

Dyna Scope 7000 Series

Bedside Monitor

DS-7001 System

Operation Manual



- Before using this device, read this operation manual thoroughly.
- Keep this manual near the device for future reference.

CAUTION:

- This device for sale by or on the order of a physician.
- The company and product names used in this manual are trademarks or registered trademarks.
- Microsoft® and Windows® is a registered trademark or trademark of US Microsoft Corporation in US and other countries.
- If this manual has pages missing or out of order, contact Fukuda Denshi for replacement.
- 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

Thank you for purchasing this product.

Before using this product, read the following precautions to make sure the product is used correctly and safely.

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Safety Precautions

Read the “Safety Precautions” thoroughly before use to ensure correct and safe use of the product.

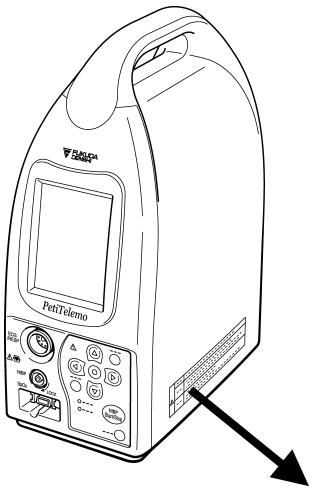
Be sure to follow the precautions indicated below, as these are important messages related to safety.

 DANGER	Failure to follow this message may cause immediate threat of death or serious injury, or complete failure of the equipment.
 WARNING	Failure to follow this message may result in death or serious injury, or complete failure of the equipment.
 CAUTION	Failure to follow this message may cause injury or failure to the equipment.
NOTE	A note is not related to product safety, but provides information about the correct use and operating procedures to prevent incorrect operation and malfunction of the equipment.

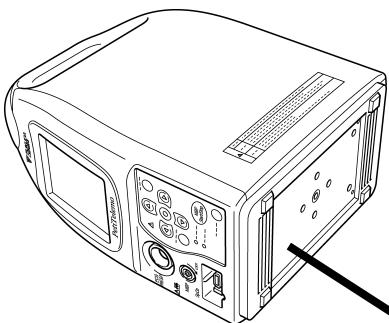
Labels Attached to the Unit

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

 CAUTION	Do not damage or erase the warning labels attached to the unit. These warning labels contain descriptions important for handling and operating the unit properly and safely. A damaged label may compromise safe operation.
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	DANGER	<ul style="list-style-type: none"> Do not operate the device where chemicals are stored, or in the presence of flammable anesthetics.
	WARNING	<ul style="list-style-type: none"> When using an electrosurgical knife, ensure proper attachment of patient plates. When using near an electrosurgical knife or other device generating high frequency, verify proper operation. Use the power cable with ground electrode and plug into a hospital-grade outlet.
	CAUTION	<ul style="list-style-type: none"> Read the operation manual thoroughly before use. Verify proper operation before use. Do not locate/store the device in an area vulnerable to high temperature/humidity. Avoid direct sunlight.



	Danger <ul style="list-style-type: none"> Use only the batteries specified for this device. Do not disassemble or modify the battery.
	Warning <ul style="list-style-type: none"> Installation of the battery should be performed only by our service representative, to avoid any risk of electric shock to the operator or malfunction of the device.
	Caution <ul style="list-style-type: none"> Replace the battery every 2 years. The battery charges when the power cable is connected to a hospital-grade outlet. To fully charge an empty battery, it takes approximately 2.5 hours by quick charging, and approximately 16 hours by standard charging. Charging will automatically stop when fully charged. The guaranteed number of charge time is approximately 300 times.

Measurement Unit for Each Parameter

The measurement units for this equipment are as follows.

<i>Parameter (Default Color)</i>	<i>Description</i>	<i>Display</i>	<i>Unit</i>
ECG (Green)	Heart Rate	HR	bpm (beats per minute)
Respiration (White)	Respiration Rate	RR (RESP)	Bpm (breaths per minute)
NIBP (White)	Non-Invasive Blood Pressure	NIBP	mmHg
SpO ₂ (Yellow)	Arterial Oxygen Saturation	SpO ₂	%
	Pulse Rate	PR	bpm (beats per minute)

Graphic Symbols

The following symbols are used for this equipment.

Symbols on the Main Unit

<i>Symbol</i>	<i>Description</i>
	Equipotential Terminal Indicates the terminal to equalize the potential difference when interconnecting the devices.
	Caution; refer to accompanying documents Indicates the need to refer to related accompanying documents before operation.
	Defibrillation-Proof Type CF Equipment Indicates that the DS-7001 is a defibrillation-proof type CF equipment.

Symbols Displayed on the Screen

<i>Symbol</i>	<i>Description</i>
	Alarm OFF Indicates the alarm is OFF.
	Heartbeat Synchronization Mark This mark flashes synchronizing to the heartbeat.
	Lead Off Indicates the electrodes are detached.
	Probe Off Indicates the SpO ₂ probe is disconnected.
	Pacemaker Mark Indicates that the patient is using a pacemaker. This mark will be displayed when YES is selected for pacemaker on the admit menu.
	Synchronized Tone Mark Indicates that the heartbeat synchronized tone is set to either ECG or SpO ₂ .
	Synchronized Lamp Mark Indicates that the heartbeat synchronized lamp is set to either ECG or SpO ₂ .
	AC Power Supply Mark Indicates that the monitor is operated with AC power supply.
	Battery Mark Indicates the battery capacity during battery operation.

Precautions for Safe Operation of Medical Electrical Equipment



CAUTION

- Read the following precautions thoroughly to correctly operate the device.
- Users should have a thorough knowledge of the operation before using this system.
 - Pay attention to the following when installing and storing the equipment.
 - Do not install or store in an area where the equipment 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 system.
 - 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 there are chemical or gasses stored.
 - 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.
 - Before operating the system, verify the following items.
 - Verify the power voltage.
 - Check the cable connection and polarity to ensure proper operation of the equipment.
 - Make sure the power system is properly grounded.
 - 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 judgement and danger.
 - Ensure all patient connections are proper and secure.
 - During operation of the system, verify the following items.
 - Always observe the system 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 device.
 - After using the system, verify the following items.
 - 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 cord. Pull by the connector part of the cable.
 - Clean the accessories and cables, and keep them together in one place.
 - Keep the unit clean to ensure proper operation of the next use.
 - If the equipment is damaged and in need of repair, user should not attempt service. Label the unit "OUT OF ORDER" and contact Fukuda Denshi.
 - Do not remodel the equipment.

CAUTION

- Maintenance Check
 - Make sure to periodically check the equipment, accessories and cables.
 - Before reusing the device that has been left unused for a while, make sure that the device works normally and safely.
- When using the electrosurgical instrument or defibrillator with this equipment, verify proper attachment of patient ground plate, ECG electrode type for the electrosurgical instrument, and paste volume, output energy for the defibrillator. Also, verify that proper ground is selected.

Precautions for Safe Operation of Medical Telemetry

CAUTION

- To operate the device correctly, read the following precautions carefully.
- The medical institution (hereinafter referred as "Institution") must decide the telemetry installation plan for the medical institution in order to prevent interference and interference between transmitters (telemetry based on destination country's radio law).
 - 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 medical 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 be examined so as not to generate electronic interference.
 - Based on the above examination result, the institution places each receiver antenna as required.
- In managing, be sure to follow the precautions below.
- 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 nominates 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 medical institution by giving proper instruction.

 **CAUTION**

- The Overall Manager creates a management log, list of wireless channels, management status for the whole medical institution (hereinafter referred to as the "management log"). 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 about the Maintenance

Safety Inspection and Maintenance

For safe operation of the equipment, regular inspection and maintenance is 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 if ;

- the equipment was subjected to extreme mechanical stress, e.g. after a heavy fall.
- the equipment was subjected to liquid spill.
- the monitoring function is interrupted or disturbed.
- parts of the equipment enclosure are cracked, removed, or lost.
- any connector or cable shows signs of deterioration.

→
"10. Maintenance"

 **WARNING**

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

Maintenance, Modifications, and Repairs

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.
- Components are used in accordance with Fukuda Denshi operating instructions.

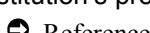
A full technical description of the DS-7001 is available from your local Fukuda Denshi representative.

Precautions about the Pacemaker



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.)



“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.

[October 14, 1998 (Letter:

www.fda.gov/cdrh/safety.html] - FDA]

Non-Explosion Proof



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.

Defibrillation Safety



- 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 directly contact the electrodes or medicament, 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 by the discharged energy.
- When defibrillating, do not touch the patient and the metal part of the device or cables.
Electric shock may result by the discharged energy.

Electrosurgery Safety



The monitoring system contains protection against interference generated by electrosurgical instruments. However, operating conditions, surgery site with respect to the location of ECG electrodes, or the type of instrument used, may cause noise on the ECG. The noise is generated at the tip of an 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 unit 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 the monitor. This will help prevent interference through the power cable.

Electrode Placement

The amount of interference is considerably different depending on the electrode position and surgery site. Place the ECG electrodes as far away as possible from the surgery site and the ground plate. Do not place electrodes in the path between the surgery site and the ground plate. If the electrodes are placed in this path, the amount of interference will be quite large.

Position (+) and (-) electrodes as close as possible to each other.

Ground Plate

When using electrosurgical instruments, make sure the contact between the patient and the ground plate is secure. If the connection is incomplete, the patient may suffer a burn at the electrode site.

Precautions about Magnetic Resonance Imaging



- Do not operate this equipment in magnetic resonance imaging (MRI) environments.
- When conducting MRI test, remove the electrodes and sensors connected to the patient (test subject).
The local heating caused by the induced electromotive force may cause burn injury to the patient (subject). For details, refer to the operation manual for the MRI testing device.

Precautions about the Fuse



If the fuse burns out, contact Fukuda Denshi Service Representative. Do not continue using it as internal damage to the equipment may be considered.

Precautions about the DS-7001



When connecting to other device, contact Fukuda Denshi service representative.

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



- Do not connect unit or cable not authorized by Fukuda Denshi to any I/O connector. If done so by mistake, the device can not deliver its maximum performance and the connected units may be damaged, resulting in a safety hazard.
- Use only the accompanying 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 plugged into 230V AC hospital grade outlet.
Use only the accompanying 3-way AC power cable to assure ground reliability. Use a power outlet that can supply sufficient power to the device.
- When using multiple ME devices simultaneously, equipotential grounding must be conducted to avoid electrical potential difference between the devices.
Presence of any electrical potential difference may result in electric shock to the patient and the operator.
- The battery installation will be performed by our service representative. Users should not attempt the procedure as it may result in electric shock or malfunction to the equipment.

 **WARNING**

- If the upper/lower alarm threshold is set to OFF, alarm will not generate even if all alarm is set to ON. Pay attention when setting the threshold OFF.
- Even if the individual parameter alarm is set to ON, all the alarm will not generate during the alarm suspend time. Check the patient's condition frequently.
- When using electrosurgical instrument with this equipment, verify ground plate attachment, electrode position, ground cable connection, etc.
A high frequency energy generated by the electrosurgical instrument may cause burn injury at the electrode site, damage the equipment, or cause electric shock.
- Do not touch the DS-7001 during defibrillation.
Electric shock may result to the patient or the operator.
- Do not disassemble/remodel the equipment.
Electric shock may result.
- Set the correct patient type on the admit menu.
This selection will affect the measurement accuracy of QRS detection, cuff inflation value of NIBP measurement, and respiration filter.
- Set the pacemaker use (Yes/No) correctly on the admit menu.
This will affect accuracy of QRS detection. The pacemaker pulse may be misdetected as QRS wave causing to overlook pacing failure.
- When measuring the SpO₂ of patient with high fever or peripheral circulatory insufficiency, check the sensor attachment periodically and change the attachment site. The temperature of attachment site will rise 2~3°C due to the sensor heat which may result in burn injury.
- For the following case, accurate measurement may not be possible.
 - Patient with excessive abnormal hemoglobin (HbCO, MetHb)
 - Patient with the pigment injected to the blood
 - Patient receiving CPR treatment
 - When a sensor is applied to a limb with NIBP cuff, arterial catheter, or intracatheter
 - When measuring at site with venous pulse
 - Patient with body motion
 - Patient with small pulse
- To see the waveform on the PC, use the application software, "Microsoft® Paint" on a PC with OS of Microsoft® Windows® 95, 98, XP, or 2000 loaded. Other application may not properly display the waveform.
- The BMP file recorded on the CF card is read only file.
 - Do not edit the file.
 - Do not perform procedure such as "Save as" on the "Paint" software.
- If the channel ID is changed without notifying, it may result in monitoring a different patient. Make sure the correct channel ID is set for the patient.
- Some wireless combinations of telemetry transmitters may generate interference with other devices.

 **WARNING**

- Before selecting the channel, verify it will not interfere with other channels.
- Make sure the telemetry manager of your system is aware of any changes to the telemetry channels.
- If transmitters are used in a neighboring medical facility, your facility and neighboring facility must make agreements on the setting of telemetry channels to prevent telemetry interference.
- Do not cover the vent hole located at the rear side of the monitor.
- If this device is used under adverse environmental conditions, not only that the device can not deliver its maximum performance, the device may be damaged and safety cannot be ensured.
If using the device under condition other than specified above, contact our service representative.

 **CAUTION**

System

- The DS-7001 is intended for patient monitoring in the general ward, ICU, CCU, OR and during in-hospital transportation. Do not use in the MRI environment, inside hyperbaric chamber, flammable anesthetic gas and outside hospital (including inside ambulance).
- When not using the DS-7001, always turn the power OFF. When not charging the battery, disconnect the power cable from the hospital grade outlet.
- For a brief time period after the power is turned ON, or when the ambient temperature is low, the display may be indistinct and the waveforms and measured value display may be unclear.
- Before monitoring, make sure that the correct time and date is set. If the time/date is not correctly set, or changed during monitoring, erroneous condition may occur to NIBP measurement, CF card periodic recording and alarm list data.
- For battery installation, channel ID / group ID setup, DIP switch setup, program upgrading, maintenance test, please contact Fukuda Denshi. Users should not attempt these operations as malfunction or trouble may result.
- When upgrading the software program, all prior memory will be erased.
- To ensure that system performs to specification, use the accessories specified by Fukuda Denshi. Otherwise, its proper functions may not be executed.
- For quality improvement, specifications are subject to change without prior notice.
- When connecting the units, make sure the power is OFF.
- AC filter will not function properly unless the correct frequency is selected.
- The display OFF function will inactivate the alarm generation and lamp function.
- The maintenance test will be performed by our service representative. Users should not attempt the procedure as malfunction to the equipment may occur.


CAUTION

Battery

- The battery operating time will shorten depending on the number of NIBP measurement times, etc.
- When using a new battery, or a battery which was stored for a long period of time, the operation time may be short at beginning of usage. In such case, repeating charging and battery operation for 2 or 3 times will bring out the original performance.
- When the battery charging duration becomes short, the battery needs to be replaced. (Indication for battery replacement is about 2 years, or 300 times of charging/discharging.)
- When the battery operation duration becomes short, the battery needs to be replaced.
- Repeated charging within short duration will cause the battery temperature to rise and may stop the charging procedure for safety purpose until the battery temperature decreases.
- Repeated charging of fully charged battery within short duration will cause the battery temperature to rise and degrade the battery.

Alarm

- If the alarm of the same level occurs at the same time, the alarm message for the newer alarm will be generated.
- While the "LEAD OFF" message is displayed, the HR alarm will not generate. Leaving this condition unresolved may result in missing a sudden change of the patient. Promptly check the electrodes when this message is displayed.

ECG Monitoring

- For stable monitoring, use the specified lead cables and electrodes. Use of other cables or electrodes may prevent proper monitoring during defibrillation or electrosurgery, and may cause a drift in the waveform baseline.
- Follow the instruction of the physician for electrode attachment position.
- The electrode colors should be corresponded to the colors of the accompanying lead cables.
- 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 at the same location for a long time, some patients may develop a skin irritation. Check the patient's skin condition periodically and change the electrode site as required.
- When using a defibrillator during ECG monitoring, a polarizing potential may interrupt monitoring for a few seconds.
- To display the pacemaker pulse on the monitor, select **Yes** for "Pacemaker", and **ON** or **Color** for "Pace Pulse" on the admit menu.
- There are some cases when pacemaker pulse can not be detected depending on the pacemaker type, pulse voltage, pulse width, lead cable (unipolar, bipolar), electrode site, or lead type which causes the pacemaker pulse amplitude to decrease and disables 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.


