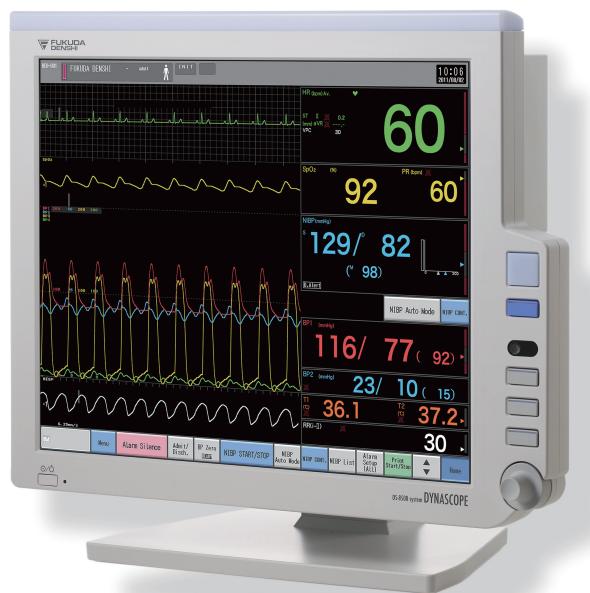


# DYNASCOPE 8000 Series Patient Monitor

# DS-8500 System

Ver. 10

## Operation Manual



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

**This manual is for the DS-8500 System Version 10.**



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

### **CAUTION**

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

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# Preface

## Introduction

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

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

## Important Notice

### For Safe Operation of the Equipment

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

### Intended Use of this Equipment

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

#### <Intended Use>

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

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

Parameters such as ECG, heart rate, respiration, non-invasive blood pressure (NIBP), pulse rate, arterial oxygen saturation (SpO<sub>2</sub>), carboxyhemoglobin saturation (SpCO), methemoglobin saturation (SpMet), and total hemoglobin concentration (SpHb), plethysmograph, temperature, invasive blood pressure (IBP), cardiac output, carbon dioxide concentration (CO<sub>2</sub>), nitrous oxide concentration (N<sub>2</sub>O), oxygen concentration (O<sub>2</sub>), anesthetic agent concentration (AG), and Spirometry may be monitored individually or in any grouping required by the clinician.

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

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

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

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

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

## Copyright

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

## Maintenance, Repair, Replacement

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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

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If you need more detailed information, please contact following.

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

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

- (2) Sales Representative

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

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

## About This Manual

---

### Expression Used in This Manual

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#### 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

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# Safety

## About the Safety Precautions

### The Meaning of Each Safety Precaution

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

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

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

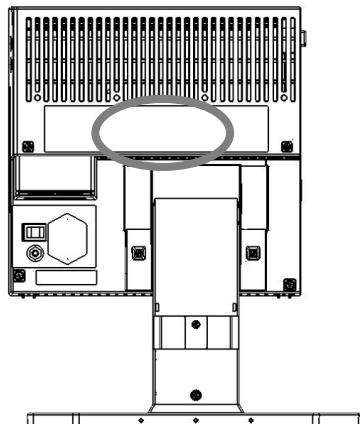
### Warning Labels Attached to the Unit

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

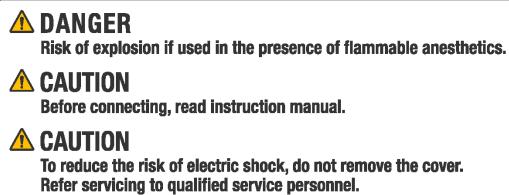


- Do not damage or erase the warning labels attached to the unit.  
These warning labels contain important descriptions for handling and operating the unit properly and safely. A damaged label may compromise safe operation.

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

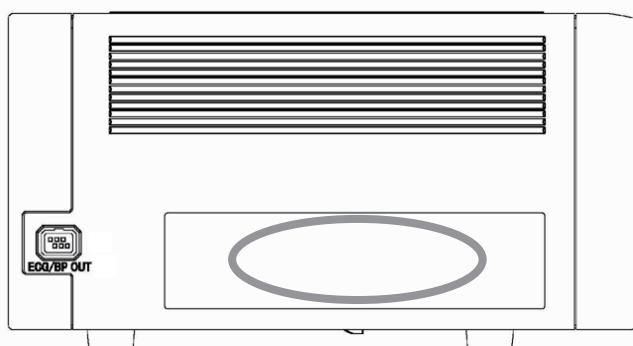


*Warning Labels Attached to the Unit*

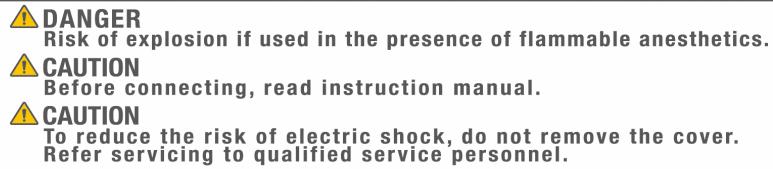


*Warning Label*

□ 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
	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.
	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.
	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.
	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 gasses are evolved.
- Verify the power frequency, voltage and allowable current (or power consumption).
- Ensure the grounding is proper by connecting the accompanying power cable to the hospital grade outlet.
- 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

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### **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

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### Medical Telemetry

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### **CAUTION** Precautions about the Installation

- ♦ The medical institution (hereinafter referred as "Institution" ) must decide the telemetry installation plan for the medical institution in order to prevent interference between transmitters (telemetry based on destination country's radio law). When telemetry has already been installed and been used, radio format, frequency, and antenna power are required to be examined to prevent interference.
- ♦ When using telemetry which requires zone location, the institution is to set up the zones as an operation unit for each transmitter to prevent electronic interference between telemetry throughout the Institution.
- ♦ When using telemetry which requires zone location, display and identify each prepared zone in the equipment.
- ♦ When laying receiver antenna for each transmitter, the Institution has to examine the installation so that electronic interference does not occur.

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



### CAUTION Precautions about the Management

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

## Precautions when Using with Other Equipment

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### Pacemaker

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### 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

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### **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

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### **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

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### **WARNING**

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

#### Location:

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

#### Power Supply:

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

#### Electrode Placement

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

#### Ground Plate

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

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

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

## MRI (Magnetic Resonance Imaging)

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### **WARNING**



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

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

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

## Precautions about Connections to Peripheral Devices

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

### **WARNING**

- ♦ When multiple equipments are connected to the patient, the total amount of leakage current may exceed the limit specified on IEC 60601-1, 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, "Collateral Standard: Safety Requirements for Medical Electrical Systems".
- ♦ 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 IEC60601-1-1. Never use a multiple portable socket-outlet or extension cord when combining equipment unless the socket outlet is supplied specifically for use with that equipment.

## Precautions for Using the Equipment

### This System

#### **DANGER**

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

#### **WARNING**

#### Warnings about the System

- Do not connect 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 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)
- The patient classification selection influences the precision of the QRS detection and NIBP measurement. Make sure the correct selection is made.
- The pacemaker use selection influences the precision of the QRS detection and arrhythmia analysis. Make sure the correct selection is made.
- If the QRS pace mask function is set to [OFF], [10ms], or [20ms], the pace pulse may be erroneously be detected as a QRS complex and HR, Asystole alarms may not generate due to incorrect HR (counting pace pulse as QRS complex). Select [OFF], [10ms], or [20ms] only if you are sure that pacing failure will not occur, or when the patient can be constantly monitored.
- Pulse oximeter should not be used as a replacement or substitute for ECG based arrhythmia analysis.
- When measuring the SpO<sub>2</sub> of patient with high fever or peripheral circulatory insufficiency, check the sensor attachment periodically and change the attachment site. The temperature of the attachment site will rise 2 to 3°C due to the sensor heat which may result in burn injury.
- For the following case, accurate measurement of SpO<sub>2</sub> may not be possible.
  - Patient with excessive abnormal hemoglobin (COHb, MetHb)
  - Patient with excessive total bilirubin
  - Patient with the pigment injected to the blood

- ♦ Patient receiving CPR treatment
- ♦ When a sensor is applied to a limb with NIBP cuff, arterial catheter, or intracatheter
- ♦ When measuring at site with venous pulse
- ♦ Patient with body motion
- ♦ Patient with small pulse
- ♦ For the following case, loss of pulse signal can occur.
  - ♦ Sensor is too tight.
  - ♦ Patient has hypotension, severe vasoconstriction, severe anemia, or hypothermia.
  - ♦ There is arterial occlusion proximal to the sensor.
  - ♦ Patient is in cardiac arrest or is in shock.
- ♦ Before the NIBP measurement, make sure the patient classification ([Adult]/[Child]/[Neonate]) is properly selected. Otherwise, correct measurement cannot be performed, and congestion or other injury may result.
- ♦ When the system alarm is suspended, all the alarms will be suspended even if the parameter alarm is set to [ON]. Also, the alarms will not be stored as recall events.
- ♦ If the upper/lower alarm limit of the parameter is set to [OFF], or arrhythmia alarm is set to [OFF], alarm will not function even if the system alarm is set to [ON]. Pay attention when setting them [OFF].
- ♦ Objective and constant arrhythmia detection is possible through the fixed algorithm incorporated in this monitor. However, excessive waveform morphology change, motion artifact, or the inability to determine the waveform pattern may cause an error, or fail to make adequate detection. Therefore, physicians should make final decisions using manual recording, alarm recording and recall waveform for evaluation.
- ♦ The RR/APNEA alarm will not be generated unless the parameter key corresponded to the selected RR/APNEA source is displayed. Make sure to display the parameter key for the RR/APNEA source.
- ♦ When selecting [0] for "Volume" or [Timer] for "Display" for the Night Mode, pay attention not to miss any important alarm by simultaneously monitoring the patient on central monitor or other monitors.
- ♦ When the alarm sound is suspended, the alarm sound will not generate for the fixed amount of time. Pay attention not to miss any important alarm by simultaneously monitoring the patient on central monitor or other monitors.
- ♦ 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub>.

measurement.

- ♦ For increased COHb: COHb levels above normal tend to increase the level of SpO<sub>2</sub>. 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<sub>2</sub>. When elevated levels of COHb are suspected, laboratory analysis (CO-Oximetry) of a blood sample should be performed.

- ♦ For increased MetHb: the SpO<sub>2</sub> may be decreased by levels of MetHb of up to approximately 10% to 15%. At higher levels of MetHb, the SpO<sub>2</sub> 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<sub>2</sub>, SpMet, SpCO, SpHb measurements.

- ♦ Motion artifact may lead to inaccurate SpMet, SpCO, SpHb measurements.

- ♦ Severe anemia may cause erroneous SpO<sub>2</sub> readings.

- ♦ Very low arterial Oxygen Saturation (SpO<sub>2</sub>) 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 valve 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<sub>2</sub> Monitoring (HPD-800/HPD-810, HCP-800/HCP-810)

- ♦ For HPD-800/HPD-810 with Capnostat 5;
  - ♦ Use only the specified airway adapter manufactured by Resironics Novametrix, LLC. Refer to the section on "Optional Accessories" for list of specified airway adapters.  
(☞ Operation Manual "CO<sub>2</sub> Concentration Measurement (Resironics)" P13-6)  
These accessories may be purchased from Fukuda Denshi or any authorized Resironics Novametrix, LLC distributor.
  - ♦ Always consider the circumference of the intubation tube when using the airway adapter. If inappropriate airway adapter is used for a patient with low ventilation, CO<sub>2</sub> may mix in to the inspired air resulting in incorrect measurement, or apnea detection may become difficult.
- ♦ For HCP-800/HCP-810;
  - ♦ When using a sampling line for intubated patients with a closed suction system, do not place the airway adapter between the suction catheter and endotracheal tube. This is to ensure that the airway adapter does not interfere with the functioning of the suction catheter.
  - ♦ Loose or damaged connections of the sampling line may compromise ventilation or cause an inaccurate measurement of respiratory gases. Securely connect all components and check connections for leaks according to standard clinical procedures.
  - ♦ Do not cut or remove any part of the sampling line. Cutting the sample line could lead to erroneous readings.
  - ♦ If too much moisture enters the sampling line (i.e., from ambient humidity or breathing of unusually humid air), the message "Check Sample Line" will appear in the message area. Replace the sampling line once the "Check Sample Line" message appears.
  - ♦ Carefully route the sampling line to reduce the possibility of patient entanglement or strangulation.
  - ♦ Do not lift the HCP-800/HCP-810 by the sampling line, as the sampling line could disconnect from the equipment, causing the equipment to fall on the patient.
  - ♦ CO<sub>2</sub> 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 Series)

- ♦ Use only specified gas sampling products manufactured by "Mindray Medical Sweden AB". Refer to section on "Optional Accessories", for list of specified "Mindray Medical Sweden AB" DRYLINE™ gas sampling products. These accessories may be purchased from Fukuda Denshi or any authorized "Mindray Medical Sweden AB" distributor.  
(☞ Operation Manual "Anesthetic Gas Concentration Measurement (Mindray Medical Sweden AB)" P13-7)
- ♦ If the water trap should break or become damaged during operation, there is a risk that bacteria and/or mucus may contaminate the MGU-800/810 series.
- ♦ The airway adapter, sampling line, and flow sensor are intended for single patient use only, and must not be reused in order to avoid cross infection.
- ♦ The MGU-800/810 series must not be used with flammable anesthetic agents.
- ♦ To protect the hospital staffs from unnecessary anesthetic agent, it is strongly recommended to connect the exhaust port 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.
- ♦ For MGU-800 Series;

- ♦ Do not use Adult 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.
- ♦ For MGU-810 Series;
  - ♦ Only combine 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 Trap
Adult	Adult	Adult (60-16100-00)	Adult (60-13100-00)
Pediatric	Child	Pediatric (60-16200-00)	Neonate (60-13200-00)
Neonate	Neonate	Pediatric (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.

**⚠ WARNING** Warnings about the 12-Lead ECG Analysis Function

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

**⚠ CAUTION** Precautions about the System

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

**⚠ CAUTION** Precautions about the ST Measurement

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

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

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

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

- ♦ ECG Recording by the Mason-Likar System

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

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

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

### CAUTION Precautions about the SpO<sub>2</sub> Monitoring

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

- ♦ Precautions for Reusable Type Sensor

The light-emitting part of the sensor should be over the root of the fingernail. Do not insert the finger too far into the sensor as it may hurt the patient. For additional warnings, cautions, or contraindications when using sensors with Nellcor Unit (HS-8312N or HG-820)/Masimo Unit (HS-8312M or HG-810), refer to SpO<sub>2</sub> sensor instruction manual.

- ♦ Precautions for Single-Patient-Use Type Sensors

The sensor can be reused on the same patient as long as the adhesive tape attaches without slippage. But do not reuse on other patients to avoid cross contamination. It is intended for single patient use only. For additional warnings, cautions, or contraindications when using sensors with Nellcor Unit (HS-8312N or HG-820)/Masimo Unit (HS-8312M or HG-810), refer to SpO<sub>2</sub> sensor instruction manual.

- ♦ If " - - " is displayed for the SpO<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> sensor, arterial catheter, or intracatheter may result in incorrect measurement.
- ♦ An operator must not get away from a patient during the NIBP measurement. However, when getting away from the patient is necessary, do not activate the Alarm Suspend and Silence functions in order not to miss any sudden changes in the patient's condition.
- ♦ Pay attention when measuring the NIBP of patient with bleeding disorders or hyper coagulation. The cuff inflation may cause petechia or circulatory failure by the blood clot.
- ♦ For the following situation, measurements will be terminated.
  - ♦ When the measurement time has exceeded 160 seconds for adult and child, 80 seconds for neonate.
  - ♦ When the inflation value has exceeded 300mmHg for adult, 210mmHg for child, and 150mmHg for neonate.
- ♦ If used with the incorrect patient classification, it will not only cause erroneous measurement, but the inflating level for the adult may be applied to child or neonate causing dangerous situation to the patient.
- ♦ The continuous measurement and 1-minute interval measurement will automatically stop after 12 minutes (maximum 15 minutes).
- ♦ If the mean MAP display is set to OFF, the MAP alarm will not be generated. Also the MAP data will not be displayed for the tabular trend or the NIBP list.



### Precautions about the BP Monitoring

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



### Precautions about the CO<sub>2</sub> Monitoring (HCP-800/HCP-810)

- ♦ Conduct CO<sub>2</sub> calibration for the following case.  
If the CO<sub>2</sub> gas calibration is not performed at a specified interval, CO<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> sampling tubes are designed for single patient use, and are not to be reused. Do not attempt to clean, disinfect, sterilize or flush any part of the sampling tube as this can cause damage to the monitor.
- ♦ Dispose of sampling tubes according to standard operating procedures or local regulations for the disposal of contaminated medical waste.
- ♦ Before use, carefully read the Directions for Use for the Microstream® EtCO<sub>2</sub> sampling tube.
- ♦ Only use Microstream® EtCO<sub>2</sub> sampling lines to ensure the monitor functions properly.

** CAUTION** Precautions about the CO<sub>2</sub> Monitoring (HPD-800/HPD-810 Gas Unit I/F with Capnostat 5)

- ♦ The airway adapter should be attached with the thicker side facing to the patient. If attached oppositely, it may damage the CO<sub>2</sub> sensor or airway adapter.
- ♦ The disposable airway adapter should be opened just before use. Do not sterilize.
- ♦ Do not reuse the disposable airway adapter.

** CAUTION** Precautions about the Alarm

- ♦ Alarm messages will be displayed according to the priority. (Level S → Level H → Level M → Level L → Level N)
- ♦ For the same alarm priority, the alarm message for the newer alarm will be displayed.
- ♦ The alarm message for the arrhythmia alarm will continue to be displayed for 30 seconds after the alarm is resolved.
- ♦ While the "LEAD OFF" message is displayed, HR alarm and arrhythmia alarm will not function. Leaving this condition unresolved may result in missing a sudden change of the patient. Promptly check the electrodes when this message is displayed.
- ♦ For the HPD-800/810 Gas Unit I/F and HCP-800/810 CO<sub>2</sub> Gas Unit, the upper EtCO<sub>2</sub> alarm will not generate if the upper limit is set to 100mmHg/13.4kPa and above as the measurement range is 0 to 99mmHg / 0 to 13.3kPa.
- ♦ Whether to use the SpO<sub>2</sub> second alarm function and its threshold selection should be based on the patient's clinical indication portent and medical evaluation.
- ♦ If the SpO<sub>2</sub> 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 DS-8500 System 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.

** 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<sub>2</sub>], and if SpO<sub>2</sub> waveform/numeric data is set to [Disp. OFF], the PR value will not be displayed.
- ♦ If the RR source is set to [CO<sub>2</sub>/GAS], and if CO<sub>2</sub> waveform/numeric data is set to [Disp. OFF], the RR value will not be displayed.
- ♦ If the RR source is set to [CO<sub>2</sub>/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 bed ID to more than one monitors on the same floor. Otherwise, it may cause to remote control more than one 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 to NIBP measurement, periodic recording, trend, NIBP list data, and age calculation from the birth date.
- ♦ 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 on the monitor 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/SPIRO Monitoring (MGU-800/810 Series)**

- ♦ When the Multigas Unit (MGU-800/810 series) and HPD-800/HPD-810 are simultaneously used, the CO<sub>2</sub> concentration measurement will be performed by the equipment selected for the "CO<sub>2</sub> Source Priority" on ([Menu]>"Parameter"[CO<sub>2</sub>]).
- ♦ The MGU-800/810 series requires at least 10 minutes of warm up period to perform full accuracy measurement.
- ♦ If the power supply is interrupted due to reason such as power failure, the MGU-800/810 series will be initialized and enter into warm-up state even if the power failure is within 30 seconds.
- ♦ About the gas calibration;
  - ♦ When the MGU-800/810 series is connected, gas calibration will immediately start.
  - ♦ After the warm-up is completed, gas calibration will perform at 4-hour intervals on stable operation.
  - ♦ Gas calibration will be performed at shorter intervals during warm up period.
  - ♦ During gas calibration, measurement data will not be updated.
  - ♦ Gas calibration does not require calibration gas.
- ♦ About the storage;
  - ♦ Do not store the MGU-800/810 series at extreme temperature as it may affect the measurement accuracy. If stored in a temperature exceeding the specified range (-10°C to 60°C), it may damage the equipment.
  - ♦ If the MGU-800/810 series is stored in low temperature, it may require additional warm-up time after turning ON the equipment.
  - ♦ Make sure the sampling line and flow sensor is securely connected to prevent any leakage.
  - ♦ In an environment where there is alcohol vapor, some errors may be observed in the measurement.
  - ♦ Contamination with CO<sub>2</sub>, N<sub>2</sub>O or anesthetic agent in the air surrounding the MGU-800/810 series may cause significant measurement errors.
- ♦ The MGU-800/810 series complies with standards for cyclical pressure up to 10kPa.
- ♦ 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 gas measurement accuracy check is performed using a low pressure gas, the accuracy of gas measurement will be reduced. Make sure to check the gas measurement accuracy using the specified calibration gas before its expiration date.
- ♦ If the error persists, refer to our service representative.
- ♦ MGU-810 Series
  - ♦ The adult flow sensor dead space is 6.9 mL and the flow resistance is 1.8 cmH<sub>2</sub>O at 60 L/min. Adjust ventilation accordingly.
  - ♦ The pediatric flow sensor dead space is 0.75 mL and the flow resistance is 0.9 cmH<sub>2</sub>O 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.
- ♦ A special coating is applied to the surface of the touch panel. Do not wipe the surface with a cloth or gauze with coarse texture. Wipe the surface with an eyeglass cleaning cloth.
- ♦ Clean the equipment frequently so stains can be removed easily.
- ♦ To prevent injury, it is recommended to wear gloves when cleaning the equipment.
- ♦ Do not allow liquids or cleaning solution to enter the equipment or connectors.
- ♦ Do not use organic solvents, thinner, toluene and benzene to avoid damaging the resin case.
- ♦ Do not polish the housing with abrasive or chemical cleaner.
- ♦ When sterilizing the entire room using a spray solution, pay close attention not to have liquids get into the equipment or connectors.
- ♦ The surface resin coating may be damaged, resulting in discoloration, scratches, or other problems.

Example:

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

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

## Wired Network (DS-LANII/ DS-LANIII)

### **WARNING**

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

### **CAUTION**

- ♦ When using the wired network transmission, configure the display so that the numeric data corresponded to the waveform is displayed. If not, the displayed waveform or numeric data may not be transmitted.
- ♦ The Bed ID is factory set to 000. If connected to the wired network with the ID unchanged, monitoring on the central monitor will not be possible.
- ♦ When connected to the wired network, make sure that there are no other bedside monitors with the same Bed ID. If there are more than one bedside monitors with the same Bed ID, the duplicated bedside monitors cannot be monitored on the central monitor.
- ♦ When connected to the DS-LANII network, set the Bed ID in the range from "001" to "048".
- ♦ When connected to the DS-LANIII network, set the Bed ID in the range from "001" to "100".
- ♦ There are following restrictions when connecting the DS-8500 System to the wired network.
  - ♦ The BP measurement unit setting should be the same for all central monitors and bedside monitors. If the BP measurement unit is different among the monitors, data such as BP waveform, BP numeric data, NIBP numeric data, NIBP list will not be transmitted. It will be treated as not measured data, and will not be displayed on the central monitor. Also, the alarm limit setup from the central monitor cannot be performed.
  - ♦ For the DS-LANII network, arrhythmia alarm of TACHY, BRADY, COUPLET, PAUSE, TRIGEMINY will not be transmitted.
  - ♦ For the DS-LANII network, arrhythmia alarm of "SLOW VT" will be transmitted as "VT".
  - ♦ For the DS-LANII network, waveform, numeric data, and alarm of BP7, BP8, TEMP3–8 will not be transmitted. Also, the displayable waveform, numeric data, and alarm will differ depending on the central monitor model type. Refer also to the operation manual for the respective central monitor.
  - ♦ The PR\_IBP alarm will not be transmitted to the central monitor.
  - ♦ If the "RR/APNEA alarm source" is other than [Impedance] (or, if [Auto] selects a setting other than [Impedance]), the RESP waveform will not be transmitted on a wired network.
  - ♦ If the "RR/APNEA alarm source" is other than [CO<sub>2</sub>/GAS] (Or, if [Auto] selects a setting other than [CO<sub>2</sub>/GAS]), the CO<sub>2</sub> 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<sub>2</sub> concentration is mmHg and [99mmHg] is selected for "Upper Limit of CO<sub>2</sub> (mmHg) Transmission" ([Initial Settings]>[System]>[DS-LAN]), the CO<sub>2</sub> value of 100mmHg or above will be transmitted as 99mmHg.
  - ♦ BIS alarm will not be generated on the central monitor.
- ♦ 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 by the DS-LAN network.
- ♦ When connected to the wired network, time/date will be synchronized with the central monitor. Even if the time/date is changed on the DS-8500 System, it will be corrected to the time/date of the central monitor.
- ♦ Depending on the central monitor model type, the ST display will be distorted if the ECG lead (ECG1 or ECG 2) is changed on the DS-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 RR and APNEA monitored on the central monitor and the DS-8500 System will be the same.

## Wireless Network System

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### 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<sub>2</sub> concentration is mmHg and [99mmHg] is selected for "CO<sub>2</sub> (mmHg) Upper Limit of Transmission" ([Initial Settings]>[System]>[Telemeter]), the CO<sub>2</sub> value of 100mmHg or above will be transmitted as 99mmHg.

## RTC and Data Backup

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### CAUTION

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

## Precautions about the Ventilator Monitoring

### **WARNING**

- ♦ The ventilator alarm sound is set to OFF at factory default setting.  
The alarm sound can be turned ON on the Sound setup screen.
- ♦ If the DS-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 assured if the alarm other than specified generates at the ventilator.  
( Maintenance Manual "Ventilator Measurement and Alarm Input" P4-1)

### **CAUTION**

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

### **WARNING**

- ♦ The ventilator alarm sound is set to OFF at factory default setting.  
The alarm sound can be turned ON on the Sound setup screen.
- ♦ If the DS-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 assured if the alarm other than specified generates at the ventilator.  
( Maintenance Manual "Ventilator Measurement and Alarm Input" P4-1)

### **CAUTION**

- ♦ The ventilator operation should be performed by well-trained and authorized personnel.
- ♦ When connecting this equipment and the ventilator, use only the specified connection cable.
- ♦ Verify that this equipment and the ventilator are properly connected.
- ♦ When connecting the cable, verify that the main power of this equipment and the ventilator is OFF.
- ♦ When Servo-i/s or SV-300 is connected, RESISTANCE (Insp, Exp), COMPLIANCE, P-V loop, F-V loop display function is not available.
- ♦ When FLOW-i is connected, P-V loop, F-V loop display function is not available.

## Precautions about the SpO<sub>2</sub> Sensor

**DANGER****Danger of Burn Injury Caused by the SpO<sub>2</sub> Sensor**

- When monitoring SpO<sub>2</sub>, 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<sub>2</sub> 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

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

### Precautions for Safe Operation under Electromagnetic Influence

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

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

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

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

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

### □ Compliance to the Electromagnetic Emissions

The DS-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	
Harmonic Emissions IEC 61000-3-2	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.
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
Conducted RF IEC 61000-4-6	3Vrms 150kHz to 80MHz	3Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the DS-8500 System, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended Separation Distance $d = 1.2 \sqrt{P}$
Radiated RF IEC 61000-4-3	3V/m 80MHz to 2.5GHz	3V/m	<p><math>d = 1.2\sqrt{P}</math> 80MHz to 800MHz  <math>d = 2.3\sqrt{P}</math> 800MHz to 2.5GHz</p> <p>Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey<sup>*1</sup>, should be less than the compliance level in each frequency range<sup>*2</sup>.</p> <p>Interference may occur in the vicinity of equipment marked with the following symbol:</p> 
<p>Note 1: At 80MHz and 800MHz, the separation distance for the higher frequency range applies.</p> <p>Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</p> <p>*1: Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast can not be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the DS-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.</p> <p>*2: Over the frequency range 150kHz to 80MHz, field strength should be less than 3V/m.</p>			

**Recommended Separation Distances between Portable and Mobile RF Communications Equipment and the DS-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. P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

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

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

**Essential Performance Statement**

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



# Chapter 1 General Description

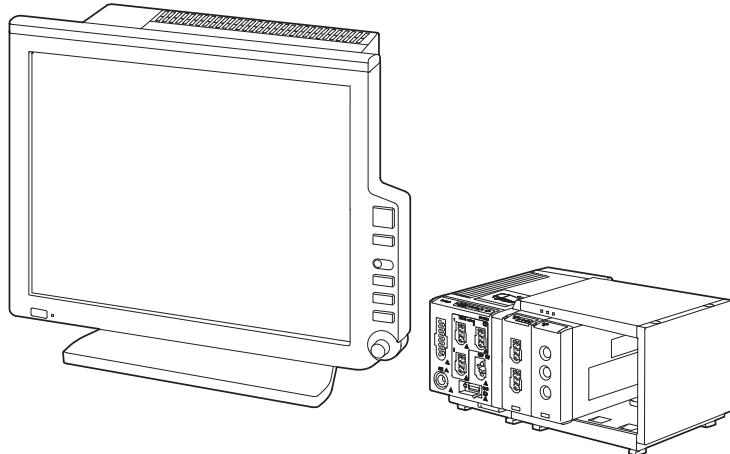
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# Chapter 1 General Description

## 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).



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

### Lineup of Main Unit

Model Type	External Monitor Unit Output	Extended Display Unit Output	LAN (TCP/IP IF)
DSC-8510	Yes	No	No
DSC-8530 (with built-in extended display board)	Yes	2ch	1ch

### Lineup of Display Unit

Model Type	Display Size	Circular Polarizing Filter
LC-8015T	15 inch	No
LC-8015TC	15 inch	Yes
LC-8019T	19 inch	No
LC-8019TC	19 inch	Yes

### Lineup of Super Unit

Model Type	Fixed Parameter	SpO <sub>2</sub> Unit	Multiparameter Measuring Items	CO <sub>2</sub> Measurement (Optional)	BIS Measurement (Optional)
HS-8312N	ECG (Max. 12-lead) , RESPx1, NIBPx1, SpO <sub>2</sub> x1	Nellcor™	3 ports Temperature x6 (maximum) IBP x6 (maximum) CO x1 (maximum)	Yes	Yes
HS-8312M	ECG (Max. 12-lead) , RESPx1, NIBPx1, SpO <sub>2</sub> x1 SpCO x1*, SpMet x1*, SpHb x1*	Masimo			

\* SpCO, SpMet, SpHb : Optional

*Lineup of Multigas Unit*

Model Type	CO <sub>2</sub> /N <sub>2</sub> O measurement	Agent GAS Measurement	O <sub>2</sub> Measurement	Spirometry
MGU-801P	Yes	Yes	Yes Paramagnetic	No
MGU-802	Yes	Yes	No	No
MGU-803	Yes	No	No	No
MGU-811P	Yes	Yes	Yes Paramagnetic	Yes
MGU-812	Yes	Yes	No	Yes
MGU-813	Yes	No	No	Yes

*Lineup of Expansion Module*

Model	Module	Parameter
HM-800	Multi Module	(IBP, TEMP, CO) x 2ch
HP-800	Multiport Module	Serial communication 2ch, Analog input 1ch
HG-810	SpO <sub>2</sub> Module M (Masimo)	SpO <sub>2</sub> , PR, SpCO*, SpMet*, SpHb*
HG-820	SpO <sub>2</sub> Module N (Nellcor)	SpO <sub>2</sub> , PR

\* SpCO, SpMet, SpHb : Optional

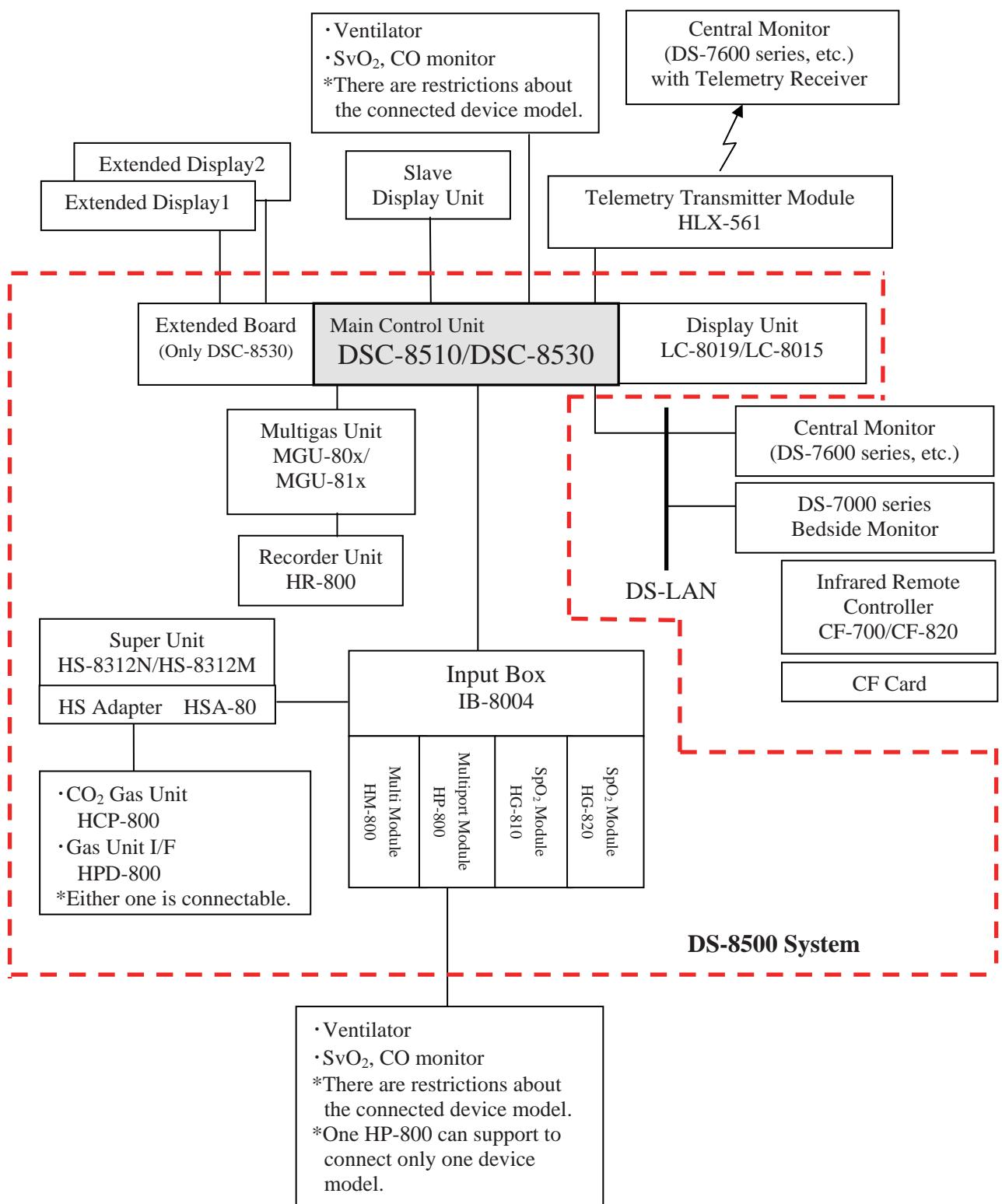
*Lineup of Gas Module*

Model	Module	Parameter
HPD-800	Gas Unit I/F	CO <sub>2</sub> measurement by Mainstream method with a connection to Capnostat 5 (Respironics).
HPD-810		
HCP-800	CO <sub>2</sub> Unit	Incorporates Covidien's Microstream technology. Sidestream Method
HCP-810		

*Input Box*

Model Type	Slot Number
IB-8004	4

## 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 set 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 touch key control using the mouse.
- ♦ 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.
- ♦ Using the multiparameter amplifier, the HS-8000 series Super Unit is capable of monitoring parameters in combination of BP (max. 6 ch.), temperature (max. 6ch.), and CO (max. 1ch.).  
In addition to ECG, respiration, SpO<sub>2</sub> (pulse wave), BP, NIBP, temperature and CO, CO<sub>2</sub> measurement is also available as optional function.
- ♦ By using the optional SpO<sub>2</sub> 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.
- ♦ For the SpO<sub>2</sub> measurement, two model types with different built-in SpO<sub>2</sub> modules are available, which are Covidien®/Nellcor™ and Masimo®.
- ♦ SpCO, SpMet, SpHb, PVI measurement are optional function available when using the HS-8312M and HG-810 with built-in Masimo SpO<sub>2</sub> 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 telemetry system and wired network. The following ventilators can be connected.
  - ♦ SV-900C/900D/900E
  - ♦ SV-300/300A
  - ♦ Servo-i/Servo-s
  - ♦ PURITAN-BENNETT Ventilator 740/760, 840
  - ♦ Evita 4/Evita XL/Evita 2 dura
- ♦ Wired network (DS-LANII/DS-LANIII) is possible via the Ethernet LAN cable.  
DS-LANII is a network based on 10BASE-T with transmission speed of 10Mbps and maximum transmission distance of 100m. DS-LANIII is a network based on 100BASE-TX with transmission speed of 100Mbps and maximum transmission distance of 100m.
- ♦ Wireless network construction is possible using the optional telemetry transmitter module (HLX-561).
- ♦ By using the optional HM-800 Multimodule, the monitoring parameters can be extended. To use the expansion module, the optional IB-8004 Input Box is required.
- ♦ By using the optional recorder unit (HR-800), the measurement data can be output on the recorder.
- ♦ By connecting the optional Multigas Unit (MGU-800/810 series), CO<sub>2</sub> concentration, anesthetic gas concentration, O<sub>2</sub> measurement, N<sub>2</sub>O 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<sub>2</sub> Gas Unit (HCP-800/HCP-810) to the AUX connector on the HS-8000 series Super Unit, CO<sub>2</sub> 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 4 port on the main unit, CO<sub>2</sub> concentration, anesthetic gas concentration (ISO, SEV, DES), O<sub>2</sub> concentration, N<sub>2</sub>O concentration, airway flow, airway pressure waveform, minute ventilation, airway resistance , etc. can be monitored.
- ♦ By using the HP-800 Multiport Module, or by connecting the Oximeter to Status II port or to COM 1 to 4 port on the main unit, SvO<sub>2</sub>, CO, etc. can be measured. The following Oximeter/CCO measurement device can be connected.
  - ♦ Vigilance
  - ♦ Vigilance CEDV
  - ♦ Vigilance III
  - ♦ Vigileo by Edwards Lifesciences
  - ♦ PiCCO2
- ♦ By using the HP-800 Multiport Module, or by connecting the A-2000/A-3000 BIS monitor (Covidien<sup>®</sup>) to Status II port or to COM 1 to 4 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<sup>®</sup>) to Status II port or to COM1 to 4 port on the main unit, regional cerebral oxygen saturation data can be monitored.

## 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" P5-18)

## □ Admit/Discharge

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

## □ Basic Setup

Display Configuration	Layout, Background, Palette, Detail Setup, Meas., Wave (Sweep Speed), Short Trend, User Key
Manual Printing	Basic (Printer, Waveform, Print Duration, Delay Time), 12-Lead (Printing Format, Position, Wave Format, Print Calibration, Printer Auto Scale), 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, PR, SpO <sub>2</sub> , 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 and details can be set.
ST	ST All Alarm, ST(II) Alarm, Waveform Review (ST), Basic Wave Refresh
List	List of alarm ON/OFF setting and lower/upper limits, Meas. List/All List, Print Setup, Recall Setup
Detail Setup	Suspend Time, Silence Time, Alarm Silence, Alarm Sound Suspend, Status Alarm Control, Alarm Limit Display

## □ Parameter

ECG	Arrhy., Arrhy. Alarm Setup, ST Setup, HR
	Lead/Size, Optimize size, Alarm Assist, Disp. ON
	Detail Setup (Filter, Synchronized Mark/Tone, Pacemaker, Pacemaker Pulse, Pace Pulse Mask Time, HR Average, ECG Drift Filter, AC Filter, Auto Lead, 3Lead Override, ST/VPC/Arrhy. Alarm Display, ECG Analog Output, ECG waveform display during Lead-OFF, Noise Detection)
RESP	Size, Common Setup (RR Synchronized Mark, RR Alarm APNEA 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), Alarm Assist, Disp. ON/OFF
SpO <sub>2</sub>	Size, Label, Alarm Assist, Disp. ON/OFF
	HS-83xxN Detail Setup (Alarm during NIBP, Synchronized Mark/Tone, Second Alarm)
	HS-83xxM Detail Setup (Alarm during NIBP, Synchronized Mark/Tone, SpO <sub>2</sub> 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 <sub>2</sub> Source Priority)
CO <sub>2</sub>	Cal Airway Adpt, Scale, Detail Setup (EtCO <sub>2</sub> Peak Duration, N <sub>2</sub> O Comp., Atmos. Pressure, O <sub>2</sub> Comp., Anesthetic Comp, CO <sub>2</sub> Source Priority), Alarm Assist, Disp. ON
BIS	A-2000/A-3000 Common Setup (Short Trend 2nd Parameter), Trend
Ext. Device	Vigilance/Vigileo, 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, Hemo-dynamics, Average CO Input, Clear Select

## ❑ Other Bed

Other Bed Display	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 <sub>2</sub> , BP, CVP, TEMP, ST, Height/Weight
	Other Setup	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, RR Alarm Increment, Trend Clip, BP Printing Scale, Night Mode Cancel, ST Display Lead Setup, Auto Display Configuration, Dim All Data Other than Numeric, All Window Opaque, Built-in Printer Message Display, Message Icon, Operation Guide Display, Notification when Changing Equipment Configuration, 12-lead Analysis Filter Display, Waveform Size Display, Patient Name on the Information Display Area, Shift Time (Day Shift, Twilight Shift, Night Shift), Key Group Setup, Event Label Setup
	Power ON/ Discharge	Check discharge at power ON, Discharge Mode, NIBP Resume Auto Mode by Manual Meas., Backup setting at Power ON/Discharge
	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 Usage, Jog Dial, 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, PB, Evita) , SvO <sub>2</sub> /CCO (Vigilance, PiCCO), GAS/SPIRO (MGU-800, MGU-810), Other (PC Comm., HLX, BIS, INVOS, FLOW-i)
	Network	Main Unit (IP Address, Sub-Network Mask, Default Gateway), Printer (network printer, IP address, MAC address, printer specification, paper size)
	Status Output	Sync. Signal Output, Alarm Output
	Analog Output	ECG, IBP Output1, IBP Output2
System	DS-LAN	DS-LAN Setup, Room ID, Bed ID, DS-LAN Pat. ID Transmission Start Position, Synchronize Hemodynamic Data with the Central Monitor, CO <sub>2</sub> (mmHg) Upper Limit of Transmission
	Telemeter	Tele. ON/OFF, Channel/Group ID, Telemetry Wave, CO <sub>2</sub> (mmHg) Upper Limit of Transmission
	Unit Module	Multiparameter connector setup of HS-8000, HM-800, SpO <sub>2</sub> channel setup
	Other Setup	AC filter, Extended Display Unit, Search Patient ID, HS-8000 Data Transfer, HS-8000 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, GAS Calibration, Parts Usage Time, Install, Module Install, Test Menu
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# Chapter 2 Name of Parts and Their Functions

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# Chapter 2 Name of Parts and Their Functions

## Name of Parts and Their Functions

### **WARNING**

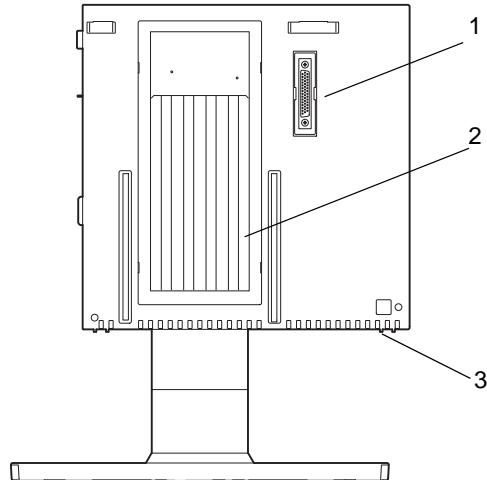
- Do not connect a unit or cable not authorized by Fukuda Denshi to any I/O connector. If done so by mistake, the equipment cannot deliver its maximum performance and the connected units may be damaged, resulting in a safety hazard.

## Main Unit: DSC-8500 series

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

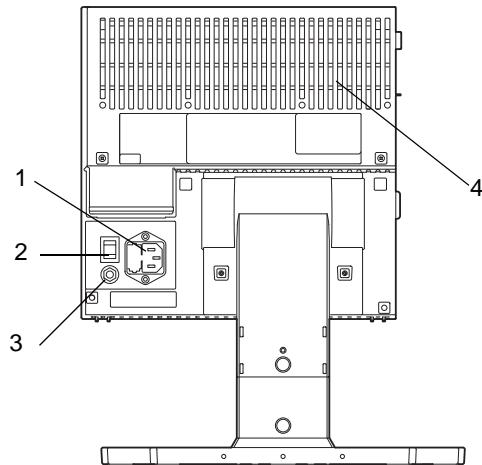
### Front Side

- Display Unit Connector  
Connects the display unit.
- Display Unit Attaching Position  
Attach the display unit (LC-8019T/LC-8019TC/LC-8015T/LC-8015TC).
- Speaker



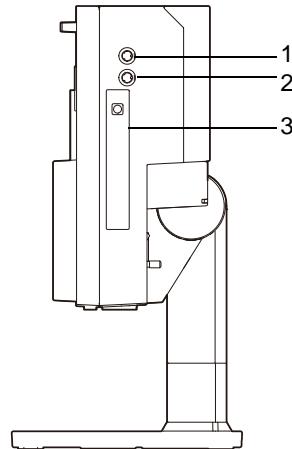
## □ Rear Side

- 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 HLX-561 Telemetry Transmitter Module.



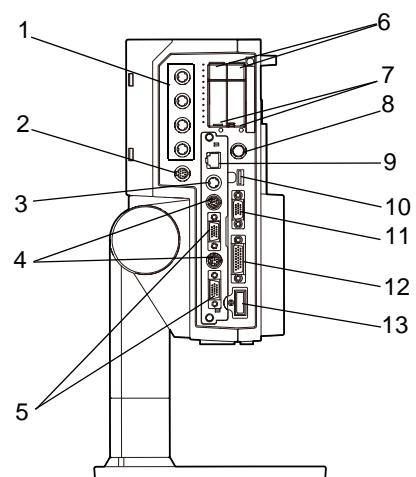
## □ Right Side

- 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

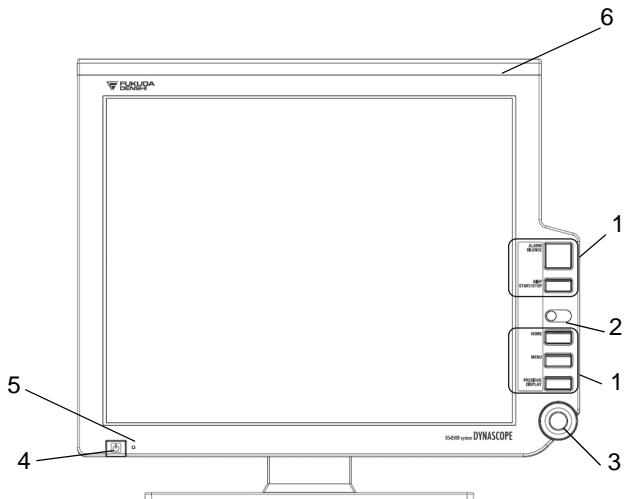


- Insert the specified CF memory card here.
- 7 CF Card Access Indicator  
Indicates CF card access status.
- 8 DS-LAN Connector  
Connects to the wired network using the Branch Cable (CJ-522).
- 9 LAN (TCP/IP) Connector  
(DSC-8530 only, otherwise optional)  
Connects the specified equipment.
- 10 I/O 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)

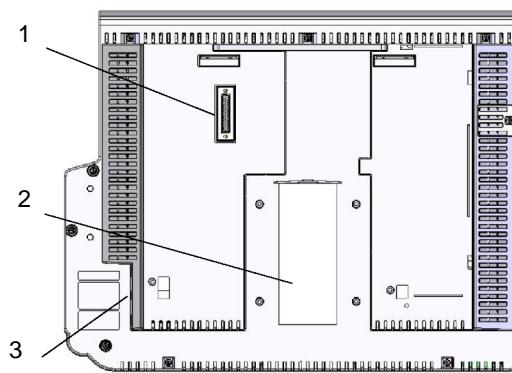
### Front Side

- 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).

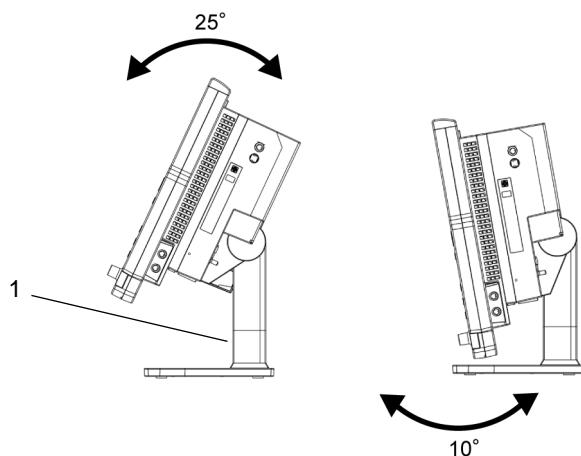


## □ Adjusting the angle of the display unit

### **⚠ 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)

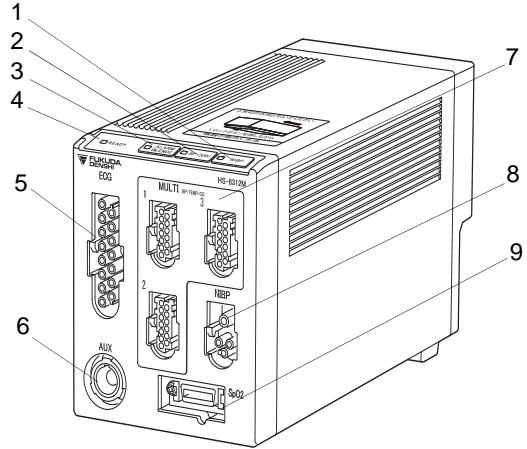
### **⚠ CAUTION**

- 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

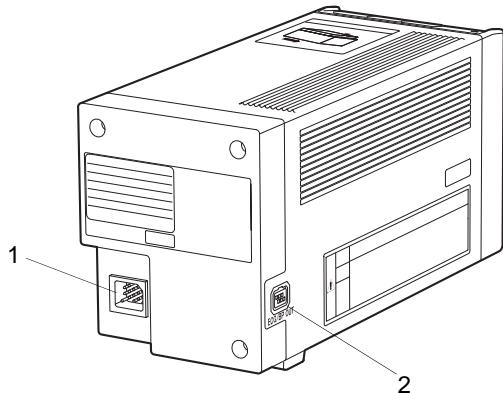
### □Front Side

- 1 NIBP Start/Stop Key with Indicator  
Starts/stops the NIBP measurement. The indicator lights during the NIBP measurement.
- 2 BP Zero Balance Key with Indicator  
Performs BP zero balance. The indicator lights during the BP zero balancing.
- 3 Alarm Silence Key with Indicator  
Silences the Alarm. The indicator lights during the alarm silence condition.
- 4 Power Supply Indicator  
Indicates the power supply status.
- 5 ECG Connector  
Connects the ECG cable.
- 6 AUX Connector  
Connects the HPD-800/HPD-810 Gas Unit I/F or HCP-800/HCP-810 CO<sub>2</sub> Gas Unit.
- 7 Multiparameter Connector x3  
Connects the input cables for BP, TEMP or CO.
- 8 NIBP Connector  
Connects the NIBP air hose.
- 9 SpO<sub>2</sub> Connector  
Connects the SpO<sub>2</sub> 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

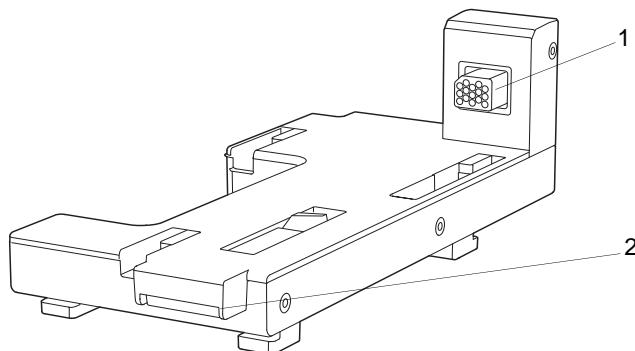
### Front Side

1 Super Unit Connector

Connects the HS-8000 series.

2 Release Lever

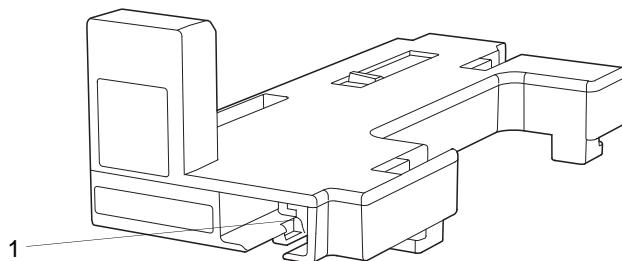
Press here to release the HS-8000 series from the HS Adapter.



### Rear Side

1 module-LAN Connector

Connects to the DSC-8500 series main unit or to the IB-8004.



## 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

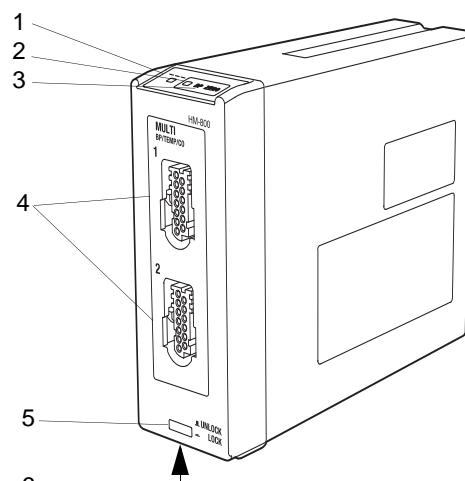
Connects the relay cables for BP, TEMP or CO.

5 Release Lock Button

Press to lock the release lever.

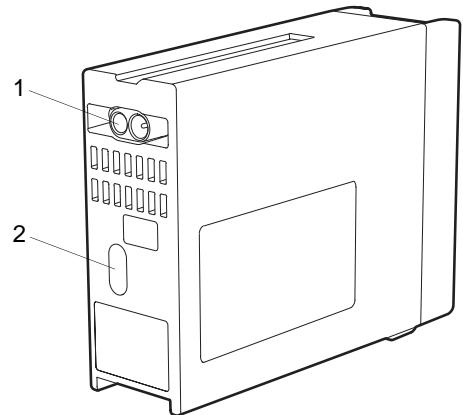
6 Release Lever

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



### □ Rear Side

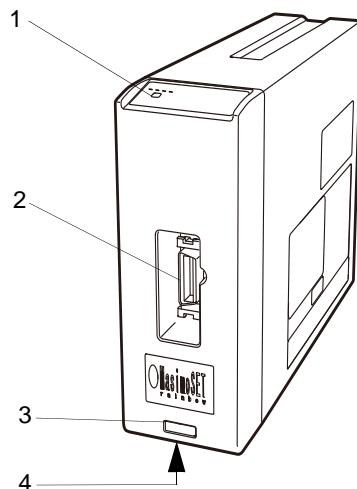
- 1 Power Input Connector  
Supplies power while connecting to the Input Box.
- 2 Infrared Communication Port  
Communicates with the Input Box via IrDA.



## SpO<sub>2</sub> Module: HG-810(Masimo)/ HG-820(Nellcor)

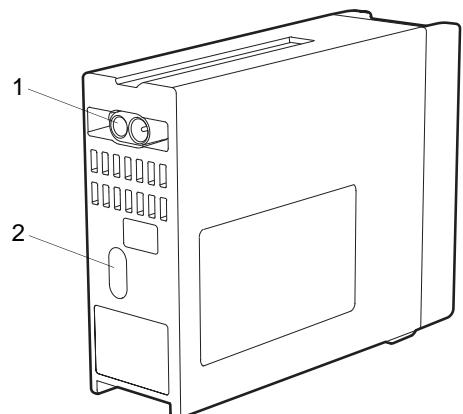
### □ Front Side

- 1 Power Supply Indicator  
Indicates the power status.
- 2 SpO<sub>2</sub> Connector  
Connects the SpO<sub>2</sub> 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

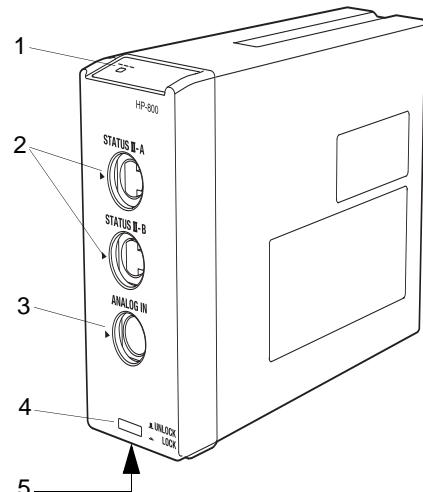
- 1 Power Input Connector  
Supplies power while connecting to the Input Box.
- 2 Infrared Communication Port  
Communicates with the Input Box via IrDA.



## Multiport Module: HP-800

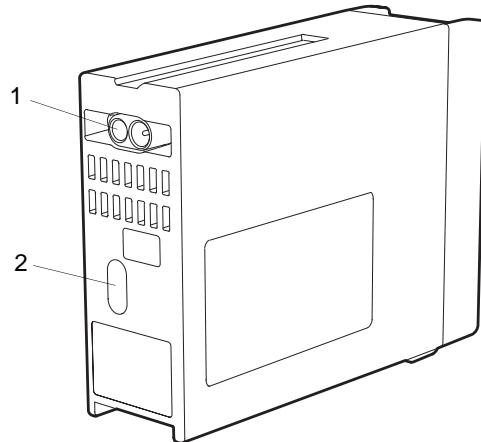
### Front Side

- 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

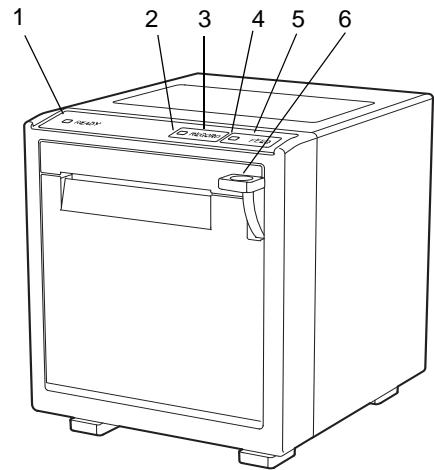
- 1 Power Input Connector  
Supplies power while connecting to the Input Box.
- 2 Infrared Communication Port  
Communicates with the Input Box via IrDA.



## Recorder Unit: HR-800

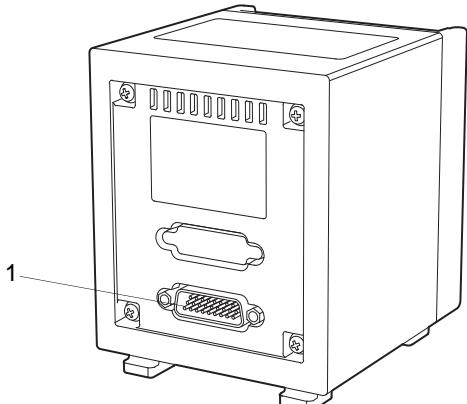
### Front Side

- 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

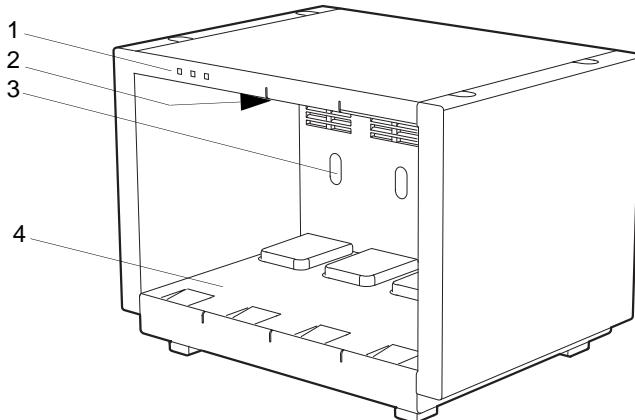
- 1 U-LINK Connector  
Connects to the MGU-800/810 series Multigas Unit or DSC-8500 series Main Unit.



## Input Box: IB-8004

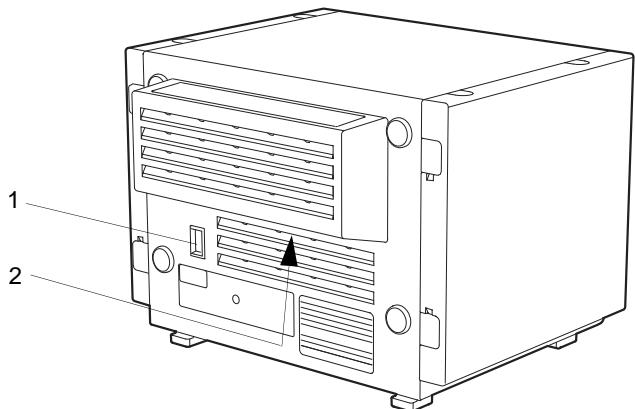
### Front Side

- 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 4 expansion modules at maximum in SLOT 1 to 4.



### Rear Side

- 1 LAN-ID Setting Dial  
Used to assign LAN-ID.
- 2 module-LAN Connector x3  
Connects to the DSC-8500 series Main Unit, IB-8004 Input Box or HSA-80 HS Adapter.



## CO<sub>2</sub> Gas Unit: HCP-800

### □ Front Side

1 Power Supply Indicator

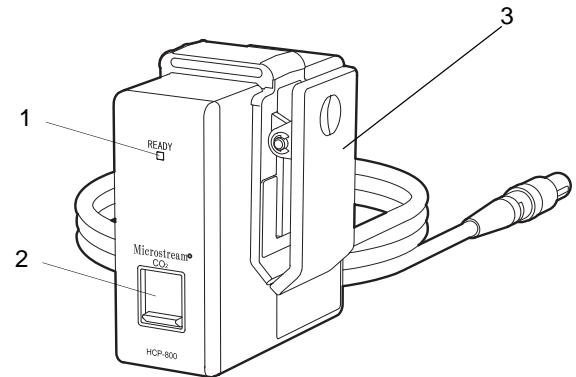
Indicates the power ON/OFF status. It will light in green while the power is ON.

2 Sampling Tube Connector

Connects the sampling tube manufactured by Covidien®.

3 Clip

Attaches to the bedside rail or headboard for bedside use.



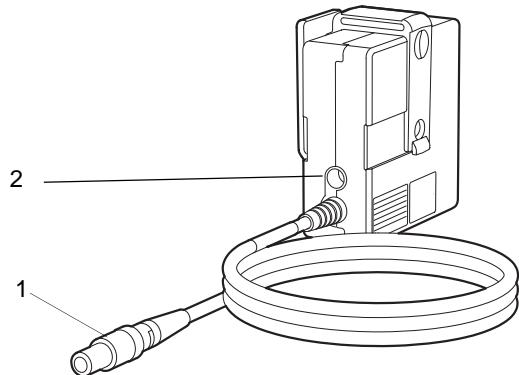
### □ Rear Side

1 AUX Connector

Connects to the AUX connector of the HS-8000.

2 Exhaust Hole

Connects the gas exhaust system and exhausts sampling gas.



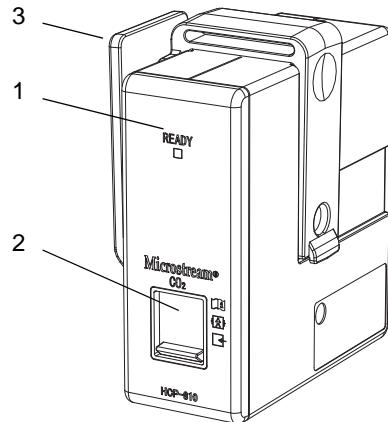
### CAUTION

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

## CO<sub>2</sub> Gas Unit: HCP-810

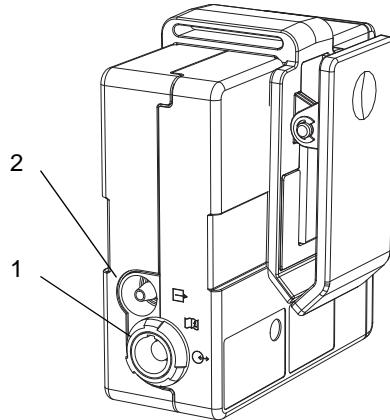
### Front Side

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



### Rear Side

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



#### CAUTION

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

## Gas Unit I/F: HPD-800

### □Front Side

#### 1 Power Supply Indicator

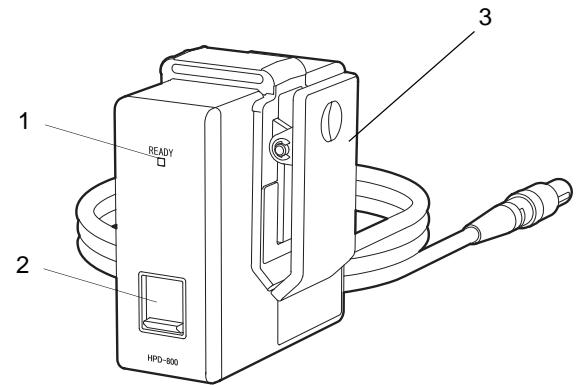
Indicates the power ON/OFF status. It will light in green while the power is ON.

#### 2 CO<sub>2</sub> Connector

Connects to the Capnostat 5 manufactured by Resironics.

#### 3 Clip

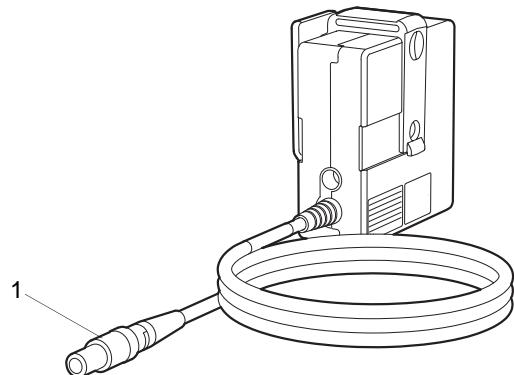
Attaches to the bedside rail or headboard for bedside use.



### □Rear Side

#### 1 AUX Connector

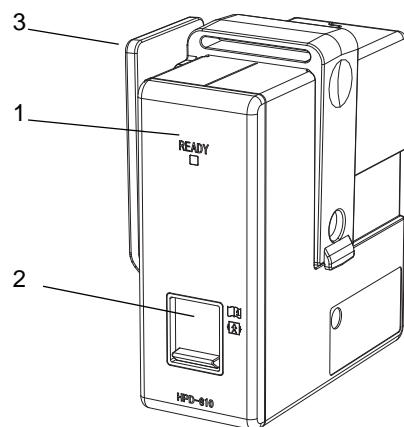
Connects to the AUX connector of the HS-8000.



## Gas Unit I/F: HPD-810

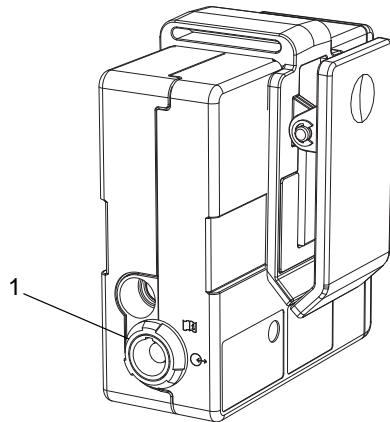
### □Front Side

- 1 Power Supply Indicator  
Indicates the power ON/OFF status. It will light in green while the power is ON.
- 2 CO<sub>2</sub> Connector  
Connects to the Capnostat 5 manufactured by Respiromics.
- 3 Clip  
Attaches to the bedside rail or headboard for bedside use.



### □Rear Side

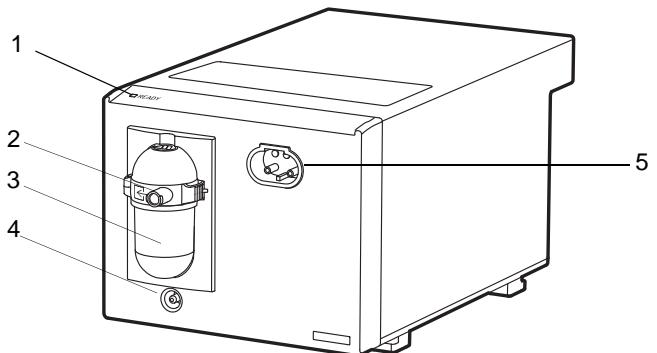
- 1 AUX Connector  
Connects to the AUX connector of HS-8000 with AUX connection cable, CJO-15RR0.65.



## Multigas Unit: MGU-800/810 Series

### Front Panel (MGU-801P/MGU-802/MGU-803/MGU-811P/MGU-812/MGU-813)

- 1 Power Supply Indicator  
Indicates the power status.
- 2 Inhale Port  
Connects the sampling tube to inhale sampling gas.
- 3 Water Trap with Reservoir  
Removes water from the sampling tube connected to the patient. When the reservoir is more than half full with water, empty the water. When connecting to a new patient, clean with specified antiseptic solution.  
( 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**

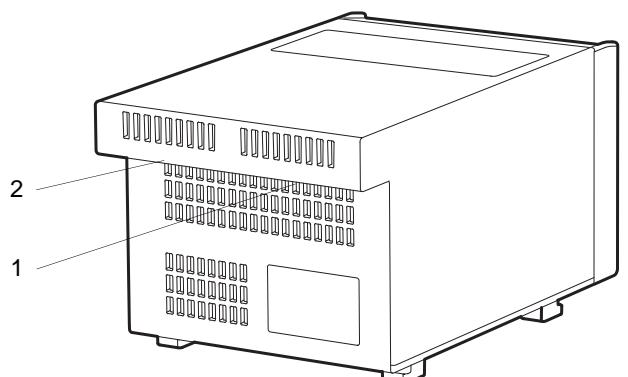
- Do not block the exhaust hole as it may cause damage to the equipment.

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

Connects the flow sensor cable.

### Rear Side

- 1 External Equipment Connector 1  
Connects the main unit.
- 2 External Equipment Connector2  
Connects to the HR-800 Recorder Unit.





# Chapter 3 Operation Procedure and Screen Examples

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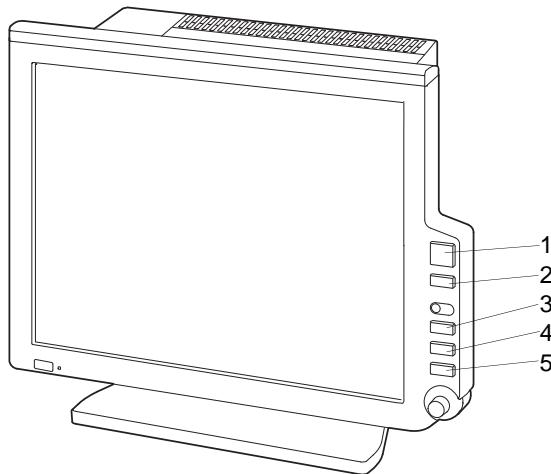


# Chapter 3 Operation Procedure and Screen Examples

## 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.

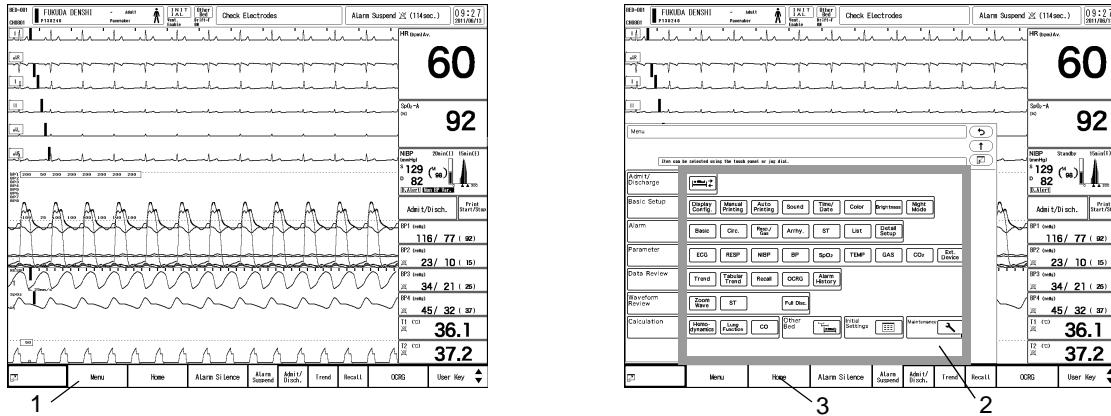
### Touch Key

**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

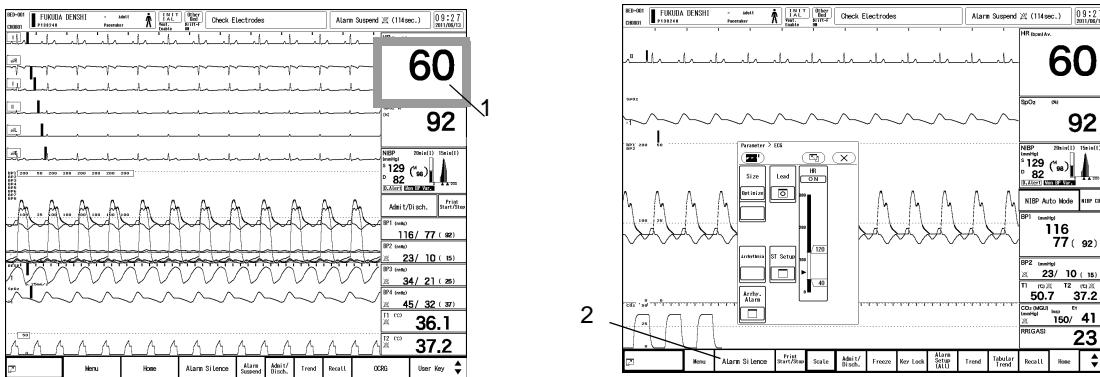


- 1 Pressing the [Menu] or the fixed key will switch the screen with a pip sound.
- 2 The touch key will respond by pressing any part of the key.
- 3 Pressing the [Home] key (fixed key or user key) at any time will return the display to the home display.

### 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



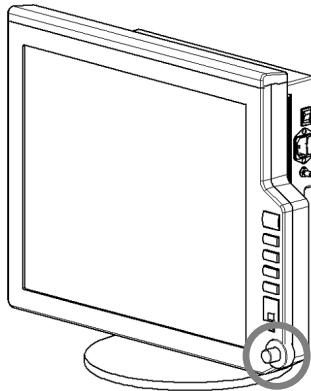
- 1 Press the numeric data box area.  
The touch key will respond by pressing any part of the numeric data box.
- 2 Pressing the [Home] key (fixed key or user key) at any time will return the display to the home display.

### 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" P3-27)

## Jog Dial

The jog dial can be used for menu operation.



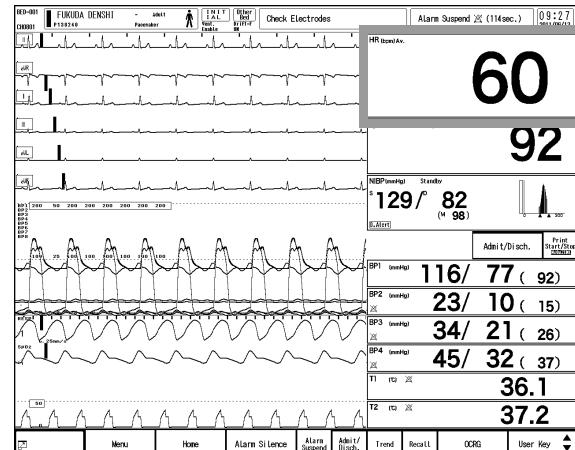
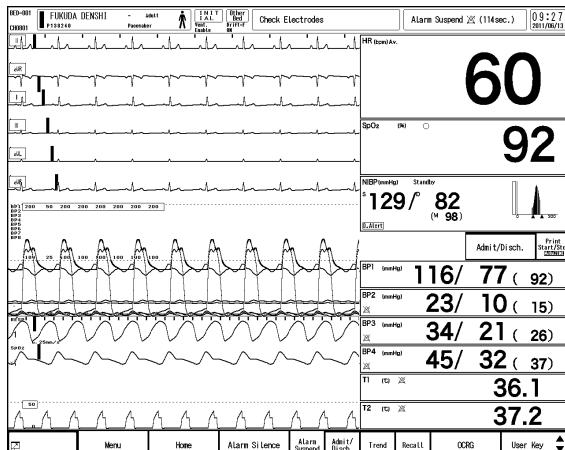
When the home display is displayed, the jog dial marker (i.e. a blue frame indicating the operation target of the jog dial) will not be displayed.

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

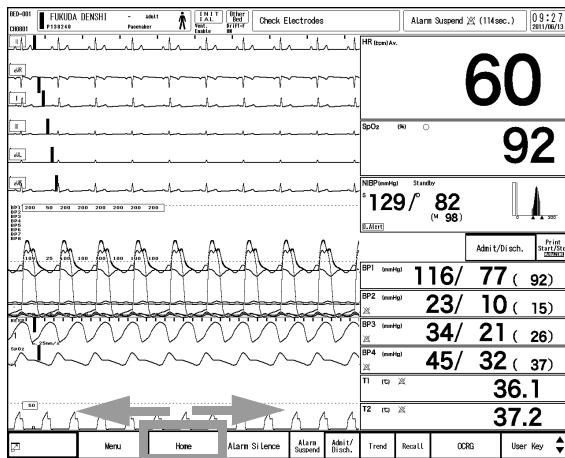
Pressing the jog dial while the jog dial marker is visible will perform the same operation as pressing the marker on the display.

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

### Home Display



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

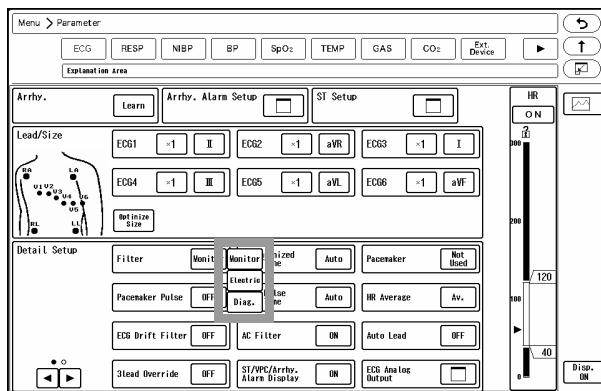


Turning the jog dial will perform operations such as changing the selection in the dropdown list or increasing/decreasing the alarm threshold.

#### 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.

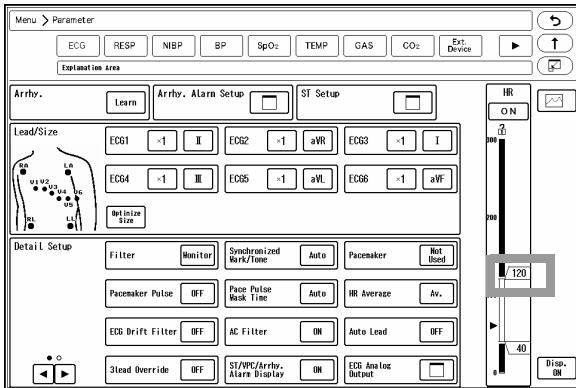
**4** Press the jog dial.

- 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.

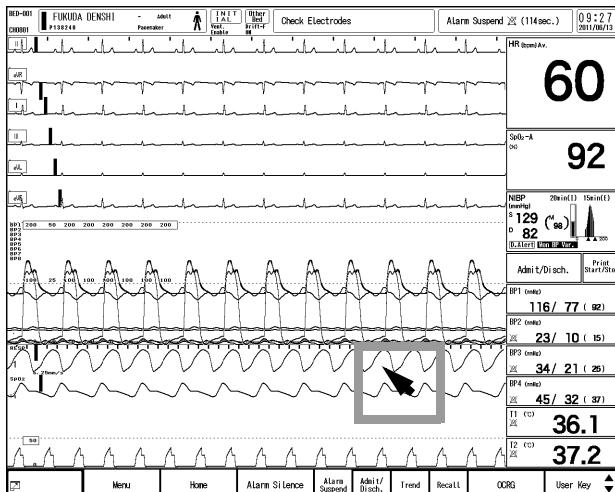
### ⚠ CAUTION

- 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" P5-23)

## 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.

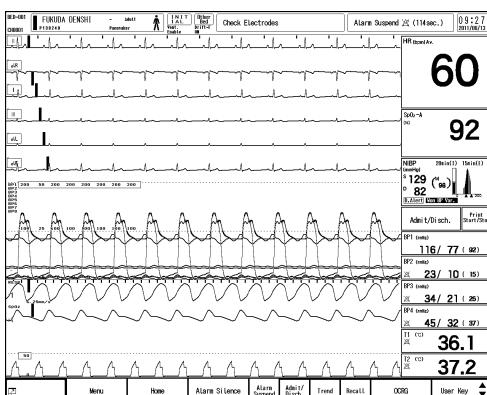
"12-Lead" is the layout for monitoring the 12-lead ECG. 12-lead ECG and other waveforms will be displayed.

"Bottom" is the layout with numeric data box at the bottom, which allows large waveform display area.

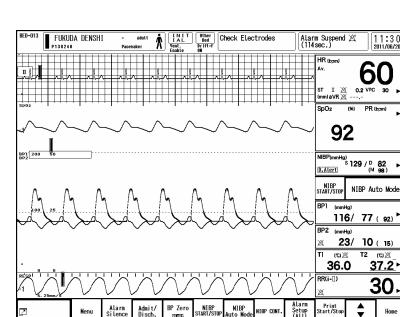
The numeric data box area can be selected from "Right", "Right&Bottom", "Left", "Left&Bottom", "Bottom".

