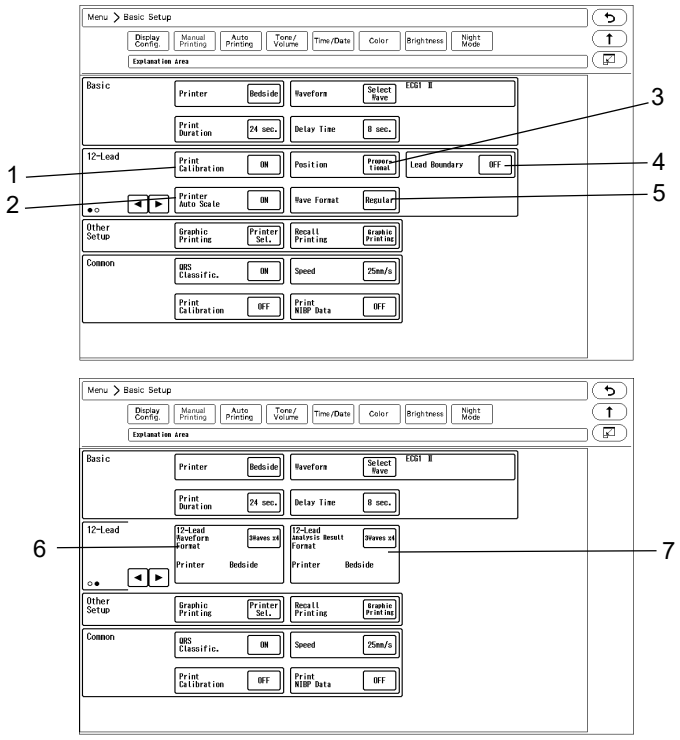
0	
1	
2	AC Filter ON
3	AC Filter ON
4	
5	
6	AC Filter ON
7	AC Filter ON

8		Drift Filter ON
9		Drift Filter ON
A	AC Filter ON	Drift Filter ON
B	AC Filter ON	Drift Filter ON
C		Drift Filter ON
D		
E	AC Filter ON	Drift Filter ON
F	AC Filter ON	Drift Filter ON

Filter setting is OFF for the numbers in blank.

Manual Printing (12-Lead)

The monitoring 12-lead waveform can be printed on the bedside monitor printer.The delay time is 6 seconds. The 12-lead waveform cannot be printed on the central monitor printer.



1 Print Calibration

[ON]: Calibration waveform will be printed. If [Bar (10mm)] is set for "Waveform Size Display" under [Initial Settings>User I/F>Display/Print], the amplitude value corresponding to the displayed waveform size will be printed.

[OFF]: Calibration waveform will not be printed.

2 Printer Auto Scale

NOTE

- The printer scale will be adjusted in the range of x1, x1/2, x1/4. It will not be adjusted to x2 or 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]: Printing 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 Lead Boundary

This setting will be displayed only when [Laser] is selected as the printer for "12-Lead Waveform", "12L

Analysis Result".

[ON]: Lead boundary between the leads will be printed.

[OFF]: Lead boundary will not be printed.

5 Waveform Format

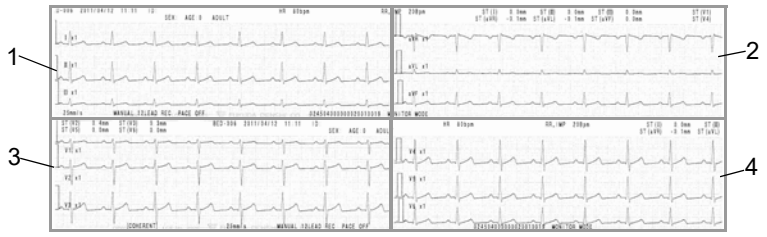
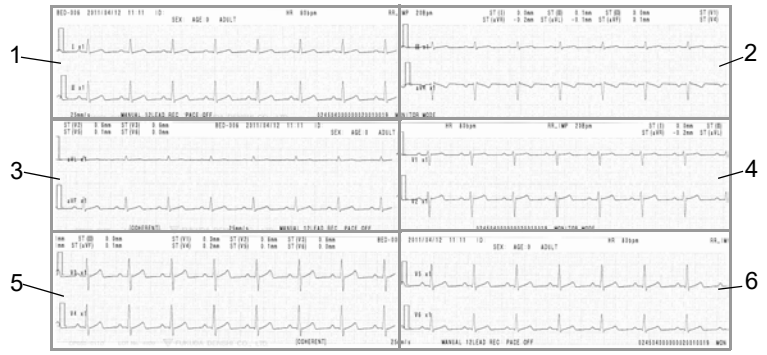
[Regular]: Printing will start from the limb leads. (In the order of I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6)

[Reverse]: Printing will start from the chest leads. (In the order of V1, V2, V3, V4, V5, V6, I, II, III, aVR, aVL, aVF)

6 12-Lead Waveform Format

When [Bedside] is set as the printer for "12-Lead Waveform", select from [3Wavesx4]/[2Wavesx6].

When [Laser] is set as the printer for "12-Lead Waveform", select from [3Wavesx4]/[3Wavesx4+Rhy.]/[6Wavesx2]/[12Waves].

Output Example	Waveform Layout	Length of Each Waveform
3 waves x 4  	First column: I,II,III Second column: aVR, aVL, aVF Third column: V1, V2, V3 Fourth column: V4, V5, V6	6 sec.
2 waves x 6  	First column: I,II Second column: III, aVR Third column: aVL, aVF Fourth column: V1, V2 Fifth column: V3, V4 Sixth column: V5, V6	6 sec.

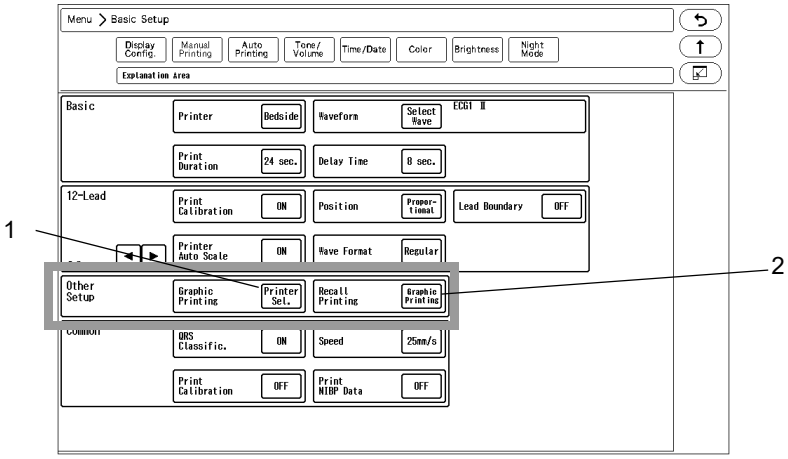
7 12-Lead Analysis Format

When [Bedside] is set as the printer for "12L Analysis Result", the format is fixed as [3Wavesx4].

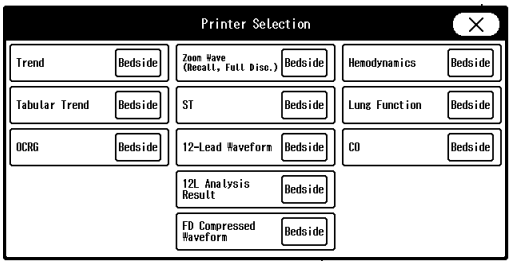
When [Laser] is set as the printer for "12L Analysis Result", select from [6Wavesx2 (2 pages)]/[6Wavesx2 (1 page)]/[3Wavesx4+Rhy.].

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 of the bedside monitor.
- [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" P4-29)

2 Recall Printing

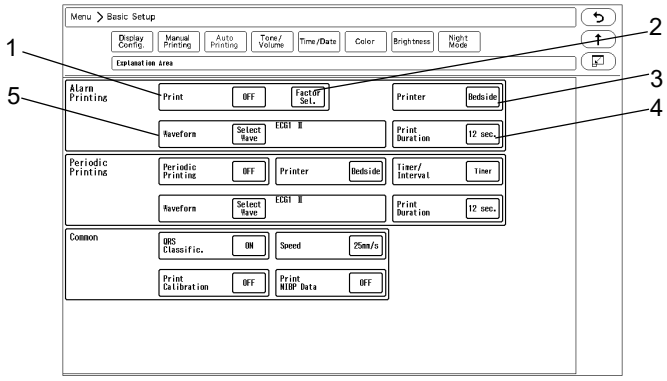
- [Graphic Printing]: Recall data will be output on the printer selected for "Graphic Printing".
- [Manual Printing]: Recall data will be output on the printer selected for "Printer" under "Basic".

Automatic Printing (Alarm Printing)

When numeric data alarm or arrhythmia alarm occurs, printing will automatically start

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

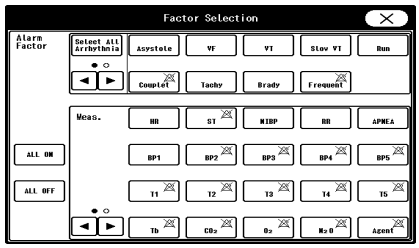


1 Alarm Printing

[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 factors will be selected.
[All ON]: All alarm factors will be selected.
[All OFF]: All selections for the alarm factor will be cancelled.

3 Printer

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

[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.
	8 sec. for the multigas unit alarm			
24 sec.	16 sec.	16 sec.	16 sec.	16 sec.

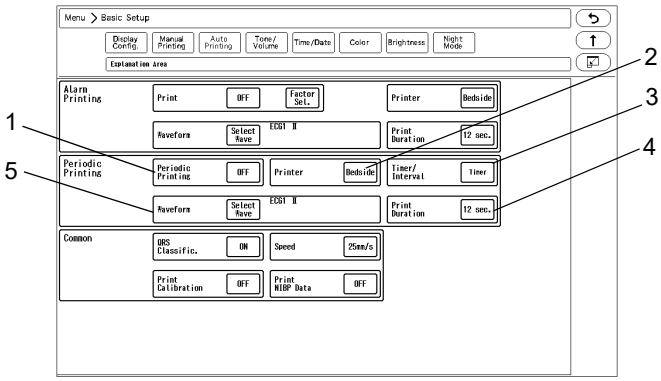
5 Waveform
(☞"Manual Printing (Basic)" P9-1)
[Alarm]: Prints the waveform of the alarm factor.

Automatic Printing (Periodic Printing)

The printing will be automatically performed with the selected interval.

NOTE

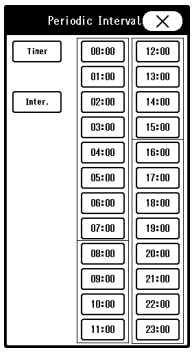
- If the periodic printing is interrupted due to paper out, etc., the latest periodic printing will be performed when the printing is resumed.
- QRS classification symbol will not be printed for periodic printing.



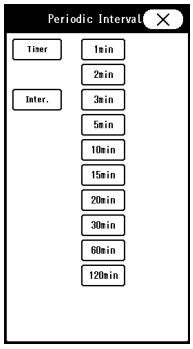
1 Periodic Printing
[ON]: Printing will automatically start at fixed interval.
[OFF]: Turns OFF the periodic printing function.

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

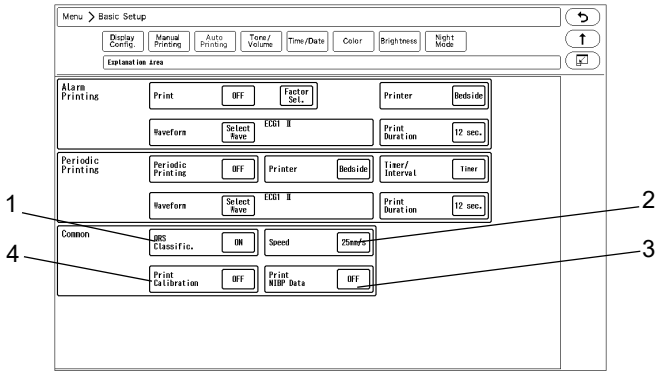
The printing will automatically stop after the selected duration.

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

1 QRS Classification

[ON]: QRS classification symbol will be printed with the ECG waveform.

Symbol	Details
N (Normal)	Normal QRS beat
V (VPC)	Ventricular extrasystole
S (SVPC)	Supraventricular extrasystole
P (Pacing Beat)	Pacing beat
F (Fusion Beat)	Fusion beat of pacing and spontaneous beat

Symbol	Details
? (Undetermined Beat)	Learning arrhythmia, or unmatched beat

[OFF]: QRS classification symbol will not be printed.

NOTE

- The QRS symbol cannot be printed for manual printing if delay time is "none" and for periodic printing. To print the QRS symbol, set the delay time to [8 sec.] or [16 sec.].
- The "S" (QRS symbol) will be printed as "N" on the central printer.

2 Printing Speed

[25mm/s]: The printing speed will be set to 25mm/s.

[50mm/s]: The printing speed will be set to 50mm/s.

3 Print NIBP Data

[ON]: Oscillation graph and NIBP data will be printed after the waveform.

[OFF]: Oscillation graph and NIBP data will not be printed.

4 Print Calibration

[Top]: Calibration waveform will be printed at the beginning of the waveform.

[Each Page]: Calibration waveform will be printed in 18.75cm interval.

[OFF]: Calibration waveform will not be printed.

Freeze Printing

The waveform trace can be suspended and printed from 12 seconds prior to the point the waveform trace was stopped.
The waveform selected for manual printing will be printed. The print duration is 12 seconds.
To freeze the waveform display, the [Freeze] key needs to be assigned as user key.
(☞"To Configure the Display" P10-7)

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

- The waveform trace will stop.

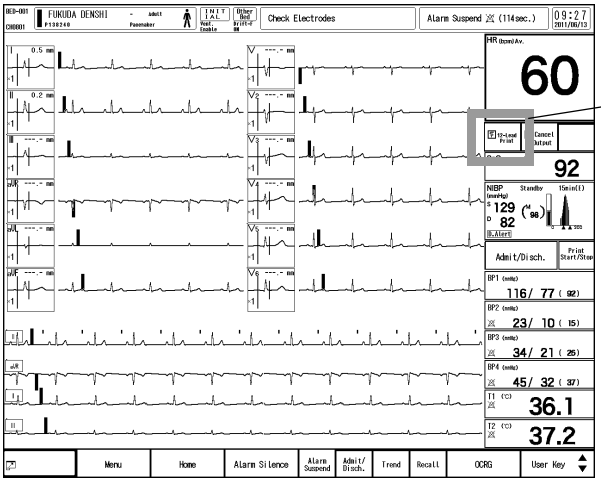
2 Press the [Print Start/Stop] key.

- 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" P10-7)



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
When printed on the bedside monitor printer:	3 waves x 4	6 sec.	6 sec.
	2 waves x 6		
When printed on the laser printer:	3Wavesx4*1	2.5 sec.	10 sec.
	6Wavesx2*1	5 sec.	
	3 wavesx4+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.

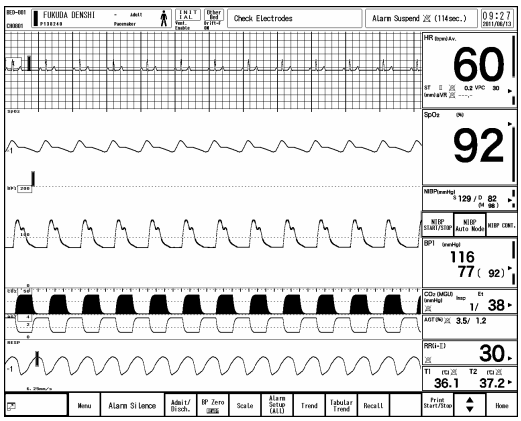
- Standard
- 12-Lead
- Enlarged Numeric Data (LC-8019T only)

When ECG cascade or block cascade is selected, a full disclosure waveform can be displayed. The user keys can be also assigned to the numeric data area.
If extended board (optional) is equipped, up to 2 extended displays can be used. (extended display function)

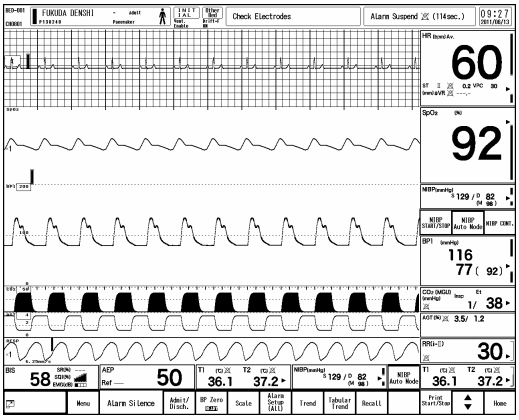
NOTE

- For LC-8015T, the enlarged numeric data layout cannot be selected.

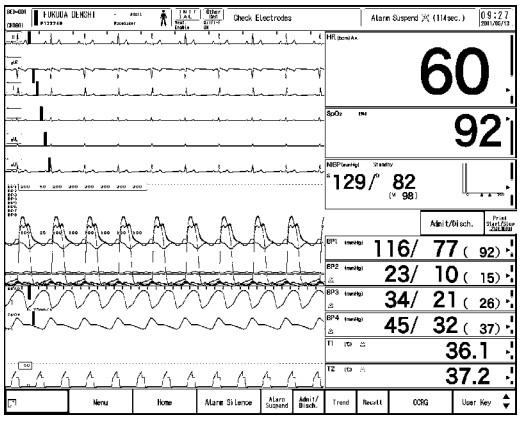
❑Display Example of LC-8019T



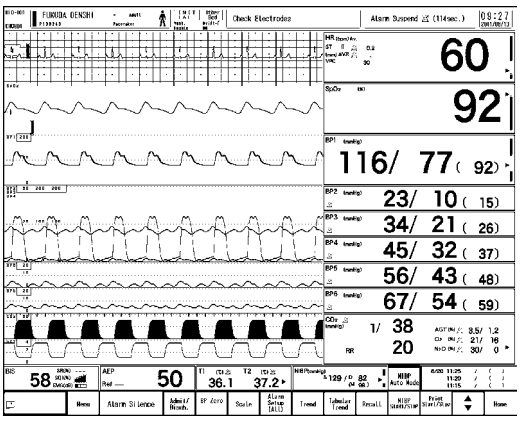
Standard (Box Layout: Right)



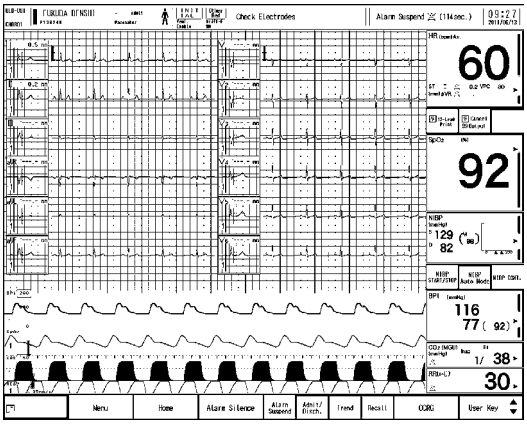
Standard (Box Layout: Right&Bottom)



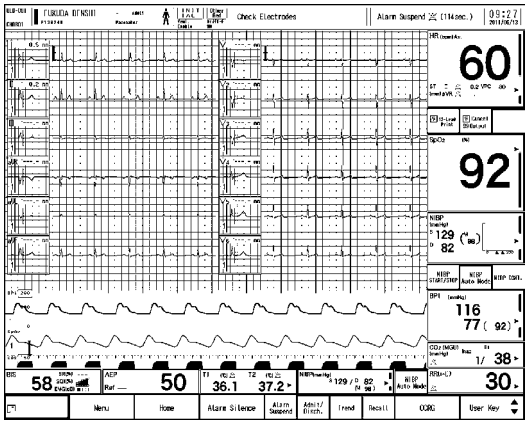
Large (Box Layout: Right)



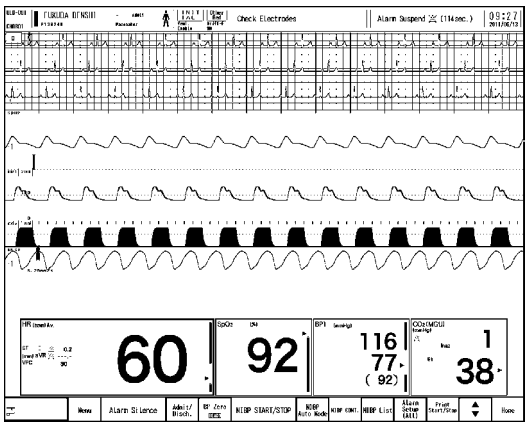
Large (Box Layout: Right&Bottom)



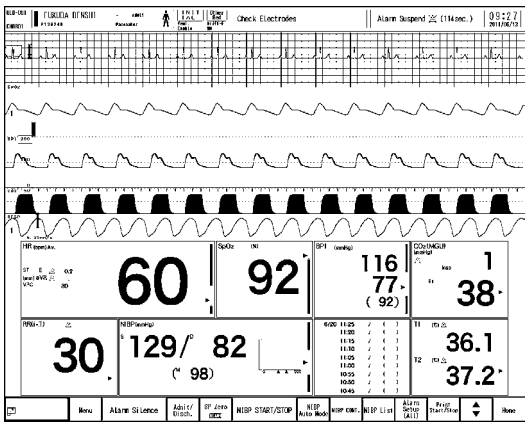
12-Lead (Box Layout: Right)



12-Lead (Box Layout: Right&Bottom)



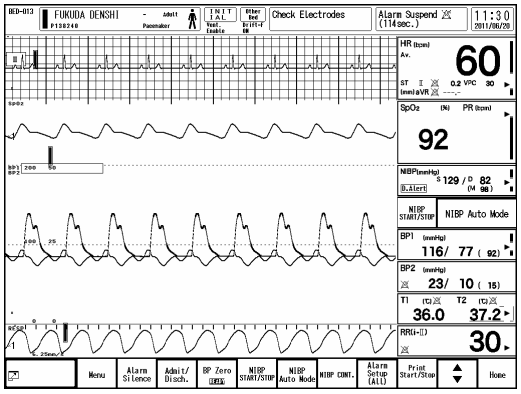
Standard (Box Layout: Bottom 1 row)



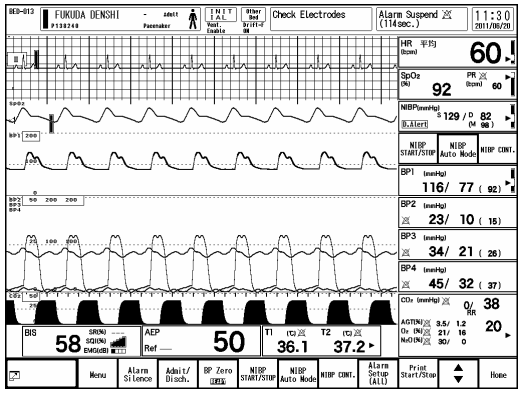
Standard (Box Layout: Bottom 2 rows)

On this system, 12 main modes and 6 sub 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.