CAUTION

- During telemetry transmission, a noise may interfere depending on the transmission condition and be erroneously detected and displayed as a pacemaker pulse.

- When the spontaneous QRS and pacemaker pulse overlaps (as in a fusion beat), QRS detection will be disabled which will reduce the heart rate.
- If a pacemaker pulse is continuously detected due to AC frequency interference, QRS detection will remain suspended which will reduce the heart rate.

Respiration Monitoring

- The electrode position appropriate for ECG monitoring may not be always appropriate for respiration monitoring.
- When using the #3382.0654.11 lead cable (for electrosurgical instrument, 3-electrodes) and CI-164 relay cable (for electrosurgical instrument, 3-electrodes), the respiration measurement can not be performed.
- When using a defibrillator during respiration monitoring, a polarizing potential may interrupt monitoring for a few seconds.

NIBP Monitoring

- Do not apply cuff to the arm or leg with vein cannulation. The blood may backflow and cease the drug injection.
- The cuff should be basically applied to a bare arm. Align the cuff height to heart position. If the cuff is pressurized over the clothing, a measurement error may be caused.
- Have the patient stay still during the measurement. Body motion such as moving the arm, laying stress on the arm, or talking may cause measurement error. Vibration and strong impact to the equipment should be also avoided.
- After applying the cuff to the patient, always check that the air hose is not bent or compressed. Otherwise, cuff pressure detection or depressurizing control can not be performed which disables the measurement.
- Pay attention when measuring the NIBP of patient with bleeding disorders or hypercoagulation. 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 120 seconds for adult, 90 seconds for child, 60 seconds for neonate. When the inflation value has exceeded 310mmHg for adult, 210mmHg for child, 160mmHg for neonate.
- If used with the incorrect patient type, 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.
- If 1-minute interval measurement (1min Start) is set, the measurement will automatically stop after 10 minutes or 20 minutes depending on the setup.
- When performing long term measurement with the interval of 2.5 seconds or less, constantly check the patient's condition. Also, when performing automatic measurement for long duration, constantly check the patient's blood circulation. Congestion may be caused at the measurement site.
- The 1-minute periodic measurement setup cannot be backed up. It will be always turned OFF when the power is turned ON again.

 CAUTION	<p>SpO₂ Monitoring</p> <ul style="list-style-type: none"> • To ensure correct measurement and safe operation, Nellcor® sensor must be used. Use of unspecified sensor may not only cause inaccurate measurement but also burn injury to the patient. • 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 and sensor. • If irritation such as skin reddening or skin fit appears with the sensor use, change the attachment site or stop using the sensor. • When fixating the sensor with a tape, do not apply the tape too strong. 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. • Change the sensor attachment site constantly (every 4 hours). As the temperature of sensor attachment site normally rises 2 ~ 3°C, compression necrosis and burn injury may generate. • As the skin of 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 a measurement error. Place a black or dark cloth over the sensor. • When not performing the measurement, unplug the relay cable and sensor from the SpO₂ connector. Otherwise, the measurement data may be erroneously displayed by the ambient light. <p>Patient Admit / Discharge</p> <ul style="list-style-type: none"> • If you start monitoring a new patient without performing a discharge procedure for the previous patient, new data will be added to the previous data which will result in inaccuracy. Before monitoring, make sure the current patient information is suitable for the patient's condition. <p>CF Card</p> <ul style="list-style-type: none"> • Use only the specified IC card (FCF-32/FCF-64/FCF-128). • When recording the waveform data on the CF card, use the CF card formatted on the DS-7001. • Never remove the CF card when the background color of the CF display is red. • When the CF card status is “ERR.” or “FULL”, format the CF card. • When deleting the data on the CF card, format the CF card. The file can not be completely deleted by the delete process on the PC. • Do not delete the REC folder. • Do not create other folder or file in the CF card. • When removing the CF card (media) from the PC, refer to the operation manual of the PC, OS, card reader, and follow the correct procedure. <p>Sleep Function</p> <ul style="list-style-type: none"> • When using the sleep function on the DS-7001, perform monitoring on the central monitor. During the sleep mode, tone and lamp will not function, and all alarm sound will not be generated on the DS-7001.
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CAUTION

Maintenance

- 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 monitor 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 monitor or connectors.
- Use only neutral detergent to clean the housing. 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. The surface resin coating may be damaged, resulting in discoloration, scratches, and other problems.
- Do not open the housing of this device.
- Avoid alcohol or other liquids from getting into the equipment.
- The time-change components must be replaced at specified period.

Precautions for Use of SpO₂ Sensor

 DANGER	<p>Burn Risk in Using SpO₂ Sensor</p> <p>In SpO₂ monitoring, always use the sensor/relay cable specified by Fukuda Denshi. If any other sensor/relay cable is used, a high temperature rise of the sensor may place the patient in danger of burns.</p> <p>If there are any questions regarding the sensor/relay cable use for SpO₂ measurements of this device, please contact Fukuda Denshi service representative.</p>
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Precautions for Use of NIBP Cuff

 CAUTION	This product contains natural rubber latex which may cause allergic reactions.
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Precautions for Ventilator Monitoring

 WARNING	<ul style="list-style-type: none">● The DS-7001 may not be able to properly receive the alarm information from the ventilator due to causes such as communication error, using environment, usage procedure, etc. Therefore, always check the devices (ventilator, communication status of ventilator and DS-7001, etc.) and safety of the patient. If any abnormality is found on the devices or patient, take appropriate actions such as ceasing the operation of the devices in the safest way for the patient.● The ventilator operation should be performed by well-trained and authorized personnel.● If the DS-7001 does not generate an alarm even though the ventilator is generating an alarm, or if any other malfunction occurs, immediately check the ventilator, monitor, and the cable, and replace the cable if necessary. If malfunction persists, cease using the monitor.● The alarm generation on the DS-7001 is not assured if the alarm other than specified generates at the ventilator (SV-900, SV-300, Servo-i/s, PB-740/760/860, VELA). ● See For details of “specified alarm”, refer to △WARNING on P3-29 “Ventilator Monitoring”● When connecting the ventilator to the monitor, using them under adverse environmental condition will not only disallow the devices to deliver their maximum performance, but also the devices may be damaged and safety cannot be ensured.● When transmitting the ventilator information to the central monitor using the medical telemetry, read the “Precautions for Safe Operation of Medical Telemetry” in the Preface.
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 **WARNING**

- When monitoring the ventilator information on the central monitor, use the DS-7600 system or DS-5700 Central Monitor. Do not use the DS-5800N/NX/NX^{MB} Central Monitor. For use of other central monitors, contact our service representative.
- When monitoring ventilator information, pulse oximetry (SpO₂) can be also simultaneously monitored.
- For connecting the DS-7001 and ventilator, use only the specified connection cable.
- Precautions about Evita2dura / Evita4 / EvitaXL
 - The Evita2dura / Evita4 / EvitaXL acquires alarm information from the serial port. The ventilator alarm that cannot be acquired from the serial port is not guaranteed. For corresponding alarm, refer to the service representative of the ventilator manufacturer.
 - The DS-7001 will not correspond to the following alarm generated at Evita2dura / Evita4 / EvitaXL.
 - O₂ monitoring disabled alarm
 - CO₂ alarm disabled alarm
 - Oximeter alarm disabled alarm
 - Neo. volume measurement inoperable alarm
 - Minute volume alarm disabled alarm
 - Minute volume alarm low off alarm
 - Tidal volume alarm high off alarm
 - Apnea alarm off alarm
 - Nebulizer active alarm
- Precautions about E200
 - When connecting the cable, the power of the E200 should be turned OFF. It should be also turned OFF when performing ventilator setup on the DS-7001. Otherwise, proper alarm monitoring cannot be performed.
 - The E200 acquires alarm information from serial port. The ventilator alarm that cannot be acquired from serial port is not guaranteed. For corresponding alarm, refer to the service representative of the ventilator manufacturer.
 - The ventilator alarm display on the DS-7001 is not assured if the alarm other than the following generates at the ventilator.
 - Upper and lower airway pressure alarm
 - Upper and lower minute ventilation alarm
 - The "gas supply source failure" alarm generated on the E200 will not be generated on the DS-7001.
 - The apnea alarm (30 seconds of apnea) generated on the E200 will be also generated on the DS-7001.
 - When monitoring the alarm of the E200, verify that the power of the E200 is OFF before turning ON the power of the DS-7001. Otherwise, confirmation screen will be displayed on the DS-7001. In such case, check that the ventilator is not in alarm condition before monitoring the alarm.
 - When selecting [E200] on the ventilator setup menu, the power of the E200 ventilator should be turned OFF. Proper alarm monitoring will not be performed if installing or setup of the E200 is performed without the power being turned OFF.
 - If "Compass VM200"(optional accessory of E200) is connected to the E200, do not use the DS-7001. The alarm generated on the VM200 will not be transmitted to the DS-7001.

WARNING



- If **OFF** is selected for the ventilator, ventilator message will not be displayed on the screen and ventilator alarm will not be generated. A proper selection should be made when connecting a ventilator.
- The DS-7001 acquires alarm information by communicating with the ventilator. The alarm information that cannot be acquired from the ventilator will not be guaranteed.

CAUTION



- As ventilator message will be displayed at the upper right of the screen during ventilator monitoring, synchronized tone and synchronized lamp information will not be displayed. Verify each setup on the tone setup and lamp setup menu.
- For the SV-900, PB, VELA, Evita, E200 ventilator, 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 will continue for 5 seconds even after the alarm cause is resolved.
- When the 2min alarm silence button on the SV-900 is pressed, the ventilator alarm on the DS-7001 will be also silenced. However, airway pressure upper limit alarm will be generated even when the 2min alarm silence button is pressed.
- The tone and volume of the ventilator alarm cannot be changed.
- When the SV-300, Servo-i, Servo-s is operated by battery, **Alarm** will be displayed for the ventilator message on the DS-7001. Do not use the DS-7001 when the ventilator is operated by battery.
- The ventilator display will be displayed until the proper communication with the ventilator is resumed. When the communication is resumed, the screen will automatically return to the home display. However, if the ventilator display was accessed by selecting **Ventilator** key on the menu display, the screen will not automatically return to the home display unless the key is not pressed for 30 seconds.
- When **Failure** condition is detected during the sleep mode, the sleep mode will be cancelled, and ventilator display will be shown.
- For connecting the DS-7001 and ventilator, use only the specified connection cable.
- Verify that the DS-7001 and the ventilator are properly connected.
- When connecting the cable, verify that the main power of the DS-7001 and the ventilator is OFF.


CAUTION

- When connecting the PURITAN-BENNETT ventilator, follow the precautions below.
 - The serial port (RS-232C) of the ventilator should be set as follows. Refer to the service representative of the ventilator manufacturer.

Baud Rate : 9600bit/s
Data Bit : 8bit
Parity Bit : none
(Stop Bit) : (1bit)
 - The DS-7001 detects the “ventilator alarm” when the nurse call port on the ventilator outputs the alarm signal. For details of ventilator setup and alarm signal output condition from the nurse call port, refer to the service representative of the ventilator manufacturer.
- When connecting the VELA, the cable must be connected to the “nurse call connector” on the rear side of VELA. Do not connect to the “PATIENT ASSIST CALL”.
- When connecting the E200 ventilator, follow the precautions below.
 - The PRINT INTERVAL should be set to 1 minute on the ventilator. Refer to the service representative of the ventilator manufacturer.
 - The DS-7001 detects the “Ventilator Alarm” when the alarm signal is output from the serial port of the E200. For output condition of the alarm signal, refer to the service representative of the ventilator manufacturer.
 - If **OFF** is selected, the “VENT” message will not be displayed at the alarm message area even if the ventilator alarm is generated.
 - When turning ON the power of the SV-300, it will take about 30 seconds to start communication.
 - When the ventilator is in alarm condition, **Alarm** will be displayed for the ventilator message.
 - During monitoring, always verify the proper communication of the DS-7001 and the ventilator. Check that the alarm is not generated at the ventilator, and **Normal** is displayed for the ventilator message on the DS-7001.

Disposing of Equipment, Accessories, or Components

	When disposing of the equipment, accessories, or components, use an industrial waste distributor. Do not dispose of as ordinary waste.
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Precautions about Transportation

→“Specifications”
for environmental
condition during
transportation.

For transporting the DS-7001, pack with specified packing materials.

Precautions about RTC or Data Backup

→P9-6
"9. Maintenance
■Maintenance Check
●Time-Change
Components"



The DS-7001 is equipped with a built-in clock. When the power of the DS-7001 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.

Precautions about the Cables



When disconnecting the cables, pull on the connector housing and not on the cord. For cables with lock tab, push the tab when disconnecting. Pull the connector straight so the connector pins will not bend. When connecting, both connectors should be directly facing each other.

Precautions for Use of Ni-MH Battery



- This battery is intended for exclusive use with the DS-7001. Do not use with other equipment. It may cause leakage, heating, explosion of the battery.
- When installing the battery to the monitor, verify the correct polarity direction. If installed oppositely, it may cause leakage, heating, explosion of the battery.
- Do not throw the battery into fire or heat the battery.
- Do not solder the battery directly to the equipment.
- Do not disassemble or remodel the equipment. If the security apparatus or protector inside the battery gets damaged, it may cause heating, explosion of the battery.
- Do not cover the part on the battery where the internal gas is emitted. It may result in explosion of the battery.
- If the leaked solution of the battery gets into the eyes, do not rub the eyes. Wash thoroughly with clean water and immediately receive medical treatment from the doctor.



- Do not connect the (+) and (-) terminals of the battery with a wire or any other metal.
- Do not peel off or scratch the exterior tubing.
- If charging does not complete within the specified charging time, remove the battery and disconnect the power supply cable from the outlet. Otherwise, it may result in leakage or heating of the battery.
- If the leaked solution of the battery gets on to the skin or clothes, immediately wash down with rinse water. If not treated soon, it may cause serious injury.


CAUTION

- Do not use or leave the battery in high temperature. It may result in battery leakage and deterioration of performance / battery life.
- Do not get the battery wet with water, sea water or chemicals. It may result in heating, rusting of the battery.
- Immediately stop using the battery if any abnormality is found during use.
- Do not use / store the battery in reach of infants.
- Do not apply strong impact or throw the battery.
- If not using the monitor for a while, turn off the power and unplug the power cable to avoid battery leakage.

Electromagnetic Compatibility

The performance of this device under electromagnetic environment complies with IEC60601-1-2 (2001).

Precautions for Safe Operation under Electromagnetic Influence



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

- 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.

- Static Electricity

- In a dry environment (room), static electricity is likely to occur. Take the following countermeasures.
 - Both operator and patient should remove any static electricity before entering the room.
 - Humidify the room.

- Lightning

A lightning nearby may induce excessive voltage to the equipment. If any danger is suspected, use the uninterruptible power supply system.

- 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 IEC60601-1-2 (2001). However, if portable transmitter or wireless LAN equipment is used in close proximity, the electromagnetic influence may largely exceed the compliance level and may cause unexpected phenomenon such as noise interference on the waveform, etc. Therefore, 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 technician.

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-7001 is intended for use in the electromagnetic environment specified below.

<i>Emissions Test</i>	<i>Compliance</i>	<i>Electromagnetic Environment - Guidance</i>
RF Emissions CISPR 11	Group 1	The equipment uses RF energy that is necessary for the internal functioning of the equipment itself. 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	This equipment is suitable for use in all establishments other than domestic and those directly connected to a low-voltage power supply network which supplies buildings used for domestic purpose.

Compliance to the Electromagnetic Immunity (1)

The DS-7001 is intended for use in the electromagnetic environment specified below. It should be assured that the DS-7001 is used in such an environment.