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

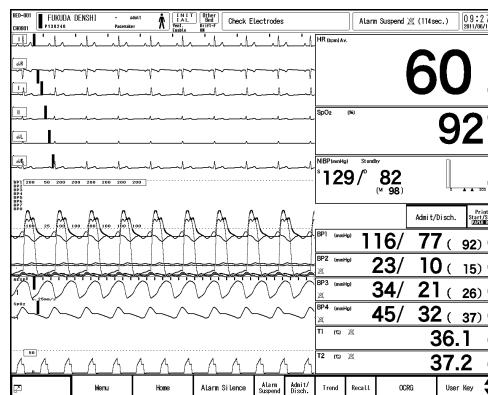
### Display Example:



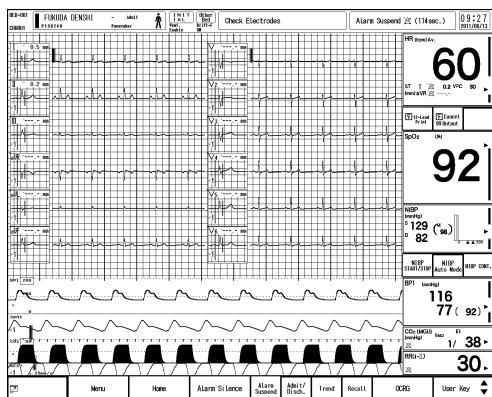
Layout: Standard, Numeric Data: Right (LC-8019T)



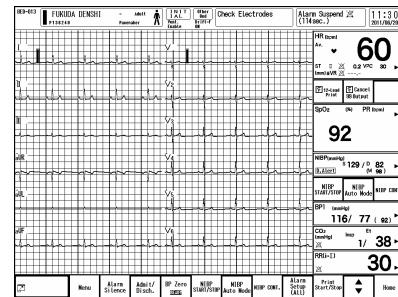
Layout: Standard, Numeric Data: Right (LC-8015T)



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 and registered as necessary.  
( "To Configure the Display" P10-7)

**NOTE**

- When LC-8015T is used, the layout for enlarged numeric data ("Large") 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.

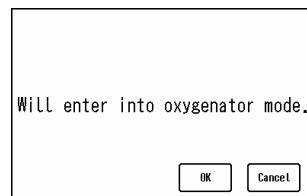
\*It is also possible to set the same alarm function with the standard monitoring mode.

#### REFERENCE

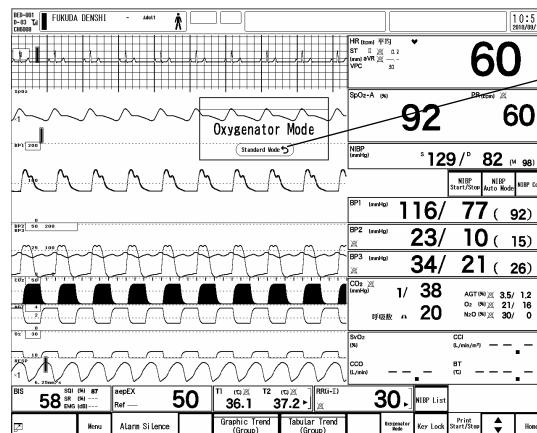
- The oxygenator mode setup can be performed on the "Alarm" screen under "Initial Settings".  
( Maintenance Manual "Alarm Related Setup" P5-4)

**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

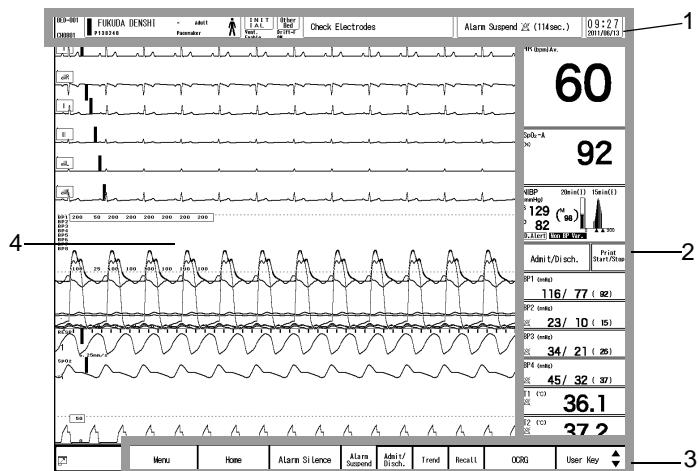
- The message window can be dragged to any position within the waveform area.
- The message window will not be displayed by selecting [OFF] for "Oxygenator Mode Message" (Menu>Initial Settings>Oxygenator Mode Setup).

## Displayed Items

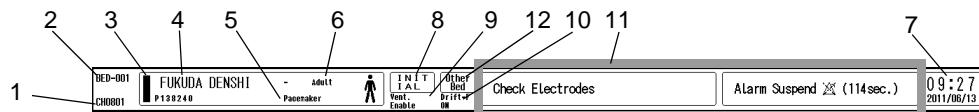
Other than waveforms and numeric data, patient name, alarm message, status message, etc. will be displayed on the screen.

### Numeric Data, Waveform, Patient Name, etc.

- 1 Information Display Area
- 2 Numeric Data Area
- 3 User Key Area
- 4 Waveform Area



### Information Display Area



- 1 Telemetry Channel (When HLX-561 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  
Displays the patient name set on the "Admit/Discharge" menu.

#### 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  
Displays the patient classification (Adult, Child, Neonate) set on the "Admit/Discharge" menu.
- 7 Date / Time  
Displays the current date (month, day) and time (hour, minute).

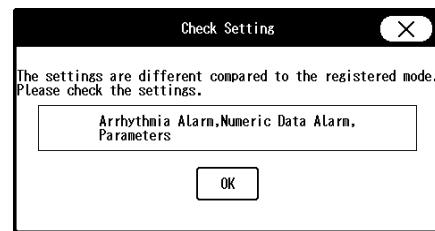
## 8 Set Mode

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 to the ventilator.

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

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

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

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

Displays the message when an alarm generates.

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

## 12 Other Bed Status

Displayed when connected to central monitor.

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

## Waveform Area

### 1 ECG

### 2 ECG Lead

### 3 ECG Size

The waveform size of ECG, RESP, SpO<sub>2</sub> can be displayed in numeric or bar.

[Initial Settings > User I/F > Display/Print > Waveform Size Display]

( Maintenance Manual "Display/Print Setup" P5-13)

### 4 BP Scale

### 5 BP Label

### 6 BP Waveform

### 7 Respiration Waveform

### 8 Respiratory Sweep Speed

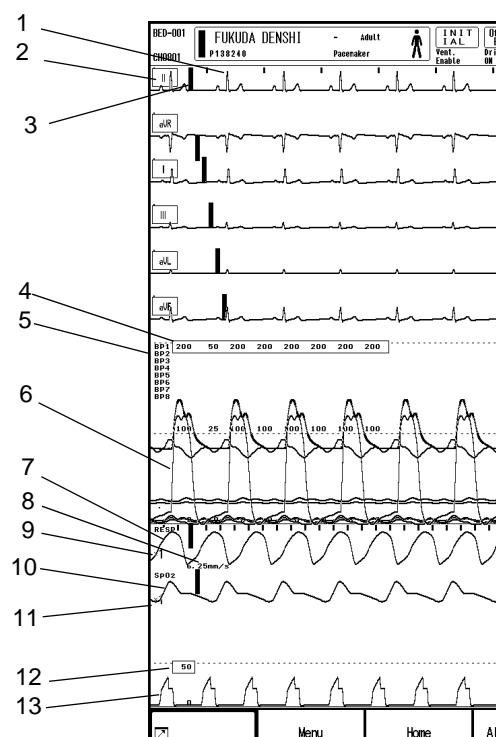
Displays the sweep speed for the impedance respiration waveform, CO<sub>2</sub> waveform, AWP, AWF waveform.

### 9 Respiration Waveform Size

### 10 SpO<sub>2</sub> Waveform

### 11 SpO<sub>2</sub> Waveform Size

### 12 CO<sub>2</sub> Scale



13 CO<sub>2</sub> Waveform

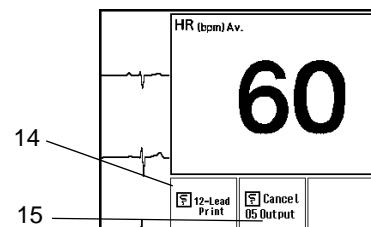
14 [12-Lead Print] Key

Displayed when ECG 12-lead waveform is displayed. The 12-lead waveform will be output to the built-in printer.

(☞ "12-lead Waveform Printing" P9-9)

15 [Cancel Printing] Key

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



#### □ Numeric Data Box Display (for all parameters)

1 Message Icon

When the numeric data box size is too small to display the message inside, a message icon will be displayed instead to indicate that message is present.

(☞ Maintenance Manual "Display/Print Setup" P5-13)

2 Alarm OFF Mark

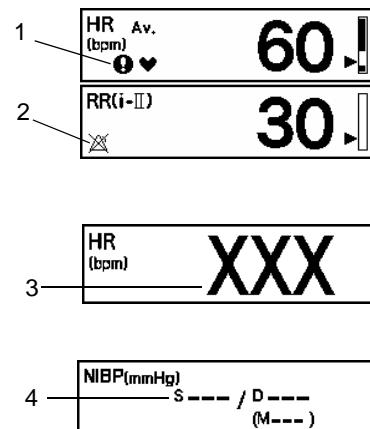
Displayed when the alarm is set to OFF.

3 Out of Measurement Range (XXX)

The measurement is out of range.

4 Measurement Error (---)

Displayed when the NIBP measurement ended erroneously.



#### □ Numeric Data Box Display (for each parameter)

##### REFERENCE

- The following numeric data box is displayed when the corresponding parameter is selected on the "Numeric Data Selection" window under "Display Config.". (☞ "Numeric Data Selection" P10-5)

HR, HR/PR

1 HR/PR Synchronization Mark

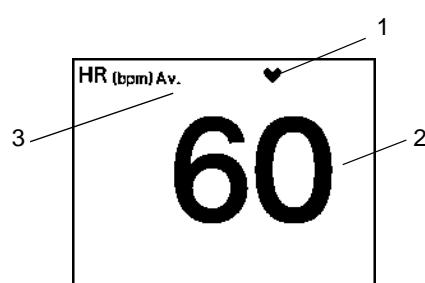
When HR or PR according to the setting of "Synchronized Mark/Tone" is detected, HR/PR synchronized mark will be displayed inside the corresponding numeric data box.

2 Heart Rate / Pulse Rate

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

3 HR Average (Instant / Average)

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

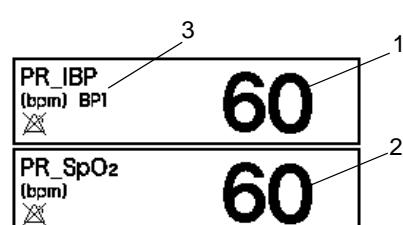


PR, HR/PR

1 Pulse Rate (BP)

2 Pulse Rate (SpO<sub>2</sub>)

3 PR\_IBP Source



**SpO<sub>2</sub>****1 SpO<sub>2</sub> Value**

The arterial oxygen saturation will be displayed.

**2 SpO<sub>2</sub> Label**

The label set for SpO<sub>2</sub> 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<sub>2</sub> Unit manufactured by Nellcor™.

**4 Pulse Rate**

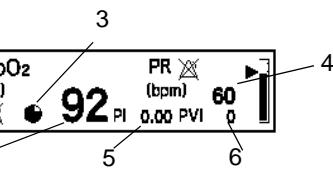
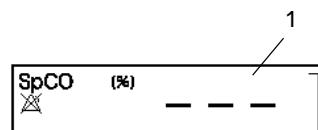
Pulse rate will be displayed. When the value exceeds the measurable range, "xxx" will be displayed.

**5 PI Value (Masimo only)**

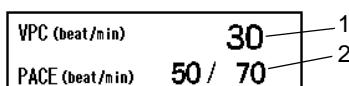
The perfusion index will be displayed.

**6 PVI Value (Masimo only, optional)**

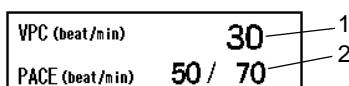
The pleth variability index will be displayed.

**SpCO/SpMet/SpHb Value (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.**VPC****1 VPC (1 min)**

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

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

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

**ST:****ST Level**

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

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

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

ST (mm)	I	0.5
	II	0.2
	III	---
	aVR	---

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

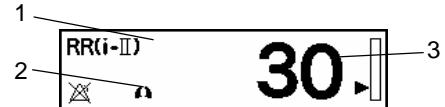
**REFERENCE**

- ♦ The leads displayed inside the ST level box can be changed.  
( Maintenance Manual "Display/Print Setup" P5-13)

## RR

### 1 RR Source

A source of RR measurement will be displayed in accordance with the "RR/APNEA Alarm Source" setup. "i" for the impedance measurement, "GAS" for the CO<sub>2</sub>/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

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

### 3 Respiration Rate

Impedance RR, CO<sub>2</sub> RR, ventilator RR will be displayed. When the value exceeds the measurable range, "xxx" will be displayed.

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

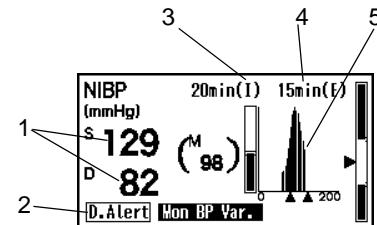
## NIBP

### 1 NIBP Value/Cuff Pressure

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

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

During measurement, a cuff pressure will be displayed.



### 2 Dyna Alert Message

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

### 3 NIBP Measurement Interval

The NIBP measurement interval will be displayed.

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

### 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

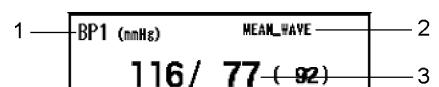
The NIBP list of latest 3/6/9/12/18 data and the measured date/time will be displayed. The number of displaying data depends on the size of numeric data box.

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

## BP Value

### 1 BP Label

The label set for the blood pressure will be displayed.



### 2 MEAN\_WAVE

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

### 3 BP

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

## PAP/ IAP/ ICP

### 1 PCWP Value, PCWP Measured Time

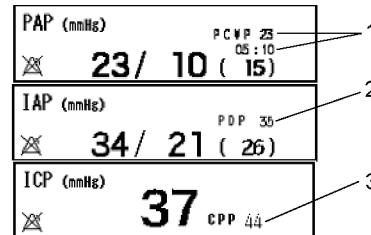
When the BP label is PAP, PCWP (Pulmonary Capillary Wedge Pressure) and measured time can be displayed.

### 2 PDP Value

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

### 3 CPP Value

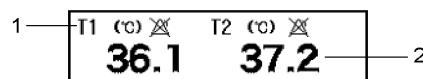
When the BP label is ICP, labeling the artery pressure as ART will allow measuring the CPP (Cerebral Perfusion Pressure). (CPP = Mean Arterial Pressure – Mean Intracranial Pressure) If the CPP value is negative value, or zero balance has not been performed for ICP or ART, "—" will be displayed, and if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



## Temperature

### 1 TEMP Label

The label set for the temperature will be displayed.



### 2 TEMP Value

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

## Blood Temperature

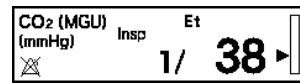
When using the thermodilution catheter for the CO measurement, blood temperature will be displayed. When the value exceeds the measurable range, "xxx" will be displayed.



## EtCO<sub>2</sub>/ InspCO<sub>2</sub>

### EtCO<sub>2</sub> Value/ InspCO<sub>2</sub> Value

The end-tidal CO<sub>2</sub> concentration and inspiratory CO<sub>2</sub> concentration measurement value will be displayed.

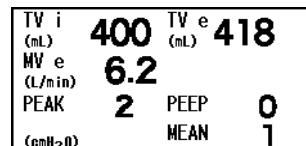


The measurement unit can be selected from mmHg / kPa / % under the "Initial Settings" menu.

## Ventilator

### Ventilator Data

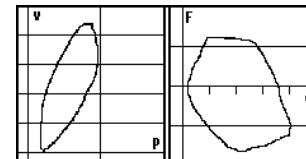
When ventilator is connected, the ventilator measurement data will be displayed.



## P-V, F-V

### P-V, F-V Loop

By connecting the ventilator or multigas unit (MGU-810 with SPIRO unit), 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<sub>2</sub>/CCO Measurement Device

#### SvO<sub>2</sub>/CCO Data

When SvO<sub>2</sub>/CCO measurement device (Vigilance/Vigilance CEDV/Vigilance II/Vigileo/PiCCO2) is connected, the measured data (SvO<sub>2</sub>, CO, etc.) will be displayed. The displayed data will differ depending on the used SvO<sub>2</sub>/CCO measurement device or display mode.

SvO <sub>2</sub> (%)	CCI (L/min/m <sup>2</sup> )
83	2.8
CCO (L/min)	BT (°C)
5.3	37.5

Oximeter/CCO Measurement Device	Displayed Data			
Vigilance (CCO mode/STAT OFF/Index OFF)	SvO <sub>2</sub> (ScvO <sub>2</sub> )	CCO	EDV	BT
Vigilance (CCO mode/STAT OFF/Index OFF)	SvO <sub>2</sub> (ScvO <sub>2</sub> )	CCO STAT	EDV STAT	BT
Vigilance (CCO mode/STAT OFF/Index OFF)	SvO <sub>2</sub> (ScvO <sub>2</sub> )	CCI	EDVI	BT
Vigilance (CCO mode/STAT OFF/Index OFF)	SvO <sub>2</sub> (ScvO <sub>2</sub> )	CCI STAT	EDVI STAT	BT
Vigilance (ICO mode)	SvO <sub>2</sub> (ScvO <sub>2</sub> )	CO AVG	CI AVG	-
PiCCO2	ScvO <sub>2</sub>	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.

- It is measured on Vigilance with CCO mode. (It will not be displayed during ICO mode.)
- SvO<sub>2</sub> 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.)

SV	SVR	1363
RWV	RWSW	8.1
0.54		
SVI	SVRI	2304
RVWI	RWSWI	4.2
0.32		

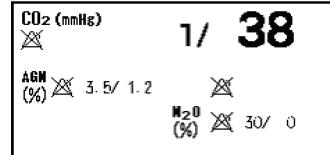
Data	Description	Formula
SV	Stroke Volume (mL/beat)	$\frac{\text{CCO} \times 1000}{\text{HR}}$
SVR	Systemic Vascular Resistance (dynes·sec·cm <sup>-5</sup> )	$\frac{(\text{MAP} - \text{CVP}) \times 79.90}{\text{CCO}}$
RWV	Right Ventricular Work (kg·m)	$\text{CCO} \times (\text{MPAP} - \text{CVP}) \times 0.0136$
RWSW	Right Ventricular Stroke Work (g·m)	$\text{SV} \times (\text{MPAP} - \text{CVP}) \times 0.0136$
SVI	Stroke Volume Index (mL/beat/m <sup>2</sup> )	$\frac{\text{SV}}{\text{BSA}}$
SVRI	Systemic Vascular Resistance Index (dynes·sec·cm <sup>-5</sup> ·m <sup>2</sup> )	$\text{SVR} \times \text{BSA}$
RVWI	Right Ventricular Work Index (kgm/m <sup>2</sup> )	$\frac{\text{RWV}}{\text{BSA}}$
RWSWI	Right Ventricular Stroke Work Index (g·m/m <sup>2</sup> )	$\frac{\text{RWSW}}{\text{BSA}}$

#### NOTE

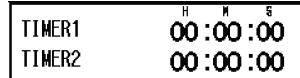
- The calculated hemodynamic data will not be stored as Vigilance list data. For the Vigilance list, the actual measured data will be stored.

**Multigas Unit Data****Multigas Unit Data**

When multigas unit or mainstream module is connected, the numeric data measured by the connected unit or module ( $\text{CO}_2$  /anesthetic gas/ $\text{O}_2$  / $\text{N}_2\text{O}$  concentration) will be displayed.

**TIMER****Stopwatch Key**

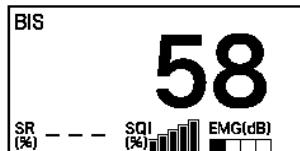
Functions as stopwatch.

**BIS****BIS Value**

When BIS Monitor is connected 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.

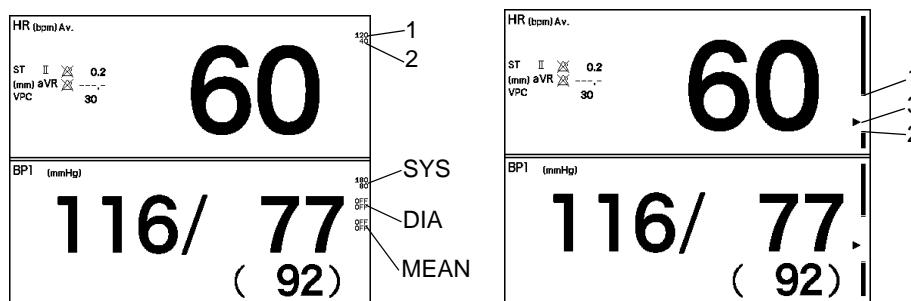


Bar Graph	SQI (0 to 100) [%]	EMG (30 to 55) [dB]
1st bar	1 to 20	30 to 38
2nd bar	21 to 40	39 to 47
3rd bar	41 to 60	48 to 55
4th bar	61 to 80	55 and above
5th bar	81 to 100	-

**INVOS****INVOS 5100C Measurement Data**

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

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

**Alarm Limit Display**

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

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

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

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

ON/OFF of alarm limit display can be selected. (☞ "List of Alarm Settings" P6-5)

1 Upper Alarm Limit

2 Lower Alarm Limit

### 3 Current Measurement Value (SYS)

**NOTE**

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

#### □ Short Trend Display

##### 1 Short Trend Display

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

The parameters to be displayed can be set on the "Display Config." menu.

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 for the alarm generating parameter will display the "recall" screen.

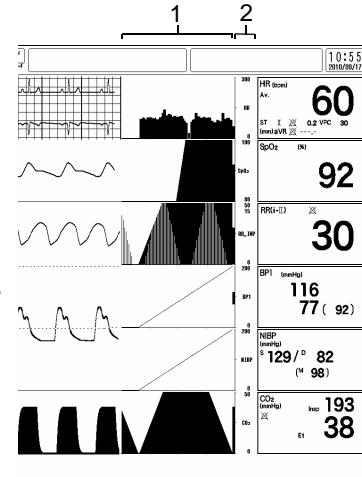
##### 2 Trend Scale

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" (Menu>Display Config.>Detail Setup).

- ▶ BP, PEAK, TV, CO<sub>2</sub>, O<sub>2</sub>, Agent

For operation procedure on the short trend display, refer to "Short Trend" P8-11.



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

Screen	Maximum Waves Displayed	Display Duration (25mm/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 & Bottom/Left & Bottom)	26	About 12 sec.	36
12-Lead (Right & Bottom/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 differs according to the waveform and numeric data to be displayed. (For example, if ECG waveform is selected, it will require at least 2 rows of display area on the screen.)

## 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 are the symbols and their meaning indicated on the unit.

Symbol	Description
	Alarm OFF Indicates the alarm is OFF.
	Pulse Tone This mark flashes synchronizing to the heartbeat.
	RR Sync. Indicator This mark flashes synchronizing to the inspiration.
	Message Icon This mark will be displayed inside the parameter key when an alarm message is present for that parameter. Whether or not to display this icon can be selected on the Initial Settings.
	Key Lock Mark Indicates that the item requires password input when changing its setting.
	Key Unlocked Mark Indicates that the key is unlocked

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

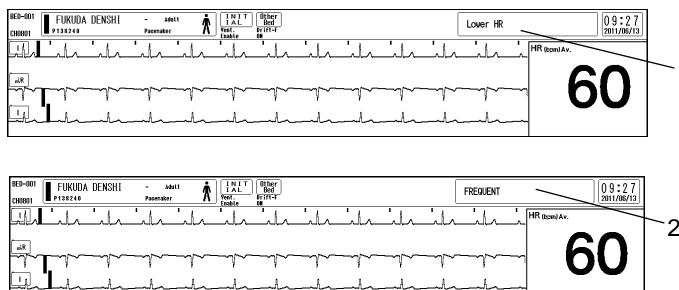
### CAUTION

- When more than one alarms 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 intervals. The alarm messages will be displayed according to the priority. If the priority level is the same, the newer alarm message will be prioritized.

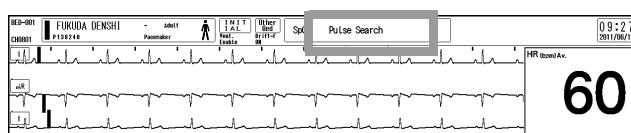
### **CAUTION**

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

## □ Equipment Status Alarm Message

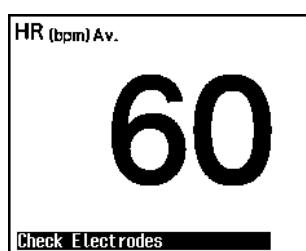
The equipment status alarm message will be displayed when proper monitoring cannot be performed.

The alarm messages will be displayed according to the priority. If the priority level is the same, the newer alarm message will be prioritized.



## □ Numeric Data Box Message

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



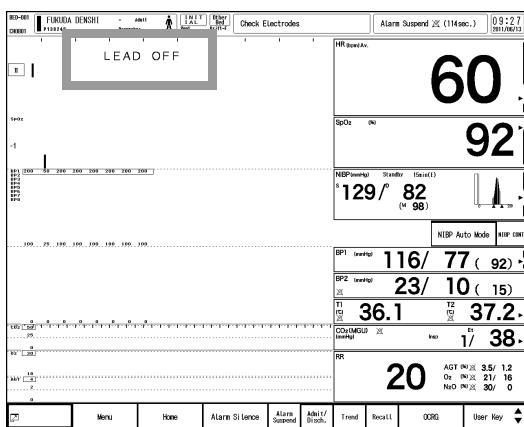
## □ Lead-Off Message

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

### **WARNING**

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

patient. Promptly check the electrodes when this message is displayed.



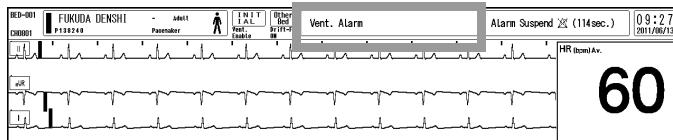
## □ Ventilator Alarm Message

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

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

### ⚠ WARNING

- The ventilator alarm sound is set to OFF at factory default setting.
- The alarm sound can be turned ON on the "Tone/Volume" menu.  
(☞ "Tone/Volume" P10-21)



## □ Ventilator Alarm Factor Message

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

### ⚠ CAUTION

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

## □ Ventilator Disconnected Confirmation Window

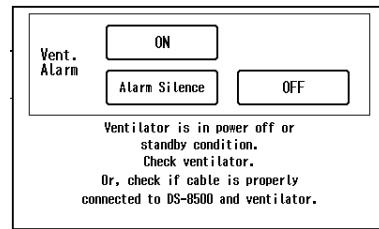
A confirmation window will be displayed when a ventilator cable is disconnected from the DS-8500, or when the power of the ventilator is turned OFF.

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

[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.

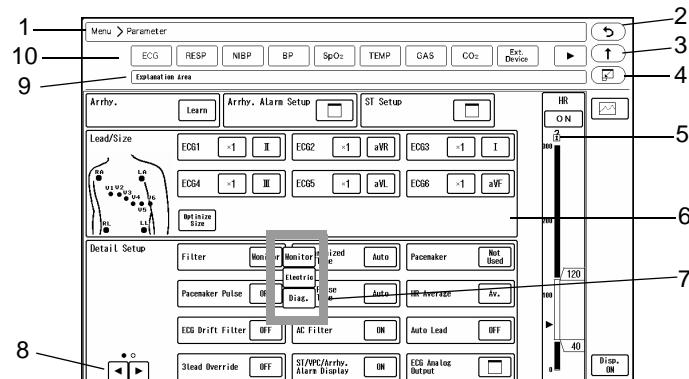
To restore the minimized window, press the Restore key in the user key and select the window to restore.

#### 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

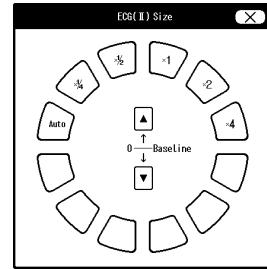
**NOTE**

- 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**

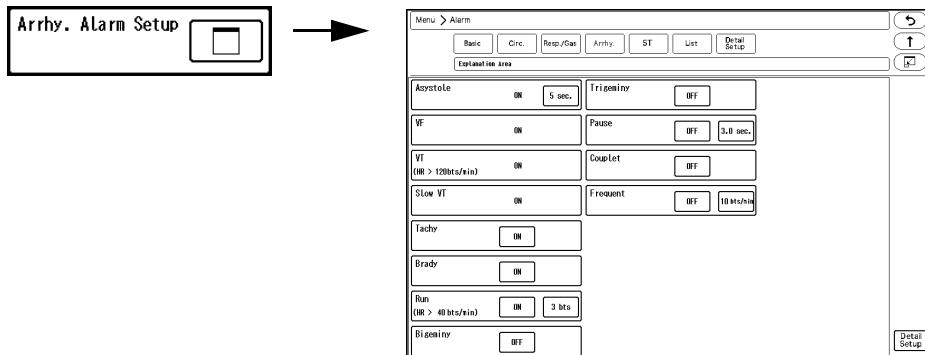
Most setup items are selected from their corresponding dropdown list.  
The dropdown list will close once a setup item has been selected.  
Pressing the item again or selecting a different item will also close the list.  
Some items will show a sub window in which the setup operation is performed.  
To close the sub window, press either the key, [Home] or key.

- ♦ <Sub window example>



When the key with the 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

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

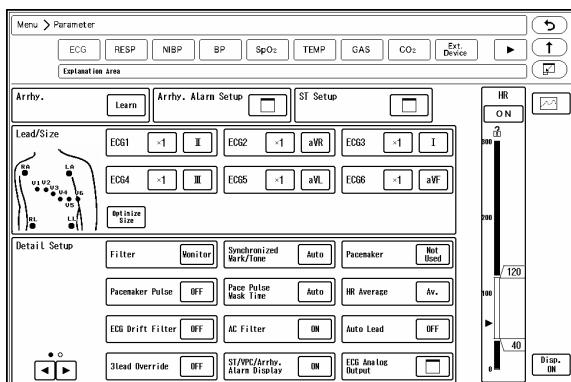
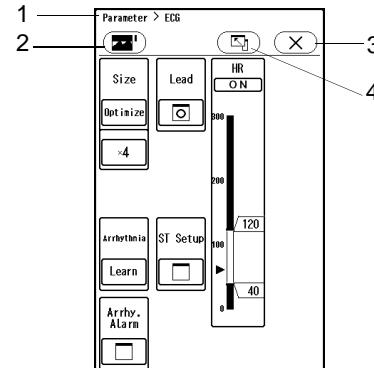
(☞ "Alarm Assist Screen" P6-13)

### 3 Close Key

Pressing the key will close the window. The window can also be closed by pressing the fixed key, or .

### 4 Detail Button

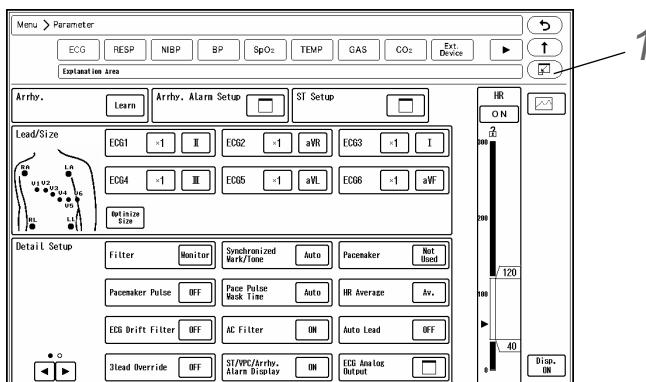
On the floating window, minimum items are displayed. Press the key to display more detailed items.



## 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.

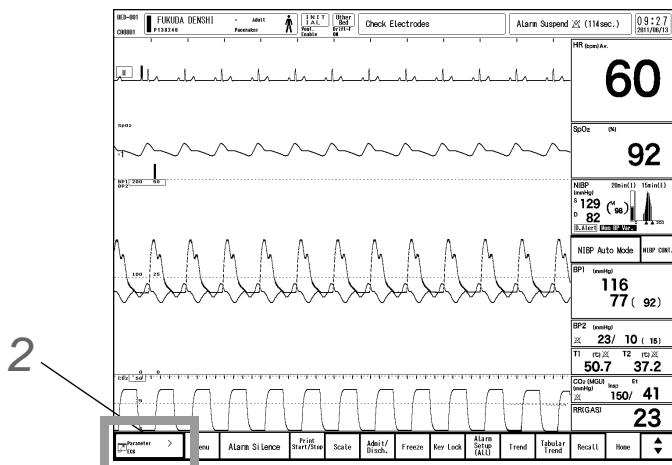
### 1 Press the icon.



▶ The window will be minimized.

### 2 Press the minimized window.

► The original window will be displayed again.



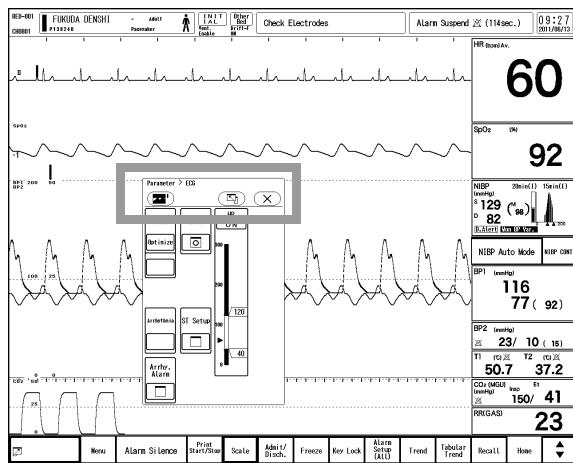
**NOTE**

- 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]).

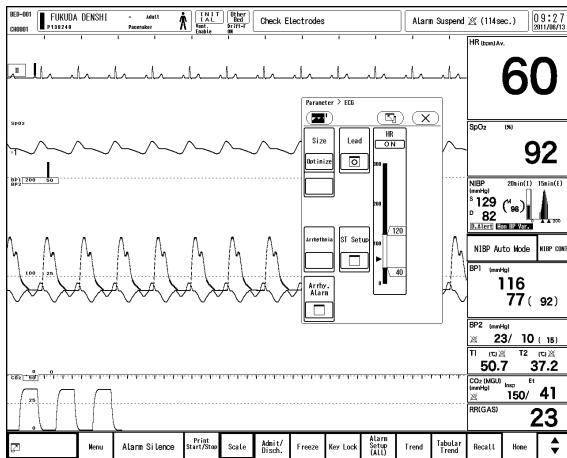
## Transfer Window

The floating window which is displayed by pressing the numeric data area can be moved by dragging the window title bar.

**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.

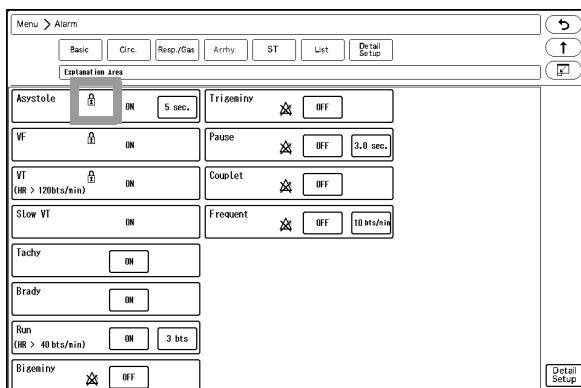
( Maintenance Manual "Key Lock" P5-2)

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

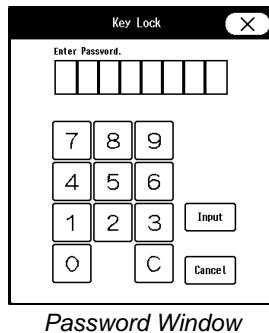
The unlocked condition will return to locked condition if operation has not been performed for about 30 seconds.

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



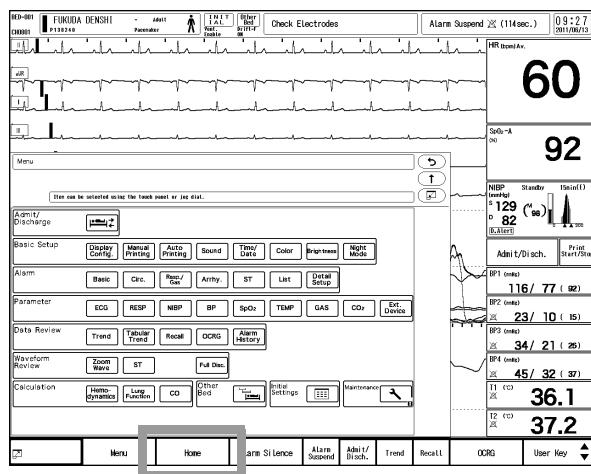
Password Window

**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.

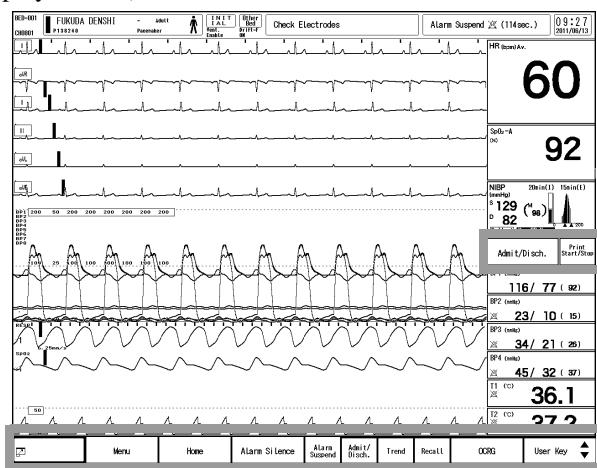
### REFERENCE

- From the preprogrammed user mode, the display configuration and alarm settings can be selected according to the monitoring purpose.  
([Maintenance Manual "User Mode Registration" P5-26](#))

## User Key

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

(["To Configure the Display" P10-7](#))



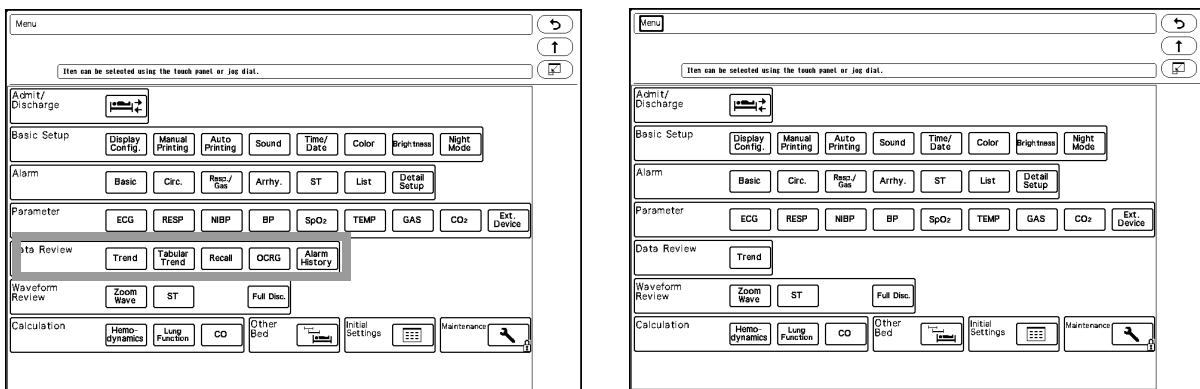
By assigning the [User Key  $\blacktriangle$ ] to the user key area, 2 pages of user keys can be registered. Press the [User Key  $\blacktriangledown$ ] to switch the pages. The user key can be displayed large by using 2 display areas.

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.

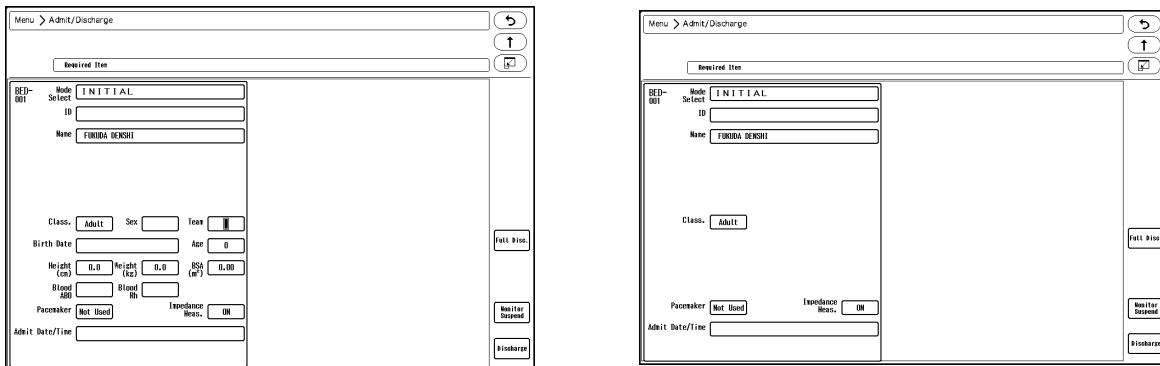
([Maintenance Manual "Display/Print Setup" P5-13](#))



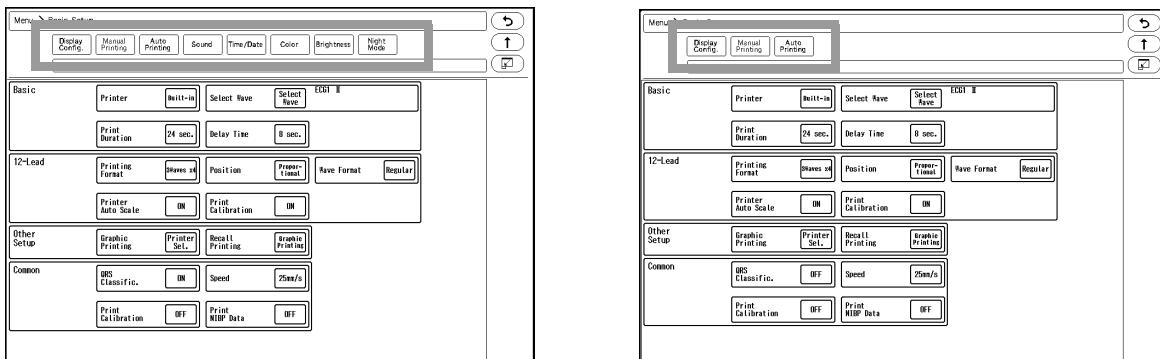
## To Delete the Unnecessary Keys (Key Mask)

Unnecessary keys, items, tabs can be deleted.

( Maintenance Manual "Key Mask" P5-19)



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

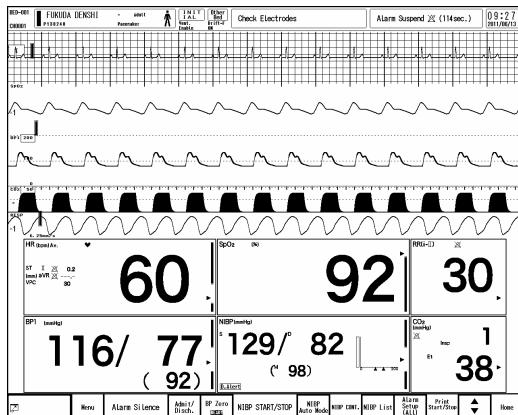
- Use only the specified 19-inch display unit. For details, refer to our service representative.

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

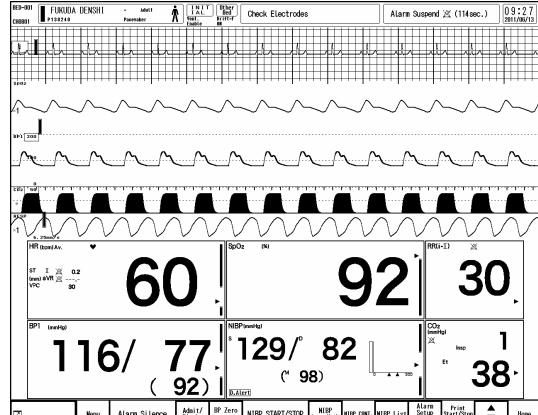
## External Monitor Display

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.



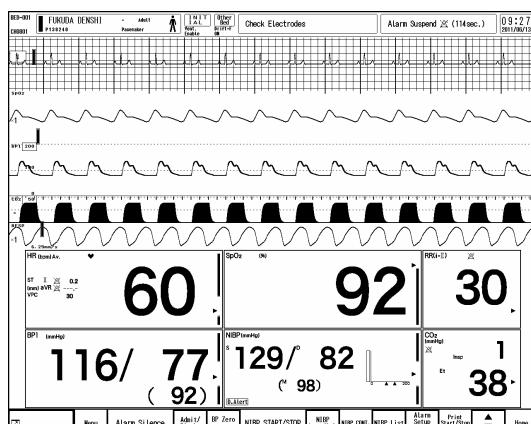
Display on the Main Display



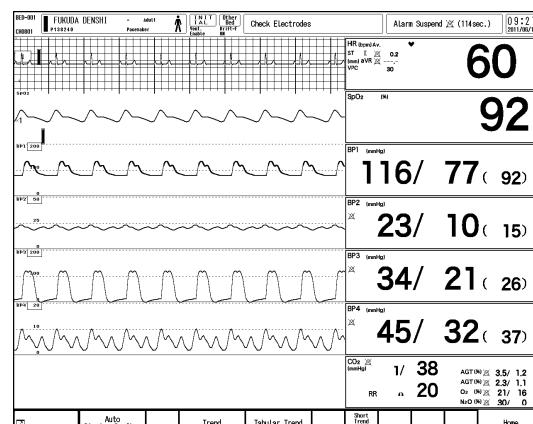
Display on the External Monitor

## 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.
- 

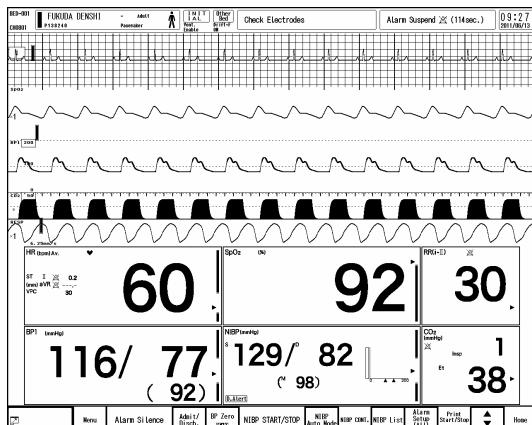
#### REFERENCE

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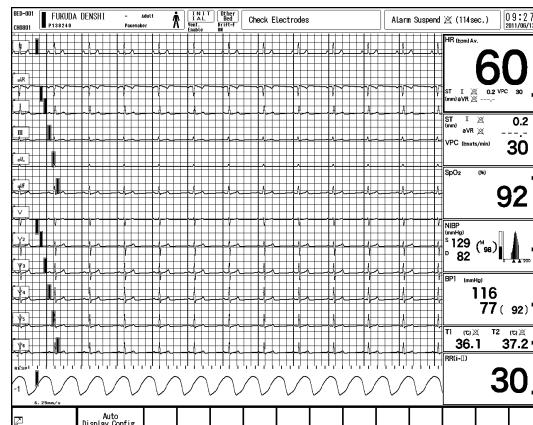
- ♦ The waveform size for the main display and the extended display is independent. On the "Initial Settings" menu, whether or not to synchronize the waveform size/scale of extended display with the main unit can be selected.  
( Maintenance Manual "Display/Print Setup" P5-13)
  - ♦ The waveform size 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" P5-13)
- ♦ 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

Daily Check .....	4-1
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# Chapter 4 Preparation

## Daily Check

Conduct the following daily check before using the equipment.

### Daily Check List

Checked Date: Day Month Year	Checked by:	No. Location:
Model Type (Main Unit)	Serial Number:	Date of Purchase: Day Month Year
Model Type (Display Unit)	Serial Number:	Date of Purchase: Day Month Year
Model Type (Super Unit)	Serial Number:	Date of Purchase: Day Month Year
Model Type (Input Box)	Serial Number:	Date of Purchase: Day Month Year
Model Type (Module)	Serial Number:	Date of Purchase: Day Month Year
Model Type (Module)	Serial Number:	Date of Purchase: Day Month Year
Model Type (Module)	Serial Number:	Date of Purchase: Day Month Year
Model Type (Module)	Serial Number:	Date of Purchase: Day Month Year

Item	Check Details	Criteria	Judgment
External appearance	Visually check the exterior for scratches, cracks, and rust.	No abnormality should be found.	OK / NG
Installation	Check whether the equipment is installed on a level surface.	The installation area must be level and free from vibration and shock.	OK / NG
	Check whether the equipment is installed in a place susceptible to adverse environment.	The environmental condition (e.g. temperature, humidity) of the installed unit should be as specified. The equipment should not be subjected to splashing water or chemicals.	OK / NG
Descriptions	Turn ON the power of the main unit, and check whether it operates normally.	The home display should appear, and the power LED located at the lower left of the display unit should light.	OK / NG
		The date and time should be correct.	OK / NG
	Turn ON the power of the main unit, and check whether it operates normally. (When IB-8004 is used)	The power LED of the main unit should light.	OK / NG
	(When HS-8000/HSA-80 is used)	The set LAN-ID indicator should light.	OK / NG
	(When HS-8000 is used)	The home display should appear, and the power LED of the HS-8000 should light.	OK / NG
		With BP relay cable and BP transducer connected, pressing the BP Zero Balance Switch should start the zero balance.	OK / NG
	(When HS-8000 is used)	Pressing the NIBP Start/Stop key should inflate the NIBP cuff.	OK / NG
	(When HS-8000 is used)	Connecting the SpO <sub>2</sub> sensor should light the sensor LED.	OK / NG
	(When HR-800 is used)	The [READY] indicator on the HR-800 should light in green.	OK / NG
	(When HR-800 is used)	Pressing [PRINT] on the HR-800 should start the waveform printing. When pressed again, the printing should stop.	OK / NG
	(When HR-800 is used)	Pressing [FEED] on the HR-800 while not printing should feed the paper.	OK / NG

Item	Check Details	Criteria	Judgment
	(When HPD-800/810, HCP-800/810 is used)	The home display should appear, and power LED should light in green.	OK / NG
	(When HCP-800/810 is used)	When the sampling tube is connected, "0" should be displayed in the numeric data box.	OK / NG
	(When MGU-800 is used)	The home display should appear, and the power LED located at the upper left of the MGU-800 should light.	OK / NG
	(When MGU-810 is used)	The home display should appear, and the power LED located at the lower right of the MGU-810 should light.	OK / NG
	(When HP-800/HM-800/HG-800 is used)	The "Check Connection" message for the module should not be displayed.	OK / NG
	(When HP-800/HM-800/HG-800 is used)	The error message for the expansion module should not be displayed on the home display.	OK / NG
Cables	Visually check all cables for any damage.	No damage should be found.	OK / NG
<b>For HCP-800/810</b>			
CO <sub>2</sub> Calibration	Check the date of the previous calibration. Previous Date: Day Month Year (*Refer to following caution.)	Should be within 1 year. *If the CO <sub>2</sub> calibration is not performed at a specified interval, CO <sub>2</sub> measurement accuracy may be affected and also subsequent gas calibration may not be possible.	OK / NG
	Check the remaining time until the next calibration. [Menu][CO <sub>2</sub> ][CO <sub>2</sub> Cal.] Remaining Time until Next Calibration: hrs.	Should not be 0 hrs.	OK / NG
<b>For MGU-800</b>			
Sampling Tube	Check that it is not reused.	Extra supplies should be kept.	OK / NG
Airway Adapter	Check that it is not reused.	Extra supplies should be kept.	OK / NG
<b>For MGU-810</b>			
Flow Sensor	Check that it is not reused.	Extra supplies should be kept.	OK / NG
<b>For MGU-800/MGU-810</b>			
Gas Calibration	Check the date of the previous gas measurement accuracy check. Previous Date: Day Month Year	Should be within 1 year.	OK / NG
Water Trap	Check the last replaced date of reservoir. Previous Replaced Date: Day Month Year	Should be within 1 month.	OK / NG
Nafion Tube DRYLINE Receptacle	Check the last replaced date of Nafion Tube, O <sub>2</sub> filter, dust filter. Previous Replaced Date: Day Month Year	Should be within 1 year.	OK / NG
Periodic Check	Check the date of the previous periodic inspection. Previous Check Date: Day Month Year	Should be within 1 year.	OK / NG

Comment

 **CAUTION**

- If the CO<sub>2</sub> gas calibration is not performed at a specified interval, CO<sub>2</sub> measurement accuracy may be affected and also subsequent gas calibration may not be possible.

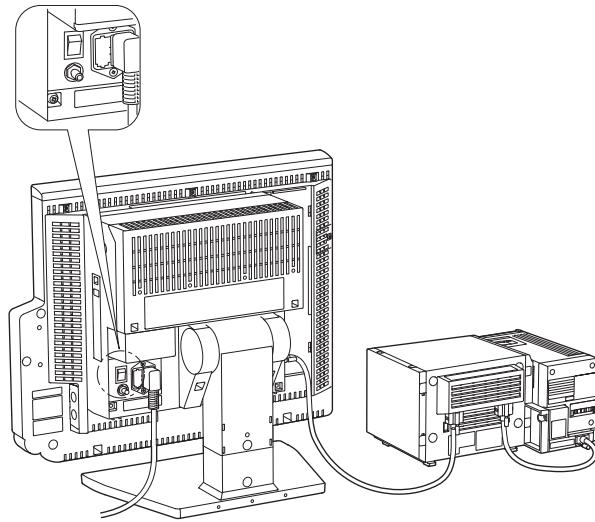
## To Start Monitoring

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

**CAUTION**

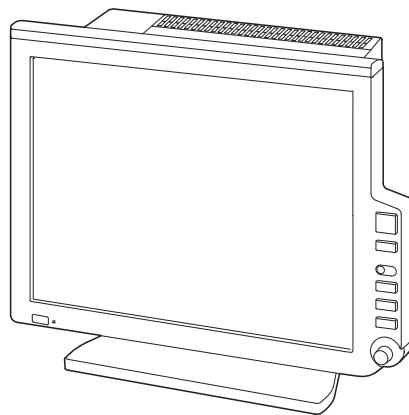
- If the system will be unused for a long period, make sure to turn OFF the power of the main unit.

- 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.

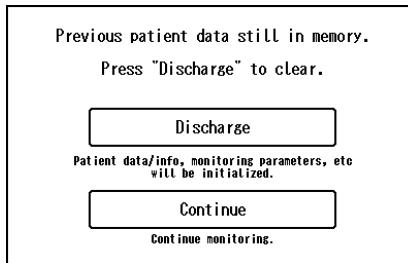
**REFERENCE**

- 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

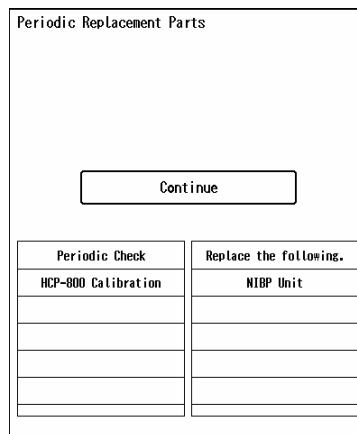
- If the standby switch was turned OFF for less than 30 seconds, the discharge confirmation screen will not be displayed. To perform the discharge procedure, press the [Discharge] key on the "Admit/Discharge" screen.  
(☞ "Discharge" P5-5)
- To start monitoring a new patient, select [Discharge] and enter the new patient information on the "Admit/Discharge" screen.

#### REFERENCE

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

## □ Periodic Replacement Message

When the periodic replacement period approaches for each part, a message will be displayed on the "Periodic Replacement Parts" screen to notify the user.



### REFERENCE

- The parts which the replacement period will be notified are Short-Term Backup Battery incorporate in the DSC-8500, NIBP unit incorporated in the Super Unit and CO<sub>2</sub> unit incorporated in the HCP-800/HCP-810.  
(☞ Maintenance Manual "Periodic Replacement" P7-1)
- Even if it is set not to display the discharge confirmation screen, "Periodic Replacement Parts" screen 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.

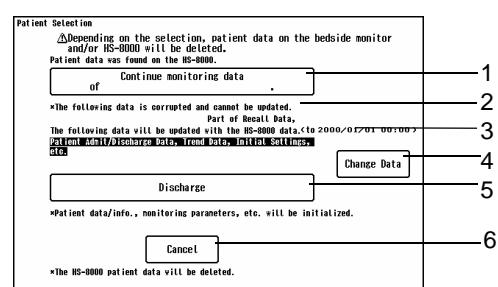
When transferring the patient to another bed, the same monitoring condition such as patient data and settings can be used on new bed by transferring the Super Unit along with the patient.

**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.

► The "Patient Selection" window will be displayed.

- [Continue monitoring data of \*\*\*]: The patient data will be transferred and monitoring will resume.
- This will be displayed when the data is damaged and cannot be transferred.
- The data that can be transferred will be displayed. To change the transferring data, press the [HS-8000 Data Selection for Transfer] and change the setting.
- [Change Data] : The data to be transferred can be changed.
- [Discharge]: The data will not be transferred and monitoring of new patient will start.
- [Cancel]: The patient data and settings stored on the 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" P5-24)
- For the setting procedure of DS-8100 data transfer, please refer to the operation manual of the DS-8100.

## To Stop Monitoring

This section explains about the procedure to stop monitoring.

**1**

Turn OFF the standby switch on the display unit.

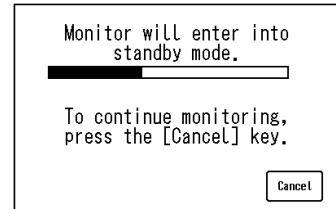
- A standby confirmation message will appear.



## 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.

### **⚠ CAUTION**

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

### **NOTE**

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

### **REFERENCE**

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

## Clock Setup

This section explains about the time/date setup procedure.

### **⚠ CAUTION**

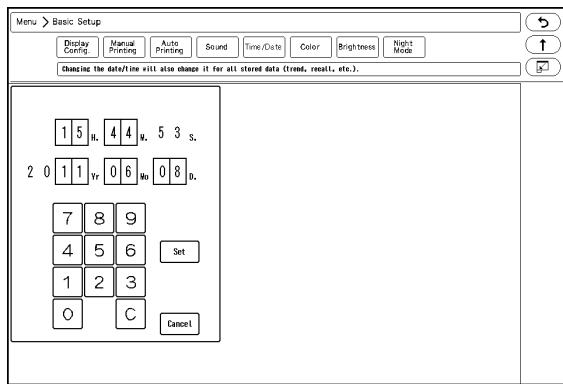
- If the time/date is not correctly set, or changed during monitoring, malfunction may occur to NIBP measurement, periodic printing, trend, list data, and age calculation from the birth date.
- If connected to a wired network system, time/date can not be set, thus it will be the same with the central 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

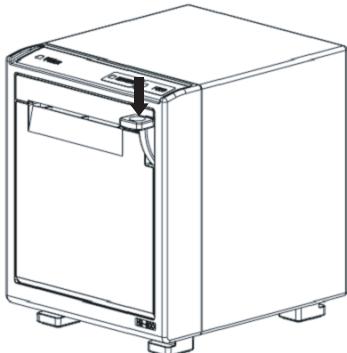
- ♦ Recording paper
  - ♦ Use only "OP050-01TDR" for the recording paper.  
The surface treatment and thickness of the recording paper affects the printing quality.
- ♦ Storing the Recording Paper  
As thermal type recording paper is used, improper storage may change the quality of the recorded content,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

burn injury. Also, it may cause failure to the thermal head and sensor.

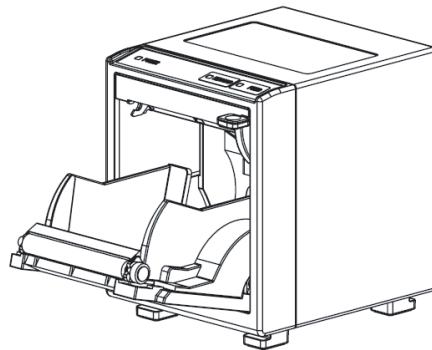
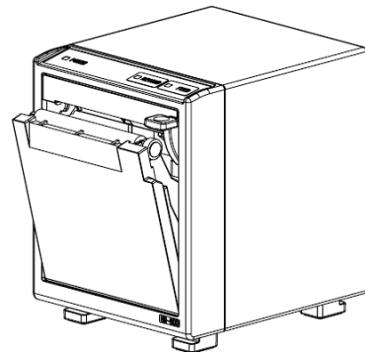
- Do not operate the equipment with wet hand. Doing so may short the thermal head.

Install the recording paper with the following procedure.

**1** Press the Open/Close Lever.

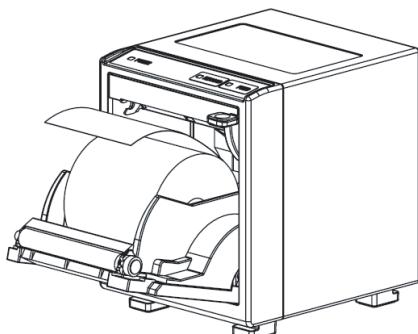


- ▶ The paper holder opens.



**2** Set the recording paper.

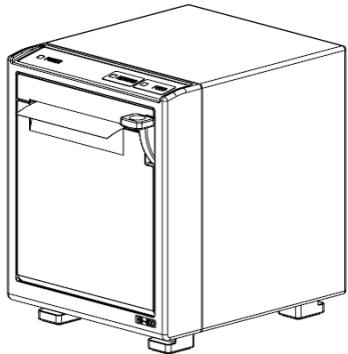
The outside surface of the paper is heat-sensitive. Make sure to place the outside surface of the paper facing up.



**NOTE**

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

**3** Close the paper holder.



**NOTE**

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

# Chapter 5 Admit/Discharge

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# Chapter 5    Admit/Discharge

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

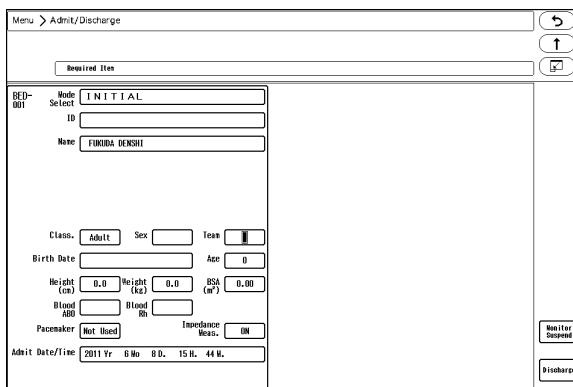
## **CAUTION**

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

## To Display the "Admit/Discharge" Screen

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

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

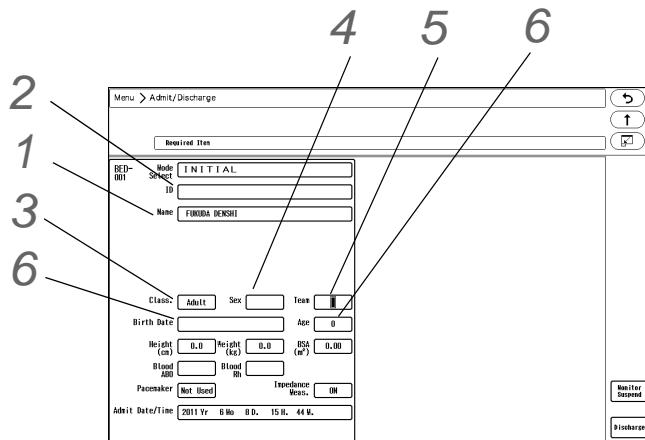


## Admit

This section explains the admit procedure.

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

## Entering the Patient Name

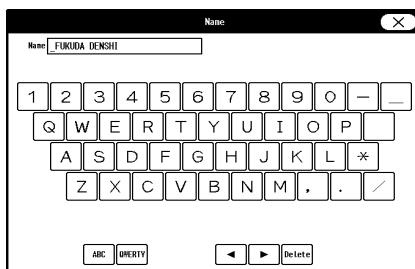


- 1** Enter the patient name.

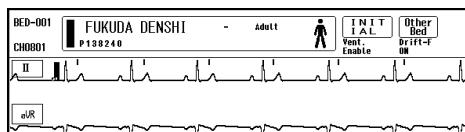
**REFERENCE**

- Up to 16 alphanumeric characters can be entered. Symbols can also be used.

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



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



- 2** Enter the patient ID.

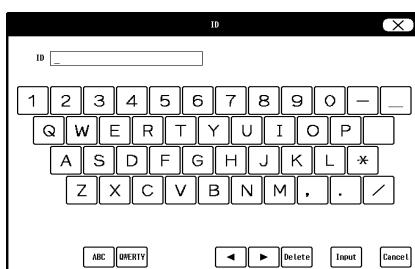
**NOTE**

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

**REFERENCE**

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

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



**NOTE**

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

### 3 Enter the patient classification.

- The patient classification selection will affect the accuracy of NIBP, HR, RR measurement. It will also affect the delay time of numeric data alarm.
- The alarm delay time is the function to prevent frequent generation of the measurement data alarm by holding the alarm generation for the duration of each delay time.

The alarm delay functions for HR/PR, BP, RR, SpO<sub>2</sub>, TEMP, EtCO<sub>2</sub>/InspCO<sub>2</sub>, TACHY, BRADY.

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

#### **WARNING**

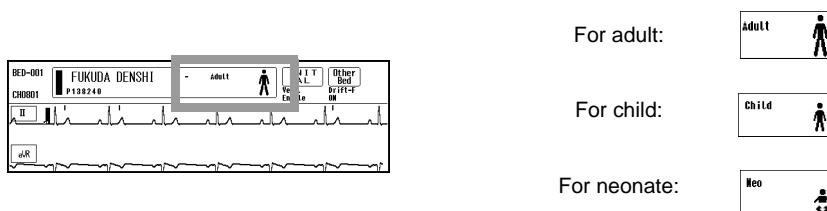
- The patient classification selection influences the precision of the QRS detection and NIBP measurement. Make sure the correct selection is made.
- To perform correct NIBP measurement, appropriate NIBP air hose corresponded to the set patient classification must be used. (However, if the patient classification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

### 1 Press the key for "Class.".

- The patient classification dropdown list will be displayed.

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

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



### 4 Select the patient's sex.

#### REFERENCE

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

### 1 Press the key for "Sex".

- The dropdown list will be displayed.

**2** Select [Male] or [Female].

**5** Set the nurse team.

**1** Press the key for "Team".

► The dropdown list for nurse team will be displayed.

**2** Select the color of the nurse team.

**6** Enter the patient's age.

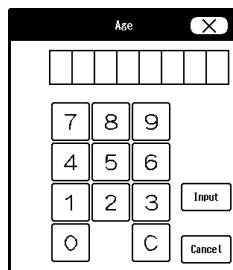
**REFERENCE**

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

To Manually Enter the Age:

**1** Press the key for "Age".

► "Age" window will be displayed.



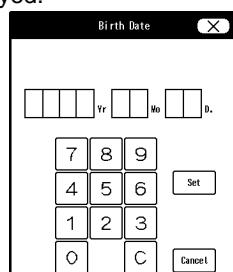
**2** Enter the age using the numeric keys.

**3** Press the [Input] key.

To Calculate the Age from the Birth Date:

**1** Press the key for "Birth Date".

► "Birth Date" window will be displayed.



**2** Enter the year, month, day using the numeric keys.

**3** Press the [Set] key.

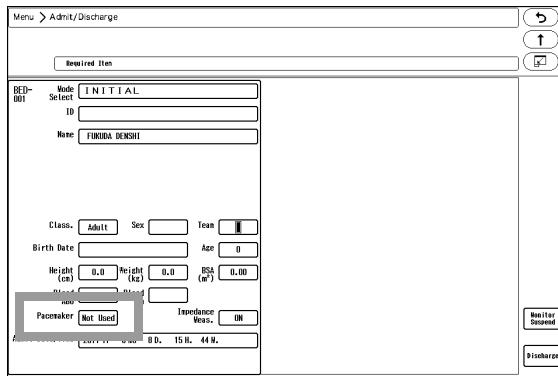
**REFERENCE**

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

## □ When Pacemaker is Used

### **⚠ WARNING**

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



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

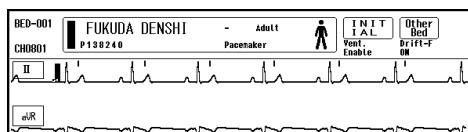
- The artificial pacemaker pulse will be displayed.
- When pacing waveform does not appear (pacing failure), erroneously detecting the pacemaker pulse as QRS will be prevented.
- The arrhythmia analysis will detect pacing beat as P (Pacemaker Beat) or F (Fusion Beat) to prevent erroneous judgment of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

**1** Press the key for "Pacemaker".

- The dropdown list will be displayed.

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

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



## Discharge

This section explains about the discharge process.

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

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

## Discharging Procedure

### **⚠ CAUTION**

- If monitoring of new patient is started without discharging the previous patient, the measurement data of the previous and new patient will become mixed up on the recall and trend data.

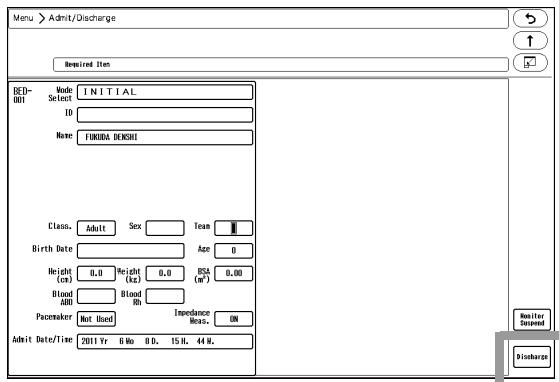
- When the discharge procedure is performed, patient data such as recall and trend will be initialized. The parameter and alarm will be reset according to the setting on [Menu]>[Initial Settings]>[User I/F]>[Power ON/Discharge].  
(☞ Maintenance Manual "Power ON/Discharge" P5-15)
- If the power is turned 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" ([Initial Settings]>[User I/F]>[Power ON/Discharge]).

**NOTE**

- Depending on the setting made for "At Discharge" ([Initial Settings]>[User I/F]>[Power ON/Discharge]), some items may not be initialized.  
(☞ Maintenance Manual "Power ON/Discharge" P5-15)
- 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" ([Initial Settings]>[User I/F]>[Power ON/Discharge]).

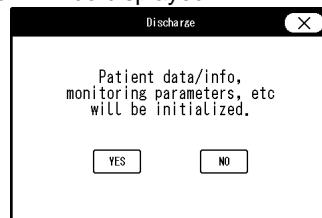
**1** Press the [Menu], "Admit/Discharge" icon.

► 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.

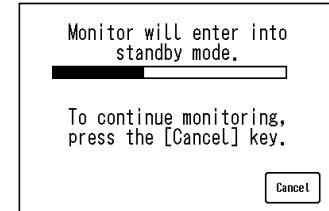
**3** Press the [Yes] key.

► The patient data, patient information will be initialized.  
► The screen will return to the home display with the selected user mode.

- The alarm settings will be initialized to the settings of the selected "Alarm System".

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

- If [Standby] is selected for "Discharge Mode" ([Initial Settings]>[User I/F]>[Power ON/Discharge]), standby progress window will be displayed.  
If the [Cancel] key is pressed, the system will stop entering 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" P5-26)

### 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" P5-26)

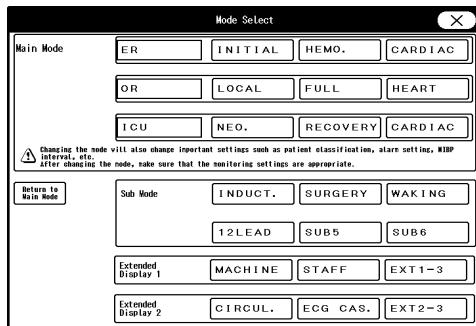
## To Select the User Mode

1

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

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

- The "Mode Select" window will be displayed.



### **⚠ WARNING**

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

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

**3** Select the sub mode.

**4** 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 the [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" P5-26)

## Suspend Monitoring

This section explains about the monitoring suspend/resume function.

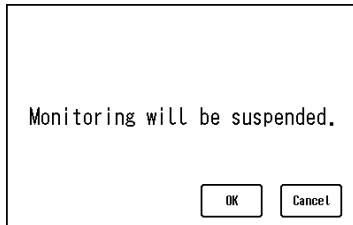
Monitoring suspend function can be used when a patient temporarily leaves the bed. If the monitoring is ceased by turning the power OFF, recall and ST data will be erased.

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

## To Suspend Monitoring

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

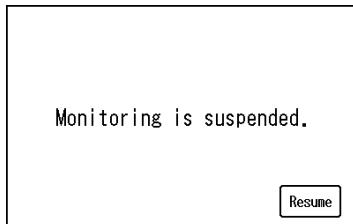
- The monitor suspend confirmation window will be displayed.

**REFERENCE**

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

**2** Press the [OK] key.

- The screen will automatically return to the home display with "Monitoring is suspended" message and [Resume] key.
- On the home display, numeric data and waveform display will be suspended.

**REFERENCE**

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

## To Resume Monitoring

**CAUTION**

- Resuming monitoring will also resume the suspended alarm.

**1** Press the [Resume] key.

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



# Chapter 6 Alarm Function

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# Chapter 6    Alarm Function

## Alarm

### To Set the Arrhythmia Alarm

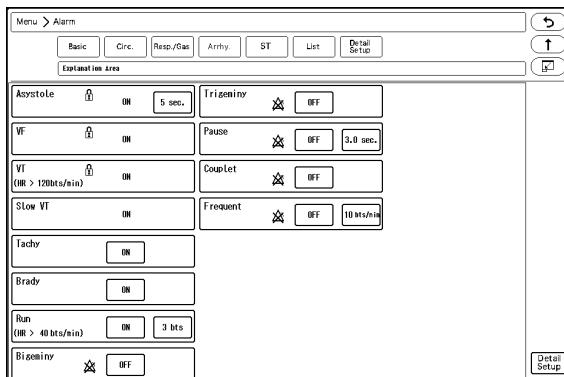
The arrhythmia alarm can be turned ON or OFF, and arrhythmia detection level can be set.

#### **⚠ WARNING**

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

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

► The arrhythmia alarm setup screen will be displayed.



**2** Set ON/OFF of each arrhythmia.

► [ON]: Arrhythmia alarm will generate.

► [OFF]: Alarm will not generate.

#### **NOTE**

- The "Arrhythmia alarm OFF" message will be displayed when the Asystole, VF, VT, Slow\_VT, and HR alarm is OFF.
- If [Always ON] is selected for "Asystole, VF, VT Alarm" on the "Initial Settings", Asystole, VF, VT, Slow\_VT alarm can not be set to OFF.  
(*Maintenance Manual "Alarm Related Setup" P5-4*)
- If [Check when OFF] is selected for "Asystole, VF, VT Alarm" on the "Initial Settings", a confirmation message will be displayed when selecting [OFF] for the Asystole, VF, FT, Slow\_VT alarms.

**REFERENCE**

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

**3** Select the level to detect each arrhythmia.

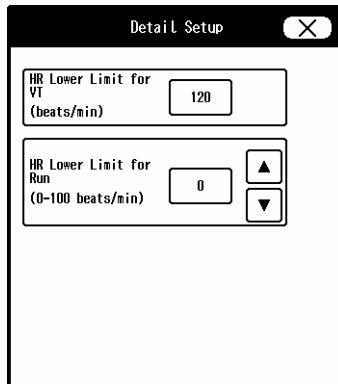
- 1 Press the detection level key for each arrhythmia.
- The detection level dropdown list will be displayed.

**2** Set the detection level.

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

**4** Set the HR Lower Limit for VT and RUN.

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

**2** Set the "HR Lower Limit for VT".

- Select the lower limit of HR value from 120 / 140bpm to generate VT.
- If the HR is below the selected value, Slow\_VT will generate.

**3** Set the "HR Lower Limit for RUN".

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

**SpO<sub>2</sub> Second Alarm Setup**

The SpO<sub>2</sub> second alarm function is available when the HS-8312N Super Unit is connected.

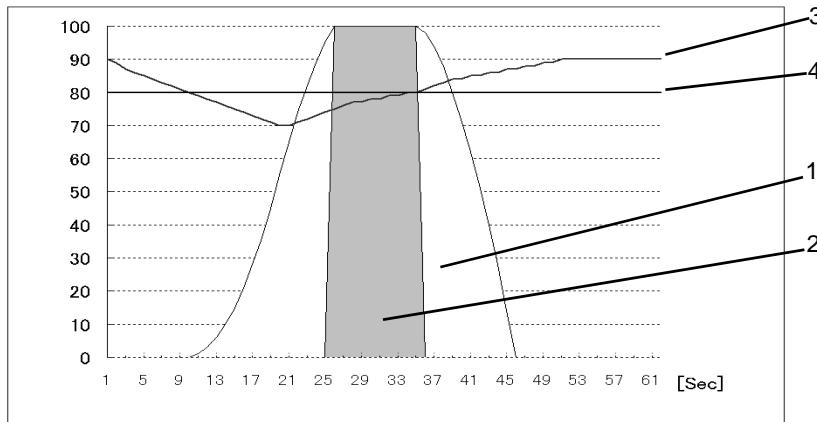
When the SpO<sub>2</sub> value is unstable around the lower alarm limit, the frequently generated alarm may be bothersome. The second alarm function controls these frequent alarms.

This function generates the alarm only when the integral value (the accumulation of difference between the alarm limit and SpO<sub>2</sub> value at every second) reaches the preprogrammed second alarm threshold value.

**NOTE**

- The SEC 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<sub>2</sub> Value

4 Alarm Limit

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

The SpO<sub>2</sub> 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<sub>2</sub> value) is accumulated each second.

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

The SpO<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> value frequently falls below the alarm limit but does not last long enough to reach the second alarm threshold.

If the SpO<sub>2</sub> 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.

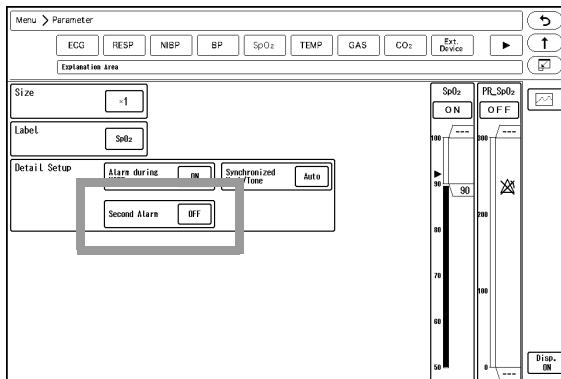

**CAUTION**

- 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<sub>2</sub> alarm and second alarm setup is set to [OFF], the second alarm integral value will be set to 0.

**1**

Press the [Menu], [SpO<sub>2</sub>] ("Parameter") keys.

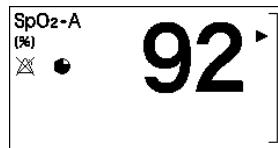
- The SpO<sub>2</sub> setup screen will be displayed.



**2** Press the key for "Second Alarm".

- The "Second Alarm" screen will be displayed.

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



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

#### REFERENCE

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

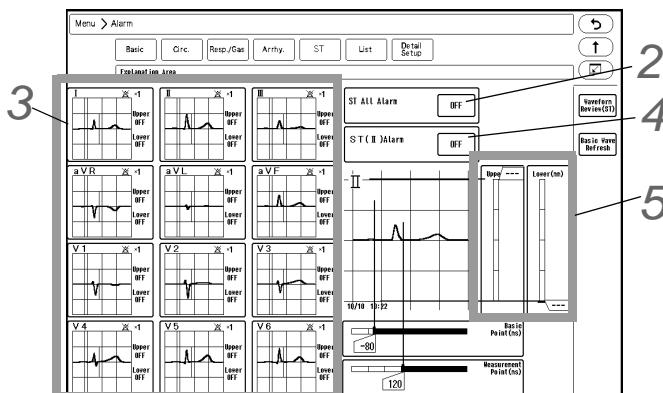
## ST Alarm Setup

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

- ▶ Alarm will be set to OFF if the value  $-20\text{mm} / -2.0\text{mV}$  or lower is selected.

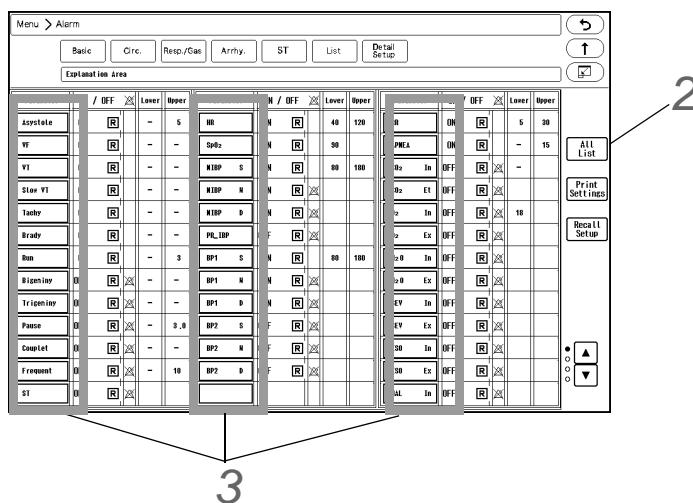
- ▶ Alarm will be set to OFF if the value  $+20\text{mm} / +2.0\text{mV}$  or above is selected.

## List of Alarm Settings

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

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

- ▶ The alarm settings list will be displayed.



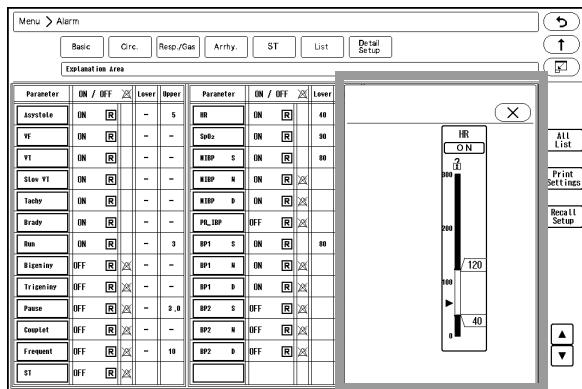
**2** Select from [All List]/[Meas. List].

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

**3** Change the alarm threshold.

- 1** Select a parameter.

- The alarm setup screen will be displayed.



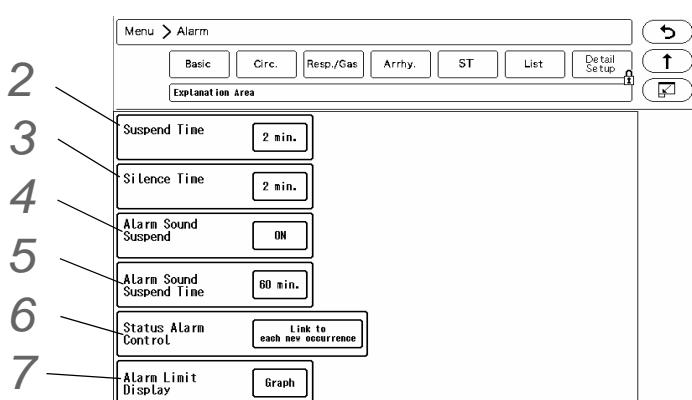
- 2** Press **[XXX]** / **[XXX]** to set the threshold level.