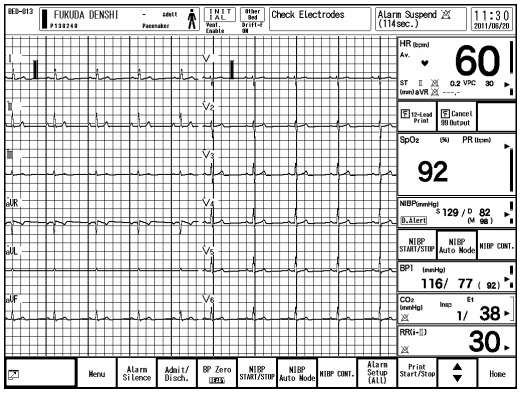
❑Display Example of LC-8015T



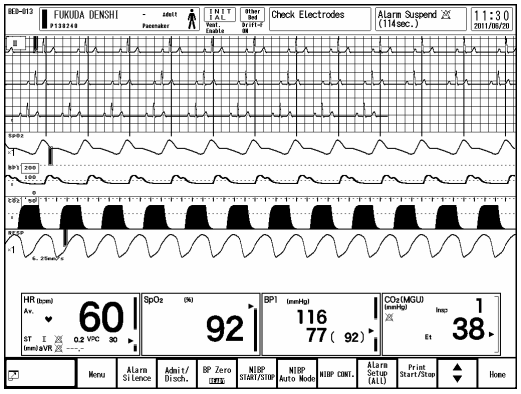
Standard (Box Layout: Right)



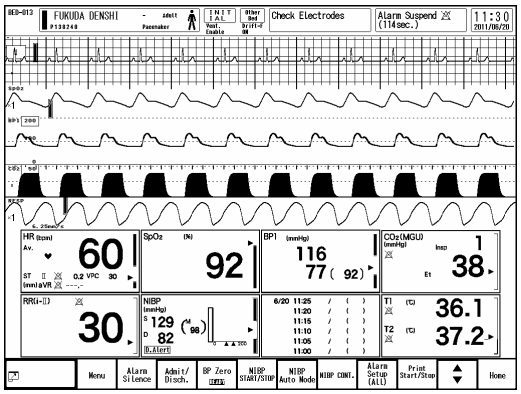
Standard (Box Layout: Right&Bottom)



12-Lead (Box Layout: Right)



Standard (Box Layout: Bottom 1 row)

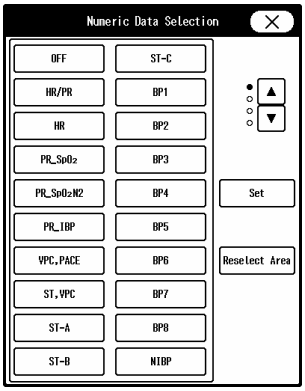


Standard (Box Layout: Bottom 2 rows)

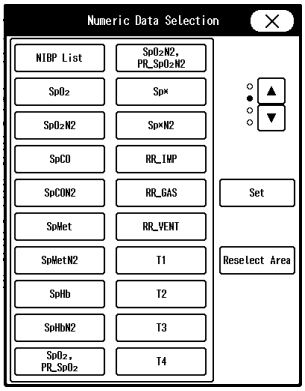
On this system, 12 main modes and 6 sub modes can be preprogrammed according to the monitoring purpose.
By preprogramming the configuration to each mode, the display configuration setups at admittance of patient can be simplified by just selecting one of the modes.
(☞"To Select the User Mode" P5-10)
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

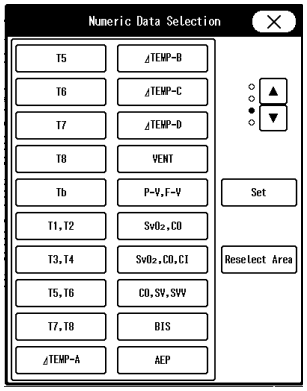
The numeric data to be displayed can be selected on the "Numeric Data Selection" window.
The parameters of the "Numeric Data Selection" window can be assigned to the numeric data box on the home display.
(☞"Numeric Data Box Display (for each parameter)" P3-12)



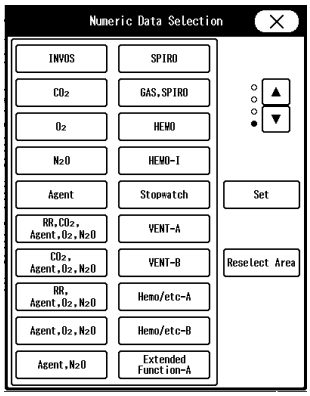
Page 1



Page 2



Page 3



Page 4

The Numeric Data Box Size for Each Parameter

Numeric Data	Size							
	Width*1	W1/2	W1			W2*3		
	Height*2	H1	H1	H2	H3	H1	H2	H3
HR/PR		x	○	○	○	○	○	○
HR		x	○	○	○	○	○	○
PR_SpO_2		x	○	○	○	○	○	○
PR_IBP		○	○	○	○	○	○	○
VPC, PACE		x	○	○	○	○	○	○
ST, VPC		x	○	○	○	○	○	○
ST-A, ST-B, ST-C		x	x	○	○	x	○	○
BP1 to BP8		x	○	○	○	○	○	○
NIBP		x	○	○	○	○	○	○
NIBP List		x	○	○	○	○	○	○
SpO_2		x	○	○	○	○	○	○
SpO_2, PR		x	○	○	○	○	○	○

The Numeric Data Box Size for Each Parameter

Numeric Data	Size						
	Width[*1]	W1/2	W1		W2[*3]		
	Height[*2]	H1	H1	H2	H3	H1	H2	H3
SpCO		x	○	○	○	○	○	○
SpMet		x	○	○	○	○	○	○
SpHb		x	○	○	○	○	○	○
Sp*		x	○	○	○	○	○	○
RR_IMP, RR_CO_2, RR_VENT		○	○	○	○	○	○	○
T1 to T8, Tb		○	○	○	○	○	○	○
T1/T2, T3/T4, T5/T6, T7/T8		x	○	○	○	○	○	○
ΔTEMP-A, ΔTEMP-B, ΔTEMP-C, ΔTEMP-D		○	○	○	○	○	○	○
VENT		x	x	○	○	x	○	○
P-V, F-V		x	x	○	○	x	○	○
SvO_2, CO		x	x	○	○	x	○	○
SvO_2, CO, CI		x	x	○	○	x	○	○
CO, SV, SVV		x	x	○	○	x	○	○
BIS		x	○	○	○	○	○	○
INVOS		x	○	○	○	○	○	○
CO_2		x	○	○	○	○	○	○
O_2		○	○	○	○	○	○	○
N_2O		○	○	○	○	○	○	○
Agent		x	○	○	○	○	○	○
RR, CO_2, Agent, O_2, N_2O		x	x	○	○	x	○	○
CO_2, Agent, O_2, N_2O		x	x	○	○	x	○	○
RR, Agent, O_2, N_2O		x	x	○	○	x	○	○
Agent, O_2, N_2O		x	x	○	○	x	○	○
Agent, N_2O		x	○	○	○	○	○	○
GAS, SPIRO		x	x	○	○	x	○	○
SPIRO		x	x	○	○	x	○	○
HEMO		x	x	○	○	x	○	○
HEMO-I		x	x	○	○	x	○	○
STOPWATCH		x	○	○	○	○	○	○
VENT-A		x	○	○	○	○	○	○
VENT-B		x	○	○	○	○	○	○
Hemo/etc-A		x	○	○	○	○	○	○
Hemo/etc-B		x	○	○	○	○	○	○
Extended Function-A		x	x	○	○[*4]	x	○	○[*4]

*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)

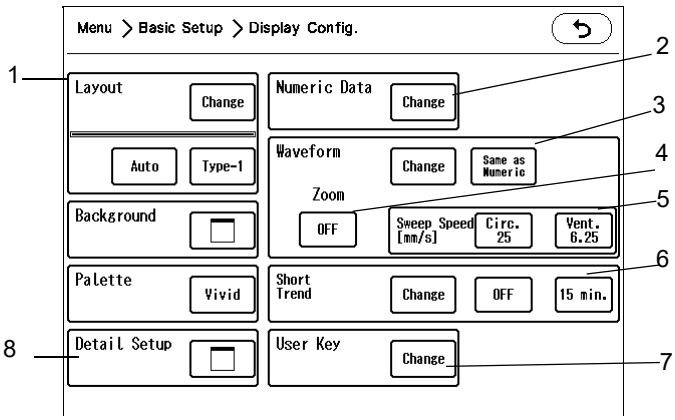
*3: For LC-8015T, W2 size can be set only for "Bottom 1 row/2 rows" layout.

*4: For "Extended Function-A", H6 is the maximum height.

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" P10-7)

2 Numeric Data
(☞"Changing the Displayed Numeric Data" P10-8)

3 Waveform
(☞"Changing the Displayed Waveform" P10-9)

4 Enlarged Waveform
(☞"Enlarged Waveform Setup" P10-13)

5 Sweep Speed
(☞"Sweep Speed" P10-12)

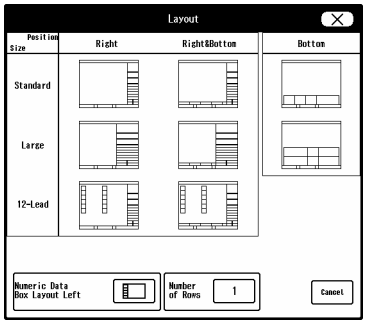
6 Short Trend
(☞"Short Trend Display" P10-10)

7 User Key
(☞"User Key Setup" P10-13)

8 Detail Setup
(☞"Detail Setup" P10-14)

❑Changing the Layout

The layout can be changed with the following procedure.



1 Press [Change] for "Layout".

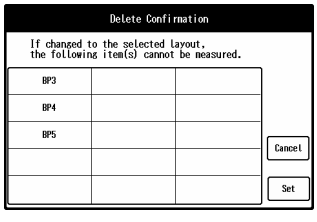
▸ The "Layout" window will be displayed.

2 Select the layout to be displayed.

▸ For LC-8015T, the following layout cannot be selected.
*Large
*12-Lead: Right/Left&Bottom

▸ When "Bottom" is selected, select the number of rows.

3 The displayed parameters will be automatically located with the selected layout. Check the home display.



▸ If there are parameters which cannot be displayed due to display area, "Delete Confirmation" window will be displayed. (shown on right)
Pressing the [Set] key will set the layout with some parameters not displayed.
Pressing the [Cancel] key will return to the "Layout" window.

4 If not changing the layout, press the [Cancel] key.

NOTE

- When bottom 2 rows for "Right/Left & Bottom" is selected for display layout, "12-Lead" layout cannot be selected.

❑Adjusting the Layout Automatically

The display layout can be automatically adjusted. The automatic mode can be selected from the following two types.

♦Type-1 (All Auto Mode)

The measured parameters will be automatically located according to the priority. The display layout remains the same. (The layout will change if there is not enough space to display all parameters.) In case of 12-lead layout, the layout will change to standard layout. The display priority can be set on the "Auto Display Configuration" under "Initial Settings". (☞Maintenance Manual "Display/Print Setup" P5-14)

♦Type-2 (Auto Mode depending on Parameter Quantity)

The parameters will be automatically located according to the parameter quantity using the current display configuration. The display layout, numeric data location and user keys on the numeric data area remain the same.

1 Select [Type-1] or [Type-2].

2 Select [Auto] for "Layout".

NOTE

- For both [Type-1] and [Type-2], the waveform layout is equivalent to that when the [Same with Numeric] key is pressed.
- When [Auto] is selected for the display layout, the following changes are not possible.
  *Changing the Displayed Waveform
  *Changing the Displayed Numeric Data
  *Changing the short trend parameters

❑Changing the Displayed Numeric Data

The displayed numeric data can be changed with the following procedure.

⚠ CAUTION

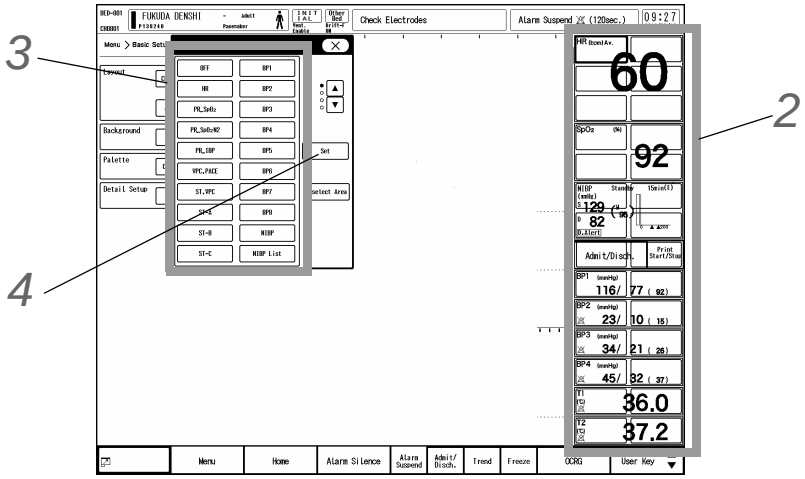
- When performing the telemetry or wired network transmission, configure the display so that the numeric data corresponding to the waveform is displayed. If not, the displayed waveform or numeric data may not be transmitted.

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.
- When the HR/PR numeric data box is set, the alarm limit settings for the following parameters on the bedside monitor will link each other. However, the alarm limit setting on the central monitor will not link with the setting on the bedside monitor. Perform the setting for each parameter.
  HR
  PR_IBP
  PR_SpO_2 (1ch)
  PR_SpO_2 (2ch)

1 Press the [Change] key for "Numeric Data".

- The display will change to numeric data selection mode.
- 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 canceled.
- To start again from the beginning, press the [Reselect Area] key.
- Adjust the size of the selected area which is indicated by blue box.

3 Select the parameter on the "Numeric Data Selection" window.
Press the ▲/ ▼ keys to switch the displayed parameters.
(☞"Numeric Data Selection" P10-5)

4 Press the [Set] key.

- The setup will be finalized.

NOTE

- The selected parameter may not be displayed depending on the combination of the parameters and size.
  In such case, "Size Error" will be displayed in numeric data area. Adjust the size.
  (☞"Numeric Data Selection" P10-5)

❑Changing the Displayed Waveform

The displayed waveform can be changed with the following procedure.

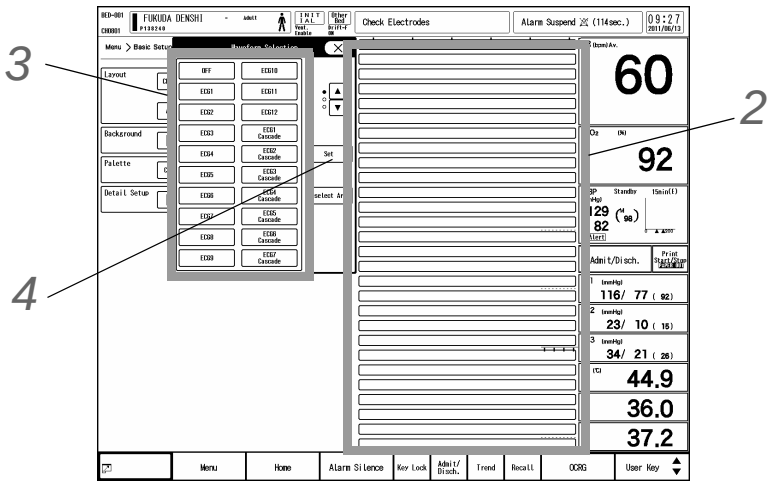
⚠ CAUTION

- When performing the telemetry or wired network transmission, 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 canceled.

▸ To start again from the beginning, press the [Reselect Area] key.

▸ Adjust the size of the selected area which is indicated by blue box.

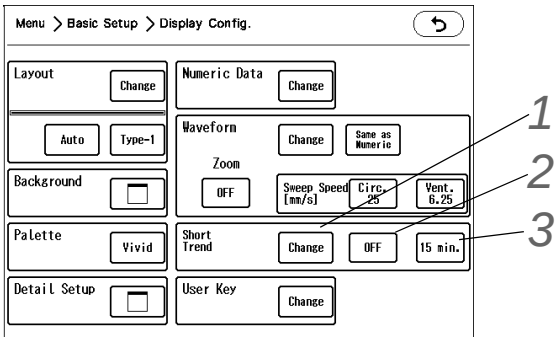
3 Select the parameter on the "Waveform Selection" window.
Press the ▲/ ▼ keys to switch the displayed parameters.
(☞"Waveform Selection" P10-17)

4 Press the [Set] key.

▸ The setup will be finalized.

❑Short Trend Display

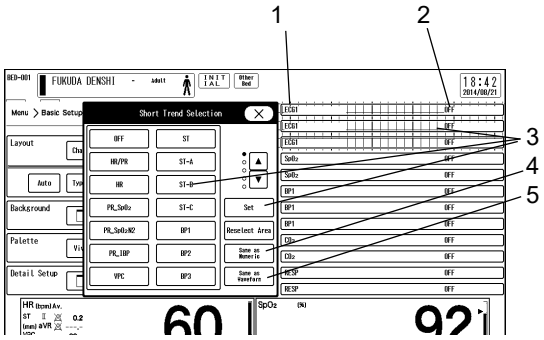
The parameters and display duration for the short trend display can be set.



NOTE

- The short trend can be displayed when the numeric data layout is "Right"/"Right&Bottom"/ "Left"/"Left&Bottom"/"Bottom".
- For the 12-lead layout, ST value of each lead will be displayed in short trend.

1 Press the [Change] key to set the parameters for the short trend display.



1 The parameters for the current waveform display area will be displayed.

2 The selected short trend parameters will be displayed.

3 Select the short trend area, and assign the parameter for that area.

4 [Same as Numeric]: The same parameters for the currently displayed numeric data will be set as the short trend parameters.

5 [Same as Waveform]: The same parameters for the currently displayed waveform will be set as the short trend parameters.

NOTE

- The [Change] key will be displayed when [User Setup] is selected for "Short Trend" (Display Config.>Detail Setup).
- [Same as Numeric], [Same as Waveform] will be applied for the displayed parameters at the point when the key is pressed. The short trend parameters will not automatically change when the displayed parameters are changed.

2 Select ON/OFF of short trend display.

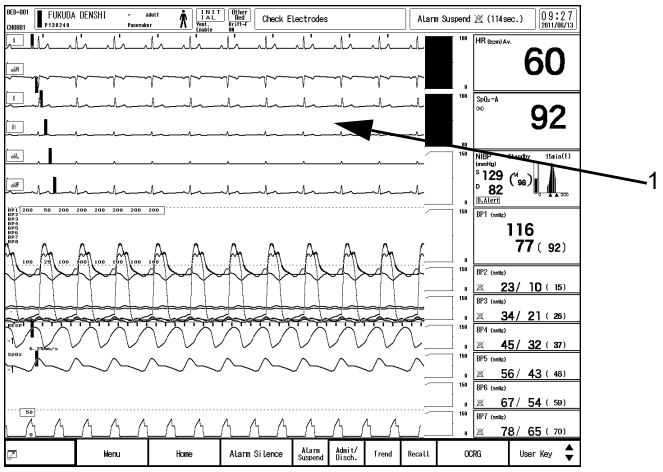
- [ON]: Short trend will be displayed on the home display.
- [OFF]: Short trend will not be displayed on the home display.
- [Overlap]: Short trend will be displayed overlapped with the waveform.

3 When [ON] or [Overlap] is selected, select the display duration. The selectable duration differs depending on the short trend data resolution and display width (7 levels).

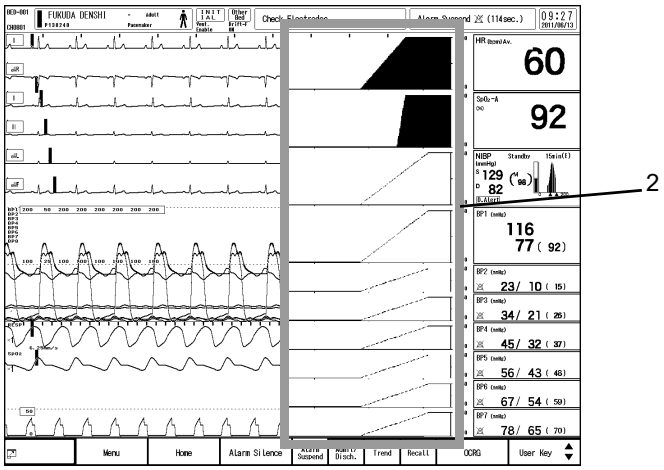
		Display Width (7 levels)						
		0	1	2	3	4	5	6
Data Resolution	5 sec.	Display OFF	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.
	10 sec.	Display OFF	10 min.	20 min.	30 min.	40 min.	50 min.	60 min.
	30 sec.	Display OFF	30 min.	60 min.	90 min.	120 min.	150 min.	180 min.

4 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 an alarm is generated for the recall alarm factor, recall screen will be displayed.
- When the cursor function is enabled, a cursor will be displayed. The display duration can be changed under "Short Trend".(Display Config.>Detail Setup)

❑Sweep Speed

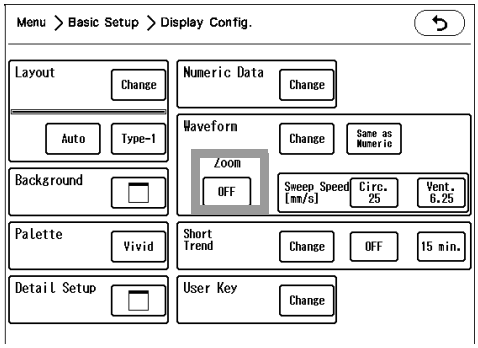
The sweep speed can be set with the following procedure. The sweep speed can be set differently for the circulatory system waveforms (ECG, BP) and respiratory system waveforms.

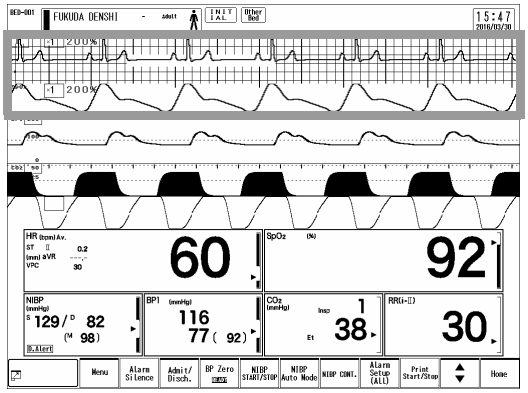
1 Select the circulatory sweep speed from [6.25]/[12.5]/[25]/[50] (mm/s).

2 Select the respiratory sweep speed from [6.25]/[12.5]/[25] (mm/s).

❑Enlarged Waveform Setup

By selecting [ON] for "Zoom", the waveform size and sweep speed will be doubled.





NOTE

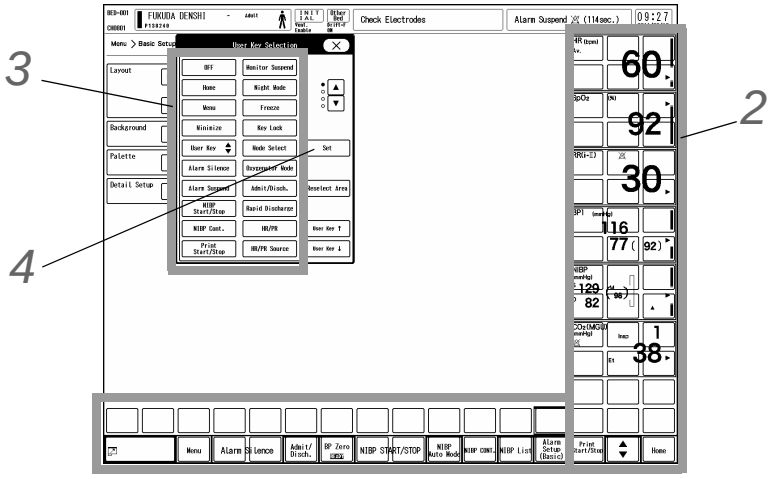
- When the sweep speed is set to [50 mm/s], "Zoom" cannot be set to [ON].
- Scale will not be enlarged.

❑User Key Setup

The user key can be set with the following procedure.

1 Press the [Change] key 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 canceled.
- To start again from the beginning, press the [Reselect Area] key.
- Adjust the size of the selected area which is indicated by blue box.

3 Select the function to assign to 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" P10-18)

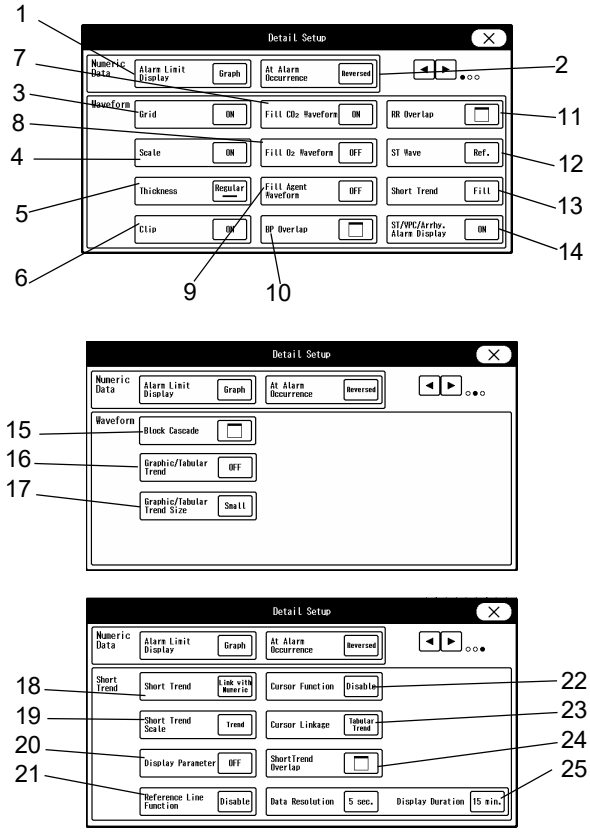
4 Press the [Set] key.

▸ 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 in reversed color at alarm occurrence.
[3D]: The numeric data will be displayed in 3D at alarm occurrence.

3 Grid

The ECG waveform can be displayed on the grid.

[ON]: Grid will be displayed.
[Bold]: Grid will be displayed in bold format.
[OFF]: Grid will not be displayed.

REFERENCE

- Short trend and grid cannot be displayed overlapped.

4 Scale

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

5 Thickness

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

6 Clip

Whether or not to clip the overlapped waveforms of the neighboring display area can be selected.

7 Fill CO_2 Waveform

Whether or not to fill in the CO_2 waveform from the baseline can be selected.

8 Fill O_2 Waveform

Whether or not to fill in the O_2 waveform from the baseline can be selected.

9 Fill Agent Waveform

Whether or not to fill in the Agent waveform from the baseline can be selected.

10 BP Overlap

The overlapping BP waveforms can be set for each overlap group 1 to 3.

11 RR Overlap

The overlapping RR waveforms can be set.

12 12-Lead ST Wave

The ST waveform to be displayed for the 12-Lead layout can be set.
[Ref.]: The ST reference waveform will be displayed.
[Average]: The average waveform will be displayed.

13 12-Lead ST Short Trend

The display format for the ST short trend can be selected from [Plot]/[Fill]/[OFF].

14 ST/VPC/Arrhy. Alarm Display

Whether or not to display the ST value, VPC (integrated value of 1 minute), arrhythmia alarm message inside the HR numeric data box can be selected.

15 Block Cascade

The waveform combination for block cascade display can be set.

16 Graphic/Tabular Trend

Graphic trend and tabular trend will be displayed in the waveform display area.

NOTE

- When [ON] is selected for "Graphic/Tabular Trend", the waveform set to the same display area with the graphic/tabular trend will not be displayed.

17 Graphic/Tabular Trend Size

Select the display area size for graphic/tabular trend from [Big]/[Medium]/[Small].

18 Short Trend

The short trend parameters can be linked to the displayed numeric data or waveform.

[Link with Numeric]: The short trend layout will be linked to the displayed numeric data on the home display.
[Link with Waveform]: The short trend layout will be linked to the displayed waveform on the home display.
[User Setup]: User settings will be applied for the short trend layout.