Immunity Test	IEC60601-1-2 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Electrostatic Discharge (ESD) IEC61000-4-2	$\pm 2, 4, 6\text{kV}$ contact $\pm 2, 4, 8\text{kV}$ air	$\pm 2, 4, 6\text{kV}$ contact $\pm 2, 4, 8\text{kV}$ air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient / burst IEC61000-4-4	$\pm 2\text{kV}$ for power supply lines $\pm 1\text{kV}$ for input/output lines	$\pm 2\text{kV}$ for power supply lines $\pm 1\text{kV}$ input/output lines	Power supply quality should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Surge IEC61000-4-5	$\pm 0.5, 1\text{kV}$: Differential Mode $\pm 0.5, 1, 2\text{kV}$: Common Mode	$\pm 0.5, 1\text{kV}$: Differential Mode $\pm 0.5, 1, 2\text{kV}$: Common Mode	Power supply quality should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines. IEC61000-4-11	$<5\% U_T$ ($>95\%$ dip in U_T) for 0.5 cycle $40\% U_T$ (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 cycle $40\% U_T$ (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.	Power supply quality should be at levels characteristic of a typical location in a typical commercial or hospital environment. If the users of the DS-7001 require continuous operation of the device during power interruption, it is recommended to supply power from uninterruptible power supply system or battery (optional).
Power frequency (50/60Hz) magnetic field IEC61000-4-8	3A/m	3A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

Note : U_T is the a.c. mains voltage prior to application of the test level.

Compliance to the Electromagnetic Immunity (2)

The DS-7001 is intended for use in the electromagnetic environment specified below. It should be assured that the DS-7001 is used in such an environment.

Immunity Test	IEC60601-1-2 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Conducted RF IEC61000-4-6	3Vrms 150kHz ~ 80MHz	3Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the DS-7001, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended Separation Distance $d = 1.2 \sqrt{P}$ $d = 1.2 \sqrt{P} \quad 80\text{MHz} \sim 800\text{MHz}$ $d = 2.3 \sqrt{P} \quad 800\text{MHz} \sim 2.5\text{GHz}$ Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol: 
Radiated RF IEC61000-4-3	3V/m 80MHz ~ 2.5GHz	3V/m	

Note 1 : At 80Mhz and 800MHz, 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.

^a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast 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 this monitor should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating this monitor.

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

Recommended Separation Distances between Portable and Mobile RF Communications Equipment and the DS-7001

The DS-7001 is intended for use in an environment in which radiated RF disturbances are controlled. The electromagnetic interference can be prevented by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the DS-7001 as recommended below, according to the maximum output power of the communications equipment.

<i>Rated Maximum Output Power of Transmitter (W)</i>	<i>Separation Distance according to Frequency of Transmitter (m)</i>		
	26MHz ~ 80MHz $d = 1.2\sqrt{P}$	80MHz ~ 800MHz $d = 1.2\sqrt{P}$	800MHz ~ 2.5GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be determined using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

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

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

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5. Alarm Setup	Describes the alarm setup procedure and the displayed alarm message.	5
6. Parameter Setup	Describes the procedure to set the measurement condition, size, scale, etc. for each parameter.	6
7. Monitoring Setup	Describes the procedure to set the tone, time, etc. for monitoring.	7
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Chapter 1

General Description

This chapter explains the general description of this equipment.

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General Description

Compact in size, the DS-7001 Bedside Monitor utilizes 3.5 inch TFT color LCD panel for monitoring ECG, respiration, SpO₂, NIBP.

The monitored data can be transmitted to the central monitor using the digital telemetry method.

Through the use of CF card, software upgrade can be performed easily.

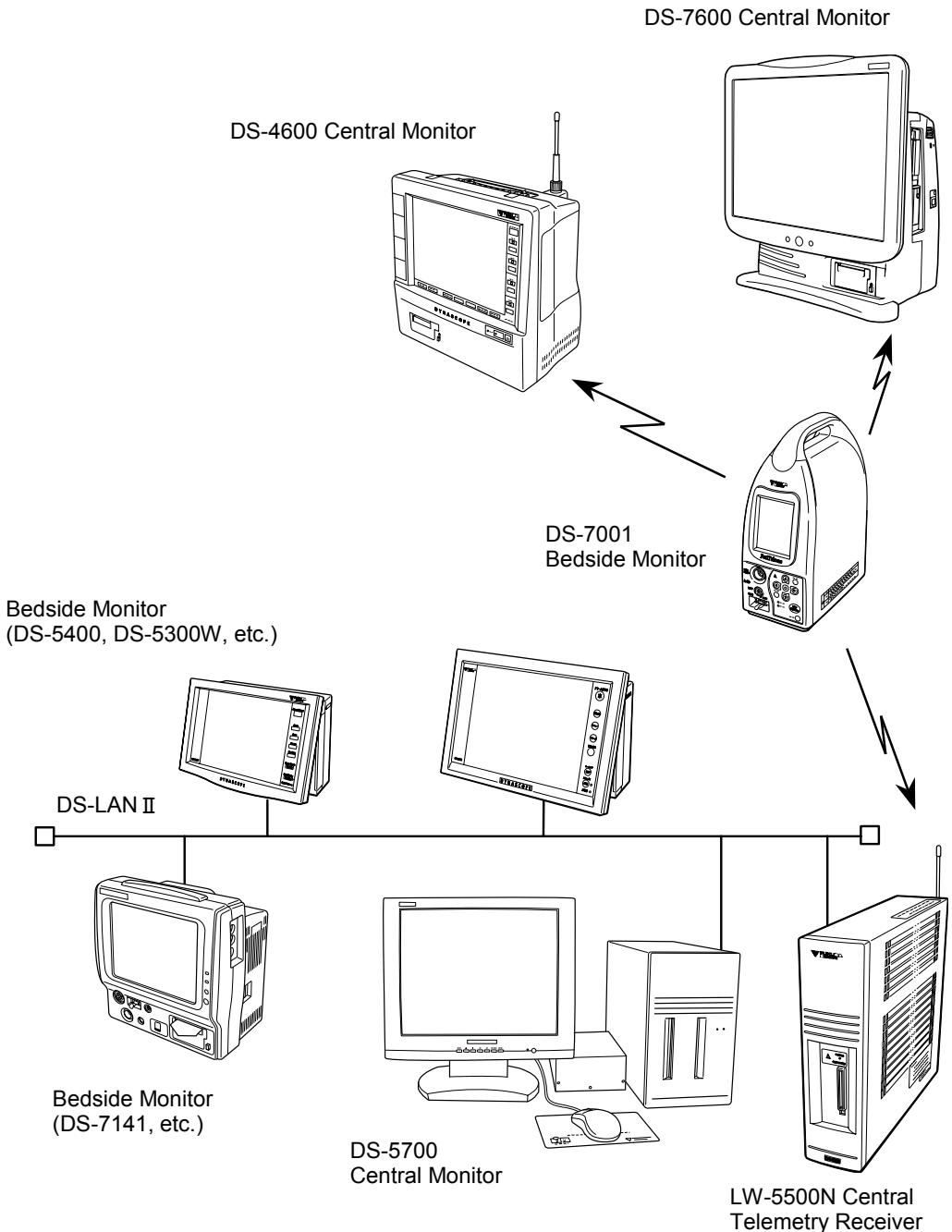
 CAUTION	The DS-7001 is intended for patient monitoring in the general ward, ICU, CCU, OR, and during in-hospital transportation. Do not use in the MRI environment, inside hyperbaric chamber, flammable anesthetic gas and outside hospital (including inside ambulance).
---	--

Features

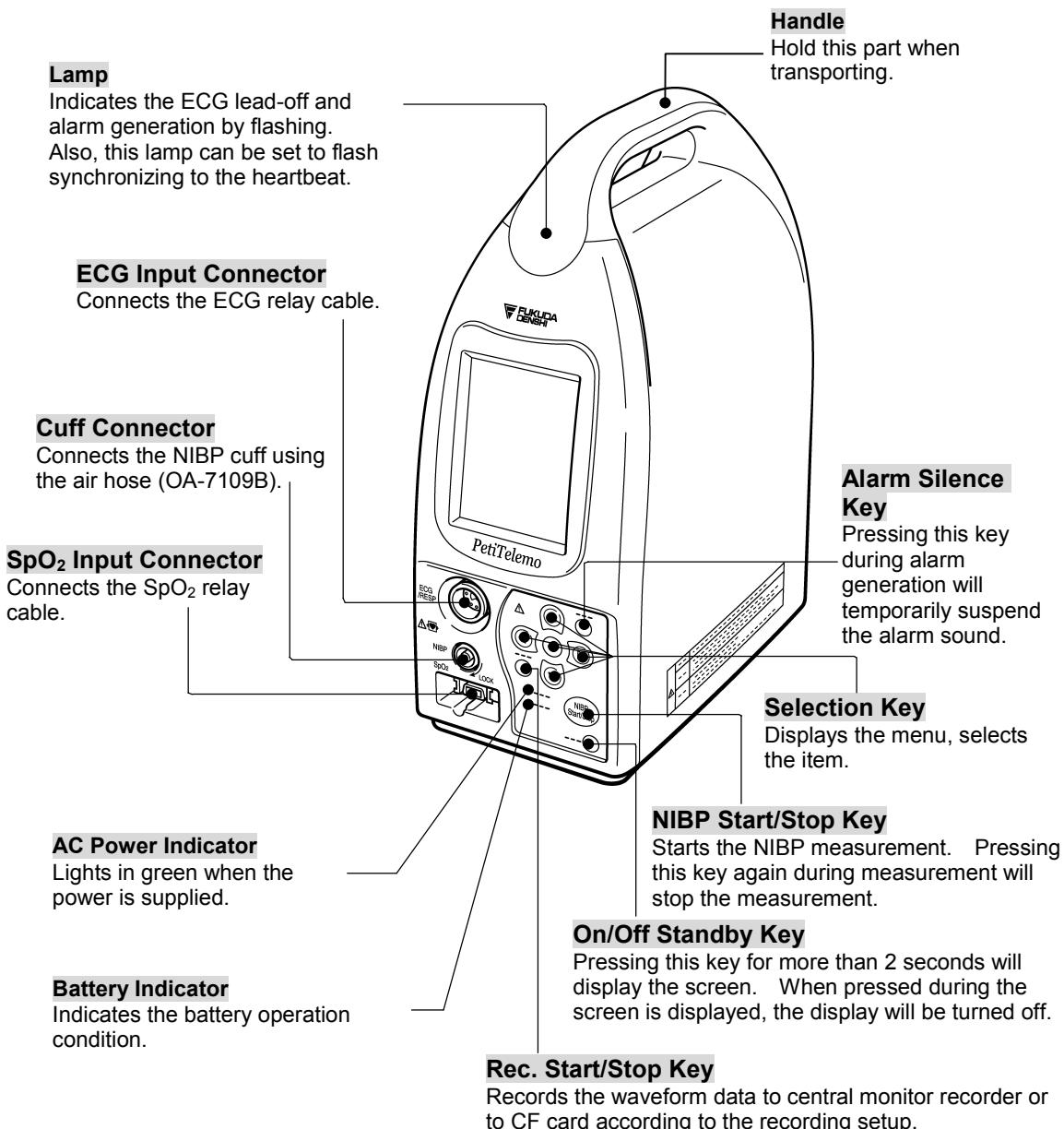
- The DS-7001 is lightweight (2.5kg) and compact in size.
- The DS-7001 can be attached to the drip stand or bedside using the exclusive mounting adapter.
- Through the use of built-in telemetry transmitter, patient data can be transmitted and monitored on the central monitor.
- Capable of monitoring ECG, respiration, SpO₂, and NIBP.
- 5 types of control key enables easy operation.
(Selection key, NIBP Start/Stop key, On/Off Standby key, Rec./Stop Key, Alarm Silence key)
- A lamp is provided as standard, which notifies ECG lead off and alarm generation by flashing.
- No cooling fan is used, ensuring clean and quiet monitoring.
- Waveform data can be recorded on the compact flash card in bitmap format.
- Upgrading of the system is possible using the compact flash card.
- By connecting a ventilator, ventilator information can be monitored.
For the SV-300, Servo-i, Servo-s, a detailed alarm message can be transmitted to the central monitor.

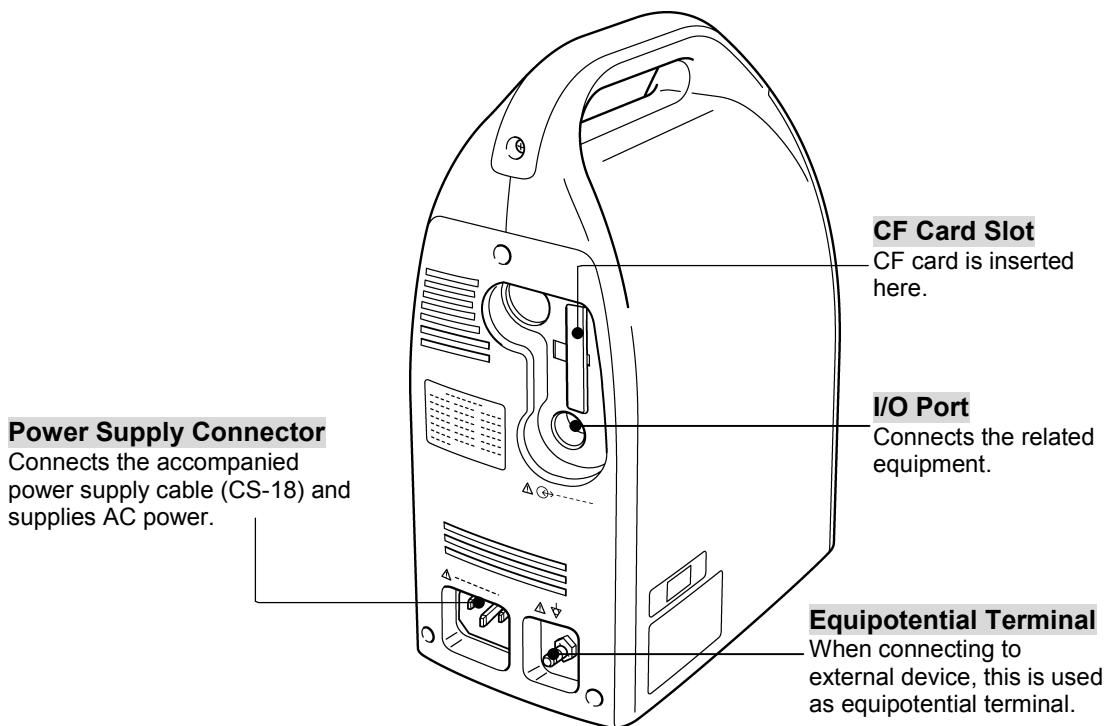
Basic Composition

The following is an example of a network connection using the DS-7001 Bedside Monitor.



Names of Parts and Their Functions





WARNING

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

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Chapter 2

Basic Operation

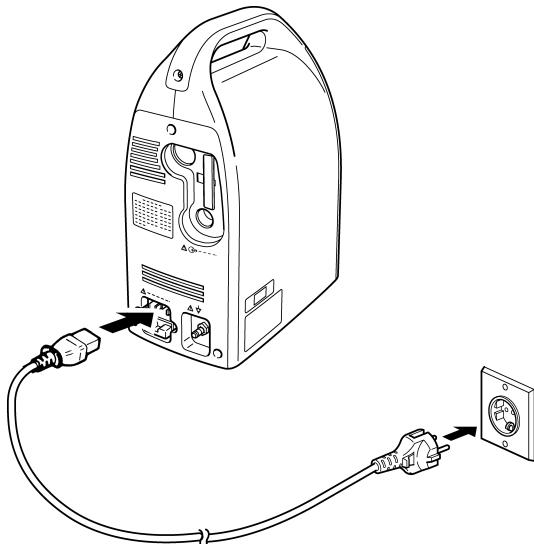
This chapter describes the basic operation for monitoring.