## Detail Setup

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

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

- The alarm detail setup screen will be displayed.



- 2** Press the key for "Suspend Time".

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

**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, alarm will be silenced for fixed amount of time set for "Silence Time".

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

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

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

► [Link to each new occurrence]: When the [Alarm Silence] key is pressed, equipment status alarm will be silenced as long as the alarm cause remains regardless of the "Silence Time" setting.

While the same equipment status alarm is generated, alarm will remain silenced.

If the alarm cause is resolved during the alarm silence time, the alarm will be cancelled.

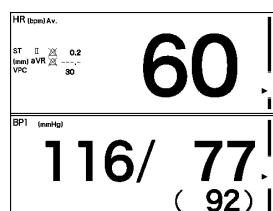
If the same alarm generates again during the alarm silence time, the alarm sound will generate.

**7** Press the key for "Alarm Limit Display".

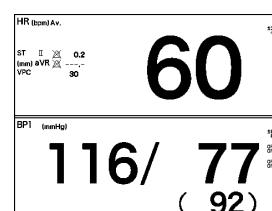
► The dropdown list will be displayed.

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

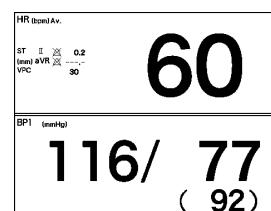
► The upper and lower alarm limit will be displayed on the home display.



Graph



Numeric



OFF

#### NOTE

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

## Alarm Limit Setup

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

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

### To Set the System Alarm (ON or Suspend)

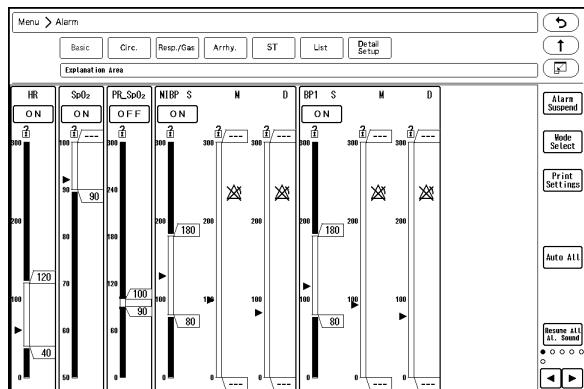
The system alarm can be set to ON or suspend, but it cannot be turned OFF.

#### **WARNING**

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

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

- The alarm setup screen will be displayed.



**2** Select whether to turn ON or suspend the alarm.

To Suspend the Alarm

**1** Press the [Alarm Suspend] key.

- The key will change to blue.  
► The alarm will suspend temporarily.  
► "Alarm Susp: xxx s" message will be displayed.



#### REFERENCE

- ♦ "xxx s" indicates the remaining time. The alarm will turn ON when the suspended time

completes.

#### To Turn ON the System Alarm

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

- ▶ The key will change to gray.
- ▶ The set alarm limits for parameters and ON/OFF will be enabled.
- ▶ The alarm suspend condition is cancelled.

#### To Silence or Suspend the System Alarm Sound

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

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

The "Alarm Sound Suspend" function suspends the alarm generation at a time such as during operation when the alarm generation is expected. The alarm monitoring continues while in the "Alarm Sound Suspend" condition. The "Alarm Sound Suspend" time can be selected from 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 cause still remains at completion of the silence duration, the alarm sound will generate again.

REFERENCE

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

2

- To suspend the alarm sound, press 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

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

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

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

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

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

The alarm silence state for all parameters will cease in the event of any of the following.

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

The alarm silence state for each parameter will cease in the event of any of the following.

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

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

## □ Precautions about Suspending the Alarm

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

The Alarm Sound Suspend state 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.

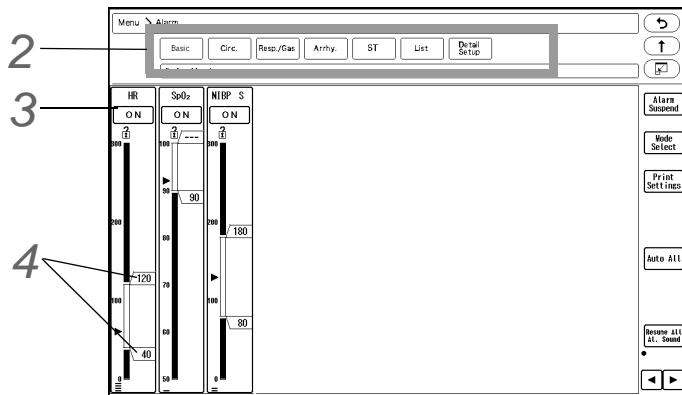
### **WARNING**

- ♦ 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<sub>2</sub>/EtCO<sub>2</sub>, InspO<sub>2</sub>/ExpO<sub>2</sub>, InspN<sub>2</sub>O/ExpN<sub>2</sub>O, 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" P5-4)

**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 / keys on the right side of the bar.
- : Adjusts the upper limit.
  - : 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.

- : 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" P5-13)

## Alarm Limit Range

Parameter	Description	
HR / PR/ BPR	ON, OFF	20 to 300bpm
ST1 to ST12	ST All Alarms	ON/OFF
	ST1 to ST12	± 2.0mV, ± 20.0mm Indiv. Alarm ON, OFF
BP1 to BP8	ON, OFF	0 to 300mmHg 0 to 40.0kPa
SpO <sub>2</sub>	ON, OFF	50 to 100%
RR	ON, OFF	5 to 150Bpm
APNEA (Upper Limit)	ON, OFF	10 to 60 sec.
TEMP1to 8	ON, OFF	30 to 45°C 86.0 to 113.0°F
NIBP	ON, OFF	10 to 300mmHg 1.5 to 40.0kPa
EtCO <sub>2</sub>	ON, OFF	1 to 100mmHg 0.1 to 13.3.0kPa 0.1 to 13.3%
InspCO <sub>2</sub> (upper limit)	ON, OFF	1 to 4mmHg 0.1 to 0.4.0kPa 0.1 to 0.4%
SpCO	ON, OFF	1 to 40%
SpMet	ON, OFF	1 to 15%
SpHb	ON, OFF	1.0 to 24.5 g/dL
ExpMV (Adult) ExpMV (Child/Neonate)	ON, OFF	2.0 to 20.0L/min 0.5 to 5.0L/min
PEAK	ON, OFF	8 to 100cmH <sub>2</sub> O
PEEP	ON, OFF	2 to 50cmH <sub>2</sub> O
BIS	ON, OFF	1 to 99

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

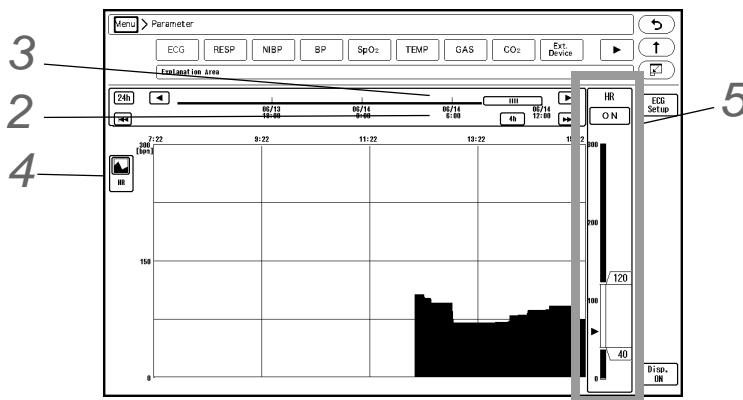
## Alarm Assist Screen

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.

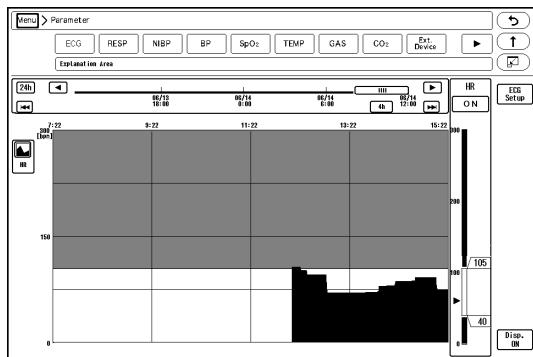
► The dropdown list will be displayed.

**2** Select the display format from , , , etc.

**5** Set the upper and lower alarm limit.

**1** Press / on the right of the bar.

- ▶ Alarm zone will be displayed on the trend.



- ▶ The displayed alarm zone will slide by sliding the or .
- ▶ The displayed alarm zone will also slide by pressing the / .

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

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# Chapter 7 Monitoring

## To Display the Parameter Setup Screen

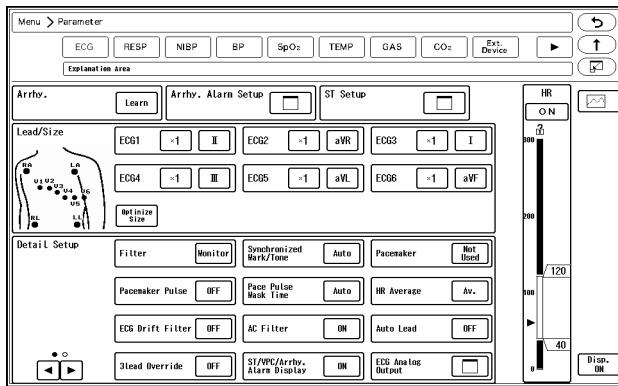
This section explains how to display the monitoring parameters setup screen.

**1**

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

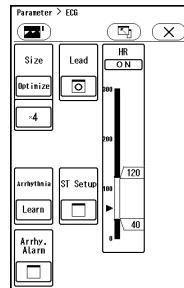
Or, press the numeric data box on the home display, and press  on the corresponding parameter setup screen.

► The "Parameter" 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

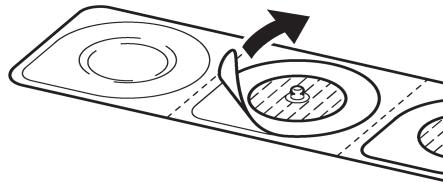
patient's heart.

- 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

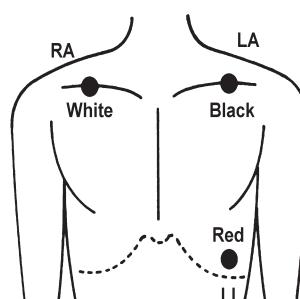
Depending on the lead cable type, 3-electrode/4-electrode/5-electrode/10-electrode placements are available. Using the 4-electrode, 5-electrode or 10-electrode application allows simultaneous monitoring of 2 ECG waveforms, and high accuracy of arrhythmia analysis can be attained. (1 to 12 waveforms can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

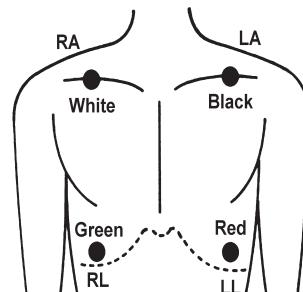
Symbol	Color	Electrode Site
RA	White	On the right infraclavicular fossa
LA	Black	On the left infraclavicular fossa
LL	Red	On the left midclavicular line, near the suprasternal line.



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

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

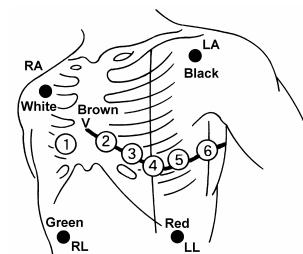
Symbol	Color	Electrode Site
RA	White	On the right infraclavicular fossa
LA	Black	On the left infraclavicular fossa
LL	Red	On the left midclavicular line, near the supracrestal line.
RL	Green	On the right midclavicular line at the same height as LL.



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

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

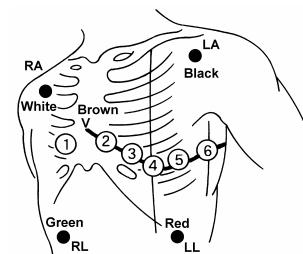
Symbol	Color	Electrode Site
RA	White	On the right infraclavicular fossa
LA	Black	On the left infraclavicular fossa
LL	Red	On the left midclavicular line, near the supracrestal line.
RL	Green	On the right midclavicular line at the same height as LL.
V	Red/Brown	Chest electrodes (V1 to V6)



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

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

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



**NOTE**

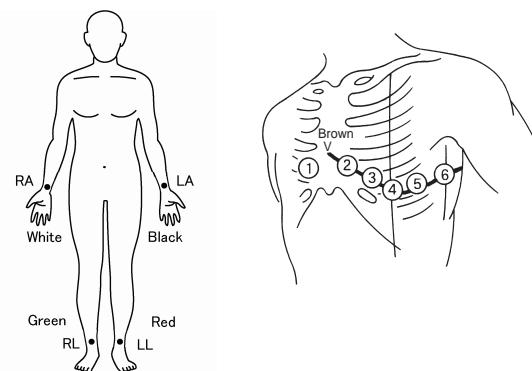
- Electrode Placement for 12-Lead ECG Analysis

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

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

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

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



## Type of Electrodes and Lead Cable

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

Do not reuse/sterilize the disposable electrodes.

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

## Connection to the Patient Monitor

**CAUTION**

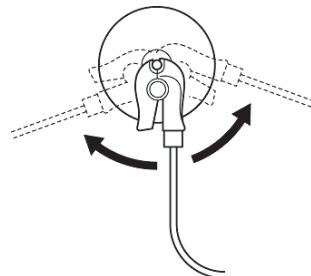
- The indication for continuous use of the electrode is about one day.
- Replace the electrode if the skin contact gets loosen due to perspiring, etc.
- When an electrode is attached to the same location for a long period, some patients may develop skin irritation. Check the patient's skin condition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

**NOTE**

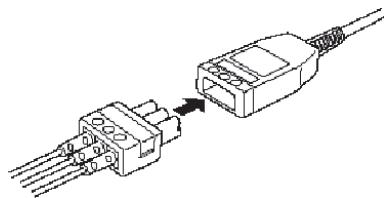
- Use only the specified relay cables, lead cables, and electrodes.
- The conductive parts of electrodes and associated connectors for applied parts, including

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

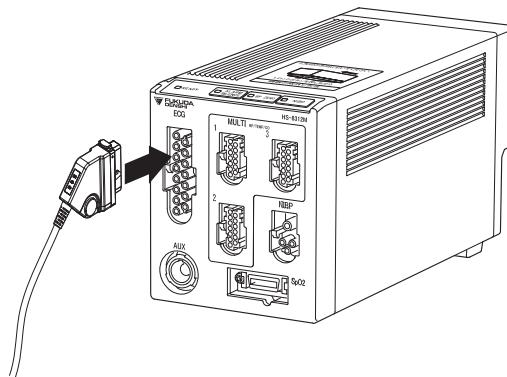
- 1** Clip on the lead cable end to the electrode convex part.
- 2** Turn to right and left and verify that it is securely connected.



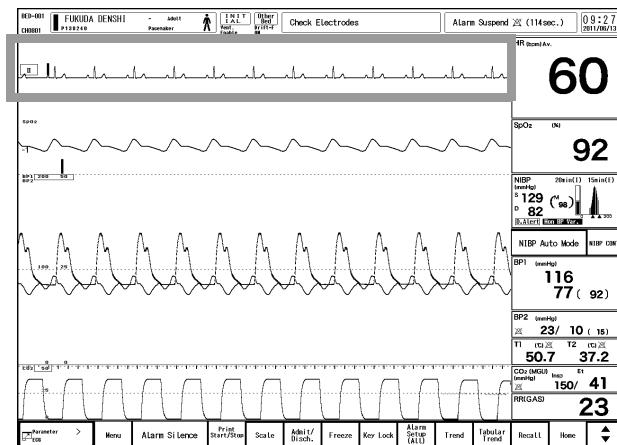
- 3** Connect the lead cable to the relay cable.



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



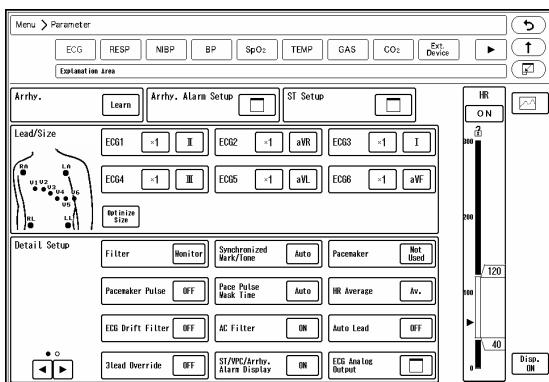
- ECG waveform and HR data will be displayed on the monitor.



- 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**

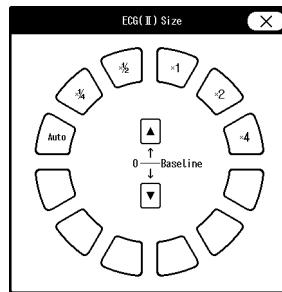
- The arrhythmia detection level and QRS detection changes with ECG waveform size. Set a proper waveform size for monitoring. When the waveform size is 1/4, 1/2, or 1, the detection level is 250µV. When the waveform size is 2 or 4, the detection level is 150µV.
- Automatic size/position of the ECG is effective only at the time the [Auto] key is pressed. This does not continually adjust size and position.
- The waveform size and position cannot be set if the waveform is not displayed. Refer to "To Configure the Display" P10-7, 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 Selection" P10-18)

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

- The "Size" screen will be displayed.



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

**2** Select the waveform size for displaying and recording.

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

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

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

**REFERENCE**

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

**□ Lead Selection**

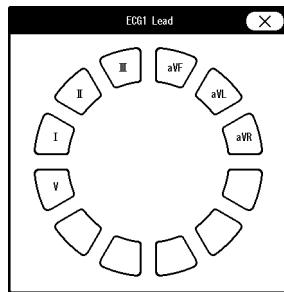
Set the monitoring lead.

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

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

- The "Lead" selection window will be displayed.



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

## 2 Select the ECG monitoring lead.

### □ HR Alarm Setup

Set the HR alarm.

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

#### NOTE

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

#### REFERENCE

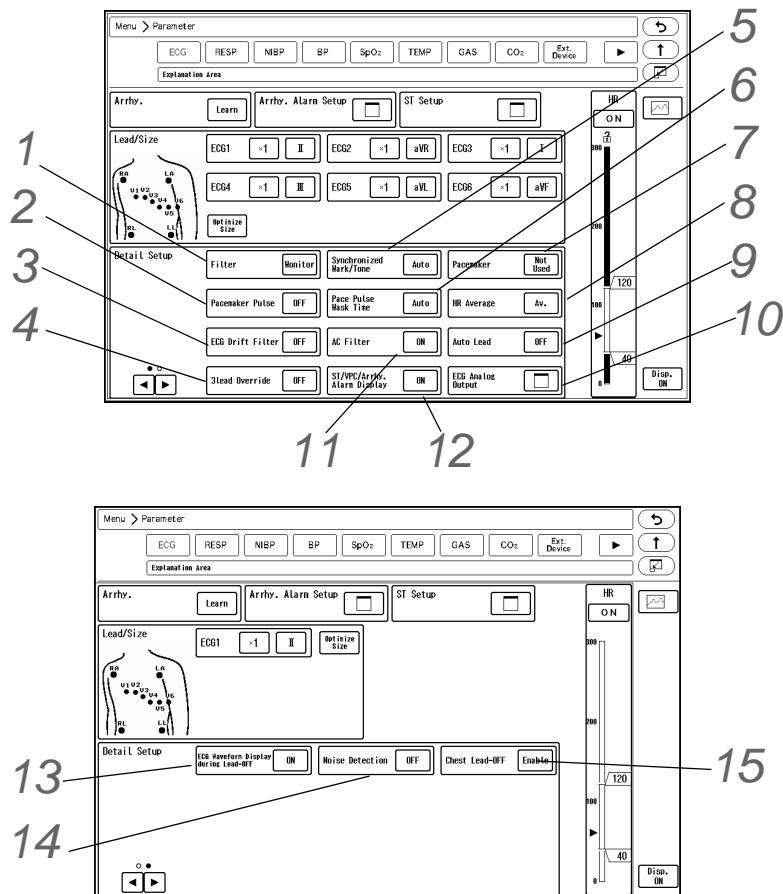
- When [Auto] is set, the upper and lower limit will be automatically set to +40bpm and -40bpm to the current value respectively. The maximum value for the auto lower limit can be forced to [30bpm], [40bpm] or [OFF] on the [HR/PR Lower Limit during Alarm Auto Setting] (Menu>Initial Settings>Alarm).

### □ Arrhythmia Alarm Setup

Set the arrhythmia alarm.

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

## □ Detail Setup



**1** Set the filter mode.

### CAUTION

- The ESIS mode can largely reduce the artifact such as electrosurgery noise and EMG, but it may also reduce the QRS amplitude. Using the ESIS mode may erroneously detect the pacemaker spike.
- The ESIS mode should be selected only when a high frequency noise largely affects the HR measurement.
- In ESIS Mode, although artifacts such as electrosurgical noise or EMG can be largely reduced, QRS amplitude attenuation, waveform distortion, or ST segment change may occur compared with other filter modes.

### REFERENCE

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

Monitor Mode (Frequency Characteristic: Adult / Child 0.5–40Hz, Neonate 1.6–40Hz)	This is the standard mode for ECG monitoring. The upper frequency is set to 40Hz to reduce artifact caused by EMG, etc.
ESIS Mode (Frequency Characteristic: Adult/Child/Neonate 1.6–15Hz)	By selecting this mode during electrosurgery, noise can be largely reduced.

Diagnosis Mode (Frequency Characteristic: 3-electrode Adult/Child/ Neonate 0.05–100Hz 4, 5,10-electrode Adult/Child/Neonate 0.05–150Hz)	Select this mode if ST measurement or high frequency ECG monitoring is performed. As the lowest frequency is set to 0.05Hz, ST level can be accurately measured.
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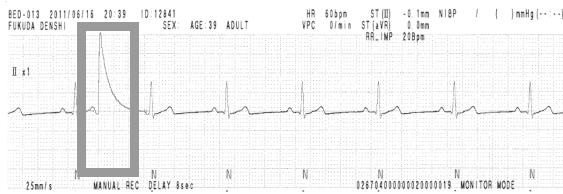
1 Press the key for "Filter".

► The dropdown list will be displayed.

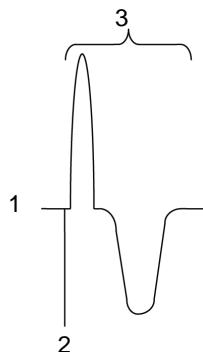
2 Select from [Monitor]/[ESIS]/[Diag.].

**NOTE**

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



2 Set the "Pacemaker Pulse".



*Pacemaker Pulse Detection Algorithm*

- 1 ECG Signal Input  
ECG signal will be input.
- 2 Pacemaker Pulse Detection and Suspension of QRS Detection  
Detects the high frequency and large amplitude signal as pacemaker pulse.  
When pacemaker pulse is detected, QRS detection will be suspended for fixed amount of time to avoid erroneous detection of pacemaker pulse as QRS.
- 3 Cancelling of Arrhythmia Detection  
Arrhythmia detection of the waveform following the pacemaker pulse will be cancelled.

**⚠ CAUTION**

- ♦ Precautions about Pacemaker Pulse Detection
  - ♦ There are some cases when the pacemaker pulse can not be detected depending on the pacemaker type, pulse voltage, pulse width, electrode lead type (unipolar, bipolar), or electrode placement which causes the pacemaker pulse amplitude to decrease and disables the pacemaker pulse detection.
  - ♦ If signals similar to a pacemaker pulse are present, such as electric blanket noise or excessive AC frequency noise, these may be erroneously detected and displayed as a pacemaker pulse.
  - ♦ When a spontaneous QRS and pacemaker pulse overlap (ex. fusion beat, etc.), QRS

detection cannot be performed properly. In this case, the heart rate is degraded.

- If a pacemaker pulse is continuously detected due to AC frequency interference, QRS detection will be suspended and the heart rate will be reduced. Arrhythmia will not be detected either.

### 1 Press the key for "Pacemaker Pulse."

- ▶ The dropdown list will be displayed.

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

- ▶ [ON]: The pacemaker artificial pulse will be displayed on to the ECG waveform with a different color.
- ▶ [OFF]: The pacemaker artificial pulse will not be displayed.

#### REFERENCE

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

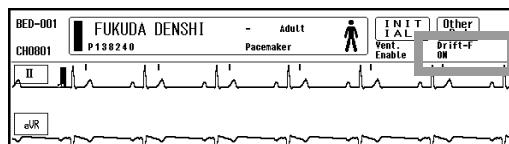
### 3 Set the Drift Filter.

#### 1 Press the key for "ECG Drift Filter".

- ▶ The dropdown list will be displayed.

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

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



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

### 4 Set the "3lead Override".

#### NOTE

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

### 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<sub>2</sub>-1]/[SpO<sub>2</sub>-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" P5-11*)
  - [ECG]: The synchronizing priority will be set in the order of ECG>SpO<sub>2</sub>-1>SpO<sub>2</sub>-2>BP . The synchronized tone will be set to [ON].
  - [SpO<sub>2</sub>]: The synchronizing priority will be set in the order of SpO<sub>2</sub>-1>SpO<sub>2</sub>-2>ECG>BP. The synchronized tone will be set to [ON].
  - [ECG]:HR synchronized mark will be displayed. The synchronized tone will be set to ON.
  - [SpO<sub>2</sub>-1]/[SpO<sub>2</sub>-2]:SpO<sub>2</sub> synchronized mark will be displayed.  
The synchronized tone will be set to ON.
  - [BP]:BP synchronized mark will be displayed. The synchronized tone will be set to ON.



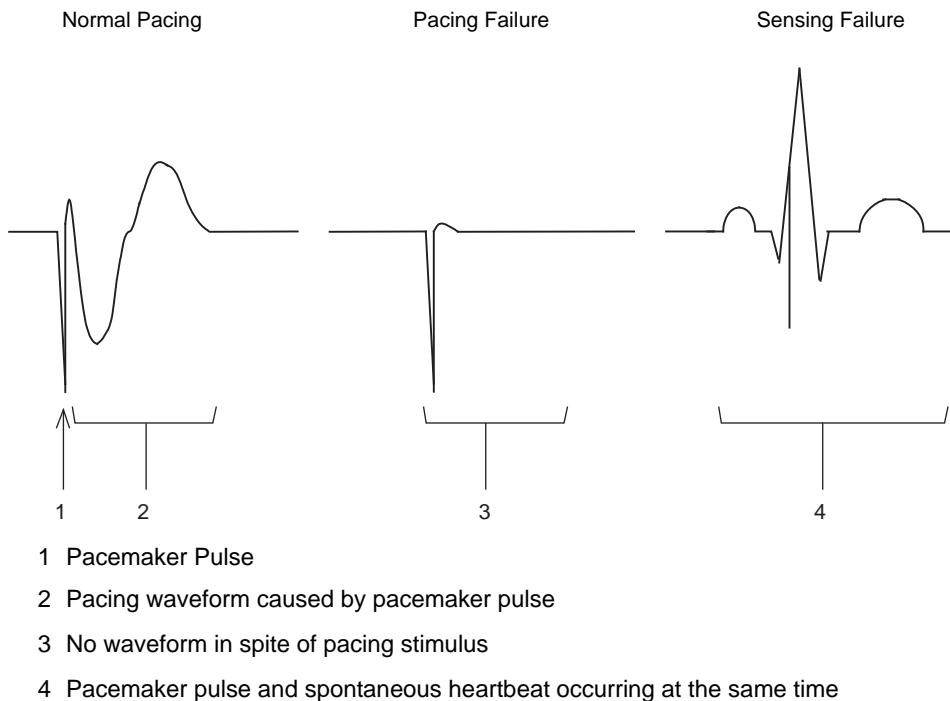
## 6 Set the "Pace Pulse Mask Time".

### **⚠ 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, asystole alarms 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.

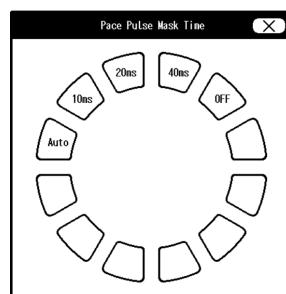
### REFERENCE

- 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** Press the key for "Pace Pulse Mask Time".

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



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

► [Auto]: Pace pulse mask time will be automatically set according to the pace pulse amplitude.

► [OFF]: Pace pulse mask time will be set to 0ms.

**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 [Inst.]/[Ave.].

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

## 9 Set the "Auto Lead".

### REFERENCE

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

*During Lead OFF*

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

### 1 Press the key for "Auto Lead".

- ▶ The dropdown list will be displayed.

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

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

## 10 Set the "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 Selection" window will be output.

## 11 Set the "AC Filter".

### REFERENCE

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

### 1 Press the key for "AC Filter".

- ▶ The dropdown list will be displayed.

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

▶ [ON]: AC filter which attenuates the AC noise of 50 to 60Hz will be set.

▶ [OFF]: AC filter will not be set.

## 12 Set the "ST/VPC/Arrhy. Alarm Display".

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

▶ The dropdown list will be displayed.

2 Select from [ON] or [OFF].

▶ [ON]: If 2 or more boxes is used for ECG numeric data display, ST level, VPC, arrhythmia alarm factor will be displayed inside the ECG numeric data box.

▶ [OFF]: ST level, VPC, arrhythmia alarm factor will not be displayed inside the ECG numeric data box.

## 13 Display the next page and set the "ECG Waveform Display during Lead-OFF".

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

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

▶ The dropdown list will be displayed.

2 Select from [ON] or [OFF].

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

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

## 14 Set the "Noise Detection".

When 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<sub>2</sub>/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<sub>2</sub>, BP.

▶ [OFF]: HR data before the noise detection will not be retained, and synchronizing source will not switch to SpO<sub>2</sub>, BP.

### NOTE

- Even if the synchronizing source is switched to SpO<sub>2</sub>, the ECG tone will remain and not change.

## 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**

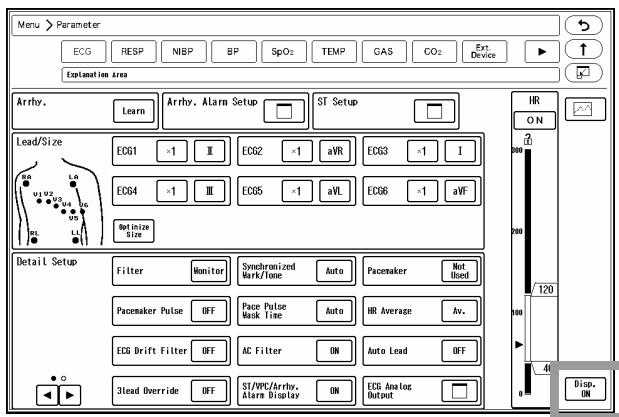
- If chest lead is set for ECG1/ECG2, chest lead OFF condition will be notified by an alarm generation even if [Disable] is set for "Chest Lead-OFF".

**□ ON/OFF of Parameter Display**

Select ON/OFF for parameter display.

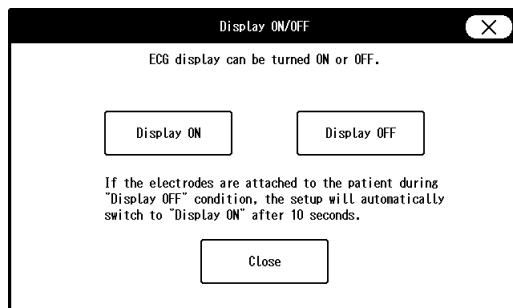
**! CAUTION**

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



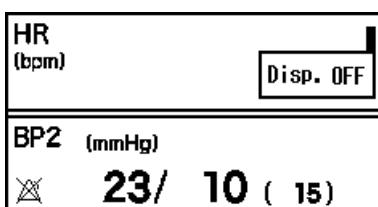
**1** Press the [Disp. ON] key.

- 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

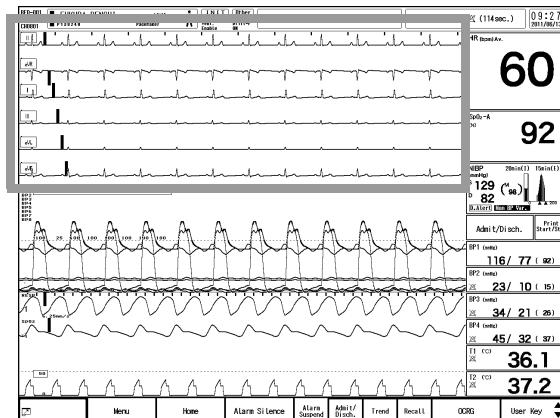
This section explains about the respiration measurement by the impedance, CO<sub>2</sub>, or ventilator method and the measurement condition settings.

**⚠ 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)

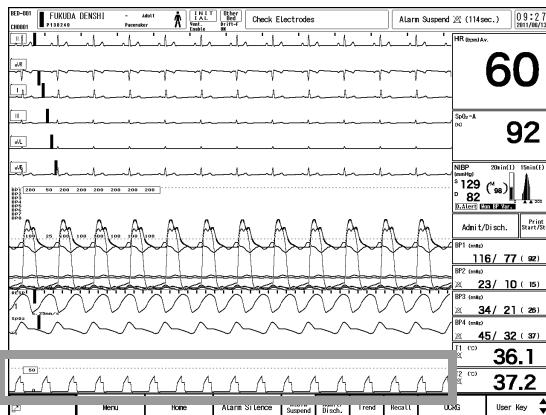
- 1** Check that the displayed ECG waveform is stable.

**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**

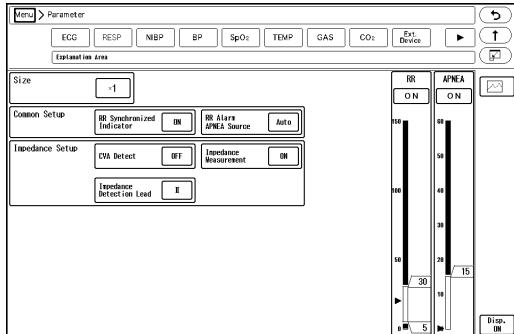
Verify that the respiration waveform and respiration rate is displayed on the home display.

**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.



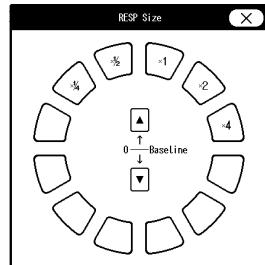
*Display Example when using the Super Unit*

**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  $0\Omega$ . 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,  $\text{CO}_2$ , ventilator, and gas unit measurement.
- For RR measured from  $\text{CO}_2$  waveform, alarm will not generate unless 2 or more respiration is detected within 30 seconds after the power is turned ON, monitoring is resumed,  $\text{CO}_2$  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<sub>2</sub>, and ventilator measurement.
- ♦ For apnea measured from CO<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub>/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<sub>2</sub>/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<sub>2</sub> 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<sub>2</sub>/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.

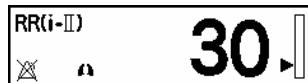
**7** Set the "RR Synchronized Mark".

**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<sub>2</sub> 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)" P6-8)  
(☞ "To Silence or Suspend the System Alarm Sound" P6-9)
- ♦ Be sure to perform Daily Check. Use of faulty equipment might harm the patient or operator.  
(☞ "Daily Check" P4-1)
- ♦ If the Equipment Status Alarm occurs or if you feel the unusual operation of the equipment, perform the inspections to confirm the safety or contact our service representative.  
(☞ "Equipment Status Alarm Message" P11-7)
- ♦ The BP value will not be displayed until zero balance is performed after the power is turned ON. Make sure to perform the zero balance.  
Once the zero balance is performed, the zero balance information will be maintained, and the BP value will be displayed.

## BP Monitoring

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.

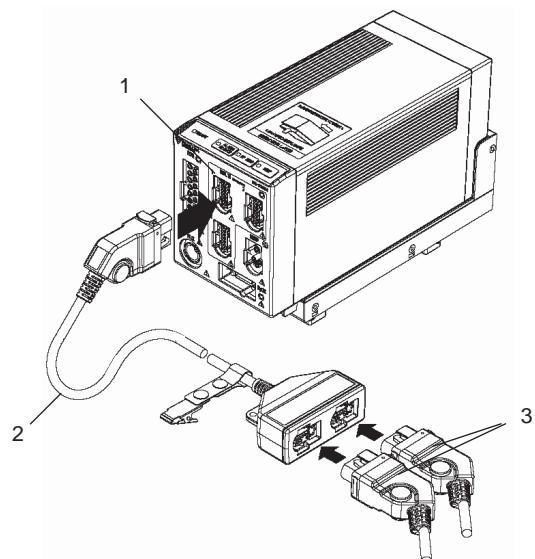
(☞ "Multiparameter Connector Setup for BP, TEMP, CO Measurement" P7-107)

- 1** Connect the 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).

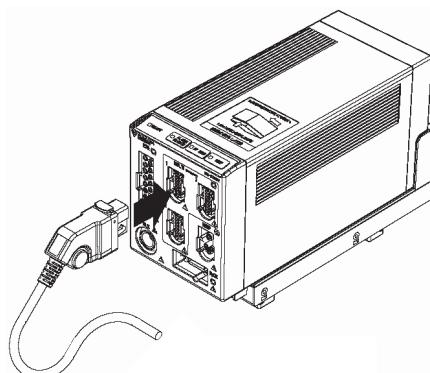
- 1 Multiparameter connector
- 2 2ch BP Conversion Cable  
CJO-P01B-DJ0.5
- 3 1ch BP Relay Cable  
CJO-P01B-S\*\*



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\*\*



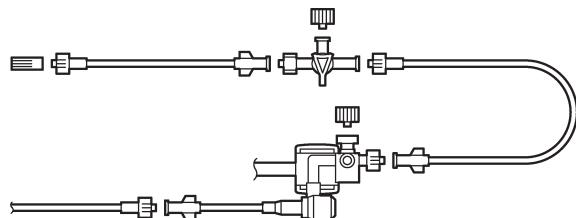
- 2** Assemble the BP measurement device.

### REFERENCE

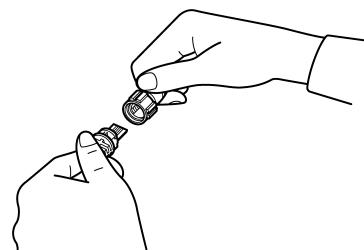
- The warm-up time is according to the specification of each blood pressure transducer for use. Refer to the manufacturer's instruction.
- Regarding the DS-8500 system specification, refer to the following.  
(☞ "BP" P14-14)

- 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 corresponded transducer.  
(☞ "Invasive Blood Pressure Measurement" P13-2)

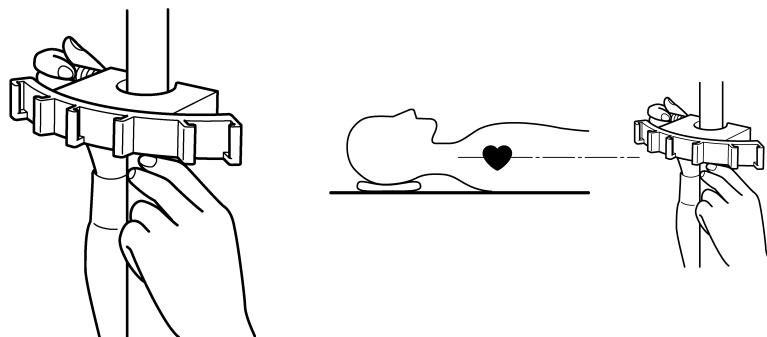
- 1 Inspect transducer packaging for damage prior to opening.
- 2 Verify that each connector is securely connected.



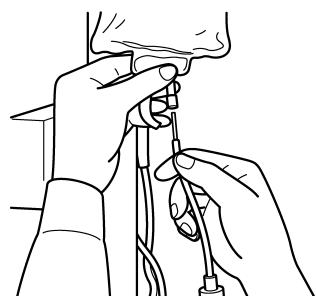
- 3 Connect the BP relay cable to the transducer.



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

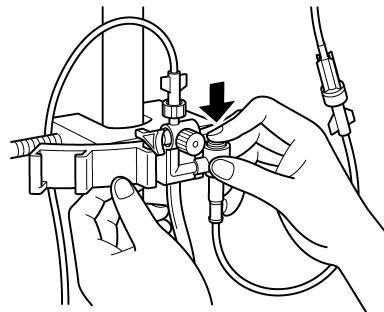


- 5 Inject 1000 units of heparin into the saline bag, mix thoroughly and puncture the infusion line through the same hole.

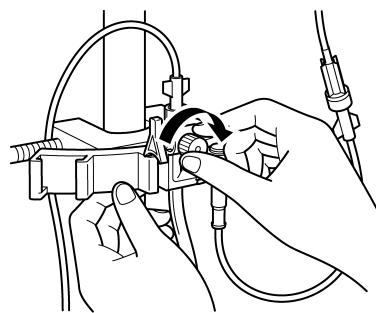


- 6 Set the saline bag to pressure bag, and hang from the infusion device. Fill saline to about 1/3 of the drip.

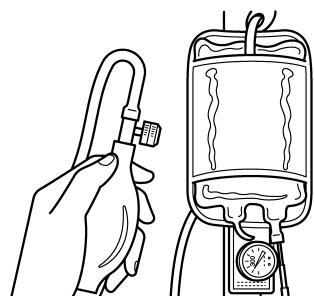
**7** After loosening the zero-port plug, push the flash button to perform priming to remove air bubbles.



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



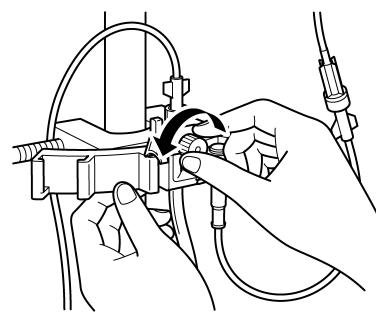
**9** Inflate the pressure bag to 300mmHg.



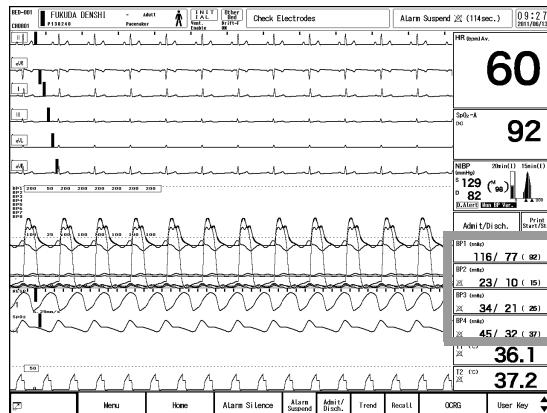
**10** Set the BP device and wait for about 5 minutes.

**3** Perform zero balance.

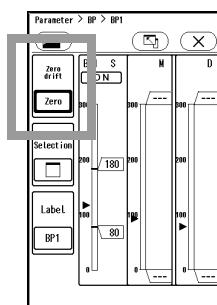
**1** Loosen the zero-port plug on open-air three-way valve one-half turn.



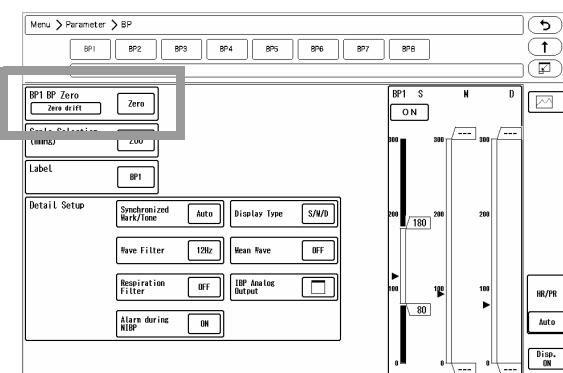
**2** Press the BP numeric data box (parameter key) on the home display.



► The BP floating window will be displayed.

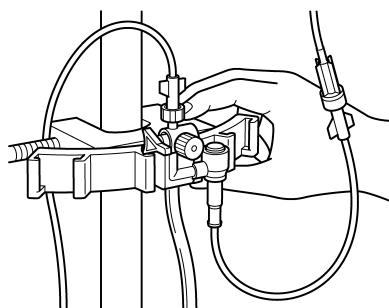


**3** Press the [Zero] key on the BP floating window or BP parameter setup screen.

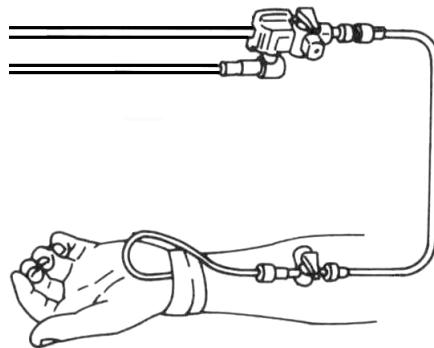


► Zero balance will start.

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



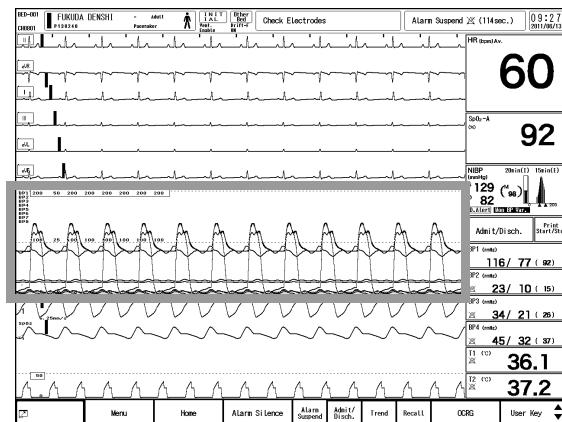
**5** Connect the catheter to the end of monitoring line.



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

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

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



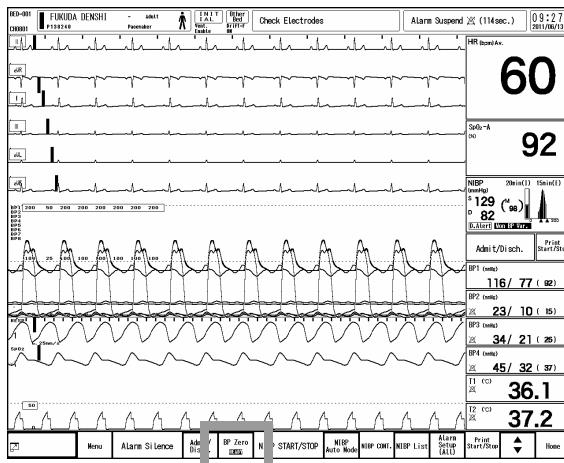
**CAUTION**

- 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

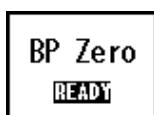
- ♦ If a message, "FAILED" is displayed, the three-way valve may not be opened to air, artifact is present, or the transducer may be defective. Check the cause and try the zero balance procedure again.
- ♦ If a message, "DRIFT" is displayed, verify that all the connections are secure.

- 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.
- A message, "Zero failed" will be displayed when the process fails.
- A message, "Zero drift" will be displayed when the BP relay cable is not connected.

### NOTE

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

**4** Close the three-way valve when the zero balance is complete.

## BP Parameter Setup

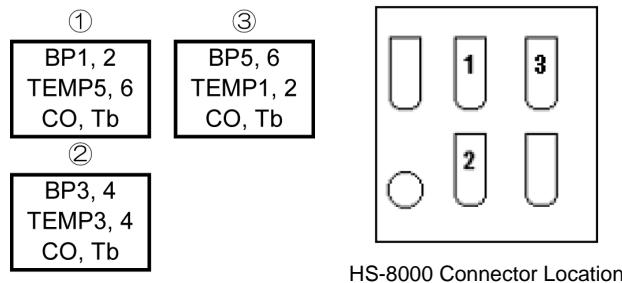
### REFERENCE

- Regarding the default value of each setting, refer to the following.  
(☞ "Setup Item/Default Value" P12-1)

## □ Default BP Label

### NOTE

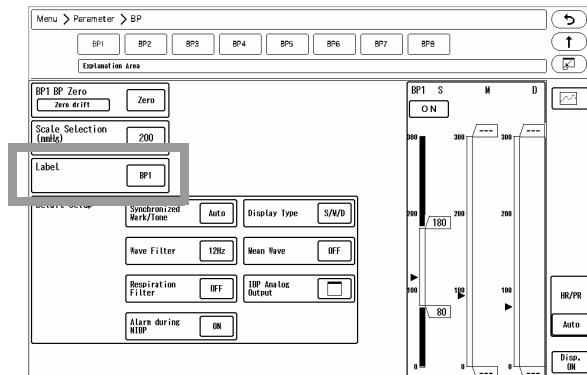
- If only the Super Unit is used and [Fixed] is selected on [Initial Settings>System>Unit Module], the default label will be automatically set according to the connector location.  
(☞ "Multiparameter Connector Setup for BP, TEMP, CO Measurement" P7-107)



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

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

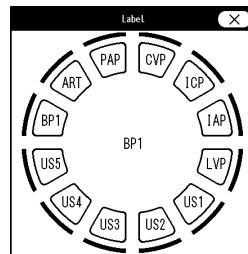
## □ Label Setup



1

Press key for "Label".

- ▶ The "Label" selection window will be displayed.



## 2 Select from [BPx]/[ART]/[PAP]/[CVP]/[ICP]/[IAP]/[LVP]/[USx].

### REFERENCE

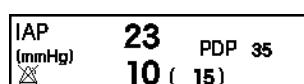
- Description of Each Label:
  - ART (Arterial Pressure)
  - PAP (Pulmonary Artery Pressure)
  - CVP (Central Venous Pressure)
  - ICP (Intra-cranial Pressure)
  - IAP (Intra-aortic Balloon Pumping Pressure)
  - LVP (Left Ventricular Pressure)
  - US1 to US5: User labels (3 characters) which can be set on the "Initial Settings".  
( Maintenance Manual "User Label Setup" P5-10)

### NOTE

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

## □ When the BP Label is IAP

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



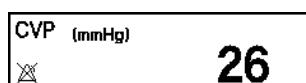
### ⚠ CAUTION

- Pay attention when monitoring graphic trend, data base, and alarm, as Systolic Pressure (SYS) = Peak Systolic Pressure (PSP).
- When ECG is not measured, PDP cannot be calculated.

## □ When the BP Label is CVP

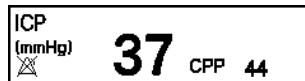
The measurement unit can be set to "mmHg", "kPa" or "cmH<sub>2</sub>O".

The measurement unit can be set on the "Initial Settings". The set measurement unit will be displayed on the BP numeric data box.  
( Maintenance Manual "Measurement Unit" P5-11)

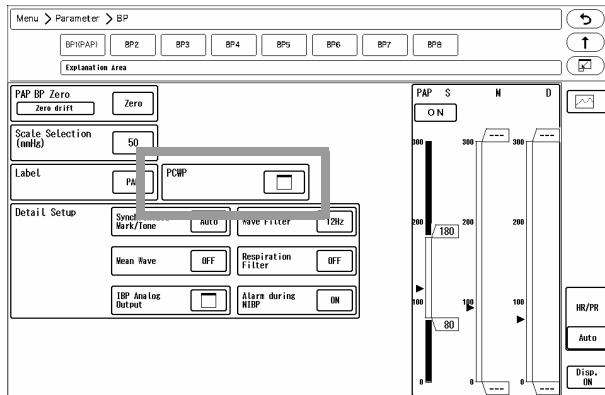


## When the BP Label is ICP

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



## PCWP Measurement

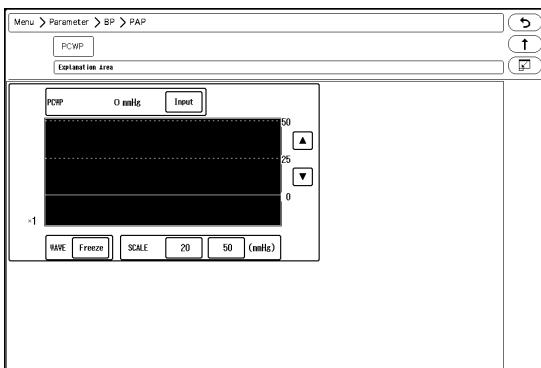


### REFERENCE

- When PAP is set as BP label, the mean value can be displayed as PCWP (Pulmonary Capillary Wedge Pressure).
- On the PCWP display, the current BP waveform and RESP waveform will be displayed.

**1** Press the key for "PCWP".

- PCWP measurement screen will be displayed.



**2** Press the [Freeze] key.

- The displayed waveform will freeze and cursor will be displayed. The cursor position indicates the current mean blood pressure.

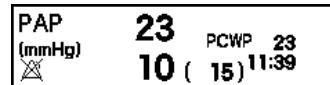
**3** Use the **[↑]** / **[↓]** keys to set the PCWP value.

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

**5** Press the [Input] key after setting the PCWP value.

- The PCWP value will be displayed inside the PAP (BP label) numeric data box with the measurement time.

It will be also displayed on the trend data.



## □ Scale Setup

### **⚠ CAUTION**

- When wireless network is used, BP waveform with a scale above the set scale will not be properly transmitted. The displayed BP scale should be within the set scale.

### **NOTE**

- Select the full scale for displaying and printing.
- The scale selection will differ depending on the label as shown below.

BP Label	Scale													
	5	10	15	20	30	40	50	75	100	150	200	250	300	mmHg
	1	2	3	4	5	6	8	12	16	20	24	32	40	kPa
BP1 to BP8 User Label				Yes			Yes	20 40cmH <sub>2</sub> O						
ART, IAP, LVP							Yes							
PAP				Yes		Yes								
CVP		Yes		Yes										
ICP	Yes	Yes	Yes	Yes			Yes							

### **REFERENCE**

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

**1** Press the key for "Scale Select".

► The scale selection window will be displayed.

**2** Select the scale from the displayed selection.

## □ Alarm

### **REFERENCE**

- For Other Bed Alarm, refer to the following.  
(☞ "Other Bed Display" P8-56)
- No alarm sound generation is available, using the alarm suspend and silence functions, when performing the zero balance or replacing the transducer. After performing the zero balance or replacing the transducer, make sure not to activate the Alarm Suspend and Silence functions.  
(☞ "To Silence or Suspend the System Alarm Sound" P6-9)

## 1 Set the BP alarm.

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

### NOTE

- Set the upper limit in the range of 2 to 300mmHg/0.2 to 40.0kPa. If a value above 300mmHg/40.0kPa is set, the upper alarm will turn OFF.
- Set the lower limit in the range of 0 to 295mmHg/0 to 39.5kPa. If a value below 0mmHg/0kPa is set, the lower alarm will turn OFF.
- Alarm will not generate until 30 seconds has passed after the zero balance or after the transducer has been opened to air.

### REFERENCE

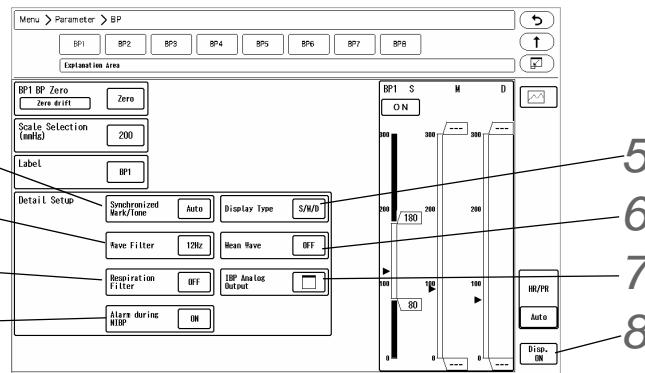
- Select ON/OFF of BP alarm and set the upper and lower alarm limit for systolic (S), diastolic (D), and mean (M) BP.
- The alarm limit should be set for each unit (mmHg / kPa).
- The adjustable increment will be according to the "BP Alarm Increment" setting. (Normal / Small).  
(☞ Maintenance Manual "Display/Print Setup" P5-13)
- The adjustable increment for upper and lower limit changes from 50mmHg/7kPa.
- When the BP label is BP1/ART, the upper and lower limit will be automatically set to +40mmHg/+5kPa and -20mmHg/-3kPa respectively to the current value.
- When the BP label is other than BP1/ART, the upper and lower limit will be automatically set to +20%, -20% respectively to the current value.

	"BP Alarm Increment" Setup	
	If [Normal] is selected;	If [Small] is selected;
0 to 50mmHg	2mmHg increment	1mmHg increment
50 to 300mmHg	5mmHg increment	
0 to 7.0kPa	0.2kPa increment	0.1kPa increment
7 to 40.0kPa	0.5kPa increment	

## □Detail Setup (BP Parameter)

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

The "BP" setup screen can be also displayed by pressing the detail key  on the BP floating window.



Display Example when BP Label is BP1/ART:

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

**REFERENCE**

- The parameter to display the HR synchronized mark can be selected from ECG/SpO<sub>2</sub>/BP (BP1 or ART). If BP1 and ART is simultaneously measured, ART will be prioritized.

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

► The dropdown list will be displayed.

- 2** Select from [ECG]/[SpO<sub>2</sub>-1]/[SpO<sub>2</sub>-2]/[BP]/[Auto]/[OFF].

► [Auto]: The synchronized mark will be displayed in the priority of "ECG>SpO<sub>2</sub>-1>SpO<sub>2</sub>-2>BP".

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

► [SpO<sub>2</sub>-1]/[SpO<sub>2</sub>-2]:SpO<sub>2</sub> 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".

**REFERENCE**

- Select the appropriate low-pass filter from 6Hz, 8Hz, 12Hz, 40Hz. An artifact may interfere on the BP waveform depending on the combination of BP measurement circuit.

- 1** Press the key for "Wave Filter".

► The dropdown list will be displayed.

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

- 3** Set the "Respiration Filter".

**REFERENCE**

- The BP waveform baseline drift caused by the respiration influence can be prevented by setting ON the respiration rejection filter.

- 1 Press the key for "Respiration Filter".  
▶ The dropdown list will be displayed.
- 2 Select from [ON] or [OFF].  
▶ [ON]: Respiration Filter will turn ON.  
▶ [OFF]: Respiration Filter will turn OFF.

## 4 Set the "Alarm during NIBP".

- 1 Press the key for "Alarm during NIBP".  
▶ The dropdown list will be displayed.
- 2 Select from [ON] or [OFF].  
▶ [ON]: BP alarm will generate even during NIBP measurement.  
▶ [OFF]: BP alarm will not generate during NIBP measurement and for 30 seconds after the measurement.

## 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 BP numeric data can be selected from [S/D/M]/[S/D]/[M]. The undisplayed BP data will not generate a BP alarm.
- ◆ If the BP label is CVP, IAP, PAP, ICP, the display type is fixed.

- 1 Press the key for "Display Type".  
▶ The dropdown list will be displayed.
- 2 Select from [S/D/M]/[S/D]/[M].  
▶ [S/D/M]: The systolic/diastolic/mean BP value will be displayed.

BP1 (mmHg)  
**116/ 77 ( 92 )**

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

BP1 (mmHg)  
**116/ 77**

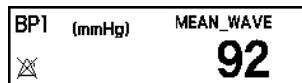
- ▶ [M]: The mean BP value will be displayed.

BP1 (mmHg)  
**92**

## 6 Select the "Mean Wave".

- 1 Press the key for "Mean Wave".  
▶ The dropdown list will be displayed.
- 2 Select from [ON] or [OFF].  
▶ [ON]: The mean BP waveform will be displayed and "MEAN\_WAVE" will be displayed inside the numeric

data box.



## 7 Set the "IBP Analog Output".

- 1 Press the key for "IBP Analog Output".  
► The "IBP Analog Output" window will be displayed.
- 2 Select the signal to output.

## 8 Select ON/OFF for parameter display.

(☞ "ECG Parameter Setup" P7-6)

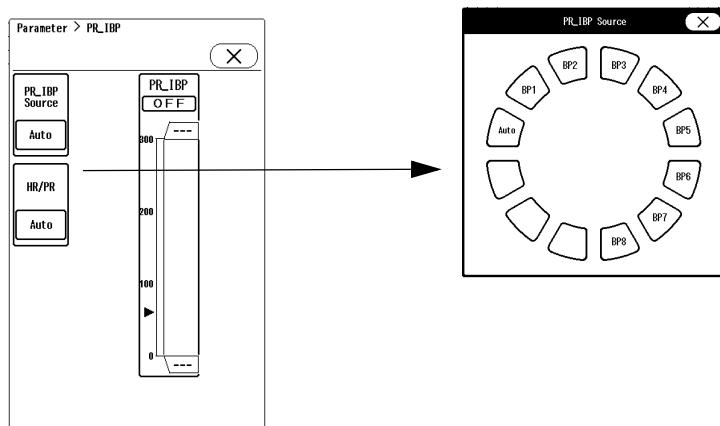
### **CAUTION**

- When the waveform and numeric data display is set to OFF, the alarm generation and tabular/graphic trend input will also cease.
- If the display of waveform/numeric data labeled as BP1/ART is set to OFF, the BP pulse rate will not be displayed.

## □BP Source Selection for PR\_IBP

Select the BP source for the pulse rate measurement.

The BP source for the PR\_IBP can be set on the window which is displayed by clicking on the "PR\_IBP source" on the PR\_IBP floating window.



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

## Pulse Oximetry

This section explains the process and settings of SpO<sub>2</sub> monitoring condition when the SpO<sub>2</sub> 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<sub>2</sub> channel manually.

( Maintenance Manual "Unit Module Setup" P4-18)

### SpO<sub>2</sub> Monitoring

#### **WARNING**

- ♦ Pulse oximeter should not be used as a replacement or substitute for ECG based arrhythmia analysis.
- ♦ When measuring the SpO<sub>2</sub> of patient with high fever or peripheral circulatory insufficiency, check the sensor attachment periodically and change the attachment site. The temperature of the attachment site will rise 2 to 3°C due to the sensor heat which may result in compression necrosis and burn injury.
- ♦ For the following case, accurate measurement may not be possible.
  - ♦ Patient with excessive abnormal hemoglobin (COHb, MetHb)
  - ♦ Patient with excessive total bilirubin
  - ♦ Patient with the pigment injected to the blood
  - ♦ Patient receiving CPR treatment
  - ♦ When a sensor is applied to a limb with NIBP cuff, arterial catheter, or intracatheter
  - ♦ When measuring at site with venous pulse
  - ♦ Patient with body motion
  - ♦ Patient with small pulse
- ♦ For the following case, loss of pulse signal can occur.
  - ♦ Sensor is too tight.
  - ♦ Patient has hypotension, severe vasoconstriction, severe anemia, or hypothermia.
  - ♦ There is arterial occlusion proximal to the sensor.
  - ♦ Patient is in cardiac arrest or is in shock.
- ♦ Do not connect a sensor or cable not authorized by Fukuda Denshi to any I/O connector. If done so by mistake, the equipment cannot deliver its maximum performance and the connected equipments may be damaged, resulting in a safety hazard.

#### **CAUTION**

- ♦ Make sure to use only the specified sensor/relay cable. Otherwise inaccurate measurements may be caused.
- ♦ Discontinue use if patient sensor is damaged in anyway.
- ♦ If irritation such as skin reddening appears with the sensor use, change the attachment site or stop using the sensor.
- ♦ When attaching the sensor with tape, do not wrap the tape too tight. At the same time, check the blood flow constantly so that congestion is not generated at the peripheral.

- Even a short duration of attachment may inhibit the blood flow and generate compression necrosis and burn injury.
- Check the sensor attachment site constantly in every 4 hours when probes or reusable sensor are used, and at least every 8 hours when single patient use sensors are used. Be especially careful of a patient with bad perfusion. If the sensor attachment position is not changed constantly, skin irritation or skin necrosis due to compression may be developed. For the patient with bad perfusion, check the sensor attachment position at least every 2 hours.
- As skin for neonate/ low birth weight infant is immature, change the sensor attachment site more frequently depending on the condition.
- Venous congestion may cause under reading of actual oxygen saturation. Therefore, assure proper venous outflow from monitored site. Sensor should not be below heart level (e.g. sensor on hand of a patient in a bed with arm dangling to the floor).
- Direct sunlight to the sensor area can cause measurements error. Place a black or dark cloth over the sensor.
- When not performing the measurement, unplug the relay cable and sensor from the SpO<sub>2</sub> connector. Otherwise, the measurement data may be erroneously displayed by the ambient light.
- The pulse wave is normalized for SpO<sub>2</sub> measurement. It does not indicate perfused blood volume. Check proper probe attachment by observing the pulse wave.
- Precautions for Reusable Type Sensor  
The light-emitting part of the sensor should be over the root of the fingernail. Do not insert the finger too far into the sensor as it may hurt the patient.  
For additional warnings, cautions, or contraindications when using sensors with Nellcor Unit (HS-8312N or HG-820)/Masimo Unit (HS-8312M or HG-810), refer to each SpO<sub>2</sub> sensor instruction manual.
- Precautions for Single-Patient-Use Type Sensors  
The sensor can be reused on the same patient as long as the adhesive tape attaches without slippage. But do not reuse on other patients to avoid cross contamination. It is intended for single patient use only.  
For additional warnings, cautions, or contraindications when using sensors with Nellcor Unit (HS-8312N or HG-820)/Masimo Unit (HS-8312M or HG-810), refer to each SpO<sub>2</sub> sensor instruction manual.
- If "— —" is displayed for the SpO<sub>2</sub> numeric data, make sure that the sensor is properly attached.

---

**1** Prepare an appropriate probe or sensor for the patient.

(☞ "Pulse Oximetry Measurement (Nellcor)" P13-3)

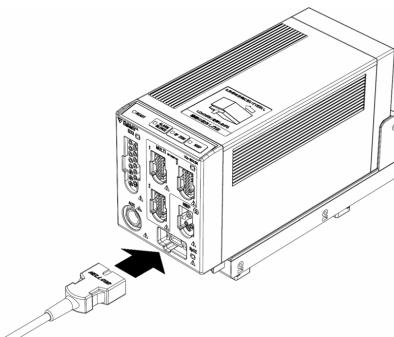
(☞ "Pulse Oximetry Measurement (Masimo)" P13-4)

**2** Connect the sensor to the Super Unit or Module.

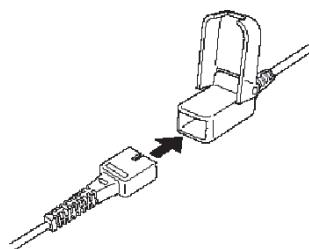
In Case of Nellcor™ Unit:

**1** Connect the DOC-10 SpO<sub>2</sub> relay cable to the SpO<sub>2</sub> connector on the HS-8312N or HG-820.

The illustration is example of connection with HS-8312N.



- 2 Insert the sensor into the SpO<sub>2</sub> relay cable connector, and lock it with the transparent cover.



**⚠ CAUTION**

- ♦ The DOC-10 SpO<sub>2</sub> relay cable is for Nellcor™ sensor only. Connect it only to the HS-8312N or HG-820. Otherwise, the equipment will not properly function.

In Case of Masimo Unit:

- 1 Connect the SpO<sub>2</sub> patient cable (LNOP®, LNCS®, Rainbow®) to the SpO<sub>2</sub> 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<sub>2</sub> 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.
- ♦ Sensors and connectors are not water-proof. Remove the sensors from the patient before bathing.

**NOTE**

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

- 3 Attach the sensor to the patient.

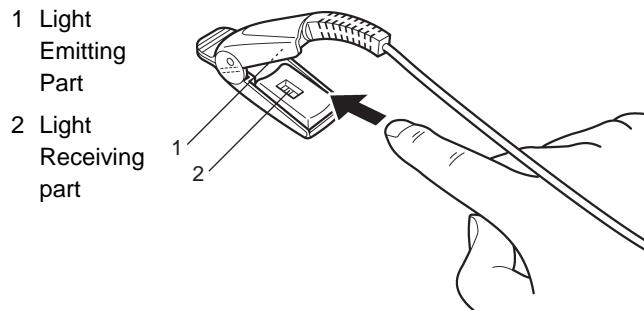
**⚠ CAUTION**

- ♦ If the nail is rough, dirty, or manicured, accurate measurement will not be possible.

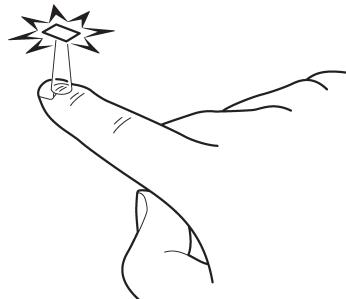
Change the finger or clean the nail before attaching the probe or sensor.

Probe Type Sensor (Ex. Durasensor DS-100A)

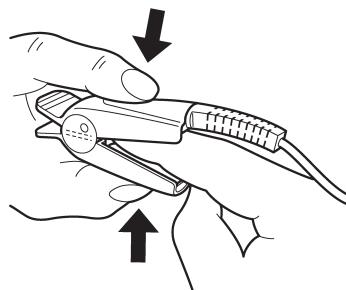
- 1 As shown below, the probe cable should be on the nail side.



- 2 Adjust the sensor so that the light-emitting part (on cable side) touches the root of the nail, and close the probe.



- 3 Press the probe lightly so that the finger and the rubber cover are appressed.

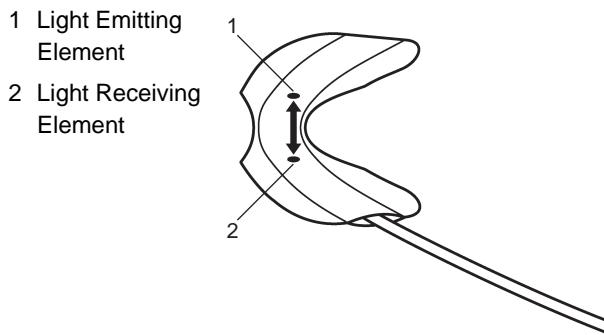


REFERENCE

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

Single-use Type

- 1 Clean the attachment site with alcohol, etc.
- 2 Align the light emitting element and light receiving element of the sensor with the measuring site in between when attaching the sensor to patient.



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

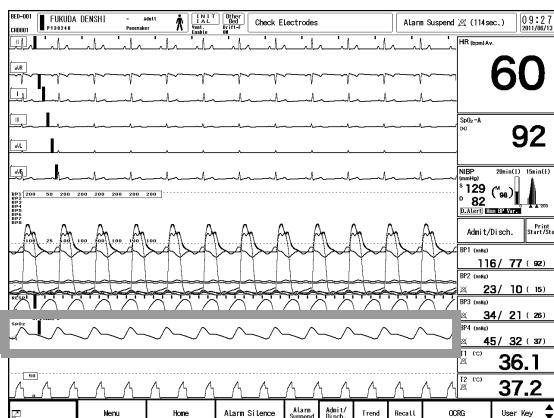


Attachment to the toe  
(Ex. MAX-I)



Attachment to the finger  
(Ex. MAX-A)

**4** Verify that the SpO<sub>2</sub> measurement and SpO<sub>2</sub> 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 can be measured only when using the Rainbow series sensor. However, SpCO, SpMet, SpHb measurements are not possible for some Rainbow series sensor.
- SpCO and SpHb cannot be measured at the same time for all the sensors. By using the sensor for SpCO, SpMet, SpHb, carboxyhemoglobin concentration (SpCO [%]), methemoglobin concentration (SpMet [%]), total hemoglobin concentration (SpHb [g/dL]) can be measured.
- For details, please refer to our service representative.

**REFERENCE**

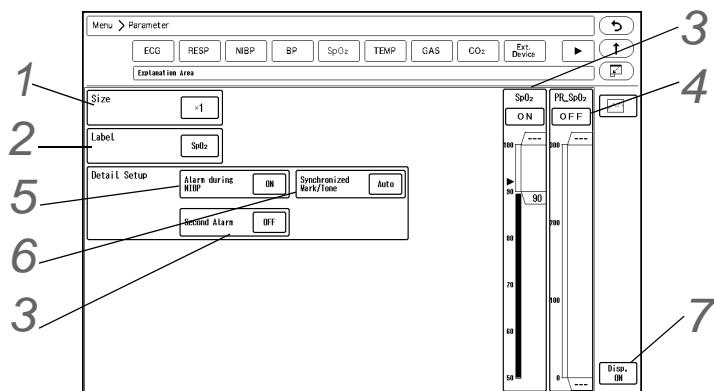
- SpCO, SpMet, SpHb measurements are optional function.
- SpCO is a value that represents the percentage of carboxyhemoglobin saturation within the blood.  
(☞ "SpO<sub>2</sub> Parameter Setup (Masimo)" P7-46)
- SpMet is a value that represents the percentage of methemoglobin saturation within the blood.  
(☞ "SpO<sub>2</sub> Parameter Setup (Masimo)" P7-46)
- SpHb is a measure of the total hemoglobin (SpHb) concentration in arterial blood. It relies on the same principles of pulse oximetry to determine the SpHb measurement.  
(☞ "SpO<sub>2</sub> Parameter Setup (Masimo)" P7-46)

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

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

## SpO<sub>2</sub> Parameter Setup (Nellcor)

This section explains the procedure to set the monitoring condition when using the HS-8312N or HG-820. Press the [Menu], [SpO<sub>2</sub>] keys to display the "SpO<sub>2</sub>" setup screen.

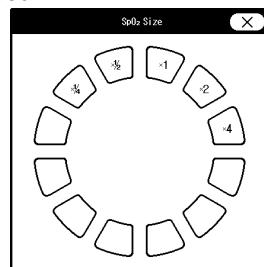


When HS-8312N is used

**1** Set the waveform size.

1 Press the key for "Size".

► The "Size" screen will be displayed.



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

## 2 Set the label.

- 1 Press key for "Label".  
► The dropdown list will be displayed.
- 2 Select from [None]/[Auto]/[RHI]/[LHI]/[RF]/[LF]/[OT].  
► When [Auto] is selected, the label will be automatically assigned depending on the SpO<sub>2</sub> unit type and channel number.  
Nellcor™ 1ch:N1, 2ch:N2  
Masimo 1ch:M1, 2ch:M2

## 3 Set the SpO<sub>2</sub> 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 to 100%. If a value above 100% is set, the upper alarm will turn OFF.
- ♦ Set the lower limit in the range of 50 to 99%. If a value below 50% is set, the lower alarm will turn OFF.

### REFERENCE

- ♦ Also, when the SpO<sub>2</sub> value is unstable around the lower alarm limit, the frequently generated alarm can be corrected by setting the second alarm function.  
(☞ "SpO<sub>2</sub> Second Alarm Setup" P6-2)
- ♦ When the limit is automatically set, the upper limit will be OFF, and the lower limit will be 90%.
- ♦ The upper/ lower limit can be set in 1% increment.
- ♦ ► indicates the current measurement value.
- ♦ The following delay occurs for the SpO<sub>2</sub> alarm depending on the patient classification and second alarm setting. (For Nellcor™)

	Second Alarm Setup	Patient Classification	
		Adult/Child	Neonate
SpO <sub>2</sub> Alarm Status Delay	For all settings	About 7 to 9 sec.	About 7 to 9 sec.
SpO <sub>2</sub> Alarm Signal Delay	OFF	About 5 sec.	0 sec.
	10	About 5 to 7 sec.	About 5 to 7 sec.
	25	About 11 to 13 sec.	About 11 to 13 sec.
	50	About 19 to 22 sec.	About 19 to 22 sec.
	100	About 36 to 38 sec.	About 36 to 38 sec.

## 4 Set the PR alarm.

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

### NOTE

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

alarm will turn OFF.

**REFERENCE**

- When [Auto] is set, the upper and lower limit will be automatically set to +40bpm and -40bpm to the current value respectively.
- The upper and lower limit can be set in 5 bpm increments.  
It can be set in 1 bpm increment if 25 bpm or below.
- The following delay occurs for the PR alarm depending on the patient classification. (For Nellcor™)
  - PR Alarm Status Delay: <Adult/Child/Neonate> About 5 to 6 sec.
  - PR Alarm Signal Delay: <Adult/Child> About 5 sec., <Neonate> 0 sec.

**5** Set the "Alarm during NIBP".**NOTE**

- During the NIBP measurement, the cuff inflation restricts the blood flow which disables the correct detection of SpO<sub>2</sub> and may generate an improper alarm.
- Selecting [OFF] for "Alarm during NIBP" will not generate the SpO<sub>2</sub>, PR alarm until the NIBP measurement is complete.

**REFERENCE**

- This setup is to be made when the SpO<sub>2</sub> sensor and NIBP cuff is placed on the same limb for measurement.

**1** Press the key for "Alarm during NIBP".

► The dropdown list will be displayed.

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

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

► [OFF]: SpO<sub>2</sub>, PR alarm will not be generated during NIBP measurement.

**6** Set the "Synchronized Mark/Tone".  
(☞ "BP Parameter Setup" P7-30)**7** Select ON/OFF for parameter display.  
(☞ "ECG Parameter Setup" P7-6)**CAUTION**

- When the waveform and numeric data display is set to OFF, the alarm generation and tabular/graphic trend input will also cease.
- When the waveform and numeric data display is set to OFF, the pulse rate measured by SpO<sub>2</sub> will not be displayed either.

**REFERENCE**

- When SpO<sub>2</sub> sensor is attached to the patient with the SpO<sub>2</sub> display set to OFF, and SpO<sub>2</sub> is measured for 10 seconds, the pulse wave and numeric data will be automatically

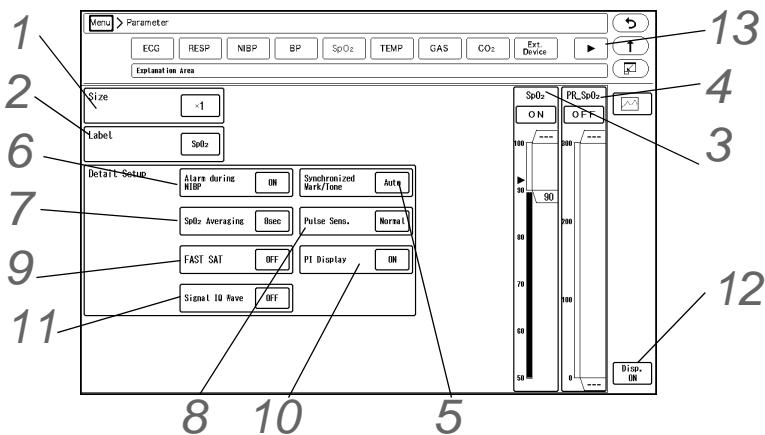
displayed.

## SpO<sub>2</sub> Parameter Setup (Masimo)

This section explains the procedure to set the monitoring condition when using the HS-8312M or HG-810. Press the [Menu], [SpO<sub>2</sub>] keys to display the "SpO<sub>2</sub>" setup screen.

### REFERENCE

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



When HS-8312M is used

- Select the waveform size.  
(☞ "SpO<sub>2</sub> Parameter Setup (Nellcor)" P7-43)
- Set the label.  
(☞ "SpO<sub>2</sub> Parameter Setup (Nellcor)" P7-43)
- Set the SpO<sub>2</sub> alarm.  
(☞ "SpO<sub>2</sub> Parameter Setup (Nellcor)" P7-43)

### REFERENCE

- The following delay occurs for the SpO<sub>2</sub> alarm depending on the patient classification and SpO<sub>2</sub> averaging duration setting. (For Masimo)

SpO <sub>2</sub> Averaging	Patient Classification	
	Adult/Child	Neonate
SpO <sub>2</sub> Alarm Status Delay	For all settings	About 7 to 9 sec. About 7 to 9 sec.
SpO <sub>2</sub> Alarm Signal Delay	For all settings	About 5 sec. 0 sec.

**4** Set the PR alarm.(☞ "SpO<sub>2</sub> Parameter Setup (Nellcor)" P7-43)**REFERENCE**

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

**5** Set the "Synchronized Mark/Tone".

(☞ "BP Parameter Setup" P7-30)

**6** Set the "Alarm during NIBP".**NOTE**

- During the NIBP measurement, the cuff inflation restricts the blood flow which disables the correct detection of SpO<sub>2</sub> and may generate an improper alarm.

**REFERENCE**

- This setup is to be made when the SpO<sub>2</sub> sensor and NIBP cuff is placed on the same limb for measurement.

**1** Press the key for "Alarm during NIBP".

- ▶ The dropdown list will be displayed.

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

- ▶ [ON]: Alarm will be generated even during NIBP measurement.
- ▶ [OFF]: SpO<sub>2</sub>, PR, SpCO, SpMet, SpHb alarm will not be generated during NIBP measurement.

**7** Set the "SpO<sub>2</sub> Averaging".**WARNING**

- Be cautious when setting the "SpO<sub>2</sub> Averaging" duration as the SpO<sub>2</sub> alarm is based on the displayed SpO<sub>2</sub> value which is averaged from the duration set in "SpO<sub>2</sub> Averaging". The alarm occurrence time will be affected or may not occur for the transient value of SpO<sub>2</sub> depending on the set duration.

**1** Press the key for "SpO<sub>2</sub> Averaging".

- ▶ The dropdown list will be displayed.

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

- To pick up the abrupt change of the value sooner, and to take advantage of the qualities of FAST SAT mode, SpO<sub>2</sub> averaging time will be fixed at [2-4 sec.] when FAST SAT is set ON.

**8** Set the "Pulse Sens."**1** Press the "Pulse Sens." key.

- The pulse sensitivity dropdown list will be displayed.

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



- ♦ If [High] is selected for pulse sensitivity, sensor-detached detection will become somewhat inaccurate.

**NOTE**

- ♦ To improve the low perfusion condition, or to perform fast tracking when the SpO<sub>2</sub> value changes abruptly, select [High].
- ♦ For standard use, select [Normal].

**9** Set the "FAST SAT".

**NOTE**

- ♦ To pick up the abrupt change of the value sooner, and to take advantage of the qualities of FAST SAT mode, SpO<sub>2</sub> averaging time will be fixed at [2-4 sec.] when FAST SAT is set ON.

**1** Press the key for "FAST SAT".

- The dropdown list will be displayed.

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

- [ON]: Abrupt change of the SpO<sub>2</sub> value can be monitored.
- [OFF]: FAST SAT will be cancelled.

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

**NOTE**

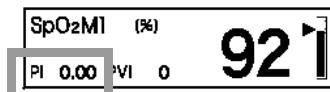
- ♦ The perfusion index is calculated by pulsatile signal divided by apulsatile signal times 100, and indicates patient's circulation condition.
- ♦ This can be used to find a good perfusion site to attach the sensor. Also, it can be used as diagnosis index to predict the patient's critical condition when at low perfusion.