19 Short Trend Scale

The short trend scale for the following parameters can be synchronized with the scale of trend or waveform.
BP / PEAK / TV / CO_2 / O_2 / Agent

20 Display Parameter

Whether or not to display the parameter name of the displayed short trend can be set.
[ON]: Displays the parameter name with the corresponding color of the parameter.
[Gray]: Displays the parameter name in gray.
[OFF]: Parameter name will not be displayed.

21 Reference Line Function

Whether or not to display the reference lines can be set for the following parameters.
HR, ST, BP1 to 4, NIBP, $EtCO_2$, SpO_2, BIS
[Enable]: The reference line function will be enabled. On the "Short Trend Setup" window (displayed when short trend scale area is pressed), ON/OFF of reference line display and reference line position can be set for each parameter.
[Disable]: The reference line function will be disabled.

NOTE

- The reference line function cannot be used for the overlapped short trend display.
- When [Enable] is selected, the function to highlight the alarm generated data cannot be used.

22 Cursor Function

Whether or not to display a cursor can be selected. By displaying a cursor, the measured data and review data (tabular trend/graphic trend/zoom wave) at the time of cursor position can be displayed.
[Enable]: The cursor function will be enabled. However, the function to enlarge/reduce the display duration by pressing the short trend area will be disabled.
[Disable]: The cursor function will be disabled.

NOTE

- The cursor function cannot be used for the overlapped short trend display.
- When [Enable] is selected, the function to highlight the alarm generated data cannot be used.
- The cursor will be displayed when the short trend area is pressed, and will be automatically cleared after a short while.

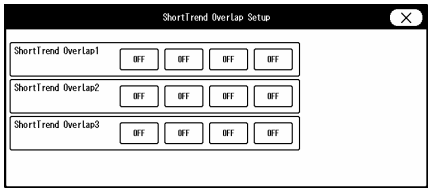
23 Cursor Linkage

When [Enable] is selected for "Cursor Function", the review data to be displayed can be selected from [Tabular Trend] / [Graphic Trend] / [Zoom Wave].

The zoom wave can be displayed only when the full disclosure waveform function is enabled.

24 Short Trend Overlap

Maximum of 4 parameters can be displayed overlapped in the same short trend area.
However 2 blocks of waveform area are required for each parameter. For example, to display 3 parameters in the same short trend area, 6 blocks of waveform area are required.



25 Data Resolution, Display Duration

Select the data resolution from [5 sec.]/[10 sec.]/[30 sec.]. The display duration will differ depending on the "Data Resolution" setting.
For [5sec.], maximum display duration is 30 minutes.
For [10sec.], maximum display duration is 1 hour.
For [30sec.], maximum display duration is 3 hours.

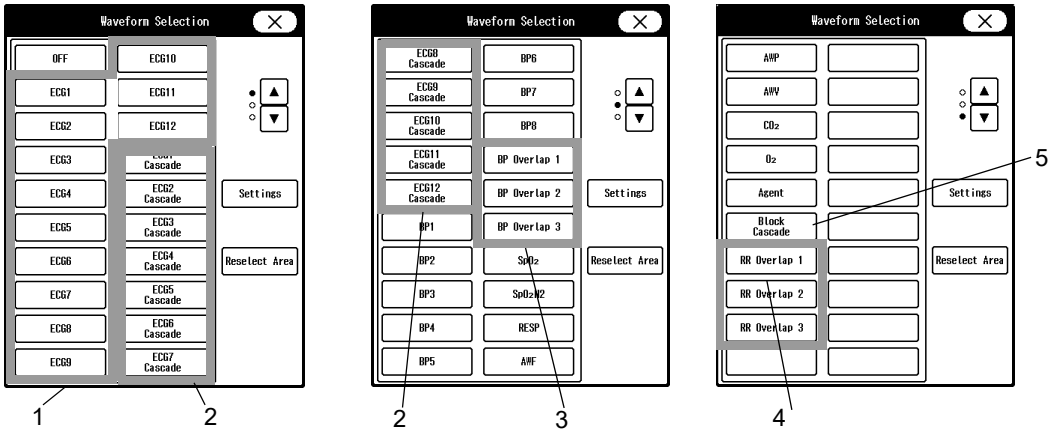
2 Press the [Home] key to check the configured display.

NOTE

- If the numeric data box is configured at the bottom of display, user keys cannot be assigned to the numeric data box area.
- After configuring the display, make sure to verify the configured display by pressing the [Home] key.
- To maintain the configured display even after the power is turned OFF or after the discharge procedure, store the configuration to one of the user modes, or select [Backup] for "Display Configuration" under Initial Settings>User I/F>At Power ON/At Discharge. (☞"To Select the User Mode" P5-10)

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*

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 BP8) 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 RR Overlap 1 to 3

The RR waveform (CO_2, O_2, Agent) set on "RR Overlap Setup" will be displayed.
If the waveform display area is too small to display the assigned waveforms, it will be displayed in the priority of CO_2>O_2>Agent.

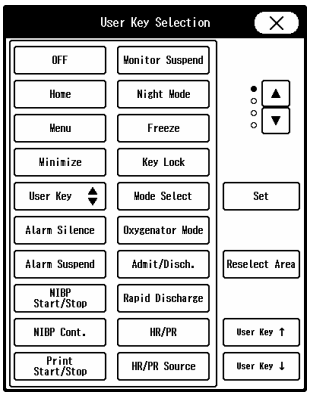
5 Block Cascade

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.

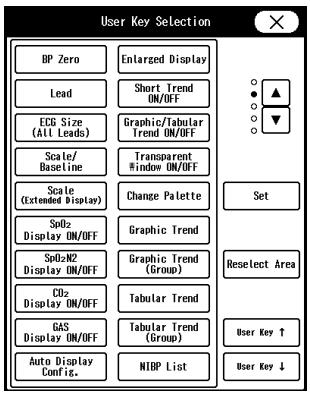
User Key Selection

The user keys can be set on the "User Key Selection" window.
This section explains the function for each user key.



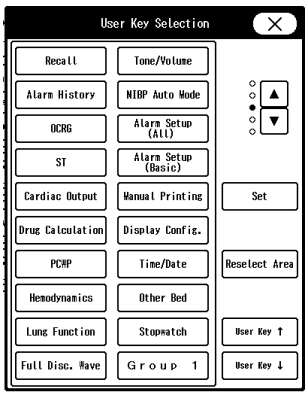
Page 1

Page 1	
OFF	Blank key will be displayed.
Home	The display will return to the home display.The [Home] key is also available as fixed key.
Menu	The menu screen will be displayed.The [Menu] key is also available as fixed key.
Minimize Window	Pressing this key will minimize the currently displayed window and will be stored to the user key.
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.The [Alarm Silence] key is also available as fixed key. 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. Holding down the key 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 Selection	User mode selection screen will be displayed.
Oxygenator Mode	The home display will switch to oxygenator mode.
Admit/Discharge	Admit/Discharge screen will be displayed.
Rapid Discharge	Confirmation window to erase the data will be displayed.
HR/PR	The HR/PR numeric data box will be switched between HR and PR.
HR/PR Source	The parameter for HR/PR Source will be automatically selected.



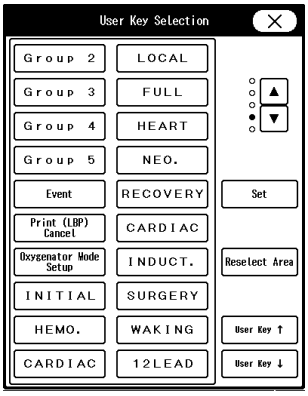
Page 2

Page 2	
BP Zero	Zero balance of BP1 to BP8 will be performed.
Leads	List of lead groups will be displayed, and selecting a lead group will display the lead selection window.It cannot be assigned to the numeric data area. 2 blocks are required to assign this key.
ECG Size (All Leads)	The waveform size for all ECG leads can be changed.
Scale	The home display will change to scale selection mode.
Scale (Extended Display)	The extended display waveform size/scale setup menu will be displayed. This setting can be performed only when [OFF] is set for "Sync wave size/scale of extended display with main unit".
SpO_2-1 Display ON/OFF	SpO_2-1 display will turn ON/OFF.
SpO_2-2 Display ON/OFF	SpO_2-2 display will turn ON/OFF.
CO_2 Display ON/OFF	CO_2 display will turn ON/OFF.
GAS Display ON/OFF	Multigas unit data display will turn ON/OFF.
Auto Display Config.	The display will be automatically configured with the currently measured parameters.
Enlarged Display	For the standard display layout, the numeric data box width will enlarge.
Short Trend ON/OFF	Short Trend display will turn ON/OFF.
Graphic/Tabular Trend ON/OFF	The graphic/tabular 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.

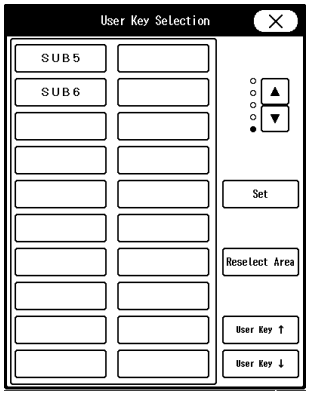


Page 3

Page 3	
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 Disclosure Waveform	The full disclosure waveform will be displayed.
12-Lead Analysis	12-lead analysis screen will be displayed.
Tone/Volume	The "Tone/Volume" menu 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.
Clock Setting	The Time/Date setup window will be displayed.
Other Bed	Other bed screen will be displayed.
STOPWATCH	Stopwatch screen will be displayed.
Group 1	Selection list of key group 1 will be displayed.



Page 4



Page 5

Page 4	
Group 2 to 5	Selection list of key group 2 to 5 will be displayed.
Event	Event selection list will be displayed. The selected event will be saved as recall waveform.
Print (LBP) Cancel	Printing on the laser printer will be canceled.
Oxygenator Mode	The "Oxygenator Mode" menu will be displayed.
Main Mode 1(Initial)	Main mode 1 will be set as the monitoring mode.
Main Mode 2 (Hemo.)	Main mode 2 will be set as the monitoring mode.
Main Mode 3 (Cardiac)	Main mode 3 will be set as the monitoring mode.
Main Mode 4 (Local)	Main mode 4 will be set as the monitoring mode.
Main Mode 5 (Full)	Main mode 5 will be set as the monitoring mode.
Main Mode 6 (Heart)	Main mode 6 will be set as the monitoring mode.
Main Mode 7 (Neo.)	Main mode 7 will be set as the monitoring mode.
Main Mode 8 (Recovery)	Main mode 8 will be set as the monitoring mode.
Main Mode 9 (Cardiac)	Main mode 9 will be set as the monitoring mode.
Sub Mode 1 (Induct.)	Sub Mode 1 will be set as the monitoring mode.
Sub Mode 2 (Surgery)	Sub Mode 2 will be set as the monitoring mode.
Sub Mode 3 (Waking)	Sub Mode 3 will be set as the monitoring mode.
Sub Mode 4 (12-Lead)	Sub Mode 4 will be set as the monitoring mode.
Page 5	
Sub Mode 5	Sub Mode 5 will be set as the monitoring mode.
Sub Mode 6	Sub Mode 6 will be set as the monitoring mode.

* The default mode names are displayed inside the brackets. The mode names can be changed.

(☞Maintenance Manual "To Program the User Mode" P5-30)

⚠ 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

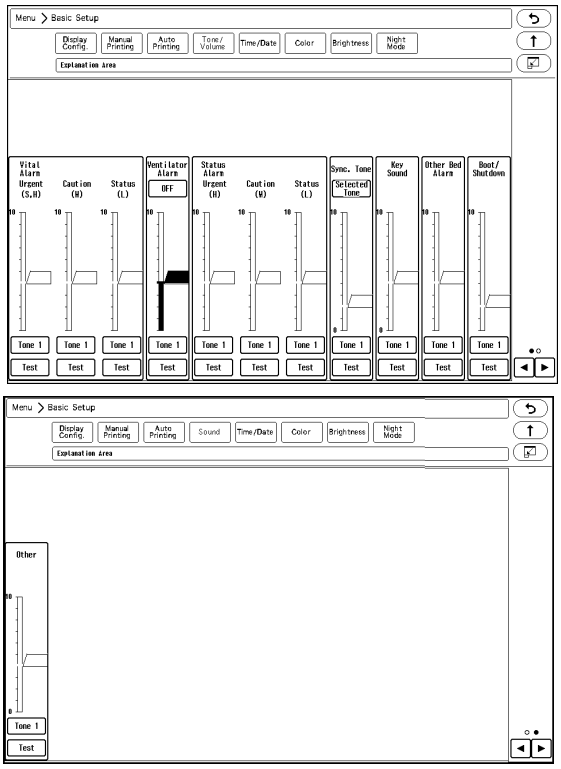
In this section, tone/volume setup procedure for alarm sound, HR synchronized sound, key sound, boot/shutdown sound is explained. The tone/volume setup screen also allows to turn OFF the ventilator alarm sound.
The volume of BP zero balance and NIBP measurement end sound can be changed on "Other" setting.

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], [Tone/Volume] ("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) > Careful (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.
- When [Selected Tone] is selected under the "Sync. Tone" setup, the set HR synchronized tone will be generated. When [Sync. with SpO_2 Value] is selected, the same tone as SpO_2 synchronized tone will be generated. If the SpO_2 value is invalid, Tone 2 will be generated.

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" Setting

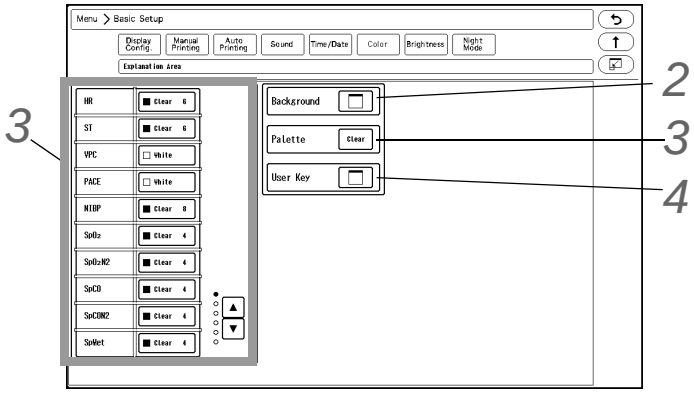
<table>
<tr><th>Alarm System</th><th>Fukuda Tone
(1) Tone 1 to 4
(2) Tone 5 to 8</th><th>Melodic Tone</th><th>Standard Tone</th></tr>
<tr><td colspan="4">Vital Alarm Sound</td></tr>
<tr><td>Level H</td><td>(1) Continuous melodic tone
(2) Continuous rapid tone</td><td>ECG: Continuous melodic tone with 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</td><td>Continuous tone</td></tr>
<tr><td>Level M</td><td>(1) Alternate high and low pitch in 5 seconds interval
(2) Rapid tone in 5 seconds interval</td><td>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 in 4 seconds interval melodic tone.
Other than above: 4 seconds interval melodic tone</td><td>4 seconds interval tone</td></tr>
<tr><td>Level L</td><td>(1) 15 seconds interval melodic tone
(2) 15 seconds interval tone</td><td>17 seconds interval melodic tone</td><td>17 seconds interval tone</td></tr>
<tr><td colspan="4">Equipment Status Alarm Sound</td></tr>
<tr><td>Level H</td><td rowspan="3">(Same with vital alarm).</td><td>Continuous melodic tone</td><td rowspan="3">(Same with vital alarm)</td></tr>
<tr><td>Level M</td><td>4 seconds interval melodic tone</td></tr>
<tr><td>Level L</td><td>17 seconds interval tone</td></tr>
<tr><td colspan="4">Volume Setup</td></tr>
<tr><td>Level H, M, L</td><td colspan="3">The volume for low level alarm cannot be set higher than the higher level alarm.</td></tr>
<tr><td colspan="4">Tone Setup</td></tr>
<tr><td>Level H
Level M
Level L</td><td>Vital Alarm: Setup can be performed.
Equipment Status Alarm: Setup can be performed.</td><td colspan="2">Vital Alarm: Setup can be performed.
Equipment Status Alarm: Setup cannot be changed.</td></tr>
<tr><td colspan="4">Setup other than above</td></tr>
<tr><td>Other Bed Alarm</td><td>Sound: Continuous tone
Tone: Cannot be changed.
Volume: Can be adjusted.</td><td colspan="2">Sound: Continuous tone
Tone: Cannot be changed.
Volume: Can be adjusted.</td></tr>
<tr><td>Ventilator Alarm Sound</td><td>Sound: Continuous tone
Tone: Cannot be changed.
Volume: Can be adjusted.</td><td>Sound: Continuous melodic tone
Tone: Cannot be changed.
Volume: Can be adjusted.</td><td>Continuous tone</td></tr>
</table>

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.



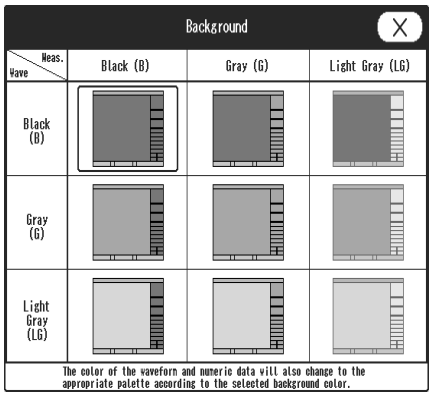
2 Set the background color.

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.

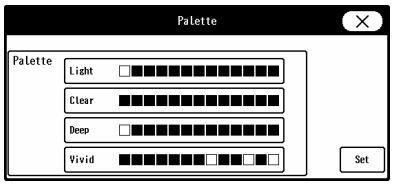
3 Set the color of the numeric data and waveforms

REFERENCE

- The color can be set for each parameter. 12 colors (+white) from each palette are selectable.

1 Press the key for "Palette".

▸ The "Palette" selection window will be displayed. (shown on right)



2 Select the palette from [Light] / [Clear] / [Deep] / [Vivid], and press the [Set] key.

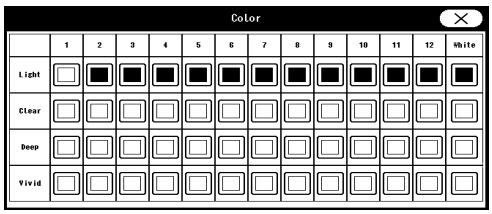
▸ The color of the numeric data and waveform will change to the selected palette color.

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. (shown on right)



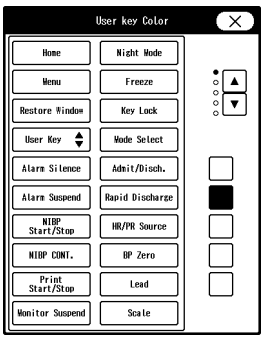
5 Select a color.

▸ 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

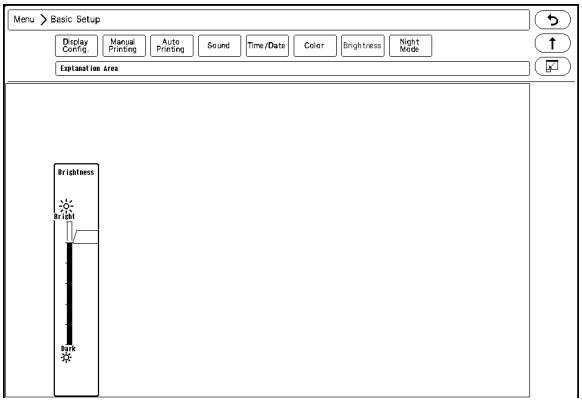
In this section, brightness adjustment of the monitor display is explained.

CAUTION

- The display 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.

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.

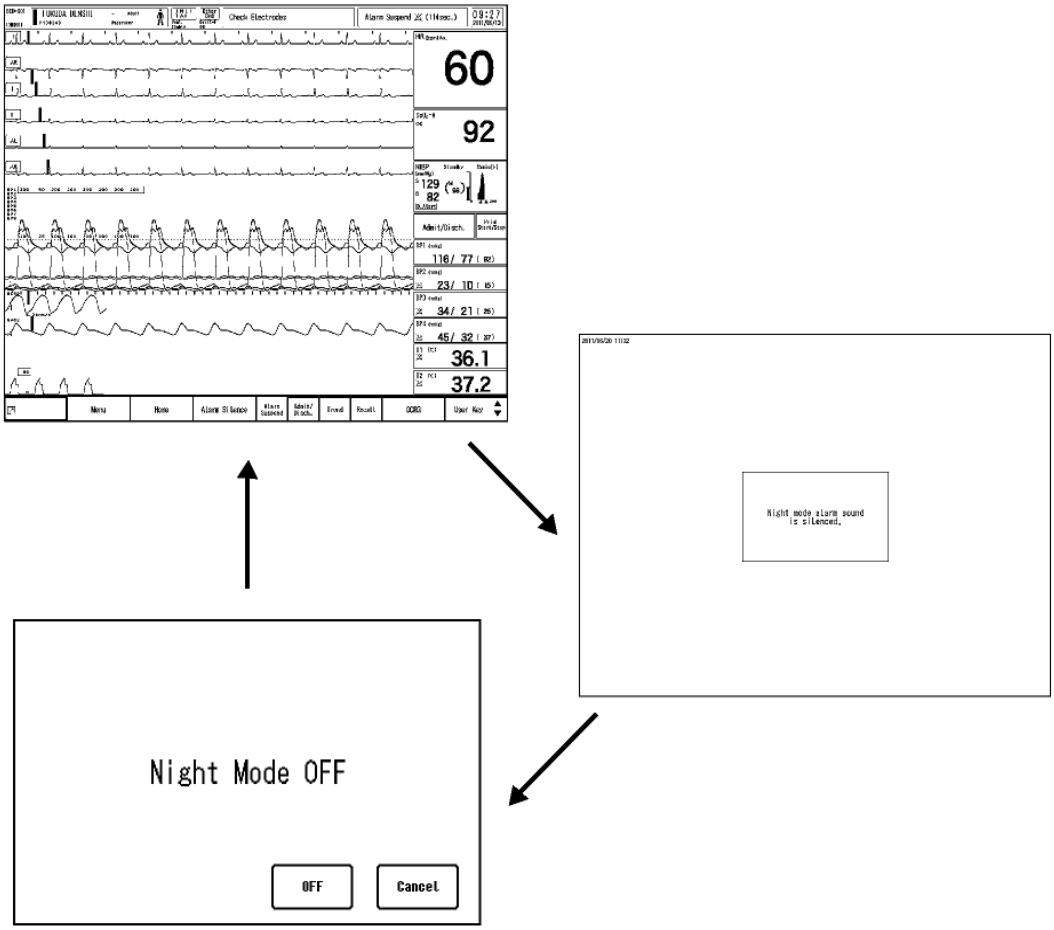
Night Mode

In this section, the procedure to set the night mode is explained.

The night mode is the preset display brightness and alarm volume which can be used when turning off the light of the ward or when the patient is asleep.

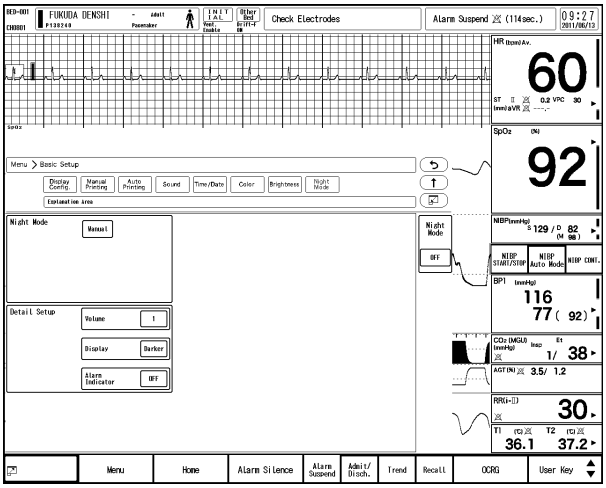
The night mode can be manually set to ON, or automatically set to ON by preprogramming the time to turn ON/OFF the night mode.

❑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" 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.

(☞Maintenance Manual "Display/Print Setup" P5-14)

NOTE

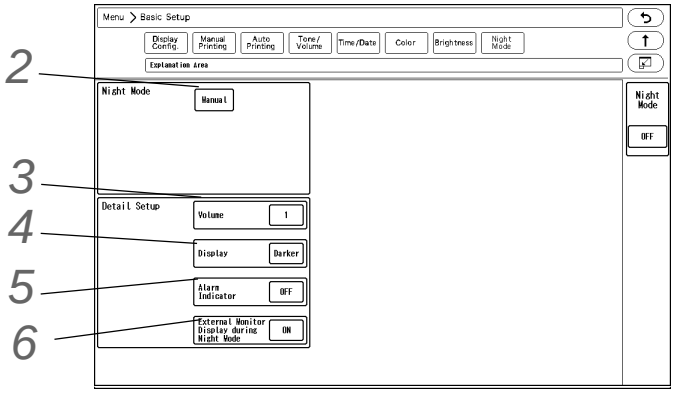
- The night mode can be manually turned ON from the menu, user key, or remote control even when the night mode is set to automatically turn ON. The night mode will automatically turn OFF at the set "End Time".
- The night mode can not be set when the ventilator alarm is generated.

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.

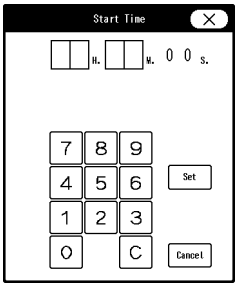
REFERENCE

- 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 [0], 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 bed 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.