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To Turn On the Power

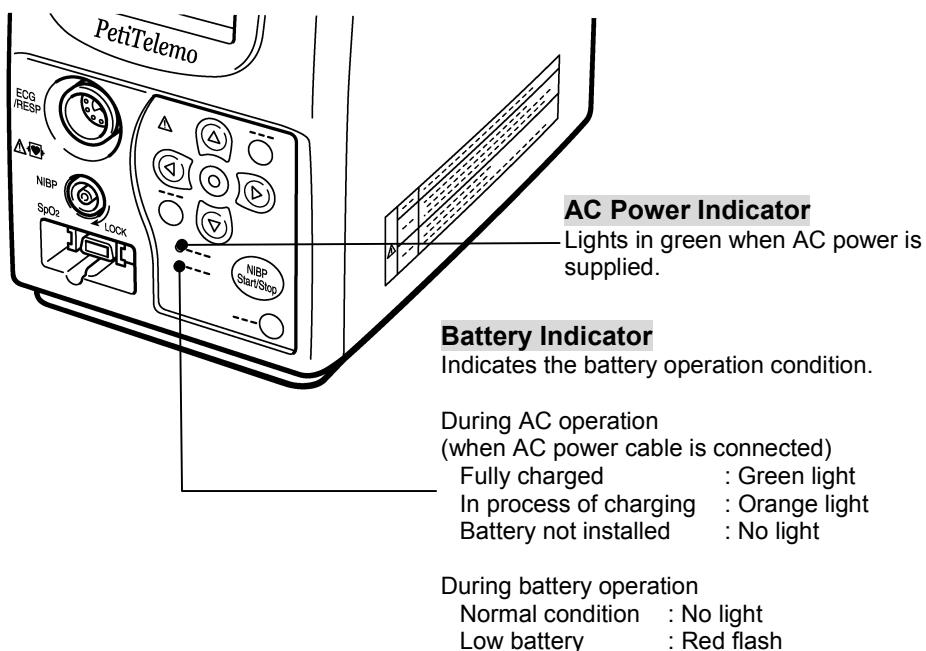
Connecting the Power Cable

Connect the accompanying AC power cable (CS-18) to the monitor and to the 3-way grounded outlet.



When the AC power is supplied to the monitor, the main power lamp will light in green.

When the battery (optional) is installed, the battery indicator lights and starts charging.



WARNING

- Use only the accompanying 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 plugged into 230V AC hospital grade outlet.
- When using multiple ME devices simultaneously, equipotential grounding must be conducted to avoid electrical potential difference between the devices. Presence of any electrical potential difference may result in electric shock to the patient and the operator.

NOTE

Equipotential grounding

When connecting multiple devices, electrical potential difference may be generated between the devices. This may result in electric shock to the patient who is connected to this device. Pay special attention for use in the operating room, ICU, CCU, Cardiac Catheter Laboratory, and Cardiovascular X-ray room. To avoid such electrical potential difference, use the accessory ground cable to connect each device's equipotential terminal to the same ground terminal. This is called equipotential grounding.

For Use with the Battery

Using the battery for operating the DS-7001 allows monitoring at places where AC power source is not available such as during in-hospital patient transportation.

Also, the DS-7001 will automatically switch to battery operation for the following cases.

- When a sudden electricity failure occurs.
- When the AC power cable is accidentally disconnected.

One (1) battery can be installed inside the unit. Fully charged battery can operate the equipment for about 60 minutes.

CAUTION

- The battery operating duration will shorten depending on the number of NIBP measurement performed, etc.
- When using a new battery, or a battery which was stored for a long period of time, the operating duration may be short at beginning of usage. In such case, repeating charging and battery operation for 2 or 3 times will bring out the original performance.

WARNING

The battery installation will be performed by our service representative. Users should not attempt the procedure as it may result in electric shock or malfunction to the equipment.

Battery Mark

The battery capacity can be verified by the battery mark on the upper part of the display.

During AC power operation, an AC power mark will be displayed instead of a battery mark.



<i>Mark</i>	<i>Battery Capacity</i>	<i>Indication of Operation Time</i>
(Blue)	The battery is fully charged.	30 min.
(Blue)	The remaining battery is less than half.	15 min.
(Red)	The battery will be depleted in about 10 minutes. (An alarm will generate, and the upper part of the display will flash.)	10 min.
AC	AC power operation	

CAUTION	<ul style="list-style-type: none">When the battery charging duration becomes short, the battery needs to be replaced. (Indication for battery replacement is about 2 years of usage, or 300 times of charging/discharging.)When the battery operation duration becomes short, the battery needs to be replaced.
---------	--

Battery Charging

Connecting the power cable to the hospital grade outlet with the battery installed will start the charging. During charging, the battery lamp lights in red. When the lamp turns to green, the charging is complete.

Operating the monitor with the AC supply allows monitoring the physiological information while charging the battery.

The following are the charging duration to fully charge an empty battery.

<i>When the display is ON (Standard Charging)</i>	<i>When the display is OFF (Quick Charging)</i>
approx. 16 hours	approx. 2.5 hours

 CAUTION	<ul style="list-style-type: none">Repeated charging within short duration will cause the battery temperature to rise and may stop the charging procedure for safety purpose until the battery temperature decreases.Repeated charging of fully charged battery within short duration will cause the battery temperature to rise and degrade the battery.
---	---

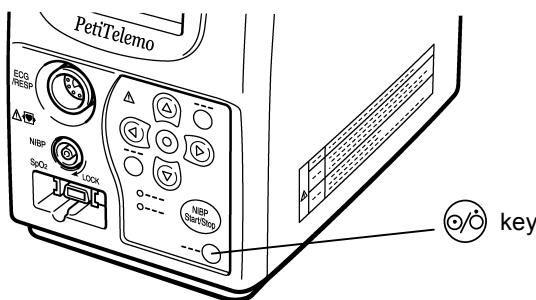
To Turn On the Power

Verify the following before turning ON the power.

- To operate with the AC power, verify the DS-7001 Bedside Monitor and the power supply cable (if necessary, equipotential ground cable) is correctly connected.
- To operate with the battery, verify the battery is charged.

1 Press the  key on the front panel for more than 2 seconds. The home display will appear, and physiological monitoring will start.

If the battery is installed, it will start charging.



2 Pressing the  key for more than 2 seconds during monitoring will turn off the display.

If the battery is installed, charging will continue.

3 To operate the monitor with a battery, unplug the power cable from the hospital grade outlet.

During battery operation, battery indicator will not light.


CAUTION

- When not using the DS-7001, always turn the power OFF.
- For a brief time period after the power is turned ON, or when the ambient temperature is low, the display may be indistinct and the waveforms and measured value display may be unclear.
- When not charging the battery, disconnect the power cable from the hospital grade outlet.

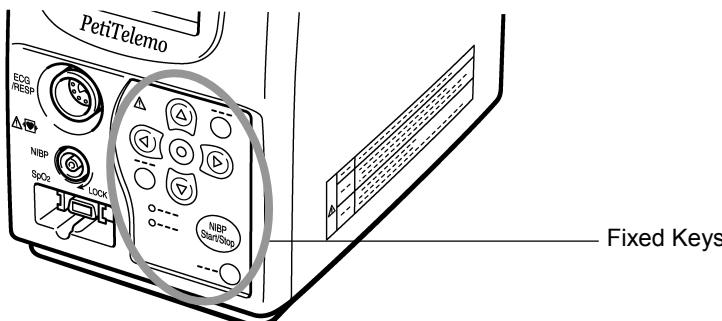
Basic Operation for Monitoring

→P7-7
"7. Monitoring Setup
■Tone / Volume"

All operation of the DS-7001 is performed using the fixed keys. The key displayed on the screen can be selected using the fixed key to display other menu, or to change the setup. Pressing the fixed key will generate a key sound to confirm that the key is pressed. This key sound can be silenced.

Fixed Key

There are 5 types of fixed keys on the DS-7001.



: Alarm Silence Key

Pressing this key will temporarily suspend the alarm sound when an alarm generates. This will not affect the alarm message.



: Rec / Stop Key

Pressing this key will start recording on the central monitor recorder or CF card with the preprogrammed condition.



NIBP Start/Stop Key

Starts the NIBP measurement. Pressing this key again during measurement will stop the measurement.

Selection Key

Moves the cursor with the keys. Press to finalize the selection.



On/Off Standby Key

Pressing this key for more than 2 seconds will display the screen. When pressed during the screen is displayed, the display will be turned off.

Displayed Keys

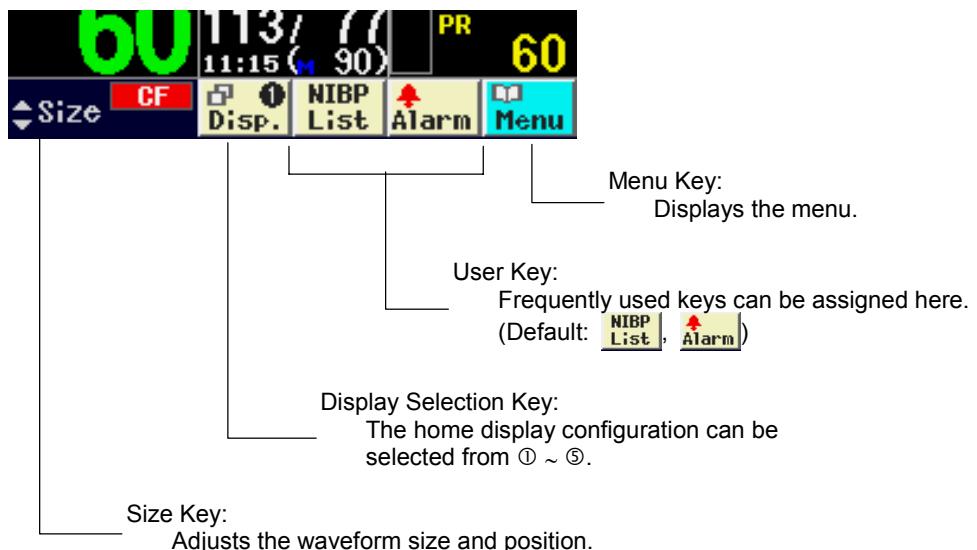
5 keys will be displayed at the bottom of the screen.

Among the 5 keys, **Size**, **Disp.**, **Menu** keys are fixed and can not be changed.

→P7-6

"7. Monitoring Setup
■User Key Setup"

The remaining 2 keys are user keys and desired function can be assigned.
By setting the user key, quick access to the frequently used function can be achieved.



Pressing **▲** **▼** while displaying the home display will make the **Size** key effective to change the size and position of the waveform.

To select a key other than **Size**, use **◀** **▶** to move to the desired key.

The background color of the selected key will turn to light blue. Press **●** to finalize the selection.

If not operated for more than 30 seconds, the light blue cursor will automatically return to **Menu** key.

[Reference]

Pressing **●** while adjusting the gain / position will display the parameter setup menu or return to the home display depending on where the light blue background is displayed.

① When the waveform area is light blue.

→Returns to the home display.

② When the numeric data area is light blue.

→The parameter setup menu for that parameter (HR/RR/SpO₂/NIBP) will be displayed.

③ When the all numeric data area (the area which **ALL** is selected for the display configuration) is light blue.

→The parameter setup selection will be displayed.

About the Home Display

→P7-9

"7. Monitoring Setup

■Color / Brightness"

The home display is the basic display for monitoring waveforms and numeric data for the patient. This will be always displayed when other setup menu is not displayed.

If the display is indistinct, adjust the brightness.

Home Display Layout

→P7-3

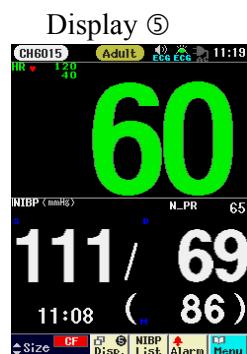
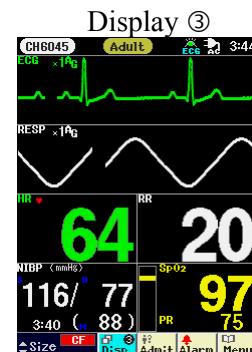
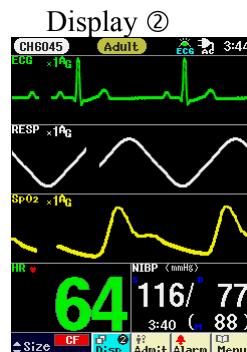
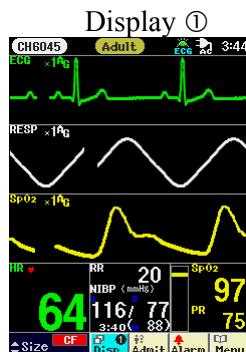
"7. Monitoring Setup

■Display

Configuration Setup"

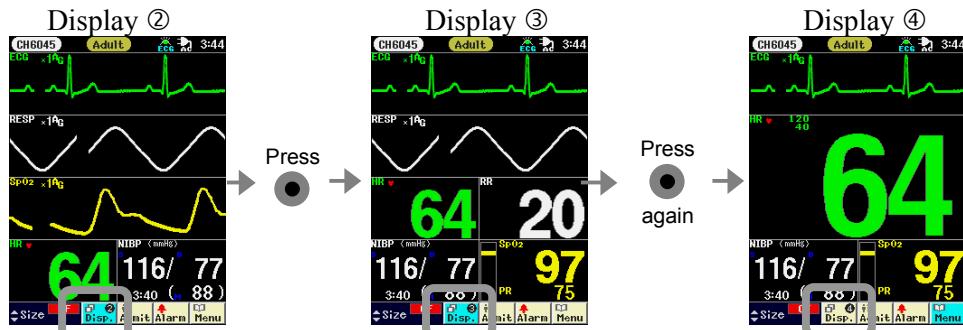
The home display can be selected from the following 5 layouts.

The displayed parameters can be selected on the display configuration setup of the system configuration menu.



To Select the Display Layout

- 1 Use to turn the background color of the key to light blue.
- 2 Pressing will sequentially select the display layout in the order of ①→②→③→④→⑤....
Press until the desired layout is displayed.



Current Layout ②
Check that the background color is light blue.

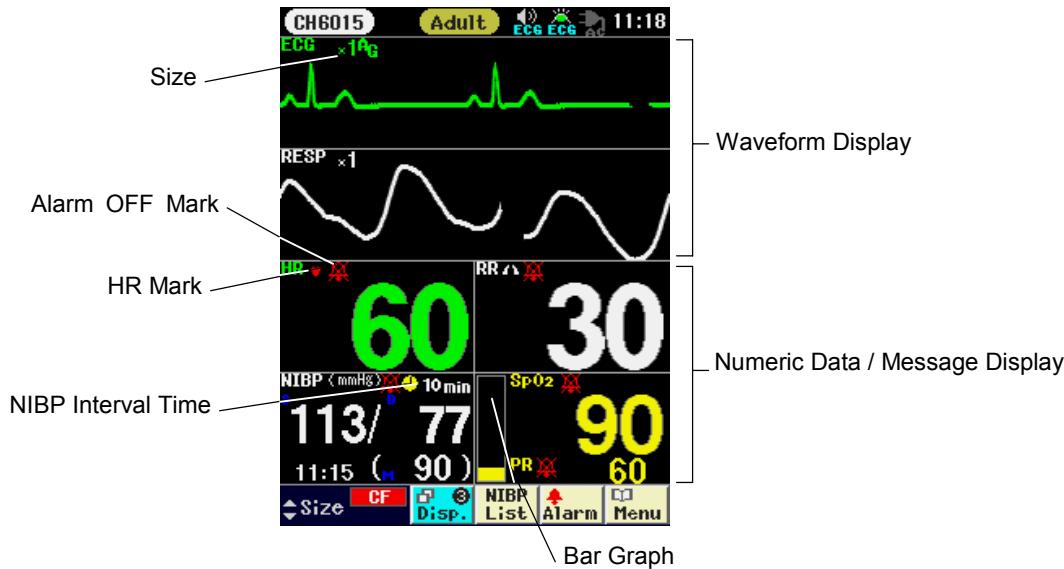
Display will switch to Layout ③.

Display will switch to Layout ④.

The Description of the Display

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

Numeric Data, Waveform, etc.



Size

Displays the waveform size.

Waveform Display

The stationary method is used for the waveform trace, which will update the waveform as it moves from left to right across the screen. Cascade display is also possible depending on the display configuration setup.

Alarm OFF Mark

Displayed when alarm setup of the corresponded parameter is turned OFF.

HR Mark

Displays the mark synchronized to the heartbeat.

Numeric Data Display / Message Display

Displays the numeric data such as HR, RR.

When in lead off or probe off condition, "Lead Off", "Probe Off" message will be displayed in the HR, SpO₂ numeric data display area respectively.

If the display is set to OFF, "OFF" message will be displayed.

When CVA condition is detected, "CVA" message will be displayed in the RR numeric display area.

Bar Graph

The bar graph of pulse waveform will be displayed in SpO₂ numeric data display area.