**1** Press the key for "PI Display".

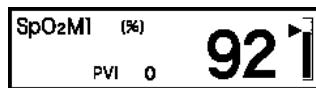
- The dropdown list will be displayed.

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

- [ON]: PI will be displayed.



- [OFF]: PI will not be displayed.



**NOTE**

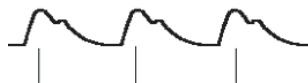
- Perfusion Index (PI) is a relative assessment of the pulse strength at the monitoring site. It is a ratio of the pulsatile and the non-pulsatile blood flow at the monitoring site. It can be used to find the most appropriate sensor application site by finding the site with the highest PI. Perfusion Index (PI) is displayed in the range from 0.02% to 20%, and the recommended value is 1% or above.
- Pleth Variability Index (PVI) is an index of the change in PI that occurs during the respiratory cycle. It is calculated by measuring the changes in PI over a time interval where one or more complete respiratory cycles have occurred. Pleth Variability Index (PVI) is displayed in the range from 0% to 100%.

**11** Set the signal IQ wave display.**NOTE**

- The signal IQ wave cannot be printed.

**REFERENCE**

- The signal IQ wave indicates the signal force and pulse wave timing. The vertical length indicates the signal quality. A low vertical line indicates a bad signal quality.



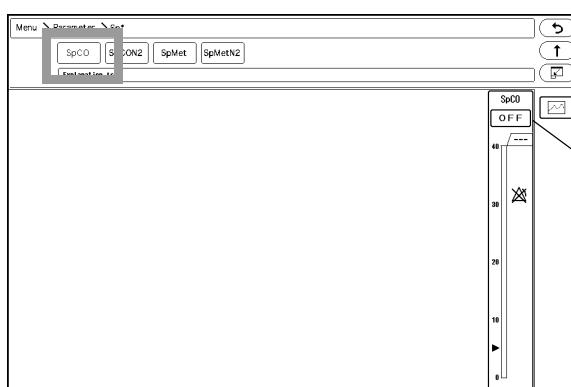
**1** Press the key for "Signal IQ Wave".

► The dropdown list will be displayed.

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

**12** Select ON/OFF for parameter display.  
(☞ "SpO2 Parameter Setup (Nellcor)" P7-43)**13** Set the SpCO alarm.

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

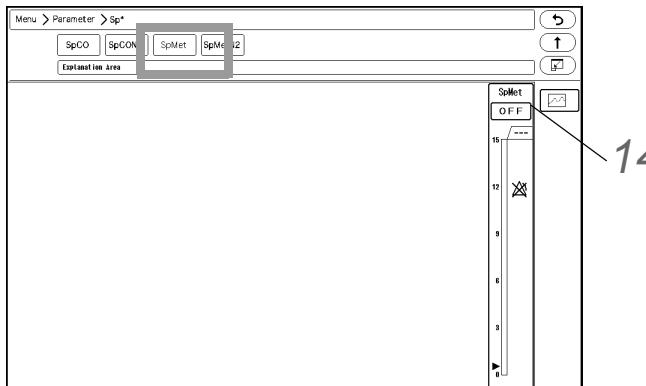
**CAUTION**

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

- ◆ The automatic alarm cannot be set.

## 14 Set the SpMet alarm.

Press the [SpMet] key to display the SpMet alarm setup screen.

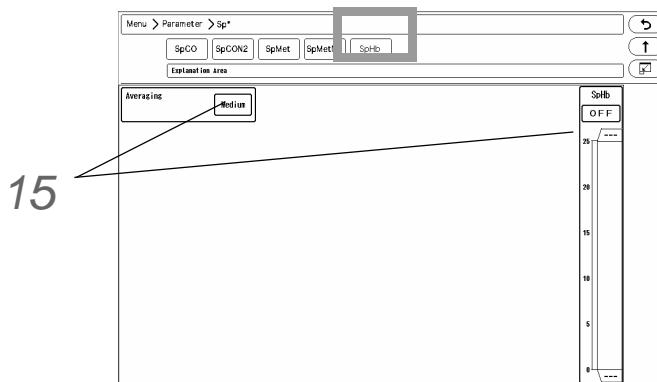


### **CAUTION**

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

## 15 Set the SpHb measurement condition.

Press the [SpHb] key to display the SpHb parameter setup screen.



1 Press the key for "Averaging".

2 Select from [Short] / [Medium] / [Long].

- ▶ [Short]: 1 minute will be set as the SpHb averaging duration.
- ▶ [Medium]: 3 minutes will be set as the SpHb averaging duration.
- ▶ [Long]: 6 minutes will be set as the SpHb averaging duration.

3 Set the SpHb alarm.

### **CAUTION**

- ◆ Set the upper limit in the range of 2.0 to 24.5g/dL.  
If a value above 24.5g/dL is set, the upper alarm will turn OFF.

- ◆ Set the lower limit in the range of 1.0 to 24.5g/dL.  
If a value below 1.0g/dL is set, the lower alarm will turn OFF.
  - ◆ The automatic alarm cannot be set.
- 

## Non-Invasive Blood Pressure

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The procedure of NIBP measurement and measurement condition setup are explained.

### CAUTION

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- ◆ For the following situation, measurements will be terminated.
    - ◆ When the measurement time has exceeded 160 seconds for adult and child, 80 seconds for neonate.
    - ◆ When the inflation value has exceeded 300mmHg for adult, 210mmHg for child, and 150mmHg for neonate.
  - ◆ If used with incorrect patient classification, it will not only cause erroneous measurement, but the inflating level for the adult may be applied to child or neonate which will compromise the safety of the patient.
- 

## NIBP Monitoring

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### WARNING

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- ◆ Before the measurement, make sure the patient classification ( Adult / Child / Neonate ) is properly selected. Otherwise, correct measurement cannot be performed, and congestion or other injury may result.
- 

### CAUTION

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- ◆ Correct NIBP measurement cannot be performed if artificial heart lung machine is used or if the pulse is difficult to detect.
- ◆ Pay attention when measuring the NIBP of patient with bleeding disorders or hyper coagulation. The cuff inflation may cause petechia or circulatory failure by the blood clot.
- ◆ The following factors may affect the NIBP value.
  - ◆ Body motion, arrhythmia, convulsion
  - ◆ Continuous noise such as cardiac massage
  - ◆ Periodic electromagnetic noise
- ◆ Do not apply the cuff to the arm or thigh where vein is secured. The blood may backflow causing the chemical injection to cease.
- ◆ Properly arrange the cuff and air hose.
- ◆ Check the condition of cuff-applied part on the patient during measurement so that the blood circulation will not be blocked over long period of time by the squashed or bent cuff hose.
- ◆ Check the patient's condition constantly while measuring over a long period of time with interval of 2.5 minutes or less. Also, periodically check the blood circulation while performing periodic measurement over a long period of time. Congestion or rash may occur at the measuring site.

- ♦ Make sure to check the patient's condition constantly when repeatedly using the NIBP continuous measurement mode as it may cause dysfunction of patient's circulation.
- ♦ When the cuff is not applied to the patient, pay attention not to leave the cuff unattended. If periodic or continuous measurement is set, the cuff will automatically inflate and may cause the rubber bag inside the cuff to burst. When not performing the NIBP measurement, set the NIBP measurement interval OFF and disconnect the air hose from the NIBP connector.
- ♦ Do not apply the NIBP cuff to site of injury. An injury may be worsened by the measurement.
- ♦ Do not apply the NIBP cuff to the arm on side treated axillary lymph nodes dissection. It may lead to lymphatic edema by the cuff pressure.
- ♦ Measuring on a limb with SpO<sub>2</sub> sensor, arterial catheter, or intracatheter may result in incorrect measurement.
- ♦ An operator must not get away from a patient during the NIBP measurement. However, when getting away from the patient is necessary, do not activate the Alarm Suspend and Silence functions in order not to miss any sudden changes in the patient's condition.  
(☞ "To Set the System Alarm (ON or Suspend)" P6-8)  
(☞ "To Silence or Suspend the System Alarm Sound" P6-9)

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## 1 Select the appropriate cuff type for the patient.

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### REFERENCE

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- ♦ According to the AHA (American Heart Association) guideline, the appropriate cuff width is 40% of the arm circumference.  
Select the appropriate cuff from the following selections.  
For other usable cuffs, refer to the section on "Optional Accessories".  
(☞ "Non-Invasive Blood Pressure Measurement" P13-2)
- 

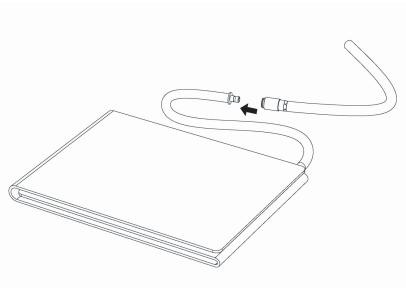
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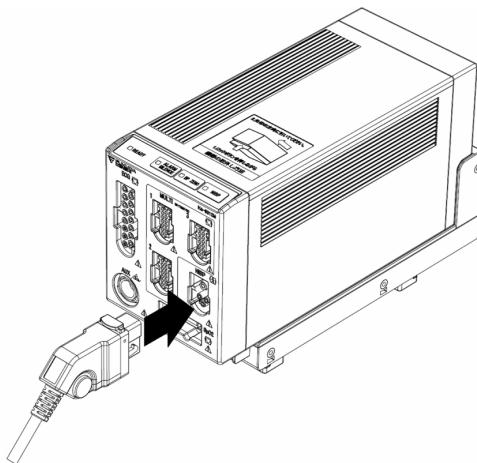
### ! CAUTION

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- ♦ Select the appropriate cuff size which best fits the arm circumference.  
If the cuff size is inappropriate, it may cause measurement error.
  - ♦ Do not use a cuff which is worn out.  
The cuff may burst during inflation.
- 

## 2 Connect the cuff to the air hose.

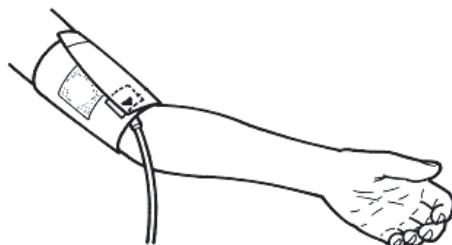


**3** Connect the air hose to the NIBP connector on the Super Unit.**CAUTION**

- Make sure the that the cuff hose connection is secure.  
If there is any air leakage, correct NIBP measurement cannot be performed.

**NOTE**

- The neonate cuff should be connected to air hose for neonate. Other cuffs should be connected to air hose for general use.  
The Super Unit automatically determines the patient classification (neonate or adult/child) according to the connected air hose. If the air hose is not connected to the cuff connection connector, the measurement will not start.

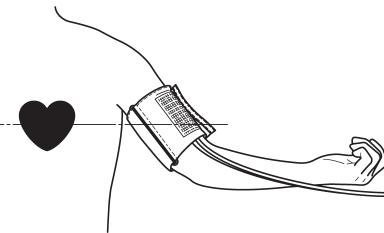
**4** Apply cuff to the patient.**NOTE**

- Position the ARTERY▼ mark over the artery on the patient's arm and wrap the cuff around.
- One or two fingers should just fit in between the cuff and arm.

**REFERENCE**

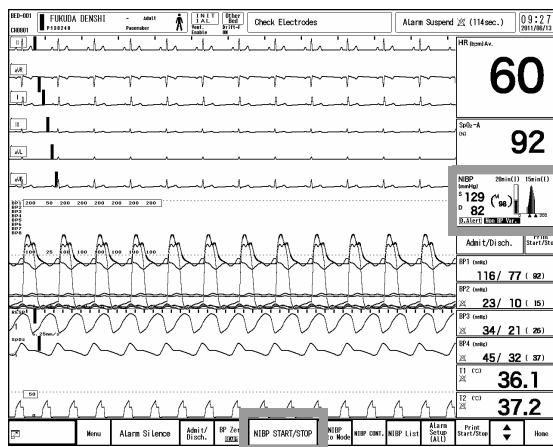
- Align the cuff height and heart position to eliminate an error caused by the blood weight.  
It is most appropriate to measure with the patient lying down and arms naturally

extended.



- ♦ Note the following points about the patient position.
  - ♦ Comfortably seated
  - ♦ Legs uncrossed
  - ♦ Feet flat on the floor
  - ♦ Back and arm supported
- ♦ To perform accurate measurements, from 5 minutes before the start of NIBP measurement, keep patient at rest and maintain a steady pulse rate and blood pressure.
- ♦ During the NIBP measurement, maintain the patient position as comfortable as possible, without such conversation.

## 5 Press 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, 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<sub>2</sub> waveform.

## Inflation Mode Setup

The maximum inflation value and measurement duration needs to be changed according to the patient classification. Set the appropriate inflation mode (Adult/Child/Neonate) according to the used cuff size on "Admit/Discharge" screen or NIBP parameter setup screen.

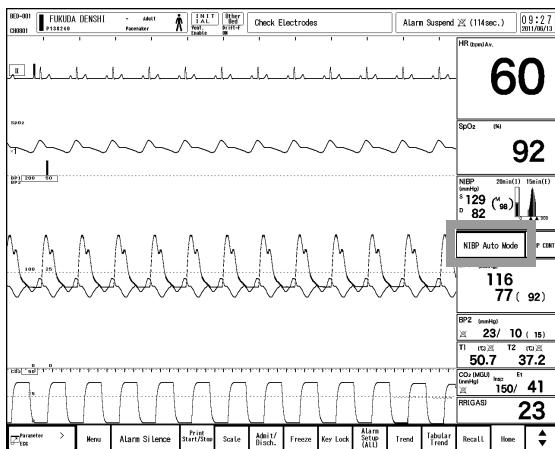
The NIBP measurement on this equipment is provided with forced exhaust system for safety purpose. When the maximum inflation value is reached or when the fixed measurement duration is exceeded, the system will automatically start to exhaust. The maximum inflation value, maximum measurement duration, initial inflation value for this exhaust system is fixed according to the patient classification (Adult/Child/Neonate) (☞ "NIBP (Non-Invasive Blood Pressure) (AAMI SP10: 2002+A1: 2003+A2:2006+(R) 2008 Manual, electronic or automated sphygmomanometers)" P14-14).

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

## NIBP Auto Mode Setup

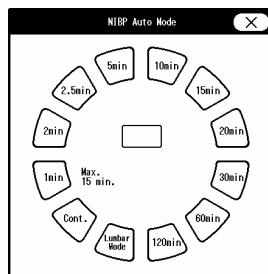
Non-invasive blood pressure can be measured automatically at selected time intervals.

If continuous measurement is started during the NIBP auto mode, the auto mode will automatically resume when the continuous measurement completes.



**1** Press the [NIBP Auto Mode] key on the home display.

- ▶ The "NIBP Auto Mode" window will be displayed.



**2** Select the measurement interval from the displayed selection.

### CAUTION

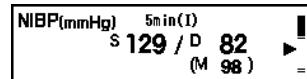
- ◆ When [1min] is selected, the 1-minute interval measurement will start from the time the selection is made.
- ◆ The 1-minute interval measurement will automatically stop after 12 minutes (maximum of 15 minutes when re-measured), and 2.5-minutes interval measurement will start.
- ◆ The continuous mode will continuously measure for 12 minutes (maximum of 15 minutes when re-measured). When the measurement completes, 2.5 minute interval measurement will start.
- ◆ 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" P7-57)
- ◆ The Lumbar mode should be used with sufficient safety measures.

### 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.

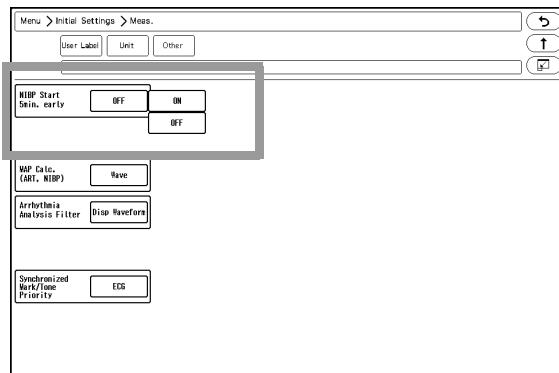
- The measurement will automatically start at selected interval.
- The selected interval will be displayed inside the numeric data box.



#### 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" P7-60)
- 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]

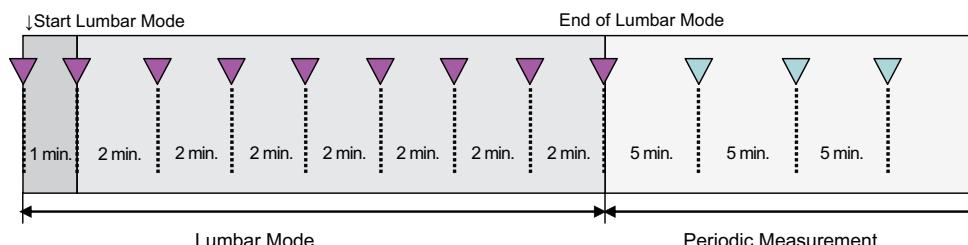


- On the "Initial Settings", whether or not to backup the NIBP measurement interval at discharge/power ON can be selected. (OFF/Backup/OFF→2.5min./OFF→5min.)

#### □ 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.

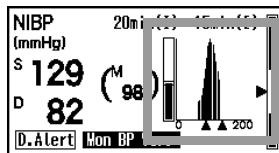
### CAUTION

- 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" P7-60)

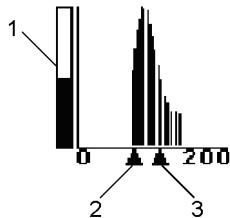


The description of the oscillation graph is as follows.

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

The bar graph shown at left indicates the size of maximum pulse amplitude compared with the reference value. For example, if the maximum pulse amplitude is 1/2 of the reference value, the bar graph will be half filled in.

- 1 Bar Graph
- 2 DIA Value
- 3 SYS Value



## Dyna Alert Function Status

The Dyna Alert function is a technology to prevent accidents which may occur by sudden BP change during the non-measured duration by estimating the variation of circulatory dynamics.

This function is available for the HS-8312N with built-in Nellcor™ module.

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

(☞ "Dyna Alert" P7-61)

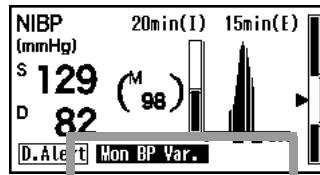
- Patient Classification: Adult (20kg or above)
- Cuff Applied Site: Upper Arm

- SpO<sub>2</sub> Sensor Attachment Site: Fingertip
- NIBP Measurement Interval: 5 to 60 minutes

**CAUTION**

- When the SpO<sub>2</sub> sensor is applied to the toe or forehead, the circulatory dynamics variation monitoring by the Dyna Alert may not properly function.
- The circulatory dynamics variation monitoring by the Dyna Alert is effective only on the HS-8312N with built-in Nellcor™ module.

In the NIBP numeric data box, the following mark and message indicating the status of the Dyna Alert function will be displayed.



D.Alert Color of Mark	Message	Status	Dyna Alert Function Status <sup>*1</sup>
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 <sup>*2</sup>	Invasive blood pressure is measured.	Suspended
Yellow	Measure NIBP	Initialization of Dyna Alert is complete, and the NIBP measurement has not been performed since the power is turned ON.	Suspended
	Poor ECG Signal	ECG signal failure due to lead-off, noise, etc.	Disable
	Poor PTG Signal	PTG (Photoplethysmograph) signal failure due to sensor off, noise, severe low perfusion, etc.	Disable
	DA-NIBP Suspended	Within 2.5 minutes from previous Dyna Alert NIBP measurement.	Suspended
	Measuring NIBP	NIBP measurement other than Dyna Alert is in progress.	Disable
	Initializing	Waiting for stable signal after starting Dyna Alert.	Disable
Green	PTG Low Perfusion	PTG amplitude is 200unit or above, and below 800unit.	Enable
	Mon. Variation	Dyna Alert is properly monitoring circulatory dynamics variation.	Enable
Pink	Measuring DA-NIBP	Dyna Alert NIBP measurement is in progress.	Disable

\*1: Disable: Circulatory dynamics variation is not monitored.

Suspended: Circulatory dynamics variation is monitored. But the display control software suspends the measurement even when the NIBP measurement is requested. When the suspending factor is resolved, the measurement will resume as quickly as possible.

Enable: Circulatory dynamics variation is monitored. The display control software responds to NIBP measurement request as quickly as possible.

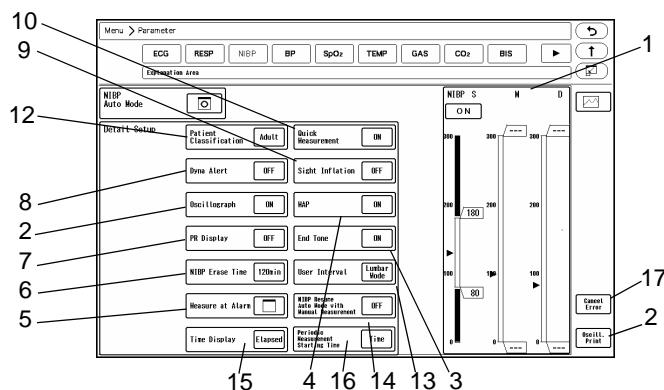
\*2: " Measuring BP" indicates the status when IBP (BP1 or ART) measurement is possible and can be displayed on the monitor.

**CAUTION**

- ♦ When using the Dyna Alert function, be aware of these risks and do not increase the NIBP interval time by relying only on the Dyna Alert function.
- ♦ After the Dyna Alert NIBP measurement, the next Dyna Alert NIBP measurement cannot be performed for 2.5 minutes.
- ♦ The Dyna Alert will not properly function for the following cases.
  - ♦ If peripheral circulatory insufficiency or very low BP is developed.
  - ♦ If highly-frequent arrhythmia is generated.
  - ♦ If an artificial heart lung machine is used.
  - ♦ If a large noise from body movement or electric surgery equipment is interfering.
  - ♦ If autonomic nerve or circulatory dynamics is largely affected by medication.

## NIBP Parameter Setup

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



### 1 NIBP Alarm

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

**NOTE**

- ♦ Set the upper limit in the range of 15 to 300mmHg/2.0 to 40.0kPa. If a value above 300mmHg/40.0kPa is set, the upper alarm will turn OFF.
- ♦ Set the lower limit in the range of 10 to 295mmHg/1.5 to 39.5kPa. If a value below 10mmHg/1.5kPa is set, the lower alarm will turn OFF.

**REFERENCE**

- ♦ Set ON/OFF of NIBP alarm, upper and lower alarm limits of systolic (S), diastolic (D), mean (M) NIBP.
- ♦ When [Auto] is selected, upper alarm limit will be set to +40mmHg/+5kPa to the current value, and the lower alarm limit will be set to -20mmHg/-3kPa to the current value.
- ♦ The alarm limit should be set for each unit (mmHg/kPa).
- ♦ The upper and lower limit can be set in 5mmHg/0.5kPa increment.

## 2 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.

### NOTE

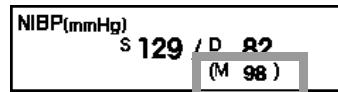
- The oscillation graph can be displayed when the NIBP numeric data box size is 2-box size or larger, and "Oscillograph" is set to ON on the "NIBP" setup screen.

## 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

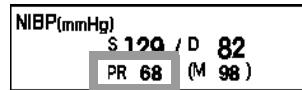
- More than one parameters can be selected.

## 6 NIBP Erase Time

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

## 7 PR

[ON]: PR will be displayed.

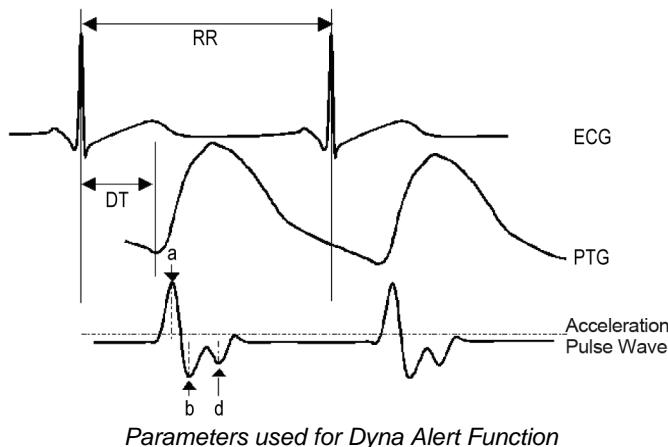


### NOTE

- PR will be only displayed. It will not generate alarm, or be displayed for the list function.

## 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 ( $\text{SpO}_2$ ) sensor is applied to the toe or forehead, the circulatory dynamics variation monitoring by the Dyna Alert may not properly function.
- The circulatory dynamics variation monitoring by the Dyna Alert is effective only on the HS-8312N with built-in Nellcor™  $\text{SpO}_2$  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: 180mmHg, Child: 140mmHg, Neonate: 110mmHg) regardless of the sight inflation setting.

## 10 Quick Measurement

[ON]: NIBP measurement will be performed in duration of about 20 to 25 seconds in case of adult patient.

### NOTE

- The quick measurement can be performed only if the patient classification is adult or child. For neonate, normal measurement will be performed regardless of this setting.

## 11 NIBP Auto Mode

NIBP measurement will be performed automatically at selected time intervals.

(☞ "NIBP Auto Mode Setup" P7-56)

## 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" P7-55)

### WARNING

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

## 13 User Interval

The interval is fixed as "Lumbar Mode".

(☞ "About the Lumbar Mode" P7-57)

## 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 when the new patient is not admitted.
- ▶ [ON]: When the power is turned ON, NIBP auto mode will resume by starting a manual measurement for the newly admitted patient. Until the NIBP auto mode is resumed or the interval is changed, "Standby" will be displayed inside the NIBP numeric data box.

### 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 interval is [15min.] and 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 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 cancelled.

**NOTE**

- ♦ Make sure that the NIBP measurement can be properly performed after solving the cause of the NIBP system error message. If the message still remains, equipment failure can be considered.

(☞ "Non-Invasive Blood Pressure" P11-33)

## 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**

- ♦ \*400 series general purpose temperature probe, manufactured by Measurement Specialities, Inc.  
700 series temperature probe cannot be used.

**2**

Connect the probe to the Super Unit or Module.

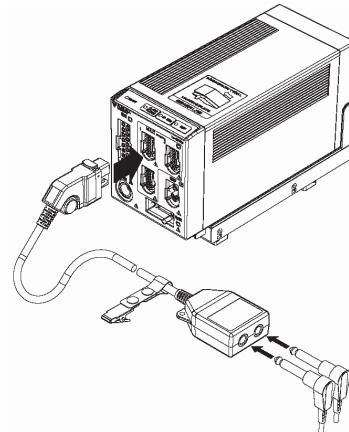
**REFERENCE**

- ♦ 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.

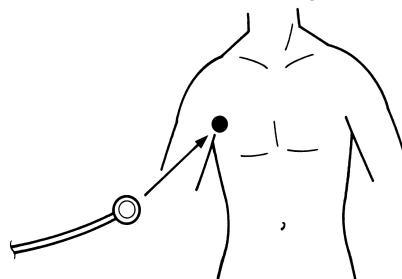
- 1 Connect the 2ch temperature relay cable (CJO-P01T-DA\*\*) to the multiconnector of the Super Unit.
- 2 Connect the temperature probe to the 2ch temperature relay cable.



- 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.

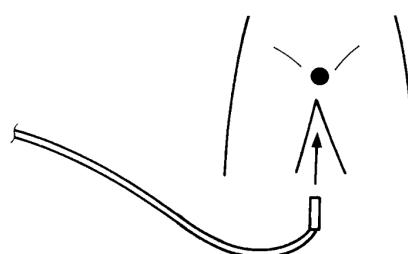


**NOTE**

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

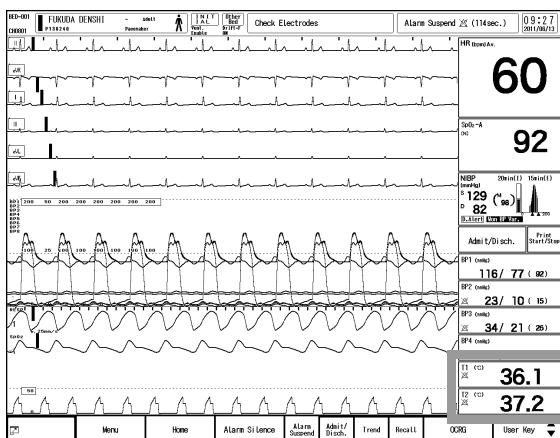
In Case of Rectal Temperature Probe 401, 402:

- 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.



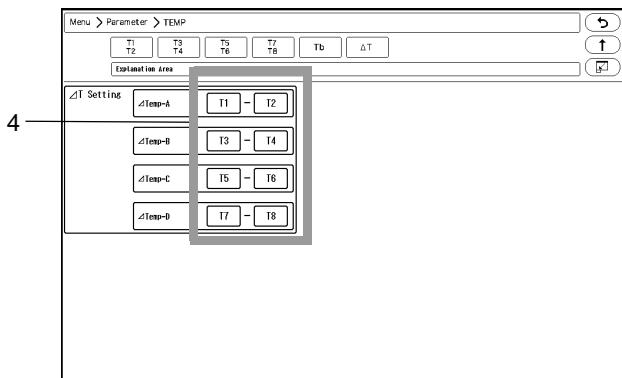
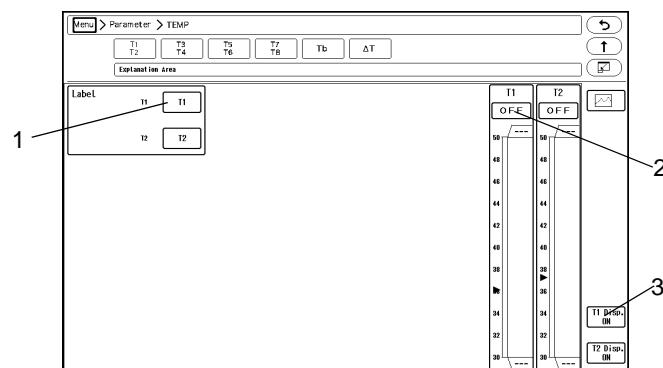
## 4 Check that the temperature is displayed.

- 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.



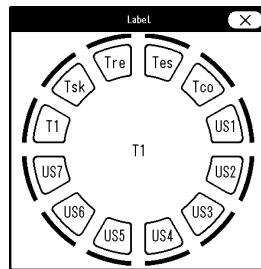
## TEMP Parameter Setup

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" P5-10)

#### NOTE

- ♦ US3 to US7 cannot be selected for the equipment connected to DS-LANII/III.

## 2 Temperature Alarm

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

#### NOTE

- ♦ Set the upper limit in the range of 31.0 to 45.0°C/88.0 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 to 44.0°C/86.0 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)

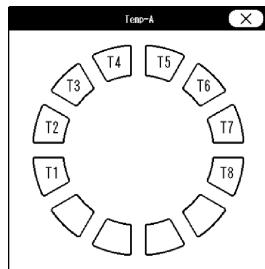
#### CAUTION

- ♦ 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  $\Delta T$ .



#### REFERENCE

- For  $\Delta T$ , the difference of temperature will be displayed.
- Maximum of 4 types of  $\Delta T$  ( $\Delta T_{\text{emp-A}}$  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  $\Delta T$ .

## Cardiac Output and Blood Temperature

When thermodilution catheter is used to measure the cardiac output, the blood temperature (T<sub>b</sub>) 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)" P8-51)

### Connecting the Super Unit

**1**

Select the catheter relay cable.

#### NOTE

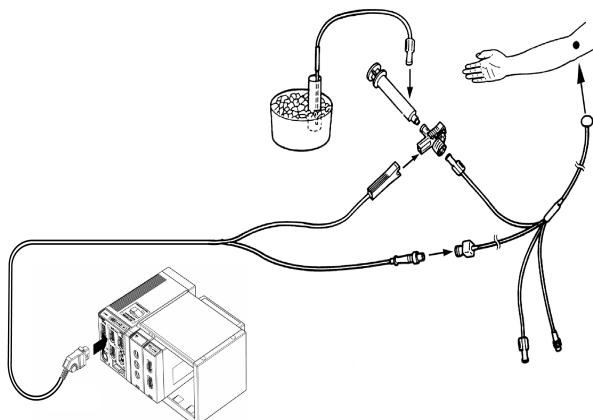
- The usable catheter relay cable depends on the injectate temperature measurement method. Select the appropriate cable according to the method.

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

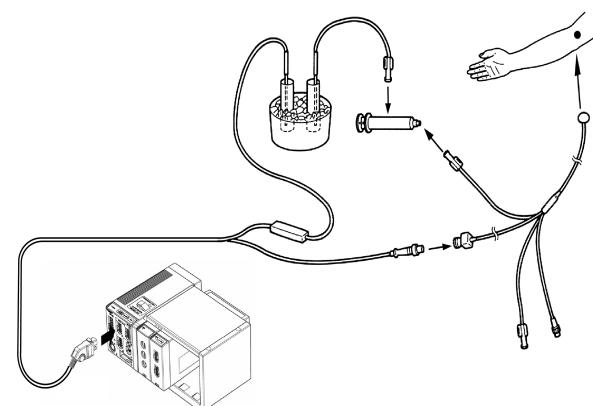
**2**

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

## Example of In-line System



## Example of Injectate Probe



## Cardiac Output Measurement Algorithm

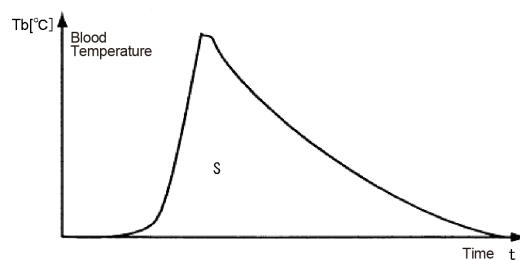
Cardiac output is measured using the thermodilution method.

**Thermodilution Method**

The thermodilution catheter is inserted from the vein through the right atrium, right ventricle, and pulmonary artery. From the side hole near the catheter tip, injectate is injected quickly to the right atrium. At this time, the heart contraction and heat diffusion mixes the injectate with blood, and causes blood temperature fall.

Variable initiated by these effects are measured as time function at the pulmonary artery, and the following thermodilution curve can be drawn.

Cardiac output is calculated by applying this to the Stewart-Hamilton formula shown below.



$$CO = 60 \cdot V_i \cdot \frac{S_i \cdot C_i}{S_b \cdot C_b} \cdot \frac{C_t(Tb-Ti)}{S} = CC \cdot \frac{Tb-Ti}{S}$$

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  $\int_0^\infty \Delta Tb(t)dt [^{\circ}\text{C sec}]$   
 $\Delta Tb(t)$  : Temperature change of Tb after "t" seconds. [°C]  
 CC : Catheter Constant (Computation Constant: CC value)  
 Si : Specific Gravity of Injectate [g/cm<sup>3</sup>]  
 Sb : Specific Gravity of Blood [g/cm<sup>3</sup>]  
 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.

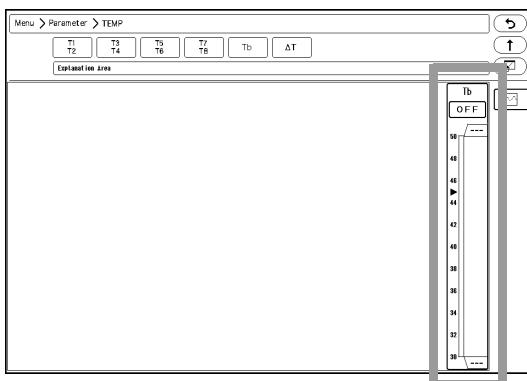
## Blood Temperature Alarm Setup

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 to 45.0°C/88.0 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 to 44.0°C/86.0 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<sub>2</sub> Concentration (Mainstream Method)

This section explains about the CO<sub>2</sub> concentration measurement procedure and measurement condition setup when using the RESPIRONICS® Capnostat 5 (Mainstream Method, Gas Unit I/F HPD-800/HPD-810).



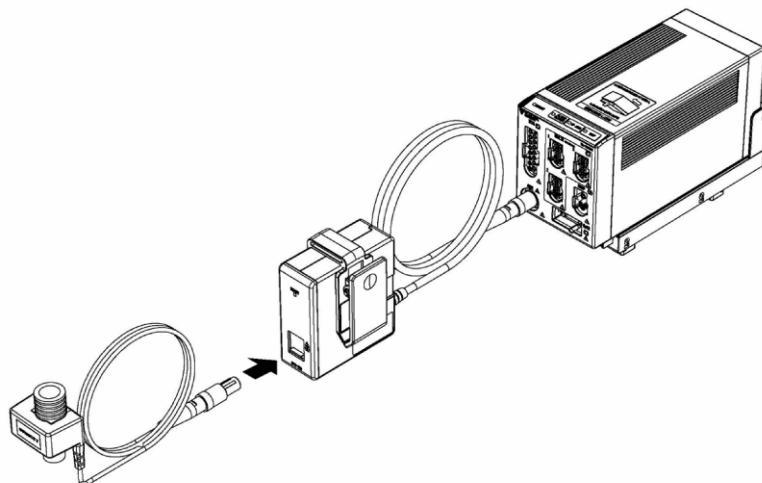
#### CAUTION

- When the multigas unit (MGU-800/MGU-810 series) and HPD-800/HPD-810 are simultaneously used, the CO<sub>2</sub> concentration measurement will be performed by the equipment selected for the "CO<sub>2</sub> Source Priority" on ([Menu]>"Parameter" [CO<sub>2</sub>]).

## Patient Application and Display

By using the HPD-800/HPD-810 Gas Unit I/F, CO<sub>2</sub> measurement by the RESPIRONICS® Capnostat 5 (Mainstream Method) can be performed.

- 1 Connect the HPD-800/HPD-810 Gas Unit I/F to the AUX connector on the HS-8000 Super Unit and the CO<sub>2</sub> sensor (Capnostat 5) to the CO<sub>2</sub> connector on the HPD-800/HPD-810.



- ▶ The CO<sub>2</sub> sensor will automatically begin warming up.
- ▶ During the warm up period, the message "CO<sub>2</sub> Warming Up" will be displayed on the monitor.
- ▶ When the warm up completes, the message will disappear.

**NOTE**

- Warm up process will require minimum of 2 minutes.

**REFERENCE**

- The CO<sub>2</sub> sensor requires a warming up process to achieve stable operating temperature.

**2**

Prepare an airway adapter suitable for the patient.

- ▶ There are 4 types of airway adapters. Select the appropriate adapter according to the used endo-tracheal tube size and operating environment.

**⚠ WARNING**

- Use only the specified airway adapter manufactured by Resironics Novametrix, LLC. Refer to the section on "Optional Accessories" for list of specified airway adapters. (☞ "CO<sub>2</sub> Concentration Measurement (Respironics)" P13-6)  
These accessories may be purchased from Fukuda Denshi or any authorized Resironics Novametrix, LLC distributor.
- Always consider the circumference of the intubation tube when using the airway adapter. If inappropriate airway adapter is used for a patient with low ventilation, CO<sub>2</sub> may mix in to the inspired air resulting in incorrect measurement, or apnea detection may become difficult.

**⚠ CAUTION**

- The disposable airway adapter should be opened just before use. Do not sterilize.
- Do not reuse the disposable airway adapter.

**3**

Verify that the warm up is complete, and attach the CO<sub>2</sub> sensor to the airway adapter until a click sound is heard.

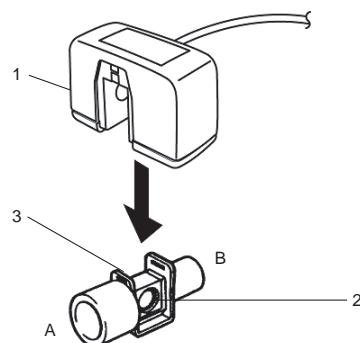
1 Capnostat 5 CO<sub>2</sub> Sensor

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<sub>2</sub> sensor or airway adapter.

- 4** Perform the setting for the O<sub>2</sub> compensation, N<sub>2</sub>O compensation, anesthetic agent compensation, atmospheric pressure  
( "CO<sub>2</sub> Parameter Setup" P7-74)

**NOTE**

- Set these items each time the condition changes.

- 5** Press the [Menu], [CO<sub>2</sub>] ("Parameter"), [Calibrate Airway Adapter] keys and perform the airway adapter calibration.

- ▶ The calibration will start.
- ▶ During Calibration: "Zeroing" message will be displayed.
- ▶ At Completion: A tone will be generated, and "Cal. complete" message will be displayed.
- ▶ When Failed: A tone will be generated, and "Cal. error" message will be displayed.

**NOTE**

- The airway adapter calibration must be performed before connecting to the respiration circuit.  
The airway adapter calibration should be also performed for the following case.
  - When the airway adapter is replaced.
  - When "Zero the CO<sub>2</sub> Adapter" or "Check airway adapter." message is displayed.
- A clean airway adapter must be used.  
If reusing an airway adapter, clean and air-dry it. Then, wipe the window with swab, and sterilize (EOG, etc.) before use.
- During the calibration, the measurement data will not be displayed but may be included in the trend data causing discontinuity.
- Calibration cannot be performed if respiration is detected within 20 seconds before calibration. In such case, wait for next 20 seconds and perform calibration again.
- When "Cal error" message is displayed, perform the airway adapter calibration again.

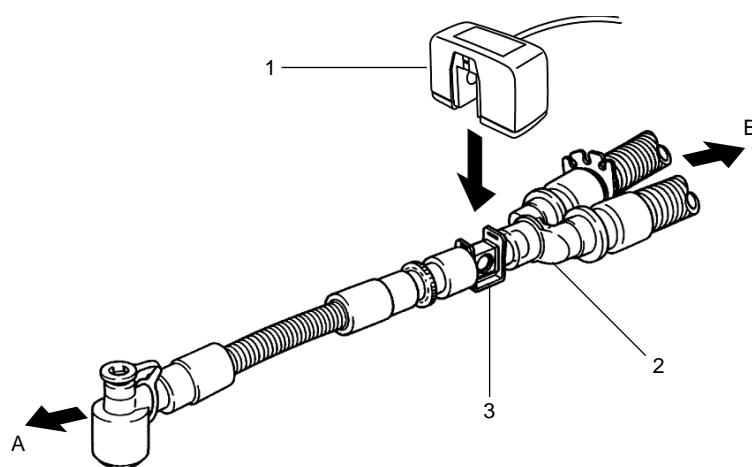
- 6** Verify that the airway adapter calibration is properly completed, disconnect the CO<sub>2</sub> sensor from the airway adapter temporarily, and attach the airway adapter to the patient's respiration circuit.

- 7** Connect the CO<sub>2</sub> sensor to the airway adapter.

- 1 Capnostat 5 CO<sub>2</sub> Sensor
- 2 Y-Piece
- 3 Airway Adapter for Adult

A: Patient Side

B: Equipment Side

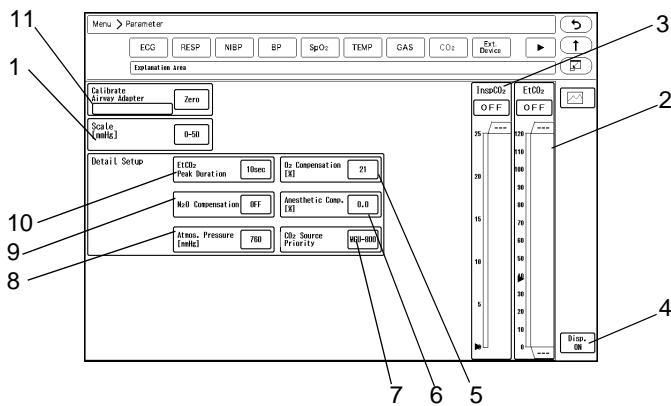


**NOTE**

- Attach the airway adapter between the patient's circuit Y-piece and intubation tube.
- The CO<sub>2</sub> sensor should be facing upward.

**8**Verify that the CO<sub>2</sub> waveform, EtCO<sub>2</sub> value, InspCO<sub>2</sub> value are displayed.**NOTE**

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

**CO<sub>2</sub> Parameter Setup**Press the [Menu], [CO<sub>2</sub>] keys to display the "CO<sub>2</sub>" setup screen.**1 Scale**

For the measurement unit in mmHg, select from [0-50]/[0-100], and for the unit in kPa or %, select from [0-4]/[0-8]/[0-10].

**2 EtCO<sub>2</sub> (End-tidal CO<sub>2</sub>)**

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

**NOTE**

- EtCO<sub>2</sub> alarm will not generate unless 2 or more respiration is detected within 30 seconds after the power is turned ON, monitoring is resumed, CO<sub>2</sub> unit is connected, or a patient is discharged.

- Set the upper limit in the range of 3 to 100mmHg/0.3 to 13.3kPa/0.3 to 13.3%. Setting a value above 100mmHg/13.3kPa/13.3% will turn OFF the alarm.
- Set the lower limit in the range of 1 to 98mmHg/0.1 to 13.1kPa/0.1 to 13.1%. Setting a value below 1mmHg/0.1kPa/0.1% will turn OFF the alarm.
- When Capnostat 5 is used, EtCO<sub>2</sub> alarm will not generate unless 2 or more respiration is detected after completion of the airway adapter calibration.

**REFERENCE**

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

**3 InspCO<sub>2</sub> (Inspired CO<sub>2</sub>)**

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

**NOTE**

- InspCO<sub>2</sub> alarm will not generate unless 2 or more respiration is detected within 30 seconds after the power is turned ON, monitoring is resumed, CO<sub>2</sub> unit is connected, or a patient is discharged.
- Set the upper limit in the range of 1 to 4mmHg/0.1 to 0.4kPa/0.1 to 0.4%. Setting a value equal to or above 4mmHg/0.4kPa/0.4% will turn the alarm OFF.
- When Capnostat 5 is used, InspCO<sub>2</sub> alarm will not generate unless 2 or more respiration is detected after completion of the airway adapter calibration.

**REFERENCE**

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

**4 Display ON/OFF**

(☞ "ECG Parameter Setup" P7-6)

**⚠ CAUTION**

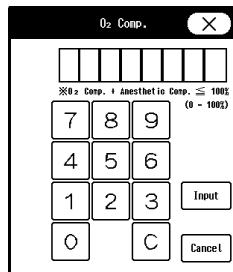
- When the waveform and numeric data display is set to OFF, the alarm generation and tabular trend input will also cease.
- When the waveform and numeric data display is set to OFF, the respiration rate measured by CO<sub>2</sub> will not be displayed either.

**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<sub>2</sub> Compensation**By entering the used O<sub>2</sub> concentration value, compensation can be made to display more accurate value.

Enter the O<sub>2</sub> compensation value on the "O<sub>2</sub>" screen, and press the [Input] key.



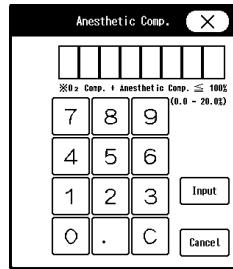
#### NOTE

- The value cannot be changed if the total value of O<sub>2</sub> compensation and anesthetic agent compensation exceeds 100%. In such case, change the O<sub>2</sub> 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 [Input] key.



#### NOTE

- The value cannot be changed if the total value of O<sub>2</sub> compensation and anesthetic agent compensation exceeds 100%. In such case, change the anesthetic agent compensation value after changing the O<sub>2</sub> compensation value.

## 7 CO<sub>2</sub> Source Priority

#### REFERENCE

- When MGU-800/ 810 and HS-8000 are simultaneously used, the CO<sub>2</sub> source to prioritize the measurement can be set.

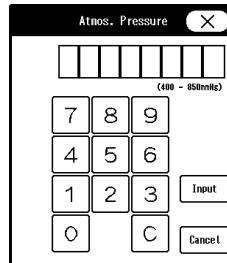
▶ [MGU-800]: CO<sub>2</sub> measurement obtained by the MGU-800/810 Multigas Unit will be prioritized.

▶ [HS-8000]: CO<sub>2</sub> measurement obtained 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 [Input] key.



#### 9 N<sub>2</sub>O Comp.

##### NOTE

- If N<sub>2</sub>O is present in the respiration circuit, the CO<sub>2</sub> value tends to be displayed higher than the actual value. By setting the N<sub>2</sub>O compensation ON, this can be adjusted.

#### 10 EtCO<sub>2</sub> Peak Duration

[10sec]/[20sec]: Maximum EtCO<sub>2</sub> value for the selected duration will be displayed.

[OFF]: EtCO<sub>2</sub> value for each respiration will be displayed.

##### NOTE

- As the EtCO<sub>2</sub> value display is updated each second, EtCO<sub>2</sub> value for each respiration cannot be displayed if respiration rate is above 60Bpm.

#### 11 Calibrate Airway Adapter

The airway adapter will be calibrated.

(☞ "Patient Application and Display" P7-71)

## CO<sub>2</sub> Concentration (Sidestream Method)

The HCP-800/HCP-810 is a CO<sub>2</sub> Gas Unit which measures CO<sub>2</sub> concentration by connecting to the AUX connector on the HS-8000. The HCP-800/HCP-810 CO<sub>2</sub> Gas Unit incorporates Covidien's Microstream® technology for EtCO<sub>2</sub> (End-tidal CO<sub>2</sub> concentration) and InspCO<sub>2</sub> (Inspiratory CO<sub>2</sub> concentration) measurement. This section explains about the CO<sub>2</sub> concentration measurement procedure and measurement condition setup for 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. Cutting the sampling line could lead to erroneous readings.
- If too much moisture enters the sampling line (i.e., from ambient humidity or breathing of unusually humid air), the message "Check Sample Line" will appear in the message area. Replace the sampling line once the "Check Sample Line" message appears.
- Carefully route the sampling line to reduce the possibility of patient entanglement or strangulation.

- Do not lift the HCP-800/HCP-810 by the sampling line, as the sampling line could disconnect from the equipment, causing the equipment to fall on the patient.
- CO<sub>2</sub> readings and respiratory rate can be affected by sensor application errors, certain ambient environmental conditions, and certain patient conditions.

**⚠ CAUTION**

- When multigas unit (MGU-800/MGU-810 series) and HCP-800/HCP-810 are simultaneously used, the CO<sub>2</sub> concentration measurement will be performed by the equipment selected for the "CO<sub>2</sub> Source Priority" on CO<sub>2</sub> menu.
- Microstream® EtCO<sub>2</sub> sampling lines are designed for single patient use, and are not to be reprocessed. 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 Microstream® EtCO<sub>2</sub> sampling lines Directions for Use.
- Only use Microstream® EtCO<sub>2</sub> sampling lines to ensure the monitor functions properly.

**NOTE**

- During nebulization or suction for intubated patient, in order to avoid moisture buildup and sampling line occlusion, remove the sampling line from the HCP-800/HCP-810.
- Replace the sampling line according to hospital protocol or when a blockage is indicated by the device. Excessive patient secretions or a build-up of liquids in the airway tubing may occlude the sampling line, requiring more frequent replacement.
- When connecting a sampling line to the HCP-800/HCP-810, screw the sampling line connector clockwise into the CO<sub>2</sub> port of the HCP-800/HCP-810 until it can no longer be turned, to ensure that it is connected securely. This will assure that there is no leak of gases during measurement at the connection point and that measurement accuracy is not compromised.
- When the caution message "Check Sample Line" appears on the screen, indicating that the FilterLine which is attached to the HCP-800/HCP-810 is blocked, the monitor's CO<sub>2</sub> pump will stop pumping the patient's breath into the monitor for testing. Follow the instructions that appear in the Troubleshooting section of this manual: First disconnect and reconnect the FilterLine. If the message still appears, disconnect and replace the FilterLine. Once a working FilterLine is attached, the pump will automatically resume operation.
- Following connection of the CO<sub>2</sub> sampling line to the HCP-800/HCP-810 and patient, check that CO<sub>2</sub> values appear on the monitor display.

## Patient Application and Display

CO<sub>2</sub> concentration measurement can be performed by connecting the HCP-800/HCP-810 CO<sub>2</sub> Gas Unit to the AUX connector on the HS-8000.

**NOTE**

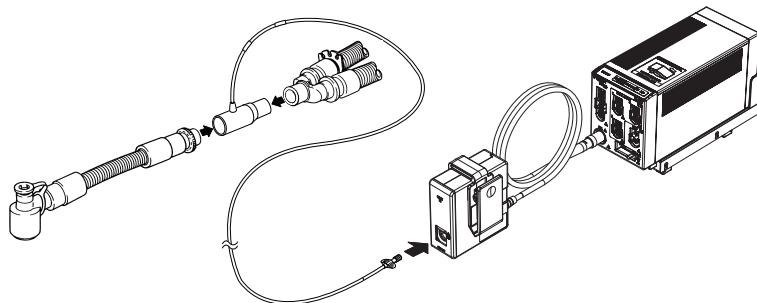
- Accurate CO<sub>2</sub> concentration measurement can be acquired after 40 seconds from turning the power ON.

**1**

Connect the HCP-800/HCP-810 CO<sub>2</sub> Gas Unit to the AUX connector on the HS-8000.

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

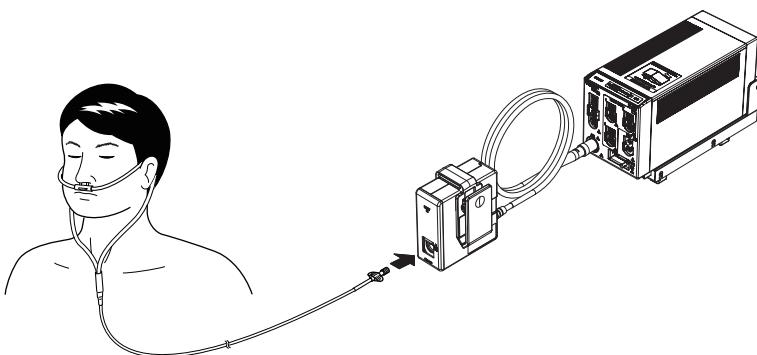
For intubated patient



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.

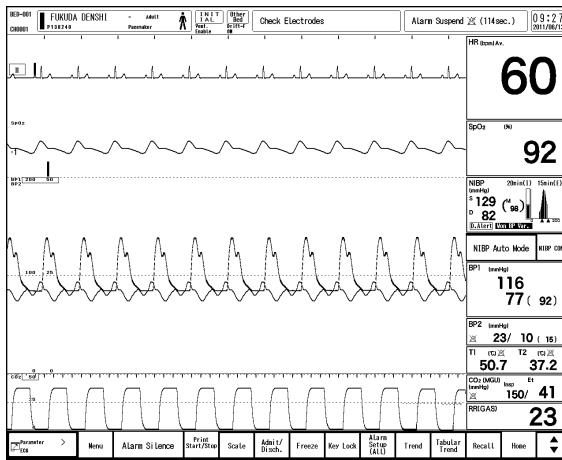
For patient using the nasal prong



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<sub>2</sub> concentration measurement.



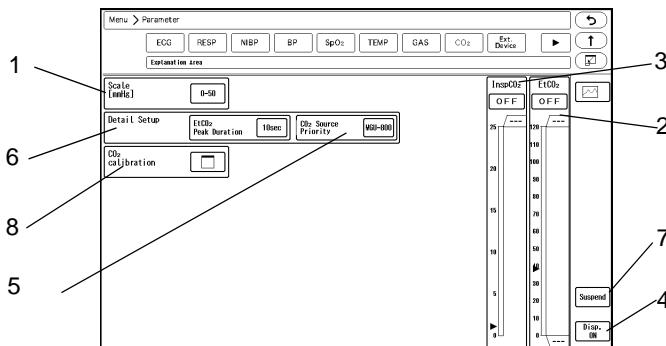
► Verify that the CO<sub>2</sub> waveform, EtCO<sub>2</sub> value, InspCO<sub>2</sub> value are displayed.

### CAUTION

- If the power supply is interrupted due to reason such as power failure, the HCP-800/HCP-810 will be initialized even if the power failure is 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<sub>2</sub> 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<sub>2</sub> numeric data box and CO<sub>2</sub> measurement cannot be performed.

**CO<sub>2</sub> Parameter Setup****1 Scale**

For the measurement unit in mmHg, press [0-50]/[0-100], and for the unit in kPa or %, press [0-4]/[0-8]/[0-10].

**2 EtCO<sub>2</sub> (End-tidal Carbon Dioxide)**

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

**NOTE**

- EtCO<sub>2</sub> alarm will not generate unless 2 or more respiration is detected within 30 seconds after the power is turned ON, monitoring is resumed, CO<sub>2</sub> unit is connected, or a patient is discharged.
- Set the upper limit in between 3 to 100mmHg/0.3 to 13.3kPa/0.3 to 13.3%. Setting the value above 100mmHg/13.3kPa/13.3% will turn OFF the alarm.
- Set the lower limit in between 1 to 98mmHg/0.1 to 13.1kPa/0.1 to 13.1%. Setting a value equal to or below 1mmHg/0.1kPa/0.1% will turn OFF the alarm.

**REFERENCE**

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

**3 InspCO<sub>2</sub> (Inspired Carbon Dioxide)**

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

**NOTE**

- InspCO<sub>2</sub> alarm will not generate unless 2 or more respiration is detected within 30

seconds after the power is turned ON, monitoring is resumed, CO<sub>2</sub> unit is connected or a patient is discharged.

- Set the upper limit in between 1 to 4mmHg/0.1 to 0.4kPa/0.1 to 0.4%. Setting a value equal to or above 4mmHg, 0.4kPa, 0.4% will turn the alarm OFF.

#### REFERENCE

- Set the alarm condition for each measurement unit (mmHg/kPa/%).
- The upper limit can be set in 1mmHg / 0.1kPa / 0.1% increments. Lower alarm limit cannot be set.
- When [Auto] is selected, upper alarm limit will be set to 3mmHg, 0.4kPa, 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 trend input will be also suspended.
- When the waveform and numeric data display is set to OFF, the respiration rate measured by CO<sub>2</sub> 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<sub>2</sub> Source Priority

#### REFERENCE

- When MGU-800/ 810 and HS-8000 are connected simultaneously, the source of the CO<sub>2</sub> source priority can be selected.

▶ [MGU-800]: CO<sub>2</sub> measurement obtained by the MGU-800/810 Multigas Unit will be prioritized.

▶ [HS-8000]: CO<sub>2</sub> measurement obtained by the HS-8000 Super Unit will be prioritized.

#### 6 EtCO<sub>2</sub> Peak Picking Duration

[10sec]/[20sec]: Maximum EtCO<sub>2</sub> value for the selected duration will be displayed.

[OFF]: EtCO<sub>2</sub> value for each respiration will be displayed.

#### NOTE

- As the EtCO<sub>2</sub> value display is updated each second, EtCO<sub>2</sub> value for each respiration cannot be displayed if respiration rate is above 60Bpm.

#### 7 Suspend CO<sub>2</sub>

[Suspend]: The pump operation will stop, CO<sub>2</sub> waveform and numeric data display will disappear, and "Suspended" will be displayed inside the CO<sub>2</sub> numeric data box.

[Resume]: Resumes CO<sub>2</sub> 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<sub>2</sub> Calibration

CO<sub>2</sub> calibration can be performed.

(☞ Maintenance Manual "CO<sub>2</sub> Calibration (HCP-800/HCP-810)" P9-4)

### CAUTION

- If the CO<sub>2</sub> gas calibration is not performed at a specified interval, CO<sub>2</sub> measurement accuracy may be affected and also subsequent gas calibration may not be possible.

## 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" P1-10)

The MGU-800/810 series complies with standard for cyclical pressure up to 10kPa.

When the multigas unit is connected, monitoring conditions for CO<sub>2</sub> concentration, anesthetic gas concentration, O<sub>2</sub> concentration, and N<sub>2</sub>O 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 (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 tube, 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.
- Be careful not to occlude the sampling line 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<sub>2</sub> concentration measurement will be performed by the equipment selected for the "CO<sub>2</sub> Source Priority" on ([Menu] > "Parameter" [CO<sub>2</sub>] ).
- 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<sub>2</sub>, N<sub>2</sub>O 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 (22°C@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<sub>2</sub>O partial pressure to 30 hPa (28°C@80% RH or 33°C@60% RH) will cause a general error for all gases of only -2% REL.

## Connecting to the Respiration Circuit

### Multigas Concentration Measurement (MGU-800 Series)

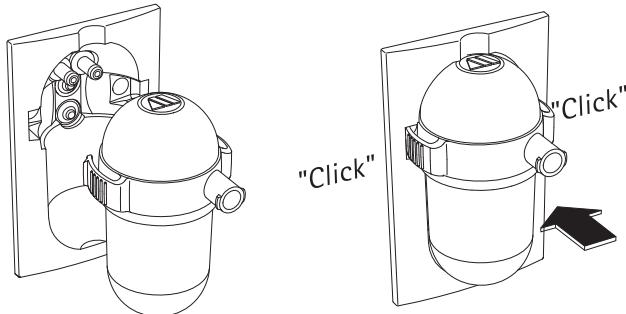
**⚠ WARNING**

- Do not use Adult 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 Water Trap (60-13100-00).  
If [Neonate] is selected as patient classification on the "Admit/Discharge" screen, install the DRYLINE™ Neonatal Water Trap (60-13200-00)  
If the used water trap and the set patient classification does not match, the message "GAS Check Water Trap Class" will be displayed.

- 1** Install the DRYLINE™ Water Trap (for adult: 60-13100-00, for 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 then connect it to the DRYLINE™ sampling line (for adult: 60-15200-00, for neonate: 60-15300-00).
- 4** Connect the other end of 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 Measurement/SPIRO (MGU-810 Series)

#### **⚠ WARNING**

- Only combine 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 Trap
Adult	Adult	Adult (60-16100-00)	Adult (60-13100-00)
Pediatric	Child	Pediatric (60-16200-00)	Neonate (60-13200-00)
Neonate	Neonate	Pediatric (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.  
(☞ "Multigas Concentration Measurement (MGU-800 Series)" P7-83, see procedure 1.)
- 2** Connect the end (for adult: 22/15 mm, for pediatric: 15 mm) of the flow sensor, marked  to the patient tracheal tube or similar.
- 3** Connect the end (for adult/ pediatric: 15 mm) 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<sub>2</sub>O at 60 L/min. Adjust ventilation accordingly.
- The pediatric flow sensor dead space is 0.75 mL and the flow resistance is 0.9 cmH<sub>2</sub>O 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<sub>2</sub> Measurement Unit Setup

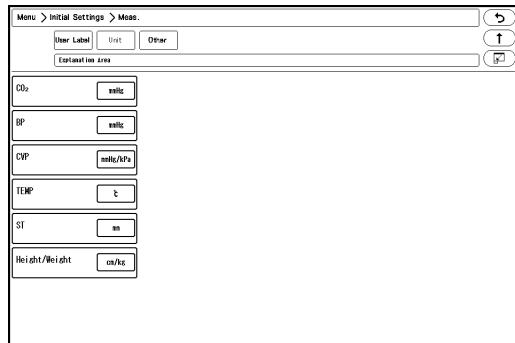
**NOTE**

- Even though the CO<sub>2</sub> 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**

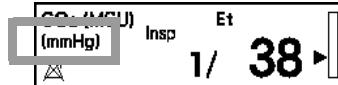
Press the [Menu], [Initial Settings], [Meas.], [Unit] key.

► 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.



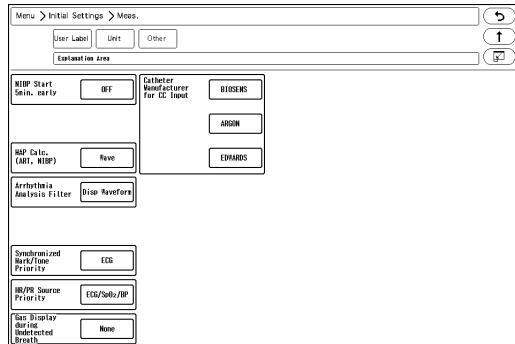
## GAS Display during Undetected Breath

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.

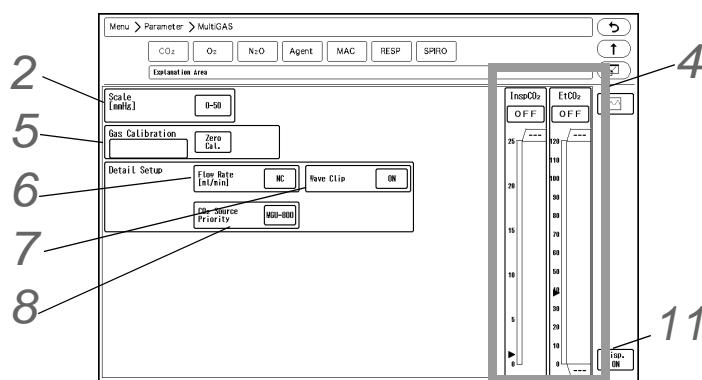
### NOTE

- 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.

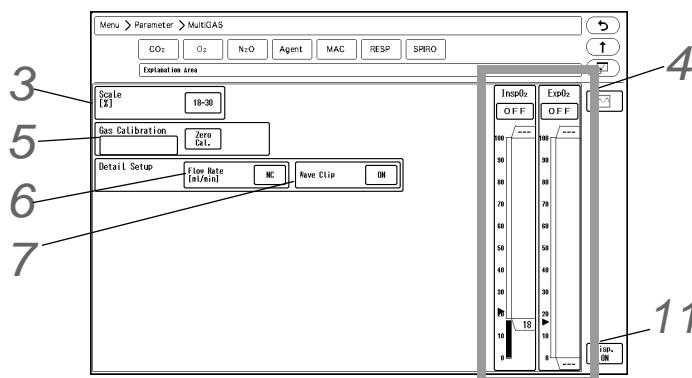
## Multigas Unit Data Setup (Multigas Concentration/Spirometry)

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

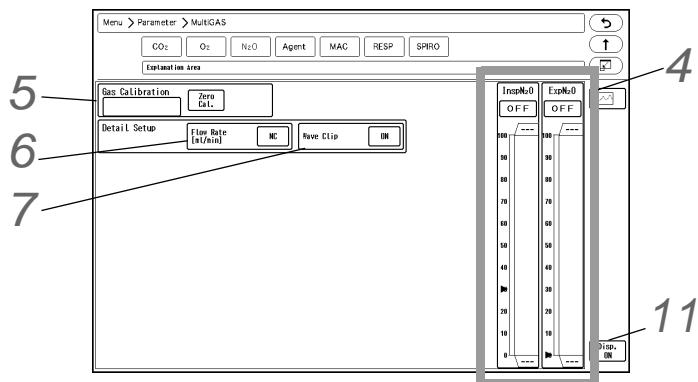
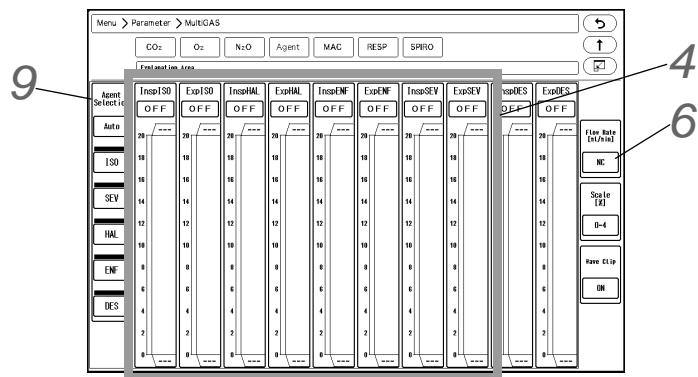
► The Multigas setup screen will be displayed.



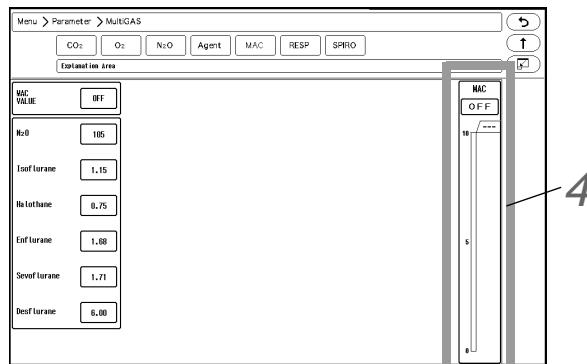
GAS\_CO<sub>2</sub> Screen (MGU-800 series)



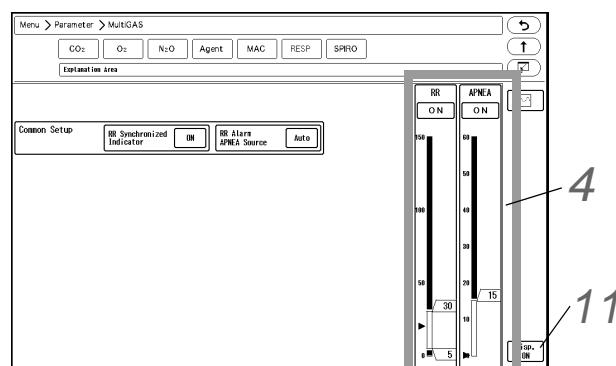
GAS\_O<sub>2</sub> Screen (MGU-800 series)

GAS\_N<sub>2</sub>O Screen (MGU-800 series)

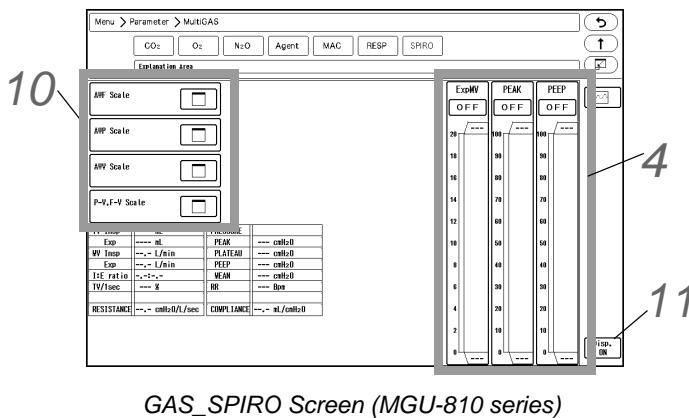
GAS\_AGT Screen (MGU-800 series)



GAS\_MAC Screen (MGU-800 series)



GAS\_RESP Screen (MGU-800 series)



GAS\_SPIRO Screen (MGU-810 series)

## 2 Set the CO<sub>2</sub> waveform scale.

1 Press the key for "Scale".

► The dropdown list will be displayed.

2 For the measurement unit in mmHg, select from [0-50]/[0-100], and for the unit in kPa or %, select from [0-4]/[0-8]/[0-10].

## 3 Set the O<sub>2</sub> 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<sub>2</sub> Alarm

### NOTE

- Set the upper limit in the range of 3 to 100mmHg/0.3 to 13.3kPa/0.3 to 13.3%. If a value above 100mmHg/13.3kPa/13.3% is set, the upper alarm will turn OFF.
- Set the lower limit in the range of 1 to 98mmHg/0.1 to 13.1kPa/0.1 to 13.1%. If a value below 1mmHg/0.1kPa/0.1% is set, the lower alarm will turn OFF.

### REFERENCE

- Set the alarm condition for each measurement unit (mmHg/kPa/%).
- The upper/lower limit can be set in 1mmHg/0.1kPa/0.1% increments.

### InspCO<sub>2</sub> Alarm

### NOTE

- Set the upper limit in the range of 1 to 4mmHg/0.1 to 0.4kPa/0.1 to 0.4%. If a value above

4mmHg/0.4kPa/0.4% is set, the upper alarm will turn OFF.

**REFERENCE**

- ♦ Set the alarm condition for each measurement unit (mmHg/kPa/%).
- ♦ The upper/lower limit can be set in 1mmHg/0.1kPa/0.1% increments.

**ExpO<sub>2</sub> Alarm****NOTE**

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

**REFERENCE**

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

**InspO<sub>2</sub> Alarm****NOTE**

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

**REFERENCE**

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

**ExpN<sub>2</sub>O/ InspN<sub>2</sub>O Alarm****NOTE**

- ♦ Set the upper and lower limit in between 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****NOTE**

- ♦ The adjustable range of the upper limit differs depending on the anesthetic agent 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 agent 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 between 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 in the range of 10 to 150Bpm. If a value above 150Bpm is set, the upper alarm will turn OFF.  
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.
- Set the lower limit in the range of 5 to 145Bpm. If a value below 5Bpm 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).

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

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

#### ExpMV/PEAK/PEEP Alarm (MGU-810 series only)

#### NOTE

- Set the upper/lower ExpMV limit in between 2.0 to 20L/minute for Adult, 0.5 to 5.0L/minute for Child/Neonate.
- Set the upper/lower PEAK limit in between 8 to 100cmH<sub>2</sub>O.

- ♦ Set the upper/lower PEEP limit in between 2 to 50cmH<sub>2</sub>O.

**REFERENCE**

- ♦ The upper/lower limit can be set as follows.  
ExpMV alarm can be set in 0.5L/minute increment.  
PEAK/PEEP alarm can be set in 1cmH<sub>2</sub>O increment.

**5** Perform the zero calibration.**NOTE**

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

**REFERENCE**

- ♦ The zeroing will be periodically performed, but perform manual zero calibration as 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 tube.

**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 or for neonate).

- ▶ When using a water trap for adult, 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, the message "GAS Check Water Trap Class" will be displayed.
  - ♦ If the "GAS Pump Regulating" message 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.
  - ♦ Use water trap and sampling line for MGU-800, water trap and flow sensor for MGU-810.
  - ♦ For the available water trap, sampling line, and flow sensor, refer to "Chapter 13 Accessories".
- (☞ "Anesthetic Gas Concentration Measurement (Mindray Medical Sweden AB)" P13-7)

**7** Set the "Wave Clip".**REFERENCE**

- ♦ If the gas waveform amplitude exceeds the scale, 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 be displayed in straight line at the upper or lower scale limit depending on the sweep speed of the waveform displayed above or below the gas waveform.

## 8 Set the "CO<sub>2</sub> Source Priority".

### REFERENCE

- When MGU-800/ 810 and HS-8000 are simultaneously used, the CO<sub>2</sub> source to prioritize the measurement can be set.

- ▶ [MGU-800]: CO<sub>2</sub> measurement obtained by the MGU-800/810 Multigas Unit will be prioritized.
- ▶ [HS-8000]: CO<sub>2</sub> measurement obtained 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 agent.

## 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

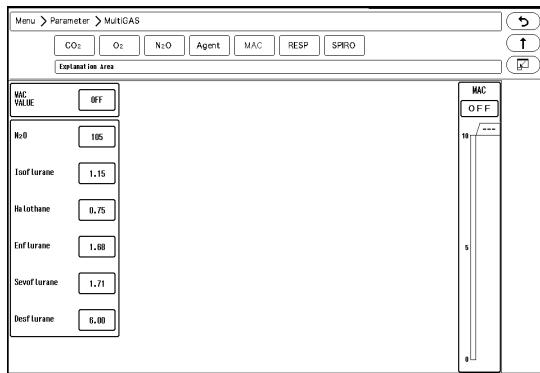
The MAC value can be displayed inside the numeric data display area.

### 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.

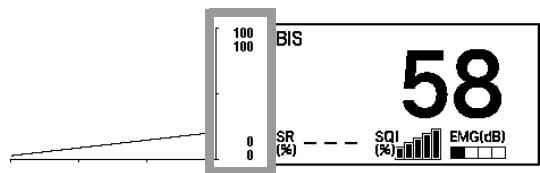
$$\text{MAC} = \frac{\text{ExN}_2\text{O}}{\text{x(N}_2\text{O)}} + \frac{\text{ExPAGT}}{\text{x(PAGT)}} + \frac{\text{ExSAGT}}{\text{x(SAGT)}}$$

- ♦ Ex N<sub>2</sub>O: Exp N<sub>2</sub>O (%)
- ♦ Ex PAGT: Exp Primary Agent (%)
- ♦ Ex SAGT: Exp Secondary Agent (%)
- ♦ X(N<sub>2</sub>O): N<sub>2</sub>O Constant
- ♦ X(PAGT): Primary Agent Constant
- ♦ X(SAGT): Secondary Agent Constant

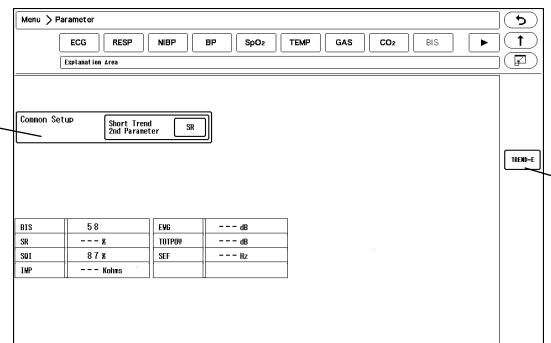
## BIS Data (A-2000/A-3000)

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**

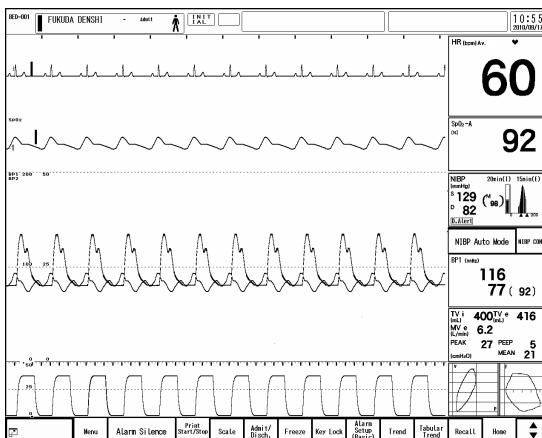
- ▶ TREND-E screen will be displayed.

## 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)

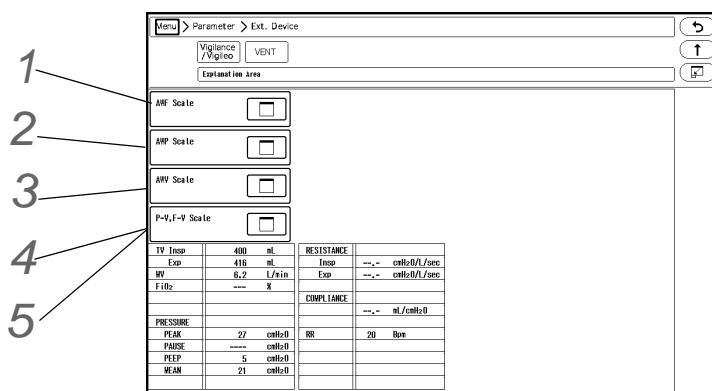
By assigning [P-V/F-V] to numeric data box, P-V (pressure-volume) loop/F-V (flow-volume) loop can be also displayed.



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.



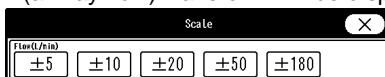
#### REFERENCE

- 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.

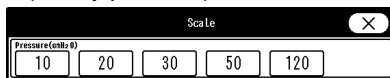


**2** Select from [ $\pm 5$ ]/[ $\pm 10$ ]/[ $\pm 20$ ]/[ $\pm 50$ ]/[ $\pm 180$ ](L/min).

**2** Set the AWP scale.

**1** Press the key for [AWP Scale].

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

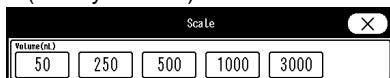


**2** Select from [10]/[20]/[30]/[50]/[120](cmH<sub>2</sub>O).

**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).

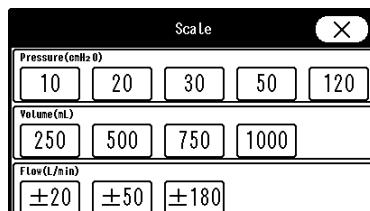
**4** Set the P-V Scale.

**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<sub>2</sub>O).

**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 [ $\pm 20$ ]/[ $\pm 50$ ]/[ $\pm 180$ ](L/min).

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

## P-V/F-V Loop Display

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

### CAUTION

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

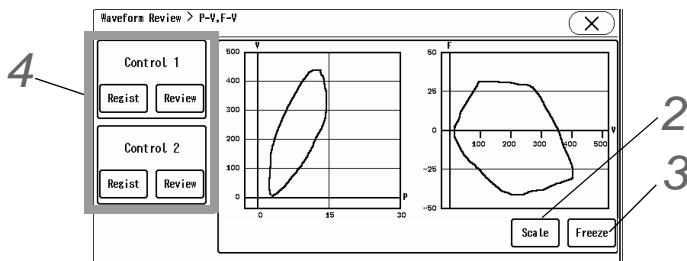
**CAUTION**

- For PURITAN-BENNETT ventilator, P-V loop and F-V loop cannot be displayed or printed.

**1**

Press the P-V/F-V numeric data box.

- The P-V/F-V review screen will be displayed.



- P-V (pressure-volume) loop/F-V (flow-volume) loop is sampled each 60ms and displayed for each respiration. The beginning of the loop is displayed in cyan, and the rest of the loop is displayed in white.
- For the P-V loop, the horizontal axis shows AWP (unit: cmH<sub>2</sub>O), 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" P4-15)

When the FLOW-i is connected, monitoring conditions for CO<sub>2</sub> concentration, anesthetic gas concentration, O<sub>2</sub> concentration, N<sub>2</sub>O 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<sub>2</sub>/EtCO<sub>2</sub>, InspO<sub>2</sub>/ExpO<sub>2</sub>, InspN<sub>2</sub>O/ExpN<sub>2</sub>O, 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.

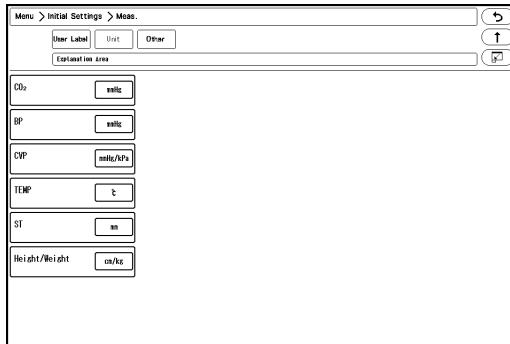
## CO<sub>2</sub> Measurement Unit Setup

**NOTE**

- The CO<sub>2</sub> measurement unit is not linked between the FLOW-i and this equipment.
- When the FLOW-i is connected, CO<sub>2</sub> alarm cannot be set. Also, the alarm will not generate.

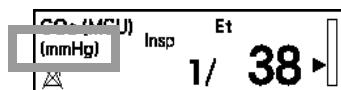
**1** Press the [Menu], [Initial Settings], [Meas.], [Unit] keys.

► The "Unit" setup screen will be displayed.