6 Set the external monitor operation.

- [ON]: Displays the home display on the external monitor.
- [OFF]: Turns OFF the external monitor display.
- [OFF (Time Only)]:
  If [Time Only] is selected for "Display": Displays the [Time Only] screen on the external monitor as well as the main unit.
  If [No Change], [Dark] or [Darker] is selected for "Display": Turns OFF the external monitor display.

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 arrhythmia alarm message other than Tachy, Brady, Ext Tachy, Ext Brady 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 for some parameters only when [Fukuda Tone] is selected for the "Alarm System"("Initial Settings"). It cannot be selected when the "Alarm System" is [Melodic Tone] or [Standard Tone].

❑Life Threatening Alarm (Alarm Level H)

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>*1
	<Upper BP# Alarm> or <Upper (label) Alarm>*1
Pulse Rate (BP)	<Lower PR Alarm>
	<Upper PR Alarm>
SpO_2*	<Lower SpO_2 # Alarm>*1
	<Upper SpO_2 # Alarm>*1
Pulse Rate (SpO_2)	<Lower PR Alarm>
	<Upper PR Alarm>
Non-Invasive Blood Pressure	<Lower NIBP Alarm>
	<Upper NIBP Alarm>
Respiration (Impedance, CO_2, Gas, Ventilator)	<Lower RR Alarm>
	<Upper RR Alarm>
Gas*2	<Lower CO_2-E Alarm>
	<Upper CO_2-E Alarm>
	<Upper CO_2-I Alarm>
	<Lower O_2-E Alarm>
	<Upper O_2-E Alarm>
	<Lower O_2-I Alarm>
	<Upper O_2-I Alarm>
	<Lower N_2O-E Alarm>
	<Upper N_2O-E Alarm>
	<Lower N_2O-I Alarm>
	<Upper N_2O-I Alarm>
	<Lower (AGT label)-E Alarm>
	<Upper (AGT label)-E Alarm>
	<Lower (AGT label)-I Alarm>
	<Upper (AGT label)-I Alarm>
SPIRO*2	<Lower MV Alarm>
	<Upper MV Alarm>
BIS (When HBX-800 is used)	<Lower BIS Alarm>
	<Upper BIS Alarm>
Arrhythmia	<Run>
	<Pause>

*1: # indicates the label of BP, TEMP, SpO_2.
For SpO_2, N1/N2/M1/M2/HR/HL/FR/FL/OT will be displayed for #.

*2: When the numeric data acquired from FLOW-i is displayed, alarm will not generate. The alarm will not generate on the central monitor either.

❑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>*1
SpMet#	<Upper SpMet# Alarm>*1
SpHb	<Lower SpHb# Alarm> *1
	<Upper SpHb# Alarm>*1
Temperature (TEMP1 to 8)	<Lower TEMP# Alarm> or <Lower (label) Alarm>*1
	<Upper TEMP# Alarm> or <Upper (label) Alarm>*1
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>
SPIRO*2	<Upper PEAK Alarm>
	<Lower PEAK Alarm>
	<Upper PEEP Alarm>
	<Lower PEEP Alarm>

*1: # indicates the channel number of BP, TEMP, SpCO, SpMet, SpHb.
For SpCO, SpMet, SpHb, N1/N2/M1/M2/HR/HL/FR/FL/OT will be displayed for #.

*2: When the numeric data acquired from FLOW-i is displayed, alarm will not generate. The alarm will not generate on the central monitor either.

❑Message (Notification)

Measuring Parameters	Message
All Alarm	<Alarm Suspend (xxx sec.)>
Alarm Sound Suspend	<Alarm Silence (xxx min.)>
Arrhythmia	<LEARN>
	<ARRHY. OFF>
Oxygenator Mode	<All Alarm OFF>

NOTE

- (xxx sec) of the <Alarm Suspend (xxx sec)> message indicates the remaining time of alarm suspended duration.
- (xxx min.) of the <Alarm Silence (xxx min.)> message indicates the remaining time of alarm sound suspended duration.
- The <ARRHY OFF> message will be displayed when the Asystole, VF, VT, Slow_VT and HR alarm is OFF.

Vital Alarm Message (DS-LAN Standard Setup)

⚠ CAUTION

- The arrhythmia alarm message other than Tachy, Brady, Ext Tachy, Ext Brady 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 for some parameters only when [Fukuda Tone] is selected for the "Alarm System"("Initial Settings"). It cannot be selected when the "Alarm System" is [Melodic Tone] or [Standard Tone].

❑Life Threatening Alarm (Alarm Level H)

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>*1
	<Upper SpO_2 # Alarm>*1
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, Gas, Ventilator)	<Lower RR Alarm>
	<Upper RR Alarm>
	<Apnea>
Gas*1	<Lower CO_2-E Alarm>
	<Upper CO_2-E Alarm>
	<Upper CO_2-I Alarm>
	<Lower O_2-E Alarm>
	<Upper O_2-E Alarm>
	<Lower O_2-I Alarm>
	<Upper O_2-I Alarm>
	<Lower N_2O-E Alarm>
	<Upper N_2O-E Alarm>
	<Lower N_2O-I Alarm>
	<Upper N_2O-I Alarm>
	<Lower (AGT label)-E Alarm>
	<Upper (AGT label)-E Alarm>
	<Lower (AGT label)-I Alarm>
	<Upper (AGT label)-I Alarm>
Arrhythmia	<Asystole>
	<VF>
	<VT>
	<Slow VT>
	<Tachy>
	<Brady>
	<Run>
	<Ext Tachy>
	<Ext Brady>

*1: For SpO_2, N1/N2/M1/M2/HR/HL/FR/FL/OT will be displayed for #.

*2: When the numeric data acquired from FLOW-i is displayed, alarm will not generate. The alarm will not generate on the central monitor either.

❑Cautionary Alarm (Alarm Level M)

Measuring Parameters	Message
Blood Pressure	<Lower BP2 to 8 Alarm> or <Lower (label other than ART) Alarm>*1
	<Upper BP2 to 8 Alarm> or <Upper (label other than ART) Alarm>*1
ST1 to 12	<Lower ST(Lead Type) Alarm>
	<Upper ST(Lead Type) Alarm>
SpCO#	<Upper SpCO# Alarm>*1
SpMet#	<Upper SpMet# Alarm>*1
SpHb	<Lower SpHb# Alarm> *1
	<Upper SpHb# Alarm>*1
TEMP (TEMP1 to 8)	<Upper TEMP# Alarm> or <Upper (label) Alarm>*1
	<Lower TEMP# Alarm> or <Lower (label) Alarm>*1
Blood Temperature	<Upper Tb Alarm>
	<Lower Tb Alarm>
MV*2	<Upper MV Alarm>
	<Lower MV Alarm>
PEAK*2	<Upper PEAK Alarm>
	<Lower PEAK Alarm>
PEEP*2	<Upper PEEP Alarm>
	<Lower PEEP 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>

*1: # indicates the channel number of BP, TEMP, SpCO, SpMet, SpHb.
For SpCO, SpMet, SpHb, N1/N2/M1/M2/HR/HL/FR/FL/OT will be displayed for #.

*2: When the numeric data acquired from FLOW-i is displayed, alarm will not generate. The alarm will not generate on the central monitor either.

❑Message (Notification)

Measuring Parameters	Message
All Alarm	<Alarm Suspend (xxx sec.)>
Alarm Sound Suspend	<Alarm Silence (xxx min.)>
Arrhythmia	<LEARN>
	<ARRHY. OFF>
Oxygenator Mode	<All Alarm 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	<DSC-8500 Failure>	10
	<DSC-8500 Speaker Failure>	10
Super Unit	<Super Unit Failure>	3
	<ECG Unit Error>	5
	<Super Unit Multiamp. Failure>	3
	<Super Unit Transducer Voltage Failure>	3
	<NIBP Meas. Error (xxx-xxx)>*1	10 or 3
	<GAS Unit I/F Failure>	3
	<Super Unit SpO_2 Failure>	5 or 1
Blood Pressure	<Transducer Voltage Failure>	3
	<Check the ART catheter.>	1
GAS (MGU-800/MGU-810)	<GAS Unit Failure>	1
SPIRO	<SPIRO Unit Error>	1
BIS (When HBX-800 is used)	<BISx Failure>	1
	<BISx Incompatible>	3

*1: # indicates an error code.

❑Cautionary Alarm (Alarm Level M)

Item	Message	Delay Time (sec.)
NIBP	<NIBP meas. failed. (###-##)>*1	1
CO_2 (HCP-800/HCP-810)	<CO_2 Check Sample Line>	1
	<CO_2 Check Exhaust Port>	1
	<CO_2 Unit Failure>	1
CO_2 (HCP-800/HCP-810)	<CO_2 Cal. Required>	1
Capnostat 5 CO_2 (Gas Unit I/F and Mainstream Module)	<CO_2 Sensor Failure>	1
GAS (MGU-800)	<GAS Check Water Trap Class>	1
	<GAS Pump OFF>	1
	<GAS Check Sample Line>	1
	<GAS Zeroing Failed>	1
	<GAS Replace Water Trap>	1
	<GAS Check Water Trap Conn.>	1
	<GAS Check Conn.>	1
SPIRO (MGU-810)	<SPIRO Check FlowSensor Class>	1
BIS (When HBX-800 is used)	<Check BIS Sensor, Perform Sensor Check>	3
Main Unit	<DSC-8500 Check Short-Term Battery>	10
	<DSC-8500 Check Long-Term Battery>	10
Super Unit	<Super Unit Check Conn.>	3
	<Super Unit Out of Operating Temp. Range>	3
	<Super Unit Analog Unadjusted>	3
Input Box	<IB-8000-# Check Conn.>*2	3
	<IB-8000-# Failure>*2	3
Display Unit	<Display Unit Failure>	3
Module	<IB# Slot# Module Failure>*3	3
	<IB# Slot# Analog Unadjusted>*3	3
Full Disclosure Waveform	<Failed to write full disclosure to the CF card.>	1

*1: On "Initial Settings" menu, the alarm level can be selected from Level M, L, N (Notification). (Default: Level M) If [Alarm Silence] key is pressed during Level M, L alarm generation, the alarm level will change to Level N (notification). # indicates an error code.

*2: # indicates the input box number.

*3: # indicates the input box number, and the slot number of input box.

❑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.>*2	3
	<SpO_2- # Replace Sensor>*2	1
	<SpO_2- # Low Perfusion>*2, *3	1
	<SpO_2- # Pulse Search>*2	1
	<SpO_2- # Noise Interference>*2	1
SpO_2 (Masimo Unit)	<SpO_2- # Check Sensor>*2	1
	<SpO_2- # Replace Cable>*2	3
	<SpO_2- # Check Cable>*2	3
	<SpO_2- # Check Sensor>*2	3
	<SpO_2- # only mode>*2	1
SpO_2 (Nellcor Unit)	<SpO_2- # Check Sensor Attach.>*2	3
	<SpO_2- # Replace Sensor>*2	1
	<SpO_2- # No Pulse Detected>*2	1
Blood Pressure	<BP # Transducer OFF>*4*9	5
Temperature	<T ## Unknown Sensor>*5	3
Non-Invasive Blood Pressure	<Check NIBP cuff, hose>*6	3
	<NIBP Check patient type, air hose>	3
Capnostat 5 CO_2 (Gas Unit I/F and Mainstream Module)	<Check CO_2 Airway Adapter>	1
SPIRO (MGU-810)	<SPIRO Check Flow Sensor>	1
BIS (When HBX-800 is used)	<Replace BIS Sensor>	3
	<BIS Sensor Usage > 24hrs.>*2	3
	<BIS Sensor Disconnected>	1
	<BIS High Impedance, Check Sensor>	3
	<BIS Lead Off, Check Sensor>	3
	<BIS SQI < 15%>*2	3
	<BISx Disconnected>	3
Connector Off	<ECG Disconnected>	3
	<BP # Disconnected>*4	3
	<SpO_2- # Disconnected>*2	3
	<T ## Disconnected>*5	3
	<CO Disconnected>	3
	<CO_2 Disconnected>	3

Item	Message	Delay Time (sec.)
Main Unit	<DSC-8500 Check Unit>	10
	<DSC-8500 Out of Operating Temp. Range>	10
Super Unit	<Super Unit Check SD Card>	3
	<Super Unit Check DIP-SW>	3
	<Super Unit TEMP Unit Failure>	3
	<HS-8000 data transfer failed.>	3
Input Box	<IB-8000-# Failure>*7	3
	<IB-8000-# Out of Operating Temp. Range>*7	3
Display Unit	<Check Display Unit>	3
	<Display Unit Out of Operating Temp. Range>	3
Module	<IB# Slot# Check Module>*8	3
	<IB# Slot# Out of Operating Temp. Range>*8	3
	<IB# Slot# Module Failure>*8	3
	<IB# Slot# Module Disconnected>*8	3
	<IB# Slot# TEMP Unit Failure>*8	3
Check Connection, Check Reception, Interference	<Check SvO_2/CCO Monitor Conn.>	1
	<Check BIS Conn.>	1
	<Check INVOS Conn.>	1
	<Check FLOW-i Conn.>	1
	<Check Printer Conn.>	3
	<Chk DS-LAN Comm>	3
	<Check HLX Conn.>	3
	<Check Printer Comm>	1
	<Check TCM Conn.>	1
Full Disclosure Waveform	<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: # indicates the label of SpO_2.

*3: On "Initial Settings" menu, the alarm level can be selected from Level L/N. (Default: Level L)

*4: # indicates the label of BP.

*5: # indicates the label of TEMP.

*6: 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).

*7: # indicates the input box number.

*8: # indicates the input box number, and the slot number of input box.

*9: On "Initial Settings" menu, the alarm level can be selected from Level M/L. (Default: Level L)

NOTE

- <NIBP meas. failed>, <Check NIBP cuff, hose>, <Connector Off>, <ECG Only 5 electrodes are used.>, <Check xx Conn.>, <Check xx Comm.>, <SPIRO Check Flow Sensor> alarms will be canceled when [Alarm Silence] key is pressed. Pay attention not to cancel the important alarm.

❑Message (Notification)

Item	Message	Delay Time (sec.)
Operation	<Waveform Frozen (xxsec.)>[*1]	1
	<Key Locked (xxsec.)>[*1]	1
	<Night Mode Active>	1
	<Oxygenator Mode>	1
ECG	<ECG Low Amplitude>	3
	<ECG Artifact>	3
	<ECG EMG Interference>	3
	<Check Electrodes>[*7]	3
Blood Pressure	<BP # Zeroing Required>[*2]	1
Temperature	<T # Unknown Sensor>[*3]	1
SpO_2 (Masimo Unit)	<SpO_2- # Demo Mode>[*4]	1
	<SpO_2- # Zeroing>[*4]	1
	<SpO_2 Check Sensor Attach.>[*7]	3
	<SpO_2 Cable Near Expiration>	3
	<SpO_2 Sensor Near Expiration>	3
SpO_2 (Nellcor Unit)	<SpO_2- # Motion Artifact>[*4]	1
	<SpO_2 Check Sensor Attach.>[*7]	3
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/HCP-810)	<CO_2 Suspended>	1
	<CO_2 Zeroing>	1
GAS (MGU-800/MGU-810)	<GAS Warm Up>	1
	<GAS Zeroing>	1
GAS (MGU-800/MGU-810)	<GAS Pump Regulating>	1
	<GAS Mixed Agents>[*5]	1
	<GAS Zero Cal. Required.>	1
	<GAS Cal. Required.>	1
SPIRO (MGU-810)	<SPIRO Warm Up>	1
	<SPIRO Calibration Active>	1
	<SPIRO Zeroing>	1
BIS (When HBX-800 is used)	<BIS Sensor Expired>[*5]	3
	<BIS Sensor Check in Progress>	3
	<BIS Ground Check in Progress>	3
	<BIS Noise>	3
	<BIS Perform "Sensor Check">	3
	<BIS SQI < 50%>	3
	<BIS Demo Sensor>	3
Non-Invasive Blood Pressure	<Initializing NIBP>	3
Recorder Unit	<Check Printer>[*6]	3
	<Check Paper>[*6]	3
	<Printer Busy>[*6]	1

Item	Message	Delay Time (sec.)
	<Check Cassette>*6	3
Central Printer	<Check Paper (Central)>*6	3
	<Check Cassette>*6	3
	<Printer Busy (Central)>*6	1
	<Check Central Printer>*6	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	<DSC-8500 Check Rotary SW>	1
	<DSC-8500 Check DIPSW>	1
System Configuration	<Check Equip. Config.>	1
	<Some parameters are not displayed due to the display layout setting.>	3
Check Connection, Check Reception, Interference	<Check System Conn.>	3
Data Transfer	<Uploading>	1
	<Upload Standby>	1

*1: ## indicates the remaining time.

*2: # indicates the channel number of BP.

*3: # indicates the channel number of TEMP.

*4: # indicates the label of SpO_2.

*5: On "Initial Settings" menu, the alarm level can be selected from Level M, L, N (Notification). (Default : Notification)

*6: The alarm generation can be inhibited depending on the setting.

*7: Displayed when lead-off or sensor-off condition remains after the power is turned ON, monitoring is resumed, or a patient is discharged.

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 8

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 on the main unit." P11-40)

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™ Model)

Message
<Unit Failure>
<Ext SpO_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
<Ext SpO_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>

Message
<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 8

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 HPD-800/HPD-810 and Capnostat 5)

Message
<Upper CO_2-E Alarm>
<Lower CO_2-E Alarm>
<Upper CO_2-I Alarm>
<Check airway adapter.>
<Zeroing>
<Warming Up>
<Zero CO_2 Adapter>
<Unknown Sensor>
<Out of Range>

❑CO_2 (HCP-800/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>

❑Gas (MGU-800/810)

Message
<Upper CO_2-E Alarm>
<Lower CO_2-E Alarm>
<Upper CO_2-I Alarm>
<Upper O_2-E Alarm>
<Lower O_2-E Alarm>
<Upper O_2-I Alarm>
<Lower O_2-I Alarm>
<Upper N_2O-E Alarm>
<Lower N_2O-E Alarm>
<Upper N_2O-I Alarm>
<Lower N_2O-I Alarm>
<Upper AGT-E Alarm>*
<Lower AGT-E Alarm>*
<Upper AGT-I Alarm>*
<Lower AGT-I Alarm>*
<Upper MAC Alarm>
<Upper RR Alarm>
<Lower RR Alarm>
<Apnea Alarm>
<GAS Check Water Trap Class>
<GAS Check Water Trap Conn.>
<GAS Pump OFF>
<GAS Pump Regulating>
<GAS Check Sample Line>
<GAS Zeroing Failure>
<GAS Unit Failure>
<GAS Warming Up>
<GAS Zeroing>
<GAS Mixed Agents>
<GAS Zeroing Required.>
<GAS Calibration lost>
<GAS Change Water Trap>
<Out of Range (CO_2)>
<Out of Range (RR_CO_2)>
<Out of Range (N_2O)>
<Out of Range (O_2)>
<Out of Range (Agent)>*

*: The selected or detected label will be displayed for the agent label.

❑SPIRO (MGU-810)

Message
<SPIRO Warming Up>
<SPIRO Check FlowSensor Class>
<SPIRO Check Flow Sensor Conn>
<SPIRO Calibration Active>
<SPIRO Zeroing>
<SPIRO Unit Failure>
<Out of Range (TV)>
<Out of Range (MV)>
<Out of Range (PRESS)>
<Upper RR Alarm>
<Lower RR Alarm>
<Apnea Alarm>
<Upper MV Alarm>
<Lower MV Alarm>
<Upper PEAK Alarm>
<Lower PEAK Alarm>
<Upper PEEP Alarm>
<Lower PEEP Alarm>

❑BIS (When HBX-800 is used)

Message
<Upper BIS Alarm>
<Lower BIS Alarm>
<Check Sensor>
<Expired Sensor>
<Invalid Sensor>
<Sensor Too Many Uses>
<Sensor Usage > 24hrs.>
<Check Sensor Conn.>
<Sensor Check in Progress>
<Ground Check in Progress>
<High Impedance>
<Artifact>
<Lead OFF>
<BIS Perform "Sensor Check">
<SQI < 15%>
<SQI < 50%>
<Artifacts>
<BISx Failure>
<BISx Incompatible>

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-8500. If the connection cable is disconnected from the ventilator, <Vent. Alarm> will generate, but <VENT_COMM> alarm will not generate on the DS-8500.
- The ventilator alarm sound is set to OFF (factory default).
- The alarm sound can be turned ON on the "Tone/Volume" menu. (☞"Tone/Volume" P10-22)

❑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-8500. If the connection cable is disconnected from the ventilator, <Vent. Alarm> will generate, but <VENT_COMM> alarm will not generate on the DS-8500.
- The ventilator alarm sound is set to OFF (factory default).
- The alarm sound can be turned ON on the "Tone/Volume" menu. (☞"Tone/Volume" P10-22)

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.
- On the DS-LAN II network, ventilator alarm factors of the SERVO-U/n/air will not be notified to the central 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" P7-2)
(☞"Electrode Placement" P7-3)

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" P7-2)
(☞"Electrode Placement" P7-3)

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" P7-2)
(☞"Electrode Placement" P7-3)

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" P7-2)
  (☞"Electrode Placement" P7-3)
- 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" P7-2)
  (☞"Electrode Placement" P7-3)
- 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" P7-2)
(☞"Electrode Placement" P7-3)

❑<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" P7-2)
  (☞"Electrode Placement" P7-3)
- 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.

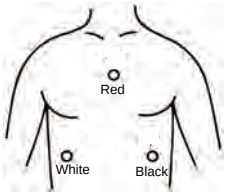
Cause

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" P7-2)
(☞"Electrode Placement" P7-3)

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" P7-2)
(☞"Electrode Placement" P7-3)

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" P7-2)
  (☞"Electrode Placement" P7-3)
- 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" P7-2)
  (☞"Electrode Placement" P7-3)

Invasive Blood Pressure

❑The PDP value is displayed as "---" .

Cause

The BP measured by the HM-800 Multi Module is labeled as [IAP].

Solution

PDP will not be calculated if the BP measured by the HM-800 is labeled as [IAP]. When using the HM-800, do not set the BP label to IAP. When monitoring PDP, set the BP label to [IAP].

❑<BP* Transducer OFF> is displayed.

Cause

The BP (1 to 8) 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

The 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, HG-820)

❑<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.

❑<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.

Cause 3

The system was started with the sensor and cable connected.

Solution

Disconnect the SpO_2 cable and sensor from this equipment, and press the standby switch to enter into standby mode. Then, press the standby switch again to cancel the standby mode, and when the monitoring screen is displayed, connect the cable and sensor.

❑<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, HG-810)

❑<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.

❑<SpO_2 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 or Module, 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 on the main unit.

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 (fixed key or 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.

❑<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.

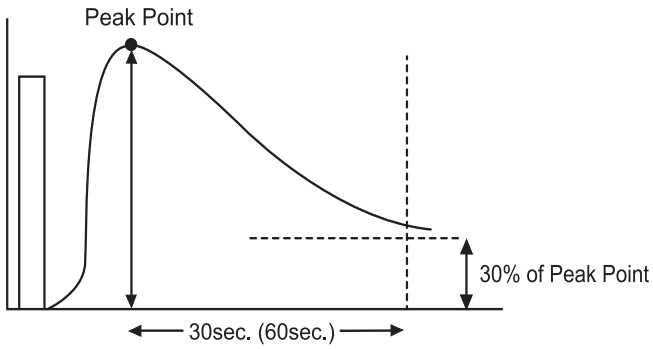
Solution

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).

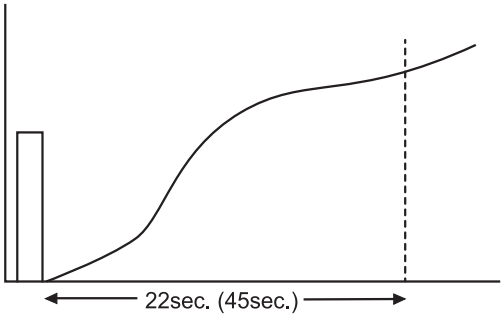
Solution

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").

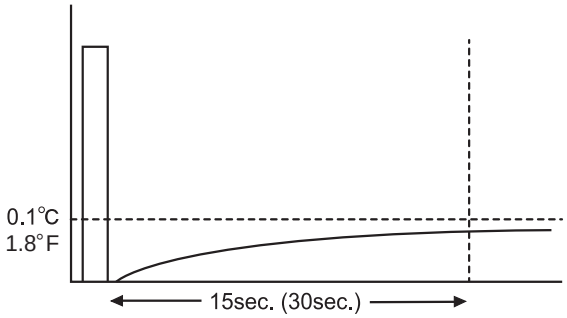
Solution

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-800/HCP-810)

❑<CO_2 Check Sample Line> is displayed.

Cause 1

The sampling tube is clogged.

Solution

Replace the sampling tube.

Cause 2

The sampling line is bent or pinched.

Solution

Make sure that the sampling line is properly allocated.

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

Cause

An error has occurred during the initialization at power ON.

Solution

Reconnect the cable of HCP-800/HCP-810 and reboot.
If the message is still displayed, CO_2 unit failure can be considered. Contact your nearest service representative.

❑<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.

❑Waveforms and measurement data are not displayed.

Cause

The gas module is used at the same time.

Solution

The HCP-800/HCP-810 and gas module cannot be used at the same time. If used, CO_2 measurement by the gas module will be prioritized.