→P3-20

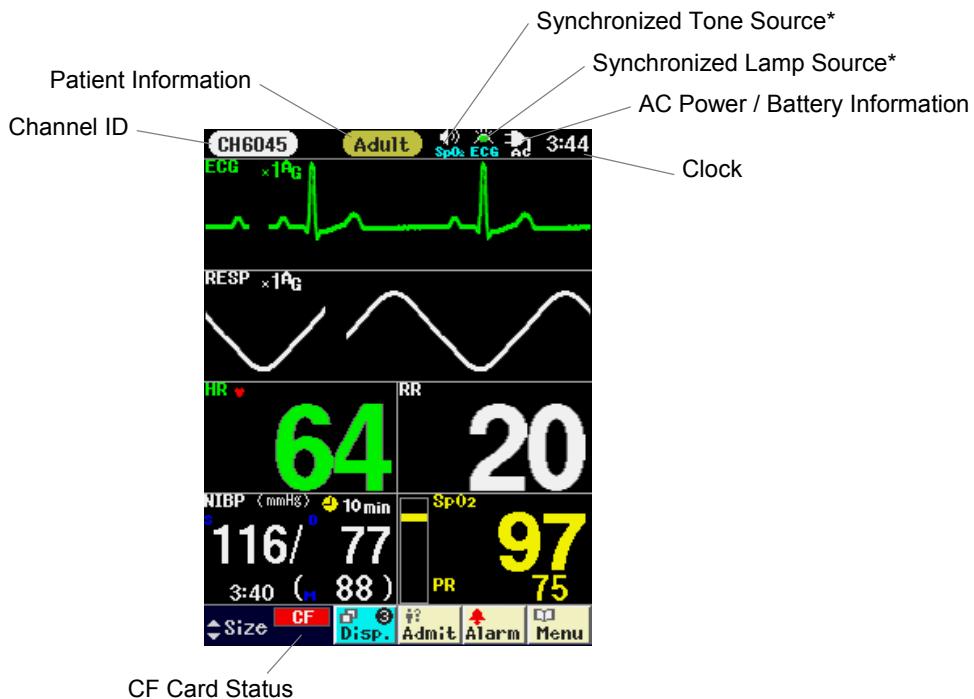
"3. Vital Application
■ To Measure the
NIBP
● NIBP Automatic
Measurement"

NIBP Interval Time

If the NIBP periodic measurement is set, a clock mark and interval time will be displayed. If the 1-minute interval measurement (1 min. Start) is started, the clock mark will flash. For the measurement duration of 10 minutes and 20 minutes, (10) and (20) will be displayed respectively.

NOTE	<p>If ALL is selected for numeric data display in the display configuration setup menu, the clock mark will not be displayed.</p>  <p>The display shows ECG, RESP, NIBP, SpO2, and PR data. The NIBP section displays a large green '64' and a yellow '20' above it, indicating a 20-second measurement interval. The SpO2 section shows '97'. The PR section shows '75'. The bottom menu bar includes 'CF', 'Disp.', 'Admit', 'Alarm', and 'Menu' buttons.</p>
------	---

Monitoring Information



→P7-12

"7. Monitoring Setup
■ Telemetry Setup"

Channel ID

Displays the channel ID for this equipment.

If telemetry transmission is not performed, **[CH OFF]** will be displayed.

Patient Information

 mark (if pacemaker is used) and patient type information (Adult / Child / Neo) will be displayed.

→P7-7

"7. Monitoring Setup
■Tone / Volume"

Synchronized Tone Source*

Displays the currently selected synchronized tone source.

This will be displayed only when ECG or SpO₂ is selected for tone source.
If OFF is selected, nothing will be displayed.

→P7-10

"7. Monitoring Setup
■Lamp"

Synchronized Lamp Source*

Displays the currently selected synchronized lamp source.

This will be displayed only when ECG or SpO₂ is selected for lamp source.
If OFF is selected, nothing will be displayed.

NOTE

* When monitoring ventilator information, synchronized tone source and lamp source information will be not displayed.
Ventilator message will be displayed instead.

AC Power / Battery Information

When the equipment is operated with the AC power,  mark will be displayed.

When the equipment is operated with the battery, the battery mark will be displayed.

Clock

Displays the current time.



CAUTION

Before monitoring, make sure that the correct time and date is set. If incorrect, set the current date / time on the clock setup menu on the system configuration menu.

CF Card Status

If the CF card is inserted to the card slot, the CF card status will be displayed.

Alarm Message for Numeric Data / Ventilator

→P5-3
"5. Alarm Function
■Description of
Alarm Message and
Alarm Sound"



Ventilator Message

By connecting the ventilator to this monitor, ventilator information is input and ventilator message such as communication status and alarm can be displayed on the screen for monitoring

Alarm Message

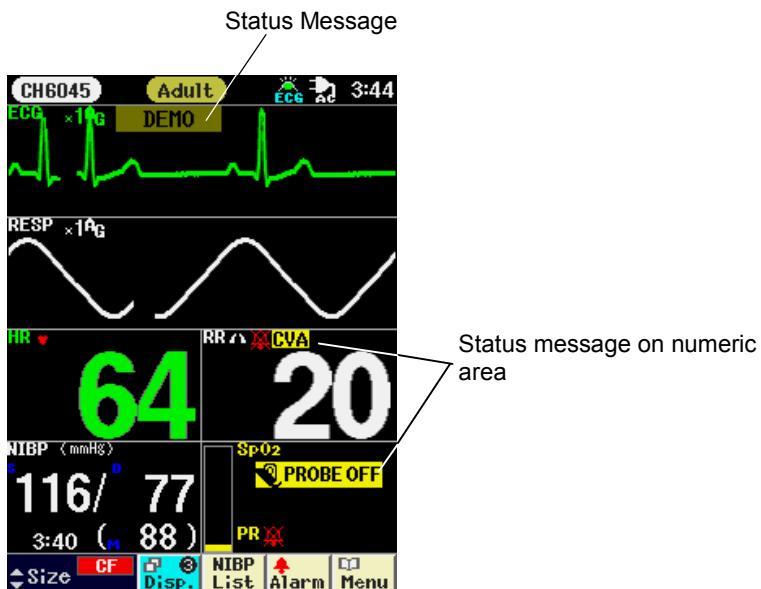
Displays the alarm message for the monitoring parameter. If more than one parameter generate alarms, the alarm message of higher priority will be displayed.

NOTE	When setup menu is displayed, alarm message will not be displayed.
------	--

Equipment Status Alarm Message

→P5-4
"5. Alarm Function
■Description of
Alarm Message and
Alarm Sound
●Equipment Status
Alarm Message"

The equipment status alarm message will be displayed when proper monitoring can not be performed. Some messages will be displayed at the numeric data display area.

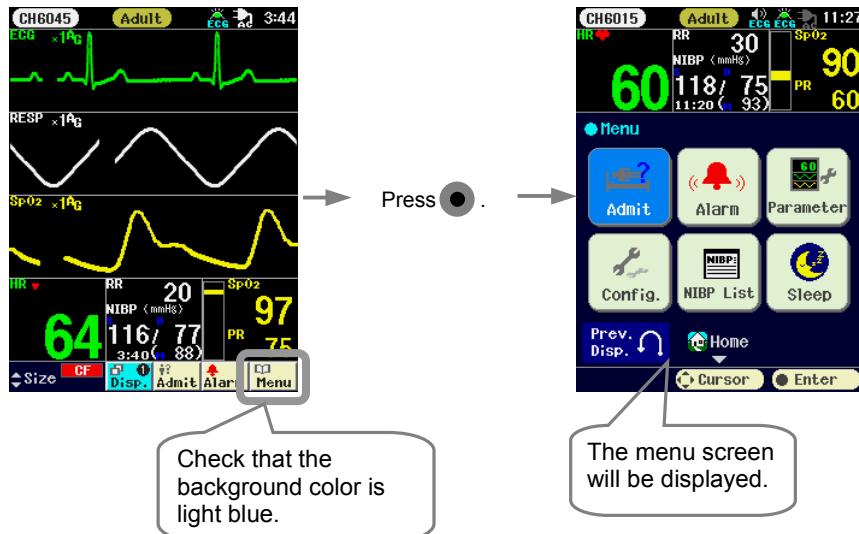


Setup Procedure

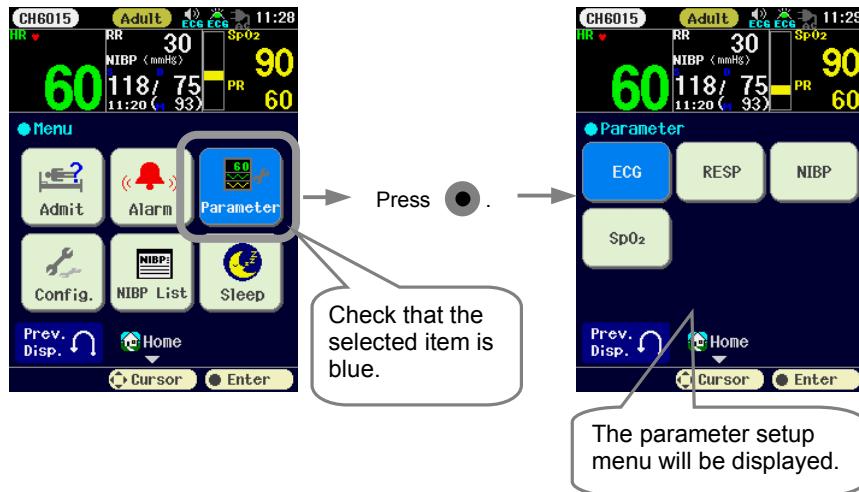
To set each monitoring condition, you must first display the menu screen. From the menu screen, patient admit setup, alarm setup, monitor setup, parameter setup, NIBP list display, alarm list display, sleep display can be performed.

To Display the Menu Screen

- Using the keys, select so that the background color becomes light blue and press .



- Use the keys to select the item. The background color of the selected item will turn to blue. Press to display the screen for the selected item.

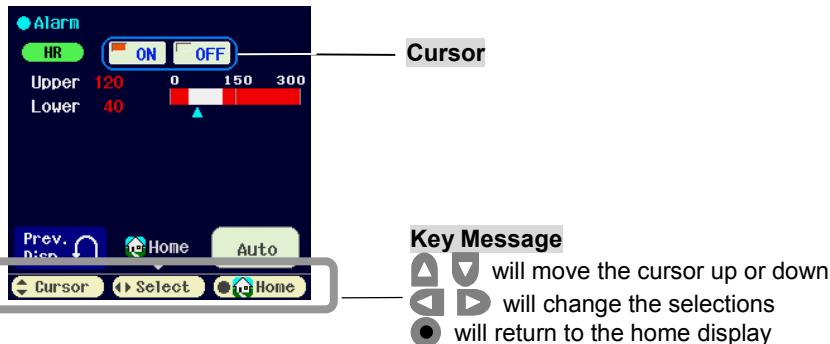


Operation Procedure on the Setup Screen

At the lower part of the display, key messages will be displayed which shows the assigned functions for the keys.

Follow these key messages when changing the setup condition on each setup screen.

For example, the following will be displayed for the HR alarm setup menu.



To select ON/OFF of HR alarm



- ① Move the cursor to "ON/OFF" using the keys.



- ② Select ON or OFF using the keys.

To set the upper limit



- ① Move the cursor to "Upper" using the keys.



- ② Set the upper limit using the keys.

To Return the Display

In this section, the procedure to return the display to the home display and to the previous display will be explained.

To Return to the Home Display

On each menu,  key will be displayed at the lower center of the display.
Pressing the  key according to this key message will return the display to the home display.



Some screen may display both  and  keys.

In this case, either pressing the  key or  key will return the display to the home display.



To Return to the Previous Display

On each menu,  key will be displayed at the lower left of the display.
Use the , ,  keys to move the cursor to  key. The background color of the key will turn to blue which indicates that this key is active.
Pressing the  key with the  key active will return the display to one previous display.



To Start Monitoring

NOTE	The setup of date/time, AC filter frequency, time constant, etc. must be performed before monitoring. Especially, if date/time is changed during monitoring, the NIBP data error may be caused. Make sure to set the date/time before monitoring. → “6. Parameter Setup”, “7. Monitoring Setup”
-------------	--

To Admit a Patient

Enter the patient information on the patient admit / discharge menu.

1 Select  (press ●) →  (press ●).

The admit menu will be displayed.



Recording ID

When **CF** is selected for “Rec. Mode” on the soft switch menu, the recording ID will be displayed.

The recording ID is numbered to identify the BMP file for the patient and will be indicated on the BMP file name.

File Name: **ΔΔMxxxxx.bmp**

Patient Recording ID Record Type Sequential No.
(00~99) (M: Manual) (00001~)

→P4-16
“4. Recording Function
■To See the CF
Card Data on the PC
●The Recorded File Name”

The recording ID will increase by 1 in the range of 00~99 as the discharge process is performed.

2 Select the patient type.



Select from **Adult** / **Child** / **Neo**.

Make sure to make the correct selection according to the monitoring patient.

CAUTION	The respiration filter setup, NIBP measurement range, etc. will depend upon the selected patient type. Be sure to set the correct patient type.
----------------	---

	Adult	Child	Neonate
NIBP measurement range	10~280mmHg	10~180mmHg	10~120mmHg
Impedance Respiration Waveform (Respiration Filter)		1.5Hz	2.5Hz
Alarm Delay	5 sec.		0 sec.

3 Select whether the patient is using the pacemaker or not.



Select from **No** / **Yes**.

Make sure to make the correct selection according to the monitoring patient.

 WARNING	<ul style="list-style-type: none"> ● The selection of patient type and pacemaker use influences the precision of the QRS detection. Make sure the correct selection is made. ● When monitoring a patient using a pacemaker, be sure to select Yes for "Pacemaker". The pacemaker pulse will be distinguished with the QRS wave for correct QRS detection. If No is selected, pacemaker pulse may be erroneously detected as QRS wave, and pacing failure may be overlooked.
---	---

4 If **Yes** is selected for "Pacemaker", select ON / OFF / Color for "Pace. Pulse".



ON will display the artificial pacemaker pulse in a same color with the ECG waveform.

OFF will not display the artificial pacemaker pulse.

Color will display the artificial pacemaker pulse in a different color with the ECG waveform.

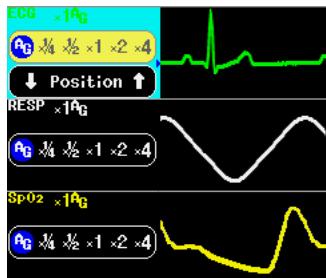
Gain / Position Setup

The gain of ECG, RESP, SpO₂ waveform and baseline position of ECG waveform can be adjusted.

1 Press **▲** or **▼** while displaying the home display.

The cursor to adjust the gain and position will be displayed on the waveform.

2 Select gain or position using **▲** **▼** keys.



The background color of the adjustable gain or position will be displayed in yellow. Also, the background color of the waveform and numeric data will be displayed in light blue.

Pressing the **▲** **▼** keys will move the yellow background color up and down.

Press the **▲** **▼** keys until the background color of the desired gain/position selection turns to yellow.

Reference

Pressing **●** while adjusting the gain / position will display the parameter setup menu or return to the home display depending on where the light blue background is displayed.

① When the waveform area is light blue.

→ Returns to the home display.

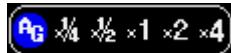
② When the numeric data area is light blue.

→ The parameter setup menu for that parameter (HR/RR/SpO₂/NIBP) will be displayed.

③ When the all numeric data area (the area which **ALL** is selected for the display configuration) is light blue.

→ The parameter setup selection will be displayed.

3 Adjust the gain / position.



Gain :

Select one from **AG** (Auto Gain) / **x1/4** / **x1/2** / **x1** / **x2** / **x4**.

AG will automatically adjust to the gain appropriate to the waveform amplitude.

◀ will decrease, and **▶** will increase the gain.



Position :

Use the **◀** **▶** keys to adjust the baseline position of the ECG waveform.

◀ will lower the position, **▶** will raise the position.

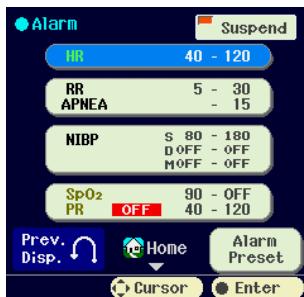
Alarm Setup for Each Parameter

The alarm can be set for each parameter.