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

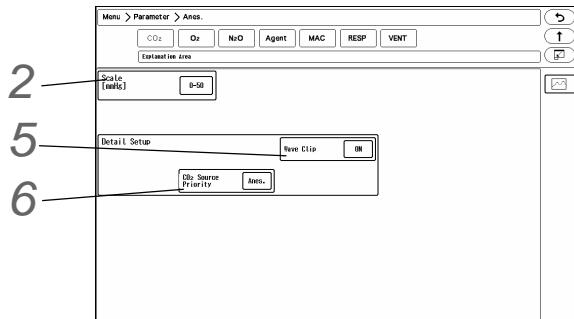
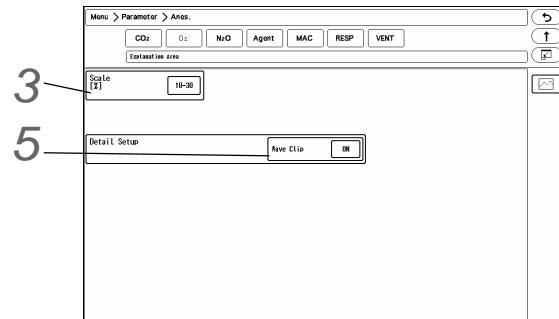
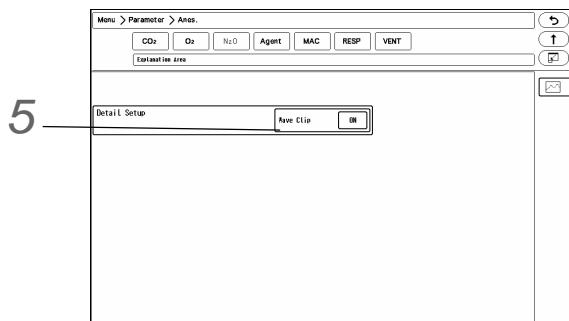
► The data of currently set measurement unit will be displayed on the graphic/ tabular trend.



## FLOW-i Setup

**1** Press the [Menu], [Anes.] "Parameter" keys.

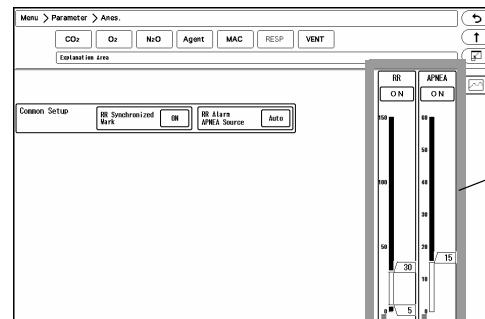
- The anesthesia setup menu will be displayed.

FLOW-i\_CO<sub>2</sub> SetupFLOW-i\_O<sub>2</sub> SetupFLOW-i\_N<sub>2</sub>O Setup

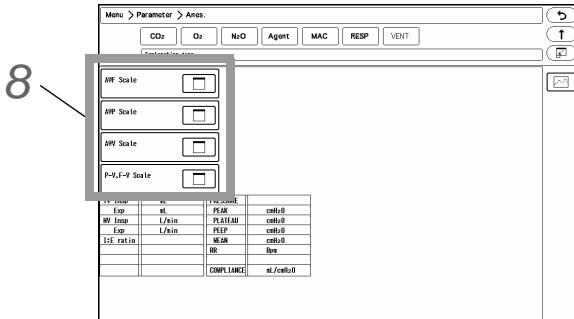
FLOW-i\_AGT Setup



FLOW-i\_MAC Setup



FLOW-i\_RESP Setup



FLOW-i\_VENT Setup

**2** Set the CO<sub>2</sub> 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<sub>2</sub> 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 be displayed in straight line at the upper or lower scale limit depending on the sweep speed of the waveform displayed above or below the gas waveform.

**6** Set the "CO<sub>2</sub> Source Priority".

**REFERENCE**

- When the FLOW-i and HS-8000 are simultaneously used, the CO<sub>2</sub> source to prioritize the measurement can be set.

► [Anesthesia]: CO<sub>2</sub> value measured by the FLOW-i will be prioritized.

► [HS-8000]: CO<sub>2</sub> 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<sub>2</sub>/EtCO<sub>2</sub>, InspO<sub>2</sub>/ExpO<sub>2</sub>, InspN<sub>2</sub>O/ExpN<sub>2</sub>O, InspAgent/ExpAgent, MAC, ExpMV, PEAK, PEEP

**NOTE**

- Set the upper limit in the range of 10 to 150Bpm. If a value above 150Bpm is set, the upper alarm will turn OFF.  
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.

- Set the lower limit in the range of 5 to 145Bpm. If a value below 5Bpm 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	5Bpm increment	1Bpm increment
Child/Neonate	2Bpm increment	1Bpm increment

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

## 8 Set the respiration waveform scale.

- Press the "Scale" key of each waveform.  
▶ The scale selection window will be displayed.
- 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.

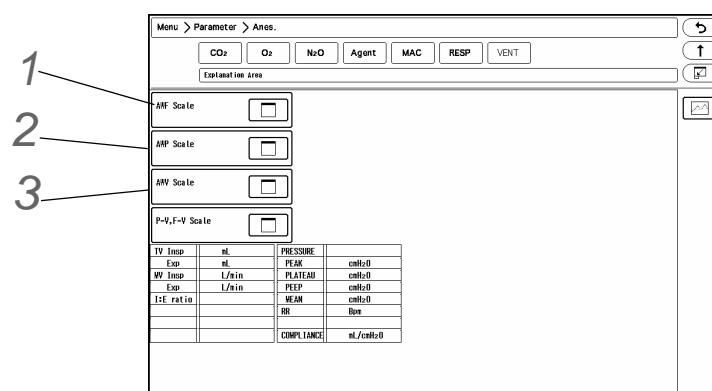
## □ Ventilator Data Display and Setup

By connecting the FLOW-i, the numeric data and waveform measured by the ventilator can be displayed.

This section explains about the AWP/AWF/AVV scale setup procedure.



Press the [Menu], [Anes.] ("Parameter"), [VENT] key to display the ventilator screen.  
The ventilator measurement will be displayed, and AWF / AWP / AVV scale can be set.



### CAUTION

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

### REFERENCE

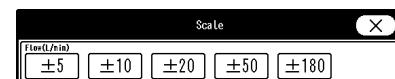
- The scale setup window can be also displayed by pressing the scale on the waveform display area or [Scale] on the user key.

**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 [ $\pm 5$ ]/ [ $\pm 10$ ]/ [ $\pm 20$ ]/ [ $\pm 50$ ]/ [ $\pm 180$ ] (L/min).



**2** AWP Scale

1 Press the key for "AWP Scale".

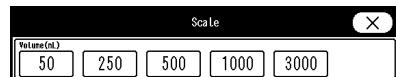
- The scale selection for AWP (airway pressure) waveform will be displayed.

2 Select from [10]/ [20]/ [30]/ [50]/ [120] (cmH<sub>2</sub>O).



### 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).

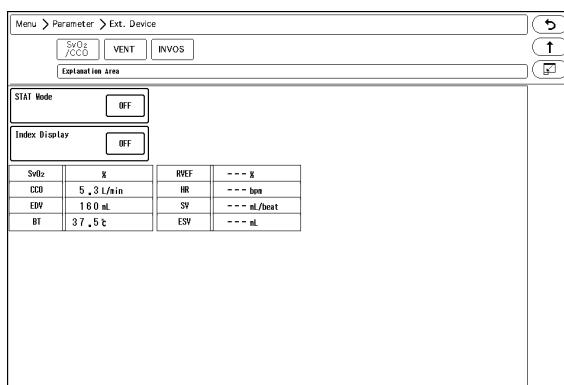


## SvO<sub>2</sub>/CCO Data

The DS-8500 system can display the monitoring data of oximeter /CCO measurement device, Vigilance, Vigilance CEDV, Vigilance II, Vigileo (Edwards Lifescience) or the hemodynamic monitoring device, PiCCO2 (PULSION Medical Systems).

( Maintenance Manual "SvO2/CCO Monitor Connection" P4-7)

On the SvO<sub>2</sub>/CCO data screen, the numeric data display can be changed.



*Display Example for ICO Mode*

**STAT Mode:** When the Vigilance is in CCO mode, STAT mode display can be set ON or OFF.

**Index Display:** When the Vigilance is in CCO mode, Index Display can be set ON or OFF.

When the Vigilance is in ICO mode, the 6 latest data of ICO (Intermittent Cardiac Output) and ICI (Intermittent Cardiac Index) will be displayed.

## STAT Mode / Index Display

- 1 Press the [Menu], [Ext. Device] ("Parameter") keys.

► The Vigilance screen will be displayed.

### NOTE

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

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

► STAT Mode [OFF], Index Display [OFF]: SvO<sub>2</sub>(or ScvO<sub>2</sub>), CCO, EDV, BT will be displayed inside the

SvO<sub>2</sub>+CO numeric data box.

SvO <sub>2</sub> (%)	EDV (mL)
83	160
CCO (L/min)	BT (°C)
5.3	37.5

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

SvO <sub>2</sub> (%)	EDVI (mL/m <sup>2</sup> )
83	80
CCI (L/min/m <sup>2</sup> )	BT (°C)
2.8	37.5

- STAT Mode [ON], Index Display [OFF]: CCO\_STAT and EDV\_STAT will be displayed instead of CCO and EDV.

SvO <sub>2</sub> (%)	EDV_STAT (mL)
83	160
CCO_STAT (L/min)	BT (°C)
5.0	37.5

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

SvO <sub>2</sub> (%)	EDVI_STAT (mL/m <sup>2</sup> )
83	80
CCI_STAT (L/min/m <sup>2</sup> )	BT (°C)
2.5	37.5

#### NOTE

- STAT mode can be changed only when Vigilance is connected.

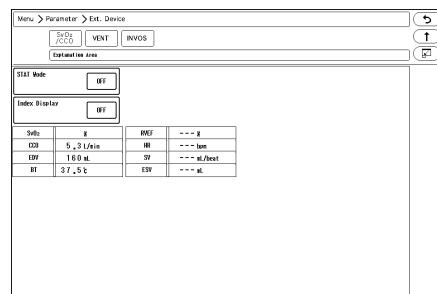
## INVOS Data

By connecting the INVOS 5100C Cerebral Oximeter (Covidien), regional cerebral oxygen saturation (rSO<sub>2</sub>) can be monitored non-invasively on the DS-8500 System.

(☞ Maintenance Manual "Connecting to the INVOS" P4-14)

On the INVOS screen, the channel can be changed for each INVOS data.

Lt-rSO<sub>2</sub>/Rt-rSO<sub>2</sub> 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<sub>2</sub>/Rt-rSO<sub>2</sub> will be displayed.  
On the INVOS screen, the channel for Lt-rSO<sub>2</sub>/Rt-rSO<sub>2</sub> 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<sub>2</sub>" / "Rt-rSO<sub>2</sub>" / "S1-rSO<sub>2</sub>" / "S2-rSO<sub>2</sub>") to set the channel.

► The dropdown list will be displayed.

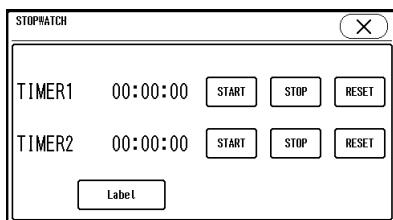
**3** Select the channel from [ch1]/[ch2]/[ch3]/[ch4].

## 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.

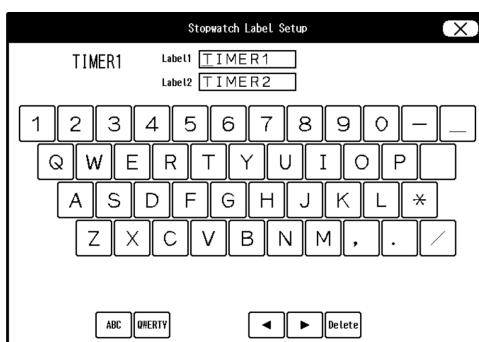
► The "Stopwatch" window will be displayed.



## 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 and Multi Module, a multiparameter connector is provided. The quantity of multiparameter connectors are as follows.

Multiparameter Connectors	Super Unit
<u>3 ports</u> Temperature x6 (maximum) BP x6 (maximum) CO x1 (maximum)	HS-8312N, HS-8312M

Multiparameter Connectors	Multi Module
<u>2 ports</u> Temperature x4 (maximum) BP x4 (maximum) CO x1 (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" P4-18)

### For HS-8312N, HS-8312M

*Combination of BP, TEMP, CO Channels*

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

*Combination of BP, TEMP, CO Channels*

3 Ports	BP	TEMP	CO
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.

 For HM-800*Combination of BP, TEMP, CO Channels*

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

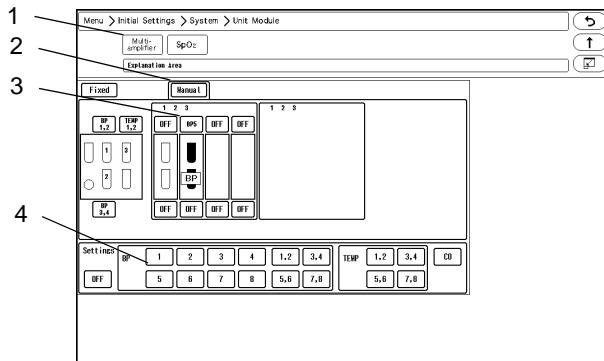
\* the quantity of channel inside the brackets is the quantity when using the 1ch BP relay cable.

## Multiparameter Connector Setup

If the Input Box is not connected, connecting the relay cable to the multiparameter connector on the HS-8000 series Super Unit will automatically set the measuring parameter. But if the Input Box is connected with the HM-800, it is necessary to set the measuring parameters manually.

Example:

To assign BP5 to multiparameter connector 1 for the HM-800 Multi Module inserted to slot 2 of the IB-8004-1.



- 1 Press the [Menu], [Initial Settings], [System], [Unit Module] , [Multiampifier] keys.
- 2 Press the [Manual] key.
- 3 Select the multiparameter connector location. The selected location will be displayed in blue.
- 4 Assign the parameter to the selected location. In this case, select [5] for "BP".  
The parameter will be assigned to the selected connector.

### **CAUTION**

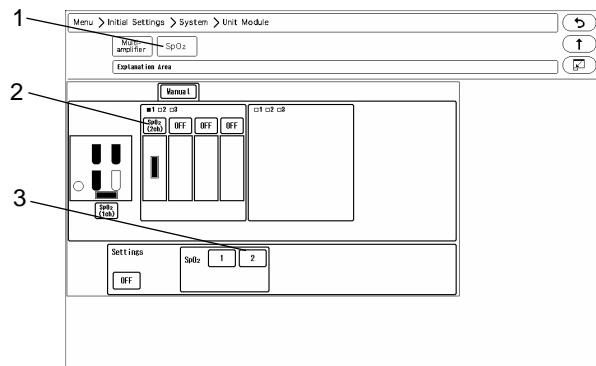
- ♦ The same parameter cannot be set to more than one connectors.
- ♦ By setting [OFF] for one of the connector, it will become selectable on another connector.
- ♦ If the parameter assigned to the multiparameter connector and the connected relay cable does not match, the connector location will be displayed in red and the connected relay cable type will be displayed.

## SpO<sub>2</sub> Channel Setup

When using the SpO<sub>2</sub> Module (HG-810, HG-820), it is necessary to set the SpO<sub>2</sub> channel manually.

Example:

To measure 1 channel of SpO<sub>2</sub> on the Super Unit, 2 channels of SpO<sub>2</sub> on the HG-810/HG-820



- 1 Press the [Menu], [Initial Settings], [System], [Unit Module], [SpO<sub>2</sub>] keys.
- 2 Select the input box slot location. The selected location will be displayed in blue.
- 3 Assign the channel to the selected location. In this case, select [2] for "SpO<sub>2</sub>".  
2 channels of SpO<sub>2</sub> will be assigned to the HG-810/HG-820.

 **CAUTION**

- ♦ It is not possible to set the second channel only.
- ♦ If the channel setting is duplicated, one of the setting will be turned OFF.

# Chapter 8 Review Function

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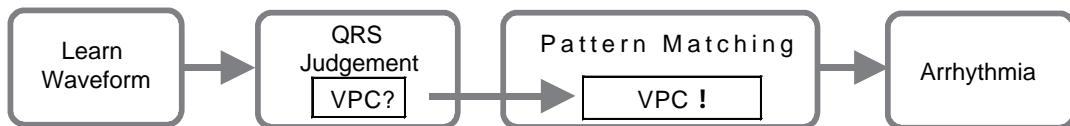
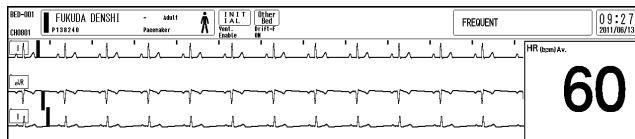


# Chapter 8 Review Function

## Arrhythmia Analysis

This section explains about the arrhythmia analysis.

### Arrhythmia Definition



The arrhythmia detection is performed by learning the normal waveform of the patient, and determines the VPC by comparing the waveform (QRS pattern) and R-R interval for each heartbeat.

The parameters such as QRS amplitude, QRS width, QRS polarity, RR interval are compared with the normal waveform to extract the abnormal QRS.

Then, the QRS with suspected VPC is pattern matched to distinguish the noise and VPC. This will finally determine the VPC and generate the arrhythmia alarm.

#### **⚠️ WARNING**

- Objective and constant arrhythmia detection is possible through the fixed algorithm incorporated in this monitor.
- However, excessive waveform morphology change, motion artifact, or the inability to determine the waveform pattern may cause an error, or fail to make adequate detection.
- Therefore, physicians should make final decisions by closely checking the data obtained by manual printing, alarm printing and recall waveform.

#### **⚠️ CAUTION**

- For stable arrhythmia detection and ECG monitoring, verify proper electrode placement, lead, waveform size, and filter mode selection. If not properly selected, 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 12 types of arrhythmia alarm will be generated.

Arrhythmia	Details	Detection Criteria
Asystole	Cardiac Arrest	Cardiac arrest is detected for more than preprogrammed time.
VF	Ventricular Fibrillation	A random, rapid electrical activity of the heart is detected.
VT	Ventricular Tachycardia	9 or more continuous ventricular beats are detected.*1
Slow_VT		9 or more continuous ventricular beats are detected.*2
TACHY	Tachycardia	HR is over the upper alarm limit.
BRADY	Bradycardia	HR is below the lower alarm limit.
RUN	Consecutive VPC	Continuous VPC exceeding the preprogrammed value is detected.
Couplet	Couplet Ventricular Extrasystole	2 continuous VPC beats are detected.
PAUSE		Cardiac arrest exceeding the preprogrammed duration is detected.
Bigeminy	Ventricular Bigeminy	3 or more continuous QRS pattern of V-N is detected.
Trigeminy	Ventricular Trigeminy	3 or more continuous QRS pattern of V-N-N is detected.
Frequent	Frequent VPC	VPC exceeding the preprogrammed value is detected within 1 minute.

\*1: HR: 140bpm / 120bpm or over

\*2: HR: below 140bpm / 120bpm

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

## Arrhythmia Alarm Setup

Arrhythmia alarm setup procedure is explained below.

ON/OFF of arrhythmia alarm and arrhythmia detection level can be set.

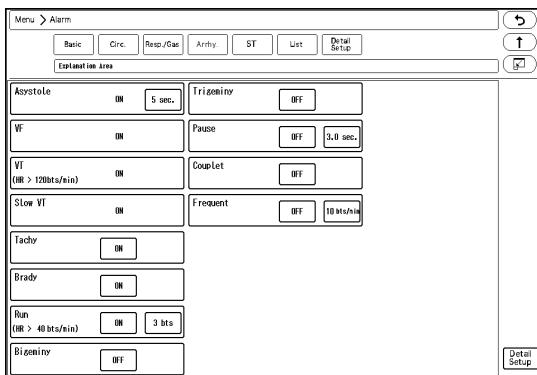
When the measured value exceeds the set arrhythmia detection level, arrhythmia alarm will generate.

### *Arrhythmia Detection Level Setting*

Arrhythmia	Range	Default	Selection
Asystole	3 to 10 sec.	5 sec.	Dropdown List
Run	2 to 8 beats	3 beats	Dropdown List
Pause	1.5 to 5 sec.	3 sec.	Dropdown List
Frequent	1 to 50 bpm	10 bpm	Numeric Keys

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

- The arrhythmia alarm setup screen will be displayed.



## 2 Set the detection level.

For Asystole, Run, Pause:

- 1 Press the key for detection level.

► The dropdown list will be displayed.

- 2 Select the detection level.

For Frequent:

- 1 Press the key for detection level.

► The "Frequent" screen will be displayed.

- 2 Use the numeric keys to enter the detection level.

- 3 Press the [Input] key.

## 3 Select ON/OFF for the alarm.

- 1 Select [ON]/[OFF] for each alarm.

► The dropdown list will be displayed.

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

► [ON]: Alarm will generate.

► [OFF]: Alarm will not generate.

### NOTE

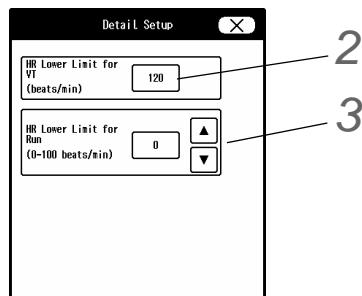
- If the patient classification is adult or child, Asystole, VF, VT, Slow VT alarm cannot be turned OFF unless [ON/OFF] is selected for "Asystole, VF, VT Alarm" under "Initial Settings".
- If the patient classification is neonate, VF, VT, Slow VT can be turned OFF regardless of the setting for "Asystole,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

## □ Arrhythmia Alarm Detail Setup

HR Lower Limit for VT and RUN can be set on the Arrhythmia Alarm "Detail Setup" screen.

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

- The "Detail Setup" screen will be displayed.



## 2 Set the "HR Lower Limit for VT".

### REFERENCE

- ♦ Select the HR lower limit to detect VT from 120 or 140bpm. If the HR is same or above the selected value, VT will be detected. If the HR is below the selected value, Slow\_VT will be detected.

- 1 Press the key for "HR Lower Limit for VT".

► The dropdown list will be displayed.

- 2 Select from [120] or [140] (beats/min.).

## 3 Set the "HR Lower Limit for RUN".

### REFERENCE

- ♦ Set the HR lower limit to detect RUN. If the HR is same or above the set value, RUN will be detected.

- 1 Press the **[▲]/[▼]** key for "HR Lower Limit for RUN".

- 2 Set the HR in the range from 0 to 100 (beats/min.).

## Arrhythmia Learn

Learning the normal ECG largely affects the accuracy of arrhythmia analysis.

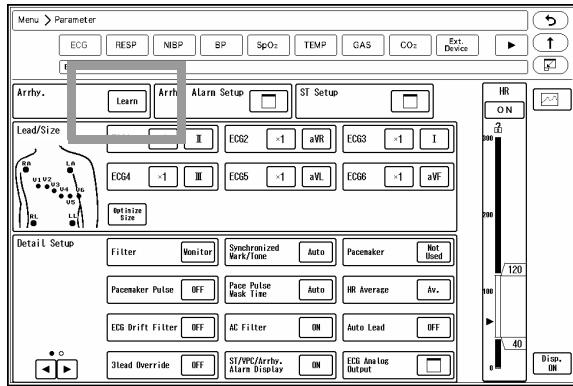
If any error occurs in arrhythmia detection and QRS judgment, performing arrhythmia learning will recover the original analyzing accuracy.

Arrhythmia learning will be performed for about 20 beats for the normal ECG, but it may take longer if the heartbeat is unstable.

During arrhythmia learning, arrhythmia alarm other than Asystole, VF, VT, Tachy, Brady will not be generated.

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

- ▶ The ECG setup screen will be displayed.



## 2 Press the [Learn] key while displayed in white.

- ▶ The key will change to blue.
- ▶ Arrhythmia learning will start.
- ▶ During arrhythmia learning, a message will be displayed.



### NOTE

- If [Used] is selected for "Pacemaker", [Learn] key will not change to blue and "LEARN" message will not be displayed, but learning process will be performed.
- Pressing the key while arrhythmia learning is in process will not stop the process.

## Graphic Trend

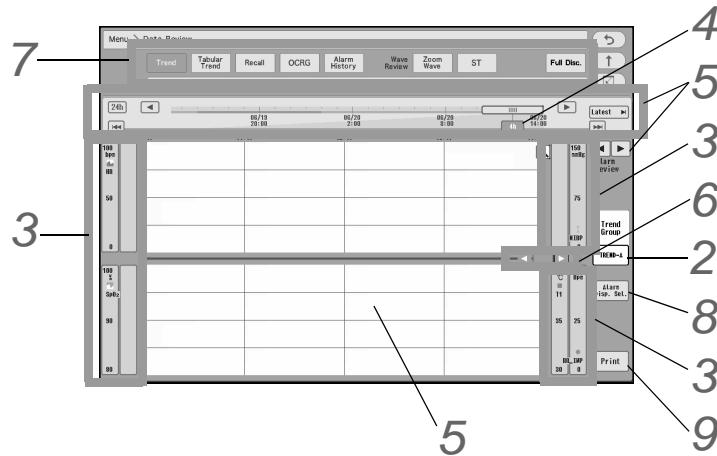
This section explains the graphic trend function and printing procedure.

If the numeric data is displayed on the home display, 24 hours of data will be automatically stored and displayed as trend data.

## Graphic Trend Setup

### 1 Press the [Menu], [Trend] ("Data Review") keys. Or, press the [Trend] key on the user key area.

- The graphic trend will be displayed.

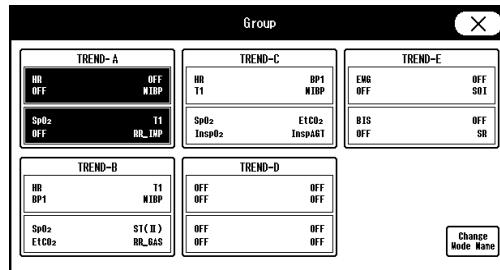


- 2 graphs are displayed on each page, and graphic trend of 4 parameters can be displayed simultaneously on each graph.

## 2 Select the trend group.

- 1 Press the [Trend Group] key.

- The "Group" window will be displayed.



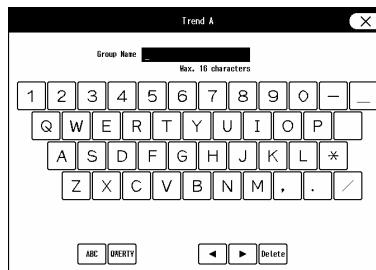
- 2 Select the group.

### REFERENCE

- 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.

- Window to enter the name of trend group will be displayed.



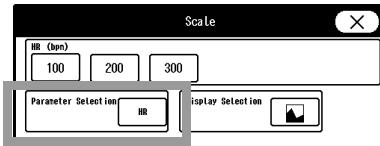
- 4 Enter the name of trend group in alphanumeric characters.

- 5 After entering the name, press to close the window.

## 3 Set the parameter, display type, scale.

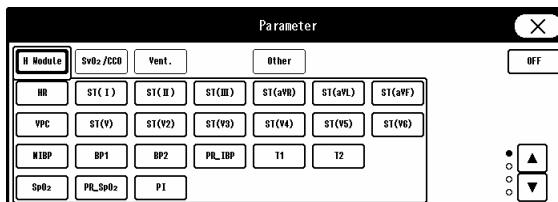
- 1 Press the scale area for each parameter.

- The "Scale" selection window will be displayed.



**2** Press the key for "Parameter Selection".

- The "Parameter" selection window will be displayed.



**3** Select a parameter.

**NOTE**

- The selected parameter will be also registered for the trend group.
- The apnea duration will be stored when it exceeds the alarm threshold level. If lower than the alarm threshold level, it will be stored as "0 (zero)".

**4** Select the scale.

**5** Press the key for "Display Selection".

- The dropdown list will be displayed.

**6** Select the display format.

**4** Select the display interval.

**1** Press the key on the time bar.

- The dropdown list will be displayed.

**2** Select the display interval.

**REFERENCE**

- The displayed data is compressed as follows depending on the display interval.  
VPC: Maximum value within the display interval  
APNEA: Maximum value within the display interval  
Other than above: Latest value within the display interval  
For example, if the 24-hour trend for the parameter with minimum resolution of 1 minute is displayed, one mark will be displayed for the 12-minute (720-second) data.
- If the display resolution is higher than the minimum resolution of the data, the same data is repeated to match the display resolution.  
Refer to the following table for resolution. The resolution will differ depending on the parameter.

*Display Resolution*

Time Span	Minimum Resolution			
	Line Display		Mark Display	
	10 sec. Sample	30 sec. Sample	10 sec. Sample	30 sec. Sample
20 min	10 sec.	30 sec.	10 sec.	30 sec.

*Display Resolution*

Time Span	Minimum Resolution			
	Line Display		Mark Display	
	10 sec. Sample	30 sec. Sample	10 sec. Sample	30 sec. Sample
1 hour	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 <sub>2</sub> , PR_SpO <sub>2</sub> , 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]/[48] 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 Scroll the slider 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 Scroll left and right.

- The cursor will move to left and right.

**3** Press the / keys.

- The cursor position can be adjusted.

**REFERENCE**

- ♦ The data display at cursor position will be automatically erased after fixed duration.

**4** Press .

- 10-minute trend data before and after the cursor position will be displayed.

**5** Press .

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

**7**

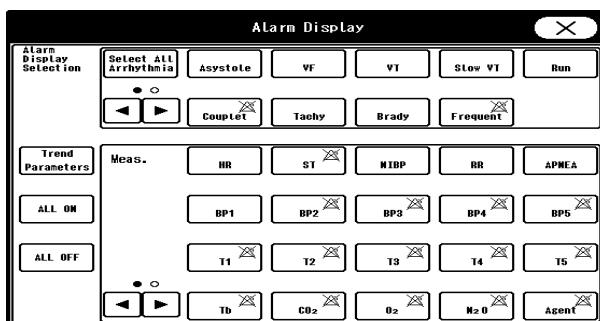
To refer to other review data of the same time, press the tab key on the left side.

**8**

Select the alarm display status.

**1** Press the [Alarm Disp. Sel.] key.

- The "Alarm Display" window will be displayed.



**2** Select the alarm display status.

- [Trend Parameters]: The displayed trend parameters will be selected.
- [Select All]: All parameters including arrhythmia will be selected.
- [Cancel All]: All selections will be cancelled.
- [Select All Arrhythmia]: All arrhythmia will be selected.
- Each parameter key: Each time the key is pressed, selected/unselected status will change.

**REFERENCE**

- ♦ If the alarm for the selected arrhythmia, parameter is generated during the displayed time range, it will be indicated in red at the alarm status display area.

**9**

Press the [Print] key.

- To print the trend data, press the [Print] key, select the parameter, and press the [Enter] key.

## Description for Each Parameter

---

Parameter	Details	Scale	Unit
HR	HR	100, 200, 300	bpm
VPC	VPC beats	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 <sub>2</sub> -1, SpO <sub>2</sub> -2	SpO <sub>2</sub> Value	0 to 100, 50 to 100, 80 to 100	%
PR_SpO <sub>2</sub> -1, PR_SpO <sub>2</sub> -2	SpO <sub>2</sub> 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 <sub>2</sub> O
PDP	Peak Diastolic Pressure of IABP	20, 50, 100, 150, 200, 300	mmHg
		4, 8, 16, 20, 24, 40	kPa
CPP	Cerebral Perfusion Pressure	20, 50, 100, 150, 200, 300	mmHg
		4, 8, 16, 20, 24, 40	kPa
PAP	Pulmonary Artery Pressure	20, 50, 100, 150, 200, 300	mmHg
		4, 8, 16, 20, 24, 40	kPa
PR_IBP	BP Pulse Rate	100, 200, 300	bpm
T1 to T8	TEMP	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 (Impedance, CO <sub>2</sub> , Ventilator)	15, 30	sec
EtCO <sub>2</sub> , InspCO <sub>2</sub> *	Gas Unit CO <sub>2</sub> Concentration	50, 100	mmHg
		4, 8, 10	kPa, %
ExpO <sub>2</sub> , InspO <sub>2</sub> *	Gas Unit O <sub>2</sub> Concentration	50, 100	%
ExpN <sub>2</sub> O, InspN <sub>2</sub> O*	Gas Unit N <sub>2</sub> O Concentration	50, 100	%
RR_GAS*	Gas Unit Respiration Rate	50, 100, 150	Bpm
ΔO <sub>2</sub> *	ΔO <sub>2</sub>	3, 6, 9	%
ExpAGT, InspAGT*	Gas Unit Agent Concentration	4, 8, 10	%
MAC*	Minimal Alveolar Concentration	5, 10	-
BIS	Bispectral Index	25, 50, 75, 100	-
SR	Suppression Ratio	25, 50, 75, 100	%
EMG	Electromyography	30 to 80	dB
SQI	Signal Quality Index	0 to 100	%
SvO <sub>2</sub>	Mixed Venous Oxygen Saturation	0 to 100, 50 to 100, 80 to 100	%
ScvO <sub>2</sub>	Central Venous Oxygen Saturation	0 to 100, 50 to 100, 80 to 100	%
CCO	Continuous Cardiac Output	6, 12, 20	L/min

Parameter	Details	Scale	Unit
CCI	Continuous Cardiac Index	6, 12, 20	L/min/m <sup>2</sup>
BT	Blood Temperature (SvO <sub>2</sub> /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	%
SpMet (1, 2)	Methemoglobin Concentration	10, 15, 100	%
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*	Expiratory Minute Ventilation Volume	6.0, 12.0, 20.0	L/min
PEAK*	Peak Airway Pressure	10, 20, 50, 100	cmH <sub>2</sub> O
PEEP*	Peak End Expiratory Pressure	10, 20, 50, 100	cmH <sub>2</sub> O
Lt-rSO <sub>2</sub>	Regional Cerebral Oxygen Saturation	20 to 100	%
Rt-rSO <sub>2</sub>			
S1-rSO <sub>2</sub>			
S2-rSO <sub>2</sub>			

\*If the FLOW-i is connected, the FLOW-i data will be displayed.

#### NOTE

- The apnea duration will be stored when it exceeds the alarm threshold level. If lower than the alarm threshold level, it will be stored as "0 (zero)".

## 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.

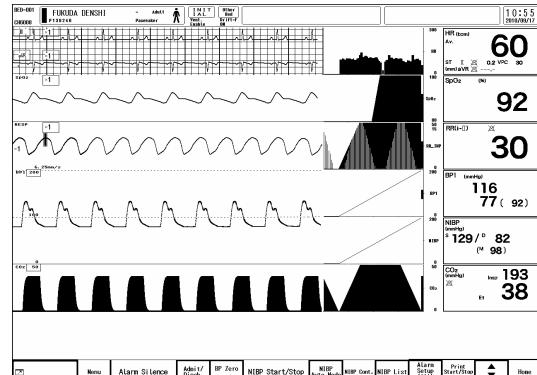
Pressing the short trend of an alarm generated parameter will display the recall screen.

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" P10-17)



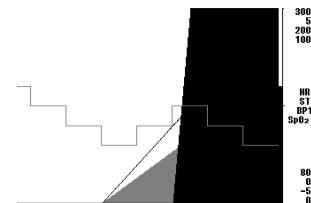
### Selecting the Parameters to be Displayed

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 linked with the displayed waveforms and numeric data. ( Maintenance Manual "Display/Print Setup" P19-13)

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" (Menu>Display Config.>Detail Setup).

BP, PEAK, TV, CO<sub>2</sub>, O<sub>2</sub>, 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.

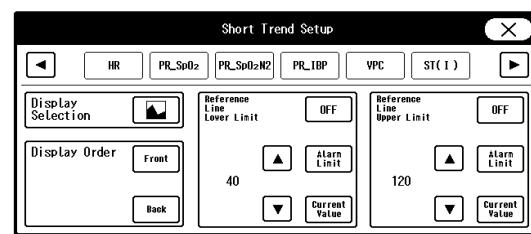
- ♦ Line
- ♦ Filled in with black color from the baseline
- ♦ Filled in with black color between S-D (For BP)
- ♦ Filled in with black color from the top
- ♦ [OFF]: Graph will not be displayed.

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.

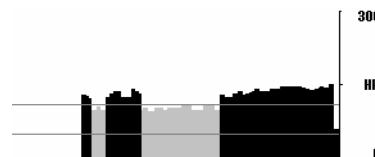
- ♦ [Front]: The display will be on the front side.
- ♦ [Back]: The display will be on the back side.



## □ 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<sub>2</sub> (Upper/Lower Limit)
- ♦ SpO<sub>2</sub> (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.

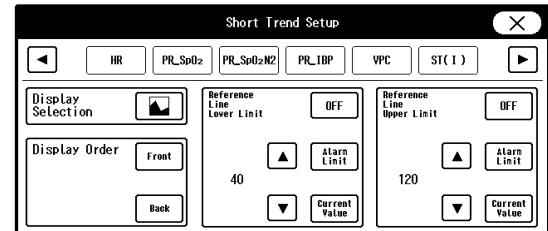
The data outside the reference lines will be displayed with higher brightness.

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.



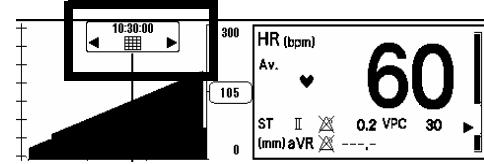
### □ Displaying the Cursor

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.

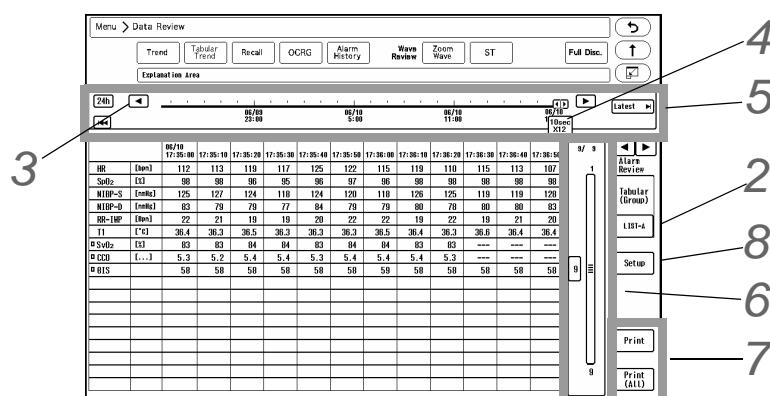
If the numeric data is displayed on the home display, 24 hours of data will be automatically stored and displayed in 10 seconds / 30 seconds interval.

### 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.

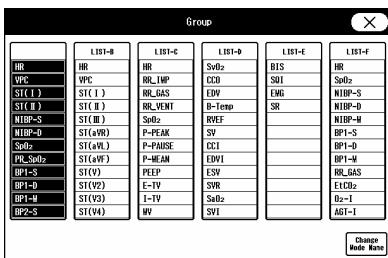
► The tabular trend will be displayed.



## 2 Change the trend group.

1 Press the [Tabular (Group)] key.

► The "Group" window will be displayed.



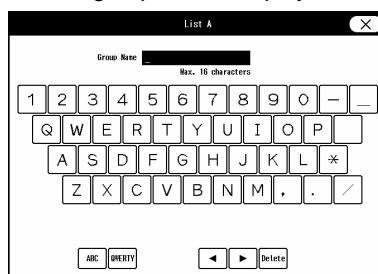
### REFERENCE

- 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 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 <sub>2</sub> , PR_SpO <sub>2</sub> , 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" P8-16)

## 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 " : ".

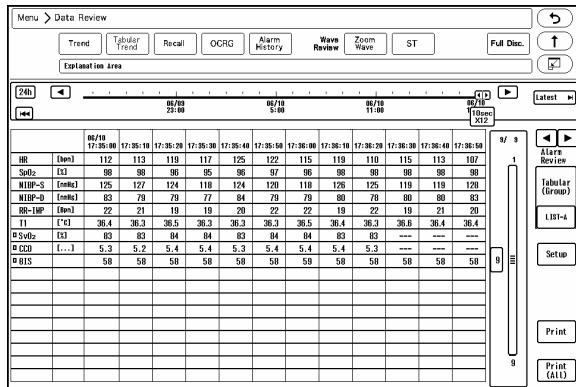
Also, if the measured data is not displayed on the home display, or BP zero balance is not performed, the data will not be displayed.

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<sub>2</sub> and InspCO<sub>2</sub> will be the same.  
For example, if the alarm is generated for BP-S, the background color of BP1-S, BP1-M, BP1-D will be displayed in red.

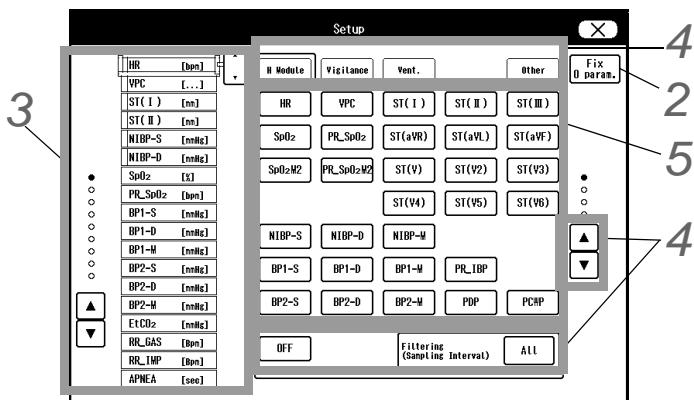


On the left side of the parameter, the color assigned for the corresponding parameter will be displayed.

## Parameter Setup for Tabular Trend

- 1** Press the [Menu], [Tabular Trend] ("Data Review"), [Setup] keys.

► The tabular trend setup screen will be displayed.



- 2** Select the number of fixed parameters.

- 1** Press the [Fix x param.] key.

► The dropdown list will be displayed.

- 2** Select from [0 param.] to [6 param.].

► The selected numbers of parameters will be fixed on the tabular trend display, and these data will be remained displayed even when scrolled.

- 3** Select the location for the parameter to be displayed.

► The selected location will be displayed with blue frame and will be displayed at the side.

### REFERENCE

- To change the location, directly press the desired location or drag the key up or down.
- To change the displayed page, press the / keys at the left side of the screen.

- 4** Select the parameters.

**1** Filter the data by sampling interval.

- ▶ [OFF]: The line where [OFF] is selected will not be displayed.
- ▶ [10 sec.]: Only the data with 10 sec. sampling interval will be displayed.
- ▶ [All]: All data will be displayed.

**2** Select the category and displaying page.

- ▶ [H Module]/[Vigilance]/[Vent.]/[Other]: The parameters for the corresponding category will be displayed.
- ▶ / : The displaying page for the parameters can be selected.

*Parameters for each Category*

H Module	HR, VPC, ST, SpO <sub>2</sub> -1, PR_SpO <sub>2</sub> -1, SpO <sub>2</sub> -2, PR_SpO <sub>2</sub> -2, NIBP, BP1 to 8, PR-IBP, PDP, PCWP, CPP, T1 to 8, Tb, CO, EtCO <sub>2</sub> , InspCO <sub>2</sub> , RR-GAS, RR-IMP, RR-VENT, APNEA, O <sub>2</sub> , N <sub>2</sub> O, 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 <sub>2</sub> /CCO	SvO <sub>2</sub> , ScvO <sub>2</sub> , SaO <sub>2</sub> , O <sub>2</sub> El, B-Temp, CCO, CCO-STAT, CCI, CCI-STAT, DO <sub>2</sub> , RVEF, RVEF-STAT, VO <sub>2</sub> , SV, SV-STAT, SVI, SVI-STAT, SVR, SVRI, SVV, EDV, EDV-STAT, EDVI, EDVI-STAT, MAP, ESV, ESVI
Ventilator	E-TV, I-TV, MV, SMV, P-PEAK, P-PAUSE, PEEP, P-MEAN, E-RES, I-RES, COMP, FiO <sub>2</sub> , P-MIN, S-COMP, D-COMP, S-RR, I/E RATIO, RES
Other	BIS, SQI, EMG, SR, SEF, TOTPOW, IMP, Lt-rSO <sub>2</sub> , Rt-rSO <sub>2</sub> , S1-rSO <sub>2</sub> , S2-rSO <sub>2</sub>

**NOTE**

- The apnea duration will be stored when it exceeds the alarm threshold level. If lower than the alarm threshold level, it will be stored as "0 (zero)".

**REFERENCE**

- "H Module" is a generic term for HS-8000, HM-800, HP-800, HG-810/HG-820.
- When the FLOW-i is connected, the display will change to "H Module/Anesthesia".

**5** Select the parameter to be displayed for the selected location.

- ▶ The blue frame will move to one row below.

**Recall**

This section explains about the recall function and the setup procedure.

**To Display the Recall Waveform**

1 Time at Alarm Occurrence

2 Recall Factor

3 Recall Waveform (Compressed: 12 sec.)

4 Diamond Mark



When the alarm for the specified recall factor occurs, maximum of 2 waveforms (12 seconds) and numeric data for each recall factor will be stored for up to 200 data. The recall data to be displayed can be selected. 14 compressed recall waveforms will be displayed. By selecting one of the waveforms, an enlarged waveform will be displayed.

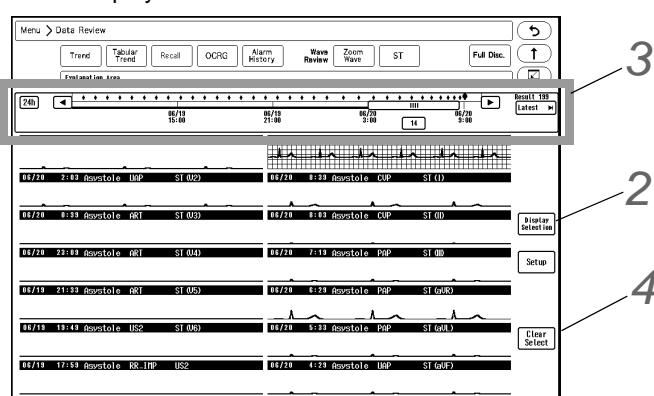
If the recall data exceeds 200, the data will be erased from the oldest one.

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.

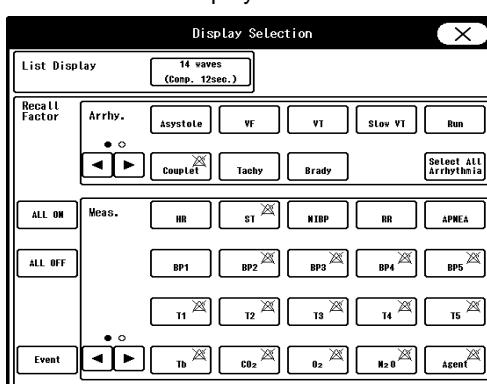
- 1** Press the [Menu], [Recall] ("Data Review") keys.  
Or, press the [Recall] key on the user key area.

- ▶ 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 .

► 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.

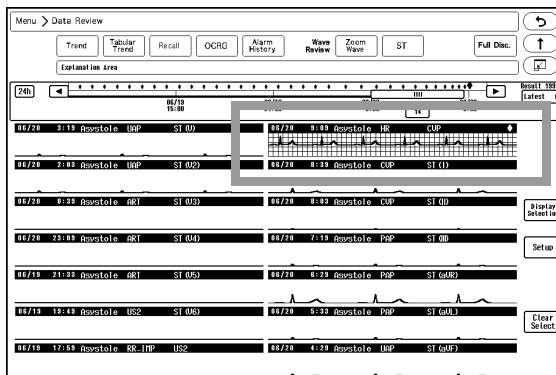
If the parameter with "x" is selected, "x" will be erased and will be removed from the deleting parameters.

**3** Press the [Delete] key, and then the [Delete OK] key to delete the parameters with "x" mark.

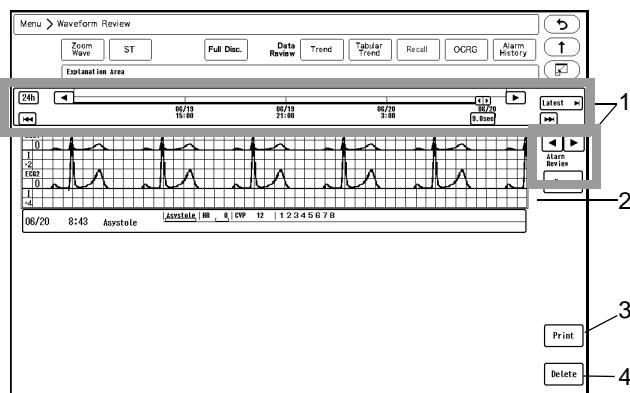
## To Display/Print the Enlarged Recall Waveform

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.

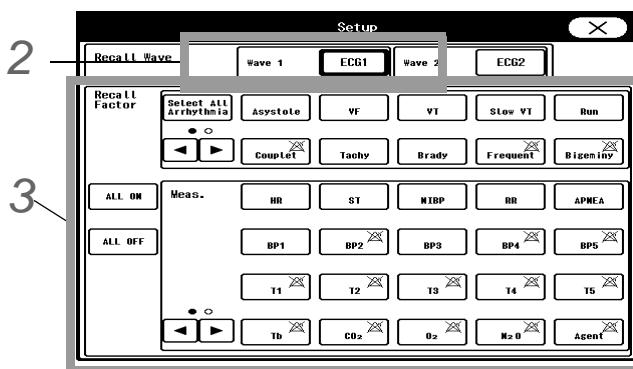
**Recall Setup**

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.



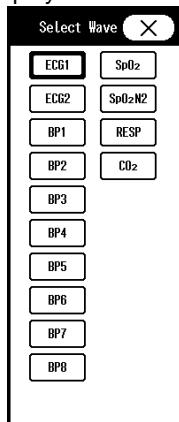
- 2** Select the recall waveform.

**REFERENCE**

- Up to 2 waveforms can be selected for the recall waveform.

- 1** Select from "Wave 1" or "Wave 2".

▶ The "Select Wave" 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

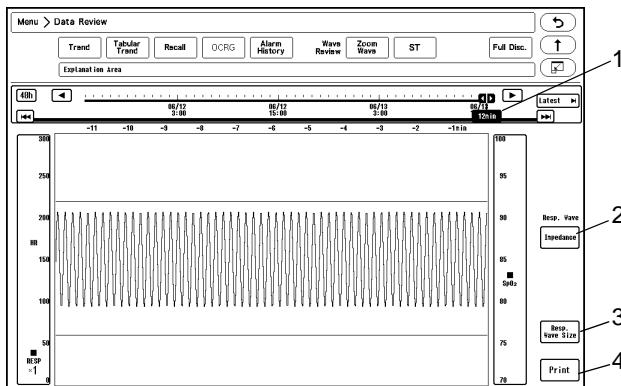
This section explains about the OCRG display.

On the OCRG display, compressed respiration waveform, HR trend and SpO<sub>2</sub> trend are displayed simultaneously. The trend scale is fixed as follows.

- HR: 0 to 300bpm
- SpO<sub>2</sub>: 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<sub>2</sub>].

#### 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]

Respiration Waveform	Size/Scale
CO <sub>2</sub>	[50]/[100] (unit : mmHg)
	[4]/[8]/[10] (unit : % or kPa)

**4 Printing**

The currently displayed trend and compressed waveform on the OCRG screen will be printed.

## Alarm History

This section explains the alarm history function and printing procedure.

The alarm generation of numeric data, arrhythmia, equipment status and change in alarm settings can be stored as alarm history. Maximum of 1599 data can be stored.

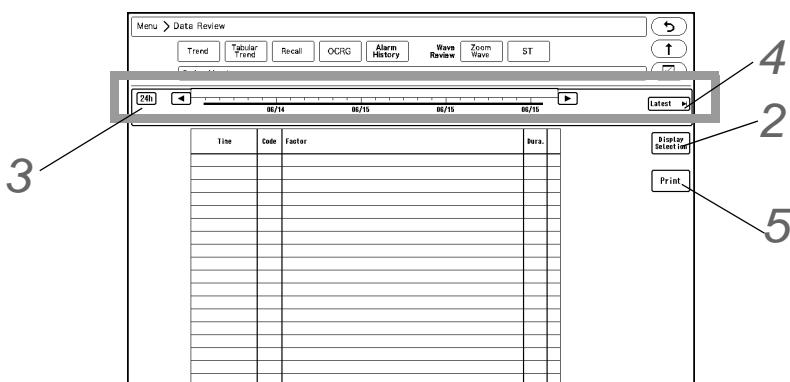
**NOTE**

- When the alarm history exceeds 1600 data, the data will be deleted from the oldest one.

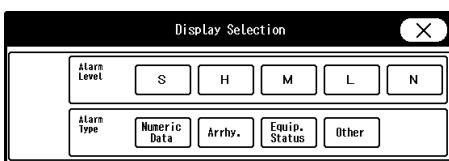
## Alarm History Setup

**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** Scroll the slider 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	3400	Tachy Setting Changed	120	
11/06/16 20:46:05	3203	RR (GAS) Lower Limit Changed	5	
11/06/16 20:46:05	3202	RR (VENT) Lower Limit Changed	5	
11/06/16 20:46:05	3205	RR (IMP) Lower Limit Changed	5	
11/06/16 20:46:05	3003	RR (GAS) Upper Limit Changed	30	
11/06/16 20:46:05	3002	RR (VENT) Upper Limit Changed	30	
11/06/16 20:46:05	300F	Apnea Upper Limit Changed	15	
11/06/16 20:46:05	300E	RR (IMP) Upper Limit Changed	30	
11/06/16 20:46:05	3001	HR Upper Limit Changed	120	
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	0A00	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.

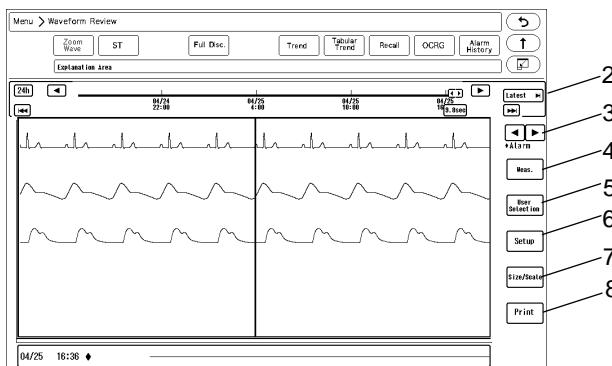
## REFERENCE

- 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.

## 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.

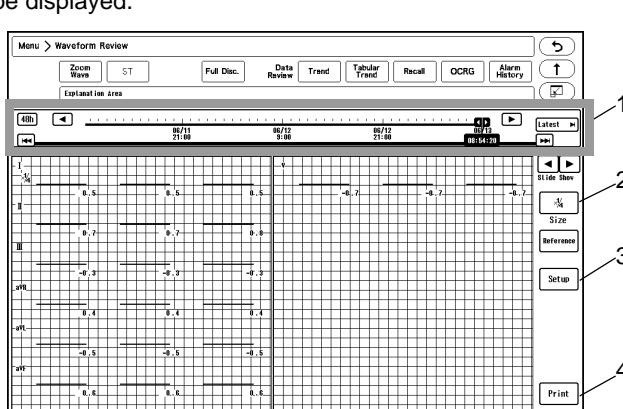
If 3-lead cable is used, maximum of 8 hours of ST waveform will be displayed.

#### 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.

- 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.

- 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.

- Print the ST waveform.

The currently displayed ST waveform will be printed.

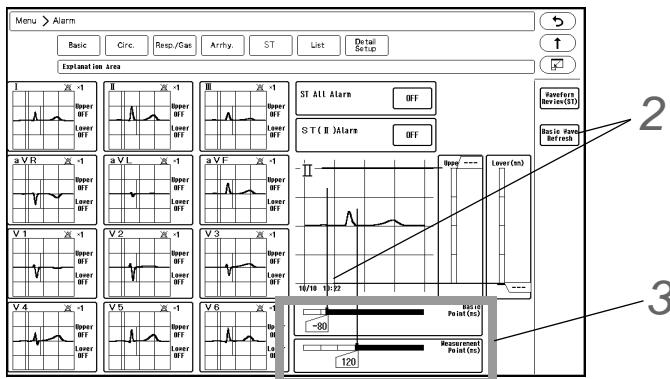
## Reference Waveform Setup

The ST reference waveform will be automatically set after learning the arrhythmia.

The reference waveform can be updated manually.

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

► The ST alarm setup screen will be displayed.



- Update the ST reference waveform.

#### CAUTION

- If the lead is off, the reference waveform cannot be set. Check if the electrode is properly attached, and perform the setup again.

- Press the [Update Ref. Wave] key.

► 16 beats average of the ECG judged as normal QRS by arrhythmia analysis will be set as the reference waveform.

► While updating the reference waveform, the [Update Ref. Wave] key will be displayed in blue.

► The updated time of the reference waveform will be displayed.

**NOTE**

- While learning arrhythmia, or if VPC is present, it will take more than 16 beats to set the reference waveform.
- When the number of electrode is changed, the reference waveform will be automatically updated.
- In case such as when the patient is discharged, the reference waveform will be automatically set.

### 3 Set the reference point and measurement point.

1 Slide  left/right for reference point.

2 Slide  left/right for measurement point.

**NOTE**

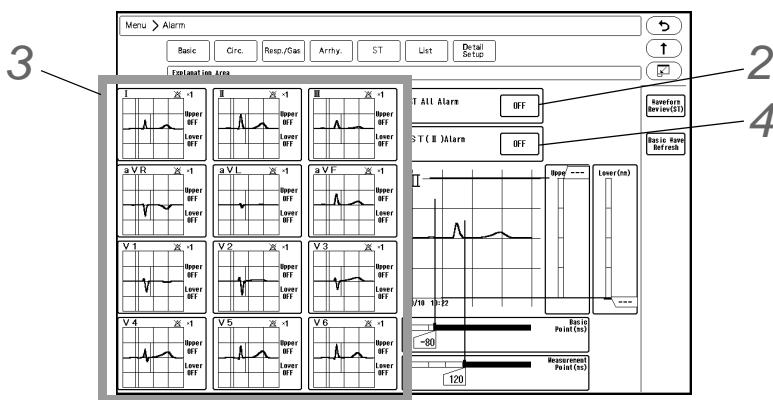
- Set the reference point in the range of -240 to 0ms in increments of 10ms from the peak of QRS to the P wave direction.
- Set the measurement point in the range of 0 to 560ms in increments of 10ms from the peak of QRS to the T wave direction.

## ST Alarm Setup

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

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

► The ST alarm setup screen will be displayed.



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

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

3 Select the lead to set the alarm limit.

► The selected lead will be displayed large at the right.

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

## 5 Set the upper and lower alarm limit.

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

### NOTE

- Set the upper limit in the range from -18mm to +20mm/-1.8mV to +2.0mV. If a value above +20mm/+2.0mV is set, the upper alarm will turn OFF.
- Set the lower limit in the range from -20mm to +18mm/-2.0mV to +1.8mV. If a value below -20mm/-2.0mV is set, the lower alarm will turn OFF.

### REFERENCE

- The upper and lower limit can be set in 1mm / 0.1mV increment.

## 12-Lead Analysis

This section explains about the 12-lead analysis function. By using the 10-electrode cable, 12-lead ECG can be displayed, analyzed, stored, and printed. Maximum of 10 analyzed results can be stored.

### ⚠ WARNING

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

### ⚠ CAUTION

- Interpretation and Minnesota codes given by this equipment do not instruct the physician as to the kind and degree of cardiac disease. Accordingly, four value judgements are given for ECG waveform and although "abnormal" indicates a large possibility of organic cardiac disease, there are cases where no cardiac disease exists despite an abnormal ECG (that is, an abnormal ECG may be caused by something other than heart).  
On the other hand, care should be taken in the event any preclinical coronary arteriosclerosis could be present despite a normal ECG interpretation.  
Therefore, for a proper diagnosis, the ECG should be integrated with other interpretations.
- ECG Recording by the Mason-Likar System  
The 12-lead ECG recorded with the torso placement of the limb leads (Mason-Likar 12-lead system) may differ from the standard 12-lead ECG. Moreover, waveforms may differ somewhat also in a supine position and a standing position (sitting position).  
Fukuda Denshi recommends to carry out the recording of the ECG by taking into consideration the waveform differences according to electrode positions or postures.
- About the ECG analysis program  
The ECG analysis program is intended to analyze the standard 12-lead ECG waveforms. Therefore, the analyzed result for waveforms recorded with the torso placement of the limb leads (Mason-Likar 12-lead system) may differ from that of the standard 12-lead ECG waveforms.
- Select "Used" for the pacemaker setting on the patient admit/discharge menu if a patient has a pacemaker.
- The threshold values for classification of 12-lead ECG interpretation and Minnesota code are set by age and sex as follows:

1. Male and Female of ages 19 years old and above
  2. Male of age 12 through 18 years old
  3. Female of age 12 through 18 years old
  4. Male and Female of ages 3 through 11 years old
  5. Male and Female of ages below 2 years old
- If no patient information (i.e. Default : "Class." [Adult], "Sex": undetermined, and "Age" [0]) has been entered, the system algorithm will handle the patient as a "35 years old male".
  - Before the analysis, make sure the patient classification ([Adult] / [Child]) is properly selected. If [Neonate] is selected, the 12-lead ECG analysis will not function.
  - Enter the age of patient if known. If no age information (i.e. Default: [0]) has been entered, the system algorithm will handle the patient as "35 years old".
  - Enter the sex of patient if known. If no sex information (i.e. Default: undetermined) has been entered, the system algorithm will handle the patient as "Male".
  - If the patient classification is set as [Child] and no age (i.e. Default: [0] ) has been entered, the system algorithm will handle the patient as "less than 2 years old."

**NOTE**

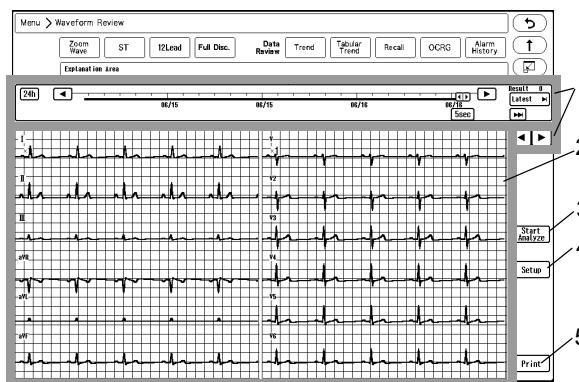
- Electrode Placement for 12-Lead ECG Analysis

When acquiring 12-lead ECG signals, Fukuda Denshi recommends placing the limb electrodes anywhere along the arms and legs. (☞ "Electrode Placement" P7-2 ) However if it is difficult, use the Mason-Likar 12-lead system. To reduce the waveform differences from the standard 12-lead, Fukuda Denshi recommends that the torso placement of the RA and LA electrodes be near as possible to each arm, in the infraclavicular fossae, within the area unaffected by myoelectricity. )

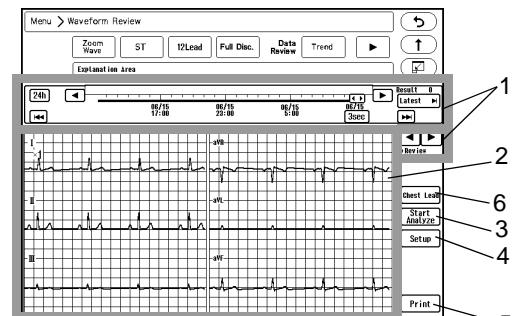
**12-Lead ECG Display**

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 the Past Data" P8-35)

### 2 The real-time waveforms are displayed.

- ▶ The 12-lead analysis will be performed based on the displayed waveforms.

**⚠️ WARNING**

- The frequency response and resolution of the monitor screen is not intended for diagnostic and ST segment interpretation. Use a recorder that provides the required resolution for this purpose.

**REFERENCE**

- Pacemaker pulse will not be displayed on the 12-lead analysis screen even if [ON] is selected 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)

**NOTE**

- 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, [Start Analyze] will not be displayed. (12-lead analysis function is not available.)

**4 Setup**

- ▶ The setup screen will be displayed.
- ▶ On the setup screen, 12-lead waveform size, filter, analysis method can be set.  
(☞ "12-Lead Analysis Setup" P8-31)

**5 Print**

- ▶ The currently displayed waveform can be printed.
- ▶ The output printer can be selected from [Built-in]/[Laser]. (Menu>Manual Printing (Basic Setup)>Graphic Printing (Other Setup)>Printer Sel.>12-Lead Waveform)  
(☞ "12-Lead Analyzed Result Output Example" P8-35)

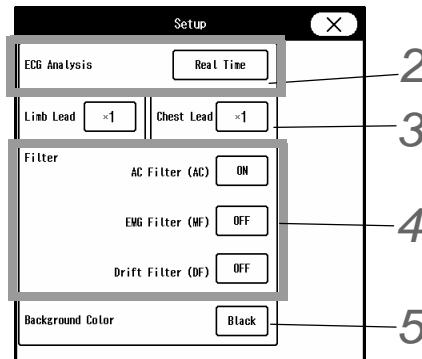
**6 Chest Lead/Limb Lead (LC-8015T only)**

- ▶ 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 set.

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

### CAUTION

- ♦ Time constant (low frequency response) for the 12-lead display depends on the "Drift Filter" setting.
- ♦ A baseline or notch will be generated on the ECG waveform (display, print, recall) during the filter setting (up to about 2.4 seconds).

## 5 Background Color

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

- ◆ [White]

Similar display with the electrocardiograph.

Background Color: White

Grid Color: Orange

Waveform Color: Black (Fixed)

- ◆ [Black]

Conventional color

Background Color: Black

Grid Color: Gray

Waveform Color: Green (Fixed)

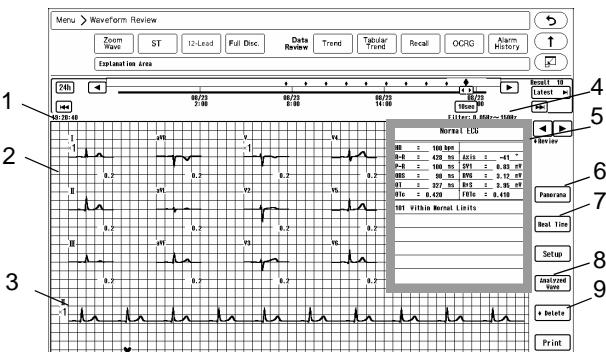
## 12-Lead ECG Analysis

Press the [Menu], [12-Lead] ("Waveform Review"), [Start Analyze] key.

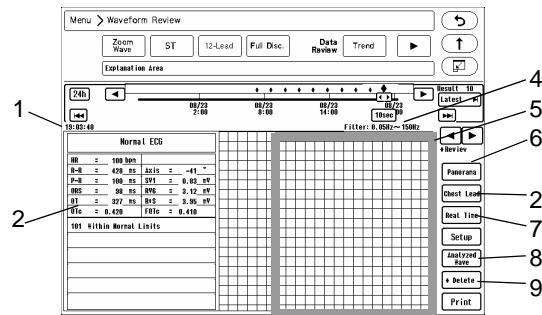
- When the analysis completes, the analyzed result will be displayed.

On the analyzed result screen, dominant waveform, 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" P5-13)

### 5 Analyzed Result

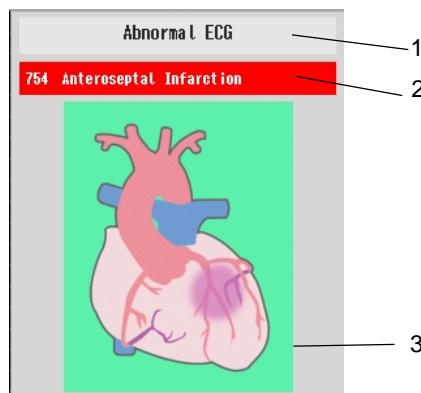
- For the analyzed result, overall judgment, numeric data, finding will be displayed.

Within Normal Limits	
HR = 100 bpm	Axis = 44 °
R-R = 428 ms	SV1 = 0.83 mV
P-R = 100 ms	RV5 = 3.12 mV
QRS = 98 ms	RS = 3.95 mV
QT = 327 ms	QTc = 0.410
QTc = 0.420	FQTc = 0.410
302 Positive T_in Y1	

- Overall Judgement: The highest grade judgement will be displayed.
- Numeric Data: Main numeric data used for ECG analysis will be displayed.  
The abnormal numeric data with the highest grade finding will be highlighted in red.
- Finding: The findings by the ECG analysis will be displayed. These will be classified by colors according to the grade specified for each finding.  
Grade 6: Red  
Grade 4: Blue  
Grade 2, 0: Black  
The highest grade finding will be highlighted in color specified for each abnormality level.

### 6 Panorama Display

- By pressing the [Panorama] key, overall judgment, finding, abnormal site will be indicated by heart illustration.

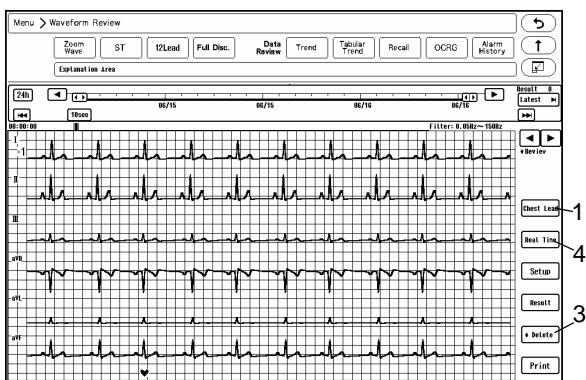


- During the panorama display, [Panorama] key will change to [Numeric].  
By pressing the [Numeric] key, the analyzed result display will change to numeric data format.
- Overall Judgement: The highest grade judgement will be displayed.

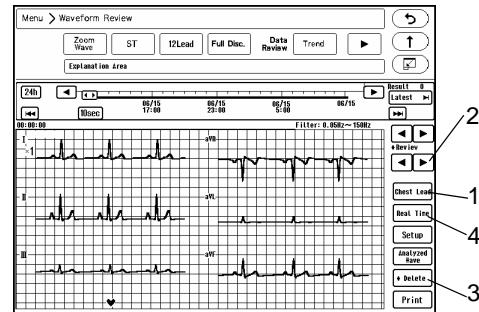
- 2 Finding: The ECG analysis finding of highest grade will be displayed.
  - 3 Abnormal Site: The finding indicated at 2 will be displayed by a heart illustration.
- 7 Analyze Real Time Waveform
- (☞ "To Analyze the Real Time Waveform" P8-34)
- 8 Display Analyzed Waveform
- (☞ "To Display the Analyzed 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

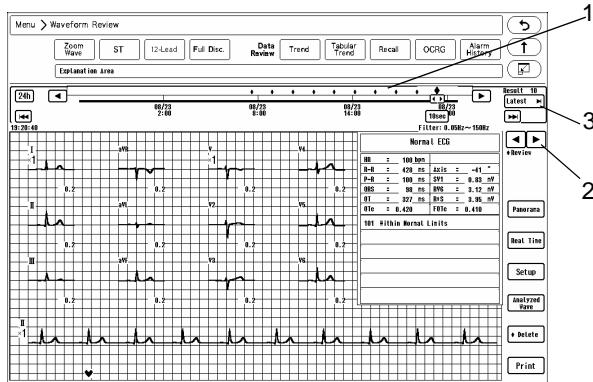
- 3 Press the [Delete] key to delete the displayed analyzed result.  
[Delete OK] will delete the displayed analyzed result data.  
[Cancel] will cancel the delete process.

## ☐ To Analyze the Real Time Waveform

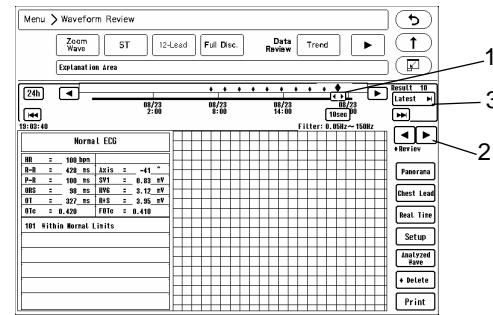
- 4 Press the [Real Time] key to return to the 12-lead analyzed result screen.  
Press the [Start Analyze] key on the 12-lead analyzed result screen.

## 12-Lead Analyzed Result Display of the Past Data

- On the 12-lead screen, scroll on the slide bar, or press the **[◀]/[▶]** key for "Review".
- Maximum of 10 analyzed results can be displayed.



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- 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
		Laser	Yes
Panorama Report	12-Lead Analysis Result	Built-in	No
		Laser	Yes
Analyzed Report	12-Lead Analysis Result	Built-in	Yes
		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.

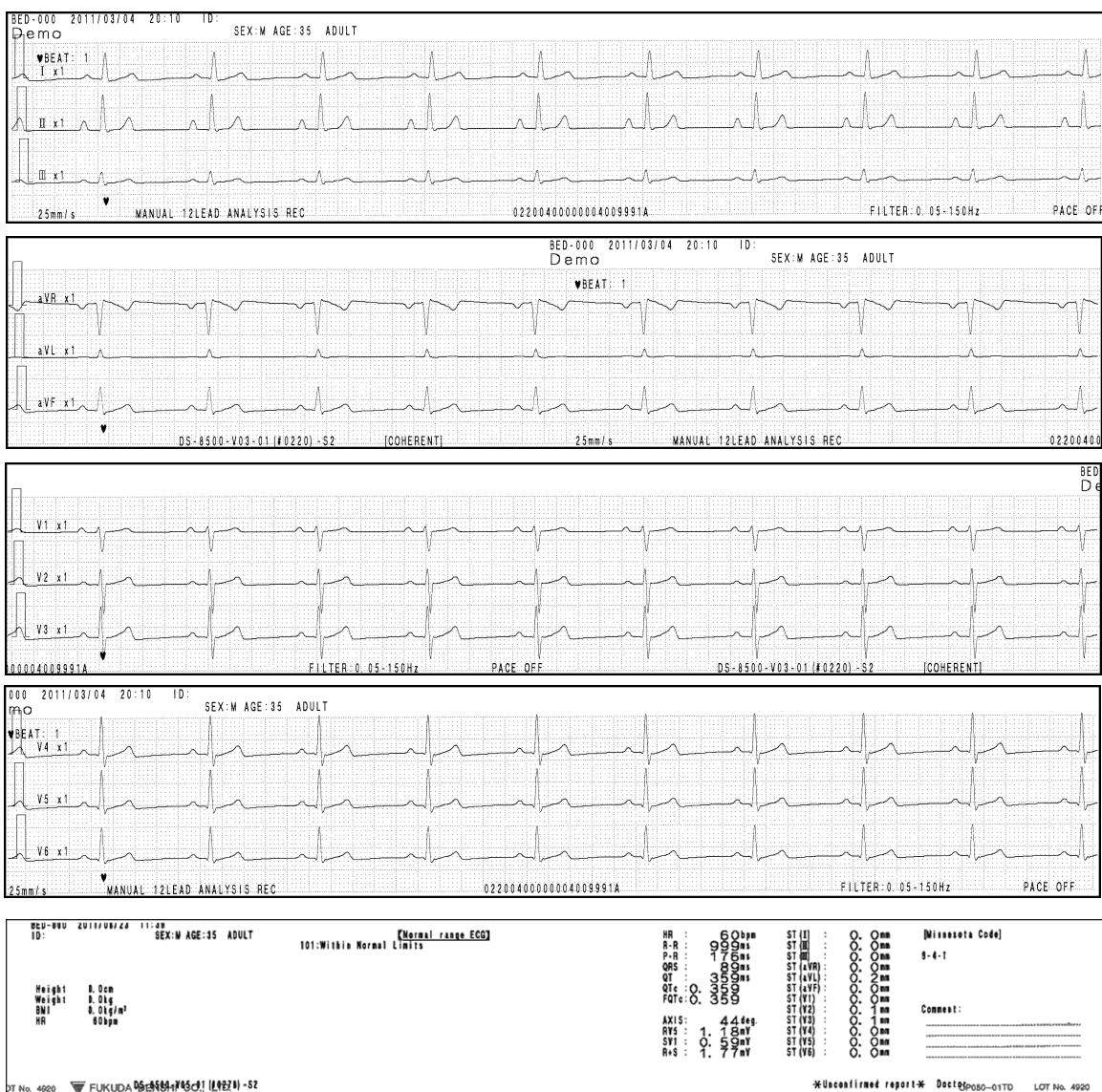
Heart Rate:	Heart rate obtained by basic arrhythmia measurement.
R-R:	R-R time of basic arrhythmia measurement. The average value of heart rates in which one P-wave has been found is calculated first, and then the average value is recalculated based on the R-R time within $\pm 25\%$ of the value calculated 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. $\text{Axis } (\circ) = \text{Tan}^{-1} \left[ \frac{\sqrt{3} (II + III)}{2I + II - III} \right]$ 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".

## Built-in Printer Output

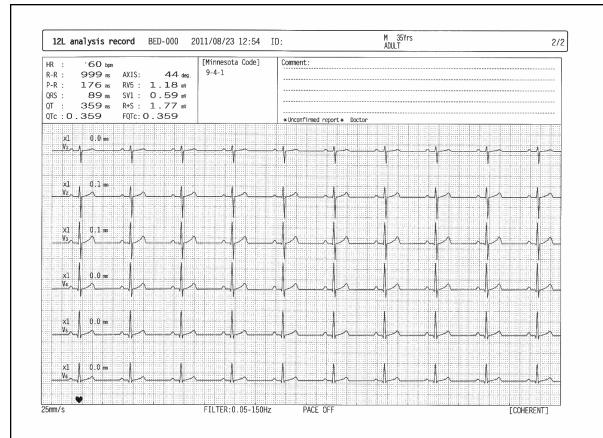
- When [Built-in] is set for the 12-lead waveform printer selection, [Waveform Report]/[Analyzed Report] key will be displayed when [Print] key is pressed.
  - The following is the output example when [Analyzed Report] is pressed.



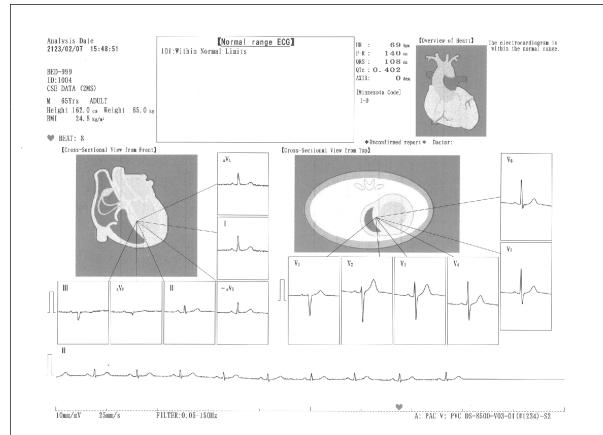
- ▶ When [Waveform Report] is pressed, the analyzed waveform will be output in a conventional format.

## □ 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" P5-5)

## To Format the CF Card

### REFERENCE

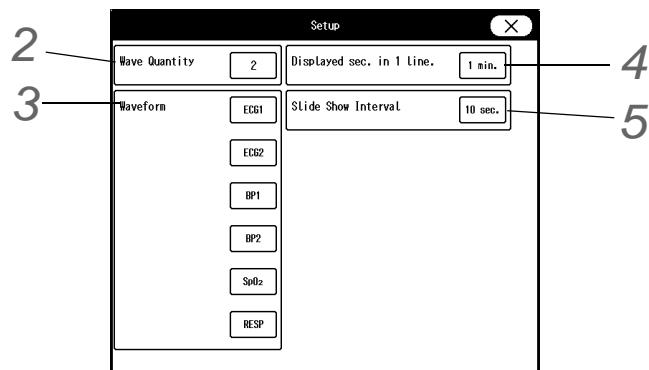
- ♦ To store the full disclosure waveform data, it is necessary to format the CF card for the full disclosure waveform.  
( Maintenance Manual "Using the CF card" P3-1)

## Waveform Setup

The quantity and type of storing waveform, display duration (sec.) per line for the full disclosure waveform can be preprogrammed.

- 1 Press the [Menu], [Full Disc.] ("Waveform Review"), [Setup] key.

- The "Setup" window for full disclosure waveform will be displayed.

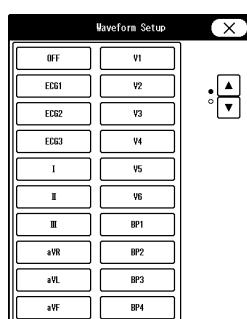


**2** Select the quantity of waveforms to display.

- 1 Press the key for "Wave Quantity".
- The dropdown list will be displayed.
- 2 Select from [1]/[2]/[3]/[4]/[5]/[6].

**3** Select the displaying waveform.

- 1 Press the key for "Waveform".
- The "Waveform Selection" window will be displayed.



**2** Select the parameter.

**4** Set the display duration (sec.) per line.

- 1 Press the key for "Time per Line".
- The dropdown list will be displayed.
- 2 Select from [10 sec.]/[30 sec.]/[1 min].

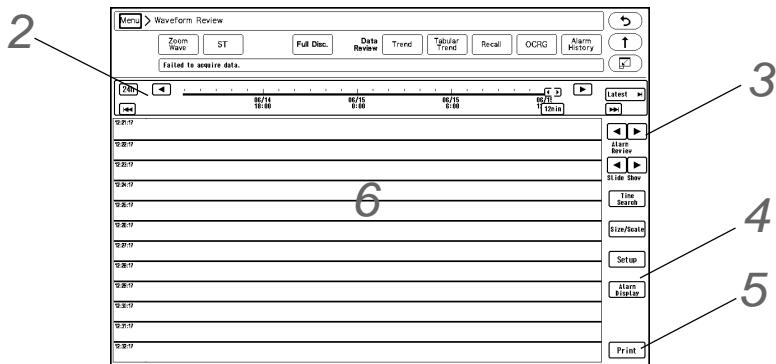
**5** Set the time interval for slide show.

- 1 Press the key for "Slide Show Interval".
- The dropdown list will be displayed.
- 2 Select from [1 sec.]/[5 sec.]/[10 sec.]/[20 sec.]/[30 sec.].

## Description of the Full Disclosure Waveform Display

**1** Press the [Menu], [Full Disc.] ("Waveform Review") key.

- ▶ Full disclosure waveform will be displayed.



**2** Scroll the displayed data.

(☞ "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 alarm-generated waveform can be changed.

**5** Press the [Print] key.

- ▶ The currently displayed waveform will be output on the printer.

**6** Press the waveform area.

- ▶ Press the desired waveform area. The Zoom Wave window will be displayed.