❑<Check CO_2 Exhaust Port> is displayed.

Cause

The exhaust port of the HCP-800/HCP-810 is clogged.

Solution

After removing the occlusion by checking the exhaust port and gas exhaust system connection, press the [Resume CO_2 Meas.] key on the CO_2 setup menu for 2 seconds.
If the message is still displayed, CO_2 unit failure can be considered. Contact your nearest service representative.

CO_2 Measurement (HPD-800/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-800/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.
(☞"CO2 Concentration (Mainstream Method)" P7-69)

❑<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 waveform are not printed for manual printing or alarm printing.

Cause

The second and third waveform are not set on the printing setup screen.

Solution

Set the second and third waveform on the corresponding printing setup screen.

❑The power supply LED on the HR-800 is lit in orange, and [Print Start/Stop] key does not function.

Cause

The U-LINK setting is incorrect.

Solution

Press the [Initial Settings]>[External Device]>[U-LINK] keys.

If HR-800 is connected via MGU-800, select [MGU-800].

If HR-800 is not connected via MGU-800, select [OFF].

❑<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.

❑The <Check HLX Conn.> message is displayed.

Cause

The connection with the HLX is interrupted.

Solution

Check the connection between the HLX and DSC-8500.
Check if [HLX] is set for the corresponding port under [Initial Settings] > [External Device] > [Main Unit HP-800].

❑The <HLX Ver.> message is displayed.

Cause

Installation has failed.

Solution

Check the software version of the HLX.
If "HLX-801 V99-99" is displayed, perform the installation again.
If the software version of "HLX-561 V01-09" or older is displayed, contact your nearest service representative.

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

❑Even though the numeric data displayed on the extended display unit or central monitor is exceeding the alarm limit, alarm does not generate.

Cause

The parameters not displayed on the display unit (LC-8015/8019) are displayed on the central monitor/extended display unit as [All Data] is selected for "Numeric Data External Output" under [Initial Settings] > [System] > [Other].

Solution 1

For the parameters which requires alarm monitoring on the extended display unit/central monitor, make sure to display those on the display unit (LC-8015/8019).

Solution 2

For the extended display unit/central monitor, if monitoring is necessary for only the parameters displayed on the display unit (LX-8015/8019), select [Displayed Data] for "Numeric Data External Output" under [Initial Settings] > [System] > [Other].

❑Nothing is displayed on the screen, and the power supply indicator is not lit.

Cause 1

The display unit is not properly attached to the main unit.

Solution

Properly connect the display unit to the main unit.
(☞Maintenance Manual "System Construction" P1-2)

Cause 2

The main unit or LCD unit is malfunctioning.

Solution

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

❑Nothing is displayed but the main power indicator is lit in red.

Cause

The main unit or LCD unit is malfunctioning.

Solution

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

Cause 2

The battery for the backup memory is depleted.

Solution

The battery needs to be replaced. Contact your nearest 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 (fluorescent light tube) or LCD unit needs to be replaced. Contact your nearest 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 your nearest service representative.

❑The system does not start although the power 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.

❑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 your nearest 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 your nearest 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 your nearest service representative.

❑The <DSC-8500 Failure>, <DSC-8500 Check Unit>, or <DSC-8500 Out of Operating Temp. Range> message is displayed.

Cause

The hardware failure has occurred.

Solution

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

❑The <Display Unit Backlight Failure>, <Check Display Unit>, or <Display Unit Out of Operating Temp. Range> message is displayed.

Cause

The display unit failure has occurred.

Solution

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

❑The <DSC-8500 Check Rotary SW> message 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 your nearest 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 your nearest service representative.

❑The <DSC-8500 Check Short-Term Battery> or <DSC-8500 Check Long-Term Battery> message is displayed.

Cause

The battery is depleted or malfunctioning.

Solution

The battery needs to be replaced. Contact your nearest service representative.

❑<Some parameters are not displayed due to the display layout setting.> 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

During auto display configuration, the quantity of measured parameters exceeded the displayable parameters.

Solution

If there are parameters which measurements are not actually performed, please disconnect their probes/cables.

❑The <Check Equip. Config.> message is displayed.

Cause 1

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.

Cause 2

On the "External Device" setting, the set external device is duplicated.

Solution

Check the "External Device" setting, and make sure that the selected external device is not duplicated. The external devices other than Vigilance, INVOS, BIS cannot be duplicated.
The FLOW-i and MGU-800/MGU-810, FLOW-i and ventilator cannot be set simultaneously.

❑The <Check Module-LAN Comm> message is displayed.

Cause

The connection of the module-LAN connector on the main unit or external device is not secured.

Solution

Securely connect the cable to the module-LAN connector.
Securely connect the cable to the external device.
If the error persists, contact your nearest service representative.

Super Unit

❑The system does not start although the power is turned ON.
The power supply LED on the Super Unit does not light in green.
<Super Unit 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 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.

Cause 3

The fuse inside the Super Unit has blown out.

Solution

Immediately turn off the power and stop using the device. Contact your nearest service representative.

Cause 4

The Super Unit is not properly connected to the HSA-80 Adapter.

Solution

Insert the Super Unit into the HSA-80 until a click sound is heard.

❑<Super Unit 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 stop using the device. Contact your nearest service representative.

❑<Super Unit Analog Unadjusted> is displayed.

Cause

One of ECG, respiration, or BP is not adjusted.

Solution

Parameter cannot be measured properly in this situation. Contact your nearest service representative.

❑<Super Unit Check DIP-SW> is displayed.

Cause

The DIP switch setting has been changed.

Solution

Contact your nearest service representative.

❑<Super Unit Check SD Card> is displayed.

Cause

The SD Card is defective or the Super Unit is malfunctioning.

Solution

Contact your nearest 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-8500 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. Reconnect the cable if necessary. If the knob is loose, tighten it securely.

❑When the HS-8000/DS-8007 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.

❑The upload process does not start.

Cause 1

[Transport] is not selected for "Data Transfer" under [Initial Settings > System > Other].

Solution

Check if [Transport] is selected for "Data Transfer" under [Initial Settings > System > Other]. If not, select [Transport].

Cause 2

On the central monitor, "Data Transfer" function is set to [OFF].

Solution

Check the setting on the central monitor.

NOTE

- For the software version and model type of the central monitor compatible to data transfer function, refer to your nearest service representative.

❑The data cannot be transferred from the DS-8007 to DS-8500.

Cause

CF Card is not inserted to the DS-8500.

Solution

Use the CF Card to save the full disclosure waveform data.

❑Alarm settings, parameter settings are not transferred from the transport monitor. The confirmation window to apply the alarm settings, parameter settings of the transport monitor is not displayed.

Cause

The "Data for Transfer" setting is set to [OFF].

Solution

Check if the "Data for Transfer" setting is set to [ON]. If not, set it to [ON].

IB-8004 Input Box

❑The system does not start although the power of the DS-8500 is turned ON. <IB-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 module connection cable is not properly connected.

Solution

Turn OFF the power, and make sure that the module connection cable is securely connected.

❑<IB# Slot# Module Disconnected> is displayed.

Cause 1

Infrared communication port is unclean.

Solution

Remove the expansion module, clean the infrared communication port, and insert the expansion module again.

Cause 2

The slot used in the IB-8004 is malfunctioning.

Solution

Insert the expansion module into another slot. If it operates properly, the IB-8004 needs to be repaired.
Stop using the equipment and contact our service representative.

Cause 3

IB-8004 or expansion module is malfunctioning.

Solution

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

❑The LAN-ID indicator remains flashing.

Cause 1

The LAN ID setting is not correct.

Solution

Check the LAN-ID setting dial and make sure to set the correct LAN-ID.
If two units of IB-8004 are connected, the same LAN ID cannot be set.

Cause 2

The IB-8004 is malfunctioning.

Solution

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

❑Power is not supplied to the expansion module.

Cause 1

The expansion module is not properly connected.

Solution

Disconnect and connect the expansion module.

Cause 2

The slot used in the IB-8004 is malfunctioning.

Solution

Insert the expansion module into another slot. If it operates properly, the IB-8004 needs to be repaired. Stop using the equipment and contact our service representative.

Cause 3

IB-8004 or expansion module is malfunctioning.

Solution

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

❑<IB-8000-# Failure>, <IB-8000-# Check Unit>, or <IB-8000-# Out of Operating Temp. Range> message is displayed.

Cause

The IB-8004 is malfunctioning.

Solution

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

Expansion Module

❑The system does not start although the power of the DS-8500 is turned ON.

Cause 1

The power cable of the main unit is not connected.

Solution

Turn OFF the power, and make sure that the module connection cable is securely connected.

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.

Cause 3

The standby switch of the display unit is set to OFF.

Solution

Turn ON the standby switch on the display unit.

❑<Check Conn.> is displayed.

Cause 1

Infrared communication port is unclean.

Solution

Remove the expansion module, clean the infrared communication port, and insert the expansion module again.

Cause 2

The slot used in the IB-8004 is malfunctioning.

Solution

Insert the expansion module into another slot. If it operates properly, the IB-8004 needs to be repaired.
Stop using the equipment and contact our service representative.

Cause 3

IB-8004 or expansion module is malfunctioning.

Solution

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

❑Power is not supplied to the expansion module.

Cause 1

The expansion module is not properly connected.

Solution

Disconnect and connect the expansion module.

Cause 2

The slot used in the IB-8004 is malfunctioning.

Solution

Insert the expansion module into another slot. If it operates properly, the IB-8004 needs to be repaired.
Stop using the equipment and contact our service representative.

Cause 3

IB-8004 or expansion module is malfunctioning.

Solution

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

❑The following error messages related to the expansion module are displayed on the monitor. <IB# Slot# Module Failure>, <IB# Slot# Analog Unadjusted>, <IB# Slot# Check Module>, <IB# Slot# Out of Operating Temp. Range>

Cause

The module connected to the IB-8004 slot is malfunctioning.

Solution

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

❑The "IB# Slot# Module Disconnected" message is displayed.

Cause 1

The expansion module is not properly connected.

Solution

Disconnect and connect the expansion module.

Cause 2

The slot used in the IB-8004 is malfunctioning.

Solution

Insert the expansion module into another slot. If it operates properly, the IB-8004 needs to be repaired. Stop using the equipment and contact our service representative.

Cause 3

IB-8004 or expansion module is malfunctioning.

Solution

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

Extended Display Unit

❑Nothing is displayed on the extended display unit. The same display with the main unit is displayed.

Cause

The video cable of the extended display unit is connected to the external monitor connector of the main unit.

Solution

Connect the cable to the extended display unit connector on the main unit.

❑The touch panel does not function on the extended display unit.

Cause

The serial communication cable is not connected.

Solution

Connect the serial communication cable of the extended display unit to the extended serial connector (COM A, COM B) of the main unit.

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-8500 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, Servo-u/n/air

- 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

Multigas Unit

❑The "GAS Unit Failure" message is displayed.

Cause

A hardware failure was detected on the gas unit.

Solution

For details, please refer to our service representative.

❑<GAS Check Sample Line> is displayed.

Cause

The sampling line or water trap is completely occluded.
The moisture inside the sampling line is drawn towards the water trap to be removed.

Solution 1

Check if the sampling line is occluded. Remove the occlusion if found.

Solution 2

Replace the sampling line, water trap.

❑<GAS Check Water Trap> is displayed.

Cause 1

The water trap of the gas unit is not inserted, or not properly attached.

Solution

Insert the water trap.
Make sure the water trap is properly connected.

Cause 2

Water trap is partly clogged or damaged.

Solution

Replace the water trap.

❑<GAS Check Water Trap Class> is displayed.

Cause

The patient classification is not corresponded to the used water trap and the sampling tube.

Solution

Make sure the patient classification is corresponded to the used water trap and the sampling tube.
When the patient classification is "Adult" or "Child", make sure to use the water trap and sampling line intended for adult/pediatric.
When the patient classification is "Neonate", make sure to use the water trap and sampling line intended for neonate.

❑<GAS Mixed Agents Detection> is displayed.

Cause

More than one halogenated anesthetic gas exists.

Solution 1

Make sure that multiple anesthetic gases are not used.
Make sure that anesthetic gas carburetor setting is correct.

Solution 2

If the problem persists, contact our service representative.

❑<GAS Zeroing Failed> is displayed.

Cause

The zero calibration process has not been properly completed.

Solution

Perform the manual zero calibration again.

❑<SPIRO Unit Failure> is displayed.

Cause

The hardware failure of the SPIRO unit was detected.

Solution

Refer to our service representative.

❑<SPIRO Check FlowSensor Class> is displayed.

Cause 1

The flow sensor is disconnected or not securely connected.

Solution

Make sure that the flow sensor is securely connected.

Cause 2

The flow sensor is damaged.

Solution

Replace the flow sensor.

Cause 3

The used flow sensor does not correspond to the patient classification setting on the monitor.

Solution

Make sure that the used flow sensor corresponds to the patient classification setting.
When the patient classification is adult, use the flow sensor intended for adult.
When the patient classification is "Child" or "Neonate", use the flow sensor intended for pediatric.

❑<SPIRO Check Flow Sensor Conn> is displayed.

Cause

This message will be displayed when flow sensor is disconnected during multigas monitoring.

Solution

To cease multigas monitoring, press the [Alarm Silence] key. The message will disappear, and the alarm will be silenced.

Solution

To continue monitoring, plug in the flow sensor. This will clear the message and silence the alarm.

SvO_2/CCO Monitor

❑The numeric data is not displayed.

Cause 1

The cable is not properly connected.

Solution 1

Connect the following cable securely.

Oximeter, CCO Measurement Device	Connection Cable	
	For STATUS II Connector	For Serial Connector
Vigilance	CJ-406RI-70Vigi (x1)	CJO-04RS4
Vigilance CEDV	CJ-406RI-70Vigi (x1)	CJO-04RS4
VigilanceII	CJ-402RI-70SVi (x1)	CJ-502
Vigileo	CJ-402RI-70SVi (x1)	CJ-502
EV1000	CJ-406RI-70Vigi (x1)	CJO-04RS4
PiCCO2	CJO-19RS5 (x1)	CJO-18RS5
PulsioFlex	-	CJ-725*1

*1: To connect the PulsioFlex PC4000, USB to RS-232C connector cable (UC-232A, ATEN) specified by PULSION Medical Systems is required.

Cause 2

The "External Device" setting is not correct.

Solution

Select from [Vigilance/Vigileo] / [PiCCO] / [PulsioFlex] for the port function on the "External Device" setup screen.

Cause 3

The measurement data is not displayed on the external device.

Solution

The measurement data of 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 monitor will display CCO/CCI data only if CCO is measured on the external device.

Cause 5

The network setting of the monitor does not correspond with that of the external device.

Solution

The network setting of the monitor is fixed to the default setting of each external device and cannot be changed. Make sure that the network setting of the connecting oximeter is in default setting.

In Case of Vigilance/Vigileo:

Check if the network is set as follows.

For procedure to check the Vigilance/Vigileo network setting, refer to the operation manual for the Vigilance/ Vigileo.

- Device: IFM Out
- Baud Rate: 19200bps
- Parity Bit: none
- Stop Bit: 1
- Data Bit: 8
- Flow Control: 2 sec.

In Case of PiCCO:

Check if the network is set as follows.

For procedure to check the PiCCO network setting, refer to the operation manual for the PiCCO.

- RS232C protocol: PiCCO2 V3.0

In Case of PulsioFlex:

Check if the network is set as follows.

For procedure to check the PulsioFlex network setting, refer to the operation manual for the PulsioFlex.

- RS232C protocol: PulsioFlex V1.0

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.

Cause 7

The software version of PiCCO does not correspond.

Solution

Check the software version of PiCCO. The compatible version is PiCCO2 V3.0 or higher.

Cause 8

The software version of PulsioFlex does not correspond.

Solution

Check the software version of PulsioFlex. The compatible version is PulsioFlex V1.0 or higher.

BIS Monitor (A-2000/A-3000)

❑The numeric data is not displayed.

Cause 1

If 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 or status connector of the main unit or the STATUS II connector of the HP-800.

BIS (When HBX-800 is used)

❑<BISx Disconnected> is displayed.

Cause 1

The BISx is disconnected.

Solution

Verify all cable connections and connect the BISx correctly.

Cause 2

The BISx cable is defective.

Solution

Check the cable including the connector part, and replace the cable if necessary.

Cause 3

The BISx is defective.

Solution

Replace the BISx.

❑<BIS High Impedance, Check Sensor> is displayed.

Cause 1

The sensor is not fully in contact with patient's skin.

Solution

Attach the electrode firmly to patient's skin.

Cause 2

The sensor application is incorrect.

Solution

Read instructions on sensor package to ensure correct sensor placement.

Cause 3

The patient interface cable (PIC cable) is defective.

Solution

Replace the patient interface cable (PIC cable).

Cause 4

The BISx is defective.

Solution

Replace the BISx.

❑<BIS Sensor Disconnected> is displayed.

Cause 1

The sensor is disconnected.

Solution

Connect the sensor.

Cause 2

Poor or contaminated connection between the sensor and patient interface cable (PIC cable).

Solution

Clean the connection part, and connect them properly.

Cause 3

The patient interface cable (PIC cable) is disconnected.

Solution

Connect the patient interface cable (PIC cable) correctly.

Cause 4

The patient interface cable (PIC cable) is defective.

Solution

Replace the patient interface cable (PIC cable).

Cause 5

The BISx is defective.

Solution

Replace the BISx.

❑<BIS Perform "Sensor Check"> is displayed.

Cause 1

At least one element of sensor has too high impedance, and "Sensor Check" window is closed before sensor check completes.

Solution

Press the "Sensor Check" key to start the sensor check process and ensure that <PASS> is displayed.

Cause 2

The sensor application is incorrect.

Solution

Read instructions on sensor package to ensure correct sensor placement.

Cause 3

The sensor is not properly connected.

Solution

Verify that the sensor is properly connected.

Cause 4

The patient interface cable (PIC cable) is defective.

Solution

Replace the patient interface cable (PIC cable).

Cause 5

The BISx is defective.

Solution

Replace the BISx.

❑<Artifacts> is displayed.

Situation: The signal quality is less than half of the level desirable for optimal monitoring conditions.

NOTE

- This message may occur as the results of artifact (non-EEG signal) such as those generated from motion (patient movement or eye blinks) or the presence of electrocautery, warming blankets, or other devices.

Cause 1

Artifact, such as those generated by motion or eyeblinks, is causing loss of EEG recognition.

Solution

If <Artifacts> appears on the display, attempt to identify and eliminate artifact source.

Cause 2

EMG bar indicates electrical activity that may be interfering with EEG recognition.

Solution

If EMG bar is illuminated, attempt to determine and eliminate cause.

Cause 3

The patient interface cable (PIC cable) is defective.

Solution

Make sure that sensor check passes. If not, replace the patient interface cable (PIC cable).

Cause 4

The BISx is defective.

Solution

Replace the BISx.

❑<BIS SQI < 15%> is displayed.

Situation: The signal quality is too low to accurately calculate a BIS value.
The BIS value and other trend variables that are adversely affected by artifact are not displayed.

NOTE

- This message may occur as the results of artifact (non-EEG signal) such as those generated from motion (patient movement or eye blinks) or the presence of electrocautery, warming blankets, or other devices.

Cause 1

Artifact, such as those generated by motion or eyeblinks, is causing loss of EEG recognition.

Solution

If <BIS SQI < 15%> appears on the display, attempt to identify and eliminate artifact source.

Cause 2

EMG bar indicates electrical activity that may be interfering with EEG recognition.

Solution

If EMG bar is illuminated, attempt to determine and eliminate cause.

Cause 3

The patient interface cable (PIC cable) is defective.

Solution

Make sure that sensor check passes. If not, replace the patient interface cable (PIC cable).

Cause 4

The BISx is defective.

Solution

Replace the BISx.

❑<BISx Incompatible> is displayed.

Cause

The sensor is not compatible with the monitor configuration.

Solution

Replace the BISx.

❑<Check BIS Sensor, Perform Sensor Check> is displayed.

Cause

Problem is detected relating to sensor ground element, or sensor is using too much current.

Solution 1

Disconnect and examine sensor connection, clean any contamination, then perform "Sensor Check".

Solution 2

Replace the sensor if necessary, then perform "Sensor Check".

Solution 3

Replace the patient interface cable (PIC cable), then perform "Sensor Check".

Solution 4

Replace the BISx, then perform "Sensor Check".

❑<Replace BIS Sensor, Too Many Uses>, <Replace BIS Sensor, Invalid Sensor> is displayed.

Cause 1

Sensor has been connected and disconnected too many times.

Solution

Replace the sensor.

Cause 2

The sensor is invalid.

Solution

Replace the sensor.

❑<Sensor Usage > 24hrs.> is displayed.

Cause

The sensor was attached to the system for more than 24 hours.

Solution

Replace the sensor.

❑<BISx Failure> is displayed.

Cause

The BISx is defective.

Solution

Replace the BISx, then perform "Sensor Check".

❑The power indicator on the HBX-800 is lit in red.

Cause

The HBX-800 is defective.

Solution

Cease using the equipment and contact your nearest service representative to repair the equipment.

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 or status connector of the main unit or the Status II connector of the HP-800.

FLOW-i

❑The numeric data is not displayed. <Check FLOW-i Connection> is displayed.

Cause 1

The cable is disconnected or not properly connected.

Solution

Securely connect the connection cable to the serial or status connector of the main unit or the Status II connector of the HP-800.

Cause 2

The FLOW-i is in standby mode.

Solution

The numeric data will be displayed when the measurement is started on the FLOW-i.

Cause 2

The software version of the DS-8500 is not compatible with the FLOW-i.

Solution

The DS-8500 with the software version 09-01 and newer is compatible with the Flow-i.
The compatible software version of FLOW-i is system software version 02 and 03 (FCI Protocol version 0004 and 0005 respectively).

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.

TCM4/TCM5 FLEX

❑The numeric data is not displayed.

Cause 1

The cable is not properly connected.

Solution

Connect the following cable securely.

Transcutaneous Blood Gas Monitor	Connection Cable	
	For Status II Connector	For Serial Connector
TCM4	-	CJ-726 (straight) *1
TCM5 FLEX	-	CJ-725 (cross) *2

*1: To connect the TCM4, the cable specified by Radiometer Medical ApS is required.The communication will be enabled by connecting the CJ-726 and the cable specified by Radiometer Medical ApS.

*2: To connect the TCM5 FLEX and CJ-725, D-sub 9-pin male to male gender changer (inch screw) is required.

Cause 2

The "External Device" setting is not correct.

Solution

Select [TCM4/TCM5] 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 $tcpO_2$, $tcpCO_2$ 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 network setting of the monitor does not match with each external device.

Solution

The network setting of the monitor cannot be changed. Make sure that the network setting of the connecting device is as follows.For details of the network setting on the TCM4 and TCM5 FLEX, refer to Radiometer Medical ApS.

In case of TCM4:

- RS-232C Protocol: Monlink

In case of TCM5 FLEX:

- RS-232C Protocol: Monlink2.0

Cause 5

The software version of TCM4 or TCM5 FLEX does not correspond.

Solution

Check the software version of TCM4 or TCM5 FLEX.
For details of the network setting on the TCM4 and TCM5 FLEX, refer to Radiometer Medical ApS.

TCM4: Version 3.04

TCM5 FLEX: Version 1.18

❑<Check TCM Conn.> is displayed.

Cause 1

The cable is disconnected, or not securely connected.

Solution

Connect the cable correctly.

Cause 2

The power of the external device has been turned OFF.

Solution

Turn ON the power of the external device.

Cause 3

The TCM series device other than TCM4, TCM5 FLEX is connected.

Solution

Only TCM4, TCM5 FLEX can be connected. Check the model type of the external device.

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 card/SD card is not inserted or not correctly set in the CF card slot/SD card slot.

Solution

Set the CF card/SD card into the CF card slot/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

The software version of the DS-8500 main unit is older than that of the data stored in the CF card.

Solution 1

Update the software version of the main unit.

Cause 2

There is no data on the CF card.

Solution 2

Check if the CF card is readable. Or, check if the data is present on the CF card. Pressing "Yes" will not start the reading process of compatible data. Error message will be displayed instead.

Cause 3

Error is detected during the read process.

Solution 3

The data may not be correctly written on the CF 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 card to write the data.

Solution 1

Check the remaining card capacity.
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 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 card is used.

Solution 3

Use the specified CF card.

❑There is no data on the CF card/SD card.

Cause

There is not data on the CF card/SD card.

Solution

Check if the CF card/SD card is readable. Or, check if the data is present on the CF card/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 unformatted.
The data stored in the card is damaged.
The card has been already used on another equipment.

Solution 1

Use the specified memory card.
Remove the card and insert it again properly.
Format the card on the used equipment. (All previous data will be deleted.)

Solution 2

If the error persists, contact our service representative.