In this section, alarm setup procedure for HR will be used as an example.

- Select  , and press .

The alarm setup menu will be displayed.



- Select   , and press .

The HR alarm setup menu will be displayed.

Select ON/OFF of HR alarm, and set the upper and lower alarm limits.



HR:  will generate the HR alarm.
 will not generate the HR alarm.

Upper: Move the cursor using the   keys and select “Upper”.

Use the   keys to set the upper limit.
(21~300bpm)

Selecting 300bpm or above will set the upper limit OFF.

Lower: Set the lower limit (20~295bpm) using the same procedure with the upper limit setup.

Selecting 20bpm or below will set the lower limit OFF.

The upper and lower limits can be set in 5bpm increments for the value 60bpm or above, and in 1bpm increments for the value below 60bpm.

→P5-11

“5. Alarm Function
■ Individual
Parameter Alarm”

ON/OFF of Parameter Display

The waveform and measurement display can be turned ON or OFF.

By turning OFF the display using this function, the measurement can be turned OFF without changing the setup items.

If ECG measurement is not performed when the ECG relay cable is connected to the monitor, HR alarm and lead off alarm will be generated.

Also, if SpO₂ measurement is not performed when the SpO₂ sensor is connected to the monitor, SpO₂/PR alarm and probe off alarm will be generated.

In case when monitoring only SpO₂ or only ECG, the alarm generation can be prevented without changing the alarm setup.



OFF message will be displayed in the numeric data display area.



The display OFF function will inactivate the alarm generation and lamp function.

However, if the electrode or SpO₂ sensor is properly attached to the patient (when not in lead-off or probe-off condition), the turned OFF display will automatically turn ON after 30 seconds.

1 The procedure for ECG display ON/OFF is explained below.

Select (press) → (press) → (press) .

The ECG parameter setup menu will be displayed.



The red mark on the key indicates that the display is OFF, and the green mark indicates that the display is ON.

- 2 Check that the mark is green, and select  (press 

The display OFF confirmation message will be displayed.



Select  to turn OFF the display.

Select  if not turning OFF the display.

- 3 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 30 seconds.
- 4 When SpO₂ sensor is attached to the patient with the SpO₂ display set to OFF, the SpO₂ waveform and numeric data will be automatically displayed after 30 seconds.

Recording the Waveform

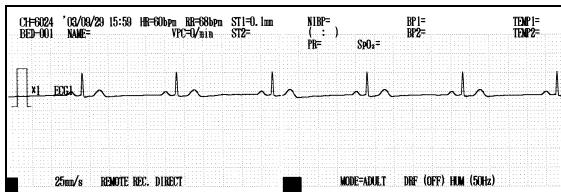
→
"4. Recording Function"

By pressing the  key, recording on the central monitor recorder or compact flash card (CF card), or recording on both can be performed.

Waveform Recording on the Central Monitor Recorder

Pressing the  key will record the waveform on the central monitor recorder.

【The Recording Example on the DS-4600 Central Monitor】



NOTE

If **CF Tele.** is selected for the "Rec. Mode" on the soft switch menu, pressing the  key on the NIBP list display or alarm list display will start the list recording. The waveform will not be recorded on the central monitor.

Waveform Recording on the CF Card

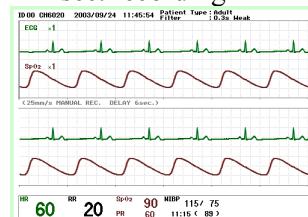
Pressing the  key will record the waveform on the CF card in bitmap format. The data will be saved in a bitmap format which allows the data to be read on the personal computer and displayed on the personal computer display, or output on the printer.

【Recording Example】

<24 sec. recording>



<12 sec. recording>



NOTE

The parameter displayed in yellow will be printed in brown.

Recording the List

The alarm list and NIBP list can be recorded on the CF card.

Alarm List Recording on the CF Card

→
"4. Recording Function"

Pressing the  key on the alarm list display will record 40 alarm data in list format.

【Example of Alarm List Recording】

ID	01	CH3001	2004/06/14	12:36:57	Patient	Type : Adult	Page	106/125
Date	Time	Alarm		Rec	Date	Time	Alarm	Rec
6/13	13:51	HR		FULL	6/13	13:23	HR	655
6/13	13:50	PR		FULL	6/13	13:21	HR	654
6/13	13:50	NIBP		FULL	6/13	13:20	PR	Used
6/13	13:49	HR		FULL	6/13	13:20	NIBP	653
6/13	13:47	HR	PR	FULL	6/13	13:19	HR	652
6/13	13:45	HR		FULL	6/13	13:17	HR	651
6/13	13:43	HR		667	6/13	13:15	HR	650
6/13	13:41	HR		666	6/13	13:13	HR	649
6/13	13:40	PR		Used	6/13	13:11	HR	648
6/13	13:40	NIBP		665	6/13	13:10	PR	Used
6/13	13:39	HR		664	6/13	13:10	NIBP	647
6/13	13:37	HR		663	6/13	13:09	HR	646
6/13	13:35	HR		662	6/13	13:07	HR	645
6/13	13:33	HR		661	6/13	13:05	HR	644
6/13	13:31	HR		660	6/13	13:03	HR	643
6/13	13:30	PR		Used	6/13	13:01	HR	642
6/13	13:30	NIBP		659	6/13	13:00	PR	Used
6/13	13:29	HR		658	6/13	13:00	NIBP	641
6/13	13:27	HR		657	6/13	12:59	HR	640
6/13	13:25	HR		656	6/13	12:57	HR	639

NIBP List Recording on the CF Card

→
"4. Recording Function"

Pressing the  key on the NIBP list display will record 40 NIBP data in list format.

【Example of NIBP List Recording】

ID	01	CH3001	2004/06/14	12:46:00	Patient	Type : Adult	Page	1/15	
Date	Time	NIBP	HR	SpO2	Date	Time	NIBP	HR	SpO2
6/14	9:50	113/ 76 (90)	0	0	6/14	6:30	113/ 76 (90)	120	95
6/14	9:40	113/ 76 (90)	60	95	6/14	6:20	113/ 76 (90)	120	95
6/14	9:30	113/ 76 (90)	0	0	6/14	6:10	113/ 76 (90)	120	95
6/14	9:20	113/ 76 (90)	60	0	6/14	6:00	113/ 76 (90)	120	95
6/14	9:10	113/ 76 (90)	0	0	6/14	5:50	113/ 76 (90)	120	95
6/14	9:00	113/ 78 (90)	60	0	6/14	5:40	113/ 76 (90)	120	95
6/14	8:50	113/ 76 (90)	0	95	6/14	5:30	113/ 76 (90)	120	95
6/14	8:40	113/ 76 (90)	60	95	6/14	5:20	113/ 76 (90)	120	95
6/14	8:30	113/ 76 (90)	0	95	6/14	5:10	113/ 76 (90)	120	95
6/14	8:20	113/ 78 (90)	60	95	6/14	5:00	113/ 76 (90)	120	95
6/14	8:10	113/ 76 (90)	0	95	6/14	4:50	113/ 76 (90)	120	95
6/14	8:00	113/ 76 (90)	60	95	6/14	4:40	113/ 76 (90)	120	95
6/14	7:50	113/ 76 (90)	0	95	6/14	4:30	113/ 76 (90)	120	95
6/14	7:40	113/ 76 (90)	60	95	6/14	4:20	113/ 76 (90)	120	95
6/14	7:30	113/ 76 (90)	0	95	6/14	4:10	113/ 77 (91)	120	95
6/14	7:20	113/ 76 (90)	60	95	6/14	4:00	114/ 76 (90)	120	95
6/14	7:10	113/ 76 (90)	0	95	6/14	3:50	113/ 76 (90)	120	95
6/14	7:00	113/ 76 (90)	84	95					
6/14	6:50	113/ 76 (90)	12	95					
6/14	6:40	113/ 76 (90)	120	95					

When the Patient is Asleep

Sleep Mode

The DS-7001 is provided with a sleep display function.

During the sleep mode, waveform and numeric data will not be displayed on the screen.

This function can be used when the patient is asleep, etc.

The monitoring operation will not be affected by the sleep function. The data measurements for all monitored parameters will continue during the sleep mode. If the telemetry transmission to the central monitor is performed, the display and alarm generation on the central monitor will continue to function even when the DS-7001 is in sleep mode.

NOTE

- If the ventilator communication status becomes **Failure** during the sleep mode, the sleep mode will be cancelled and the ventilator display will appear.
- The low battery alarm will be generated even during the sleep mode.

1. Select (press (press

The screen will turn to sleep mode.

To cancel the sleep mode, press the     



CAUTION

When using the sleep function on the DS-7001, perform monitoring on the central monitor. During the sleep mode, tone and lamp will not function, and all alarm sound will not be generated on the DS-7001.

Discharging Procedure

When you have completed monitoring the patient, perform the discharge procedure and initialize the setup value such as alarm limits. The NIBP list and alarm list data will be also initialized.



If you start monitoring a new patient without performing a discharge procedure for the previous patient, new data will be added to the previous data which will result in inaccuracy. Before monitoring, make sure the current patient information is suitable for the patient's condition.

→P5-18
5. Alarm Function
■Backup of Alarm Setup"

If **Backup** is selected for "Discharge Alarm" in the alarm backup menu, alarm limits will not be initialized at discharge. Monitoring with the same alarm setup will be possible even after the discharge procedure.

[The Data which will be Initialized]

- | | |
|---------------|--|
| Alarm Setup | : Depends on the "Discharge"setup of the alarm backup menu. |
| Value | Backup will back up the alarm value.
Clear will initialize the alarm value. |
| NIBP periodic | |
| Measurement | : It will be set OFF. |
| NIBP List | : The data will be cleared. |
| Alarm List | : The data will be cleared. |

1. Select (press ●) → (press ●) → (press ●).

The discharge confirmation will be displayed.



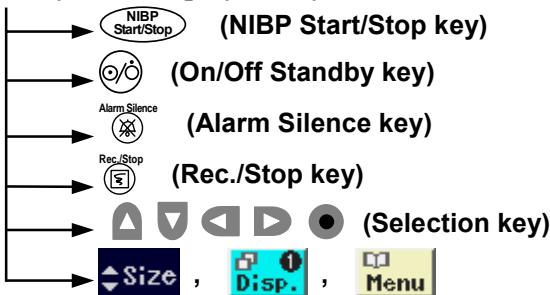
2. If OK to discharge, select **OK**.

The patient information and setup items will be initialized.
To cancel the discharge procedure, select **Cancel**.

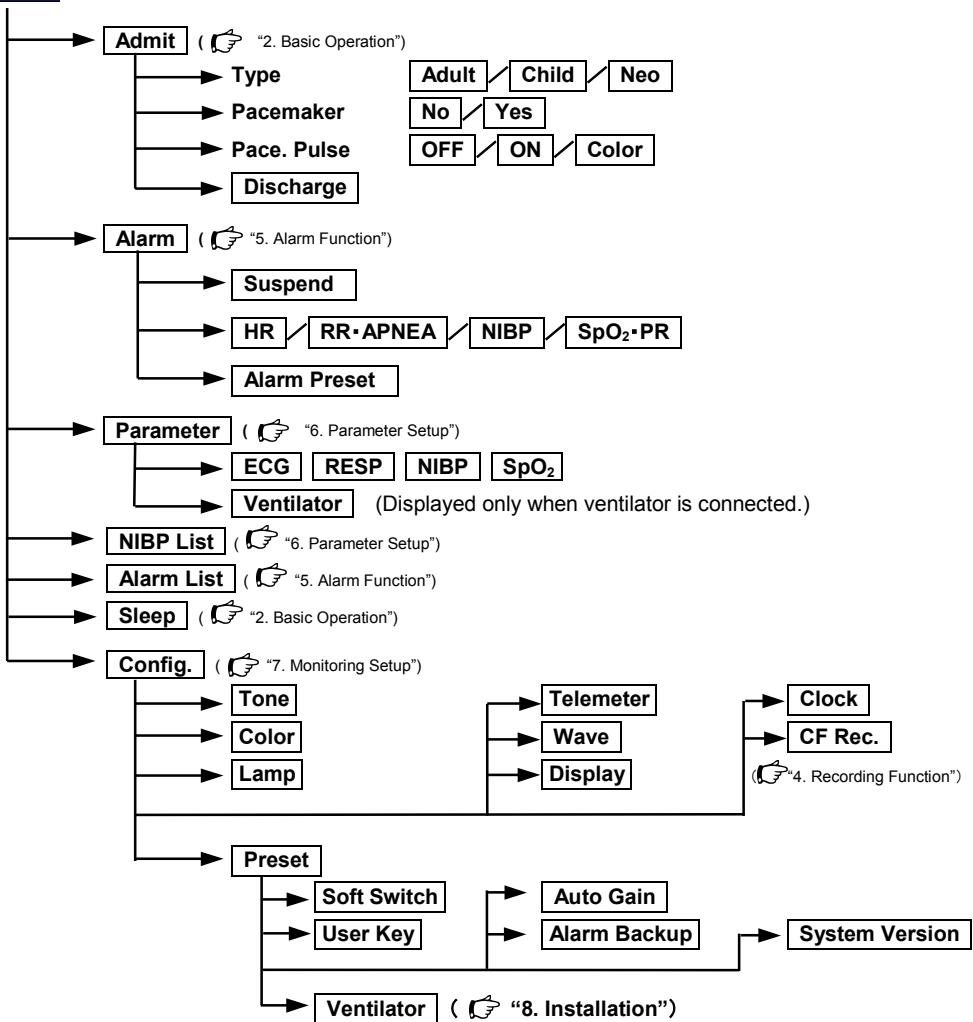
When the waveform data is recorded on the CF card, the recording ID will increase by 1 in the range of 00~99 each time the discharge procedure is performed.

Operation Flow

Fixed Keys and Displayed Keys



Menu (Menu Function)



Chapter 3

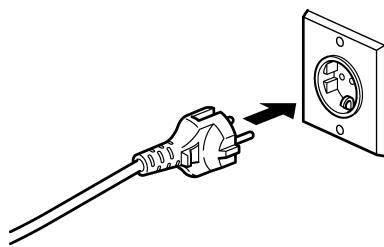
Vital Application

This chapter describes the procedure for vital application, etc.

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Before Attaching the Electrodes	3-3
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Before Turning ON the Power

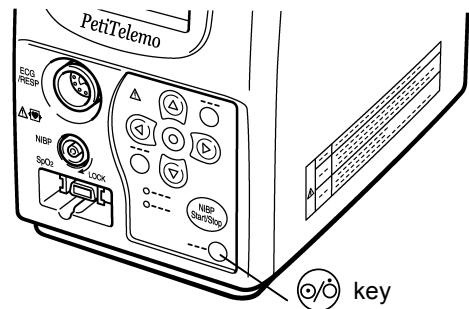
1. Check the grounding.



Properly ground using the 3-way AC plug.

The grounding is required to prevent AC noise.

2. Turn ON the power.



Turn ON the power and check for appropriate display.

To Acquire ECG Waveform

Lead Cable Types

→P11-4
"11. Accessories
■Optional
Accessories
●ECG, Impedance
Respiration"

Refer to the following table for the types of lead cable that can be used with the DS-7001.

<i>Lead Cable</i>	<i>Relay Cable</i>	<i>No. of Electrodes</i>	<i>No. of Leads</i>	<i>ECG Lead</i>
#3382.0654.11 (for electrosurgery)	CI-164	3	1	Only lead II
#3380.0654.04	CI-162			
CM-61	CI-161			



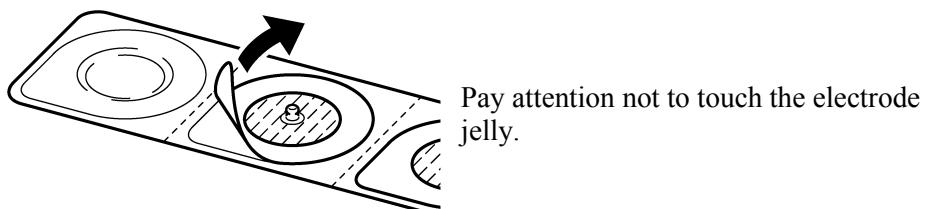
For stable monitoring, use the specified lead cables and electrodes. Use of other cables or electrodes may prevent proper monitoring during defibrillation or electrosurgery, and may cause a drift in the waveform baseline.