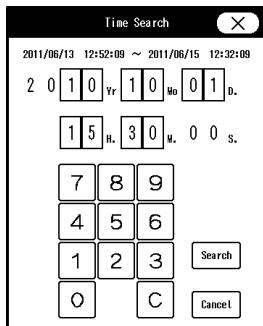
## To Search by Time

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 ( $m^2$ )	$h^{0.725} \times w^{0.425} \times 71.84 \times 10^{-4}$ (Dubois Formula)
CI	Cardiac Index (L/min/ $m^2$ )	$\frac{CO}{BSA}$
SV	Stroke Volume (mL/beat)	$\frac{CO \times 1000}{HR}$
SVI	Stroke Volume Index (mL/beat/ $m^2$ )	$\frac{SV}{BSA}$
SVR	Systemic Vascular Resistance (dynes·sec·cm $^{-5}$ )	$\frac{(MAP - CVP) \times 79.90}{CO}$
SVRI	Systemic Vascular Resistance Index (dynes·sec·cm $^{-5} \cdot m^2$ )	SVR $\times$ BSA
PVR	Pulmonary Vascular Resistance (dyn·sec·cm $^{-5}$ )	$\frac{(MPAP - PCWP) \times 79.90}{CO}$
PVRI	Pulmonary Vascular Resistance Index (dyn·sec·cm $^{-5} \cdot m^2$ )	PVR $\times$ BSA
LVW	Left Ventricular Work (kg·m)	CO $\times$ (MAP-PCWP) $\times 0.0136$
LVWI	Left Ventricular Work Index (kg·m $^2$ )	$\frac{LVW}{BSA}$
LVSW	Left Ventricular Stroke Work (g·m)	SV $\times$ (MAP-PCWP) $\times 0.0136$
LVSWI	Left Ventricular Stroke Work Index (g·m/m $^2$ )	$\frac{LVSW}{BSA}$
RVW	Right Ventricular Work (kg·m)	CO $\times$ (MPAP-CVP) $\times 0.0136$
RVWI	Right Ventricular Work Index (kg·m/m $^2$ )	$\frac{RVW}{BSA}$
RVSW	Right Ventricular Stroke Work (g·m)	SV $\times$ (MPAP-CVP) $\times 0.0136$
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<sub>2</sub>O", it will

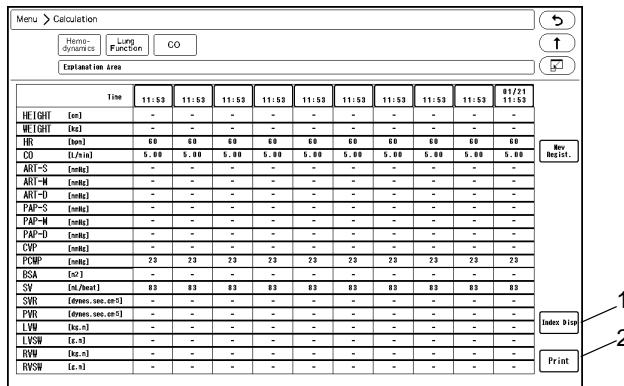
be converted to "mmHg" when calculating.

## 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, LVS, RVW, RVS will alternately switch with that of CI, SVI, SVRI, PVRI, LVWI, LWSWI, RVWI, RWSWI.

- 2** [Print] key

The currently displayed hemodynamic data will be printed.

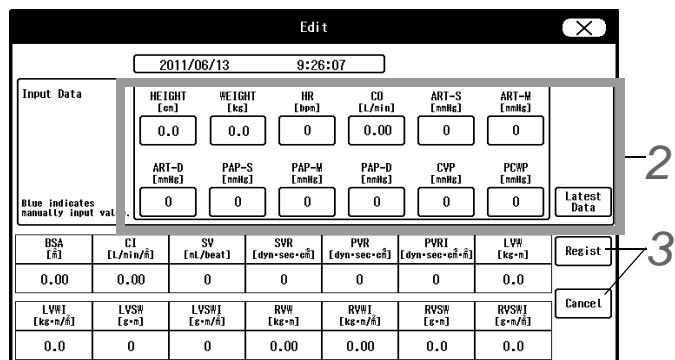
## New Input of Hemodynamics Calculation

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.

- Press the [Latest Data] key.  
▶ The measured data will be displayed.

To Edit the Data:

- Select the data to edit.  
▶ The numeric keys will be displayed.
- Enter the value using the numeric keys.
- 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
BSA	Body Surface Area (m <sup>2</sup> )	0 to 9.99m <sup>2</sup>
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

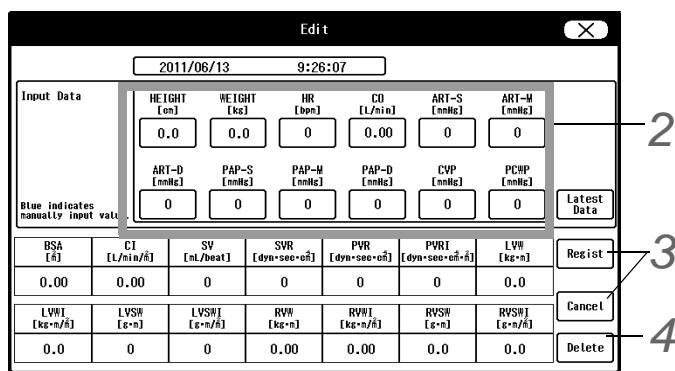
- If the necessary value for calculation is not input, the calculation result will not be displayed.
- Maximum of 10 data can be registered. If exceeded, the oldest data will be deleted.

- 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.

- Press the [Menu], [Hemodynamics] ("Calculation"), and then the date/time display area for the data to edit.  
▶ The "Edit" window will be displayed.



- Edit the data.  
(☞ "New Input of Hemodynamics Calculation" P8-44)
- Register the edited data.  
(☞ "New Input of Hemodynamics Calculation" P8-44)
- Delete the data.

- Press the [Delete] key.  
▶ The "Delete" window will be displayed.
- 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 <sup>2</sup> )	$h^{0.725} \times w^{0.425} \times 71.84 \times 10^{-4}$
CaO <sub>2</sub>	Arterial Oxygen Content (mL/dL)	$CaO_2 = 1.34 \times Hb \times SaO_2 + 0.003 \times PaO_2$
CvO <sub>2</sub>	Mixed Venous Oxygen Content (mL/dL)	$CvO_2 = 1.34 \times Hb \times SvO_2 + 0.003 \times PvO_2$
a-vDO <sub>2</sub>	Arteriovenous Oxygen Content Difference (vol %)	$a-vDO_2 = CaO_2 - CvO_2$
DO <sub>2</sub>	Oxygen Transport(mL/min)	$DO_2 = CaO_2 \times CO \times 10$
DO <sub>2</sub> I	Oxygen Transport Index(mL/min/m <sup>2</sup> )	$DO_2I = CaO_2 \times Cl \times 10$
VO <sub>2</sub>	Oxygen Consumption(mL/min)	$VO_2 = a-vDO_2 \times CO \times 10$
VO <sub>2</sub> I	Oxygen Consumption Index(mL/min/m <sup>2</sup> )	$VO_2I = a-vDO_2 \times Cl \times 10$
O <sub>2</sub> ER	Oxygen Extraction Rate (%)	$O_2ER = (CaO_2 - CvO_2) / CaO_2 \times 100$
AaDO <sub>2</sub>	Alveolar-Arterial Oxygen Difference (Torr)	$AaDO_2 = PAO_2 - PaO_2$ $PAO_2 = PI O_2 - (PACO_2/R) \times (1 - FIO_2 \times (1 - R))$ R:Respiration Quotient (0.8 for this equipment) $PI O_2 = (PB - 47) \times FIO_2$
Q <sub>s</sub> /Q <sub>t</sub>	Shunt Rate (%)	$Q_s/Q_t = (CcO_2 - CaO_2) / (CcO_2 - CvO_2)$ $CcO_2 = 1.34 \times Hb + 0.003 \times PAO_2$

#### REFERENCE

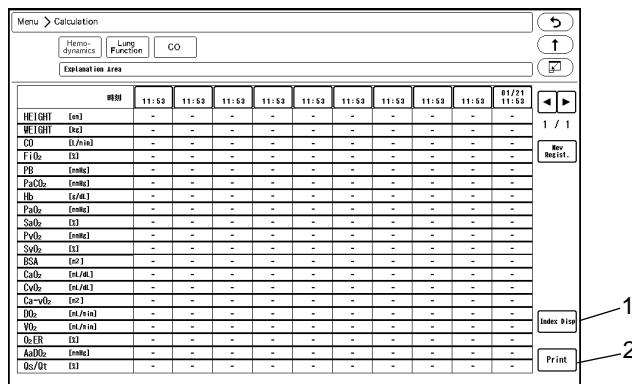
- The blood pressure unit for lung function calculation is "mmHg". If the unit is other than "mmHg", it will be converted to "mmHg" when calculating.

## To Display/Print the Lung Function Data

256 lung function data can be viewed in list format.

- Press the [Menu], [Lung Function] ("Calculation") keys.

► The lung function list will be displayed.



- [Index Disp] key

The display of BSA, CaO<sub>2</sub>, CvO<sub>2</sub>, a-vDO<sub>2</sub>, DO<sub>2</sub>, VO<sub>2</sub>, O<sub>2</sub>ER, AaDO<sub>2</sub>, Qs/Qt will alternately switch with that of CI, DO<sub>2</sub>I, VO<sub>2</sub>I.

- [Print] key

The currently displayed lung function data will be printed.

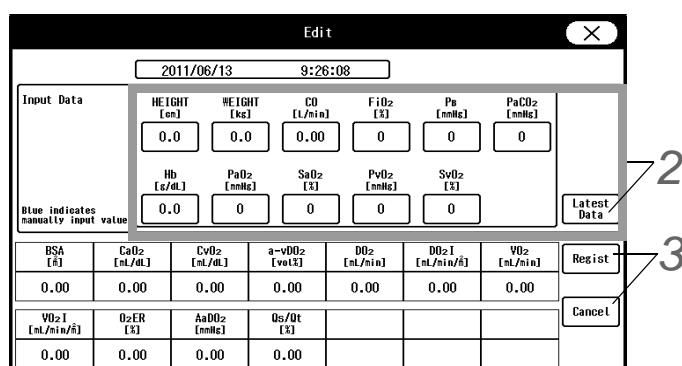
## New Input of Lung Function Calculation

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.

- Press the [Menu], [Lung Function] ("Calculation"), [New Regist.] keys.

► The "Edit" window will be displayed.



- Enter the calculation data.

- 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 <sup>2</sup> )
CO	Cardiac Output (L/min)
FIO <sub>2</sub>	Fraction of Inspiratory Oxygen(%)
P <sub>B</sub>	Atmospheric Pressure (mmHg)
PaCO <sub>2</sub>	Partial Pressure of Arterial Carbon Dioxide (mmHg)
Hb	Hemoglobin Concentration (g/dL)
PaO <sub>2</sub>	Partial Pressure of Arterial Oxygen (mmHg)
SaO <sub>2</sub>	Arterial Oxygen Saturation(%)
P̄O <sub>2</sub>	Partial Pressure of Mixed Venous Oxygen (mmHg)
S̄O <sub>2</sub>	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.

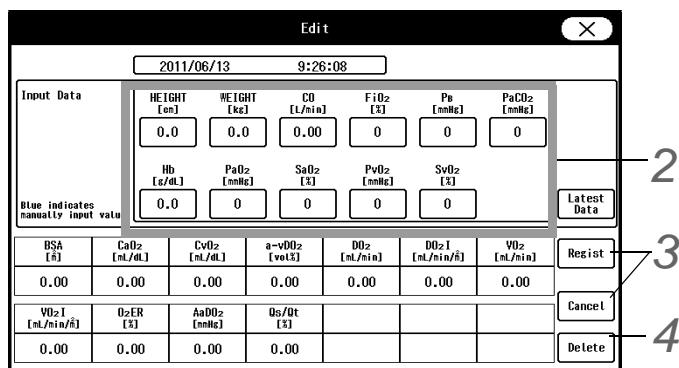
## To Edit the Lung Function Input Data

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" P8-48)

**3**

Register the lung function list.

(☞ "New Input of Lung Function Calculation" P8-48)

**4**

Delete the data.

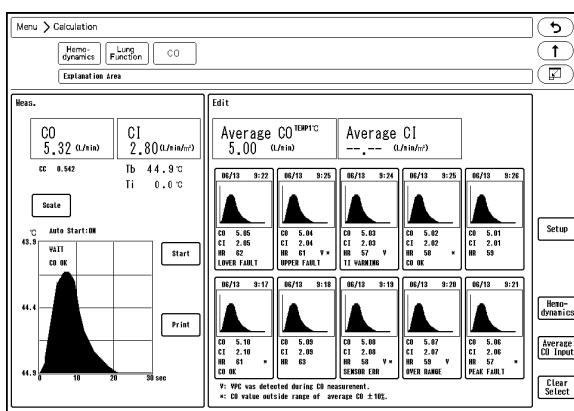
(☞ "New Input of Lung Function Calculation" P8-48)

## 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.

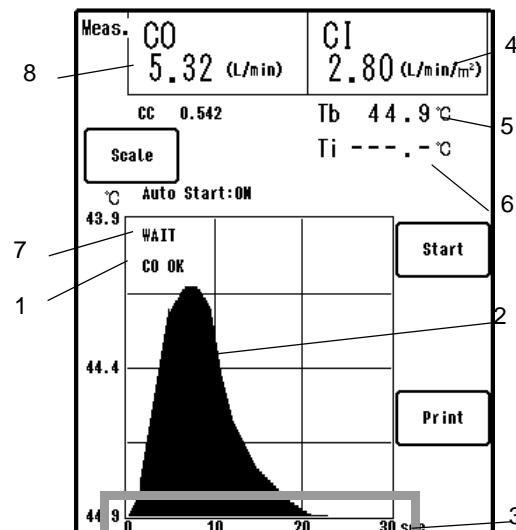
### To Display the CO Measurement Screen

- 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)

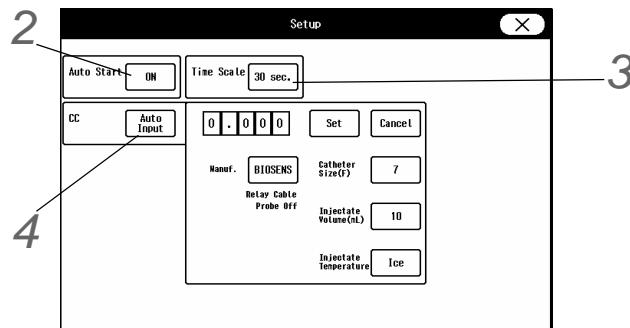


## Cardiac Output Setup

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".

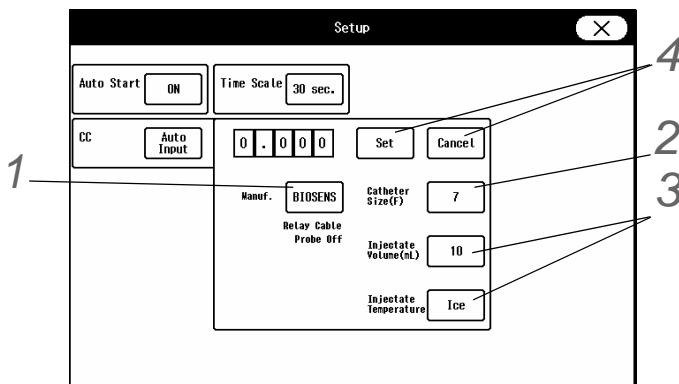
► The dropdown list will be displayed.

- 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.

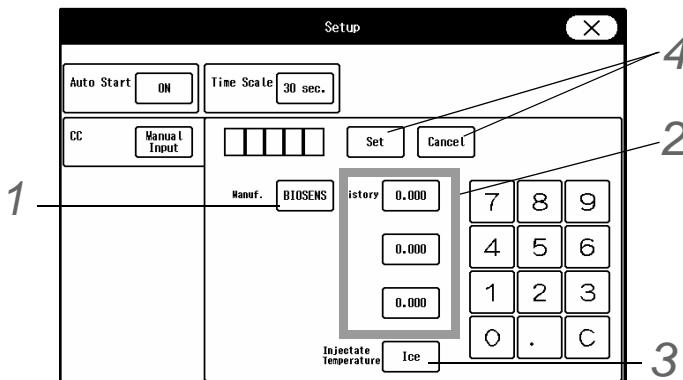
- 4** Press the [Set]/[Cancel] key.

► [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 be connected.

## □ Manual Input of Computation Constant



**1** Select the catheter manufacturer from [BIOSENS]/[ARGON]/[EDWARDS].

**2** Up to 3 types of CC value can be programmed for each manufacturer.

When the programmed history is present:

**1** Press the key for "History".

When the programmed history is not present:

**1** Use the numeric keys to enter the CC value.

**3** Set the "Injectate Temperature".

(☞ "Auto Input of Computation Constant" P8-53)

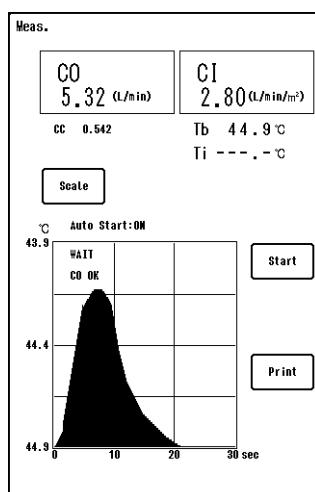
**4** Press the [Set]/[Cancel] key.

▶ [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 Name" P5-1)
- For the following cases, measurements may be inaccurate.
  - Shunt disease, tricuspid regurgitation or pulmonic regurgitation.
  - During exercise stress  
As body temperature varies non-continuously and unevenly by exercise, constant CO value cannot be measured.
  - Excessive Arrhythmia  
As blood volume varies non-continuously due to arrhythmia, accurate CO value cannot be measured.

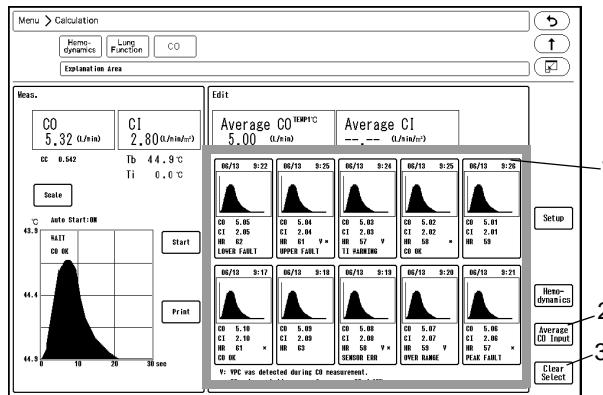
## To Edit the CO Measurement Result

The average CO and average CI can be calculated by performing the CO measurement continuously and editing the measurement result.

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

- ▶ The CO measurement screen will be displayed.

- The average CO and average CI value obtained from the measurement result will be displayed.



### 1 To Change the Selected Status

The selected data for the average value will be displayed in blue.

Press the graph area to change the selected status.

V Mark: VPC detected during CO measurement.

\*: CO value exceeding the average CO value  $\pm 10\%$ .

### 2 [Average CO Input] key

The displayed average CO value will be input to the list.

#### NOTE

- If the height, weight, BSA is changed on the "Admit/Discharge" screen, average CI will be recalculated.
- As the CI will not be recalculated after the hemodynamic calculation, store the average CI by hemodynamic calculation before changing the height, weight, and BSA.

### 3 [Delete Sel.] key ([Delete] key)

The [Delete Sel.] key will change to [Delete] key and allows to delete the data.

x mark will be displayed for the data to be deleted, and pressing the [Delete] key will delete the data.

## Other Bed Display

This section explains about the function to display the waveform and numeric data of other bedside monitors and to set the alarms for other bedside monitors.

The other bed alarm function generates the alarm sound for the other bed on this monitor. To use this function, wired network (DS-LANII or DS-LANIII) connection is required.

#### ⚠ CAUTION

- On the DS-LANII network system, maximum of 3 monitors (including the central monitor) can display the data of this monitor using the other bed display function. However, there is no restriction of numbers for the DS-7000 series central monitors and DS-5700. These monitors will be counted as 1 monitor regardless of the numbers.  
Ex. 1) In case of 1 central monitor and 5 bedside monitors (A to E):  
The total number of monitors that can display the data of Bedside Monitor A is 3 monitors which consist of 1 central monitor and 2 out of 4 bedside monitors (B to E).  
Ex. 2) In case of 3 central monitors (DS-7000 series or DS-5700) and 5 bedside monitors (A to E):  
The total number of monitors that can display the data of Bedside Monitor A is 5 monitors which consist of 3 central monitors and 2 out of 4 bedside monitors (B to E).
- If the number of bedside monitors displaying the same bed exceeds the limit, the bedside monitor with smaller ID will be prioritized.
- If monitoring 12-lead waveform on the central monitor, the total numbers of monitors that can

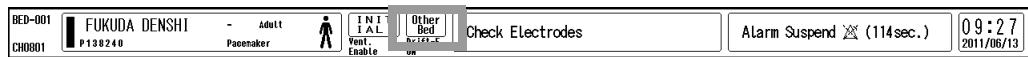
display the same bed will be reduced by 1.

**NOTE**

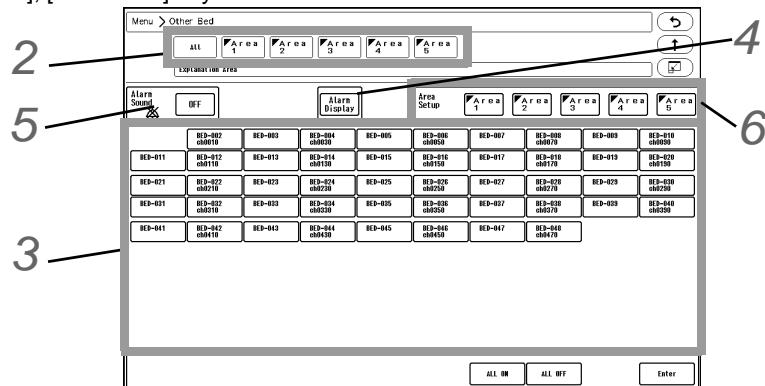
- This equipment cannot connect to a wired network of AU-5500N 8ch Recorder set as the administrator.  
Even if connected, other bed display, printing and other function cannot be used.

## Other Bed Display/Alarm

The other bed display can be accessed from the menu or from the preprogrammed user key. Also, by setting the other bed alarm [ON], [Other Bed] key will be displayed when other bedside monitor generates an alarm. By pressing this [Other Bed] key, the display for the other bed can be accessed.



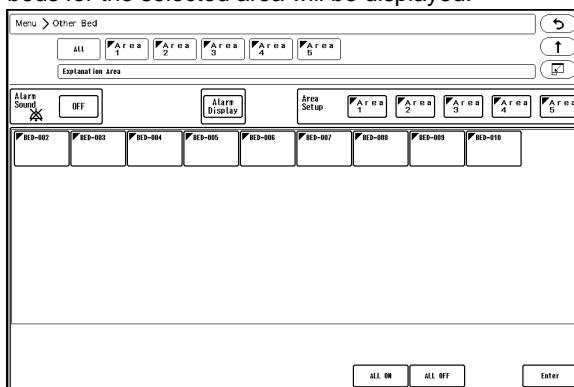
- 1** Press the [Menu], [Other Bed] keys.



- On the other bed selection screen, select the bed from the maximum of 100 beds (DS-LANIII) connected to the wired network. The bed ID/room ID for the alarm generated bed will be displayed in red. For the alarm generated bed, bell mark icon will be displayed.

- 2** Select the area.

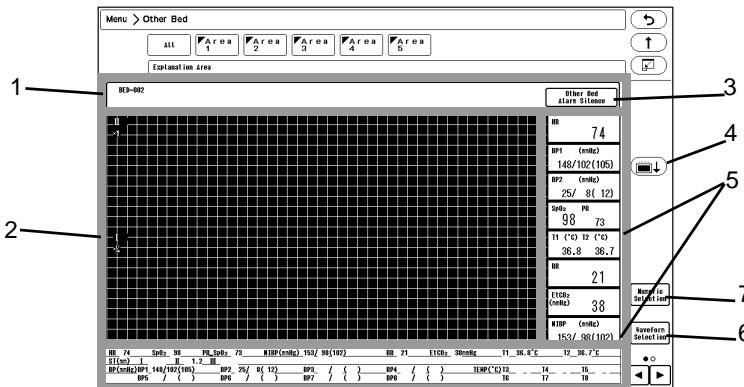
- Select the area to be displayed.
  - [All]: The beds for all the area connected to the network will be displayed.
  - [Area 1 to 5]: The beds for the selected area will be displayed.



**3**

Press the room/bed ID key to display the other bed.

The waveforms and numeric data for the selected bed will be displayed. If the alarm is generated for that bed, numeric data alarm, arrhythmia alarm message will be displayed.

**1** Message Area

The message for the other bed will be displayed.

**2** Waveform Display Area

Maximum of 6 waveforms for the DS-LANIII network, and maximum of 2 waveforms for the DS-LANII network can be displayed.

**3** By pressing the [Other Bed Alarm Silence] key on the other bed display, the alarm sound for the displayed bed can be silenced.

**4** 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-LANIII network, and maximum of 2 waveforms for the DS-LANII 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**

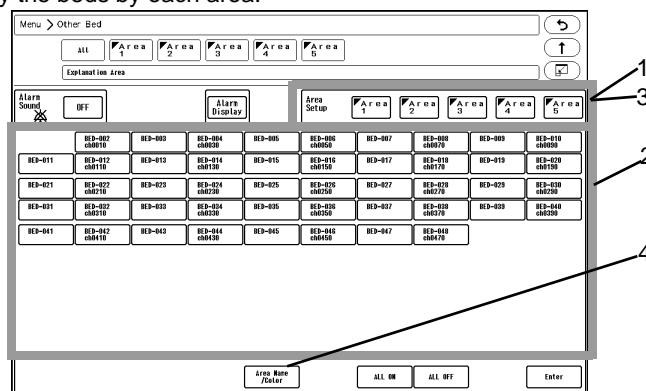
Turn ON the other bed alarm.

- [ON]: Other bed alarm will be generated.
- [OFF]: Other bed alarm will not be generated.

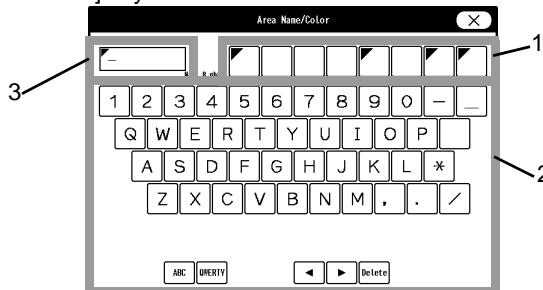
**6**

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 "Area Setup" will be displayed in blue. To return to the original mode, press the key for "Area Setup" again.
- 2 Select the room/bed ID for the bed to assign to the area. The selected bed will be indicated by blue frame. To cancel the selection, press the key for the bed again.
  - ▶ [Select All], [Cancel All]: Selection/cancellation for all the beds can be performed at once.
  - ▶ [Enter]: The selection will be finalized.
- 3 Press the key for "Area Setup" to change the area setup mode.
- 4 Press the [Area Name/Color] key.



- 1 Select the color to distinguish the area.  
A triangle mark with the selected color will be displayed at the corner of the room/bed ID key.
- 2 Enter the area name using the numeric keys.
- 3 Maximum of 8 characters can be set for the area name.



# Chapter 9 Printing

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Manual Printing (12-Lead) .....	9-2
Manual Printing (Other Setup) .....	9-4
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# Chapter 9 Printing

## Printing Setup

This section describes the procedure for printing.

For the DS-8500 System, the following can be performed.

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

### REFERENCE

- ♦ The printed HR/PR data depends on the ECG/SpO<sub>2</sub>/BP selection for "Synchronized Mark/Tone" (Menu>Parameter>ECG, SpO<sub>2</sub>, BP).  
 "Synchronized Mark/Tone" 7-11)

**1** Press the [Menu], [Manual Printing] or [Auto Printing] ("Basic Setup") keys.

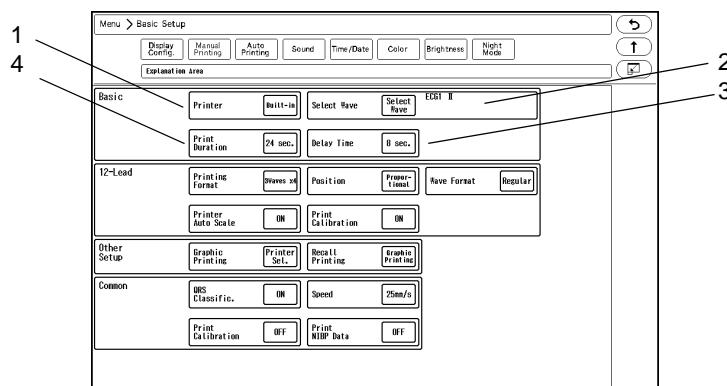
► The manual printing or automatic printing setup screen will be displayed.

### Manual Printing (Basic)

The manual printing can be set to start from the time the key is pressed, or 8 sec. / 16 sec. prior to the time the key is pressed.

Also, the printing can be set to automatically stop after 24 seconds, or continue to print until the [Print Start/Stop] key is pressed again.

The printer can be selected from built-in printer or central monitor printer.



**1** Printer

[Built-in]: Outputs to the HR-800 Recorder Unit.

[Central]: Outputs to the central monitor printer.

**2** Waveform

On the "Select Wave" window, 3 waveforms can be selected for printing.

The key for the selected waveform will be displayed in blue.

### 3 Delay Time

[None]: Printing will start from the point the [Print Start/Stop] key is pressed.

[8 sec.]/[16 sec.]: Printing will start 8 sec. or 16 sec. prior from the point the [Print Start/Stop] key is pressed.

**NOTE**

- If [None] is selected for the manual printing delay time, QRS classification symbol will not be printed. To print the QRS symbol, set the delay time to [8 sec.] or [16 sec.].

### 4 Print Duration

[24sec.]: Printing will automatically stop after 24 seconds.

[Cont.]: Printing will continue until the [Print Start/Stop] key is pressed again or until paper runs out.

## □ To Start/Stop the Printing

**1**

Press 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.

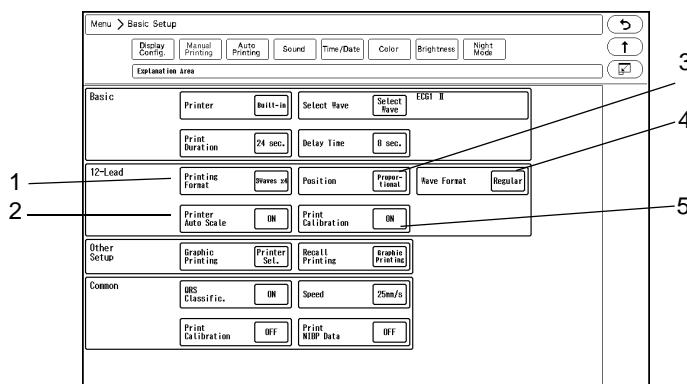


Message	Details
none	Normal Operation
PAPER OUT	There is no paper.
CASSETTE	Check the cassette.
CHECK?	Other abnormality is found.

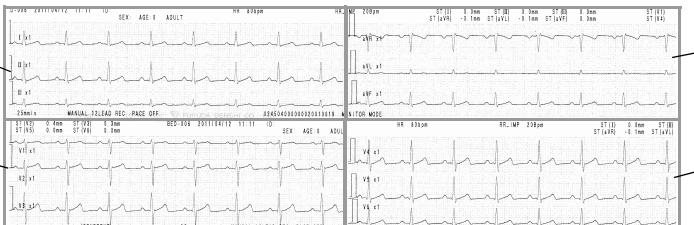
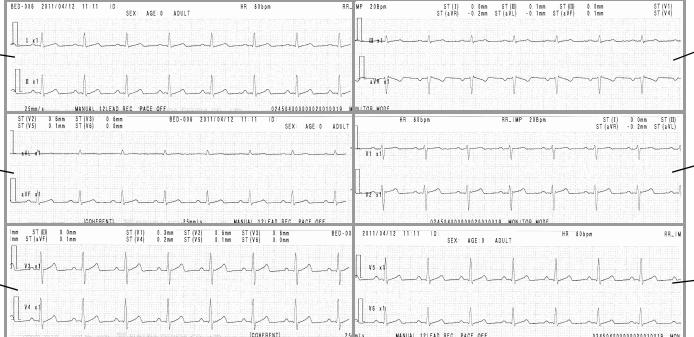
## Manual Printing (12-Lead)

The 12-lead waveform can be printed on the built-in printer. (Delay time: 6 seconds)

It cannot be printed on the central monitor printer.



### 1 Printing Format

Output Example	Waveform Layout	Length of Each Waveform
<b>3Wavesx4</b> 	1st column: I,II,III 2nd column: aVR, aVL, aVF 3rd column: V1, V2, V3 4th column: V4, V5, V6	6 sec.
<b>2Wavesx6</b> 	1st column: I,II 2nd column: III, aVR 3rd column: aVL, aVF 4th column: V1, V2 5th column: V3, V4 6th column: V5, V6	6 sec.

## 2 Printer Auto Scale

**NOTE**

- The printer scale will be adjusted in the range of x1, x1/2, x1/4. It will not be adjusted to x2, x4 even if the amplitude is small.

**REFERENCE**

- When position adjustment is [OFF], select whether or not to automatically adjust the scale.

[ON]: Printing scale will be automatically adjusted.

[OFF]: 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 Waveform Format

[Regular]: Printing will start from the limb leads. (In the order of I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6)

[Reverse]: Printing will start from the chest leads. (In the order of V1, V2, V3, V4, V5, V6, I, II, III, aVR, aVL, aVF)

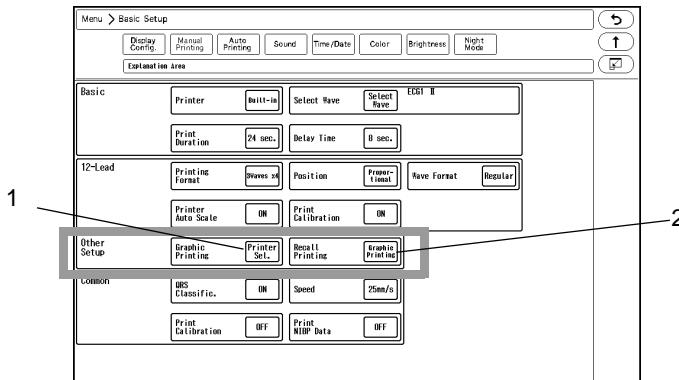
## 5 Print Calibration

[ON]: Calibration waveform will be printed.

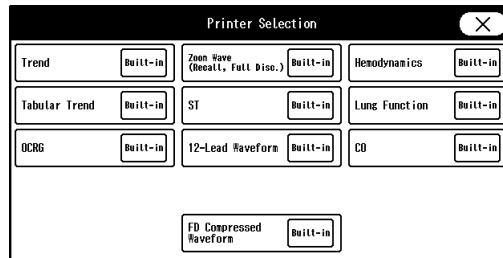
[OFF]: Calibration waveform will not be printed.

## Manual Printing (Other Setup)

Select the printer for graphic printing and recall printing.



- 1 Press the key for [Graphic Printing] to display the "Printer Selection" window.



- ▶ [Built-in]: Data will be printed on the HR-800 Recorder Unit.
- ▶ [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" P4-24)

- 2 Recall Printing

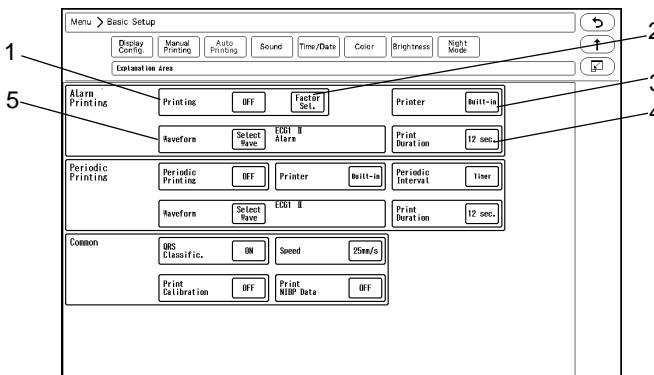
- ▶ [Graphic Printing]: Recall data will be output on the printer selected for "Graphic Printing".
- ▶ [Manual Printing]: Recall data will be output on the printer selected for "Printer" under "Basic".

## Automatic Printing (Alarm Printing)

The data will be automatically printed at occurrence of numeric alarm or arrhythmia alarm.

### NOTE

- The alarm detection is performed each second, and if more than one alarm occurs at the same time, one data will be stored according to the alarm priority.
- Maximum of 3 alarm data can be stored. If more than 3 alarms generate, the higher priority alarm will replace the previously stored lower priority alarm. The stored data will be deleted once it is printed.
- Priority of alarm printing factor ;
   
ASYSTOLE>VF>VT>SLOW VT>TACHY>BRADY>RUN>
   
HR(HR / PR\_SpO<sub>2</sub> / PR\_IBP)>APNEA>BP1(or ART)>SpO<sub>2</sub>>
   
NIBP>RR(RR\_IMP / RR\_CO<sub>2</sub> / RR\_GAS / RR\_VENT)>EtCO<sub>2</sub>>
   
GAS(CO<sub>2</sub>-E / CO<sub>2</sub>-I / AGT-E / AGT-I / O<sub>2</sub>-E / O<sub>2</sub>-I / N<sub>2</sub>O-I)>MAC>MV>PAUSE>COUPLET>
   
BIGEMINY>TRIGEMINY>FREQUENT>BP2>BP3>BP4>BP5>BP6>
   
BP7>BP8>ST>TEMP>Tb>InspCO<sub>2</sub>>SpCO>SpMet>SpHb>PEAK>PEEP>BIS

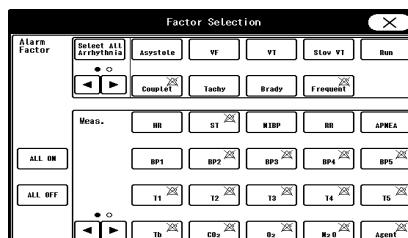


### 1 Alarm Printing

[ON]: Printing will automatically start at alarm occurrence.

[OFF]: Printing will not start at alarm occurrence.

### 2 Alarm Factor Selection



The "Factor Selection" window will be displayed.

The selected alarm factor key will be displayed in blue.

The alarm OFF mark will be displayed inside the key for the parameter in alarm OFF condition.

[Select All Arrhythmia]: All arrhythmia will be selected as alarm factor.

[All ON]: All parameters will be selected as alarm factor.

[All OFF]: All selections for the alarm factor will be cancelled.

### 3 Printer

[Built-in]: Data will be printed on the HR-800 Recorder Unit.

[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)

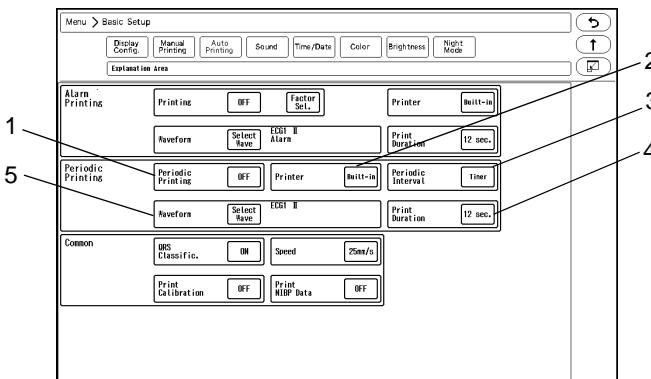
[Alarm]: Prints the waveform of the alarm factor.

## 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.

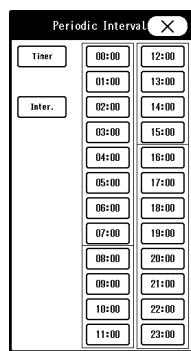
[OFF]: Turns OFF the periodic printing function.

## 2 Printer

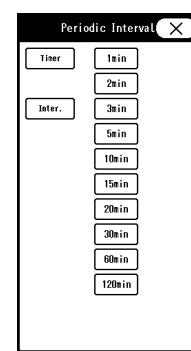
[Built-in]: Data will be printed on the HR-800.

[Central]: Data will be printed on the central monitor printer.

### 3 Periodic Interval



Display Example for "Timer"



Display Example for "Interval"

[Timer]: Printing will automatically start at selected time.

[Interval]: Printing will automatically start at selected interval.

#### REFERENCE

- If [5 min.] is selected for [Interval], printing will start at 10:00, 10:05, ...10:25. If [60 min.] is selected, printing will start at 10:00, 11:00, 12:00, ....

### 4 Print Duration

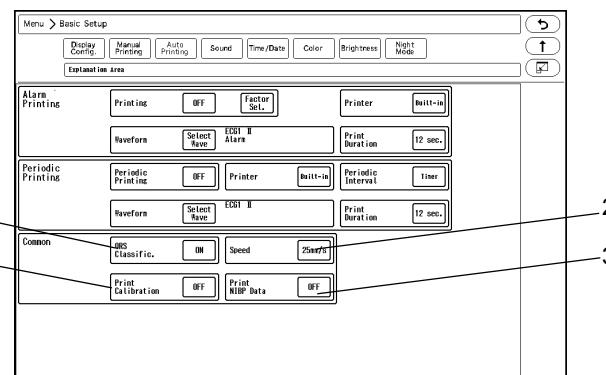
The printing will automatically stop after the selected duration.

### 5 Waveform

(☞ "Manual Printing (Basic)" P9-1)

## Common Setup for Printing

The printing condition common for manual printing and automatic printing can be set.



Display Example for Automatic Printing

### 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.

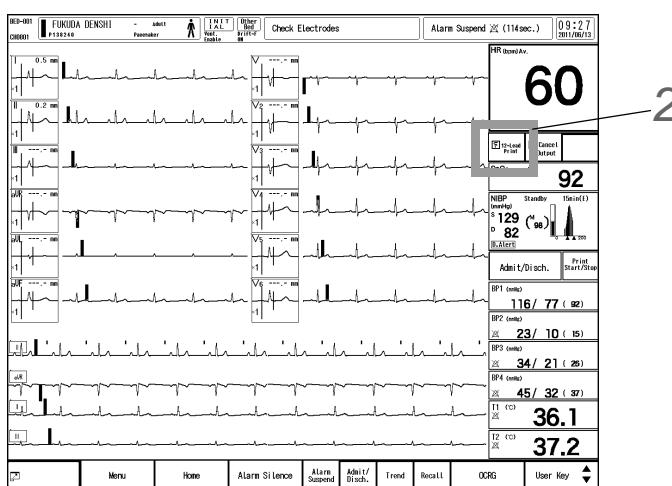
- ▶ The displayed waveform will be printed.
- ▶ Freeze printing will be output on the built-in printer. The waveforms selected for manual printing will be printed.

## 12-lead Waveform Printing

If "12-lead" layout is set for the display configuration, [12-Lead Print] key will be displayed to allow 12-lead waveform printing.

**1**

Select "12-Lead" for the display layout. (Menu>Display Config.)



**2**

Press the [12-Lead Print] key.

- ▶ Printing will start.
- ▶ The printing duration of the waveforms for each format are as follows.

	Printing Format	Printing Duration	Delay Time
In case of built-in printer	3 Waves x 4	6 sec.	6 sec.
	2 Waves x 6		
In case of laser printer	3 Waves x 4 <sup>*1</sup>	2.5 sec.	10 sec.
	6 Waves x 2	5 sec.	
	3 Waves x 4+Rhythm <sup>*1</sup>	12.5 sec.	
	12 Waves <sup>*2</sup>	10 sec.	

<sup>\*1</sup> :The waveform output will be in the time sequence of waveform block order.

<sup>\*2</sup> : The waveform output will be in the same time phase for all waveforms.



# Chapter 10 System Configuration

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Night Mode .....	10-29



# 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)

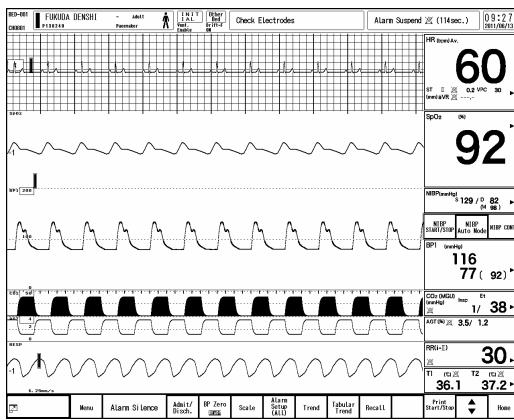
If ECG cascade or block cascade is selected, full disclosure waveform can be displayed. It is also possible to assign user keys to the numeric data area.

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

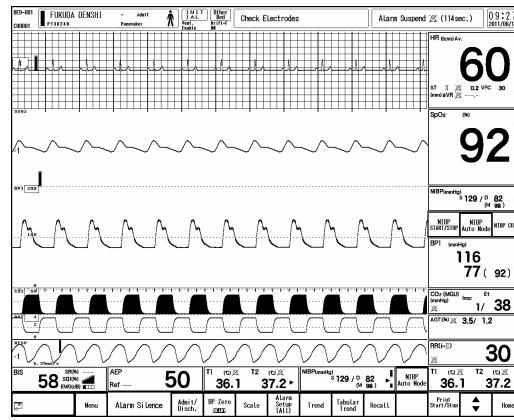
**NOTE**

- When LC-8015T is used, the layout for enlarged numeric data ("Large") cannot be selected.
-

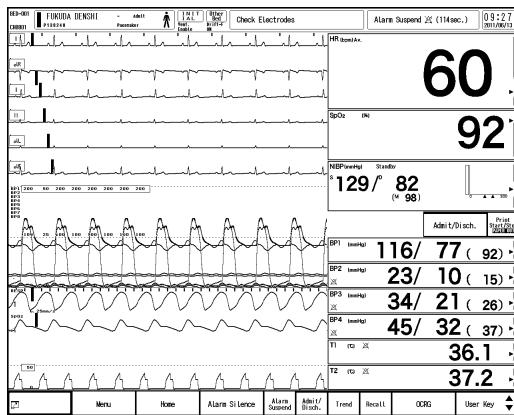
## Display Example of LC-8019T



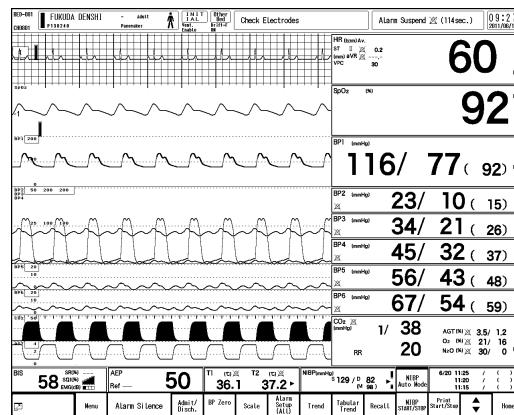
Standard (Box Layout: Right)



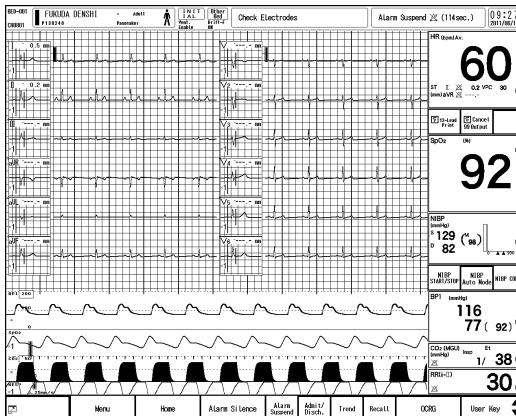
Standard (Box Layout: Right&amp;Bottom)



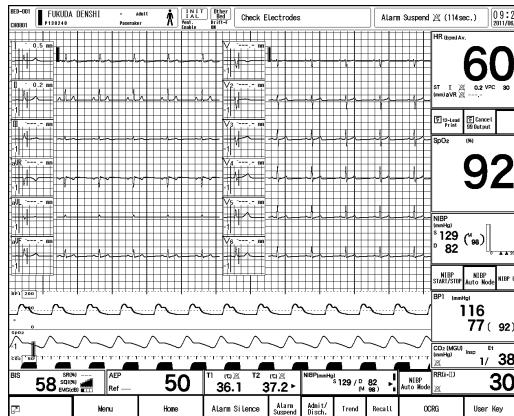
Large (Box Layout: Right)



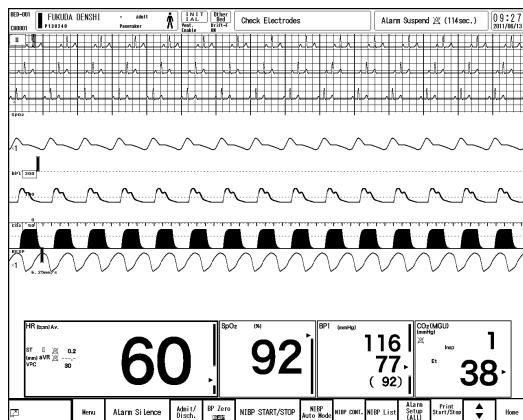
Large (Box Layout: Right&amp;Bottom)



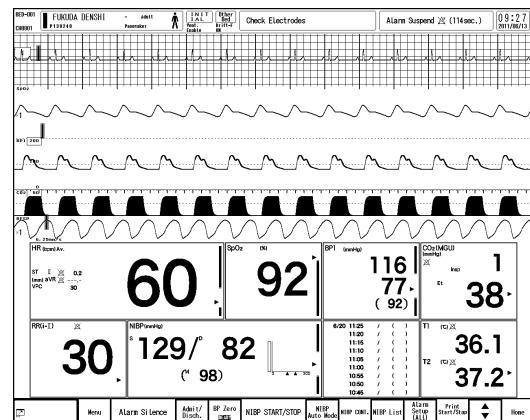
12-Lead (Box Layout: Right)



12-Lead (Box Layout: Right&amp;Bottom)



Standard (Box Layout: Bottom 1 row)



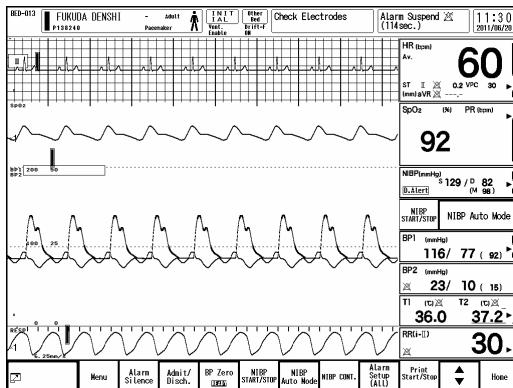
Standard (Box Layout: Bottom 2 rows)

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.

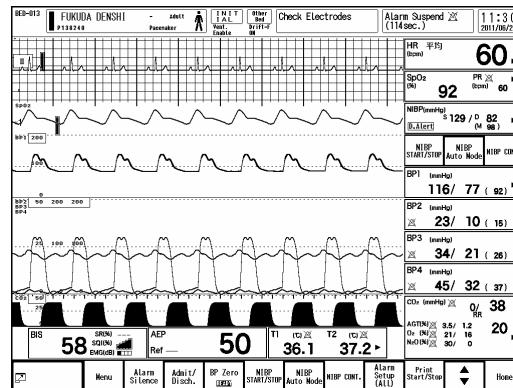
(☞ "To Select the User Mode" P5-7)

It is recommended to program the mode in rough classification such as patient's condition, monitoring purpose (ICU or surgery), and if necessary, perform unique setup for each patient.

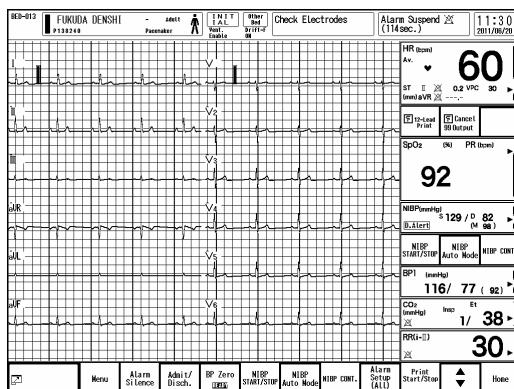
## □ Display Example of LC-8015T



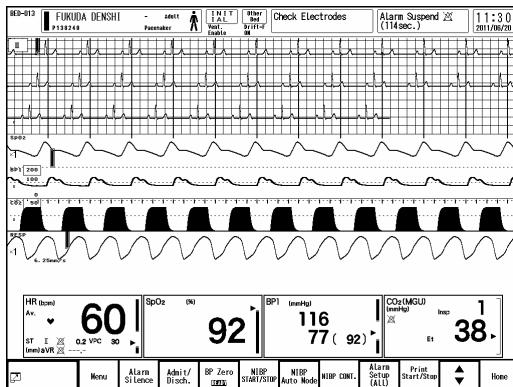
Standard (Box Layout: Right)



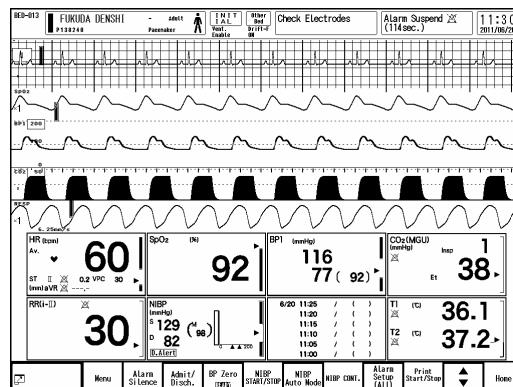
Standard (Box Layout: Right&amp;Bottom)



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" P5-7)

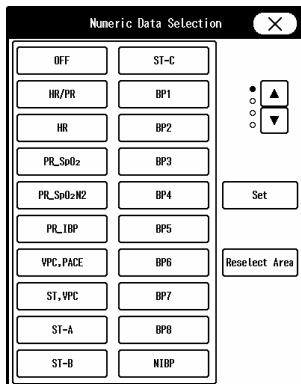
It is recommended to program the mode in rough classification such as patient's condition, monitoring purpose (ICU or surgery), and if necessary, perform unique setup for each patient.

## Numeric Data Selection

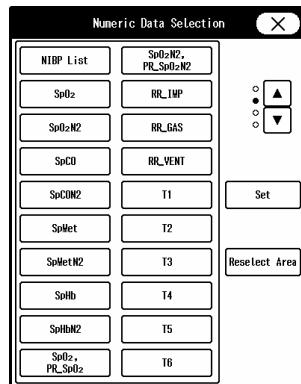
The numeric data to be displayed can be selected on the "Numeric Data Selection" window.

By selecting a parameter on the "Numeric Data Selection" window, it will be assigned to the numeric data box on the home display.

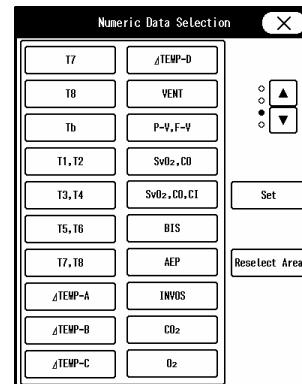
(☞ "Numeric Data Box Display (for each parameter)" P3-11)



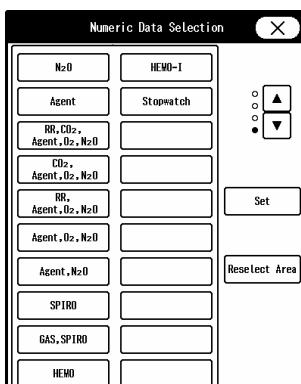
First Page



Second Page



Third Page



Fourth page

### The Numeric Data Box Size for Each Parameter

Numeric Data	Numeric Data Box Size							
	Width * <sup>1</sup>	W1/2	W1			W2 * <sup>3</sup>		
	Height * <sup>2</sup>	H1	H1	H2	H3	H1	H2	H3
HR/PR	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HR	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PR_SpO2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PR_IBP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VPC, PACE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ST, VPC	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ST-A, ST-B, ST-C	No	No	Yes	Yes	No	Yes	Yes	Yes
BP1 to BP8	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NIBP	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NIBP List	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SpO2	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SpO2, PR	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*The Numeric Data Box Size for Each Parameter*

Numeric Data	Numeric Data Box Size							
	Width <sup>*1</sup>	W1/2	W1			W2 <sup>*3</sup>		
	Height <sup>*2</sup>	H1	H1	H2	H3	H1	H2	H3
SpCO	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SpMet	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SpHb	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RR_IMP, RR_CO <sub>2</sub> , RR_VENT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
T1 to T8, Tb	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
T1/T2, T3/T4, T5/T6, T7/T8	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ΔTEMP-A, ΔTEMP-B, ΔTEMP-C, ΔTEMP-D	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VENT	No	No	Yes	Yes	No	Yes	Yes	
P-V, F-V	No	No	Yes	Yes	No	Yes	Yes	
SvO <sub>2</sub> , CO	No	No	Yes	Yes	No	Yes	Yes	
SvO <sub>2</sub> , CO, Cl	No	No	Yes	Yes	No	Yes	Yes	
BIS	No	Yes	Yes	Yes	Yes	Yes	Yes	
INVOS	No	Yes	Yes	Yes	Yes	Yes	Yes	
CO <sub>2</sub>	No	Yes	Yes	Yes	Yes	Yes	Yes	
O <sub>2</sub>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
N <sub>2</sub> O	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Agent	No	Yes	Yes	Yes	Yes	Yes	Yes	
RR, CO <sub>2</sub> , Agent, O <sub>2</sub> , N <sub>2</sub> O	No	No	Yes	Yes	No	Yes	Yes	
CO <sub>2</sub> , Agent, O <sub>2</sub> , N <sub>2</sub> O	No	No	Yes	Yes	No	Yes	Yes	
RR, Agent, O <sub>2</sub> , N <sub>2</sub> O	No	No	Yes	Yes	No	Yes	Yes	
Agent, O <sub>2</sub> , N <sub>2</sub> O	No	No	Yes	Yes	No	Yes	Yes	
Agent, N <sub>2</sub> O	No	Yes	Yes	Yes	Yes	Yes	Yes	
GAS, SPIRO	No	No	Yes	Yes	No	Yes	Yes	
SPIRO	No	No	Yes	Yes	No	Yes	Yes	
HEMO	No	No	Yes	Yes	No	Yes	Yes	
HEMO-I	No	No	Yes	Yes	No	Yes	Yes	
Stopwatch	No	Yes	Yes	Yes	Yes	Yes	Yes	

\*1: W1/2 is about 34mm, W1 is about 69mm, W2 is about 138mm

\*2: H1 is about 17mm, H2 is about 36mm, H3 is about 55mm (H1 is the same length as waveform areax2)

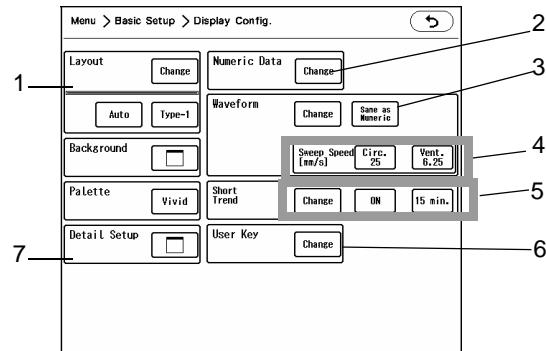
\*3: For LC-8015T, W2 size can be set only for "Bottom 1 row/2 rows" layout.

## To Configure the Display

**1** Press the [Menu], [Display Config.] ("Basic Setup") keys.

- ▶ The display configuration menu will be displayed.

- 1 Layout  
(☞ "Changing the Layout" P10-7)
- 2 Numeric Data  
(☞ "Changing the Displayed Numeric Data" P10-8)
- 3 Waveform  
(☞ "Changing the Displayed Waveform" P10-9)
- 4 Sweep Speed  
(☞ "Sweep Speed" P10-12)
- 5 Short Trend  
(☞ "Short Trend Display" P10-10)
- 6 User Key  
(☞ "User Key Setup" P10-12)
- 7 Detail Setup  
(☞ "Detail Setup" P10-14)



### □ Changing the Layout

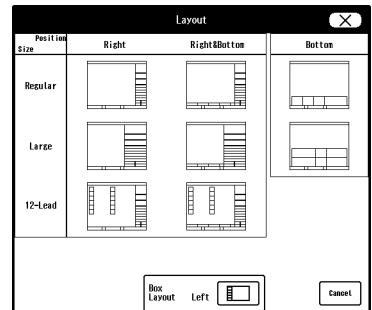
The layout can be changed with the following procedure.

**1** Press [Change] for "Layout".

- ▶ The "Layout" window will be displayed.

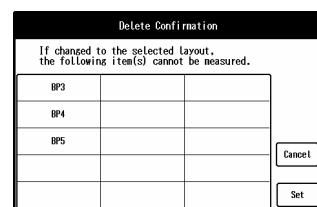
**2** Select the layout to be displayed.

- ▶ For LC-8015T, the following layout cannot be selected.  
\*Large  
\*12-Lead: Right/Left&Bottom



**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.

## □ Adjusting the Layout Automatically

The display layout can be automatically adjusted. The automatic mode can be selected from "Type-1" or "Type-2".

### ♦ 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 not enough space on the screen.) When 12-lead layout is displayed, the layout will change to "Standard". The order of display priority can be set on the "Auto Display Configuration" (Initial Settings>User I/F). ( Maintenance Manual "Display/Print Setup" P5-13)

### ♦ Type-2 (Auto Mode depending on Parameter Quantity)

The parameters will be automatically located depending on the 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 telemetry transmission or wired network communication, configure the display so that the numeric data corresponding to the waveform is displayed. If not, the displayed waveform or numeric data may not be transmitted.

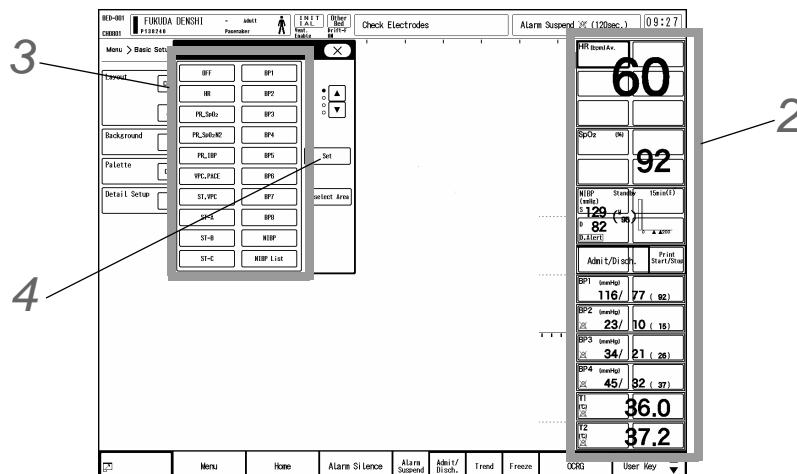
#### NOTE

- ♦ For HR/PR data, an alarm will be generated only for the current parameter displayed in the HR/PR numeric data box.  
The parameter for the HR/PR numeric data box can be selected by pressing the key for "HR/PR" on the ECG, BP, SpO<sub>2</sub> parameter setup window/floating window or by pressing the [HR/PR] user key.

**1** Press the [Change] key for "Numeric Data".

- ▶ The display will change to numeric data selection mode.

- The "Numeric Data Selection" window will be displayed.



**2** Press the numeric data display area to change the parameter.

- By pressing the selected area again, the selection will be cancelled.
- To restart from the beginning, press the [Reselect Area] key.
- Adjust the size of the selected area which will be indicated in blue frame.

**3** Select the parameter on the "Numeric Data Selection" window.

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 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.

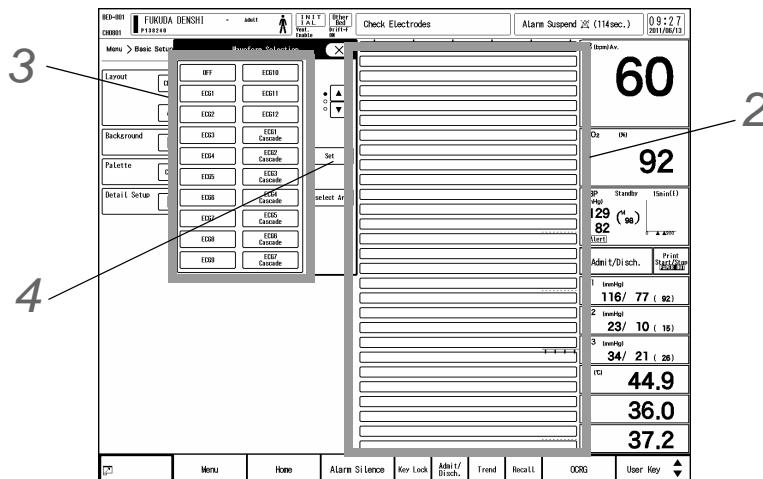
#### ⚠ CAUTION

- When performing telemetry transmission or wired network communication, configure the display so that the numeric data corresponding to the waveform is displayed. If not, the displayed waveform or numeric data may not be transmitted.

**1** Press [Change] for "Waveform".

- The display will change to waveform selection mode.

- ▶ The "Waveform Selection" window will be displayed.



**2** Press the waveform display area to change the parameter.

- ▶ By pressing the selected area again, the selection will be cancelled.
- ▶ To restart from the beginning, press the [Reselect Area] key.
- ▶ Adjust the size of the selected area which will be indicated in blue frame.

**3** Select the parameter on the "Waveform Selection" window.

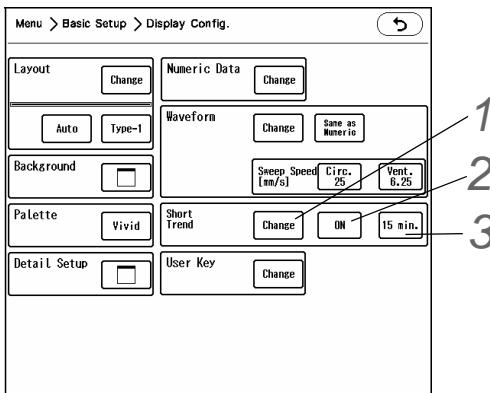
Press the **▲** / **▼** keys to switch the displayed parameters.  
( ↴ "Waveform Selection" P10-17)

**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.

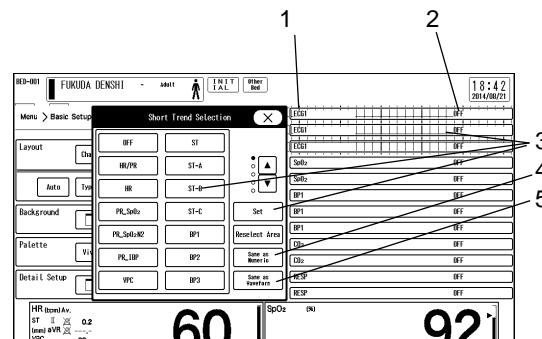


### NOTE

- ◆ 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.

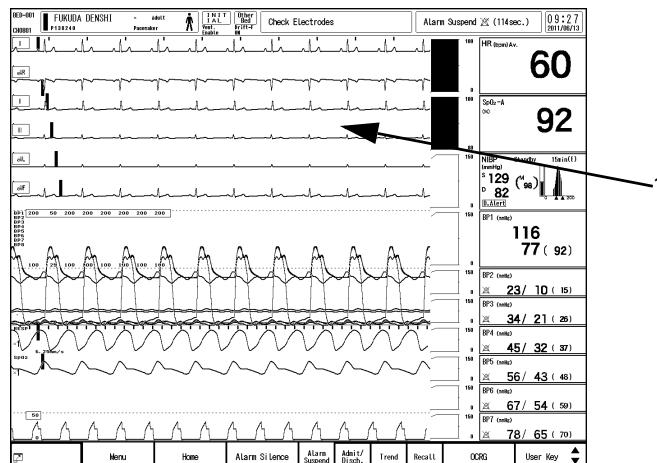
- ▶ [ON]: Short trend will be displayed on the home display.
- ▶ [OFF]: Short trend will not be displayed on the home display.
- ▶ [Overlap]: Short trend will be displayed overlapped with the waveform.

**3** When [ON] or [Overlap] is selected, select the display duration. The selectable duration differs depending on the short trend data resolution.

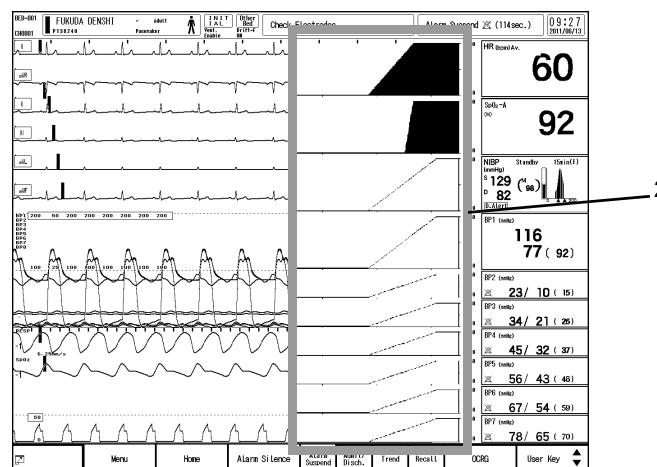
		Display Duration (7 levels)						
		0	1	2	3	4	5	6
Data Resolution	5 sec.	Display OFF	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.
	10 sec.	Display OFF	10 min.	20 min.	30 min.	40 min.	50 min.	60 min.
	30 sec.	Display OFF	30 min.	60 min.	90 min.	120 min.	150 min.	180 min.

**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 data 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 separately for circulatory (ECG, BP) waveform and respiratory (RESP) waveform.

**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).

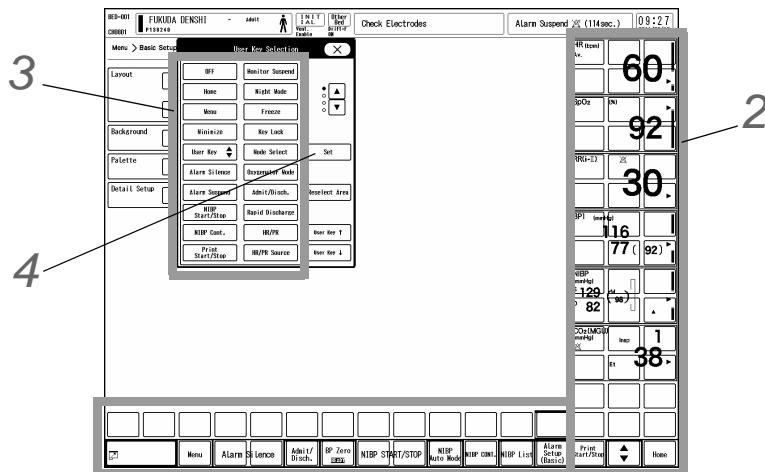
## □ User Key Setup

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 cancelled.
- To restart from the beginning, press the [Reselect Area] key.
- Adjust the size of the selected area which will be indicated in blue frame.

## 3 Select the 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.

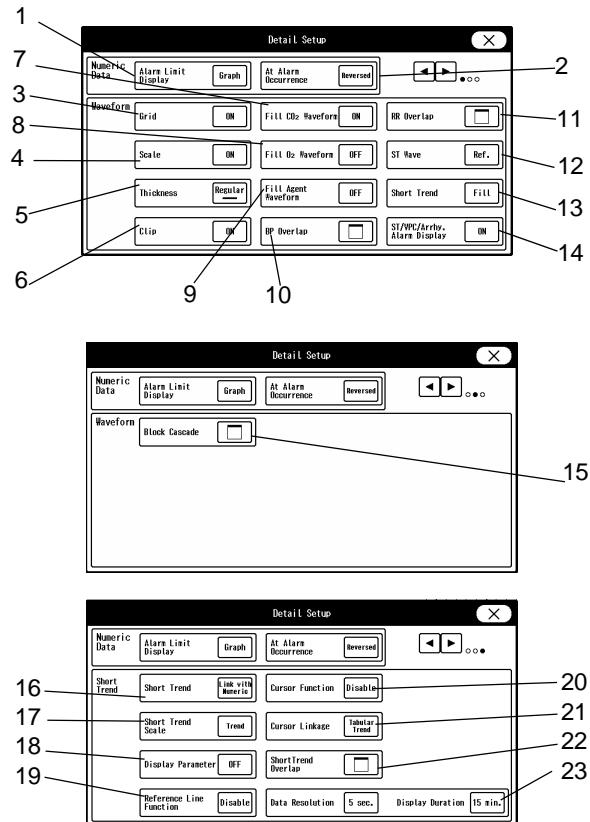
- The setup will be finalized.

## 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 reversed (highlighted) at alarm occurrence.

[3D]: The numeric data will be displayed in 3D at alarm occurrence.

### 3 Grid

The ECG waveform can be displayed on the grid.

[ON]: Grid will be displayed.

[Bold]: Grid will be displayed in bold format.

[OFF]: Grid will not be displayed.

#### REFERENCE

- Short trend and grid cannot be displayed overlapped.

### 4 Scale

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

### 5 Thickness

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

**6 Clip**

Whether or not to clip the overlapped waveforms of the neighboring display area can be selected.

**7 Fill CO<sub>2</sub> Waveform**

Whether or not to fill in the CO<sub>2</sub> waveform from the baseline can be selected.

**8 Fill O<sub>2</sub> Waveform**

Whether or not to fill in the O<sub>2</sub> 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 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.

**17 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<sub>2</sub> / O<sub>2</sub> / Agent

**18 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.

**19 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<sub>2</sub>, SpO<sub>2</sub>, 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.

## 20 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.

## 21 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.

## 22 Short Trend Overlap

The parameters to be displayed overlapped in the same short trend area can be set (maximum 4 parameters).

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.



## 23 Data Resolution, Display Duration

Select the data resolution from [5sec.] / [10sec.] / [30sec.]. The display duration differs depending on the data resolution.

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

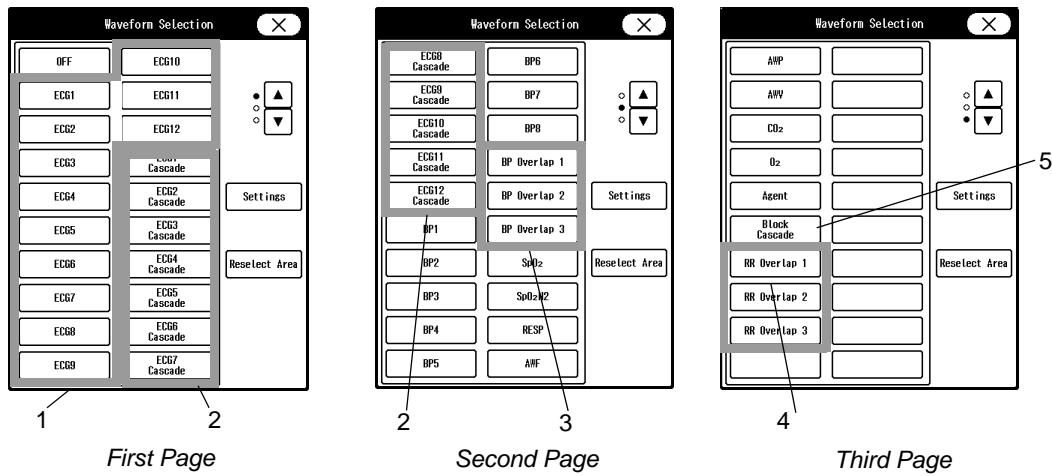
Press the [Home] key to check the configured display.

### 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, press the [Home] key and verify the configured display.
- ♦ To maintain the configured display even after the power is turned OFF or after the discharge procedure, store the configuration to one of the user modes, or select [Backup] for "Display Configuration" under "Power ON/Discharge" menu (Initial Settings>User I/F). (☞ "To Select the User Mode" P5-7)

## Waveform Selection

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



### 1 ECG1 to ECG12

The ECG waveform of the specified channel will be displayed. Minimum of 2 blocks are required to display the ECG waveform.

### 2 ECG1 to ECG12 Cascade

The ECG waveform of the specified channel will be displayed in cascade. Minimum of 2 blocks are required to display in cascade.

### 3 BP Overlap 1 to 3

The BP waveform (BP1 to 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<sub>2</sub>, O<sub>2</sub>, 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<sub>2</sub>>O<sub>2</sub>>Agent.

### 5 Block Cascade

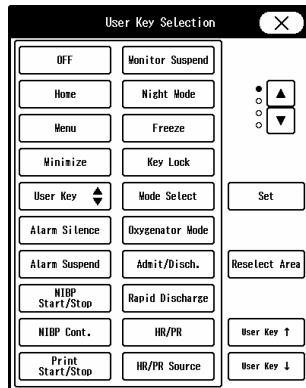
The waveforms (2 to 6) set on the "Block Cascade Setup" will be displayed in one block.

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

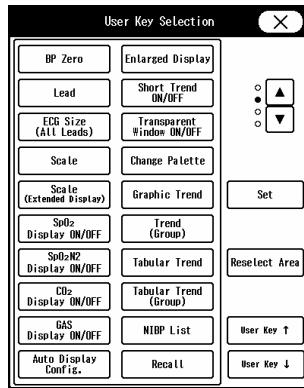
## User Key Selection

The user keys can be set on the "User Key Selection" window.

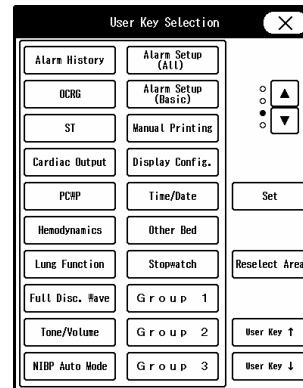
In this section, the user key function is explained.



First Page



Second Page

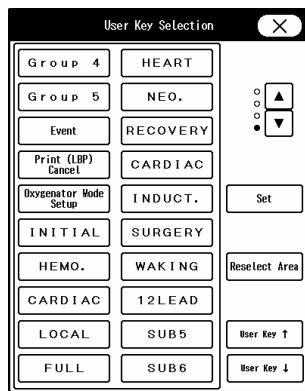


Third Page

First Page	
OFF	Blank key will be displayed.
Home	The display will return to the home display. The [Home] key is also available as fixed key on the display unit housing.
Menu	"Menu" screen will be displayed. The [Menu] key is also available as fixed key on the display unit housing.
Minimize	The displayed window will be minimized.
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 will be silenced for fixed amount of time. The [Alarm Silence] key is also available as fixed key on the display unit housing. By pressing the key for more than 3 seconds while the alarm is not generated, it will bring the system to "Alarm Sound Suspend" condition.
Alarm Suspend	Alarm (sound and display) will be suspended for fixed amount of time.
NIBP Start/Stop	NIBP measurement will start/stop.
NIBP Cont.	NIBP continuous measurement will start/stop.
Print Start/Stop	Manual printing will start/stop.
Monitor Suspend	Confirmation window to suspend monitoring will be displayed.
Night Mode	Night mode will turn ON/OFF.
Freeze	Waveform trace will freeze for fixed amount of time. Pressing the [Print Start/Stop] key while in freeze condition will print the frozen waveform. Pressing the key again will start the waveform trace again.
Key Lock	Touch key operation will turn ON/OFF. It can be used when cleaning the display panel.
Mode Select	User mode selection screen will be displayed.
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 appear.
HR/PR	The parameter to display inside the HR/PR numeric data box will sequentially change.
HR/PR Source	HR/PR source parameter will automatically change.

Second Page	
Zero Balance	Zero balance of BP1 to BP8 will be performed.
Lead	List of lead groups will be displayed, and selecting a lead group will display the lead selection window. 2 blocks of user key area are required to assign this key. It cannot be assigned to numeric box area.
ECG Size (All Leads)	The ECG waveform size for all leads can be changed at once.
Scale	The home display will change to scale selection mode.
Scale (Extended Display)	The waveform size/scale displayed on the extended display can be set. This key can be used only when [OFF] is set for "Sync. wave size/scale of extended display with main unit". (Initial Settings>User I/F)
SpO <sub>2</sub> -1 Display ON/OFF	SpO <sub>2</sub> -1 display will turn ON/OFF.
SpO <sub>2</sub> -2 Display ON/OFF	SpO <sub>2</sub> -2 display will turn ON/OFF.
CO <sub>2</sub> Display ON/OFF	CO <sub>2</sub> 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	The home display layout will switch between "Regular" and "Large".
Short Trend ON/OFF	Short Trend display will turn ON/OFF.
Transparent Window ON/OFF	Transparent window will turn ON/OFF.
Change Palette	Palette selection window will be displayed.
Trend	The graphic trend will be displayed.
Trend (Group)	List of trend group will be displayed, and selecting a trend group will display the graphic trend.
Tabular Trend	The tabular trend will be displayed.
Tabular Trend (Group)	List of tabular trend groups will be displayed, and selecting a trend group will display the tabular trend.
NIBP List	NIBP list will be displayed.
Recall	Recall screen will be displayed.

Third Page	
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	Full disclosure waveform will be displayed.
Tone/Volume	Tone/Volume setup screen will be displayed.
NIBP Auto Mode	NIBP Auto Mode window will be displayed.
Alarm Setup (All)	Alarm settings for all parameters will be displayed.
Alarm Setup (Basic)	Alarm settings for basic parameters will be displayed.
Manual Printing	Manual printing setup screen will be displayed.
Display Configuration	The display configuration window will be displayed.
Time/Date	Time/Date setup screen will be displayed.
Other Bed	Other bed screen will be displayed.
Stopwatch	Stopwatch screen will be displayed.
Group 1 to 3	Selection list of key group 1 to 3 will be displayed.



Fourth Page

Fourth page	
Group 4 to 5	Selection list of key group 4 to 5 will be displayed.
Event	Event selection list will be displayed. The selected event will be stored as recall waveform.
Print (LBP) Cancel	Printing on the laser printer will be cancelled.
Oxygenator Mode Setup	Oxygenator mode setup window will be displayed.
Main Mode 1(INITIAL)	Main mode 1 (INITIAL) will be set as the monitoring mode.
Main Mode 2(HEMO.)	Main mode 2 (HEMO.) will be set as the monitoring mode.
Main Mode 3 (CARDIAC)	Main mode 3 (CARDIAC) will be set as the monitoring mode.
Main Mode 4(LOCAL)	Main mode 4 (LOCAL) will be set as the monitoring mode.
Main Mode 5(FULL)	Main mode 5 (FULL) will be set as the monitoring mode.
Main Mode 6(HEART)	Main mode 6 (HEART) will be set as the monitoring mode.
Main Mode 7(NEO.)	Main mode 7 (NEO.) will be set as the monitoring mode.
Main Mode 8(RECOVERY)	Main mode 8 (RECOVERY) will be set as the monitoring mode.
Main Mode 9 (CARDIAC)	Main mode 9 (CARDIAC) will be set as the monitoring mode.
Sub Mode 1 (INDUCT.)	Sub Mode 1 (INDUCT.) will be set as the monitoring mode.
Sub Mode 2 (SURGERY)	Sub Mode 2 (SURGERY) will be set as the monitoring mode.
Sub Mode 3 (WAKING)	Sub Mode 3 (WAKING) will be set as the monitoring mode.
Sub Mode 4 (12 LEAD)	Sub Mode 4 (12 LEAD) will be set as the monitoring mode.
Sub Mode 5 (SUB 5)	Sub Mode 5 will be set as the monitoring mode.
Sub Mode 6 (SUB 6)	Sub Mode 6 will be set as the monitoring mode.