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	Description	Default	At Power ON	At Discharge
Mode Selection	Main Mode 1 to 9, Sub Mode 1 to 6, Extended Display1 1 to 3, Extended Display2 1 to 3	Main Mode 1	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	
ID	Numeric, Alphabet, Symbol (20 characters)	Blank	Backup	Initialize
Patient Name	Numeric, Alphabet, Symbol (16 characters)	Blank	Backup	Initialize
Patient Classification	Adult, Child, Neonate	Adult	Depends on the "Patient Classification" setting under [Initial Settings>User I/ F>Power ON/Discharge].	
Sex	Male, Female	No selection	Backup	Initialize
Team	Red, Orange, Yellow, Yellow-green, Green, Light Blue, Blue, Purple	Red	Backup	Initialize
Birth Date	Birth Date	Blank	Backup	Initialize
Age	0 year to 150 years or 0 day to 999 days	0 year	Backup	Initialize
Height	0.0 cm to 300.0 cm	0.0 cm	Backup	Initialize
Weight	0.0 kg to 350.0 kg	0.0 kg	Backup	Initialize
BSA	0.00 m^2 to 9.99 m^2	0.00 m^2	Backup	Initialize
Blood Type	A, B, O, AB Rh +/-	Blank	Backup	Initialize
Pacemaker	Used, Not used	Not Used	Depends on the setting under [Initial Settings>User I/F>Power ON/Discharge].	
Impedance Measurement	ON, OFF	ON	Depends on the setting under [Initial Settings>User I/F>Power ON/Discharge].	
Admit Date	Year, Month, Day	Blank	Backup	Initialize

Alarm

Item	Description	Default	At Power ON	At Discharge
System Alarm	Suspend, ON	Suspend	-	-
HR*3	ON, OFF 20 bpm to 300 bpm 5 bpm increments	ON 40 bpm to 120 bpm	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge]. If "Main Mode" setting is [Backup] ; Depends on the "Alarm" setting under [Power ON/Discharge].	
PR _IBP*3 PR_SpO_2*3	ON, OFF 20 bpm to 300 bpm 5 bpm increments	OFF OFF to OFF		
Asystole*1	ON, OFF 3 sec. to 10 sec. 1 sec. increments	ON 5 sec.		
VF*1	ON, OFF	ON		
VT*1	ON, OFF	ON		
Slow_VT	ON, OFF	ON		
Run	ON, OFF 2 beats to 8 beats 1 beat increments	ON 3 beats		
Couplet	ON, OFF	OFF		
Pause	ON, OFF 1.5 sec. to 5 sec. 0.5 sec. increments	OFF 3.0 sec.		
BIGEMINY	ON, OFF	OFF		
TRIGEMINY	ON, OFF	OFF		
FREQUENT	ON, OFF 1 bpm to 50 bpm 1 bpm increments	OFF, 10 bpm		
Tachy	ON, OFF	ON		
Brady	ON, OFF	ON		
Ext Tachy*3	ON, OFF 22 bpm to 300 bpm 5 bpm increments	OFF 150 bpm		
Ext Brady*3	ON, OFF 20 bpm to 295 bpm 5 bpm increments	OFF 30 bpm		
Triplet	ON, OFF	OFF		
R on T	ON, OFF 200 ms to 600 ms 8 ms increments	OFF 320ms		
Multiform	ON, OFF	OFF		
Vent Rhythm	ON, OFF	OFF		
SVT	ON, OFF 2 beats to 10 beats 1 beat increments	OFF 6 beats		
Irregular RR	ON, OFF 10% to 20% 5% increments	OFF 10%		
Prolonged RR	ON, OFF	OFF		
S FREQUENT	ON, OFF 1 bpm to 50 bpm 1 bpm increments	OFF 10 bpm		
S Couplet	ON, OFF	OFF		
VPC	ON, OFF	OFF		
SVPC	ON, OFF	OFF		
Pacer not Capture	ON, OFF 80 ms to 480 ms 8 ms increments	OFF 320 ms		

Item	Description	Default	At Power ON	At Discharge
Pacer not Pacing	ON, OFF 20 bpm to 200 bpm 5 bpm increments	OFF 50 bpm		
HR Lower Limit for VT	120 bpm, 140 bpm	120	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge]. If "Main Mode" setting is [Backup]; Depends on the "Alarm" setting under [Power ON/Discharge].	
HR Lower Limit for Run*4	0 bpm to 100 bpm 10 bpm increments	40 bpm		
HR Lower Limit for SVT	100 bpm to 250 bpm 10 bpm increments	150 bpm		
ST1 to ST12(mm)*2	ST All Alarm ON, OFF Individual Alarm ON, OFF ±20 mm 1 mm increments	ST All Alarm OFF Individual Alarm OFF OFF to OFF		
ST1 to ST12(mV)*2	ST All Alarm ON, OFF Individual Alarm ON, OFF ±2.00mV0.1mV increments	ST All Alarm OFF Individual Alarm OFF OFF to OFF		
BP1 (mmHg) *5	ON, OFF 0 mmHg to 300 mmHg 5 mmHg increments	ON SYS: 80 to 180 DIA: OFF to OFF MEAN: OFF to OFF		
BP1 (kPa) *5	ON, OFF 0 kPa to 40.0 kPa 0.5 kPa increments	ON SYS: 10.0 to 24.0 DIA: OFF to OFF MEAN: OFF to OFF		
BP2 to BP8 (mmHg) *5	ON, OFF 0 mmHg to 300 mmHg 5 mmHg increments	OFF SYS: OFF to OFF DIA: OFF to OFF MEAN: OFF to OFF		
BP2 to BP8 (kPa) *5	ON, OFF 0 kPa to 40.0 kPa 0.5 kPa increments	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".

*3: For HR, Ext Tachy, Ext Brady, 60 bpm or lower can be set in 1 bpm increments. For PR_SpO_2, 25 bpm or lower can be set in 1 bpm increments.

*4: "HR Lower Limit for Run" can be set in 5 bpm increments for 50 bpm and above.

*5: For BP, 50 mmHg/7.0 kPa or lower can be set in 2 mmHg/0.2 kPa increments.

Item	Description	Default	At Power ON	At Discharge
CVP (mmHg) (kPa) *2	ON, OFF 0 mmHg to 300 mmHg 5 mmHg increments 0 kPa to 40 kPa 0.5 kPa increments	OFF SYS: OFF to OFF DIA: OFF to OFF MEAN: OFF to OFF	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge]. If "Main Mode" setting is [Backup]; Depends on the "Alarm" setting under [Power ON/Discharge].	
CVP (cmH_2O)	ON, OFF 0 cmH_2O to 40 cmH_2O 1 cmH_2O increments	OFF SYS: OFF to OFF DIA: OFF to OFF MEAN: OFF to OFF		
RR_IMP*3 RR_VENT*3 RR_CO_2*3	ON, OFF 5 Bpm to 150 Bpm 5 Bpm increments 5 Bpm to 150 Bpm (Neonate) 2 Bpm increments	ON 5 Bpm to 30 Bpm		
Apnea	ON, OFF 10 sec. to 60 sec. 1 sec. increments	ON 15 sec.		
SpO_2	ON, OFF 50%SpO_2 to 100%SpO_2 1%SpO_2 increments	ON 90%SpO_2 to OFF		
EXT SpO_2	ON, OFF 50-90%SpO_2 1%SpO_2 increments	ON 80%SpO_2		
SpCO	ON, OFF 1%SpCO to 40%SpCO 1%SpCO increments	OFF		
SpMet	ON, OFF 1%SpMet to 15%SpMet 1%SpMet increments	OFF		
SpHb	ON, OFF 1.0 g/dL to 24.5 g/dL 0.1 g/dL increments	OFF		
NIBP (mmHg)	ON, OFF 10 mmHg to 300 mmHg 5 mmHg increments	ON SYS: 80 to 180 DIA: OFF to OFF MEAN: OFF to OFF		
NIBP (kPa)	ON, OFF 1.5 kPa to 40.0 kPa 0.5 kPa increments	ON SYS: 10.0 to 24.0 DIA: OFF to OFF MEAN: OFF to OFF		
TEMP1 to TEMP8 (°C)	ON, OFF 30-45°C 0.5°C increments	OFF, OFF to OFF		
Tb (°C)	ON, OFF 30-45°C 0.5°C increments	OFF, OFF to OFF		
CO_2-E (mmHg) *1	ON, OFF 1 mmHg to 100 mmHg 1 mmHg increments	OFF	Depends on the "Main Mode" setting under [Setup>Initial Settings>User I/F>Power ON/ Discharge].	
CO_2-E (kPa) *1	ON, OFF 0.1 kPa to 13.3 kPa 0.1 kPa increments	OFF		
CO_2-E (%) *1	ON, OFF 0.1% to 13.3% 0.1% increments	OFF		
CO_2-I (mmHg) *1	ON, OFF 1 mmHg to 4 mmHg 1 mmHg increments	OFF		
CO_2-I (kPa) *1	ON, OFF 0.1 kPa to 0.4 kPa 0.1 kPa increments	OFF		
CO_2-I (%) *1	ON, OFF 0.1% to 0.4% 0.1% increments	OFF		
O_2-E (%) *1	ON, OFF 18-100%	OFF		
O_2-I (%) *1	ON, OFF 18-100%	OFF		
N_2O-E (%) *1	ON, OFF 0-100%	OFF		
N_2O-I (%) *1	ON, OFF 0-100%	OFF		

Item		Description	Default	At Power ON	At Discharge
ISO-E (%) , HAL-E (%) , ENF-E (%) *1		ON, OFF 0.5-6.0%	OFF	Depends on the "Main Mode" setting under Initial Settings>User I/F>Power ON/Discharge]. If "Main Mode" setting is [Backup]; Depends on the "Alarm" setting under [Power ON/Discharge].	
ISO-I (%) , HAL-I (%) , ENF-I (%) *1		ON, OFF 0.5-6.0%	OFF		
SEV-E (%) *1		ON, OFF 0.5-8.0%	OFF		
SEV-I (%) *1		ON, OFF 0.5-8.0%	OFF		
DES-E (%) *1		ON, OFF 0.5-18.0%	OFF		
DES-I (%) *1		ON, OFF 0.5-18.0%	OFF		
MAC*1		ON, OFF 0.1 to 9.9	OFF		
PEAK*1		ON, OFF 8-100cmH_2O	OFF		
PEEP*1		ON, OFF 2 cmH_2O to 50 cmH_2O	OFF		
MV-E*1		Adult: ON, OFF 0.5 L/min to 20 L/min Child, Neonate: ON, OFF 0.5 L/min to 5 L/min	OFF		
BIS (When HBX-800 is used)		ON, OFF 1 to 99 increments of 1	ON 40 to OFF		
Alarm Settings (Setup)	Alarm Suspend Time	1 min., 2 min.	2 min.	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
	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.]/[240min.]/[360min].	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		

*1: When the numeric data acquired from FLOW-i is displayed, alarms cannot be set. Also, these alarms will not generate.

*2: For CVP, 50 mmHg/7.0 kPa or lower can be set in 2 mmHg/0.2 kPa increments.

*3: For RR, 1 Bpm increments may be applied depending on the "RR Alarm Increment" settings. (☞Maintenance Manual "User I/F" P5-14)

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	Description	Default	At Power ON	At Discharge
Leads	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	*1	
Size	Auto, x1/4, x1/2, x1, x2, x4	ECG1 to ECG12 x1	*1	
Filter Mode	Monitor, Diagnosis, ESIS	Monitor	Backup	Backup
Synchronized Mark/Tone	ECG, SpO_2-1, SpO_2-2, BP, Auto, OFF	Auto	Backup	Backup
Pacemaker	*Same with "Patient Admit/Discharge" section.			
Pacemaker Pulse	ON, OFF	OFF	Backup	Backup
Pace Pulse Mask Time	Auto, 10ms, 20ms, 40ms, OFF	Auto	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	Initialize
HR Average	Average, Instant	Average	Backup	Backup
HR Delay	ON, OFF	OFF	Backup	Backup
Drift Filter	ON, OFF	OFF	Backup	Backup
AC Filter	ON, OFF	ON	Backup	Backup
Auto Lead	ON, OFF	OFF	Backup	Backup
3-lead Override	ON, OFF	OFF	Backup	Backup
ST/VPC/Arrhy. Alarm Display	ON, OFF	ON	Backup	Backup
ECG Analog Output	Disp. Lead, Selected Lead	Disp. Lead	Backup	Backup
ECG Waveform Display during Lead-OFF	ON, OFF	OFF	Backup	Backup
Noise Detection	ON, OFF	OFF	Backup	Backup
Chest Lead-OFF	Enable, Disable	Enable	Backup	Backup

*1: Depends on the "Main Mode" setting under [Setup>Initial Settings>User I/F>Power ON/Discharge]. If "Main Mode" setting is [Backup] ; Depends on the "ECG1, ECG2 Size" setting under [Setup>Initial Settings>User I/F>Power ON/Discharge].

RESP

Item	Description	Default	At Power ON	At Discharge
Size	x1/4, x1/2, x1, x2, x4	x1	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	Initialize
RR Synchronized Mark	ON, OFF	ON	Backup	Backup
RR/APNEA Alarm Source	Auto, Impedance, Ventilator, CO_2/GAS	Auto	Backup	Backup
CVA Detect	ON, OFF	OFF	*1	

RESP

Item	Description	Default	At Power ON	At Discharge
Impedance Measurement	*Same with "Patient Admit/Discharge" section.			
Impedance Detection Lead	I, II	II	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	

*1: Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge]. If "Main Mode" setting is [Backup]; Depends on the "CVA Detect" setting under [Power ON/Discharge].

SpO_2 (General)

Item	Description	Default	At Power ON	At Discharge
Size	x1/4, x1/2, x1, x2, x4	x1	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	Initialize
Synchronized Mark/Tone	*Same with ECG setting.			
Alarm during NIBP	ON, OFF	ON	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
Label	None/Auto/RH/LH/RF/LF/OT	None		

SpO_2 (Nellcor™)

Item	Description	Default	At Power ON	At Discharge
Second Alarm	OFF, 10, 25, 50, 100	OFF	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	Initialize

SpO_2 (Masimo Unit)

Item	Description	Default	At Power ON	At Discharge
SpO_2 Averaging	2-4 sec, 4-6 sec, 8 sec, 10 sec, 12 sec, 14 sec, 16 sec	8 sec.	*1	
Pulse Sensitivity	Normal, High, APOD	Normal	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
FAST SAT	ON, OFF	OFF		
Perfusion Index	ON, OFF	ON		
Signal IQ Wave	ON, OFF	OFF		
SpHb Averaging	Short, Medium, Long	Medium		

*1: Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge]. If "Main Mode" setting is [Backup] ; Depends on the "SpO_2 Averaging" setting under [Power ON/Discharge].

NIBP

Item	Description	Default	At Power ON	At Discharge
Patient Classification	*Same with "Patient Admit/Discharge" section.			
Quick Measurement	ON, OFF	ON	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
NIBP Auto Mode	Cont., 1min, 2min, 2.5min, 5min, 10min, 15 min, 20min, 30min, 60min, 120min, Lumbar Mode, OFF	OFF	*1	

NIBP

Item	Description	Default	At Power ON	At Discharge
Dyna Alert	ON, OFF	ON	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
Sight Inflation	ON, OFF	OFF		
Oscillograph	ON, OFF, Real Time	OFF		
Mean	ON, OFF	ON		
PR Display	ON, OFF	OFF		
End Tone	ON, OFF	ON		
NIBP Erase Time	60 min., 120 min.	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, BP7, BP8, T1, T2, T3, T4, T5, T6, T7, T8, Tb, CO_2, O_2, N_2O, AGENT, SpCO, SpMet, SpHb, MV, PEEP, PEAK, BIS	No Selection		
Auto Mode with Start/ Stop key	ON, OFF	ON	Backup	Backup
Time Display	Elapsed, Meas.	Elapsed Time	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
Periodic Measurement Starting Time	Time, Meas.	Time		

*1: Depends on the "Main Mode" setting under [Setup>Initial Settings>User I/F>Power ON/Discharge]. If "Main Mode" setting is [Backup] ; Depends on the "NIBP Auto Mode" setting under [Setup>Initial Settings>User I/F>Power ON/Discharge].

BP1 to 8

Item	Description	Default	At Power ON	At Discharge
Scale*1	20, 50, 75, 100, 150, 200, 250, 300 mmHg	200 mmHg 50 mmHg (BP2)	*2	
	4, 8, 12, 16, 20, 24, 32, 40 kPa	24 kPa 8 kPa (BP2)		
Label	BP*, ART, PAP, CVP, ICP, IAP, LVP, US1 to US5	BP*: BP1 to BP8	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
Synchronized Mark/Tone	*Same with ECG setting.			
Display Type	S/M/D, S/D, M	S/M/D	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
Wave Filter	6, 8, 12, 40 Hz	12 Hz		
Mean Wave	ON, OFF	OFF		
Respiration Filter	ON, OFF	OFF		
Alarm during NIBP	ON, OFF	ON		
ART Catheter Check Message	ON, OFF	OFF		

*1: The scale selection will differ depending on the label.

*2: Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge]. If "Main Mode" setting is [Backup]; Depends on the "BP Scale" setting under [Power ON/Discharge].

TEMP1 to TEMP8

Item	Description	Default	At Power ON	At Discharge
Label	T#, Tsk, Tre, Tes, Tco, US1 to US7	T* (T1 to T8)	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	

ΔTEMP-A to TEMP-D

Item	Description	Default	At Power ON	At Discharge
ΔTemp-A	(T1-T8) to (T1-T8)	T1 to T2	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
ΔTemp-B	(T1-T8) to (T1-T8)	T3 to T4		
ΔTemp-C	(T1-T8) to (T1-T8)	T5 to T6		
ΔTemp-D	(T1-T8) to (T1-T8)	T7-T8		

CO_2 (Capnostat 5/HPD-800/HPD-810)

Item	Description	Default	At Power ON	At Discharge
Scale	0-50, 0-100 mmHg	0-50	*1	
	0-4, 0-8, 0-10 kPa	0-4		
	0-4, 0-8, 0-10%	0-4		
$EtCO_2$ Peak Duration	10 sec, 20 sec, OFF	10 sec.	*2	
CO_2 Source Priority	MGU-800, HS-8000	HS-8000	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
O_2 Compensation	0-100%	21%		
N_2O Compensation	ON, OFF	OFF		
Anesthetic Compensation	0.0-20.0%	0.0%		
Atmospheric Pressure	400 mmHg to 850 mmHg	760 mmHg		

*1: Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge]. If "Main Mode" setting is [Backup]; Depends on the "CO_2 Scale" setting under [Power ON/Discharge].

*2: Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge]. If "Main Mode" setting is [Backup]; Depends on the "$EtCO_2$ Peak Duration" setting under [Power ON/Discharge].

CO_2 (COVIDIEN/HCP-800/HCP-810)

Item	Description	Default	At Power ON	At Discharge
Scale	0-50, 0-100 mmHg	0-50	*1	
	0-4, 0-8, 0-10 kPa	0-4		
	0-4, 0-8, 0-10%	0-4		
$EtCO_2$ Peak Duration	10 sec, 20 sec, OFF	10 sec.	*2	
CO_2 Source Priority	MGU-800, HS-8000	HS-8000	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	

* 1: Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].If "Main Mode" setting is [Backup]; Depends on the "CO_2 Scale" setting under [Power ON/Discharge].

*2: Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].If "Main Mode" setting is [Backup]; Depends on the "$EtCO_2$ Peak Duration" setting under [Power ON/Discharge].

SPIRO, Ventilator, FLOW-i

Item	Description	Default	At Power ON	At Discharge
AWP Scale	10, 20, 30, 50, 120 cmH_2O	50 cmH_2O	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
AWF Scale	5, 10, 20, 50, 180 L/min	50 L/min		
AWV Scale	50, 250, 500, 1000, 3000 mL	500 mL		

Cardiac Output (CO)

Item	Description	Default	At Power ON	At Discharge
Auto Start	ON, OFF	ON	Backup	Backup
Time Scale	30 sec., 60 sec.	30 sec.	Backup	Backup

Multigas Concentration, FLOW-i

Item	Description	Default	At Power ON	At Discharge
GAS_CO_2 Scale*	50, 100 mmHg	0-50 mmHg	*2	
	4, 8, 10kPa	4 kPa		
	4, 8, 10%	4%		
GAS_O_2 Scale*1	18-30, 18-60, 18-100, 0-30, 0-60, 0-100%	18-30%	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
Agent Selection	ISO, HAL, ENF, SEV, DES, Auto	Auto		
Agent Scale*1	0-4, 0-8, 0-16%	4%		
Flow Rate (When adult/child water trap is used.)	120, 150, 200 ml/min	200 ml/min		
Flow Rate (When neonate water trap is used.)	70, 100, 120 ml/min	120 ml/min		
Wave Clip*1	ON, OFF	ON		
CO_2 Source Priority	MGU-800, HS-8000	MGU-800		
	Anesthesia, HS-8000*1	Anesthesia		

*1: This setting is enabled when FLOW-i is connected.

*2: Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge]. If "Main Mode" setting is [Backup]; Depends on the "CO_2 Scale" setting under [Power ON/Discharge].

BIS (A-2000/A-3000)

Item	Description	Default	At Power ON	At Discharge
Short Trend 2nd Parameter	SR, EMG, SQI, OFF	SR	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	

BIS (When HBX-800 is used)

Item	Description	Default	At Power ON	At Discharge
Scale	EEG1, EEG2	±50μV	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
Short Trend 2nd Parameter	SR, EMG, SQI, OFF	SR		
Continuous Impedance Check	ON, OFF	ON	Initialize	Initialize
Smoothing Rate	15, 15, 30 sec.	15 sec.	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
EEG Filter	ON, OFF	ON		

Stopwatch

Item	Description	Default	At Power ON	At Discharge
Label 1	9 alphanumeric characters	TIMER1	Backup	Backup
Label 2		TIMER2	Backup	Backup

SvO_2/CCO

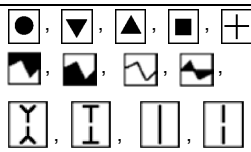
Item	Description	Default	At Power ON	At Discharge
STAT Mode	ON, OFF	OFF	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
Index Display	ON, OFF	OFF		
Short Trend Selection	CO+SVV, CO, SVV	CO+SVV		

INVOS

Item	Description	Default	At Power ON	At Discharge
Lt-rSO_2	ch1, ch2, ch3, ch4	ch1	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/Discharge].	
Rt-rSO_2	ch1, ch2, ch3, ch4	ch2		
S1-rSO_2	ch1, ch2, ch3, ch4	ch3		
S2-rSO_2	ch1, ch2, ch3, ch4	ch4		

Data Review

Graphic Trend

Item	Description	Default	At Power ON	At Discharge
Trend A	HR, ST (I to V6) , SpO_2, PR_ SpO_2, VPC, NIBP, BP1 to 8, PR_IBP, PDP, CPP, TEMP1 to 8, Tb, ΔTEMP-A to D, RR_IMP, APNEA, $EtCO_2$, $InspCO_2$, RR_ GAS, $ExpN_2O$, $InspN_2O$, O_2, ExpAGT, InspAGT, MAC, BIS, SR, EMG, SQI, SvO_2, $ScvO_2$, CCO, CCI, BT, RR_VENT, $ExpO_2$, Insp O_2, PI, PVI, SpCO, SpMet, SpHb, PEAK, PEEP, ExpMV	Upper Row: HR, NIBP Lower Row: SpO_2, TEMP1, RR_IMP	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	
Trend B		Upper Row: HR, BP1, TEMP1, NIBP Lower Row: SpO_2, $EtCO_2$, ST (II) , RR_CO_2		
Trend C		Upper Row: HR, TEMP1, BP1, NIBP Lower Row: SpO_2, $InspO_2$, $EtCO_2$, InspAGT		
Trend D		N/A		
Trend E		Upper Row: EMG, SQI Lower Row: BIS, SR		
Time	20min. 1h, 2h, 4h, 8h, 12h, 16h, 24h (LC-8019T) 10min, 1h, 2h, 4h, 8h, 12h, 16h, 24h (LC-8015T)	4 hours		
Display Selection				
Background Color	White, Black, Gray	Black	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	
Mark	Small, Big	Small		

Graphic Trend

Item	Description		Default	At Power ON	At Discharge
Scale, Display Selection	HR, PR_SpO_2, PR_IBP	100, 200, 300 bpm	300 bpm		
	ST (V to V6)	± 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 BP8	20, 50, 100, 150, 200, 300 mmHg 4, 8, 16, 20, 24, 40 kPa	200 mmHg 24 kPa		
	PDP, CPP	20, 50, 100, 150, 200, 300 mmHg 4, 8, 16, 20, 24, 40 kPa	200 mmHg 24 kPa		
	NIBP	100, 150, 200, 300 mmHg 16, 20, 24, 40kPa	200 mmHg 24 kPa		
	TEMP1 to TEMP8,	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		
	SpO_2	0-100, 50-100, 80-100%SpO_2	80-100%SpO_2		
	SpCO	0-20, 0-40, 0-100%SpCO	0-20%SpCO		
	SpMet	0-10, 0-15, 0-100%SpMet	0-10%SpMet	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	
	RR_IMP, RR_VENT, RR_GAS	50, 100, 150 Bpm	50Bpm		
	Apnea	15 sec., 30 sec.	15 sec.		
	CO_2	50, 100 mmHg 4.0, 8.0, 10.0 kPa 4.0, 8.0, 10.0%	50 mmHg 4.0 kPa 4.0%		
	O_2	50, 100%	100%		
	ΔO_2	3.0, 6.0, 9.0%	3%		
	N_2O	50, 100%	100%		
	Agent	4.0, 8.0, 10.0%	8%		
	PI	0-10, 0-20%	0-10%		
	PVI	0-30, 0-60, 0-100%	0-30%		
	PEAK	0-10, 0-20, 0-50, 0-100 cmH_2O	0-20 cmH_2O		
	PEEP	0-10, 0-20, 0-50, 0-100 cmH_2O	0-20 cmH_2O		
	MV	0.0-6.0, 0.0-12.0, 0.0 L/min to 20.0 L/min	0.0 L/min to 12.0 L/min		