Before Attaching the Electrodes

- 1 Clean the electrode sites with an alcohol swab or other skin preparation. If necessary, shave the electrode sites to remove excessive hair.



- 2 Peel off the backing of disposable electrode.



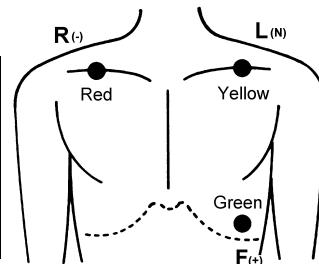
Electrode Placement

The lead type for the DS-7001 is fixed as lead II, and cannot be changed.

Attach the electrodes on the locations shown below.

For 3-electrode lead (1 waveform monitoring)

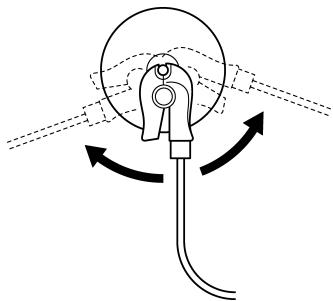
Symbol	Color	Electrode Site
R(-)	Red	On the right infraclavicular
L(N)	Yellow	On the left infraclavicular
F(+)	Green	On the left midclavicular line, near the suprasternal line.



- Follow the instruction of the physician for electrode attachment position.
- The electrode colors should be corresponded to the colors of the accompanying lead cables.
- 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 at the same location for a long time, some patients may develop a skin irritation. Check the patient's skin condition periodically and change the electrode site as required.

Connection to the Patient Monitor

1 Connect the lead cable (for 3-electrode) to the electrode.

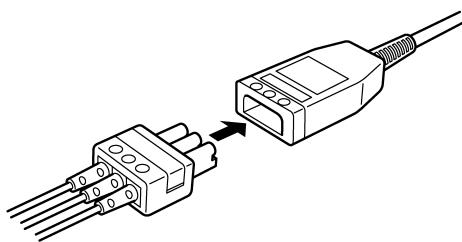


For hook type electrodes, firmly clip the hook at the ECG lead cable end.

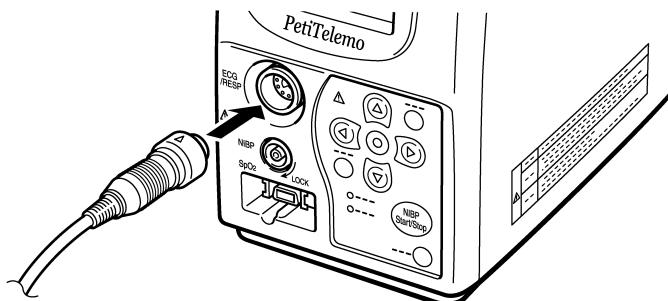
For magnet type electrode, attach the concave part of lead cable end and convex part of electrode until a click sound is heard. Check that it is securely connected by turning the lead cable end left and right.

For patients with excessive body motion, secure the electrode and lead cable using tapes.

2 Connect the other end of the ECG lead cable to the ECG relay cable.



3 Connect the other end of the ECG relay cable to ECG input connector.

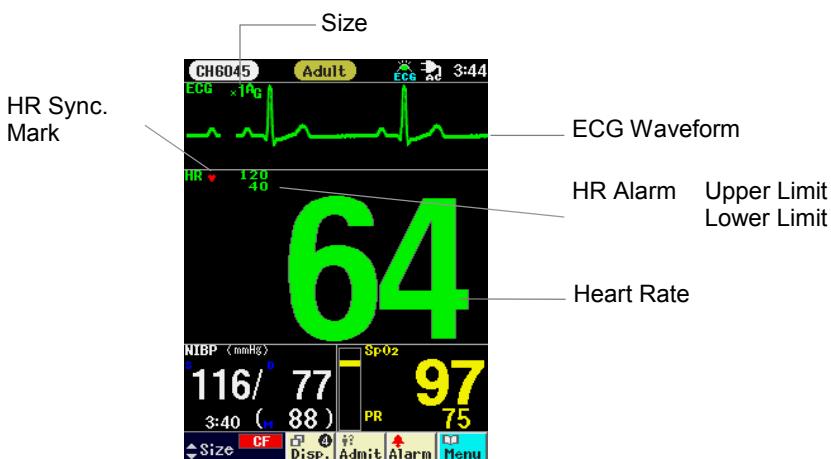


4 Verify that the ECG waveform is displayed on the monitor.

The displayed heart rate is an averaged value over 6 seconds of R-R interval. (3 seconds for neonates)

Adjust the waveform size and position as necessary.

→P6-2
“6. Parameter Setup
■Gain / Position
Adjustment”



CAUTION

Precautions for Monitoring

- For stable monitoring, use the specified lead cables and electrodes. Use of other cables or electrodes may prevent proper monitoring during defibrillation or electrosurgery, and may cause a drift in the waveform baseline.
- When using a defibrillator during ECG monitoring, a polarizing potential may interrupt monitoring for a few seconds.
- To display the pacemaker pulse on the monitor, select Yes for "Pacemaker", and ON or Color for "Pace. Pulse" on the admit menu.
- Depending on the transmission condition, a noise may interfere resulting in false detection of the pacemaker pulse.

Setup for ECG Monitoring

The following setup can be performed for the ECG monitoring.

→P6-5
"6. Parameter Setup
■ ECG"



- Tone Source
- Lamp Source
- Noise Filter
- Time Constant

Tone Source

A tone synchronized to the heartbeat or pulse can be generated. (Default: OFF)

Lamp Source

The lamp on the handle can be set to flash synchronized to the heartbeat or pulse. (Default: ECG)

Noise Filter

A noise interfered to the ECG waveform can be removed. (Default: Weak)

Time Constant

0.1s will allow relatively stable ECG monitoring.

The waveform will stabilize at the baseline and the large waveform such as R wave will be emphasized.

0.3s will allow monitoring emphasized on the small waveform such as P wave and ST wave. (Default: 0.3s)

→P7-14
"7. Monitoring Setup
■ Preset Menu
● Wide AC Filter"

Reference

A noise interference on the ECG waveform such as electrosurgical equipment, electric blanket, etc. can be considered. Select the noise filter according to the environment.

Also, when AC noise interferes, set the "Wide AC Filter" of the soft switch menu to "wide" or "adapt wide".

Respiration (Impedance Measurement)

1 Verify that the ECG waveform is properly acquired.



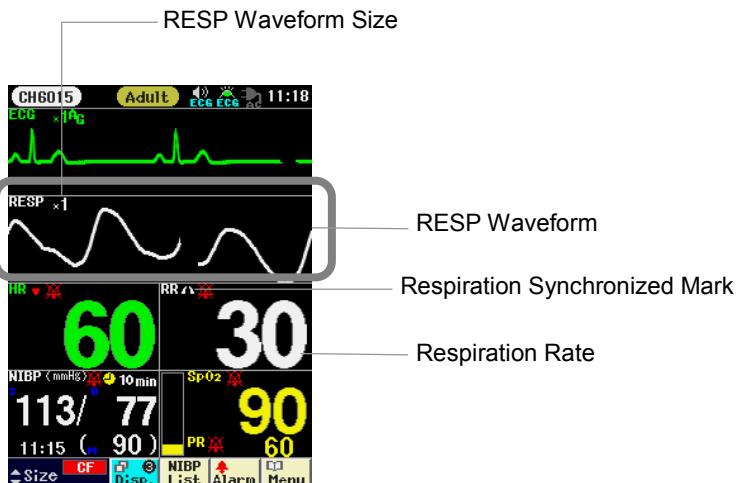
The respiration waveform is detected from the ECG electrodes (between the R-electrode (red) and the F-electrode (green)). Therefore, if a stable ECG waveform is acquired, a respiration waveform can be also acquired. However, there are cases when stable respiration can not be acquired due to artifact interference such as body motion, heartbeat, etc. In such case, change the electrode position.

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

Respiration rate is an averaged value of intervals of 15 seconds.
Adjust the waveform size and sweep speed.

→For gain and position setup, see P6-12
"6. Parameter Setup
■ Respiration"

→For waveform sweep speed setup, see P7-5
"7. Monitoring Setup
■ Waveform Setup"



- The electrode position appropriate for ECG monitoring may not be always appropriate for respiration monitoring.
- When using the #3382.0654.11 lead cable (for electrosurgical instrument, 3-electrodes) and CI-164 relay cable (for electrosurgical instrument, 3-electrodes), the respiration measurement can not be performed.
- When using a defibrillator during respiration monitoring, a polarizing potential may interrupt monitoring for a few seconds.

Setup for Respiration Monitoring

The following setup can be performed for the respiration monitoring.

→
For procedure to
change the setup,
see P6-12
“6. Parameter Setup
■Respiration”



- Respiration Synchronized Indicator
- CVA Detection ON/OFF
- Impedance Respiration Measurement ON/OFF

Respiration Synchronized Indicator

The respiration synchronized mark “” can be set to display in the respiration parameter key. (Default: OFF)

CVA Detection

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. 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 the CVA detection function set to ON (Default: OFF), the “CVA detected” message will be displayed, and an alarm sound (single tone) will be generated.

Impedance Respiration Measurement

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 a 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.

If the patient is using an adaptive (minute ventilation) pacemaker, set the impedance respiration measurement OFF. (Default: ON)

To Measure the SpO₂

Sensor Types

There are 2 types of sensor. Appropriate sensor should be selected for each patient considering the patient's weight, extent of body motion, sensor attachment site, perfusion condition, and sensor using time.

To connect the DS-7001 and the sensor, the DOC-10 SpO₂ relay cable is necessary.

Probe Type (Reusable Type, for adult finger)



DS-100A

For adult with weight of 40kg and over.

This is for temporary use. When continuously using for long period of time, use the following single-use type.

Single Use Type (Disposable Type)



OXISENSOR III N-25 (for neonate toe)

For neonate with weight of 3kg and over.



OXISENSOR III I-20 (for pediatric toe)

For pediatric with weight of 3kg~20kg



OXISENSOR III D-20 (for pediatric finger)

For pediatric or adult with weight of 10kg~50kg



OXISENSOR III D-25 (for adult finger)

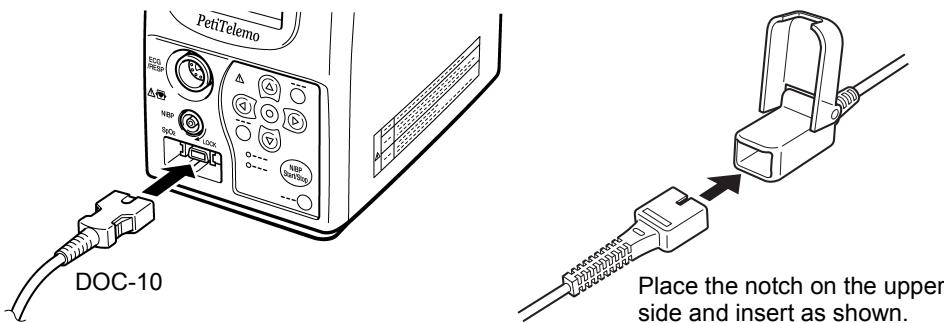
For adult with weight of 30kg and over.

CAUTION

To ensure correct measurement and safe operation, Nellcor® sensor must be used.
Use of unspecified sensor may not only cause inaccurate measurement but also burn injury to the patient.

Sensor Attachment

- 1 Plug in the DOC-10 SpO₂ Relay Cable to the SpO₂ input connector of the DS-7001. Then connect the sensor to the DOC-10.

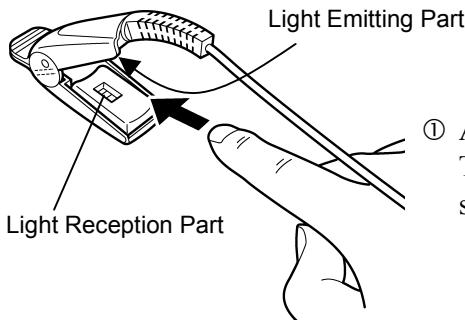


- 2 Attach the sensor to the patient.

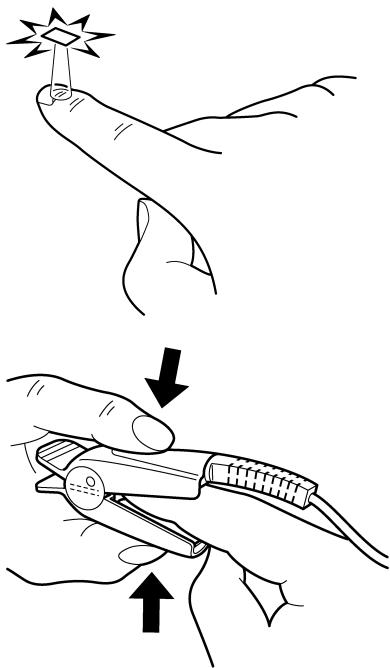
CAUTION

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 and sensor.

【Probe Type Sensor】



- ① Attach the sensor as shown on left.
The sensor cable should be on the nail side.



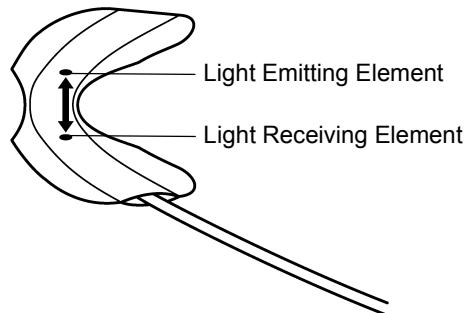
- ② Adjust the sensor so that the light-emitting part (on cable side) touches the root of the nail, and close the probe.

- ③ Press the probe lightly so that the finger and the rubber cover are appressed. 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 Fixate the cable with surgical tape so that the sensor does not come off when a cable is pulled.



Attachment to the toe



Attachment to the finger

3 Verify that the SpO₂ is displayed.

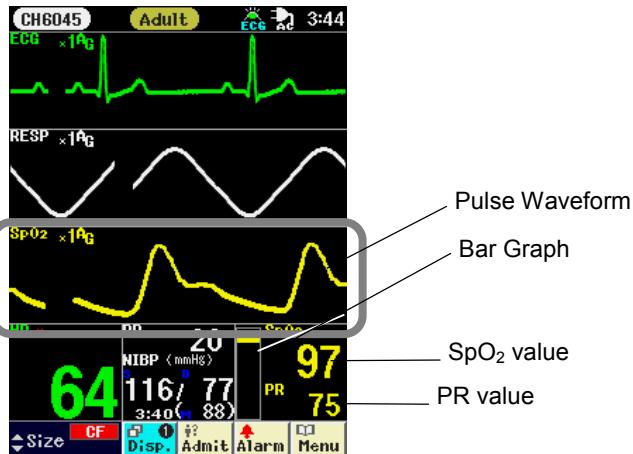
Adjust the waveform size and sweep speed.

→P6-2

"6. Parameter Setup
■Gain / Position
Adjustment"

→P7-5

"7. Monitoring Setup
■Waveform Setup"



WARNING

- When measuring the SpO₂ of patient with high fever or peripheral circulatory insufficiency, check the sensor attachment periodically and change the attachment site. The temperature of attachment site will rise 2~3°C due to the sensor heat which may result in burn injury.
- For the following case, accurate measurement may not be possible.
 - Patient with excessive abnormal hemoglobin (HbCO, MetHb)
 - Patient with the pigment injected to the blood
 - Patient receiving CPR treatment
 - When a sensor is applied to a limb with NIBP cuff, arterial catheter, or intracatheter
 - When measuring at site with venous pulse
 - Patient with body motion
 - Patient with small pulse


CAUTION

- If irritation such as skin reddening or skin fit appears with the sensor use, change the attachment site or stop using the sensor.
- When fixating the sensor with a tape, do not apply the tape too strong. 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.
- Change the sensor attachment site constantly (every 4 hours). As the temperature of sensor attachment site normally rises 2 ~ 3°C, compression necrosis and burn injury may generate.
- As the skin of 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 a measurement error. Place a black or dark cloth over the sensor.
- When not performing the measurement, unplug the relay cable and sensor from the SpO₂ connector. Otherwise, the measurement data may be erroneously displayed by the ambient light.

SpO₂ Monitoring Setup

The following setups can be performed for the SpO₂ monitoring.