\* Default user mode names are displayed inside the brackets. The mode names can be changed.

(☞ Maintenance Manual "To Program the User Mode" P5-27)

### WARNING

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

## Tone/Volume

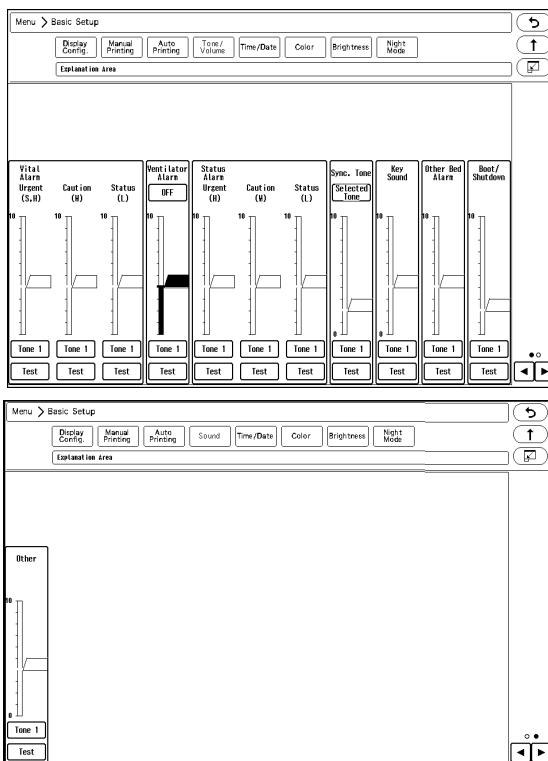
In this section, tone/volume setup procedure for alarm sound, HR synchronized sound, key sound, boot/shutdown sound is explained. The tone/volume setup screen also allows to turn OFF the ventilator alarm sound. The volume of BP zero balance and NIBP measurement end sound can be changed on "Other" setting.

### NOTE

- The tone setup for synchronized sound is effective only for HR and BP synchronized sound. The tone for SpO<sub>2</sub> synchronized sound will change according to the SpO<sub>2</sub> value. The tone will increase as the SpO<sub>2</sub> 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<sub>2</sub>, CO<sub>2</sub> 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" P5-4)

**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<sub>2</sub> Value] is selected, the same tone as SpO<sub>2</sub> synchronized tone will be generated. If the SpO<sub>2</sub> 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

Alarm System	Fukuda Tone (1) Tone 1 to 4 (2) Tone 5 to 8	Melodic Tone	Standard Tone	
<b>Vital Alarm Sound</b>				
Level H	(1) Continuous melodic tone (2) Continuous rapid tone	ECG: Continuous melodic tone with rising pitch SpO <sub>2</sub> , O <sub>2</sub> : Continuous melodic tone with falling pitch CO <sub>2</sub> : Continuous melodic tone with mixed low and high pitch Other than above: Continuous melodic tone	Continuous tone	
Level M	(1) Alternate high and low pitch in 5 seconds interval (2) Rapid tone in 5 seconds interval	ECG: Rising pitch in 4 seconds interval melodic tone SpO <sub>2</sub> , O <sub>2</sub> : Falling pitch in 4 seconds interval melodic tone CO <sub>2</sub> : Mixed low and high pitch in 4 seconds interval melodic tone. Other than above: 4 seconds interval melodic tone	4 seconds interval tone	
Level L	(1) 15 seconds interval melodic tone (2) 15 seconds interval tone	17 seconds interval melodic tone	17 seconds interval tone	
<b>Equipment Status Alarm Sound</b>				
Level H	(Same with vital alarm).	Continuous melodic tone	(Same with vital alarm)	
Level M		4 seconds interval melodic tone		
Level L		17 seconds interval tone		
<b>Volume Setup</b>				
Level H, M, L	The volume for low level alarm cannot be set higher than the higher level alarm.			
<b>Tone Setup</b>				
Level H	Vital Alarm: Setup can be performed. Equipment Status Alarm: Setup can be performed.	Vital Alarm: Setup can be performed. Equipment Status Alarm: Setup cannot be changed.		
Level M				
Level L				
<b>Setup other than above</b>				
Other Bed Alarm	Sound: Continuous tone Tone: Cannot be changed. Volume: Can be adjusted.	Sound: Continuous tone Tone: Cannot be changed. Volume: Can be adjusted.		
Ventilator Alarm Sound	Sound: Continuous tone Tone: Cannot be changed. Volume: Can be adjusted.	Sound: Continuous melodic tone Tone: Cannot be changed. Volume: Can be adjusted.	Continuous tone	

## Color

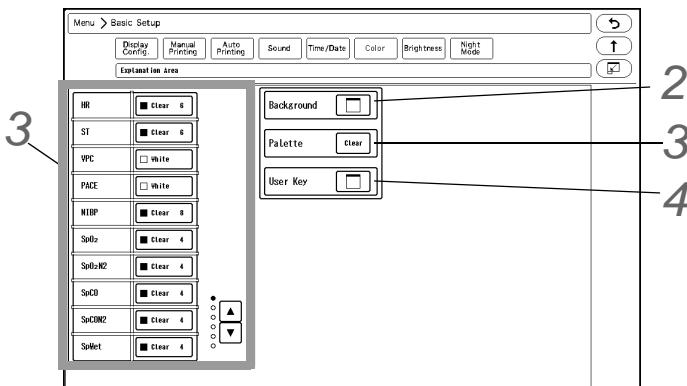
In this section, setup procedure for the color of background, numeric data, waveform is explained.

The colors of the background, numeric data, waveform, user key can be customized.

The colors can be customized according to the various monitoring scene such as recognizable colors from a far distance or colors which will not strain your eyes by the long time monitoring.

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

► The "Color" selection window will be displayed.



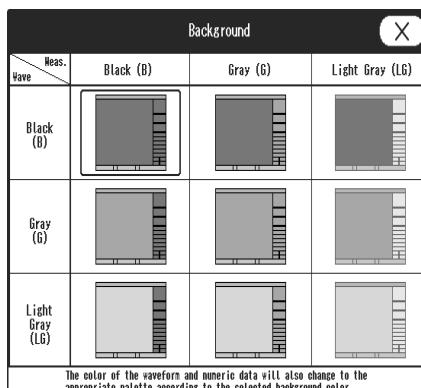
- 2** Set the background color.

### REFERENCE

- The background color for the numeric data area and waveform area can be selected from three colors (black, gray, light gray).
- The background color can be also set by pressing the [Menu], [Display Config.] ("Basic Setup"), "Background" keys.

- 1** Press the key for "Background".

► The "Background" color selection window will be displayed.



- 2** Select the background color.

► The selected background color will be immediately reflected.

- 3** Set the color of numeric data and waveform.

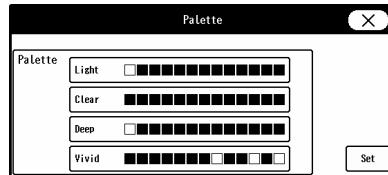
### REFERENCE

- The color can be set for each parameter. 12 colors (+white) for each palette are

selectable.

**1** Press the key for [Palette].

► The "Palette" selection window will be displayed.



**2** Select the palette from [Light] / [Clear] / [Deep] / [Vivid], and press the [Set] key.

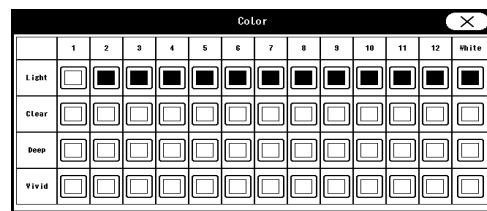
► The color of the numeric data and waveform will change to the selected palette color.

**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.



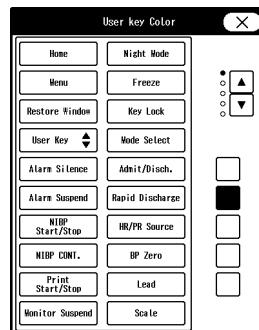
**5** Select a color.

► 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.

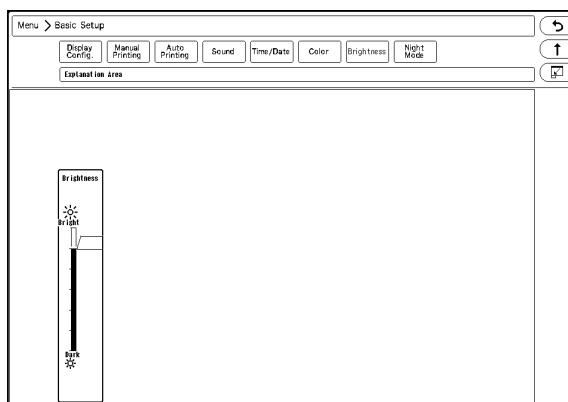
### **CAUTION**

- 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.

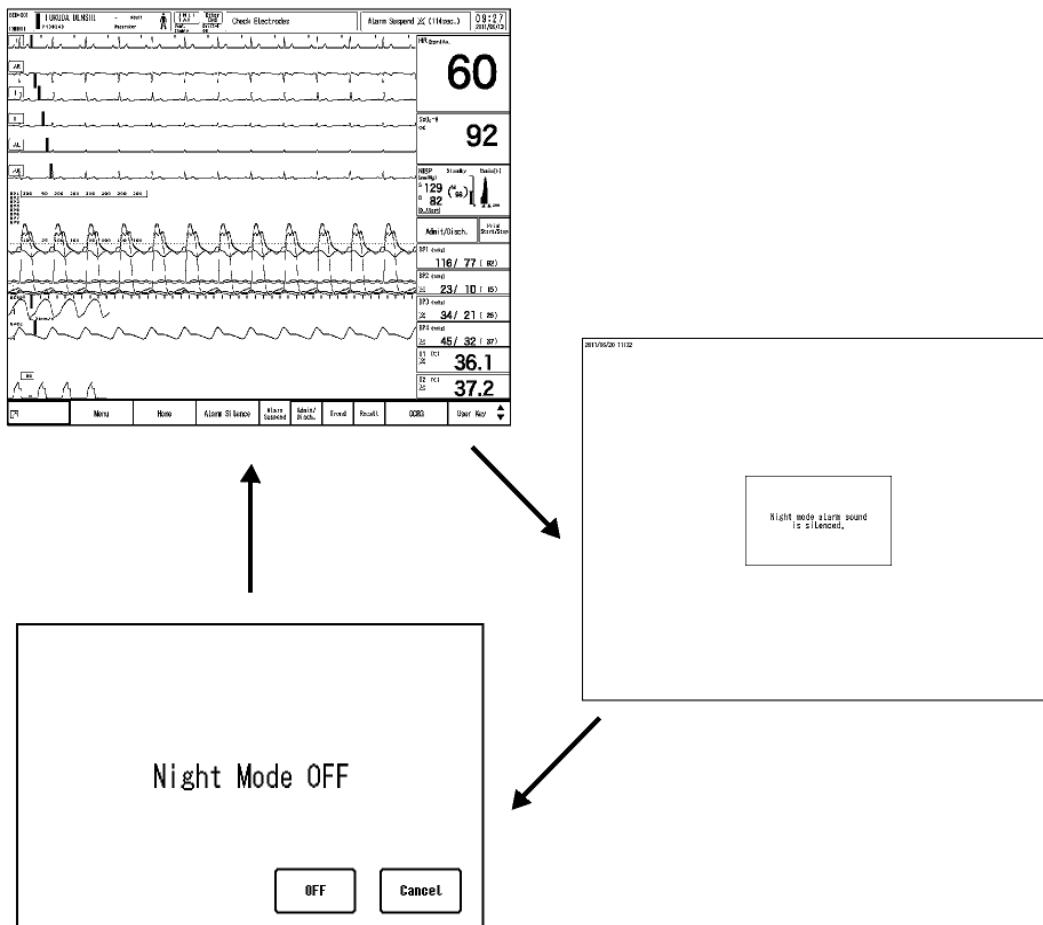
## Night Mode

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.

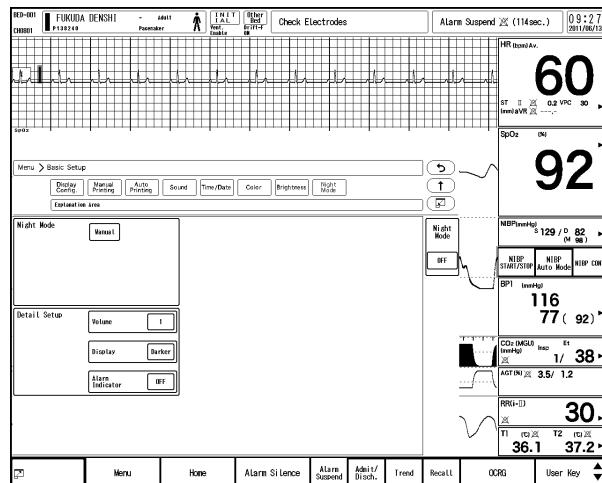
### □ Operation flow when the night mode is set to "Timer"



□ 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" P5-13)

**NOTE**

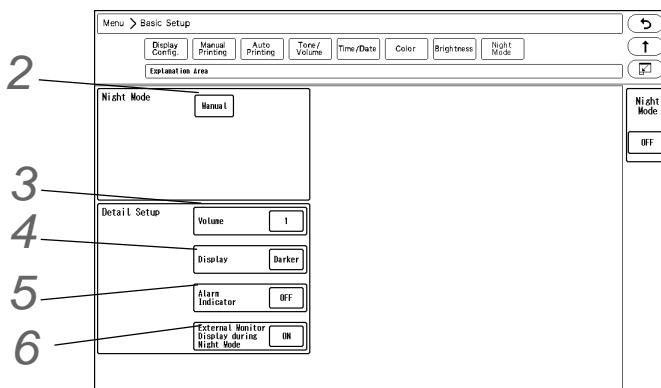
- ♦ The night mode can be manually turned ON from the menu, user key, or remote control even when the night mode is set to automatically turn ON. The night mode will automatically turn OFF at the set "End Time".
- ♦ The night mode can not be set when the ventilator alarm is generated.

## 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.

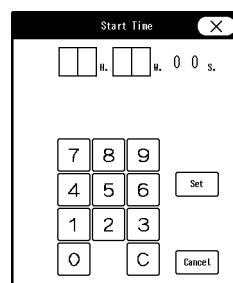
### REFERENCE

- 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.

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# Chapter 11 Troubleshooting

## Message List

This section lists the alarm messages for each parameter.

For the vital alarm message, there are numeric data alarm and arrhythmia alarm, and the delay time are as follows.

- Numeric Data Alarm: Adult/Child: 5 sec., Neonate: none
- Arrhythmia Alarm: Adult/Child/Neonate: none

### Vital Alarm Message



#### CAUTION

- The alarm message for the arrhythmia alarm will continue to be displayed for 30 seconds after the alarm is resolved.
- The alarm level shown below is the standard level set by Fukuda Denshi.
- The alarm level can be changed on the "Initial Settings".

#### Top Priority Alarm (Alarm Level S)

This level can be selected for some parameters only when [Fukuda Tone] is selected for the "Alarm System" ("Initial Settings"). It cannot be selected when the "Alarm System" is [Melodic Tone] or [Standard Tone].

#### Life Threatening Alarm (Alarm Level H)

Parameter	Message
Respiration (Impedance, CO <sub>2</sub> , Ventilator)	Apnea
Arrhythmia	ASYSTOLE
	VF
	VT
	TACHY
	BRADY

Cautionary Alarm (Alarm Level M)

Parameter	Message
HR	Lower HR Alarm
	Upper HR Alarm
BP	Lower BP# Alarm or Lower (label) Alarm*1
	Upper BP# Alarm or Upper (label) Alarm*1
Pulse Rate (BP)	Lower PR Alarm
	Upper PR Alarm
SpO <sub>2</sub> #	Lower SpO <sub>2</sub> # Alarm*1
	Upper SpO <sub>2</sub> # Alarm*1
Pulse Rate (SpO <sub>2</sub> )	Lower PR Alarm
	Upper PR Alarm
Non-Invasive Blood Pressure	Lower NIBP alarm
	Upper NIBP alarm
Respiration (Impedance, CO <sub>2</sub> , GAS, Ventilator)	Lower RR alarm
	Upper RR alarm
Gas*2	Lower CO <sub>2</sub> -E Alarm
	Upper CO <sub>2</sub> -E Alarm
	Upper CO <sub>2</sub> -I Alarm
	Lower O <sub>2</sub> -E Alarm
	Upper O <sub>2</sub> -E Alarm
	Lower O <sub>2</sub> -I Alarm
	Upper O <sub>2</sub> -I Alarm
	Lower N <sub>2</sub> O-E Alarm
	Upper N <sub>2</sub> O-E Alarm
	Lower N <sub>2</sub> O-I Alarm
	Upper N <sub>2</sub> O-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
Arrhythmia	RUN

\*1: # indicates the label of BP, TEMP, SpO<sub>2</sub>.

For SpO<sub>2</sub>, N1/N2/M1/M2/HR/HL/FR/FL/OT will be displayed for #.

\*2: When the numeric data acquired from the FLOW-i is displayed, the alarms will not generate. Also, these alarms will not generate on the central monitor.

## Treatment Needed Alarm (Alarm Level L)

Parameter	Message
ST1 to 12	Lower ST (Lead Type) Alarm
	Upper ST (Lead Type) Alarm
SpCO#	Upper SpCO# Alarm*
SpMet#	Upper SpMet# Alarm*
SpHb#	Lower SpHb# Alarm*
	Upper SpHb# Alarm*
Temperature (TEMP1 to 8)	Lower TEMP# Alarm or Lower (label) Alarm*
	Upper TEMP# Alarm or Upper (label) Alarm*
Blood Temperature	Upper Tb Alarm
	Lower Tb Alarm
Arrhythmia	PAUSE
	COUPLET
	BIGEMINY
	TRIGEMINY
	FREQUENT
SPIRO	Upper PEAK Alarm
	Lower PEAK Alarm
	Upper PEEP Alarm
	Lower PEEP Alarm

\*: # indicates the channel no. of TEMP, SpCO, SpMet, SpHb.

For SpCO, SpMet, SpHb, N1/N2/M1/M2/HR/HL/FR/FL/OT will be displayed for #.

## Notification Alarm

Parameter	Message
All Alarm	Alarm Suspend (xxx sec.)
Alarm Sound Suspend	Alarm Silence (xxx min.)
Arrhythmia	LEARN
	ARRHY. OFF
Oxygenator Mode	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 alarm message for the arrhythmia alarm will continue to be displayed for 30 seconds after the alarm is resolved.
- ♦ The alarm level shown below is the standard level set by Fukuda Denshi.
- ♦ The alarm level can be changed on the "Initial Settings".

### Top Priority Alarm (Alarm Level S)

This level can be selected for some parameters only when [Fukuda Tone] is selected for the "Alarm System" ("Initial Settings"). It cannot be selected when the "Alarm System" is [Melodic Tone] or [Standard Tone].

Life Threatening Alarm (Alarm Level H)

Parameter	Message
HR	Lower HR Alarm
	Upper HR Alarm
Pulse Rate (SpO <sub>2</sub> )	Lower PR Alarm
	Upper PR Alarm
Pulse Rate (BP)	Lower PR Alarm
	Upper PR Alarm
SpO <sub>2</sub> #	Lower SpO <sub>2</sub> # Alarm*1
	Upper SpO <sub>2</sub> # Alarm*1
BP	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 <sub>2</sub> , Gas, Ventilator)	Lower RR Alarm
	Upper RR Alarm
	Apnea
Gas*1	Lower CO <sub>2</sub> -E Alarm
	Upper CO <sub>2</sub> -E Alarm
	Upper CO <sub>2</sub> -I Alarm
	Lower O <sub>2</sub> -E Alarm
	Upper O <sub>2</sub> -E Alarm
	Lower O <sub>2</sub> -I Alarm
	Upper O <sub>2</sub> -I Alarm
	Lower N <sub>2</sub> O-E Alarm
	Upper N <sub>2</sub> O-E Alarm
	Lower N <sub>2</sub> O-I Alarm
	Upper N <sub>2</sub> O-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
	Tachy
	Brady
	Run

\*1: For SpO<sub>2</sub>, N1/N2/M1/M2/HR/HL/FR/FL/OT will be displayed for #.

## Cautionary Alarm (Alarm Level M)

Parameter	Message
BP	Lower BP2 to 8 Alarm or Lower (label other than ART) Alarm* <sup>1</sup>
	Upper BP2 to 8 Alarm or Upper (label other than ART) Alarm* <sup>1</sup>
ST1 to 12	Lower ST (Lead Type) Alarm
	Upper ST (Lead Type) Alarm
SpCO#	Upper SpCO# Alarm* <sup>1</sup>
SpMet#	Upper SpMet# Alarm* <sup>1</sup>
SpHb	Lower SpHb# Alarm* <sup>1</sup>
	Upper SpHb# Alarm* <sup>1</sup>
TEMP (TEMP1 to 8)	Upper TEMP# Alarm or Upper (label) Alarm* <sup>1</sup>
	Lower TEMP# Alarm or Lower (label) Alarm* <sup>1</sup>
Blood Temperature	Upper Tb Alarm
	Lower Tb Alarm
MV* <sup>2</sup>	Upper MV Alarm
	Lower MV Alarm
PEAK* <sup>2</sup>	Upper PEAK Alarm
	Lower PEAK Alarm
PEEP* <sup>2</sup>	Upper PEEP Alarm
	Lower PEEP Alarm
Arrhythmia	Pause
	Couplet
	Bigeminy
	Trigeminy
	Frequent

\*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 the FLOW-i is displayed, the alarms will not generate. Also, these alarms will not generate on the central monitor.

## Notification Alarm

Parameter	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.

## Equipment Status Alarm Message

### Top Priority Alarm (Alarm Level S)

Parameter	Message	Delay Time (sec.)
Ventilator	Vent. Alarm	1
	VENT COMM	1

### Life Threatening Alarm (Alarm Level H)

Parameter	Message	Delay Time (sec.)
Main Unit	DSC-8500 Failure	10
	DSC-8500 Speaker Failure	10
Super Unit	HS-8000 Failure	3
	ECG Unit Error	5
	HS-8000 Multiamp. Failure	3
	NIBP Meas. Error (Exx-xx)*	10 or 3
	GAS Unit I/F Failure	3
	HS-8000 SpO <sub>2</sub> Failure	5 or 1
GAS (MGU-800/MGU-810)	GAS Unit Failure	1
SPIRO	SPIRO Unit Error	1

\*: x indicates an error code

## Cautionary Alarm (Alarm Level M)

Parameter	Message	Delay Time (sec.)
NIBP	NIBP meas. failed. (Cxx-xx) <sup>*1</sup>	1
CO <sub>2</sub> (HCP-800/HCP-810)	CO <sub>2</sub> Check Sample Line	1
	CO <sub>2</sub> Check Exhaust Port	1
	CO <sub>2</sub> Unit Failure	1
	CO <sub>2</sub> Cal. Required	1
Capnostat 5 CO <sub>2</sub> (Gas Unit I/F and Mainstream Module)	CO <sub>2</sub> Sensor Failure	1
GAS (MGU-800)	GAS Check Water Trap	1
	GAS Pump OFF	1
	GAS Check Sample Line	1
	GAS Zeroing Failed	1
	GAS Replace Water Trap	1
	GAS Check Conn.	1
SPIRO(MGU-810)	SPIRO Check FlowSensor Class	1
Main Unit	DSC-8500 Check Short-Term Battery	10
	DSC-8500 Check Long-Term Battery	10
Super Unit	HS-8000 Out of Operating Temp. Range	3
	HS-8000 Analog Unadjusted	3
Input Box	IB-8000-# Failure <sup>*2</sup>	3
Display Unit	Display Unit Failure	3
Module	IB# Slot# Module Failure <sup>*3</sup>	3
	IB# Slot# Analog Unadjusted <sup>*3</sup>	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. (Default: Level M)

If "Alarm Silence" key is pressed during Level M/L alarm generation, the alarm level will change to Level N (notification).

x indicates an error code.

( "NIBP measurement failed (Cxx-xx)" is displayed." P11-35)

\*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)

Parameter	Message	Delay Time (sec.)
ECG	Check Electrodes (#, #, #) <sup>*1</sup>	3
	ECG Check Electrodes Attachment.	3
	Cannot Analyze	1
	ECG Pacing Detection Error	1
	ECG EMG Interference	3
	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 <sub>2</sub> (Masimo Unit)	SpO <sub>2</sub> -# Check Sensor Attach. <sup>*2</sup>	3

Parameter	Message	Delay Time (sec.)
	SpO <sub>2</sub> -# Replace Sensor* <sup>2</sup>	1
	SpO <sub>2</sub> -# Low Perfusion* <sup>2,*3</sup>	1
	SpO <sub>2</sub> -# Pulse Search* <sup>2</sup>	1
	SpO <sub>2</sub> -# Noise Interference* <sup>2</sup>	1
	SpO <sub>2</sub> -# Check Sensor Attach.* <sup>2</sup>	1
	SpO <sub>2</sub> -# Replace Cable* <sup>2</sup>	3
	SpO <sub>2</sub> -# Check Cable* <sup>2</sup>	3
	SpO <sub>2</sub> -# Check Sensor Conn.* <sup>2</sup>	3
	SpO <sub>2</sub> -# only mode * <sup>2</sup>	1
SpO <sub>2</sub> (Nellcor Unit)	SpO <sub>2</sub> -# Check Sensor Attach.* <sup>2</sup>	3
	SpO <sub>2</sub> -# Replace Sensor* <sup>2</sup>	1
	SpO <sub>2</sub> -# No Pulse Detected* <sup>2</sup>	1
BP	BP# Transducer OFF* <sup>4</sup>	5
TEMP	T## Unknown Sensor* <sup>5</sup>	3
Non-Invasive Blood Pressure	Check NIBP cuff, hose* <sup>6</sup>	3
	NIBP Check patient type, air hose	3
Capnostat 5 CO <sub>2</sub> (Gas Unit I/F and Mainstream Module)	CO <sub>2</sub> Check airway adapter.	1
SPIRO (MGU-810)	SPIRO Check Flow Sensor Conn	1
Connector Off	ECG Disconnected	3
	BP Disconnected* <sup>4</sup>	3
	SpO <sub>2</sub> -# Disconnected* <sup>2</sup>	3
	T## Disconnected* <sup>5</sup>	3
	CO Disconnected	3
	CO <sub>2</sub> Disconnected	3
Main Unit	DSC-8500 Check Unit	10
	DSC-8500 Out of Operating Temp. Range	10
Super Unit	HS-8000 Check Conn.	3
	HS-8000 Check SD Card	3
	HS-8000 Check DIP SW	3
	HS-8000 TEMP Unit Failure	3
	HS-8000 data transfer failed.	3
Input Box	IB-8000-# Check Conn.* <sup>7</sup>	3
	IB-8000-# Check Unit* <sup>7</sup>	3
	IB-8000-# Out of Operating Temp. Range* <sup>7</sup>	3
Display Unit	Check Display Unit	3
	Display Unit Out of Operating Temp. Range	3
Module	IB# Slot# Check Module* <sup>8</sup>	3
	IB# Slot# Out of Operating Temp. Range* <sup>8</sup>	3
	IB# Slot# Module Failure* <sup>8</sup>	3
	IB# Slot# Module Disconnected* <sup>8</sup>	3
	IB# Slot# TEMP Failure* <sup>8</sup>	3

Parameter	Message	Delay Time (sec.)
Check Connection, Check Reception, Interference	Check SvO <sub>2</sub> /CCO Monitor Conn.	1
	Check BIS Conn.	1
	Check INVOS Connection	1
	Check Printer Conn.	3
	Chk DS-LAN Comm	3
	Check HLX Conn.	3
	Check Printer Comm	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<sub>2</sub>.

\*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.

#### 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 Conn> alarms will be cancelled when [Alarm Silence] key is pressed. Pay attention not to cancel the important alarm.

## Notification Alarm

Parameter	Message	Delay Time (sec.)
Operation	Waveform Frozen (## sec.) <sup>*1</sup>	1
	Key Locked (## sec.) <sup>*1</sup>	1
	Night Mode Active	1
	Oxygenator Mode	1
ECG	ECG Low Amplitude	3
	ECG Artifact	3
	ECG EMG Interference	3
	Check Electrodes <sup>*7</sup>	3
BP	BP# Zeroing Required <sup>*2</sup>	1
TEMP	T# Unknown Sensor <sup>*3</sup>	1
SpO <sub>2</sub> (MASIMO Unit)	SpO <sub>2</sub> # Demo Mode <sup>*4</sup>	1
	SpO <sub>2</sub> # Zeroing <sup>*4</sup>	1
	SpO <sub>2</sub> # Check Sensor Attach. <sup>*7</sup>	3
SpO <sub>2</sub> (Nellcor Unit)	SpO <sub>2</sub> # Motion Artifact <sup>*4</sup>	1
	SpO <sub>2</sub> # Check Sensor Attach. <sup>*7</sup>	3
Capnostat 5 CO <sub>2</sub> (Gas Unit I/F and Mainstream Module)	CO <sub>2</sub> Warming Up	1
	Zero the CO <sub>2</sub> Adapter	1
	Unknown CO <sub>2</sub> Sensor	1
CO <sub>2</sub> (HCP-800/HCP-810)	CO <sub>2</sub> Suspended	1
	CO <sub>2</sub> Zeroing	1
GAS (MGU-800/MGU-810)	GAS Warm Up	1
	GAS Zeroing	1
	GAS Pump Regulating	1
	GAS Mixed Agents <sup>*5</sup>	1
	GAS Zero Cal. Required.	1
	GAS Cal. Required.	1
SPIRO (MGU-810)	SPIRO Warm Up	1
	SPIRO Zeroing	1
	SPIRO Zeroing	1
Non-Invasive Blood Pressure	Initializing NIBP	3
Printer	Check Printer <sup>*6</sup>	3
	Check Paper <sup>*6</sup>	3
	Printer Busy <sup>*6</sup>	1
	Check Cassette <sup>*6</sup>	3
Central Printer (Built-in)	Check Paper (Central) <sup>*6</sup>	3
	Check Cassette <sup>*6</sup>	3
	Printer Busy (Central) <sup>*6</sup>	1
	Check Central Printer <sup>*6</sup>	3
Central Printer (Laser)	Central Printer Check Connection	1
	Central Printer Check Setting	1
	Check Central ID	1
	Check DS-LAN Comm	1

Parameter	Message	Delay Time (sec.)
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

\*1: # indicates the remaining time.

\*2: # indicates the channel no. of BP.

\*3: # indicates the channel no. of TEMP.

\*4: # indicates the label of SpO<sub>2</sub>.

\*5: On "Initial Settings" menu, the alarm level can be selected from Level M/L/N. (Default: N)

\*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.

\*8: On "Initial Settings" menu, the alarm level can be selected from Level N/OFF. (Default: N)

## 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
Out of Range

 **Pulse Rate (BP Source)**

Message
Upper PR Alarm (BP)
Lower PR Alarm (BP)
Out of Range

 **NIBP**

If "NIBP Meas. Error" is displayed, the message can be cancelled by pressing [Cancel Error] on the NIBP setup screen, or [NIBP Start/Stop] key (user key).

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

(☞ "NIBP Meas. Error (Exx-xx)" is displayed." P11-37)

Message
NIBP Meas. Error
Upper NIBP Alarm
Lower NIBP Alarm
Measurement Failed.
Check NIBP cuff, hose
Check patient type, air hose
Initializing
Out of Range

 **SpO<sub>2</sub> (Nellcor Model)**

Message
Unit Failure
Lower SpO <sub>2</sub> Alarm
Upper SpO <sub>2</sub> Alarm
Replace Sensor
Check Sensor Attach.
No Pulse Detected
Motion Artifact
Pulse Search

SpO<sub>2</sub>/SpCO/SpMet/SpHb (Masimo Model)

Message
Lower SpO <sub>2</sub> Alarm
Upper SpO <sub>2</sub> Alarm
Upper SpCO Alarm
Upper SpMet Alarm
Lower SpHb Alarm
Upper SpHb Alarm
Replace Sensor
Check Sensor Attach.
Low Confidence
Pulse Search
Noise Interference
Check Sensor
Replace Cable
Check Cable
Check Sensor Conn.
Zeroing Sensor
SpO <sub>2</sub> only mode
Low Signal IQ
Low Confidence

 PR-SpO<sub>2</sub>

Message
Upper PR alarm (SpO <sub>2</sub> )
Lower PR alarm (SpO <sub>2</sub> )
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<sub>2</sub> (Gas Unit I/F HPD-800/HPD-810 and Capnostat 5)**

Message
Upper CO <sub>2</sub> -E Alarm
Lower CO <sub>2</sub> -E Alarm
Upper CO <sub>2</sub> -I Alarm
Check airway adapter.
Zeroing
Warming Up
Zero CO <sub>2</sub> Adapter
Unknown Sensor
Out of Range

**❑CO<sub>2</sub> (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 <sub>2</sub> -E
Lower CO <sub>2</sub> -E
Upper CO <sub>2</sub> -I

Gas (MGU-800/810)

Message
Upper CO <sub>2</sub> -E Alarm
Lower CO <sub>2</sub> -E Alarm
Upper CO <sub>2</sub> -I Alarm
Upper O <sub>2</sub> -E Alarm
Lower O <sub>2</sub> -E Alarm
Upper O <sub>2</sub> -I Alarm
Lower O <sub>2</sub> -I Alarm
Upper N <sub>2</sub> O-E Alarm
Lower N <sub>2</sub> O-E Alarm
Upper N <sub>2</sub> O-I Alarm
Lower N <sub>2</sub> O-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 <sub>2</sub> )
Out of Range (RR_CO <sub>2</sub> )
Out of Range (N <sub>2</sub> O)
Out of Range (O <sub>2</sub> )
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

## Ventilator Alarm Message

### Top Priority Alarm (Alarm Level S)

Parameter	Message
Ventilator	Vent. Alarm
Ventilator	VENT_COMM

#### **WARNING**

- The ventilator alarm sound is set to OFF at factory default setting.
- The alarm sound can be turned ON on the "Sound" ("Basic Setup") menu.  
( "Tone/Volume" P10-21)

### Ventilator Alarm Factor

#### **CAUTION**

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

Displayed Alarm Message	Note
VENT AWP	Airway Pressure Alarm
VENT MV	Minute Ventilation Alarm
VENT APNEA	Apnea Alarm
VENT CONT. HP	Continuous High Pressure Alarm
Upper VENT_FiO <sub>2</sub>	FiO <sub>2</sub> Upper Limit Alarm
Lower VENT_FiO <sub>2</sub>	FiO <sub>2</sub> Lower Limit Alarm
Upper VENT_CO <sub>2</sub>	EtCO <sub>2</sub> Upper Limit Alarm
Lower VENT_CO <sub>2</sub>	EtCO <sub>2</sub> 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

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### Status Message

Message	Details
WAIT	Preparing for measurement. It will be also displayed when catheter relay cable is not connected to the CO module, or when thermodilution catheter is not connected.
READY	Ready to start the measurement.
BUSY	In process of measurement.
END	Measurement is completed.

### Result Status

The result status will be displayed for 30 seconds after completion of measurement.

Message	Details
CO_OK	CO is correctly measured.
UPPER_FAULT	Measurement error <ul style="list-style-type: none"> <li>• After the injection, the blood temperature is out of the measurement range.</li> <li>• The thermistor connector and relay cable are not securely connected.</li> <li>• The sensor or relay cable is defective.</li> </ul>
PEAK_FAULT	Measurement error <ul style="list-style-type: none"> <li>• The peak of the thermodilution curve can not be detected.</li> <li>• The thermistor connector and relay cable are not securely connected.</li> <li>• The sensor or relay cable is defective.</li> </ul>
LOWER_FAULT	Measurement error <ul style="list-style-type: none"> <li>• The blood temperature has not returned to stable condition after the measurement.</li> <li>• The thermistor connector and relay cable are not securely connected.</li> <li>• The sensor or relay cable is defective.</li> </ul>
SENSOR_ERROR	Measurement error <ul style="list-style-type: none"> <li>• The thermistor connector and relay cable are not securely connected.</li> <li>• The sensor or relay cable is defective.</li> </ul>
OVER RANGE	Measurement error <ul style="list-style-type: none"> <li>• The CO value is out of the calculation range.</li> </ul>

## Troubleshooting

This section explains the troubleshooting for each case.

### ECG

#### <Check Electrodes> or <LEAD OFF> is displayed.

##### Cause 1

The electrode is detached, or is not making good electrical contact with the skin.

##### Solution

Check the electrode attachment.

Replace the electrodes.

Check if the lead cable or relay cable is defective (wire break, etc.).

(☞ "Before Attaching the Electrodes" P7-1)

(☞ "Electrode Placement" P7-2)

##### Cause 2

Even though the "3-lead Override" (ECG Parameter Setup) is set to [ON], electrodes other than LA, RA, LL are connected.

##### Solution

Set the "3-lead Override" to [OFF].

Or, detach the electrodes other than LA, RA, LL.

#### <ECG Low Amplitude> is displayed.

##### Cause 1

The ECG amplitude is 0.25mV or below for the waveform size of x1, x1/2, x1/4, and 0.150mV or below for the waveform size of x2, x4.

##### Solution

Change the electrode site, or select a lead with higher QRS amplitude.

##### NOTE

- Using 4-electrode or 5-electrode instead of 3-electrode allows more accurate QRS detection.

##### Cause 2

The electrode contact is poor.

Electrical blanket or other noise source is near the patient.

##### Solution

Attach the electrodes firmly. Or, replace the electrodes.

- If the lead cable or relay cable is defective (wire break, etc.), replace it.
- If any noise source is near the patient, locate it away from the patient as much as possible.

##### Cause 3

Even though the "3-lead Override" (ECG Parameter Setup) is set to [ON], electrodes other than LA, RA, LL are

connected.

Solution

Set the "3-lead Override" to [OFF]. Or, detach the electrodes other than LA, RA, LL.

<ECG Artifact> is displayed.

Cause 1

The electrode contact is poor.

Electrical blanket or other noise source is near the patient.

Solution

Attach the electrodes firmly.

- ♦ If the lead cable or relay cable is defective (wire break, etc.), replace it.
- ♦ If any noise source is near the patient, locate it away from the patient as much as possible.

Cause 2

EMG is interfering.

Solution

- ♦ Change the electrode site to a location where the myoelectricity will be less likely to interfere.
- ♦ Select ESIS for the filter mode.



**CAUTION**

- ♦ Selecting a ESIS for the filter mode will decrease the QRS amplitude and may result in not counting the heart rate.

Cause 3

Even though the "3-lead Override" (ECG Parameter Setup) is set to [ON], electrodes other than LA, RA, LL are connected.

Solution

Set the "3-lead Override" to [OFF]. Or, detach the electrodes other than LA, RA, LL.

The ECG waveform is displayed in baseline.

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

Cause 1

Electrode is detached.

Solution

Reattach the electrode. If the electrode contact is poor, replace the electrode.

(☞ "Before Attaching the Electrodes" P7-1)

(☞ "Electrode Placement" P7-2)

Cause 2

The lead cable is disconnected from the electrode terminal.

Solution

Securely connect the lead cable.

**REFERENCE**

- ♦ If the error persists, wire break of the lead cable or relay cable may be considered. Contact our service representative.

□ <Check Electrodes Attachment> is displayed.

Cause 1

The electrode contact with the skin is poor. There is substantial contact resistance between the electrodes.

Solution

Replace all the electrodes. Make sure to use the electrodes of the same type.

(☞ "Before Attaching the Electrodes" P7-1)

(☞ "Electrode Placement" P7-2)

Cause 2

Even though the "3-lead Override" (ECG Parameter Setup) is set to [ON], electrodes other than LA, RA, LL are connected.

Solution

Set the "3-lead Override" to [OFF]. Or, detach the electrodes other than LA, RA, LL.

□ <ECG Unit Error> is displayed.

Cause

A communication error has occurred between the ECG measuring unit.

Solution

A wire break or failure of the ECG unit can be considered. Contact our service representative.

□ The measurement data is displayed as "xxx".

Cause

The heart rate is outside the measurement range.

Solution

- ♦ Check the electrode attachment.  
(☞ "Before Attaching the Electrodes" P7-1)  
(☞ "Electrode Placement" P7-2)
- ♦ Replace the electrode, or check the lead cable and relay cable.

□ The heart rate is not counted. The heart rate is low.

Cause

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

Solution 1

Change the electrode site, or select a lead with higher QRS amplitude.

 **CAUTION**

- ♦ Using 4-electrode or 5-electrode instead of 3-electrode allows more accurate QRS detection.
- ♦ Also, if large amount of noise is interfering, the noise may be erroneously detected as QRS. Change the electrode site to increase the ECG amplitude.

Solution 2

Increase the displayed waveform size. By increasing the waveform size, small QRS wave will become detectable. However, noise may be also detected.

## ❑ Heart rate is not counted, and <LEAD OFF> is displayed.

### Cause 1

The electrode of the displayed lead type is detached, or is not making good electrical contact with the skin.

#### Solution

- ♦ Check the electrode attachment.  
(☞ "Before Attaching the Electrodes" P7-1)  
(☞ "Electrode Placement" P7-2)
- ♦ Replace the electrode, or check the lead cable and relay cable.

### Cause 2

Even though the "3-lead Override" (ECG Parameter Setup) is set to [ON], electrodes other than LA, RA, LL are connected.

#### Solution

Set the "3-lead Override" to [OFF]. Or, detach the electrodes other than LA, RA, LL.

## ❑ Artificial pacemaker pulse is not displayed.

### Cause 1

[Not Used] is selected for "Pacemaker" on the "Admit/Discharge" screen.

#### Solution

Select [Used] for "Pacemaker".

### Cause 2

"Pacemaker Pulse" is set to [OFF] (ECG Parameter Setup).

#### Solution

Select [ON] for "Pacemaker Pulse".

### Cause 3

The electrode attachment site is not appropriate.

#### Solution

Check the electrode attachment site.

(☞ "Before Attaching the Electrodes" P7-1)  
(☞ "Electrode Placement" P7-2)

## ❑ <ECG Pacing detection error> is displayed.

### Cause 1

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

#### Solution 1

- ♦ Check the electrode attachment.  
(☞ "Before Attaching the Electrodes" P7-1)  
(☞ "Electrode Placement" P7-2)
- ♦ Replace the electrode, or check the lead cable and relay cable.
- ♦ If any noise source is near the patient, move it away from the patient as far as possible.

#### Solution 2

If the patient is not wearing a pacemaker, select [Not Used] for "Pacemaker" ("Admit/Discharge").

<ECG Disconnected> is displayed.

Cause

While monitoring the ECG, the relay cable was unplugged.

Solution 1

To cease monitoring, press the [Alarm Silence] key. The message will disappear, and the alarm will be silenced.

Solution 2

To continue monitoring, plug in the ECG relay cable. This will clear the message and silence the alarm.

<Cannot Analyze> is displayed.

Cause

A noise is interfering on the ECG and arrhythmia analysis is suspended for more than 30 seconds.

"Suspend Arrhy, Analysis during Noise Interference" ("Initial Settings") is set to ON, and arrhythmia analysis is suspended for more than 30 seconds due to continuous noise or EMG interference.

Solution

Check the electrode attachment, and remove the noise source.

- ♦ Check the electrode attachment , lead cable and relay cable.
- ♦ If the electrode, lead cable, or relay cable is defective, replace them.
- ♦ If any noise source is near the patient, move it away from the patient as far as possible.  
If EMG is interfering, change the electrode site to a location where EMG will less likely to interfere.

## Respiration

---

<CVA detected> message is displayed.

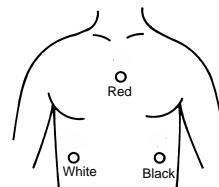
Cause

Heartbeat is interfering and superimposed on the respiration waveform.

Solution

Place the electrode as shown below where the heartbeat will be less likely to interfere.

Or, select a lead where the heartbeat will be less likely to interfere.



<RR meas. range is exceeded.> message is displayed.

Cause 1

Electrode is detached.

Solution

Reattach the electrode. If the electrode contact is poor, replace the electrode.

(☞ "Before Attaching the Electrodes" P7-1)

(☞ "Electrode Placement" P7-2)

**Cause 2**

The electrode contact impedance is high.

**Solution 1**

Reattach the electrode. If the electrode contact is poor, replace the electrode.

(☞ "Before Attaching the Electrodes" P7-1)

(☞ "Electrode Placement" P7-2)

**Solution 2**

Change the lead for respiration measurement.

 **"0" is displayed for respiration rate, or apnea alarm is generated.****Cause**

The amplitude of the respiration waveform is too low.

**Solution 1**

Change the electrode site, or select a lead with higher QRS amplitude.

**Solution 2**

Increase the displayed waveform size.

 **The respiration waveform and respiration rate is not displayed.****Cause**

The impedance respiration measurement is ceased.

**Solution**

Select [ON] for "Impedance Measurement" on "Admit/Discharge" or "RESP" setup screen.

** CAUTION**

- If the pacemaker with the minute ventilation measuring function is used, turn OFF the impedance respiration measurement. Otherwise, both the pacemaker and this monitor will not be able to perform accurate measurement.

 **The measurement data is displayed as "xxx".****Cause**

The respiration rate is outside the measurement range.

**Solution**

- Check if the electrodes are properly attached.  
(☞ "Before Attaching the Electrodes" P7-1)  
(☞ "Electrode Placement" P7-2)
- Replace the electrode, or check the lead cable.
- Change the lead for respiration measurement.

 **The lead for respiration measurement cannot be changed.****Cause**

HLX is used.

**Solution**

- If HLX is set, the lead will be fixed to [II].
- If the respiration amplitude for lead II is small, check the electrode attachment.

(☞ "Before Attaching the Electrodes" P7-1)  
(☞ "Electrode Placement" P7-2)

## Invasive Blood Pressure

---

- The PDP value is displayed as "---".

Cause

The BP measured by the HM-800 multimodule is labeled as [IAP].

Solution

PDP will not be calculated if BP label measured by HM-800 is set to [IAP]. When using the HM-800, do not set the BP label to IAP. To monitor the PDP data, set the BP label of Super Unit to [IAP].

- The "BP\* Transducer OFF" message is displayed.

Cause

The BP (1 to 8) transducer is not connected.

Solution 1

To cease monitoring, press the [Alarm Silence] key. This will clear the message and silence the alarm.

Solution 2

Connect the transducer.

- The "BP\* Zero Required" message is displayed.

Cause

The BP zero balance has not been performed since the power is turned ON.

Solution

Open the three-way valve of the transducer to air and perform zero balance.

- The measurement data is displayed as "---".

Cause

The BP zero balance has not been performed since the power is turned ON.

Solution

Open the three-way valve of the transducer to air and perform zero balance.

- BP value and waveform are not displayed properly.

Cause

The BP zero-balance is unstable.

Solution 1

Open the three-way valve of the transducer to air and perform zero balance.

Solution 2

Disconnect the BP transducer from the BP relay cable, and check if there is any abnormality on the connector terminal. Make sure that there is no distortion or no substance (such as blood, medicament) attached which may cause contact failure.

If any abnormality is found, replace the BP transducer or BP relay cable.

**□ The measurement data is displayed as "xxx".****Cause**

The BP value is outside the measurement range.

**Solution**

Perform BP zero balance again.

Check if the measurement data is within the measurement range.

Check the BP relay cable and BP transducer.

**□ The <BP# Disconnected> message is displayed.****Cause**

While monitoring the blood pressure, BP relay cable was disconnected from the 2ch BP conversion cable.

**Solution 1**

To cease monitoring, press the [Alarm Silence] key. This will clear the message and silence the alarm.

**Solution 2**

To continue monitoring, plug in the BP interface cable or 2ch BP conversion cable. This will clear the message and silence the alarm.

**□ The zero balance process fails.****Cause**

The three-way valve may not be opened to air, or artifact is present due to movements, etc.

**Solution**

Check if the three-way valve is opened to air. Verify that <Zero ready> is displayed on the parameter setup screen, or <READY> is displayed on the user key before starting the zero balance.

---

## SpO<sub>2</sub> Measurement (HS-8312N, HG-820)

---

**□ <SpO<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> Motion Artifact> is displayed.

Cause

There is excessive body motion from the patient.

Solution

Relocate the sensor to which body motion will have less influence.

The pulse waveform is not displayed, or interrupted.

Situation: The "SpO<sub>2</sub> Check Sensor Attach." message is displayed.

Cause 1

The amplitude of the pulse waveform is too low, or the sensor is not positioned correctly.

Solution

Check that the light emitting and receiving parts of the sensor LED are aligned.

Cause 2

The sensor is defective.

Solution

Replace the sensor.

Cause 3

SpO<sub>2</sub> sensor is not firmly connected to the connector.

Solution

Make sure the SpO<sub>2</sub> 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<sub>2</sub> value is unstable.

Cause 1

There is excessive body motion from the patient which disables correct measurement.

Solution 1

Have the patient lie still.

Solution 2

Relocate the sensor, or change the sensor to which the body motion will have less influence.

Cause 2

The probe size is not appropriate.

Solution

Select a probe size which is appropriate for the patient.

Cause 3

Sensor is exposed to light.

Solution

Place a black or dark cloth over the sensor to avoid direct sunlight.

<HS-8000 SpO<sub>2</sub> Failure> is displayed.

Cause 1

The sensor is defective.

Solution

Replace the sensor.

Cause 2

Communication error has occurred with the SpO<sub>2</sub> unit.

Solution

A defective cable or SpO<sub>2</sub> unit failure can be considered.

Contact our service representative.

<SpO<sub>2</sub> Replace Sensor> is displayed.

Cause 1

The sensor is not connected securely.

Solution

Connect the sensor securely.

Cause 2

The sensor is defective.

Solution

Replace the sensor.

Cause 3

A wrong sensor is used.

Solution

Replace the sensor.

For the available sensors, refer to our service representative.

<SpO<sub>2</sub> Disconnected> is displayed.

Cause

The SpO<sub>2</sub> relay cable is disconnected during SpO<sub>2</sub> monitoring.

Solution 1

To cease monitoring, press the [Alarm Silence] key. This will clear the message and silence the alarm.

Solution 2

To continue monitoring, plug in the SpO<sub>2</sub> relay cable. This will clear the message and silence the alarm.

## SpO<sub>2</sub> Measurement (HS-8312M, HG-810)

### □<SpO<sub>2</sub> Replace Sensor> is displayed.

#### Cause 1

The sensor is not connected securely.

#### Solution

Connect the sensor securely.

#### Cause 2

The sensor is defective.

#### Solution

Replace the sensor.

#### Cause 3

A wrong sensor is used.

#### Solution

Replace the sensor.

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

### □<SpO<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> Noise Interference> is displayed.

Cause

External signal or energy is interfering with the measurement.

Solution

Remove the external interference.

□<SpO<sub>2</sub> Check Sensor>, <SpO<sub>2</sub> Replace Cable>, or <SpO<sub>2</sub> Check Cable> is displayed.

Cause

Unrecognizable sensor is connected.

A wrong patient cable is used.

When attached to the patient, the sensor was exposed to high-intensity light which lead to false recognition.

Solution

Reattach the SpO<sub>2</sub> sensor and patient cable.

Replace with a Fukuda Denshi specified patient cable and sensor.

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

□<HS-8000 SpO<sub>2</sub> Failure> is displayed.

Cause

Communication error has occurred with the SpO<sub>2</sub> unit.

Solution

A broken wire or failure of the SpO<sub>2</sub> unit can be considered. Contact our service representative.

<SpO<sub>2</sub> Disconnected> is displayed.

Cause

The SpO<sub>2</sub> relay cable is disconnected during SpO<sub>2</sub> monitoring.

Solution 1

To cease monitoring, press the [Alarm Silence] key. This will clear the message and silence the alarm.

Solution 2

To continue monitoring, plug in the SpO<sub>2</sub> relay cable. This will clear the message and silence the alarm.

<SpO<sub>2</sub> 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<sub>2</sub> connector.

<Low Signal IQ> is displayed.

Cause

There is excessive body motion or sensor attached position is not appropriate.

Solution 1

Check that the light emitting and receiving parts of the sensor LED are aligned.

Solution 2

Relocate the sensor to which body motion will have less influence.

PVI, SpCO, SpMet, SpHb cannot be measured.

Cause 1

PVI, SpCO, SpMet, SpHb measurements are optional functions.

Solution

It is necessary to add these as the measuring parameters.

For details, please refer to our service representative.

Cause 2

The used sensor cannot measure the PVI, SpCO, SpMet, SpHb.

Solution

Use the sensor which can measure the PVI, SpCO, SpMet, SpHb.

For details, please refer to our service representative.

## Non-Invasive Blood Pressure

The cuff is not inflated although the pump is operating.

Cause 1

The air hose is not firmly connected, and the air is leaking.

Solution

Check if the air hose is properly connected.

**Cause 2**

The cuff size does not match the selected patient type.

**Solution**

Use the cuff with correct size for the selected patient type.

 **The pump is not operating.****Cause**

The air hose is disconnected from the NIBP Connector.

**Solution**

Check if the air hose is properly connected.

 **The measurement data is displayed as "---".****Cause 1**

The measurement accuracy is not reliable due to body motion artifact.

**Solution**

During the measurement, have the patient stay still.

**Cause 2**

The pulse is too small to acquire reliable measurement accuracy.

**Solution**

Check if the cuff is properly attached to the patient, or cuff size is correct.

**Cause 3**

The air hose is disconnected.

**Solution**

Check if the air hose is tightly connected, and then measure again. If the same message is displayed again, air may be internally leaked.

Contact our service representative.

 **<Check NIBP cuff, hose> is displayed.****Cause 1**

The connection between the cuff and air hose or the air hose and NIBP connector is loose or disconnected.

**Solution**

If connection is loose or disconnected, securely connect it and perform the measurement again.

If the same message is displayed again, air may be internally leaked. Cease the measurement and contact our service representative.

**Cause 2**

The cuff was subjected to compression.

**Solution**

Make sure that the cuff is not subjected to compression, and measure with the patient arms extended as much as possible.

If the same message is displayed again, a blockage in the air system can be considered. Cease the measurement and contact our service representative.

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

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

### C02-00 When not performing quick measurement, the data could not be measured.

#### Cause 1

According to the patient condition, the blood pressure may not be correctly measured.

#### Solution

Check the patient condition, and measure again.

#### Cause 2

The cuff application is loose.

#### Solution

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

### C02-01 When performing quick measurement, the data could not be measured.

#### Cause 1

According to the patient condition, the blood pressure may not be correctly measured.

#### Solution

Check the patient condition, set the quick measurement to OFF, and measure again.

#### Cause 2

The cuff application is loose.

#### Solution

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

### C02-02 The air hose was disconnected from the NIBP connector during the measurement.

#### Cause

The air hose was disconnected from the NIBP connector during the measurement.

#### Solution

Connect the air hose to the NIBP Connector, and then measure again.

### C03-xx The exhaust ventilation has ceased, or the target deflation speed was not achieved.

#### Cause 1

During measurement, the artifact such as body motion may have interfered.

#### Solution

Keep the patient still as much as possible, and measure while the patient is not moving. When performing the measurement during surgery, avoid artifact caused by the surgery.

#### Cause 2

During the measurement, air hose was bent or occluded by the compression.

#### Solution

Make sure that the air hose is not bent or compressed before the measurement.

If the error persists and C03-xx error is frequently displayed, contact our service representative and notify the error code.

**C04-xx The inflation was insufficient for the patient blood pressure.**Cause

The blood pressure has significantly increased from the previous measurement.

Solution

Check the cuff application and size and perform the manual measurement.

**C06-xx The pulse signal detected during the measurement was unstable.**Cause 1

During the measurement, the patient has trembled or moved.

Solution

Keep the patient still as much as possible, and measure while the patient is not trembling or moving.

Cause 2

Arrhythmia has frequently occurred during the measurement.

Solution

If arrhythmia occurs frequently, correct measurement cannot be performed. Measure when arrhythmia is not frequently occurring.

**C07-00 The measurement time has exceeded the allowed time.**Cause

Measurement is automatically repeated because the body motion is detected or inflation is insufficient.

Solution

Check the cuff application or size, measure by keeping the patient still without body motion.

**C08-00 Measured PR value was abnormal.**Cause

The patient has trembled or moved.

Solution

Keep the patient still as much as possible, and measure while the patient is not moving.

**C09-00 The inflation value has exceeded the allowed maximum value.**Cause

The cuff was subjected to compression.

Solution

Check that the cuff is not subjected to compression, and measure with the patient arms extended as much as possible.

**C10-xx Measured pulse amplitude was abnormal.**Cause

The cuff size does not match the patient.

Solution

Check if the cuff size is appropriate for the patient and that the cuff is properly wrapped before the measurement.

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

Cause

The preprogrammed time to clear the NIBP data has elapsed.

Solution

Select the appropriate time for "NIBP Erase Time" from [60min], [120min] which best fits the monitoring purpose.

- The NIBP periodic measurement is ceased.

Cause

The "NIBP Meas. Error (Exx-xx)" occurred during the measurement.

Solution

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

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

Cause

An error has occurred on the NIBP unit.

E08-01: Communication Error (Sub CPU)  
E08-02: WatchDog Timeout  
E08-03: Pressure Offset Error  
E08-04: Pressure Comparison Error  
E08-05: Sub CPU Power Supply Failure  
E08-06: Pressure Sensor 2 Power Supply Failure  
E08-07: Pressure Sensor 1 A/D Reference Power Voltage Failure  
E08-08: Rapid Exhaust Error  
E08-09: Air Hose Identification Error  
E09-A: Exceeded Maximum Cuff Pressure  
E09-B: Inflation Timeout  
E09-C: Quick Mode Timeout  
E09-D: Measurement started during the long pause  
E09-E: Measurement Timeout  
E09-F: Main CPU Pressure Data Transmission Timeout  
E09-G: Pressure Sensor 1 +5V Power Supply Failure  
E09-H: Zeroing Timeout  
E09-I: ROM Test Error  
E09-J: RAM Test Error  
E09-L: Clock Transmission Ceased  
E09-M: Communication Failure at Power ON  
E09-N: Pressure Comparison Error  
E09-O: Maximum Inflation Timeout  
E09-Q: Measurement started before zeroing  
E09-R: Zeroing Error  
E09-S: WatchDog Timeout  
E09-T: +5V Digital Power Supply Failure  
E09-U: Main CPU Power Supply Failure  
E09-V: Pump Control Signal Failure  
E09-W: Quick Exhaust Valve Control Signal Failure  
E09-X: Sub CPU Constant Exhaust Valve Control Signal Failure  
E09-Y: Main CPU Constant Exhaust Valve Control Signal Failure

Solution

The error message can be cancelled by pressing [Cancel Error] on the NIBP parameter setup screen or [NIBP Start/Stop] key (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 our service representative.

## Temperature

---

### <T\* Unknown Sensor> is displayed.

#### Cause 1

The 700 series is used.

#### Solution

Use the 400 series temperature probe for measurement.

#### Cause 2

There is a contact failure of the temperature probe.

#### Solution

Check if the temperature probe is properly inserted.

### The measurement data is displayed as "xxx".

#### Cause

The temperature measurement is outside the measurement range.

#### Solution

Check if the temperature probe is properly inserted.

Replace the temperature probe, or check the temperature probe.

### <T\* Disconnected> is displayed.

#### Cause

While monitoring the temperature, the temperature sensor was unplugged.

#### Solution 1

To cease monitoring, press the [Alarm Silence] key. The message will disappear, and the alarm will be silenced.

#### Solution 2

To continue monitoring, plug in the temperature sensor. This will clear the message and silence the alarm.

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

#### Cause

An error was detected on the temperature unit.

#### Solution

A failure of the equipment can be considered. Cease the measurement and contact our service representative.

## Cardiac Output (CO)

---

- When measured consecutively, the measurement value varies. ( $\pm 10\%$  or more)

### Cause 1

The injection method is not appropriate.

#### Solution

Inject within 1 to 3 seconds.

### Cause 2

Injection temperature is not appropriate.

#### Solution

If iced injectate is used, pay attention not to warm the injector with hands.

### Cause 3

The thermistor location is not appropriate.

#### Solution

Reposition the thermistor.

### Cause 4

Arrhythmia event has occurred during the measurement.

#### Solution

Wait until the patient has stable heart rhythm.

### Cause 5

There was patient's body movement during the measurement.

#### Solution

Have the patient stay still during the measurement.

### Cause 6

The patient's hemodynamics changed during the measurement.

#### Solution

Wait until the patient has stable hemodynamics.

- Abnormal measurement value is displayed.

### Cause

The catheter size, injectate volume, catheter constant (CC) is not correct.

#### Solution

Set the proper condition, CC value for the used catheter.

- The blood temperature (T<sub>b</sub>), injectate temperature (T<sub>i</sub>) is not displayed.

### Cause

The catheter is not properly connected.

#### Solution

Securely connect the catheter.

The thermodilution curve is deformed.

Cause

The injection is not smooth, steady motion.

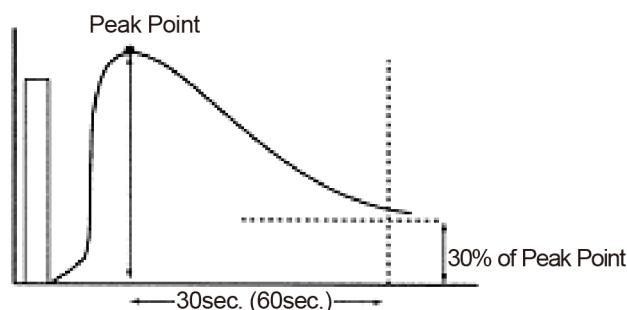
Solution

Inject promptly within 1 to 3 seconds.

The baseline of the thermodilution curve is displaced to the minus side. <LOWER FAULT> is displayed.

Cause

The blood temperature has not returned to stable condition after the measurement.



The thermodilution curve did not return to the cut off point soon enough. The temperature must return to a point that is 30% of the peak value within 30 seconds (or 60 seconds depending on the setup).

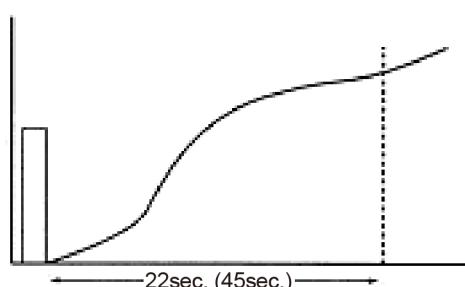
Solution

If performing continuous measurement, wait for 30 to 60 seconds and check that "Ready" is displayed before performing the next measurement.

The thermodilution curve is low. <PEAK FAULT> is displayed.

Cause

The peak of the thermodilution curve can not be detected.



After the measurement is started, the peak of the thermodilution curve was not determined within 22 seconds (when the time scale is "30 sec" ) or 45 seconds (when the time scale is "60 sec" ).

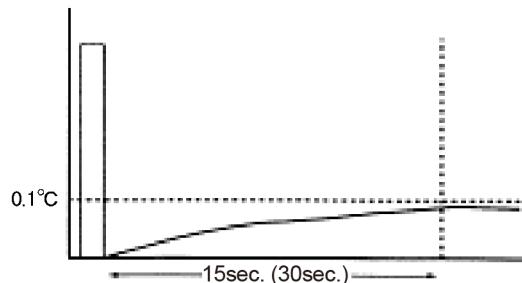
Solution

The thermistor may be contacting the pulmonary artery wall. Reposition the thermistor and measure again.

<UPPER FAULT> message is displayed.

Cause

After the injection, the blood temperature is out of the measurement range.



After the measurement is started, the change in blood temperature is less than 0.1°C for more than 15 seconds (when the time scale is "30 sec" ) or 30 seconds (when the time scale is "60 sec" ).

Solution

Use the iced injectate, and measure again.

<OVER RANGE> is displayed.

Cause

The CO value is out of the calculation range.

Solution

The area of the thermodilution curve is too large to calculate. Start the measurement again.

The measurement is interrupted, and the error message, <UPPER\_FAULT>, <PEAK\_FAULT>, <LOWER\_FAULT> , <SENSOR\_ERROR> is displayed.

Cause 1

The thermistor connector and relay cable is not securely connected.

Solution

Correct measurement cannot be performed unless the thermistor connector and relay cable is securely connected. Check the connection and perform the measurement again.

Cause 2

The sensor or relay cable is defective.

Solution

If the sensor or cable is defective, measurement can not be performed. Replace the sensor or cable and perform the measurement again.

<CO Disconnected> message is displayed.

Cause

The catheter relay cable was disconnected while monitoring the cardiac output.

Solution 1

To cease monitoring, press the [Alarm Silence] key. The message will disappear, and the alarm will be silenced.

Solution 2

To continue monitoring, plug in the catheter relay cable. This will clear the message and silence the alarm.

## CO<sub>2</sub> Measurement (HPD-800/HPD-810)

---

### □<CO<sub>2</sub> Sensor Failure> is displayed.

#### Cause 1

The CO<sub>2</sub> sensor temperature has increased above 40°C.

#### Solution

Remove any heat generating source around the sensor.

#### Cause 2

The CO<sub>2</sub> sensor is malfunctioning.

#### Solution 1

Replace the CO<sub>2</sub> 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<sub>2</sub> Adapter> is displayed.

#### Cause

The CO<sub>2</sub> sensor is not zero balanced.

#### Solution

Perform the zero calibration of the sensor.

(☞ "CO<sub>2</sub> Concentration (Mainstream Method)" P7-71)

### □<Check CO<sub>2</sub> 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<sub>2</sub> Sensor> is displayed.

#### Cause

Unsupported CO<sub>2</sub> sensor is connected.

#### Solution

Connect the specified CO<sub>2</sub> sensor.

<CO<sub>2</sub> Disconnected> is displayed.

Cause

When the cable is disconnected during CO<sub>2</sub> 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.

## CO<sub>2</sub> Measurement (HCP-800/HCP-810)

---

<CO<sub>2</sub> Check Sample Line> is displayed.

Cause 1

The sampling line is clogged.

Solution

Replace the sampling line.

Cause 2

The sampling line is bent or pinched.

Solution

Make sure that the sampling line is properly allocated.

<Initializing> message 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 same message is displayed again, CO<sub>2</sub> unit failure can be considered. Contact our service representative.

<CO<sub>2</sub> Unit Error> is displayed.

Cause 1

Communication error has occurred with the CO<sub>2</sub> unit.

Solution

A broken wire or failure of the CO<sub>2</sub> unit can be considered. Contact our service representative.

There is substantial measurement error.

Cause 1

20 minutes have not yet elapsed since the power is turned ON.

Solution

For 20 minutes from turning ON the power, there will be a substantial measurement error.

Cause 2

The CO<sub>2</sub> calibration value is not appropriate.

Solution

Perform the CO<sub>2</sub> calibration again.

<CO<sub>2</sub> Disconnected> is displayed.

Cause

When the filter line is disconnected during CO<sub>2</sub> 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<sub>2</sub> measurement by the gas module will be prioritized.

---

## 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<sup>MB</sup>
- ♦ 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<sub>2</sub> waveform is not displayed on the central monitor although the CO<sub>2</sub> 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<sub>2</sub>] for "RR/APNEA Alarm Source" on the RESP setup screen.

In this case, RR and apnea alarm will be generated based on CO<sub>2</sub> measurement.

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

Cause 1

[CO<sub>2</sub>] 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<sub>2</sub>] is set for "RR/APNEA Alarm Source". AWF, AWP waveform will be displayed.
- The CO<sub>2</sub> waveform will not be displayed if [Impedance] is set for "RR/APNEA Alarm Source". AWF, AWP waveform will be displayed.
- The CO<sub>2</sub> waveform and impedance waveform will not be displayed if [Vent.] is set for "RR/APNEA Alarm Source".

- <Check DS-LAN Comm> is displayed.

Cause 1

The LAN cable is loose, or contact failure has occurred. The power of the central monitor has been turned OFF.

Solution

Check the LAN connection on both the main unit and wall side. Disconnect and connect it again to make sure that it is firmly connected

Check the LAN connection on the central monitor. Disconnect and connect it again to make sure that it is firmly connected.

Turn ON the power of the central monitor.

## Telemeter

---

- The data cannot be received at the telemetry center.

Cause

The channel ID or group ID is not corresponded with the telemetry receiver.

Solution

Set the correct channel ID and group ID.

- The impedance respiration waveform cannot be received at the telemetry center.

Cause 1

[CO<sub>2</sub>] 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 the software version of "HLX-501 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.



- 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 indicator of the Super Unit does not light in green.  
<HS-8000 Check Conn.> is displayed.

Cause 1

The power cable of the main unit is not connected.

Solution

Turn OFF the power and connect the power cable.

Cause 2

The 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 cease the operation. Contact our 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.

<HS-8000 Out of Operating Temp. Range> is displayed.

Cause

The temperature inside the Super Unit has exceeded the operating temperature range.

Solution

The operation cannot be assured. Immediately turn OFF the power and cease the operation. If the same message is repeatedly displayed, contact our service representative.

<HS-8000 Analog Unadjusted> is displayed.

Cause

One of ECG, respiration, or BP is not adjusted.

Solution

Correct measurement cannot be performed if not adjusted. Contact our service representative.

<HS-8000 Check DIP SW> is displayed.

Cause

The DIP switch setting has been changed.

Solution

Contact our service representative.

<HS-8000 Check SD Card> is displayed.

Cause

The SD Card is defective or the Super Unit is malfunctioning.

Solution

Contact our service representative.

---

## Data Transfer Function

---

The patient name is flashing.

Cause 1

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

An error occurs during the data update process.

Cause

HS-8000 is disconnected during the data update process.

Solution 1

Do not disconnect the HS-8000 during the data update process. If the same error persists, refer to our service

representative.

Solution 2

If the error occurs during the write process, start again from the read process.

If the same error persists, refer to our service representative.

Cause 2

The module connection cable is not properly connected.

Solution

Turn OFF the power, and make sure that the module connection cable is securely connected. Reconnect the cable if necessary. If the knob is loose, tighten it securely.

- When the HS-8000 is connected, the alarm sound is suspended.

Cause

This is a normal operation. To not suspend the alarm sound, set the alarm sound suspend function OFF.

- The recall data cannot be transferred.

Cause 1

The SD card is not inserted to the Super Unit.

Solution

Insert the SD card to the Super Unit.

Cause 2

The SD card is not formatted.

Solution

Format the SD card.

## 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<sub>2</sub>
- ♦ 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/Servo-s]

- ♦ No network setting.

[PB-740/760/840]

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

[Evita4/2dura/XL]

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

## 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<sub>2</sub>/CCO Monitor

---

- The numeric data is not displayed.

### Cause 1

The cable is not properly connected.

#### Solution 1

Connect the following cable securely.

Oximeter, CCO Measurement Device	Connection Cable	
	For STATUS II Connector	For Serial Connector
Vigilance	CJ-406RI-70Vigi (x1)	CJO-04RS4
Vigilance CEDV	CJ-406RI-70Vigi (x1)	CJO-04RS4
Vigilancell	CJ-402RI-70SVi (x1)	CJ-502
Vigileo	CJ-402RI-70SVi (x1)	CJ-502
EV1000	CJ-406RI-70Vigi (x1)	CJO-04RS4
PiCCO2	CJO-19RS5 (x1)	CJO-18RS5

### Cause 2

The "External Device" setting is not correct.

#### Solution

Select [Vigilance/Vigileo] or [PiCCO] 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<sub>2</sub>, 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

#### 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.

## 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.

## 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. The <Check FLOW-i Connection> message 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.

## 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

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# Chapter 12 Setup Item/Default Value

This section lists selection, default setting, and backup status for each setup item.  
The following indicates the selection, default setting and backup status for each setup item.

## Patient Admit / Discharge

---

Item	Details	Default	Power ON	Discharge
Mode Selection	Main Mode 1 to 9, Sub Mode 1 to 6, Extended Display1 1 to 3, Extended Display2 1 to 3	1	Backup	Backup
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	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
Sex	Male, Female	No selection	Backup	Initialize
Team	Red, Orange, Yellow, Yellow-green, Green, Light Blue, Blue, Purple	Red	Backup	Backup
Year, Month, Day	Year, Month, Day	Blank	Backup	Initialize
Age	0 to 150 years or 0 to 999 days	0 year	Backup	Initialize
Height	0.0 to 300.0cm / 0.0 to 118.1in	0.0cm / 0.0in	Backup	Initialize
Weight	0.0 to 350.0kg / 0.0 to 771.6lb	0.0kg / 771.6lb	Backup	Initialize
BSA	0.00 to 9.99m <sup>2</sup>	0.00 m <sup>2</sup>	Backup	Initialize
Blood Type	A, B, O, AB Rh +/-	Blank	Backup	Initialize
Pacemaker	Used, Not used	Not Used	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
Impedance Measurement	ON, OFF	ON	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
Admit Date	Year, Month, Day	Blank	Backup	Initialize

## Alarm

---

Item	Details	Default	Power ON	Discharge
System Alarm	Alarm Suspend ON/OFF	Alarm Suspend ON	-	-
HR, PR_SpO <sub>2</sub> , PR_IBP	ON, OFF 20 to 300bpm	OFF 40-120		
ASYSTOLE*1	ON, OFF 3 to 10 sec.	ON 5 sec.		
VF*1	ON, OFF	ON		
VT*1	ON, OFF	ON		
SLOW_VT*1	ON, OFF	ON		
Run	ON, OFF 2 to 8 beats	ON 3 beats		
Couplet	ON, OFF	OFF		
Pause	ON, OFF 1.5 to 5 sec.	OFF 3.0 sec.		
Bigeminy	ON, OFF	OFF		
Trigeminy	ON, OFF	OFF		
Frequent	ON, OFF 1 to 50 beats/min.	OFF, 10 beats/min.		
TACHY	ON, OFF	ON		
BRADY	ON, OFF	ON		
HR Lower Limit for VT	120, 140 beats/min.	120		
HR Lower Limit for RUN	0 to 100 beats/min.	40		
ST1 to ST12 (mm)*2	ST All Alarm ON, OFF Indiv. Alarm ON, OFF ±20mm	ST All Alarm OFF Indiv. Alarm OFF OFF to OFF	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
ST1 to ST12 (mV)*2	ST All Alarm ON, OFF Indiv. Alarm ON, OFF ±2.00mV	ST All Alarm OFF Indiv. Alarm OFF OFF to OFF		
BP1 (mmHg)	ON, OFF 0 to 300mmHg	ON SYS: 80-180 DIA: OFF-OFF MEAN: OFF-OFF		
BP1 (kPa)	ON, OFF 0 to 40.0kPa	ON SYS: 10.0-24.0 DIA: OFF-OFF MEAN: OFF-OFF		
BP2 to BP8(mmHg)	ON, OFF 0 to 300mmHg	OFF SYS: OFF-OFF DIA: OFF-OFF MEAN: OFF-OFF		
BP2 to BP8(kPa)	ON, OFF 0 to 40.0kPa	OFF SYS: OFF-OFF DIA: OFF-OFF MEAN: OFF-OFF		

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

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

Item	Details	Default	Power ON	Discharge
CVP (mmHg)	ON, OFF 0 to 300mmHg	OFF SYS: OFF-OFF DIA: OFF-OFF MEAN: OFF-OFF		
CVP (cmH <sub>2</sub> O)	ON, OFF 0 to 40 cmH <sub>2</sub> O	OFF SYS: OFF-OFF DIA: OFF-OFF MEAN: OFF-OFF		
RR_IMP, RR_VENT, RR_CO <sub>2</sub>	ON, OFF 5 to 150bpm	ON 5 to 30		
APNEA	ON, OFF 10 to 60 sec.	ON 15 sec.		
SpO <sub>2</sub>	ON, OFF 50 to 100%	ON 90-OFF		
SpCO	ON, OFF 1 to 40%	OFF		
SpMet	ON, OFF 1 to 15%	OFF		
SpHb (g/dL)	ON, OFF 1.0 to 24.5g/dL	OFF		
NIBP (mmHg)	ON, OFF 10 to 300mmHg	ON SYS: 80-180 DIA: OFF-OFF MEAN: OFF-OFF		
NIBP (kPa)	ON, OFF 1.5 to 40.0kPa	ON SYS: 10.0-24.0 DIA: OFF-OFF MEAN: OFF-OFF		
TEMP1 to TEMP8 (°C)	ON, OFF 30 to 45°C	OFF OFF-OFF	Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F].	
TEMP1 to TEMP8 (°F)	ON, OFF 86 to 113°F	OFF OFF-OFF		
Tb (°C)	ON, OFF 30 to 45°C	OFF OFF-OFF		
Tb (°F)	ON, OFF 86 to 113°F	OFF OFF-OFF		
CO <sub>2</sub> -E (mmHg)	ON, OFF 1 to 100mmHg	OFF		
CO <sub>2</sub> -E (kPa)	ON, OFF 0.1 to 13.3kPa	OFF		
CO <sub>2</sub> -E (%)	ON, OFF 0.1 to 13.3%	OFF		
CO <sub>2</sub> -I (mmHg)	ON, OFF 1 to 4mmHg	OFF		
CO <sub>2</sub> -I (kPa)	ON, OFF 0.1 to 0.4kPa	OFF		
CO <sub>2</sub> -I (%)	ON, OFF 0.1 to 0.4%	OFF		
O <sub>2</sub> -E, O <sub>2</sub> -I (%)	ON, OFF 18 to 100%	OFF		
N <sub>2</sub> O-E, N <sub>2</sub> O-I (%)	ON, OFF 0 to 100%	OFF		
ISO-E (%), HAL-E (%), ENF-E (%)	ON, OFF 0.5 to 6.0%	OFF		
ISO-I (%), HAL-I (%), ENF-I (%)	ON, OFF 0.5 to 6.0%	OFF		
SEV-E, SEV-I (%)	ON, OFF 0.5 to 8.0%	OFF		
DES-E, DES-I (%)	ON, OFF 0.5 to 18.0%	OFF		
PEAK	ON, OFF 8 to 100cmH <sub>2</sub> O	OFF		
PEEP	ON, OFF 2 to 50cmH <sub>2</sub> O	OFF		
MV-E	Adult: ON, OFF 0.5 to 20L/min Child, Neonate: ON, OFF 0.5 to 5L/min	OFF		

Item		Details	Default	Power ON	Discharge
Alarm Detail Setup	Alarm Suspend Time	1, 2 min.	2 min.	Backup	Backup
	Alarm Silence Time	1, 2 min.	2 min.	Backup	Backup
	Suspend Alarm Sound	ON, OFF	ON	Backup	Backup
	Suspend Alarm Sound Time	1min., 2min., 5min., 10min., 30min., 60min., 90min., 120min., 240min., 360min.,	60 min.	Backup	Backup
	Status Alarm Control	Link to alarm silence time, Link to each new occurrence	Link to each new occurrence	Backup	Backup
	Alarm Limit Display	Graph, Numeric, OFF	Graphic	Backup	Backup

\*3: When the numeric data acquired from the FLOW-i is displayed, the alarms cannot be set. Also, these alarms will not generate.

#### NOTE

- Selecting [Backup] for "Power ON" and "Discharge" under [Initial Settings] > [User I/F] > [Power ON/Discharge] will retain the setting at "Power ON" and "Discharge" respectively. If [Initialize] is selected, the setting will be initialized with the selected mode at "Power ON" and "Discharge".

## Parameter

### ECG

Item	Details	Default	At Power ON	At Discharge
Lead	I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6	ECG1: II ECG2: aVR ECG3: I ECG4: III ECG5: aVL ECG6: avF ECG7: V1 ECG8: V2 ECG9: V3 ECG10: V4 ECG11: V5 ECG12: V6		Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F].
Size	Auto, x1/4, x1/2, x1, x2, x4	ECG1 to ECG12 x1	Backup	Initialize
Filter	Monitor, Diagnosis, ESIS	Monitor	Backup	Backup
Synchronized Mark/Tone	ECG, SpO <sub>2</sub> -1, SpO <sub>2</sub> -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	Backup	Initialize
HR Average	Instant, Average	Average	Backup	Backup
Drift Filter	ON, OFF	OFF	Backup	Backup
AC Filter	ON, OFF	ON	Backup	Backup
Automatic Lead Switch	ON, OFF	OFF	Backup	Backup
3-lead Override	ON, OFF	OFF	Backup	Backup

## ECG

Item	Details	Default	At Power ON	At Discharge
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

## RESP

Item	Details	Default	At Power ON	At Discharge
Size	x1/4, x1/2, x1, x2, x4	x1	Backup	Initialize
RR Synchronized Mark	ON, OFF	ON	Backup	Backup
RR Alarm, APNEA Source	Auto, Impedance, Ventilator, CO <sub>2</sub> /GAS	Auto	Backup	Backup
CVA Detect	ON, OFF	OFF	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
Impedance Measurement	*Same with "Patient Admit/Discharge" section.			
Impedance Detection Lead	I, II	II	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	

SpO<sub>2</sub> (General)

Item	Details	Default	At Power ON	At Discharge
Size	x1/4, x1/2, x1, x2, x4	x1	Backup	Initialize
Synchronized Mark/Tone	*Same with selection for ECG Setup.			
Alarm during NIBP	ON, OFF	ON	Backup	Backup
Label	None/Auto/RH/LH/RF/LF/OT	none	Backup	Backup

SpO<sub>2</sub> (Nellcor™ Unit)

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

SpO<sub>2</sub> (Masimo Unit)

Item	Details	Default	At Power ON	At Discharge
SpO <sub>2</sub> Averaging	2–4sec, 4–6sec, 8sec, 10sec, 12sec, 14sec, 16sec	8 sec.	Backup	Backup
Pulse Sensitivity	Normal, High	Normal	Backup	Backup
FAST SAT	ON, OFF	OFF	Backup	Backup
Perfusion Index	ON, OFF	ON	Backup	Backup
Signal IQ Wave	ON, OFF	OFF	Backup	Backup
SpHb Averaging	Short, Medium, Long	Medium	Backup	Backup

## NIBP

Item	Details	Default	At Power ON	At Discharge
Patient Classification	*Same with "Patient Admit/Discharge" section.			
Quick Measurement	ON, OFF	ON	Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F].	
NIBP Auto Mode	Cont., 1min, 2min, 2.5min, 5min, 10min, 15min, 20min, 30min, 60min, 120min, Lumbar Mode, OFF	OFF	Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F].	
Dyna Alert	ON, OFF	ON	Backup	Backup
Sight Inflation	ON, OFF	OFF	Backup	Backup
Oscillograph	ON, OFF	OFF	Backup	Backup
MAP	ON, OFF	ON	Backup	Backup
PR	ON, OFF	OFF	Backup	Backup
End Tone	ON, OFF	ON	Backup	Backup
NIBP Erase Time	60 min., 120 min.	120 min	Backup	Backup
User Interval	Lumbar Mode	Lumbar Mode	Backup	Backup
Measure at Alarm	ON, OFF	OFF	Backup	Backup
	Asystole, VF, VT, Slow VT, Run, Bigeminy, Trigeminy, Pause, Couplet, Tachy, Brady, Frequent	No Selection	Backup	Backup
	HR, ST, RR, APNEA, SpO <sub>2</sub> , BP1, BP2, BP3, BP4, BP5, BP6, BP7, BP8, T1, T2, T3, T4, T5, T6, T7, T8, Tb, CO <sub>2</sub> , O <sub>2</sub> , N <sub>2</sub> O, AGENT, SpCO, SpMet, SpHb, MV, PEEP, PEAK	No Selection	Backup	Backup
Auto Mode with Start/Stop key	ON, OFF	ON	Backup	Backup
Time Display	Elapsed, Meas.	Elapsed	Backup	Backup
Periodic Measurement Starting Time	Time, Meas.	Time	Backup	Backup

## BP1 to 8

Item	Details	Default	At Power ON	At Discharge
Scale*	20, 50, 75, 100, 150, 200, 250, 300mmHg	200mmHg 50mmHg (BP2)	Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F].	
	4, 8, 12, 16, 20, 24, 32, 40kPa	24.3kPa 8kPa (BP2)		
Label	BP#, ART, PAP, CVP, ICP, IAP, LVP, US1 to US5	BP# indicates BP1 to BP8	Backup	Backup
Synchronized Mark/Tone	*Same with selection for ECG Setup.			
Display Type	S/D/M, S/D, M	S/D/M	Backup	Backup
Wave Filter	6, 8, 12, 40Hz	12Hz	Backup	Backup
Mean Wave	ON, OFF	OFF	Backup	Backup
Respiration Filter	ON, OFF	OFF	Backup	Backup
Alarm during NIBP	ON, OFF	ON	Backup	Backup

\*: The scale selection will differ depending on the label.