Graphic Trend

Item	Description		Default	At Power ON	At Discharge
	SvO_2, $ScvO_2$	0-100, 50-100, 80-100%	0-100%		
	CCO	6, 12, 20 L/min	6 L/min		
	CCI	6.0, 12.0, 20.0 L/min/m^2	6 L/min/m^2		
	BT	20.0-45.0, 30.0-40.0°C	20.0-45.0°C		
	BIS	25, 50, 75, 100	100		
	SR	25, 50, 75, 100%	100%		
	SQI	0-100%	100%		
	EMG	30 dB to 80 dB	30 dB to 80 dB		
	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	Description	Default	At Power ON	At Discharge
Time	10sec., 30sec., 1min., 2min., 2.5min., 5min., 10min., 15min., 30min., 60min., NIBP	5 min.	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	
Group	A to F	A		
Fixed Parameters	0 to 6 param.	0 param.		
Parameter Selection	[H Module/Anes.] HR, VPC, ST, SpO_2-1, PR_SpO_2-1, SpO_2-2, PR_SpO_2-2, NIBP, BP1 to 8, PR-IBP, PDP, PCWP, CPP, T1 to 8, Tb, CO, $EtCO_2$, $InspCO_2$, RR-GAS, RR-IMP, RR-VENT, APNEA, O_2, N2O, Agent, E-TV, I-TV, E-MV, I-MV, P-PEAK, P-PAUSE, PEEP, P-MEAN, RES, COMP, TV 1sec, I/E RATIO, PI, PVI, SpCO, SpMet, SpHb, OFF			
	[SvO_2/CCO] SvO_2, $ScvO_2$, SaO_2, O_2EI, B-Temp, CCO, CCO-STAT, CCI, CCI-STAT, DO_2, RVEF, RVEFSTAT, VO_2, SV, SV-STAT, SVI, SVI-STAT, SVR, SVRI, SVV, EDV, EDV-STAT, EDVI, EDVISTAT, MAP, ESV, ESVI, CFI, iCO, iCI, iSV, iSVI, iSVR, iSVRI, GEDV, GEDI, GEF, EVLW, ELWI, PVPI, ITBV, ITBI, VO_2e, VO_2I, VO_2Ie, iB-Temp, SQI, MAP, CVP, HR, PR, SpO_2, iMAP, iCVP, iAvgPR, PO_2I, HGB, dPmx, CO CAL, OFF			
	[Ventilator] E-TV, I-TV, MV, SMV, P-PEAK, P-PAUSE, PEEP, P-MEAN, E-RES, I-RES, COMP, FiO_2, P-MIN, S-COMP, D-COMP, S-RR, I/E RATIO, RES, $VTCO_2$, $etCO_2$, VCO_2, Flowee, Ti, Ti/Ttot, PEEPtot, Elastance, Cdyn, D-Chara, Leakage, S-Mve//Mve, Tc, WOBvent, WOBpat, CPAP, P0.1, Edipeak, Edmin, SBI, VT/PBW, OFF			

Tabular Trend

Item	Description	Default	At Power ON	At Discharge
	[Anes.] Flowee, Ti, Ti/Ttot, Sup.Air, SupO_2, SupN_2O, OFF			
	[Other] BIS, SQI, EMG, SR, SEF, TOTPOW, IMP, Lt-rSO_2, Rt-rSO_2, S1-rSO_2, S2-rSO_2, tcpO_2, tcpCO_2, OFF			
	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_CO_2, RR_IMP, APNEA, TEMP1, TEMP2	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	
	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, O_2-I, 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, O_2-I, AGT-I		
Filtering (Sampling Interval)	10sec., All	All	Initialize	Initialize

OCRG

Item	Description	Default	At Power ON	At Discharge
Display Duration	12 min., 24 min.	12 min.	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	
Waveform	Impedance, CO_2	Impedance		
Respiration Waveform Size (Impedance)	x 1/4, x1/2, x1, x2, x4	x1		
Respiration Waveform Size (CO_2)	50, 100 mmHg	50 mmHg		

Recall

Item	Description	Default	At Power ON	At Discharge
Waveform	ECG1, ECG2, BP1 to 8, SpO_2, RESP, CO_2, GAS_CO_2	ECG1, ECG2	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ 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 8, TEMP1 to 8, Tb, CO_2, O_2, N_2O, AGENT, SpCO, SpMet, SpHb, PEAK, PEEP, MV	All ON		
List	14 waves	14 waves		
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 8, TEMP1 to 8, Tb, CO_2, O_2, N_2O, AGENT, Event 1 to 8, SpCO, SpMet, SpHb, PEAK, PEEP, MV	All ON		

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)	OFF		
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		

Tone/Volume

Item	Description	Default	At Power ON	At Discharge
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	Description	Default	At Power ON	At Discharge
Layout	Standard/Right, Standard/Right&Bottom, Large/Right, Large/Right&Bottom, 12-Lead/Right, 12-Lead/Right&Bottom, Numeric/Bottom 1 row, Numeric/Bottom 2 rows Standard/Left, Standard/Left&Bottom, Large/Left, Large/Left&Bottom, 12-Lead/Left, 12-Lead/Left&Bottom, Standard/Right&Bottom 2 rows, Standard/ Left&Bottom 2 rows	Large/Bottom 2 rows	Depends on the setting under [Initial Settings>User I/F>Power ON/Discharge].	
Auto Display Config.	Type-1, Type-2	Type-1		
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 8, NIBP, NIBP LIST, SpO_2-1, SpO_2-1 PR_SpO_2-1, PR_SpO_2-1, RR_IMP, RR_CO_2, RR_VENT, TEMP1 to 8, TEMP1 2, TEMP3 4, TEMP5/6, TEMP7/8, SpO_2-2, SpO_2-2/PR_SpO_2-2, PR_SpO_2-2 ΔTEMP-A to D, VENT, P-V F-V, SvO_2 CO, BIS, CO_2, O_2, N_2O, Agent, RR/CO_2/Agent/O_2/N_2O, CO_2/Agent/O_2/N_2O, RR/Agent/O_2/N_2O, Agent/O_2/N_2O, Agent/N_2O, HEMO, HEMO-I, STOPWATCH, SpCO, SpMet, SpHb, GAS/SPIRO, SPIRO, Sp*-1, Sp*-2, VENT-A, VENT-B, Hemo/etc-A, Hemo/ etc-B, Extended Function-A	HR, SpO_2-1, NIBP, BP1, RR_IMP, CO_2	Depends on the setting under [Initial Settings>User I/F>Power ON/Discharge].	
Waveform	OFF, ECG1 to ECG12, ECG1 Cascade to ECG12 Cascade, BP1 to BP8, BP Overlap 1 to BP Overlap 3, SpO_2-1, SpO_2-2, RESP, AWF, AWP, AWV, CO_2, O_2, Agent, Block Cascade, RR Overlap 1 to 3, EEG1,2	ECG1, SpO_2-1, BP1, RESP, CO_2		
Enlarged Waveform	ON, OFF	OFF		
Sweep Speed	Circ.: 6.25, 12.5, 25, 50 Vent.: 6.25, 12.5, 25	Circ.: 25 Vent.: 6.25		
Short Graphic Trend	Short Trend Selection ON, OFF, Overlap Display Length: 0, 5, 10, 15, 20, 25, 30 min.	OFF 15 min.		

Display Configuration

Item	Description		Default	At Power ON	At Discharge
User Key	OFF, Home, Menu, Minimize, User Key, Main 1 to 9, Extended Display 1 Mode 1 to 3, Extended Display 2 Mode 1 to 3, Sub Mode 1 to 6, BP1 to 6 Scale, Initialize Scale, Alarm Silence, Alarm Suspend, NIBP Start/Stop, NIBP Cont., Print Start/Stop, Monitor Suspend, Night Mode, Freeze, Key Lock, Mode Select., Oxygenator Mode, Admit/Discharge, Rapid Discharge, NIBP Start/Stop, HR/PR, HR/PR Source, NIBP Cont., BP Zero, Lead, ECG Size (All Leads), Monitor Suspend, Scale, Scale (Extended Display), SpO_2 Display ON/OFF, CO_2 Display ON/OFF, GAS Display ON/OFF, Suspend CO_2, Auto Display Config., Enlarged Display, 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, All), Manual Printing, Display Config., Time/Date, Stopwatch, Group 1, Group 2, Group 3, Group 4, Group 5, Event, Print (LBP) Cancel, Oxygenator Mode, Drug Calculation		User Key Down 1/2 Menu, Alarm Silence, Admit/Disch., BP Zero, NIBP Start/Stop, NIBP Auto Mode, NIBP Cont., NIBP List Alarm Setup., 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	Depends on the setting under [Initial Settings>User I/F>Power ON/Discharge].	
Detail Setup (Numeric Data)	Alarm Limit Display	Graph, Numeric, OFF	Graph	Depends on the setting under [Initial Settings>User I/F>Power ON/Discharge].	
	At Alarm Occurrence	Reversed, 3D	Reversed		
	ST/VPC/Arrhy. Alarm Display	ON, OFF	ON	Backup	Backup
Detail Setup (Wave)	Grid	ON, OFF, Bold	ON	Depends on the setting under [Initial Settings>User I/F>Power ON/Discharge].	

Display Configuration

Item	Description		Default	At Power ON	At Discharge
Detail Setup (Wave)	Scale	ON, Bold1, Bold2	ON	Depends on the setting under [Initial Settings>User I/F>Power ON/Discharge].	
	Thickness	Thin, Regular, Thick	Regular		
	Clip	ON, OFF	ON		
	CO_2 Wave Fill	ON, OFF	ON		
	O_2 Wave Fill	ON, OFF	OFF		
	Agent Wave Fill	ON, OFF	OFF		
	12-Lead ST Wave	Ref., Average	Ref.		
	12-Lead ST Short Trend	OFF, Fill, Plot	Fill		
	BP Overlap 1	BP1 to 8	BP1 to 4		
	BP Overlap 2		N/A		
	BP Overlap 3		N/A		
	RR Overlap 1	CO_2, O_2, Agent	CO_2, O_2, Agent		
	RR Overlap 2		N/A		
	RR Overlap 3		N/A		
	Block Cascade	Waveform Quantity: 2 to 6 Displayed Waveform: OFF, ECG1 to 12, BP1 to 8, SpO_2, RESP, AWF, AWP, CO_2, O_2, Agent	Waveform Quantity: 2 Displayed Waveforms: ECG1, ECG2		
	Graphic/Tabular Trend	ON, OFF	OFF		
	Graphic/Tabular Trend Size	Big, Medium, Small	Small		
Short Graphic Trend	Short Trend	Link with Numeric, Link with Waveform, User Setup	Link with Numeric	Depends on the setting under [Initial Settings>User I/F>Power ON/Discharge].	
	Short Trend Scale	Trend, Waveform	Graphic Trend		
	Display Parameter	ON, Gray, OFF	OFF		
	Reference Line Function	Enable, Disable	Disable		
	Cursor Function	Enable, Disable	Disable		
	Cursor Linkage	Tabular Trend, Graphic Trend, Zoom Wave	Tabular Trend		
	Short Trend Overlap 1		OFF, OFF, OFF, OFF		
	Short Trend Overlap 2		OFF, OFF, OFF, OFF		
	Short Trend Overlap 3		OFF, OFF, OFF, OFF		
	Data Resolution	5 sec., 10 sec., 30 sec.	5 sec.		

NOTE

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

Manual Printing

Item		Description	Default	At Power ON / At Discharge
Basic	Printer	Bedside, Central	Bedside	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].
	Waveform	ECG1, ECG2, ECG3, BP1 to 8, SpO_2, RESP, CO_2, O_2, Agent, AWF, AWP	ECG1	
	Print Duration	24 sec., Cont.	24 sec.	
	Delay Time	None, 8sec., 16 sec.	8 sec.	
12-lead	12-Lead Waveform Format (Bedside)	3 wavesx4, 2 wavesx6	3 waves x 4	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].
	12-Lead Waveform Format (Laser)	3 wavesx4, 3 wavesx4+Rhy., 6 wavesx2, 12 waves	3 waves x 4	
	12-Lead Analysis Format (Bedside)	3 waves x 4	3 waves x 4 (fixed)	
	12-Lead Analysis Format (Laser)	6 wavesx2 (2 pages), 6 wavesx2 (1 page), 3 wavesx4+Rhythm	6 wavesx2 (2 pages)	
	Position	Center, Proportional, OFF	Proportional	
	Wave Format	Regular, Reverse	Regular	
	Printer Auto Scale	ON, OFF	ON	
	Print Calibration	ON, OFF	ON	
	Lead Boundary	ON, OFF	ON	
Other Setup: Graphic Printing	Graphic Trend	Bedside, Central, Laser	Bedside	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].
	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	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].

Auto Printing

Item		Description	Default	At Power ON	At Discharge
Alarm Printing	Printing	ON, OFF	OFF	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	
	Factor	Alarm for each arrhythmia, parameter	All		
	Printer	Bedside, Central	Bedside		
	Waveform	ECG1, ECG2, ECG3, BP1 to 8, SpO_2, RESP, CO_2, O_2, Agent, AWF, AWP, Alarm	ECG1, Alarm Factor		
	Print Duration	12 sec., 24 sec.	12 sec.		
Periodic Printing	Periodic Printing	ON, OFF	OFF	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	
	Printer	Bedside, Central	Bedside		
	Waveform	ECG1, ECG2, ECG3, BP1 to 8, SpO_2, RESP, CO_2, O_2, Agent, AWF, AWP	ECG1		
	Periodic Interval	Interval, 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	Description	Default	At Power ON	At Discharge
QRS Classification	ON, OFF	ON	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	
Speed	50 mm/S, 25 mm/S	25 mm/S		
Print Calibration	Top, Each Page, OFF	OFF		
Print NIBP Data	ON, OFF	OFF		

Other Setup

Item		Description	Default	At Power ON	At Discharge
Night Mode	Mode	Manual, Timer	Manual	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	
	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		
	External Monitor Display during Night Mode	ON, OFF, OFF (Time Only)	ON		
Color	Background Color (Meas.) Background Color (Wave)	Black, Gray, Light Gray	Numeric Data: Black Waveform: Black	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	
	Palette	Light, Clear, Deep, Vivid	Vivid		
	HR	12 colors + White	6		
	ST		6		
	VPC		White		
	PACE		White		
	NIBP		8		

Other Setup

Item		Description	Default	At Power ON	At Discharge
	SpO_2(Ch1, Ch2)		4		
	SpCO (Ch1, Ch2)		4		
	SpMet (Ch1, Ch2)		4		
	SpHb (Ch1, Ch2)		4		
	CO_2		8		
	RESP		White		
	BP1, ART		1		
	PAP		4		
	CVP		8		
	ICP		7		
	IAP		12		
	LVP		2		
	US1 to US5 (BP)		White		
	BP2		8		
	BP3		4		
	BP4		6		
	BP5		2		
	BP6		12		
	BP7		9		
	BP8		7		
	TEMP1 to 8, Tb		2		
	Tsk, Tre, Tes, Tco, US1 to US7		2		
	AWF		6		
	AWP		4		
	AWV		8		
	BIS		2		
	INVOS		White		
	SvO_2+CO		White		
	Stopwatch		White		
Brightness	Brightness	7 levels	Top	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	
Stopwatch Label	1	9 alphanumeric characters	TIMER1	Backup	Backup
	2		TIMER2	Backup	Backup

Chapter 13 Accessories

Chapter 13 Accessories

Accessories

This section lists the accessories for the main unit (DSC-8500 series).

⚠ 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.

- DS-8500 System Operation Manual (This Manual)
- DS-8500 System Maintenance Manual
- Parts Replacement Label
- Double Washer Sems Screw M4x12: Q'ty 2 (For connecting the main unit and the display unit)
- Double Washer Sems Screw M4x65: Q'ty 2 (For connecting the main unit and the display unit)

Optional Accessories

The following products are available as optional accessories for the DS-8500 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
Adult Cuff (Large)	CUF-7101	Width 17cm, Reusable, Latex
Adult Cuff (Medium)	CUF-7102A	Width 14.5cm, Reusable, Latex
Adult Cuff (Small)	CUF-7103	Width 11cm, Reusable, Latex
Pediatric Cuff	CUF-7104	Width 10.5cm, Reusable, Latex
Infant Cuff	CUF-7105	Width 8.5cm, Reusable, Latex
Infant Cuff	CUF-8501	Width 8 to 13 cm
Pediatric Cuff	CUF-8502	Width 12 to 19 cm
Adult Cuff (Small)	CUF-8503	Width 17 to 25 cm
Adult Cuff (Medium)	CUF-8504	Width 23 to 33 cm
Adult Cuff (Large)	CUF-8505	Width 31 to 40 cm
Adult Cuff (Thigh)	CUF-8506	Width 38 to 50 cm
Air Hose (1.5m) General	OA-80APL1.5	For CUF-7101/7102A/7103/7104/7105
Air Hose (3.5m) General	OA-80APL3.5	For CUF-7101/7102A/7103/7104/7105
Air Hose (1.5m) General	OA-80APR1.5	For Rectus Connector Type
Air Hose (3.5m) General	OA-80APR3.5	For Rectus Connector Type
NIBP Extension Hose (1.5m)	OA-7110A	For CUF-7101/7102A/7103/7104/7105
NIBP Extension Hose (3.5m)	OA-7110B	For CUF-7101/7102A/7103/7104/7105

Item	Model Type	Note
Air Hose (1.5m) Neonate	OA-80NE1.5	For SunTech Medical Neonatal Soft Disposable BP Cuff
Air Hose (3.5m) Neonate	OA-80NE3.5	For SunTech Medical Neonatal Soft Disposable BP Cuff

Temperature Measurement (Manufactured by Fukuda Denshi)

Item	Model Type	Q'ty	Note
2ch Temperature Relay Cable	CJO-P01T-DA0.5	1	0.5m Use with YSI400 compatible probe
2ch Temperature Relay Cable	CJO-P01T-DA4.0	1	4m Use with YSI400 compatible probe

NOTE

- 700 series temperature probe cannot be used.

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
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
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-800/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-800/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.

Anesthetic Gas Concentration Measurement (Manufactured by Mindray Medical Sweden AB)

❑For MGU-800/810 Series, Artema Model

Sampling Devices

Item	Model Type	Note
DRYLINE Water Trap, Adult	60-13100-00	Non-sterile
DRYLINE Water Trap, Neonate	60-13200-00	Non-sterile
DRYLINE Airway Adapter, Straight	60-14100-00	Non-sterile, disposable
DRYLINE Airway Adapter, Elbow	60-14200-00	Non-sterile, disposable
DRYLINE Sampling Line, Adult	60-15200-00	Non-sterile, 2.5m, disposable
DRYLINE Sampling Line, Neonate	60-15300-00	Non-sterile, 2.5m, disposable
SPIRIT Flow sensor, Adult	60-16100-00	For MGU-810 series, single-use only
SPIRIT Flow sensor, Pediatric	60-16200-00	For MGU-810 series, single-use only
Calibration Gas	60-12001-00	
Calibration Gas Regulator	60-12000-00	
Exhaust Tube	60-12120-00	

BIS Measurement (Manufactured by Covidien)

Item	Model Type	Remarks
BISx	186-0195-SF	SW 1.13
Patient Interface Cable	186-0107	
BIS Extended Use Sensor	186-0160	
BIS Pediatric Sensor	186-0200	
BIS Quatro Sensor	186-0106	

⚠ CAUTION

- Avoid liquid ingress to the patient interface cable (PIC). Contact of fluids with the PIC sensor connector can interfere with PIC performance.
- To minimize the risk of patient strangulation, the patient interface cable (PIC) must be carefully placed and secured.
- When installing the BISx, it should not be closely attached to the patient. Secure it on the bedside rail or pole using a clip.
- BIS sensor is disposable. Do not reuse it.
- Do not reuse the BIS sensor to other patients. It may cause cross-infection.
- The duration for one usage should be within 24 hours.

Others (Manufactured by Fukuda Denshi)

Item	Model Type	Remarks
Ground cable	CE-12	
Ground cable	CE-01A	
Power Supply Cable	CS-34	
Extension Board	CC-82	
Extension Board	CC-83	
Display Unit Connection Cable	CJ-731B	2.5 m
Display Unit Connection Cable	CJ-731C	6 m
Display Unit Connection Cable	CJ-731D	10 m
Remote Control Unit	CF-820	
Printing Paper	OP050-01TDR	10 per box
Ethernet Branch Cable	CJ-522A	Length 1 m (For DS-LAN)
Ethernet Branch Cable	CJ-522B	Length 2 m (For DS-LAN)
Ethernet Branch Cable	CJ-522C	Length 4 m (For DS-LAN)
Ethernet Branch Cable	CJ-522D	Length 10 m (For DS-LAN)
Ethernet Branch Cable	CJ-522E	Length 20 m (For DS-LAN)
RS-232C Cable	CJ-725	Cross Cable with Core
CF Card	FCF-16GA	16GB, For full disclosure waveform
CF Card	FCF-128	128MB, For data transfer (for DS-8500)
CF Card	FCF-1000	1GB, For data transfer (for DS-8500)
SD Card	SD-1G	1GB, For data transfer (for HS-8000)
SD Card	SD-8G	8GB, For data transfer (for HS-8000)
DS-8007 Adapter	DSA-82	
Module Connection Cable	CJO-08SS0.3	module-LAN Cable 0.3 m
Module Connection Cable	CJO-08SS1.5	module-LAN Cable 1.5 m
Module Connection Cable	CJO-08SS3.5	module-LAN Cable 3.5 m
Module Connection Cable	CJO-08SS5	module-LAN Cable 5 m
Module Connection Cable	CJO-08SS10	module-LAN Cable 10 m
Unit Connection Cable	CJO-09SS0.3	U-Link Cable 0.3 m
Unit Connection Cable	CJO-09SS1.5	U-Link Cable 1.5 m
Unit Connection Cable	CJO-09SS5	U-Link Cable 5 m
AUX Connection Cable (0.65 m)	CJO-15RR0.65	Relay cable for HCP-810/HPD-810/HBX-800 Connects to the HS-8000
AUX Connection Cable (1.5 m)	CJO-15RR1.5	
AUX Connection Cable (3 m)	CJO-15RR3	
AUX Connection Cable LEM (0.36)	CJO-25TR0.36	Relay cable for HCP-810/HPD-810/HBX-800 Connects to the DS-8007/HM-801
AUX Connection Cable LEM (0.65)	CJO-25TR0.65	
AUX Connection Cable LEM (1.5)	CJO-25TR1.5	
AUX Connection Cable LEM (2.7)	CJO-25TR2.7	
Input Box Spacer	OAO-47A	
IB Clamp Base	OAO-51A	

Item	Model Type	Remarks
HS Fixing Base	OAO-52A	
HLX Holder for DS-8500	OAO-40A	For HLX-561
HLX-801 Mounting Bracket	OAT-8185A	
Main Unit Stand for DS-8500	OAO-44A	
HS Attachment Spacer	OAO-46A	
HS Rail Clamp	OAO-48A	
HS Suspension Base	OAO-49A	
Cover Panel	OAO-45A	
HS Pole Clamp	OAO-50A	
Telemetry Transmitter Module	HLX-801 (FA), HLX-801 (G)	
External Output Box	CJO-C01Q-SJ0.3	For HS-8000 series

❑External Equipment Connection Cable

Equipment	Model Type	Remarks
SV-300	CJ-401RI-70SV3	For Status II Connector
SERVO-i / SERVO-s/ SERVO-U/ SERVO-n/ SERVO-air	CJ-402RI-70SVi	For Status II Connector
SERVO-U/n/air (Alarm Detection Only)	CJO-27DJ2	For Status II Connector
PB 740/760/840	CJ-403RI-70PB	For Status II Connector
Evita (XL, 4, dura)	CJ-402RI-70SVi	For Status II Connector
VELIA, ASTRAL	CJO-23DR2	For Status II Connector
VS ULTRA	CJO-24DR2	For Status II Connector
Vigilance, Vigilance CEDV, EV1000	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
PiCCO2	CJO-18RS5	For Serial Connector
	CJO-19RS5	For Status II Connector
FLOW-i	CJ-502	For Serial Connector
	CJ-402RI-70SVi	For Status II Connector
Magnetic Card Reader/Barcode Reader	CJ-756	For Serial Connector
PulsioFlex PC4000	CJ-725	For Serial Connector[*1]
TCM4	CJ-726	For Serial Connector
TCM5 FLEX	CJ-725	For Serial Connector

[*1]: To connect the PulsioFlex PC4000, USB to RS-232C connector cable (UC-232A, ATEN) specified by PULSION Medical Systems is required.

Chapter 14 Specification

Chapter 14 Specification

Specification

This section states the specification of this equipment.

Main Unit: DSC-8500 Series

Size

265(W) x 263(H) x 117(D) mm (not including the protrusion)

Weight

5.5 kg (not including the accessory)

Environmental Conditions

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

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 (DS-8500 System)
Protection against Ignition of Flammable Gas	Not provided

Power Supply

Voltage	100-240 V AC
Frequency	50/60 Hz
Power Consumption	150 VA

Usable Life

6 years	According to self-certification (☞Maintenance Manual "Periodic Replacement" P7-1)

Display Unit: LC-8019T/8019TC/8015T/8015TC

Size

LC-8019T/LC-8019TC	468 (W) mm x 371 (H) mm x 56 (D) mm (not including the hinge and protrusion)
LC-8015T/LC-8015TC	395 (W) mm x 297 (H) mm x 50 (D) mm (not including the hinge and protrusion)

Weight

LC-8019T/LC-8019TC	6.0 kg (not including the accessory)
LC-8015T/LC-8015TC	3.5 kg (not including the accessory)

Environmental Conditions

Operating Temperature	10°C to 40°C
Operating Humidity	30% to 85% (non-condensing)
Operating Atmospheric Pressure	70 kPa to 106 kPa
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 basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests)
Degree of protection against electric shock	Class I Equipment (DS-8500 System)
Protection against Ignition of Flammable Gas	Not provided

Power Supply

Voltage	DC 18 V (Supplied from DSC-8500 series main unit)

Usable Life

6 years	According to self-certification

Super Unit: HS-8312N/8312M and HSA-80

Size

HS-8312N/8312M	85 (W) mm x 200 (D) mm x 100 (H) mm (not including the protrusion)
HSA-80	85 (W) mm x 188 (D) mm x 68 (H) mm (not including the protrusion)

Weight

HS-8312N/8312M	1.2 kg (not including the accessory)
HSA-80	0.2 kg (not including the accessory)

Environmental Conditions

Operating Temperature	10°C to 40°C
Operating Humidity	30% to 85% (non-condensing)
Operating Atmospheric Pressure	70 kPa to 106 kPa
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 basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests)
Type of protection against electric shock	Class I Equipment (DS-8500 System)
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
Protection against Ignition of Flammable Gas	Not provided

Power Supply

Voltage	HSA-80: DC 18 V (Supplied from DSC-8500 series main unit) HS-8000 Series: DC 12 V (Supplied from DSC-8500 series main unit via HSA-80)

Usable Life

6 years	According to self-certification (☞Maintenance Manual "Periodic Replacement" P7-1)

Expansion Unit: MGU-800/810 Series and HR-800

Size

MGU-801P/MGU-802 /MGU-803	125 (W) mm x 110 (H) mm x 200 (D) mm (not including the protrusion)
/MGU-811P/MGU-812 /MGU-813	125 (W) mm x 108.5 (H) mm x 200 (D) mm (not including the protrusion)
HR-800	87 (W) mm x 108.5 (H) mm x 100 (D) mm (not including the protrusion)

Weight

AGO_2 Gas Unit	MGU-801P	1.8 kg (not including the accessory)
	MGU-811P	1.8 kg (not including the accessory)
AG Gas Unit	MGU-802	1.7 kg (not including the accessory)
	MGU-812	1.8 kg (not including the accessory)
CO_2 Unit	MGU-803	1.7 kg (not including the accessory)
	MGU-813	1.8 kg (not including the accessory)
HR-800	0.44 kg (not including the accessory)	

Environmental Conditions

Operating Temperature	MGU Series 10°C to 35°C
	HR Series 10°C to 40°C
Operating Humidity	30% to 85% (non-condensing)
Operating Atmospheric Pressure	70 kPa to 106 kPa
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 basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests)
Type of protection against electric shock	Class I Equipment (DS-8500 System)
Degree of protection against electric shock	Respiration Gas (MGU-800/810): Type BF Applied Part
Protection against Ignition of Flammable Gas	Not provided
Voltage	MGU-800/810 Series: DC 18 V (Supplied from DSC-8500 series main unit)
	HR-800: DC 18 V (Supplied via DSC-8500 series main unit or MGU-800/810 series)

Usable Life

6 years	According to self-certification

Expansion Module: HM-800, HP-800, HG-810/820

Size

40 (W) mm x 100 (H) mm x 135 (D) mm (not including the protrusion)

Weight

HM-800	0.5 kg (not including the accessory)
HP-800	0.5 kg (not including the accessory)
HG-810/HG-820	0.5 kg (not including the accessory)

Environmental Conditions

Operating Temperature	10°C to 40°C
Operating Humidity	30% to 85% (non-condensing)
Operating Atmospheric Pressure	70 kPa to 106 kPa
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)
Type of protection against electric shock	Class I Equipment (DS-8500 System)
Degree of protection against electric shock	TEMP, BP, CO (HM-800): Type CF Applied Part
	SpO_2, SpCO, SpMet, SpHb (HG-810): Type CF Applied Part
	SpO_2 (HG-820) : Type CF Applied Part
Protection against Ignition of Flammable Gas	Not provided

Power Supply

Voltage	DC 12 V (Supplied from the DSC-8500 series main unit via IB-8004 Input Box)

Usable Life

6 years	According to self-certification

Gas Unit I/F: HPD-800/HPD-810 and CO_2 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)
Operating Atmospheric Pressure	70 kPa to 106 kPa
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 basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests)
The type of protection against electric shock	Class I Equipment (with DS-8500 system)
The degree of protection against electric shock	CO_2 : Type BF Applied Part
Protection against defibrillation discharge	Provided
Operation Mode	Continuous Operating Equipment
The degree of protection against ingress of water	IPX0 (no protection)
Protection against ignition of flammable gas	Not provided

Power Supply

Voltage	HCP-800/HCP-810: DC 12V HPD-800/HPD-810: DC 5V/12V (Supplied from DSC-8500 series Main Unit via HS-8000 AUX connector)

Usable Life

6 year	According to self-certification. (☞Maintenance Manual "Periodic Replacement" P7-1)

Input Box: IB-8004

Size

IB-8004	180 (W) mm x 137.5 (H) mm x 160 (D) mm (not including the protrusion)

Weight

IB-8004	1.3 kg (not including the accessory)

Environmental Conditions

Operating Temperature	10°C to 40°C
Operating Humidity	30% to 85% (non-condensing)
Operating Atmospheric Pressure	70 kPa to 106 kPa
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 basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests)
Type of protection against electric shock	Class I Equipment (DS-8500 System)
Protection against Ignition of Flammable Gas	Not provided

Power Supply

Voltage	DC 18 V (Supplied from DSC-8500 series main unit)

Usable Life

6 years	According to self-certification

BISx I/F Unit: HBX-800

Size

36 (W) mm x 87 (D) mm x 91 (H) mm (not including the protrusion)

Weight

0.2 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)
Operating Atmospheric Pressure	70 kPa to 106 kPa
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 (DS-8500 System)/Internally Powered Equipment (DS-8500 System)
Degree of protection against electric shock	BIS: Type BF Applied Part (When connected to BISx)
Protection against Ignition of Flammable Gas	Not provided
Waterproof/Dustproof	IPX0
Voltage	DC 12 V / 5 V

Usable Life

6 years	According to self-certification

Performance

This section states the performance of the DS-8500 system.

Display Panel

Display Device	19 inch TFT Color LCD (LC-8019T/LC-8019TC)
	15 inch TFT Color LCD (LC-8015T/LC-8015TC)
Resolution	19 inch: 1280×1024 pixel, refresh frequency 60Hz
	15 inch: 1024 pixel × 768 pixel, refresh frequency 60 Hz
Function Control	Touch Screen Method
Waveform Trace	Stationary Trace
Sweep Speed	ECG/SpO_2/BP (6.25 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s) RESP/ CO_2/O_2/AG (6.25 mm/s, 12.5 mm/s, 25 mm/s)

Operation

Touch Panel	Eight-Wire Resistive Analog Touch Screen
Jog Dial	With push switch
Fixed Keys	5 keys (NIBP Start/Stop, Home, Menu, Prev. Disp., Alarm Silence)

Alarm Function

Alarm Sound Pressure:	Standard Tone Maximum: 81 dB, Minimum: 48 dB

Clock Accuracy

	±2 min. per year (25°C)

Telemetry Transmission

HLX-561

Modulation Method	Digital, Frequency Shift Keying (FSK)
RF Output Power	-15 dBm Standard, 0 dBm MAX
Transmission Frequency	608 MHz to 614 MHz
Channel spacing	12.5 kHz

HLX-801

Modulation Method	Digital, Frequency Shift Keying (FSK)
RF Output Power	0 dBm
Transmission Frequency	608 to 614 MHz
Channel spacing	12.5 kHz

HLX-801(G)

Modulation Method	Digital, Frequency Shift Keying (FSK)
RF Output Power	7.0 dBm
Transmission Frequency	1395 MHz to 1400 MHz, 1427 MHz to 1432 MHz
Channel spacing	25.0 kHz

ECG

Lead Type	Wired 3, 4, 5, 10-electrode
Frequency Characteristic (HS-8000)	150Hz/40Hz/15Hz (3, 4, 5, 10-electrode)
Input impedance	2.5 MΩ or above
Maximum Input Voltage	10 mVp-p
Polarization Voltage	±825 mV or above
Common Mode Rejection Ratio	90 dB or above
HR Measurement Range	Adult: 0, 12 bpm to 300 bpm Neonate: 0, 30 bpm to 300 bpm
HR Measurement Accuracy	±3 bpm
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:
Lead-off Detection Current	100nA and below
Heart rate meter accuracy and response to irregular rhythm	80 bpm Ventricular Bigeminy : 80 bpm  60 bpm Ventricular Bigeminy : 60 bpm  120 bpm Ventricular Bigeminy : 120 bpm  90 bpm Bidirectional Systoles : 90 bpm 
Response time of heart rate meter to change in heart rate	HR change from 80 bpm to 120 bpm: Range 4.7 sec. to 5.1 sec., Average 4.8 sec. HR change from 80 bpm to 40 bpm: Range 5.0 sec. to 5.5 sec., Average 5.3 sec.

Time to ALARM for tachycardia	Ventricular Tachycardia 1 mVpp, 206 bpm: Range 7.3 sec. to 8.1 sec., Average 7.6 sec.
	
	Ventricular Tachycardia 2 mVpp, 206 bpm: Range 7.4 sec. to 8.2 sec., Average 7.7 sec.
	Ventricular Tachycardia 0.5 mVpp, 206 bpm: Range 8.5 sec. to 9.4 sec., Average 8.9 sec.
	Ventricular Tachycardia 2 mVpp, 195 bpm: Range 5.0 sec. to 5.4 sec., Average 5.2 sec.
	
	Ventricular Tachycardia 4 mVpp, 195 bpm: Range 4.1 sec. to 5.8 sec., Average 5.0 sec.
	Ventricular Tachycardia 1 mVpp, 195 bpm: Range 6.3 sec. to 8.0 sec., Average 7.0 sec.
Active Noise Suppression	RL Drive Maximum 10.8 mV
Tall T-wave Rejection Capability	1.2 mV 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 ms to 2 ms, amplitude ±2 mV to ±700 mV
	b) Pacemaker Pulse with Over/Undershoot Rejection is not possible.
	c) Pacer Pulse Detector Rejection of Fast ECG Signals Slew Rate 3.2V/S
Sampling Rate	Analog Front End: 8000 samples/s/channel Digital Signal Processing: 500 samples/s/channel and above (without skew)
Resolution	5 μV/LSB and below
Skew	100 μs and below

12-Lead Analysis

Safety Standards	IEC 60601-2-25
Leads	Standard 12 leads
Sensitivity	1/4, 1/2, 1, 2, 4
Polarization Voltage	±825mV or above
Frequency Response	0.05 to 150Hz
Time Constant (Low Frequency Response)	3.2 sec.
Common Mode Rejection Ratio	90dB or above
Input Impedance	2.5MΩ or above
Internal Noise	30μVp-p or lower
Sampling Rate	8000/sec./CH
Filters	AC filter: -20dB or less at 50Hz or 60Hz EMG (electromyogram) Filter : -3dB (-6dB/oct) at 35Hz or 25Hz Drift Filter: -3dB or less at 0.25Hz or 0.5Hz
Basic Measurement Value	Heart Rate, R-R time, P-R time, QRS time, QT time, QTc, electrical axis, SV1, RV5(6)
Interpretation and Code	Approx. 120 types
Minnesota Code	Approx. 130 types
Grade Judgment	4 types

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

Temperature

Measurement Method	Thermistor Method
Probe	400 only
Measurement Range	0°C to 45°C
Measurement Accuracy	±0.2°C when 25°C to 45°C ±0.4°C when outside above range
Number of channels	Maximum 8 channels
Temperature Delay Time (From temperature probe to monitor display)	6 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 SaO_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 8 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

Anesthetic Agent Concentration	MGU-800/MGU-810
Sidestream Method	
Measurement Method	CO_2, N_2O, Volatile Anesthetic: Infra-Red Solid-State Method O_2: Paramagnetic Method
Warm-Up Time	Multigas Module ISO Accuracy: 45 sec. Full Accuracy: 10 sec.
Auto Zeroing	Multigas Module ISO Accuracy: 30 sec. Full Accuracy: 4 hours
Measurement Range	
CO_2:	0 to 10.0% (0 to 76mmHg, 0 to 10kPa)
N_2O:	0 to 100%
O_2:	0 to 100%
AG Halothane:	0 to 5%
AG Enflurane:	0 to 5%
AG Isoflurane:	0 to 5%
AG Sevoflurane:	0 to 8%
AG Desflurane:	0 to 18%
RR:	0, 2 to 100Bpm
Measurement Accuracy	
CO_2:	0 to 1[vol%]: ±0.1[vol%] 1 to 5[vol%]: ±0.2[vol%] 5 to 7[vol%]: ±0.3[vol%] 7 to 10[vol%]: ±0.5[vol%]
N_2O:	0 to 20[vol%]: ±2[vol%] 20 to 100[vol%]: ±3[vol%]
O_2:	MGU-801P/MGU-811P 0 to 25[vol%]: ±1[vol%] 25 to 80[vol%]: ±2[vol%] 80 to 100[vol%]: ±3[vol%]
Volatile Anesthetic	Halothane, enflurane, and isoflurane 0 to 1[vol%]: ±0.15[vol%] 1 to 5[vol%]: ±0.2[vol%] Sevoflurane 0 to 1[vol%]: ±0.15[vol%] 1 to 5[vol%]: ±0.2[vol%] 5 to 8[vol%]: ±0.4[vol%] Desflurane 0 to 1[vol%]: ±0.15[vol%] 1 to 5[vol%]: ±0.2[vol%] 5 to 10[vol%]: ±0.4[vol%] 10 to 15[vol%]: ±0.6[vol%] 15 to 18[vol%]: ±1.0[vol%]
Respiration Rate	±1 bpm when below 60 bpm
Respiration Detection	Changes with CO_2 level in 1[vol%].

Interference from other gases

Interference Gas or Vapor	Interference to Measurement Data [vol%]			
	CO_2	N_2O	O_2	Volatile Anesthetic
CO_2 *1*2	-	0.1	0.2	0
N_2O *1*2	0.1	-	0.2	0.1
O_2 *1*2	0.1	0.1	-	0.1
Volatile Anesthetic*1*2	0.1	0.1	1.0	Secondary 0.1 (Average)
<100% Xenon	0.1	0	0.5	0
<50% Helium	0.1	0	0.5	0
Metered dose inhaler propellants	Not specified.	Not specified.	0.5	Not specified.
<0.1% Ethanol	0	0	0.5	0
Saturated Isopropanol Vapor	0.1	0	0.5	0
<1% Acetone	0.1	0.1	0.5	0
<1% Methane	0.1	0.1	0.5	0

*1: This is the maximum influence within the gas level of specified measurement accuracy. The total influence will not exceed 5% of the gas level.

*2: For CO_2, N_2O, O_2, the influence from mixed agent is the same as that from single agent.

Threshold

Volatile Anesthetic
Primary 0.15[vol%] (Full Accuracy)
0.4[vol%] (during warm-up)
For halothane, add 0.1[vol%] to above value.
Secondary 0.3[vol%] (Full Accuracy)
0.5[vol%] (during warm-up)
If primary agent is larger than 10[vol%], 5% of primary gas level.
(10% for isoflurane)
For halothane, add 0.1[vol%] to above value.

Flow Rate
70 mL/min to 200 mL/min
±10 mL/min or ±10%, whichever is greater

Delay Time
4s (When genuine accessory is used)

Rise Time (When genuine accessory is used)

CO_2
250 ms (Fall Time 200 ms)

N_2O
250ms

O_2
At flow rate of 200 mL/min: 500 ms (15% to 21%) , 700 ms (21% to 60%)

At flow rate of 120 mL/min: 600 ms (15% to 21%) , 800 ms (21% to 60%)

Halothane, Isoflurane, Sevoflurane, Desflurane, Enflurane 300 ms

Enflurane
350 ms

DRYLINE Water Trap
Emptying interval (half full, worst case)
Adult/Child: 17 hours @ 200 mL/min, 37°C, 100% RH
Neonate: 20 hours @ 120 mL/min, 37°C, 100% RH

Spirometry (MGU-810 series)

AWP [cmH_2O]

Measurement Range: -20 cmH_2O to 100 cmH_2O (Adult, Pediatric*)

Accuracy: ±1 cmH_2O (Adult, Pediatric*)

AWF (both direct.)[L/min]

Measurement Range: 1.5 L/min to 100 L/min (Adult), 0.25 L/min to 25 L/min (Pediatric*)

Tidal Volume (insp. and exp.) [mL]

Measurement Range: 150 mL to 2000 mL (Adult), 15 mL to 300 mL (Pediatric*)

Accuracy: ±6% or 30 mL, whichever is greater (Adult), ±6% or 4 mL, whichever is greater (Pediatric*)

Minute Ventilation Volume (insp. and exp.)[L/min]

Measurement Range: 2 L/min to 20 L/min (Adult), 0.5 L/min to 5 L/min (Pediatric*)

Compliance [mL/cmH_2O]

Measurement Range: 4 mL/cmH_2O to 100 mL/cmH_2O (Adult), 1 mL/cmH_2O to 100 mL/cmH_2O (Pediatric*)

Airway Resistance [cmH_2O/L/s]

Measurement Range: 0 cmH_2O/L/s to 40 cmH_2O/L/s (Adult, Pediatric*)

Peak, Plateau, PEEP, and Mean Pressure [cmH_2O]

Measurement Range: -20 cmH_2O to 100 cmH_2O (Adult, Pediatric*)

I:E Ratio

Measurement Range: 1:4.5 to 2:1 (Adult, Pediatric*)

Conditions of Use for Stated Accuracy

Respiration Rate (RR): 4 Bpm to 35 Bpm (Adult), 4 Bpm to 50 Bpm (Pediatric*)

I:E Ratio: 1:4.5 to 2:1 (Adult, Pediatric*)

Intubation Tube: 5.5 mm to 10 mm (Adult), 3 mm to 6 mm (Pediatric*)

*Including neonate.

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

Input Box (IB-8004)

Connectable Units	Maximum 2 unit
Number of Slots	Maximum 8 slots (IB-8004 x 2)

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.

BIS Monitoring (HBX-800 with BISx)

Bispectral Index (BIS)	Range: 0 to 100
Signal Quality Index (SQI)	Range: 0% to 100%
EMG Range	25 dB to 100 dB (Tabular Trend)
	30 dB to 55 dB (Bar Graph) / 30 dB to 80 dB (Graphic Trend)
Suppression Ratio (SR)	0-100%
Spectral Edge Frequency (SEF)	0.5 Hz to 30.0 Hz
Total Power (TOTPOW)	40 dB to 100 dB
Waveform Scale	±25μV, ±50μV, ±100μV, ±250μV
Filter ON	2.0-70Hz Notch filter 50/60Hz
Filter OFF	0.25-100Hz Notch filter OFF
Alarm Range	Upper Alarm 2 to 99, OFF
	Lower Alarm 1 to 98, OFF
	Increment: 1 step

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	
Compliance	Compliance	COMP	mL/cmH_2O	

Description	Parameter	Display	Unit	Default
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	$dyn\text{-}sec\text{-}cm^{-5}$	
	Systemic Vascular Resistance Index	SVRI	$(dyn\text{-}sec\text{-}cm^{-5}\text{-}m^2)$	
	Blood Temperature	BT	°C, °F	°F
	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
Multigas Unit	End-tidal Carbon Dioxide	CO_2-E	mmHg, kPa, %	mmHg
	Inspired Carbon Dioxide	CO_2-I	mmHg, kPa, %	mmHg
	End Tidal Oxygen	O_2-E	%	
	Fraction of Inspiratory Oxygen	O_2-I	%	
	Expired Nitrous Oxide	N_2O-E	%	
	Inspired Nitrous Oxide	N_2O-I	%	
	End Tidal Anesthetic Gas	AGT-E	%	
	Inspired Anesthetic Gas	AGT-I	%	

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	%	

Description	Parameter	Display	Unit	Default
PiCCO Data	Pulse Contour Cardiac Output	CCO	L/min	
	Pulse Contour Cardiac Output Index	CCI	L/min/m^2	
	Stroke Volume	SV	mL	
	Stroke Volume Index	SVI	mL/m^2	
	Stroke Volume Index	SVV	%	
	Systemic Vascular Resistance	SVR	dyn x s x cm^{-5}	
	Systemic Vascular Resistance Index	SVRI	dyn x s x cm^{-5} x m^2	
	Central Venous Oxygen Saturation	$ScvO_2$	%	
	Oxygen Delivery	DO_2	ml/min	
	Oxygen Consumption	VO_2	ml/min	

Description	Parameter	Display	Unit	Default
PulsioFlex Data	Pulse Contour Cardiac Output	CCO	L/minute	
	Pulse Contour Cardiac Output Index	CCI	L/minute/m^2	
	Stroke Volume	SV	mL/beat	
	Stroke Volume Index	SVI	mL/m^2	
	Stroke Volume Variation	SVV	%	
	Systemic Vascular Resistance	SVR	dyn x sec x cm^{-5}	
	Systemic Vascular Resistance Index	SVRI	dyn x sec x cm^{-5} x m^2	
	Central Venous Oxygen Saturation	$ScvO_2$	%	
	Oxygen Delivery	DO_2	mL/minute	
	Oxygen Consumption	VO_2	mL/minute	
	index of Left Ventricular Contractility	dPmx	mmHg/sec	
	Calibrated Cardiac Output	CO CAL	L/min	
	Heart Rate	HR	bpm (beats per minute)	
	Mean Arterial Pressure	MAP	mmHg	
	Global End-Diastolic Volume	GEDV	mL	
	Global End-Diastolic Volume Index	GEDI	mL/m^2	
	Extravascular Lung Water	EVLW	mL	
	Extravascular Lung Water Index	ELWI	mL/kg	
	Pulmonary Vascular Permeability Index	PVPI	---	
	Global Ejection Fraction	GEF	%	
	Cardiac Function Index	CFI	1/min	
	Blood Temperature	BT	°C, °F	°F
	Oxygen Delivery Index	DO_2I	mL O_2/min/m2	
	Oxygen Consumption Index	VO_2I	mL O_2/min/m2	

Description	Parameter	Display	Unit	Default
TCM4, TCM5 FLEX Data	Transcutaneous Oxygen Partial Pressure	$tcpO_2$	mmHg, kPa	*
	Transcutaneous Carbon Dioxide Partial Pressure	$tcpCO_2$	mmHg, kPa	*

*: The measurement unit of $tcpO_2$, $tcpCO_2$ can be set on the TCM4 or TCM5 FLEX. When the measurement unit is changed, the tabular trend data of $tcpO_2$ and $tcpCO_2$ on the bedside monitor will be deleted.

About the SpO_2 Clinical Test

❑Covidien Unit

The SpO_2 and pulse rate measurement accuracy have been validated for each range by testing on healthy adult male and female volunteers against a laboratory CO-Oximeter.

The SpO_2 accuracy has been validated for the range from 70% to 100% by testing on healthy adult male and female volunteers (age: 19 to 48 years old) with light to dark skin pigmentation. The standard deviation is ±2% which encompasses 68% of the population.

The pulse rate accuracy has been validated for the range from 70% to 100% by testing on healthy adult male and female volunteers (age: 19 to 48 years old) with light to dark skin pigmentation The standard deviation is ±3 bpm which encompasses 68% of the population.

These clinical test data are disclosed based on the data provided from Covidien.

❑Masimo Unit

The SpO_2, SpCO, SpMet, and pulse rate measurement accuracy have been validated for each range by testing on healthy adult male and female volunteers against a laboratory CO-Oximeter.

SpO_2 and SpMet accuracy have been validated by testing on 16 neonatal NICU patients ranging in age from 7 days to 135 days old and weighing between 0.5 kg to 4.25 kg. Seventy-nine (79) data samples were collected over a range of 70% to 100% SpO_2 and 0.5% to 2.5% HbMet with a resultant accuracy of 2.9% SpO_2 and 0.9% SpMet.

The SpO_2 accuracy has been validated for the range from 70% to 100% by testing on healthy adult male and female volunteers (age: 21 to 36 years old) with light to dark skin pigmentation. Without body motion, the standard deviation is ±2% which encompasses 68% of the population. With body motion, the standard deviation is ±3% which encompasses 68% of the population. For the validation, frictional or contact motion of 1 cm to 2 cm, and random vibration of 1 Hz to 5 Hz were tested.

The pulse rate accuracy has been validated for the range from 70% to 100% by testing on healthy adult male and female volunteers (age: 24 to 37 years old) with light to dark skin pigmentation The standard deviation is ±3 bpm which encompasses 68% of the population.

The SpCO accuracy has been validated for the range from 0% to 40% by testing on healthy adult male and female volunteers with light to dark skin pigmentation. The standard deviation is ±3% which encompasses 68% of the population.

The SpMet accuracy has been validated for the range from 0% to 15% by testing on healthy adult male and female volunteers with light to dark skin pigmentation. The standard deviation is ±1% which encompasses 68% of the population.

The SpHb accuracy has been validated for the range from 8 g/dL to 17 g/dL by testing on healthy adult male and female volunteers with light to dark skin pigmentation. The standard deviation is ±1 g/dL which encompasses 68% of the population.

These clinical test data are disclosed based on the data provided from Masimo.

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