## TEMP1 to TEMP8

Item	Details	Default	At Power ON	At Discharge
Label	T#, Tsk, Tre, Tes, Tco, US1 to US7	T* (T1 to T8)	Backup	Backup

## ΔT Setting

Item	Details	Default	At Power ON	At Discharge
ΔTemp-A	(T1 to T8) - (T1 to T8)	T1-T2	Backup	Backup
ΔTemp-B	(T1 to T8) - (T1 to T8)	T3-T4	Backup	Backup
ΔTemp-C	(T1 to T8) - (T1 to T8)	T5-T6	Backup	Backup
ΔTemp-D	(T1 to T8) - (T1 to T8)	T7-T8	Backup	Backup

CO<sub>2</sub> (Capnostat 5/HPD-800/HPD-810)

Item	Details	Default	At Power ON	At Discharge
Scale	0-50, 0-100mmHg	0-50	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	0-4, 0-8, 0-10kPa	0-4		
	0-4, 0-8, 0-10%	0-4		
EtCO <sub>2</sub> Peak Duration	10, 20sec, OFF	10 sec.	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
CO <sub>2</sub> Source Priority	MGU-800, HS-8000	HS-8000		
O <sub>2</sub> Comp.	0-100%	21%	Backup	Backup
N <sub>2</sub> O Comp.	ON, OFF	OFF	Backup	Backup
Anesthetic Gas Comp.	0.0-20.0%	0.0%	Backup	Backup
Atmospheric Pressure	400 to 850mmHg	760mmHg	Backup	Backup

CO<sub>2</sub> (COVIDIEN/HCP-800/HCP-810)

Item	Details	Default	At Power ON	At Discharge
Scale	0-50, 0-100mmHg	0-50	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	0-4, 0-8, 0-10kPa	0-4		
	0-4, 0-8, 0-10%	0-4		
EtCO <sub>2</sub> Peak Duration	10, 20sec, OFF	10 sec.	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
CO <sub>2</sub> Source Priority	MGU-800, HS-8000	HS-8000		

## SPIRO, Ventilator, FLOW-i

Item	Details	Default	At Power ON	At Discharge
AWP Scale	10, 20, 30, 50, 120cmH <sub>2</sub> O	50cmH <sub>2</sub> O	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
AWF Scale	5, 10, 20, 50, 180 L/min	50L/min	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
AWV Scale	50, 250, 500, 1000, 3000mL	500mL	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	

## Cardiac Output (CO)

Item	Details	Default	At Power ON	At Discharge
Auto Start	ON, OFF	ON	Backup	Backup
Time Scale	30, 60 sec	30 sec.	Backup	Backup

## Multigas Concentration, FLOW-i

Item	Details	Default	At Power ON	At Discharge
GAS_CO <sub>2</sub> Scale*	50, 100mmHg	0 to 50mmHg	Backup	Backup
	4, 8, 10kPa	4kPa		
	4, 8, 10%	4%		
GAS_O <sub>2</sub> Scale*	18-30, 18-60, 18-100, 0-30, 0-60, 0-100%	18-30%	Backup	Backup
Agent Sel.	ISO, HAL, ENF, SEV, DES, Auto	Auto	Backup	Backup
Agent Scale*	0-4, 0-8, 0-16%	4%	Backup	Backup
Flow Rate (When adult/child water trap is used.)	120, 150, 200ml/min	200ml/min	Backup	Backup
Flow Rate (When neonate water trap is used.)	70, 100, 120ml/min	120ml/min	Backup	Backup
Wave Clip*	ON, OFF	ON	Backup	Backup
CO <sub>2</sub> Source Priority	MGU-800, HS-8000	MGU-800	Backup	Backup

\*These items will become effective when the FLOW-i is connected.

## BIS (A-2000/A-3000)

Item	Details	Default	At Power ON	At Discharge
Short Trend 2nd Parameter	SR, EMG, SQI, OFF	SR	Backup	Backup

## Stopwatch

Item	Details	Default	At Power ON	At Discharge
Label 1	9 alphanumeric characters	TIMER1	Backup	Backup
Label 2		TIMER2	Backup	Backup

## Data Review

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Graphic Trend

Item	Details	Default	At Power ON	At Discharge	
Trend A	HR, ST(I to V6), SpO <sub>2</sub> , PR_SpO <sub>2</sub> , VPC, NIBP, BP1 to 8, PR_IBP, PDP, CPP, TEMP1 to 8, Tb, ΔTEMP-A to D, RR_IMP, APNEA, EtCO <sub>2</sub> , InspCO <sub>2</sub> , RR_GAS, ExpN <sub>2</sub> O, InspN <sub>2</sub> O, O <sub>2</sub> , ExpAGT, InspAGT, MAC, BIS, SR, EMG, SQI, SvO <sub>2</sub> , ScvO <sub>2</sub> , CCO, CCI, BT, RR_VENT, ExpO <sub>2</sub> , InspO <sub>2</sub> , PI, PVI, SpCO, SpMet, SpHb, PEAK, PEEP, ExpMV	Upper Row: HR, NIBP Lower Row: SpO <sub>2</sub> , TEMP1, RR_IMP	Backup	Backup	
Trend B		Upper Row: HR, BP1, TEMP1, NIBP Lower Row: SpO <sub>2</sub> , EtCO <sub>2</sub> , ST(II), RR_CO <sub>2</sub>	Backup	Backup	
Trend C		Upper Row: HR, TEMP1, BP1, NIBP Lower Row: SpO <sub>2</sub> , InspO <sub>2</sub> , EtCO <sub>2</sub> , InspAGT	Backup	Backup	
Trend D		N/A	Backup	Backup	
Trend E		Upper Row: EMG, SQI Lower Row: BIS, SR	Backup	Backup	
Time	20min, 1h, 2h, 4h, 8h, 12h, 16h, 24h(LC-8019T) 10min, 1h, 2h, 4h, 8h, 12h, 16h, 24h(LC-8015T)	4 hours	Backup	Backup	
Display Selection	             				
Scale, Display Selection	HR, PR_SpO <sub>2</sub> , PR_IBP	100, 200, 300bpm	300bpm 	Backup	Backup
	ST(V to V6)	±0.2, ±0.5, ±1.0, ±2.0mV ±2.0, ±5.0, ±10.0, ±20.0mm	±0.5mV ±5.0mm 	Backup	Backup
	VPC	20, 50, 100 beats	20 beats 	Backup	Backup
	BP1 to BP8	20, 50, 100, 150, 200, 300mmHg 4, 8, 16, 20, 24, 40kPa	200mmHg, 24kPa 	Backup	Backup
	PDP, CPP	20, 50, 100, 150, 200, 300mmHg 4, 8, 16, 20, 24, 40kPa	200mmHg, 24kPa 	Backup	Backup
	NIBP	100, 150, 200, 300mmHg 16, 20, 24, 40kPa	200mmHg, 24kPa 	Backup	Backup
	TEMP1 to TEMP8,	20.0-45.0, 30.0-40.0°C 68.0-113.0, 86.0-104.0°F	30.0-40.0°C 86.0-104.0°F 	Backup	Backup
	Tb	20.0-45.0, 30.0-40.0°C 68.0-113.0, 86.0-104.0°F	20.0-45.0°C 68.0-113.0°F 	Backup	Backup
	SpO <sub>2</sub>	0-100, 50-100, 80-100%	80-100% 	Backup	Backup
	SpCO	0-20, 0-40, 0-100%	0-20% 	Backup	Backup

## Graphic Trend

Item	Details		Default	At Power ON	At Discharge
Scale, Display Selection	SpMet	0-10, 0-15, 0-100%	0-10%	Backup	Backup
	SpHb	10-20, 0-25g/dL	10-20g/dL	Backup	Backup
	RR_IMP, RR_VENT, RR_GAS	50, 100, 150Bpm	50Bpm	Backup	Backup
	APNEA	15, 30 sec.	15 sec.	Backup	Backup
Scale, Display Selection	CO <sub>2</sub>	50, 100mmHg 4.0, 8.0, 10.0kPa 4.0, 8.0, 10.0%	50mmHg 4.0kPa 4.0%	Backup	Backup
	O <sub>2</sub>	50, 100%	100%	Backup	Backup
	ΔO <sub>2</sub>	3.0, 6.0, 9.0%	3%	Backup	Backup
	N <sub>2</sub> O	50, 100%	100%	Backup	Backup
	Agent	4.0, 8.0, 10.0%	8%	Backup	Backup
	PI	0-10, 0-20%	0-10%	Backup	Backup
	PVI	0-30, 0-60, 0-100%	0-30%	Backup	Backup
	PEAK	0-10, 0-20, 0-50, 0-100 cmH <sub>2</sub> O	0-20 cmH <sub>2</sub> O	Backup	Backup
	PEEP	0-10, 0-20, 0-50, 0-100 cmH <sub>2</sub> O	0-20 cmH <sub>2</sub> O	Backup	Backup
	MV	0.0-6.0, 0.0-12.0, 0.0-20.0L/min	0.0-12.0L/min	Backup	Backup
	SvO <sub>2</sub> , ScvO <sub>2</sub>	0-100, 50-100, 80-100%	0-100%	Backup	Backup
	CCO	6, 12, 20L/min	6L/min	Backup	Backup
	CCI	6.0, 12.0, 20.0L/min/m <sup>2</sup>	6L/min/m <sup>2</sup>	Backup	Backup
	BT	20.0-45.0, 30.0-40.0°C 68.0-113.0, 86.0-104.0°F	20.0-45.0°C 68.0-113.0°F	Backup	Backup
	BIS	25, 50, 75, 100	100	Backup	Backup
	SR	25, 50, 75, 100%	100%	Backup	Backup
	SQI	0-100%	100%	Backup	Backup
	EMG	30-80dB	30-80dB	Backup	Backup
	Lt-rSO <sub>2</sub>	20-100	20-100	Backup	Backup
	Rt-rSO <sub>2</sub>	20-100	20-100	Backup	Backup
	S1-rSO <sub>2</sub>	20-100	20-100	Backup	Backup
	S2-rSO <sub>2</sub>	20-100	20-100	Backup	Backup

## Tabular Trend

Item	Details	Default	At Power ON	At Discharge
Time	10sec., 30sec., 1min., 2min., 2.5min., 5min., 10min., 15min., 30min., 60min., NIBP	5 min.	Backup	Backup
Group	A to F	A	Backup	Backup
Fixed Parameters	0 to 6 param.	0 param.	Backup	Backup
List Selection	<p>[H Module]</p> OFF, HR, VPC, ST(I to V6), SpO <sub>2</sub> , PR_SpO <sub>2</sub> , NIBP-S/D/M, BP1 to 8- S/D/M, PR_IBP, PDP, PCWP, CPP, TEMP18, Tb, CO, EtCO <sub>2</sub> , InspCO <sub>2</sub> , RR_GAS, RR_IMP, RR_VENT, APNEA, O <sub>2</sub> -E, O <sub>2</sub> -I, N <sub>2</sub> O-E, N <sub>2</sub> O-I, AGT-E, AGT-I, AGT2-E, AGT2-I PI, PVI, SpCO, SpMet, SpHb, E-TV, I-TV, , E-MV, I-MV, P-PEAK, P-PAUSE, PEEO, P-MEAN, RES, COMP, TV1sec, I/E RATIO			
	<p>[SvO<sub>2</sub>/CCO]</p> SvO <sub>2</sub> , ScvO <sub>2</sub> , SaO <sub>2</sub> , O <sub>2</sub> EI, B-Temp, CCO, CCO-STAT, CCI, CCI-STAT, DO <sub>2</sub> , RVEF, RVEF-STAT, VO <sub>2</sub> , SV, SV-STAT, SVI, SVI-STAT, SVR, SVRI, SVV, EDV, EDV-STAT, EDVI, EDVI-STAT, MAP, ESV, ESVI, OFF			
	<p>[Ventilator]</p> E-TV, I-TV, MV, SMV, P-PEAK, P-PAUSE, PEEP, P-MEAN, E-RES, I-RES, COMP, FiO <sub>2</sub> , P-MIN, S-COMP, D-COMP, S-RR, I/E RATIO, RES			
	<p>[Other]</p> BIS, SQI, EMG, SR, SEF, TOTPOW, IMP, Lt-rSO <sub>2</sub> , Rt-rSO <sub>2</sub> , S1-rSO <sub>2</sub> , S2-rSO <sub>2</sub>			
Trend A	HR, VPC, ST(I), ST(II), NIBP-S, NIBP-D, SpO <sub>2</sub> , PR_SpO <sub>2</sub> , BP1-S, BP1-D, BP1-M, BP2-S, BP2-D, BP2-M, EtCO <sub>2</sub> , RR_CO <sub>2</sub> , RR_IMP, APNEA, TEMP1, TEMP2		Backup	Backup
Trend B	HR, VPC, ST(I) to ST(V6)		Backup	Backup
Trend C	HR, RR_IMP, RR_GAS, RR_VENT, SpO <sub>2</sub> , P-PEAK, P-PAUSE, P-MEAN, PEEP, E-TV, I-TV, MV, E-RES, I-RES, COMP, O <sub>2</sub> -I, EtCO <sub>2</sub> , APNEA		Backup	Backup
Trend D	SvO <sub>2</sub> , CCO, EDV, B-Temp, RVEF, SV, CCI, EDVI, ESV, SVR, SaO <sub>2</sub> , SVI, ESVI, SVRI, CCO_STAT, EDV_STAT		Backup	Backup
Trend E	BIS, SQI, EMG, SR		Backup	Backup
Trend F	HR, SpO <sub>2</sub> , NIBP-S, NIBP-D, NIBP-M, BP1-S, BP1-D, BP1-M, RR_GAS, EtCO <sub>2</sub> , O <sub>2</sub> -I, AGT-I		Backup	Backup
Filtering (Sampling Interval)	10sec., All	All	Initialize	Initialize

## OCRG

Item	Details	Default	At Power ON	At Discharge
Display Time	12, 24 min.	12 min.	Backup	Backup
Waveform	Impedance, CO <sub>2</sub>	Impedance	Backup	Backup
Respiration Waveform Size (Impedance)	x 1/4, x1/2, x1, x2, x4	x1	Backup	Backup
Respiration Waveform Size (CO <sub>2</sub> )	50, 100 mmHg	50 mmHg	Backup	Backup

## Recall

Item	Details	Default	Power ON	Discharge
Waveform Selection	ECG1, ECG <sub>2</sub> , BP1 to 8, SpO <sub>2</sub> , RESP, CO <sub>2</sub> , GAS_CO <sub>2</sub>	ECG1, ECG2	Backup	Backup
Recall Factor	Asystole, VF, VT, Slow VT, Run, Bigeminy, Trigeminy, Pause, Couplet, Tachy, Brady, Frequent HR, ST, NIBP, RR, APNEA, SpO <sub>2</sub> , PR, BP1 to 8, TEMP1 to 8, Tb, CO <sub>2</sub> , O <sub>2</sub> , N <sub>2</sub> O, AGENT, SpCO, SpMet, SpHb, PEAK, PEEP, MV	All ON	Backup	Backup
List Display	14 waves	14 waves	Backup	Backup
Recall Display Selection	Asystole, VF, VT, Slow VT, Run, Bigeminy, Trigeminy, Pause, Couplet, Tachy, Brady HR, ST, NIBP, RR, APNEA, SpO <sub>2</sub> , PR, BP1 to 8, TEMP1 to 8, Tb, CO <sub>2</sub> , O <sub>2</sub> , N <sub>2</sub> O, AGENT, Event 1 to 8, SpCO, SpMet, SpHb, PEAK, PEEP, MV	All ON	Backup	Backup

## ST Measurement

Item	Details	Default	At Power ON	At Discharge
Meas. Point	0 to 560ms	120ms	Backup	Backup
Ref. Point	0 to -240ms	-80ms		
ST Wave Size	x1/4, x1/2, x1, x2, x4	x1		
Slide Show Interval	1, 5, 10, 20, 30 sec.	5 sec.		
ST Waveform Interval	10 sec., 1 min., 5 min., 10 min.	10 sec.		

## NOTE

- The graphic trend, tabular trend, alarm history will be stored even when the power is turned OFF.
- The ST data, OCRG data, Recall data will be stored for 5 minutes after the power is turned OFF.

## 12-lead Display

Item	Details	Default	At Power ON	At Discharge
ECG Analysis	Real Time, Review	Real Time	Backup	Backup
Limb Lead Size	x1/4, x1/2, x1, x2, x4	x1	Backup	Backup

## 12-lead Display

Item		Details	Default	At Power ON	At Discharge
Chest Lead Size		x1/4, x1/2, x1, x2, x4	x1	Backup	Backup
Filter	AC Filter	ON, OFF	OFF	Backup	Backup
	EMG Filter	OFF, Strong (25Hz), Weak (35Hz)	OFF	Backup	Backup
	Drift Filter	OFF, Strong (0.50Hz), Weak (0.25Hz)	OFF	Backup	Backup
Background Color		White, Black	Black	Backup	Backup

**Basic Setup**

## Tone/Volume

Item	Details		Default	At Power ON	At Discharge
Vital Alarm Sound	Urgent	Volume: 11 levels	4	Backup	
		Tone: 5 type *	1		
	Caution	Volume: 11 levels	4		
		Tone: 5 type *	1		
	Status	Volume: 11 levels	4		
		Tone: 4 type *	1		
	Ventilator Alarm Sound	ON/OFF	OFF		
		Volume: 11 levels	4		
		Tone: 1 type	1		
Status Alarm Control Alarm Sound	Urgent	Volume: 11 levels	4		
		Tone: 1 type *	1		
	Caution	Volume: 11 levels	4		
		Tone: 1 type *	1		
	Status	Volume: 11 levels	4		
		Tone: 1 type *	1		
Pulse Tone	Volume: 11 levels		2		
	Tone: 5 type		1		
	Sync. with SpO <sub>2</sub> Value: Selected Tone, Sync. with SpO <sub>2</sub> Value		Selected Tone		
Key Sound	Volume: 11 levels		4		
	Tone: 3 type		1		
Other Bed Alarm	Volume: 11 levels		4		
	Tone: 1 type		1		
Boot Sound Shutdown Sound	Volume: 11 levels		2		
	Tone: 3 type		1		
Other	Volume: 11 levels		4		
	Tone: 1 type		1		

\* When [Fukuda Tone] is selected for "Alarm System", the tone can be selected from 8 levels.

## Display Configuration

Item	Details	Default	At Power ON	At Discharge
Layout	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	Large/Bottom 2 rows	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
Auto Display Config.	Type-1, Type-2	Type-1	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
Background Color	Refer to the Color Setup.			
Palette	Refer to the Color Setup.			
Numeric Data	OFF, HR/PR, HR, PR_IBP, VPC/PACE, ST/VPC, ST-A to C, BP1 to 8, NIBP, NIBP LIST, SpO <sub>2</sub> -1, Spo <sub>2</sub> -1/PR_SpO <sub>2</sub> -1, PR_SpO <sub>2</sub> -1, RR_IMP, RR_CO <sub>2</sub> , RR_VENT, TEMP1 to 8, TEMP1/2, TEMP3/4, TEMP5/6, TEMP7/8, SpO <sub>2</sub> -2, SpO <sub>2</sub> -2/PR_SpO <sub>2</sub> -2, PR_SpO <sub>2</sub> -2 ΔTEMP-A to D, VENT, P-V F-V, SvO <sub>2</sub> CO, BIS, CO <sub>2</sub> , O <sub>2</sub> , N <sub>2</sub> O, Agent, RR/CO <sub>2</sub> /Agent/O <sub>2</sub> /N <sub>2</sub> O, CO <sub>2</sub> /Agent/O <sub>2</sub> /N <sub>2</sub> O, RR/Agent/O <sub>2</sub> /N <sub>2</sub> O, Agent/O <sub>2</sub> /N <sub>2</sub> O, Agent/N <sub>2</sub> O, HEMO, HEMO-I, STOPWATCH, SpCO, SpMet, SpHb, GAS/SPIRO, SPIRO	HR, SpO <sub>2</sub> -1, NIBP, BP1, RR_IMP, CO <sub>2</sub>	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
Waveform	OFF, ECG1 to 12, ECG1 to 12 Cascade, BP1 to 8, BP Overlap 1 to 3, SpO <sub>2</sub> -1, SpO <sub>2</sub> -2, RESP, AWF, AWP, AWV, CO <sub>2</sub> , O <sub>2</sub> , Agent, Block Cascade, RR Overlap 1 to 3	ECG1, SpO <sub>2</sub> -1, BP1, RESP, CO <sub>2</sub>		
Sweep Speed	Circ.: 6.25, 12.5, 25, 50 Vent.: 6.25, 12.5, 25	Circ.: 25 Vent.: 6.25	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
Short Trend	Short Trend Selection ON, OFF, Overlap Display Length: 0, 5, 10, 15, 20, 25, 30 min.	OFF 15 min.	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	

## Display Configuration

Item	Details		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 <sub>2</sub> Display ON/OFF, CO <sub>2</sub> Display ON/OFF, GAS Display ON/OFF, 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, Hemodynamics, Lung Function, Full Disc. Wave, 12-Lead Analysis, 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 Setup		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	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
Detail Setup (Numeric Data)	Alarm Limit Display	Graph, Numeric, OFF	Graph	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	At Alarm Occurrence	Reversed, 3D	Reversed	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	ST/VPC/Arrhy. Alarm Display	ON, OFF	ON	Backup	Backup
Detail Setup (Waveform)	Grid	ON, OFF, Bold	ON	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	Scale	ON, Bold1, Bold2	ON	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	Thickness	Thin, Regular, Thick	Regular	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	Clip	ON, OFF	ON	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	Fill CO <sub>2</sub> Waveform	ON, OFF	ON	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	Fill O <sub>2</sub> Waveform	ON, OFF	OFF	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	Fill Agent Waveform	ON, OFF	OFF	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	

## Display Configuration

Item	Details		Default	At Power ON	At Discharge
	12-Lead ST Wave	Ref., Average		Ref.	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].
	12-Lead ST Short Trend	OFF, Fill, Plot		Fill	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].
	BP Overlap 1	BP1 to 8		BP1 to 4	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].
	BP Overlap 2			N/A	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].
	BP Overlap 3			N/A	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].
	RR Overlap 1	CO <sub>2</sub> , O <sub>2</sub> , Agent		CO <sub>2</sub> , O <sub>2</sub> , Agent	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].
	RR Overlap 2			N/A	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].
	RR Overlap 3			N/A	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].
	Block Cascade	Waveform Quantity: 2 to 6 Displayed Waveform: OFF, ECG1 to 12, BP1 to 8, SpO <sub>2</sub> , RESP, AWF, AWP, CO <sub>2</sub> , O <sub>2</sub> , Agent	Waveform Quantity: 2 Displayed Waveforms: ECG1, ECG2	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
Short Trend	Short Trend	Link with Numeric, Link with Waveform, User Setup	Link with Numeric	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	Short Trend Scale	Trend, Waveform	Trend	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	Display Parameter	ON, Gray, OFF	OFF	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	Reference Line Function	Enable, Disable	Disable	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	Cursor Function	Enable, Disable	Disable	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	Cursor Linkage	Tabular Trend, Graphic Trend, Zoom Wave	Tabular Trend	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	Short Trend Overlap 1		OFF, OFF, OFF, OFF	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	
	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.	Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F].	

**NOTE**

- The display configuration setting can be saved to be used after power ON or discharge by selecting [Backup] for "Display Configuration" under [Initial Settings] > [User I/F] > [Power ON/Discharge]. If [Initialize] is selected, the setting will be initialized to the currently selected mode.

**Manual Printing**

Item		Details	Default	At Power ON	At Discharge
Basic	Printer	Built-in, Cent.	Built-in	Backup	Backup
	Waveform Selection	ECG1, ECG2, ECG3, BP1 to 8, SpO <sub>2</sub> , RESP, CO <sub>2</sub> , O <sub>2</sub> , Agent, AWF, AWP	ECG1	Backup	Backup
	Print Duration	24 sec., Cont.	24 sec.	Backup	Backup
	Delay Time	None, 8sec., 16 sec.	8 sec.	Backup	Backup
12-Lead	Printing Format	3 waves x 4, 2 waves x 6	3Wavesx4	Backup	Backup
	Position	Center, Proportional, OFF	Proportional	Backup	Backup
	Wave Format	Regular, Reverse	Regular	Backup	Backup
	Printer Auto Scale	ON, OFF	ON	Backup	Backup
	Print Calibration	ON, OFF	ON	Backup	Backup
Other Setup: Graphic Printing	Trend	Built-in, Central, Laser	Built-in	Backup	Backup
	Tabular Trend	Built-in, Central, Laser	Built-in	Backup	Backup
	OCRG	Built-in, Laser	Built-in	Backup	Backup
	Zoom Wave (Recall, Full Disc.)	Built-in, Central, Laser	Built-in	Backup	Backup
	ST	Built-in, Central, Laser	Built-in	Backup	Backup
	12-Lead Waveform	Built-in, Laser	Built-in	Backup	Backup
	12L Analysis Result	Built-in, Laser	Built-in	Backup	Backup
	FD Compressed Waveform	Built-in, Laser	Built-in	Backup	Backup
	Hemodynamics	Built-in, Central, Laser	Built-in	Backup	Backup
	Lung Function	Built-in, Central, Laser	Built-in	Backup	Backup
CO		Built-in, Central, Laser	Built-in	Backup	Backup
Other Setup: Recall Printing		Graphic Printing, Manual Printing	Graphic Printing	Backup	Backup

## Auto Printing

Item	Details	Default	At Power ON	At Discharge
Alarm Printing	Printing	ON, OFF	OFF	Backup
	Factor	Alarm for each arrhythmia, parameter	All	Backup
	Printer	Built-in, Cent.	Built-in	Backup
	Waveform Selection	ECG1, ECG2, ECG3, BP1 to 8, SpO <sub>2</sub> , RESP, CO <sub>2</sub> , O <sub>2</sub> , Agent, AWF, AWP, Alarm	ECG1, Alarm Factor	Backup
	Print Duration	12, 24 sec.	12 sec.	Backup
Periodic Printing	Periodic Printing	ON, OFF	OFF	Backup
	Printer	Built-in, Cent.	Built-in	Backup
	Waveform Selection	ECG1, ECG2, ECG3, BP1 to 8, SpO <sub>2</sub> , RESP, CO <sub>2</sub> , O <sub>2</sub> , Agent, AWF, AWP	ECG1	Backup
	Periodic Interval	Inter., Timer	Timer	Backup
	Interval	1, 2, 3, 5, 10, 15, 20, 30, 60, 120 min.	120 min.	Backup
	Timer	0:00 to 23:00 (1:00 interval)	none	Backup
	Print Duration	6, 12, 24 sec.	12 sec.	Backup

## Common Setup for Printing

Item	Details	Default	At Power ON	At Discharge
QRS Classification	ON, OFF	ON	Backup	Backup
Speed	50mm/s, 25mm/s	25mm/S	Backup	Backup
Print Calibration	Top, Each Page, OFF	OFF	Backup	Backup
Print NIBP Data	ON, OFF	OFF	Backup	Backup

## Other Setup

Item	Details	Default	Power ON	Discharge
Night Mode	Mode	Manual, Timer	Manual	Backup
	Start Time	00:00 to 23:59	Start Time: 21:00	Backup
	End Time	00:00 to 23:59	End Time: 07:00	Backup
	Volume	No Change, 3, 1, 0	1	Backup
	Screen	No Change, Dark, Darker, Timer	Darker	Backup
	Alarm Indicator	ON, OFF	OFF	Backup
	External Monitor Display during Night Mode	ON, OFF, OFF (Time Only)	ON	Backup
Color	Background Color (Meas., Wave)	Black, Gray, Light Gray	Meas: Black Wave: Black	Backup
	Palette	Light, Clear, Deep, Vivid	Vivid	Backup
	HR	12 colors + White	6	Backup
	ST		6	Backup
	VPC		White	Backup
	PACE		White	Backup
	NIBP		8	Backup
	SpO <sub>2</sub> (Ch1)		4	Backup
	SpO <sub>2</sub> (Ch2)		4	Backup

## Other Setup

Item	Details	Default	Power ON	Discharge	
SpCO (Ch1)		4	Backup	Backup	
SpCO (Ch2)		4	Backup	Backup	
SpMet (Ch1)		4	Backup	Backup	
SpMet (Ch2)		4	Backup	Backup	
SpHb (Ch1)		4	Backup	Backup	
SpHb (Ch2)		4	Backup	Backup	
CO <sub>2</sub>		8	Backup	Backup	
RESP		White	Backup	Backup	
BP1		1	Backup	Backup	
ART		1	Backup	Backup	
PAP		4	Backup	Backup	
CVP		8	Backup	Backup	
ICP		7	Backup	Backup	
IAP		12	Backup	Backup	
LVP		2	Backup	Backup	
US1(BP)		White	Backup	Backup	
US2(BP)		White	Backup	Backup	
US3(BP)		White	Backup	Backup	
US4(BP)		White	Backup	Backup	
US5(BP)		White	Backup	Backup	
BP2		8	Backup	Backup	
BP3		4	Backup	Backup	
BP4		6	Backup	Backup	
BP5		2	Backup	Backup	
BP6		12	Backup	Backup	
BP7		9	Backup	Backup	
BP8		7	Backup	Backup	
TEMP1 to 8, Tb		2	Backup	Backup	
Tsk, Tre, Tes, Tco, US1 to US7		2	Backup	Backup	
AWF		6	Backup	Backup	
AWP		4	Backup	Backup	
AWV		8	Backup	Backup	
BIS		2	Backup	Backup	
INVOS		White	Backup	Backup	
SvO <sub>2</sub> +CO		White	Backup	Backup	
Stopwatch		White	Backup	Backup	
Brightness	Brightness	7 levels	Highest	Backup	Backup
Stopwatch Label	1	9 alphanumeric characters	TIMER1	Backup	Backup
	2		TIMER2	Backup	Backup



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# 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

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

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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

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Item	Model Type	Note
Adult Cuff (Large)	CUF-7101	Width 17cm, Reusable, Latex
Adult Cuff (Medium)	CUF-7102A	Width 14.5cm, Reusable, Latex
Adult Cuff (Small)	CUF-7103	Width 11cm, Reusable, Latex
Pediatric Cuff	CUF-7104	Width 10.5cm, Reusable, Latex
Infant Cuff	CUF-7105	Width 8.5cm, Reusable, Latex
Tempa-Kuff® Neonatal Cuff Infant #5	99750	Disposable, Latex-Free, 40/box
Tempa-Kuff® Neonatal Cuff Neonatal Extra Large #4	99848	Disposable, Latex-Free, 40/box
Tempa-Kuff® Neonatal Cuff Neonatal Large #3	99729	Disposable, Latex-Free, 40/box
Tempa-Kuff® Neonatal Cuff Neonatal Medium #2	99890	Disposable, Latex-Free, 40/box
Tempa-Kuff® Neonatal Cuff Neonatal Small #1	99801	Disposable, Latex-Free, 40/box
Air Hose (1.5m) General	OA-80APL1.5	For CUF-7101/7102A/7103/7104/7105
Air Hose (3.5m) General	OA-80APL3.5	For CUF-7101/7102A/7103/7104/7105
NIBP Extension Hose (1.5m)	OA-7110A	For CUF-7101/7102A/7103/7104/7105
NIBP Extension Hose (3.5m)	OA-7110B	For CUF-7101/7102A/7103/7104/7105

Item	Model Type	Note
Air Hose (1.5m) Neonate	OA-80NE1.5	For Tempa-Kuff® Neonatal Cuff
Air Hose (3.5m) Neonate	OA-80NE3.5	For Tempa-Kuff® Neonatal Cuff

\*Tempa-Kuff® Neonatal Cuffs, manufactured by TRIMLINE Medical Products Corporation.

## Temperature Measurement

Item	Model Type	Q'ty	Note
Rectal Temperature Probe (for adult)	401	1	
Rectal Temperature Probe (for pediatric)	402	1	
Body Surface Probe	409B	1	
2ch Temperature Relay Cable	CJO-P01T-DA0.5	1	0.5m
2ch Temperature Relay Cable	CJO-P01T-DA4.0	1	4m

\* 400 series general purpose temperature probe, manufactured by Measurement Specialities, Inc.

## Pulse Oximetry Measurement (Nellcor)

Item	Model Type	Note
DURASENSOR	DS-100A	Reusable For adult finger (weight of 40kg and over)
OxiMax	MAX-N	Single-Patient-Use For neonate foot/adult finger (Neonate: weight of less than 3kg, Adult: weight of 40kg and over)
OxiMax	MAX-I	Single-Patient-Use For infant toe (weight of 3 to 20kg)
OxiMax	MAX-P	Single-Patient-Use For pediatric finger (weight of 10 to 50kg)
OxiMax	MAX-A	Single-Patient-Use For adult finger (weight of 30kg and over)
OxiMax	MAX-R	Single-Patient-Use For adult nose (weight of 50kg and over)
OxiMax	MAX-FAST	Single-Patient-Use For adult/pediatric forehead (weight of 10kg and over)
SpO <sub>2</sub> Relay Cable	DOC-10	3m

### NOTE

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

## Pulse Oximetry Measurement (Masimo)

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### SpO<sub>2</sub>, PR, PI, and PVI Measurement

Item	Model Type	Note
Masimo SET Sensor	LNOP DCI (1269)	Reusable, Adult, Weight: > 30 kg
Masimo SET Sensor	LNOP Adt (1001)	Single Patient Use, Adult, Weight: > 30 kg
Masimo SET Sensor	LNOP Pdt (1025)	Single Patient Use, Pediatric, Weight: 10 kg - 50 kg
Masimo SET Sensor	LNOP Inf-L (1800)	Single Patient Use, Infant, Weight: 3 kg - 20 kg
Masimo SET Sensor	LNOP Neo-L (1798)	Single Patient Use, Neonatal/Adult, Weight: < 3 kg or > 40 kg
Masimo SET Sensor	LNOP NeoPt-L (1651)	Single Patient Use, Neonatal, Weight: < 1 kg
Masimo SET Sensor	LNOP Blue (1970)	Adhesive Sensors for Neonatal/Infant/Pediatrics, Weight 2.5-30 kg
Masimo SET Sensor	LNCS DCI (1863)	Reusable, Adult, Weight: > 30 kg
Masimo SET Sensor	LNCS Adtx (1859)	Single Patient Use, Adult, Weight: > 30 kg
Masimo SET Sensor	LNCS Pdt (1860)	Single Patient Use, Pediatric, Weight: 10 - 50 kg
Masimo SET Sensor	LNCS Inf-L (1861)	Single Patient Use, Infant, Weight: 3 kg - 20 kg
Masimo SET Sensor	LNCS Neo-L (1862)	Single Patient Use, Neonatal/Adult, Weight: < 3 kg or > 40 kg
Masimo SET Sensor	LNCS NeoPt-L (1901)	Single Patient Use, Neonatal, Weight: < 1 kg
LNOP Red Patient Cable	Red PC-04 (2058)	For LNOP sensor, 1.2m
LNOP Red Patient Cable	Red PC-08 (2059)	For LNOP sensor, 2.4m
LNOP Red Patient Cable	Red PC-12 (2060)	For LNOP sensor, 3.6m
LNCS Red Patient Cable	Red LNC-04 (2055)	For LNCS sensor, 1.2m
LNCS Red Patient Cable	Red LNC-10 (2056)	For LNCS sensor, 3.0m
LNCS Red Patient Cable	Red LNC-14 (2057)	For LNCS sensor, 4.2m

### SpO<sub>2</sub>, PR, PI, PVI, SpMet, and SpCO Measurement

Item	Model Type	Note
Masimo Rainbow Sensor	Rainbow DCI-dc3 (2201)	Reusable, Adult, 0.9m, Weight: >30kg
Masimo Rainbow Sensor	Rainbow DCI-dc8 (2407)	Reusable, Adult, 2.4m, Weight: >30kg
Masimo Rainbow Sensor	Rainbow DCI-dc12 (2202)	Reusable, Adult, 3.6m, Weight: >30kg
Masimo Rainbow Sensor	Rainbow R25 (2221)	Single Patient Use, Adult, Weight: >30kg
Masimo Rainbow Sensor	Rainbow R25-L (2219)	Single Patient Use, Adult/Neonatal, Weight: <3kg or >30kg
Masimo Rainbow Sensor	Rainbow R20 (2222)	Single Patient Use, Pediatric, Weight: 10kg - 50kg
Masimo Rainbow Sensor	Rainbow R20-L (2220)	Single Patient Use, Infant, Weight: 3kg - 30kg
Masimo Rainbow Patient Cable	Rainbow RC-1 (2405)	For Rainbow Sensor, 0.3m
Masimo Rainbow Patient Cable	Rainbow RC-4 (2406)	For Rainbow Sensor, 1.2m
Masimo Rainbow Patient Cable	Rainbow RC-12 (2404)	For Rainbow Sensor, 3.6m

## SpO<sub>2</sub>, PR, PI, PVI, SpMet, and SpHb Measurement

Item	Model Type	Note
Masimo Rainbow ReSposable Sensor	Rainbow ReSposable R2-25 Sensor System (3457)	Single Patient Use, Adult, Weight > 30 kg, R2-25a adhesive sensors & R2-25r reusable sensors 10-R2-25a /box, 2-R2-25r /box
Masimo Rainbow ReSposable Sensor	Rainbow ReSposable R2-20 Sensor System (3458)	Single Patient Use, Pediatric, Weight 10 kg - 50 kg, R2-20a adhesive sensors & R2-20r reusable sensors 10-R2-20a /box, 2-R2-20r /box
Masimo Rainbow ReSposable Sensor	Rainbow ReSposable R2-25a Sensors (2753)	Single Patient Use, Adult, Weight > 30 kg, R2-25a adhesive sensors For use with R2-25r, 25-R2-25a /box
Masimo Rainbow ReSposable Sensor	Rainbow ReSposable R2-20a Sensors (2755)	Single Patient Use, Pediatric/Slender Digit, Weight 10 - 50 kg R2-20a adhesive sensors For use with R2-20r, 25-R2-20a /box
Masimo Rainbow ReSposable Sensor	Rainbow ReSposable R2-25r Sensors (2754)	Single Patient Use, Adult, Weight > 30 kg, R2-25r reusable sensors For use with R2-25a, 5-R2-25r /box
Masimo Rainbow ReSposable Sensor	Rainbow ReSposable R2-20r Sensors (2756)	Single Patient Use, Pediatric/Slender Digit, Weight 10 - 50 kg R2-20r reusable sensors For use with R2-20a, 5-R2-20r /box
Masimo Rainbow Patient Cable	Rainbow RC-1 (2405)	For Rainbow Sensor, 0.3m
Masimo Rainbow Patient Cable	Rainbow RC-4 (2406)	For Rainbow Sensor, 1.2m
Masimo Rainbow Patient Cable	Rainbow RC-12 (2404)	For Rainbow Sensor, 3.6m

### NOTE

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

### NOTE

- The number inside the brackets indicates Masimo PN.
- SpCO and SpHb cannot be measured at the same time for all the sensors.
- There are various types of sensors available. For details, refer to our service representative.

## CO Measurement

Item	Model Type	Note
Catheter Relay Cable	CJO-P01C-C2.4	
Injectate Probe Relay Cable	CJO-P01C-T2.4	

## CO<sub>2</sub> Concentration Measurement (Respironics)

For HPD-800/HPD-810 Gas Unit I/F with Resironics Novametrix, LLC. Capnostat 5 CO<sub>2</sub> Sensor

Item	Model Type	Note
Capnostat 5 CO <sub>2</sub> 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<sub>2</sub> Concentration Measurement (Covidien)

For HCP-800/HCP-810 CO<sub>2</sub> Gas Unit

Sampling Devices

Item	Model Type	Note
<b>Intubated EtCO<sub>2</sub></b>		
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
<b>Non-Intubated EtCO<sub>2</sub></b>		
Smart CapnoLine Plus (Adult/Intermediate)	009818	For oral/nasal, short term use
Smart CapnoLine Plus O <sub>2</sub> (Adult/Intermediate)	009822	For oral/nasal, short term use
Smart CapnoLine (Pediatric)	007266	For oral/nasal, short term use
Smart CapnoLine H Plus O <sub>2</sub> (Adult/Intermediate)	010433	For oral/nasal, long term use
Smart CapnoLine H (Pediatric)	010581	For oral/nasal, long term use
Smart CapnoLine H/O <sub>2</sub> (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 <sub>2</sub> (Adult)	008180	For nasal, long term use
CapnoLine H/O <sub>2</sub> (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 (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

## Others

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Item	Model Type	Note
Ground Cable	CE-11	
Ground Cable	CE-12	
Ground Cable	CE-01A	
Power Supply Cable	CS-34	
Extension Board	CC-82	Extended display function: 1 display unit
Extension Board	CC-83	Extended display function: 2 display units
RS-232C Cable	CJ-725	Cross Cable with Core
Display Unit Connection Cable	CJ-731B	Length 2.5m
Display Unit Connection Cable	CJ-731C	Length 6m
Display Unit Connection Cable	CJ-731D	Length 10m
IR Remote Control Unit	CF-820	
Recording Paper	OP050-01TDR	10 per box
Ethernet Branch Cable	CJ-522A	Length 1m (For DS-LAN)
Ethernet Branch Cable	CJ-522B	Length 2m (For DS-LAN)
Ethernet Branch Cable	CJ-522C	Length 4m (For DS-LAN)
Ethernet Branch Cable	CJ-522D	Length 10m (For DS-LAN)
Ethernet Branch Cable	CJ-522E	Length 20m (For DS-LAN)
CF Card	FCF-16GA	16GB
CF Card	FCF-128	128MB
CF Card	FCF-1000	1GB
SD Card	SD-1G	1GB
SD Card	SD-8G	8GB
Module Connection Cable	CJO-08SS0.3	module-LAN Cable 0.3m
Module Connection Cable	CJO-08SS1.5	module-LAN Cable 1.5m
Module Connection Cable	CJO-08SS3.5	module-LAN Cable 3.5m
Module Connection Cable	CJO-08SS5	module-LAN Cable 5m
Module Connection Cable	CJO-08SS10	module-LAN Cable 10m
Unit Connection Cable	CJO-09SS0.3	U-Link Cable 0.3m
Unit Connection Cable	CJO-09SS1.5	U-Link Cable 1.5m
Unit Connection Cable	CJO-09SS5	U-Link Cable 5m
AUX Connection Cable (0.65m)	CJO-15RR0.65	For HCP-810, HPD-810
AUX Connection Cable (1.5m)	CJO-15RR1.5	
AUX Connection Cable (3m)	CJO-15RR3	
Input Box Spacer	OAO-47A	
IB Clamp Base	OAO-51A	
HS Fixing Base	OAO-52A	
HLX Holder for DS-8500	OAO-40A	For HLX-501
Main Unit Stand for DS-8500	OAO-44A	
HS Attachment Spacer	OAO-46A	
HS Rail Clamp	OAO-48A	

Item	Model Type	Note
HS Suspended Base	OAO-49A	
HS Pole Clamp	OAO-50A	
Cover Panel	OAO-45A	
External Output Box	CJO-C01Q-SJ0.3	For HS-8000 Series
DS-8500 12-Lead Analysis Optional Software	DS-8500-12LA	For 12-lead ECG analysis function

External Equipment Connection Cable

External Device	Model Type	Note
SV-300	CJ-401RI-70SV3	For Status II Connector
Servo-i/Servo-s	CJ-402RI-70SVi	For Status II Connector
PB740/760/840	CJ-403RI-70PB	For Status II Connector
Evita (XL, 4, 2 dura)	CJ-402RI-70SVi	For Status II Connector
Vigilance, Vigilance CEDV	CJ-406RI-70Vigi	For Status II Connector
	CJO-04RS4	For Serial Connector
Vigilancell, Vigileo	CJ-402RI-70SVi	For Status II Connector
	CJ-502	For Serial Connector
BIS Monitor (A-2000/A-3000)	CJ-407RI-70BIS	For Status II Connector
	CJO-03RS4	For Serial Connector
INVOS 5000C	CJ-406RI-70Vigi	For Status II Connector
	CJO-04RS4	For Serial Connector
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



# Chapter 14 Specification

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# 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

5.5kg (not including the accessory)

#### Environmental Conditions

Operating Temperature	10 to 40°C
Operating Humidity	30 to 85 % (non-condensing)
Transport / Storage Temperature	-10 to 60°C
Transport / Storage Humidity	10 to 95% (40°C) (non-condensing) However, for the CF-820 IR Remote Control Unit, the following condition applies. 10 to 90% (38°C) (non-condensing)
Storage Atmospheric Pressure	700 to 1060hPa

#### 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)
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	AC 100-240V
Frequency	50/60 Hz
Power Consumption	150VA

#### Usable Life

6 years	According to self-certification. (  Maintenance Manual "Periodic Replacement" P7-1)
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**Display Unit: LC-8019T/8019TC/8015T/8015TC****Size**

LC-8019T/LC-8019TC	468(W)x371(H)x56(D)mm (not including the hinge and protrusion)
LC-8015T/LC-8015TC	395(W)x297(H)x50(D)mm (not including the hinge and protrusion)

**Weight**

LC-8019T/LC-8019TC	6.0kg (not including the accessory)
LC-8015T/LC-8015TC	3.5kg (not including the accessory)

**Environmental Conditions**

Operating Temperature	10 to 40°C
Operating Humidity	30 to 85 % (non-condensing)
Transport / Storage Temperature	-10 to 60°C
Transport / Storage Humidity	10 to 95%(40°C) (non-condensing)
Storage Atmospheric Pressure	700 to 1060hPa

**Safety**

General Standard	IEC 60601-1:1988+A1:1991+A2:1995 (Medical electrical equipment - Part 1: General requirements for safety)
	IEC 60601-1-1:2000 (Medical electrical equipment- Part 1-1: General requirements for safety - Collateral standard: Safety requirements for medical electrical systems)
EMC Standard	IEC 60601-1-2: 2007 (Medical electrical equipment - Part 1-2: General requirements for 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)
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	DC18V (supplied from DSC-8500 series Main Unit.)
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**Usable Life**

6 years	According to self-certification.
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**Super Unit: HS-8312N/8312M and HSA-80****Size**

HS-8312N/8312M	85(W)x100(H)x200(D)mm (not including the protrusion)
HSA-80	85(W)x68(H)x188(D)mm (not including the protrusion)

**Weight**

HS-8312N/8312M	1.2kg (not including the accessory)
HSA-80	0.2kg (not including the accessory)

**Environmental Conditions**

Operating Temperature	10 to 40°C
Operating Humidity	30 to 85 % (non-condensing)
Transport / Storage Temperature	-10 to 60°C
Transport / Storage Humidity	10 to 95%(40°C) (non-condensing)
Storage Atmospheric Pressure	700 to 1060hPa

**Safety**

General Standard	IEC 60601-1:1988+A1:1991+A2:1995 (Medical electrical equipment - Part 1: General requirements for safety)  IEC 60601-1-1:2000 (Medical electrical equipment- Part 1-1: General requirements for safety - Collateral standard: Safety requirements for medical electrical systems)
EMC Standard	IEC 60601-1-2: 2007 (Medical electrical equipment - Part 1-2: General requirements for 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	ECG/RESP (Impedance), SpO <sub>2</sub> , SpCO*, SpMet*, SpHb*, TEMP, BP, CO: Type CF Applied Part * HS-8312M only NIBP: 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	HSA-80: DC18V (supplied from DSC-8500 series Main Unit)  HS-8000 Series: DC12V (supplied from DSC-8500 series Main Unit via HSA-80 HS Adapter)
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**Usable Life**

6 years	According to self-certification. (  Maintenance Manual "Periodic Replacement" P7-1)
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**Expansion Unit: MGU-800/810 Series and HR-800****Size**

MGU-801P/MGU-802 /MGU-803/MGU-811P /MGU-812/MGU-813	125(W)x109(H)x200(D)mm (not including the protrusion)
HR-800	87(W)x109(H)x100(D)mm (not including the protrusion)

**Weight**

AGO <sub>2</sub> Gas Unit	MGU-801P	2.1kg
	MGU-811P	2.2kg
AG Gas Unit	MGU-802	1.7kg
	MGU-812	1.8kg
CO <sub>2</sub> Unit	MGU-803	1.7kg
	MGU-813	1.8kg
HR-800	0.54kg (not including the accessory)	

**Environmental Conditions**

Operating Temperature	MGU Series 10 to 35°C HR-800 10 to 40°C
Operating Humidity	30 to 85 % (non-condensing)
Transport / Storage Temperature	-10 to 60°C
Transport / Storage Humidity	10 to 95%(40°C) (non-condensing)
Storage Atmospheric Pressure	700 to 1060hPa

**Safety**

General Standard	IEC 60601-1:1988+A1:1991+A2:1995 (Medical electrical equipment - Part 1: General requirements for safety)  IEC 60601-1-1:2000 (Medical electrical equipment- Part 1-1: General requirements for safety - Collateral standard: Safety requirements for medical electrical systems)
EMC Standard	IEC 60601-1-2: 2007 (Medical electrical equipment - Part 1-2: General requirements for 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	Respiration Gas (MGU-800/810 series): 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	MGU-800/810 series: DC18V (supplied from the DSC-8500 series Main Unit) HR-800: DC18V (supplied from the DSC-8500 series Main Unit or via MGU-800/810 series)
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**Usable Life**

6 years	According to self-certification.
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## Expansion Module: HM-800, HP-800, HG-810/820

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### **Size**

40(W)x100(H)x135(D)mm (not including the protrusion)

### **Weight**

HM-800	0.4kg (not including the accessory)
HP-800	0.4kg (not including the accessory)
HG-810/HG-820	0.4kg (not including the accessory)

### **Environmental Conditions**

Operating Temperature	10 to 40°C
Operating Humidity	30 to 85 % (non-condensing)
Transport / Storage Temperature	-10 to 60°C
Transport / Storage Humidity	10 to 95% (40°C) (non-condensing)
Storage Atmospheric Pressure	700 to 1060hPa

### **Safety**

General Standard	IEC 60601-1:1988+A1:1991+A2:1995 (Medical electrical equipment - Part 1: General requirements for safety)  IEC 60601-1-1:2000 (Medical electrical equipment- Part 1-1: General requirements for safety - Collateral standard: Safety requirements for medical electrical systems)
EMC Standard	IEC 60601-1-2: 2007 (Medical electrical equipment - Part 1-2: General requirements for 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	TEMP, BP, and CO (HM-800): Type CF Applied Part SpO <sub>2</sub> , SpCO, SpMet, and SpHb (HG-810): Type CF Applied Part SpO <sub>2</sub> (HG-820): Type CF 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	DC12V (supplied from DSC-8500 series Main Unit via IB-8004 Input Box.)
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### **Usable Life**

6 years	According to self-certification.
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## Gas Unit I/F: HPD-800/HPD-810 and CO<sub>2</sub> Gas Unit: HCP-800/HCP-810

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### **Size**

36(W)x91(H)x87(D)mm (not including the protrusion)

### **Weight**

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

### **Environmental Conditions**

Operating Temperature	10 to 40°C
Operating Humidity	30 to 85 % (non-condensing)
Transport / Storage Temperature	-10 to 60°C
Transport / Storage Humidity	10 to 95%(40°C) (non-condensing)
Storage Atmospheric Pressure	700 to 1060hPa

### **Safety**

General Standard	IEC 60601-1:1988+A1:1991+A2:1995 (Medical electrical equipment - Part 1: General requirements for safety)  IEC 60601-1-1:2000 (Medical electrical equipment- Part 1-1: General requirements for safety - Collateral standard: Safety requirements for medical electrical systems)
EMC Standard	IEC 60601-1-2: 2007 (Medical electrical equipment - Part 1-2: General requirements for 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 <sub>2</sub> : 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)
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### **Usable Life**

6 year	According to self-certification. (参照 Maintenance Manual "Periodic Replacement" P7-1)
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## Input Box: IB-8004

### Size

IB-8004 184(W)x129(H)x164(D)mm (not including the protrusion)

### Weight

IB-8004 1.3kg (not including the accessory)

### Environmental Conditions

Operating Temperature 10 to 40°C

Operating Humidity 30 to 85 % (non-condensing)

Transport / Storage Temperature -10 to 60°C

Transport / Storage Humidity 10 to 95%(40°C) (non-condensing)

Storage Atmospheric Pressure 700 to 1060hPa

### Safety

General Standard IEC 60601-1:1988+A1:1991+A2:1995  
(Medical electrical equipment - Part 1: General requirements for safety)

IEC 60601-1-1:2000  
(Medical electrical equipment- Part 1-1: General requirements for safety - Collateral standard: Safety requirements for medical electrical systems)

EMC Standard IEC 60601-1-2: 2007  
(Medical electrical equipment - Part 1-2: General requirements for 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)

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 DC 18V (supplied from DSC-8500 series Main Unit)

### Usable Life

6 years According to self-certification.

## Performance

This section states the performance of this equipment.

### Display

Device	19 inch TFT Color LCD (LC-8019T/LC-8019TC)
	15 inch TFT Color LCD (LC-8015T/LC-8015TC)
Resolution	19 inch: 1280x1024 pixel, refresh frequency 60Hz
	15 inch: 1024x768 pixel, refresh frequency 60Hz
Function Control	Touch Screen Method
Waveform Trace	Stationary Trace
Sweep Speed	ECG / SpO <sub>2</sub> / BP (6.25mm/s, 12.5mm/s, 25mm/s, 50mm/s) RESP / CO <sub>2</sub> / O <sub>2</sub> / AG (6.25mm/s, 12.5mm/s, 25mm/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 ] Highest: 81dB, Lowest 48dB
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### Telemetry Transmission (HLX-561, Optional)

Modulation Method	Digital, Frequency Shift Keying (FSK)
RF Output Power	-15 dBm Standard, 0 dBm MAX
Transmission Frequency	608 to 614 MHz
Channel spacing	12.5 kHz

**ECG**

Lead Type	Wired 3, 4, 5, 10-electrode
Frequency Characteristic	150Hz/40Hz/15Hz(4, 5, 10-electrode) 100Hz/40Hz/15Hz(3-electrode)
Input Impedance	2.5MΩ or above
Maximum Input Voltage	10mVp-p
Polarization Voltage	± 825mV or above
Common Mode Rejection Ratio	90 dB or above
HR Measurement Range	Adult/Child: 0, 12 to 300bpm Neonate: 0, 30 to 300bpm
HR Measurement Accuracy	±3bpm
HR Display Response Time	Adult/Child: 6 sec., Neonate: 3 sec.
Instant HR	Calculated each second based on the latest RR interval.
Waveform Size Selection	1/4, 1/2, 1, 2, 4
Accuracy of Input Signal Reproduction	Overall system error and frequency response is set using method A, B, C, and D.
Defibrillation Proof	Provided
Heart rate meter accuracy and response to irregular rhythm	80bpm Ventricular Bigeminy : 80bpm



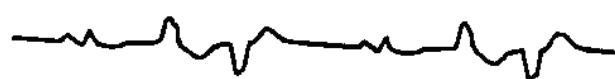
60bpm Ventricular Bigeminy : 60bpm



120bpm Ventricular Bigeminy : 120bpm



90bpm Bidirectional Systoles : 90bpm



Response time of heart rate meter to change in heart rate	HR change from 80bpm to 120bpm: Range 4.7 to 5.1 sec., Average 4.8 sec.
	HR change from 80bpm to 40bpm: Range 5.0 to 5.5 sec., Average 5.3 sec.

Time to ALARM for tachycardia

Ventricular Tachycardia 1mVpp, 206bpm:  
Range 7.3 to 8.1 sec., Average 7.6 sec.



Ventricular Tachycardia 2mVpp, 206bpm:  
Range 7.4 to 8.2 sec., Average 7.7 sec.

Ventricular Tachycardia 0.5mVpp, 206bpm:  
Range 8.5 to 9.4 sec., Average 8.9 sec.

Ventricular Tachycardia 2mVpp, 195bpm:  
Range 5.0 to 5.4 sec., Average 5.2 sec.



Ventricular Tachycardia 4mVpp, 195bpm:  
Range 4.1 to 5.8 sec., Average 5.0 sec.

Ventricular Tachycardia 1mVpp, 195bpm:  
Range 6.3 to 8.0 sec., Average 7.0 sec.

Active Noise Suppression

RL DRIVE Max. 10.8mV

Tall T-wave Rejection Capability

1.2mV T-wave can be removed when tested according to IEC 60601-2-27.

Transient Characteristic

3.2 sec, 0.3 sec, 0.1 sec (time constant can be changed)

Rejection of Pacemaker Pulse

a) Pacemaker Pulse without Over/Ubershoot  
Capable to reject pulses of pulse width 0.1 to 2ms, amplitude  $\pm 2$  to  $\pm 700$ mV

b) Pacemaker Pulse with Over/Ubershoot  
Rejection is not possible.

c) Pacer Pulse Detector Rejection of Fast ECG Signals  
Slew Rate 3.2V/S

#### 12-Lead ECG Analysis (Optional Function)

Safety Standards ANSI/AAMI EC11 (1991/(R) 2007), IEC 60601-2-25 (1999), IEC 60601-2-51 (2003)

Leads Standard 12 leads

Sensitivity 1/4, 1/2, 1, 2, 4

Polarization Voltage  $\pm 825$ mV 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  $2.5M\Omega$  or above

Internal Noise  $30\mu V_{p-p}$  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	1.5Hz (adult, child) / 2.5Hz (neonate)
Current	100µA and below (at $66.65\text{kHz} \pm 5\%$ )
Measurement Range	0, 4 to 150Bpm
Measurement Accuracy	$\pm 3\text{Bpm}$

**TEMP**

Measurement Method	Thermistor Method
Probe	400 series only
Measurement Range	0 to 45°C
Measurement Accuracy	25 to 45°C ±0.2°C Outside above range ±0.4°C
No. of Channels	Maximum 8 channels
Temperature Delay Time (From temperature probe to monitor display)	6sec. or less (Not including the time constant of temperature probe.)

## Pulse Oximeter

Measurement Update Rate 1 sec.

### Nellcor Unit (HS-8312N or HG-820)

Measurement Method	2 Wavelength Pulse Wave Method Wavelength: Approx. 660nm (red light) Approx. 890nm (infrared light) Output: 15mW or below
Measurement Range	1 to 100%
Resolution	1%
Measurement Accuracy	Adult: $\pm 3\%$ when 70 to 100% (DS-100A) Neonate: $\pm 2\%$ when 70 to 100%
PR Measurement Range	20 to 250bpm
PR Resolution	1bpm
PR Accuracy	$\pm 3\text{bpm}$ when 20 to 250bpm
Measurement Response Time	6 to 7 sec. (averaging duration)

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**NOTE**

- The SpO<sub>2</sub> measurement accuracy is determined based on the values of the root-mean-square (rms) difference between SpO<sub>2</sub> readings of the pulse oximeter equipment and values of SaO<sub>2</sub> determined with a CO-oximeter, by healthy adult volunteers. The pulse oximeter equipment measurements are statistically distributed;  $\pm 2\%$  measurement accuracy means that only about two-thirds of pulse oximeter equipment measurements can be expected to fall within  $\pm 2\%$  of the value measured by a CO-oximeter.

## Masimo Unit (HS-8312M or HG-810)

Measurement Method	2 Wavelength Pulse Wave Method Masimo LNOP/LNCS Sensor Wavelength: Approx. 660nm (red light) Approx. 905nm (infrared light) Output: 15mW or below
Masimo Rainbow Sensor	Wavelength: 7 or more different wavelengths are used within the range of 500nm to 1400nm Output: 25mW or below

SpO<sub>2</sub>

Measurement Range	1 to 100%
Resolution	1%
Measurement Accuracy	Adult: ±2% when 70 to 100% (No motion) ±3% when 70 to 100% (Motion) ±2% when 70 to 100% (Low perfusion) Neonate: ±3% when 70 to 100% (No motion / Motion / Low perfusion)
PI (Perfusion Index)	

Measurement Range	0.02 to 20%
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## PVI

Measurement Range	0 to 100%
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## SpCO

Measurement Range	0 to 99%
Resolution	1%
Measurement Accuracy	Adult: ±3% when 1 to 40%

## SpMet

Measurement Range	0 to 99.9%
Resolution	0.1%
Measurement Accuracy	Adult/Neonate: ±1% when 1 to 15%

## SpHb

Measurement Range	0 to 25.0 g/dL
Resolution	0.1g/dL
Measurement Accuracy	Adult: ±1g/dL when 8 to 17 g/dL

## Pulse Rate

Measurement Range	26 to 239bpm
Measurement Accuracy	± 3bpm when 26 to 239bpm (No motion)± 5bpm when 26 to 239bpm (Motion / Low perfusion)
Measurement Response Time	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<sub>2</sub> measurement accuracy is determined based on the values of the root-mean square (rms) difference between SpO<sub>2</sub> readings of the pulse oximeter equipment and values of SaO<sub>2</sub> 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 function.
- SpO<sub>2</sub>, SpCO and SpMet accuracy was determined by testing on healthy adult volunteers in the range of 60-100% SpO<sub>2</sub>, 0-40% SpCO, and 0-15% SpMet against a laboratory CO-Oximeter. SpO<sub>2</sub> and SpMet accuracy was determined on 16 neonatal NICU patients ranging

in age from 7-135 days old and weighting between 0.5-4.25kg. Seventy-nine (79) data samples were collected over a range of 70-100% SaO<sub>2</sub> and 0.5-2.5% MetHb with a resultant accuracy of 2.9% SpO<sub>2</sub> and 0.9% SpMet.

- ♦ The Masimo sensors have been validated for no motion accuracy in human blood studies on healthy adult male and female volunteers with light to dark skin pigmentation in induced hypoxia studies in the range of 70-100% SpO<sub>2</sub> against a laboratory CO-Oximeter and ECG monitor. This variation equals plus or minus one standard deviation. Plus or minus one standard deviation encompasses 68% of the population.
- ♦ The Masimo sensors have been validated for motion accuracy in human blood studies on healthy adult male and female volunteers with light to dark skin pigmentation in induced hypoxia studies in the range of 70-100% SpO<sub>2</sub> against a laboratory CO-Oximeter and ECG monitor. This variation equals plus or minus one standard deviation which encompasses 68% of the population.
- ♦ The Masimo SET Technology has been validated for low perfusion accuracy in bench top testing against a Biotek Index2 simulator and Masimo's simulator with signal strengths of greater than 0.02% and transmission of greater than 5% for saturations ranging from 70 to 100%. This variation equals plus or minus one standard deviation which encompasses 68% of the population.
- ♦ The Masimo sensors have been validated for pulse rate accuracy for the range of 25-240 bpm in benchtop testing against a Biotek Index2 simulator. This variation equals plus or minus one standard deviation which encompasses 68% of the population.
- ♦ SpHb accuracy has been validated on healthy adult male and female volunteers and on surgical patients with light to dark skin pigmentation in the range of 8-17g/dL SpHb against a laboratory CO-oximeter. This variation equals plus or minus one standard deviation which encompasses 68% of the population. The SpHb accuracy has not been validated with motion or low perfusion.
- ♦ The following substances may interfere with pulse CO-Oximetry measurements:
  - Elevated levels of Methemoglobin (MetHb) may lead to inaccurate SpO<sub>2</sub> and SpCO measurements
  - Elevated levels of Carboxyhemoglobin (COHb) may lead to inaccurate SpO<sub>2</sub> measurements
  - Very low arterial Oxygen Saturation (SpO<sub>2</sub>) levels may cause inaccurate SpCO and SpMet measurements
  - Severe anemia may cause erroneous SpO<sub>2</sub> readings.
  - Dyes, or any substance containing dyes, that change usual blood pigmentation may cause erroneous readings.
  - Elevated levels of total bilirubin may lead to inaccurate SpO<sub>2</sub>, SpMet, SpCO and SpHb readings.

For more details, see the "Specifications" of the following operation manuals.

- ♦ Covidien (Nellcor) OxiMax N-600x Pulse Oximeter
- ♦ Masimo Radical-7 Pulse CO-Oximeter

**BP**

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

**NOTE**

- Blood pressure measurements determined with this device are equivalent to those obtained by a trained observer using the cuff/stethoscope auscultation method, within the limits prescribed by the American National Standard, Electronic or automated sphygmomanometers.

**CO<sub>2</sub> (Carbon Dioxide Concentration)**

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

Measurement Method	Infra-Red Solid-State Method, Mainstream Method
Measurement Range	0 to 150mmHg
Measurement Accuracy	0 to 40mmHg:±2mmHg 41 to 70mmHg:±5% 71 to 100mmHg:±8% 101 to 150mmHg:±10%
RR Measurement Range	0 to 150Bpm
RR Measurement Accuracy	±1Bpm
Response Time	60ms and below
Covidien® Unit	
Measurement Method	Infra-Red Solid-State Method, Microstream® Method
Measurement Range	0 to 99mmHg
Measurement Accuracy	0 to 38mmHg:±2mmHg 39 to 99mmHg: ± [5 + 0.08 × (displayed value-39)]% : (RR: 80Bpm and below) : The larger of ± 4mmHg or ±12% : (RR: over 80Bpm)
Variation of Measurement Accuracy	±2mmHg (Within 6 hours after power ON)
RR Measurement Range	0 to 150Bpm
RR Measurement Accuracy	0 to 70Bpm:±1Bpm 71 to 120Bpm:±2Bpm 121 to 150Bpm:±3Bpm
Flow Rate	50mL/min +15, -7.5mL/min.
System Response Time	4.2 sec.
Delay Time	4.0 sec.
Rise Time	0.2 sec.

**CO**

Measurement Method	Thermodilution Method
Measurement Range	0.1 to 20L/min
Measurement Range and Accuracy	
Blood Temperature	17 to 45°C ±0.3°C
Injectate Temperature	-1 to 35°C ±0.5°C

**Anesthetic Agent Concentration (MGU-800/MGU-810 series)**

Measurement Method	CO <sub>2</sub> , N <sub>2</sub> O, Agents:	Sidestream, non-dispersive infra-red (NDIR) technology
	O <sub>2</sub> :	Paramagnetic oxygen technology (MGU-801P/811P only)
Warm-Up Time		ISO Accuracy: 45 sec. Full Accuracy: 10 min.
Auto Zeroing		ISO Accuracy: 30 sec. Full Accuracy: 4 hours
Measurement Range	CO <sub>2</sub> :	0 to 10.0%(0 to 76mmHg, 0 to 10kPa)
	N <sub>2</sub> O:	0 to 100%
(MGU-801P/811P only)	O <sub>2</sub> :	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%
	Respiration Rate (RR): 0, 2 to 100Bpm
Measurement Accuracy (Full Accuracy)	<p><math>\text{CO}_2</math>: 0 to 1[vol%]:<math>\pm 0.1</math>[vol%]            1 to 5[vol%]:<math>\pm 0.2</math>[vol%]            5 to 7[vol%]:<math>\pm 0.3</math>[vol%]            7 to 10[vol%]:<math>\pm 0.5</math>[vol%]            &gt;10[vol%]: unspecified</p> <p><math>\text{N}_2\text{O}</math>: 0 to 20[vol%]:<math>\pm 2</math>[vol%]            20 to 100[vol%]:<math>\pm 3</math>[vol%]</p> <p><math>\text{O}_2</math>: 0 to 25[vol%]:<math>\pm 1</math>[vol%]            (MGU-801P/811P only) 25 to 80[vol%]:<math>\pm 2</math>[vol%]            80 to 100[vol%]:<math>\pm 3</math>[vol%]</p> <p>Halothane, Enflurane, Isoflurane: 0 to 1[vol%]:<math>\pm 0.15</math>[vol%]            1 to 5[vol%]:<math>\pm 0.2</math>[vol%]            &gt;5[vol%]: unspecified</p> <p>Sevoflurane: 0 to 1[vol%]:<math>\pm 0.15</math>[vol%]            1 to 5[vol%]:<math>\pm 0.2</math>[vol%]            5 to 8[vol%]:<math>\pm 0.4</math>[vol%]            &gt;8[vol%]: unspecified</p> <p>Desflurane: 0 to 1[vol%]:<math>\pm 0.15</math>[vol%]            1 to 5[vol%]:<math>\pm 0.2</math>[vol%]            5 to 10[vol%]:<math>\pm 0.4</math>[vol%]            10 to 15[vol%]:<math>\pm 0.6</math>[vol%]            15 to 18[vol%]:<math>\pm 1.0</math>[vol%]            &gt;18[vol%]: unspecified</p> <p>Respiration Rate (RR): <math>\pm 1</math>Bpm when below 60Bpm            Unspecified when above 60Bpm</p>
Respiration Detection	>1[vol%] change in $\text{CO}_2$ level
Interference from other gases	<p><math>\text{CO}_2</math>: <math>\text{O}_2</math>: 0.1[vol%]  <math>\text{N}_2\text{O}</math>: 0.1[vol%]            Any agent: 0.3[vol%]</p> <p><math>\text{N}_2\text{O}</math>: <math>\text{CO}_2</math>: 0[vol%]  <math>\text{O}_2</math>: 0[vol%]            Any agent: 0[vol%]</p> <p><math>\text{O}_2</math>: <math>\text{CO}_2</math>: 0.2[vol%]  <math>\text{N}_2\text{O}</math>: 0.2[vol%]            Any agent: 1.0[vol%]</p> <p>Anesthetic Agents <math>\text{CO}_2</math>: 0[vol%]  <math>\text{N}_2\text{O}</math>: 0.1[vol%]  <math>\text{O}_2</math>: 0.1[vol%]            Second agent: 0.2[vol%](Typical)</p>
Threshold	<p><math>\text{CO}_2</math>: 0.1[vol%] (0.3% during ISO accuracy mode)            (if the measured data is &lt; 0.1%, 0.0% is displayed.)</p> <p><math>\text{N}_2\text{O}</math>: 3[vol%] (3% during ISO accuracy mode)            (if the measured data is &lt; 3%, 0.0% is displayed.)</p> <p>Primary Agent ID*: 0.15% (0.4% during ISO accuracy mode)</p> <p>Secondary Agent ID*: 0.3% (0.5% during ISO accuracy mode) or 5% <math>_{\text{REL}}</math> (10% <math>_{\text{REL}}</math> for Isoflurane) of primary agent if primary agent&gt;10%</p>
	* For HAL, add 0.1% $_{\text{ABS}}$ to threshold values.
Flow Rate	70 to 200mL/min $\pm 10$ mL/min or $\pm 10\%$ , whichever is greater

System Response Time	4 sec. (includes sampling time and response time when using the sampling tube shorter than 2.5m)
DRYLINE Water Trap	Emptying interval (half full, worst case) Adult: 17 h @ 200 mL/min, 37°C, 100% RH Neonate: 20 h @ 120 mL/min, 37°C, 100% RH

**Spirometry (MGU-810 series)**AWP [cmH<sub>2</sub>O]Measurement Range: -20 to 100 cmH<sub>2</sub>O (Adult, Pediatric\*)Accuracy: ±1 cmH<sub>2</sub>O (Adult, Pediatric\*)

AWF (both direct.)[L/min]

Measurement Range: 1.5 to 100L/min (Adult), 0.25 to 25 L/min (Pediatric\*)

Tidal Volume (insp. and exp.) [mL]

Measurement Range: 150 to 2000 mL (Adult), 15 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 to 20 L/min (Adult), 0.5 to 5 L/min (Pediatric\*)

Compliance [mL/cmH<sub>2</sub>O]Measurement Range: 4 to 100 mL/cmH<sub>2</sub>O (Adult), 1 to 100 mL/cmH<sub>2</sub>O (Pediatric\*)Airway Resistance [cmH<sub>2</sub>O/L/s]Measurement Range: 0 to 40 cmH<sub>2</sub>O/L/s (Adult, Pediatric\*)Peak, Plateau, PEEP, and Mean Pressure [cmH<sub>2</sub>O]Measurement Range: -20 to 100 cmH<sub>2</sub>O (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 to 35 Bpm (Adult), 4 to 50 Bpm (Pediatric\*)

I:E Ratio: 1:4.5 to 2:1 (Adult, Pediatric\*)

Intubation Tube: 5.5 to 10 mm (Adult), 3 to 6 mm (Pediatric\*)

\*Including neonate.

**Recording (Recorder Unit)**

Recording Speed 50mm/s, 25mm/s (Error: within ±5%)

Resolution Head Direction: 8 dots/mm  
Feed Direction: 40 lines/mm (at recording speed of 25mm/s)

Recording Waveforms 3 waveforms

Recording Type Waveform Recording, List Recording, Graphic Recording

Detection Paper out, printhead temperature

Protective Circuit Provided

**Input Box (IB-8004)**

Connectable Units Maximum 2 units

Number of Slots Maximum 8 slots (IB-8004 x 2)

**Analog Waveform Output**

Output Voltage	ECG output 1V/mV (fixed), BP output 1V/100mmHg (fixed)
Output Voltage Accuracy	within $\pm 10\%$ (Both ECG and BP output)
Analog Output Frequency Range	ECG Output 0.5 to 20Hz BP Output DC to 40Hz
Delay Time	35ms and below (ECG waveform) 35ms and below (BP waveform: when 40Hz is set for waveform filter)
Output Impedance	$100\Omega \pm 10\%$
Load Impedance	$1k\Omega$ to $\infty$
Pacemaker Pulse	none

**QRS Synchronization Output**

Output Waveform	Square Wave (Positive/negative logic can be selected.)
Output Voltage	+4.3V to +5.0V (High Level) +0.3V and below (Low Level)
Synchronized Signal Width	100ms
Delay Time	35ms and below (when the "Filter" setting is [Monitor] or [Diag.])
Output Impedance	Open Collector Output (+5V 500 $\Omega$ pull-up resistor)

**NOTE**

- The delay time of analog waveform output and QRS synchronization output depends on the filter setting and the input waveform type of the patient monitor. For detailed information of the delay time, refer to Fukuda Denshi service representative.
- The QRS synchronized signal is not intended to be used as synchronized signal for defibrillator. For details, refer to Fukuda Denshi service representative.

**Measurement Unit for Each Parameter**

The measurement units for this equipment are as follows.

Details	Parameter	Display	Unit	Default
Heart Rate / Pulse Rate	ECG	HR	bpm (beats per minute)	
	BP	PR_IBP	bpm	
	SpO <sub>2</sub>	PR_SpO <sub>2</sub>	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 <sub>2</sub> , Gas Module	RR_GAS	Bpm	
Apnea	Impedance	APNEA	s (second)	
	CO <sub>2</sub>	APNEA	s (second)	
	Ventilator	APNEA	s (second)	
Blood Pressure	BP	BP	mmHg, kPa cmH <sub>2</sub> O (CVP only)	mmHg

Details	Parameter	Display	Unit	Default
Non-Invasive Blood Pressure	Non-Invasive Blood Pressure	NIBP	mmHg, kPa	mmHg
Arterial Oxygen Saturation	SpO <sub>2</sub>	SpO <sub>2</sub>	%	
Perfusion Index	Perfusion Index	PI	%	
	Pleth Variability Index	PVI	%	
Carboxyhemoglobin Concentration	SpCO	SpCO	%	
Methemoglobin Concentration	SpMet	SpMet	%	
Total Hemoglobin Concentration	SpHb	SpHb	g/dL	
Temperature	TEMP	TEMP	°C, °F	°C
End Tidal CO <sub>2</sub> Concentration	CO <sub>2</sub>	EtCO <sub>2</sub>	mmHg, kPa, %	mmHg
Inspiratory CO <sub>2</sub> Concentration	CO <sub>2</sub>	InspCO <sub>2</sub>	mmHg, kPa, %	mmHg
Cardiac Output	CO	CO	L/minute	
Blood Temperature	Blood Temperature	Tb	°C	
Injectate Temperature	Injectate Temperature	Ti	°C	
Airway Flow	Airway Flow	AWF	L/minute	
Airway Pressure	Airway Pressure	AWP	cmH <sub>2</sub> O	
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 <sub>2</sub> O	
Airway Resistance	Expiratory Resistance	E-RES	cmH <sub>2</sub> O/L/sec	
	Inspiratory Resistance	I-RES	cmH <sub>2</sub> O/L/sec	
Airway Pressure	Mean Airway Pressure	MEAN	cmH <sub>2</sub> O	
	Peak Airway Pressure	PEAK	cmH <sub>2</sub> O	
	Pause Airway Pressure	PAUSE	cmH <sub>2</sub> O	
	Plateau Pressure	PLATEAU	cmH <sub>2</sub> O	
Peak End Expiratory Pressure	Peak End Expiratory Pressure	PEEP	cmH <sub>2</sub> O	
Inspired Oxygen	Inspired Oxygen	FIO <sub>2</sub>	%	

Details	Parameter	Display	Unit	Default
Vigilance Data Vigilance Vigilance CEDV Vigilance II Vigileo	Mixed Venous Oxygen Saturation	SvO <sub>2</sub>	%	
	Central Venous Oxygen Saturation	ScvO <sub>2</sub>	%	
	Arterial Oxygen Saturation	SaO <sub>2</sub>	%	
	Oxygen Uptake Index	O <sub>2</sub> EI	%	
	Oxygen Transport	DO <sub>2</sub>	mL/minute	
	Oxygen Consumption	VO <sub>2</sub>	mL/minute	
	Stroke Volume	SV	mL/beat	
	Stroke Volume (STAT Mode)	SV_STAT	mL	
	Stroke Volume Index	SVI	mL/m <sup>2</sup>	
	Stroke Volume Index (STAT Mode)	SVI_STAT	mL/m <sup>2</sup>	
	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 <sup>2</sup>	
	Continuous Cardiac Index (STAT Mode)	CCI_STAT	L/minute/m <sup>2</sup>	
	Systemic Vascular Resistance	SVR	dyn-sec-cm <sup>-5</sup>	
	Systemic Vascular Resistance Index	SVRI	(dyn-sec-cm <sup>-5</sup> -m <sup>2</sup> )	
	Blood Temperature	BT	°C	
	Ejection Fraction	RVEF	%	
	Ejection Fraction (STAT Mode)	RVEF_STAT	%	
	End-Diastolic Volume	EDV	mL	
	End-Diastolic Volume (STAT Mode)	EDV_STAT	mL	
	End-Diastolic Volume Index	EDVI	mL/m <sup>2</sup>	
	End-Diastolic Volume Index (STAT Mode)	EDVI_STAT	mL/m <sup>2</sup>	
	End-Systolic Volume	ESV	mL	
	End-Systolic Volume Index	ESVI	mL/m <sup>2</sup>	
	Stroke Volume Variance	SVV	%	

Details	Parameter	Display	Unit	Default
Multigas Unit	End-tidal Carbon Dioxide	CO <sub>2</sub> -E	mmHg, kPa, %	mmHg
	Inspired Carbon Dioxide	CO <sub>2</sub> -I	mmHg, kPa, %	mmHg
	End Tidal Oxygen	O <sub>2</sub> -E	%	
	Inspired Oxygen	O <sub>2</sub> -I	%	
	Expired Nitrous Oxide	N <sub>2</sub> O-E	%	
	Inspired Nitrous Oxide	N <sub>2</sub> O-I	%	
	End Tidal Anesthetic Gas	AGT-E	%	
	Inspired Anesthetic Gas	AGT-I	%	

Details	Parameter	Display	Unit	Default
BIS Data	Bispectral Index	BIS	(no unit)	
	Signal Quality Index	SQI	%	
	Electromyograph	EMG	dB	
	Suppression Ratio	SR	%	
	Spectral Edge Frequency	SEF	Hz	
	Total Power	TOTPOW	dB	
	Impedance	IMP	Kohms	
INVOS 5100C Monitor Data	Regional Cerebral Oxygen Saturation (Left)	Lt-rSO <sub>2</sub>	%	
	Regional Cerebral Oxygen Saturation (Right)	Rt-rSO <sub>2</sub>	%	

Details	Parameter	Display	Unit	Default
PiCCO Data	Pulse Contour Cardiac Output	CCO	L/min	
	Pulse Contour Cardiac Output Index	CCI	L/min/m <sup>2</sup>	
	Stroke Volume	SV	mL	
	Stroke Volume Index	SVI	mL/m <sup>2</sup>	
	Stroke Volume Index	SVV	%	
	Systemic Vascular Resistance	SVR	dyn x s x cm <sup>-5</sup>	
	Systemic Vascular Resistance Index	SVRI	dyn x s x cm <sup>-5</sup> x m <sup>2</sup>	
	Central Venous Oxygen Saturation	ScvO <sub>2</sub>	%	
	Oxygen Delivery	DO <sub>2</sub>	ml/min	
	Oxygen Consumption	VO <sub>2</sub>	ml/min	



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