→
For procedure to
change the setup,
see P6-23
“6. Parameter Setup
■Arterial Oxygen
Saturation”



- Bar Graph
- Ignore NIBP (ON/OFF)

Bar Graph Display

Selecting **ON** will display the pulse waveform in bar graph in the SpO₂ numeric data display area.

Selecting **OFF** will not display the bar graph. (Default: ON)

SpO₂ Alarm during NIBP Measurement (Ignore NIBP)

This function is used when the SpO₂ sensor and NIBP cuff is placed on the same limb for measurement.

During the NIBP measurement, the cuff inflation restricts the blood flow which disables the correct detection of the SpO₂ value and PR, and may generate improper alarm.

Setting **OFF** for “Ignore NIBP” will not generate the SpO₂/PR alarm and SpO₂ sensor check alarm until the NIBP measurement is complete. (Default: OFF)

→P6-5
“6. Parameter Setup
■ECG”

On the ECG configuration menu, the following setup can be also made.

- Tone Source
- Lamp Source

Tone Source

A tone synchronized to the heartbeat or pulse can be generated. (Default: OFF)

Lamp Source

The lamp on the handle can be set to flash synchronized to the heartbeat or pulse. (Default: ECG)

To Measure the NIBP

Cuff Types

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.



Infant Cuff

CUF-7105

Width 8.5cm



Pediatric Cuff

CUF-7104

Width 10.5cm



Adult Cuff (small)

CUF-7103

Width 11cm



Adult Cuff (medium)

CUF-7102A

Width 14.5cm



Adult Cuff (large)

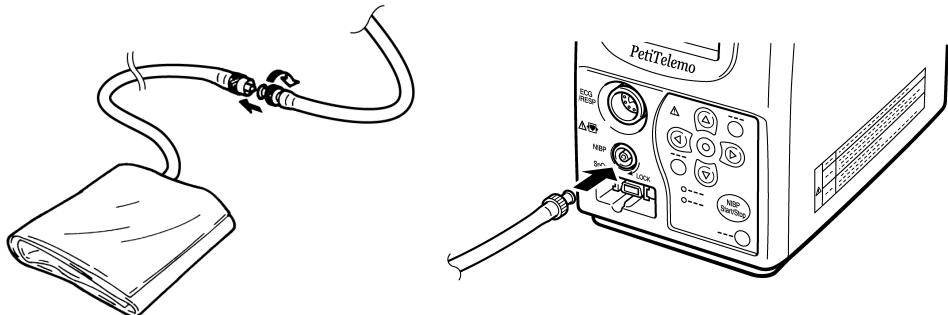
CUF-7101

Width 17cm

Cuff and Air Hose Connection

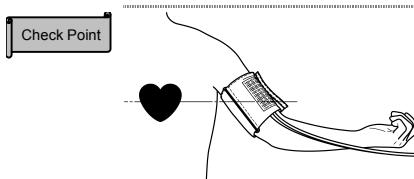
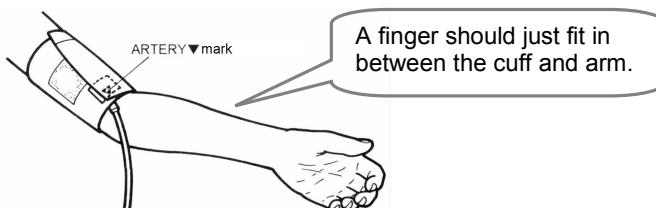
- 1 Connect the cuff to the air hose, and then connect the air hose to the cuff connection connector on the monitor.**

Turn the metal end to the right and firmly connect so that air leakage will not occur.



- 2 Apply cuff to the patient.**

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



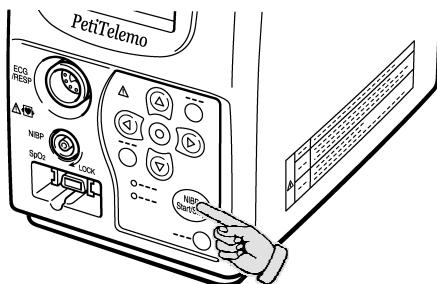
Align the cuff height and heart position to eliminate an error caused by the blood weight. It is most appropriate to measure with the patient lying down and arms naturally extended.

CAUTION

- Do not apply cuff to the arm or leg with vein cannulation. The blood may backflow and cease the drug injection.
- The cuff should be basically applied to a bare arm. Align the cuff height to heart position. If the cuff is pressurized over the clothing, a measurement error may be caused.
- Have the patient stay still during the measurement. Body motion such as moving the arm, laying stress on the arm, or talking may cause measurement error. Vibration and strong impact to the equipment should be also avoided.
- After applying the cuff to the patient, always check that the air hose is not bent or compressed. Otherwise, cuff pressure detection or depressurizing control can not be performed which disables the measurement.

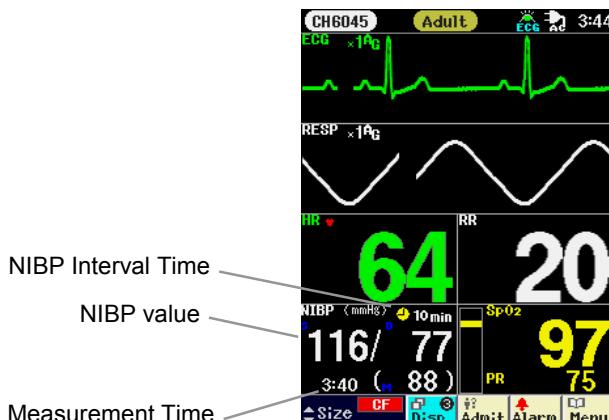
NIBP Manual Measurement

- 1 Pressing the  key will start inflating the cuff pressure and starts the measurement.

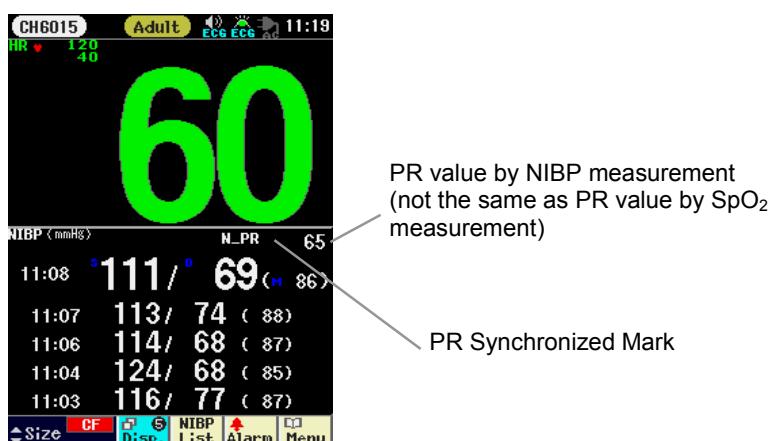


- 2 Upon completion, the measured value will be displayed inside the NIBP numeric data display area.

To cease the measurement during the process, press the  key again.



(When the NIBP list display is ON, and the display is Layout 5)



NOTE

- The PR synchronized mark may not properly flash for patient with weak pulse, neonate, or when noise interference is present on the pulse wave.
- This device measures the blood pressure by oscillometric method. The PR synchronized mark will differ with the korotkoff sound by the auscultation method.
- When the NIBP data is displayed in the upper area of Display 5, the PR synchronized mark and N_PR value will not be displayed.

→P6-18
“●To Display NIBP List / Graphic Trend in the NIBP Data Area”

When the NIBP list display is ON, and Display 4 or 5 is selected for the display layout, the latest 5 data can be displayed in the NIBP numeric data display area (larger area).

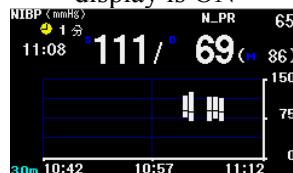
And, by setting the NIBP graphic display ON, the NIBP graphic trend can be displayed.

The NIBP list and graphic trend can be displayed simultaneously.

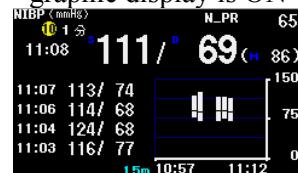
When the NIBP list display is ON



When the NIBP graphic display is ON



When the NIBP list / graphic display is ON



On the NIBP list display, the latest 120 data can be displayed in list format.

●NIBP List			
Page 1/15			
Date	Time	NIBP	HR
6/15	15:48	114 / 78 (89)	60 ---
6/15	15:47	113 / 76 (90)	60 90
6/15	15:45	114 / 76 (89)	60 90
6/15	15:42	113 / 77 (90)	60 90
6/15	15:40	114 / 77 (89)	60 90
6/15	15:37	113 / 77 (92)	60 90
6/15	15:35	112 / 76 (89)	60 90
6/15	15:32	113 / 77 (90)	60 90

Back ⏪ Next

Prev. Disp. Home List Rec.

→P2-18
“Basic Operation
■To Start Monitoring
●To Admit a Patient”



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



- Pay attention when measuring the NIBP of patient with bleeding disorders or hypercoagulation. 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 120 seconds for adult, 90 seconds for child, 60 seconds for neonate.
 - When the inflation value has exceeded 310mmHg for adult, 210mmHg for child, 160mmHg for neonate.
- If used with the incorrect patient type, 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.

NIBP Automatic Measurement

The NIBP can be measured automatically at the selected time intervals.
(Default: OFF)

1 Select → → .

The NIBP parameter setup menu will be displayed.



Auto Mode (min):

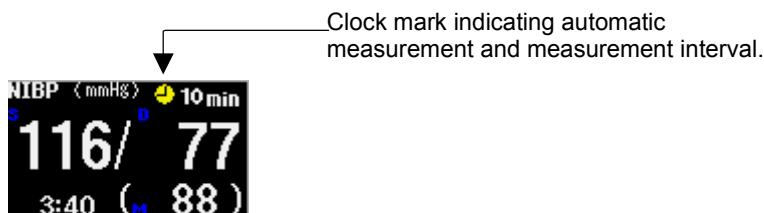
Select the interval time from / / / / / / / / / .

Select if not performing the periodic measurement.

The measurement will automatically start at the selected interval.

If automatic mode and 1-minute interval measurement are both set, the automatic measurement will start upon completion of 1-minute interval measurement.

For example, if (min) is selected for “Auto Mode”, and is selected for “1min Start”, 5-minute interval measurement will start after 10 minutes of 1-minute interval measurement.



CAUTION

- If 1-minute interval measurement (1min Start) is set, the measurement will automatically stop after 10 minutes or 20 minutes depending on the setup.
- When performing long term measurement with the interval of 2.5 seconds or less, constantly check the patient's condition. Also, when performing automatic measurement for long duration, constantly check the patient's blood circulation. Congestion may be caused at the measurement site.

Reference

The measurement time will be the integral multiple of the selected interval time beginning with 0 minute.

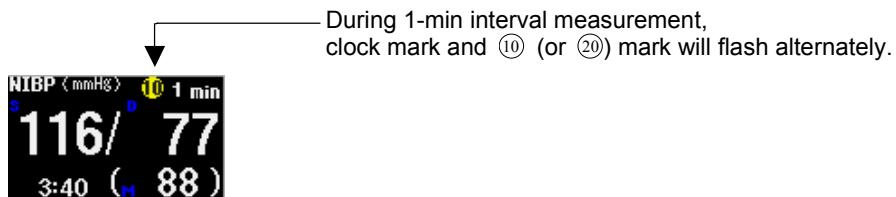
If the present time is 13:14, the measurement time will be as follows for each interval time.

1min. interval	13:15, 13:16, 13:17, . . .
2	13:16, 13:18, 13:20, . . .
2.5	13:15, 13:17:30, 13:20, . . .
3	13:15, 13:18, 13:21, . . .
5	13:15, 13:20, 13:25, . . .
10	13:20, 13:30, 13:40, . . .
15	13:15, 13:30, 13:45, . . .
30	13:30, 14:00, 14:30, . . .
60	14:00, 15:00, 16:00, . . .
120	14:00, 16:00, 18:00, . . .

NIBP 1-Minute Interval Measurement (1min Start)

1-minute interval measurement will automatically complete after 10 minutes or 20 minutes, and returns to the previously selected automatic mode.

Starting the 1-minute interval measurement will flash the clock mark displayed on the home display. According to the selected measurement duration, ⑩ and ⑯ will be displayed respectively for 10 minutes and 20 minutes.



1 Select → → .

The NIBP parameter setup menu will be displayed.



1min Start:

OFF will not perform the 1-minute interval measurement.

10min will stop the 1-minute interval measurement after 10 minutes.

20min will stop the 1-minute interval measurement after 20 minutes.

NOTE

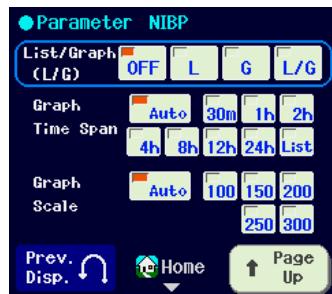
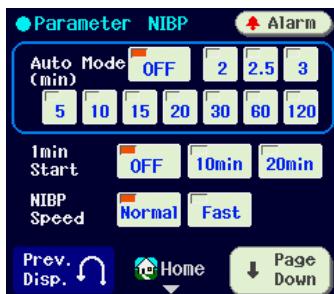
- The 1-minute interval measurement will always start from 00 second. When 1-minute interval measurement is set, the measurement will start from the next 00 second.
- If **ALL** is selected for numeric display configuration, a clock mark will not be displayed.



NIBP Monitoring Setup

The following setups can be performed for the NIBP monitoring.

→P6-16
"6. Parameter Setup
■Non-Invasive Blood Pressure (NIBP)"



NIBP Speed

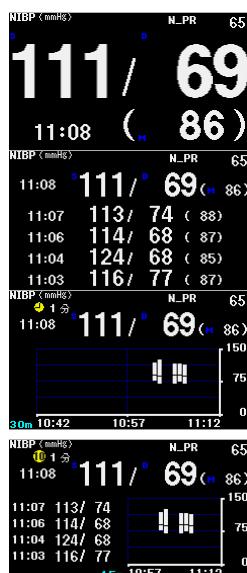
The NIBP cuff inflation speed can be selected from standard or high speed.
(Default: Normal)

List / Graph (L/G)

When the display layout is Display 4 or 5, NIBP list and graphic trend can be displayed in the numeric data display area (larger area). (Default: OFF)

[Reference]

To display the NIBP list and graphic trend for Display 4, it is necessary to configure the display so that NIBP is displayed in the larger display area.



OFF will display only the latest NIBP value.

L will display the 5 latest NIBP value in list format.

G will display the latest NIBP value and graphic trend.

L/G will display the 5 latest NIBP value and graphic trend.

[Reference]

[About the Graphic Trend]

On the graphic trend, NIBP list data (total 120 data) will be plotted.
36 data for G, 18 data for L/G can be plotted. The plotting interval differs depending on the time span as shown in the following table.

The latest NIBP data of the corresponding time interval will be plotted.

<i>Time Span</i>		<i>Time Interval for Each Plot</i>
<i>G</i>	<i>L/G</i>	
30m	15m	50 sec.
1h	30m	100 sec. (1 min. 40 sec.)
2h	1h	200 sec. (3 min. 20 sec.)
4h	2h	400 sec. (6 min. 40 sec.)
8h	4h	800 sec. (13 min. 20 sec.)
12h	6h	1600 sec. (26 min. 40sec.)
24h	12h	3200 sec. (53 min. 20sec.)

Graphic Trend Time Span

Select the graphic trend time span from **Auto**, **30m**, **1h**, **2h**, **4h**, **8h**, **12h**, **24h**, **List**.

List will plot the value each time the measurement is performed. The latest 36 data for G, 18 data for L/G will be plotted.

Auto will automatically set the time span from 30m, 1h, 2h, 4h, 8h, 12h, 24h so that all data on the NIBP list can be displayed. However, during the automatic measurement, the time span will be automatically set according to the auto mode interval as shown in the following table. (Default: Auto)

<i>Auto Mode Interval</i>	<i>Time Span for Auto</i>	
	<i>G</i>	<i>L/G</i>
1 min.	30m	15m
2 min.	1h	30m
2.5 min.	2h	1h
3 min.	2h	1h
5 min.	4h	2h
10 min.	8h	4h
15 min.	12h	6h
20 min.	12h	6h
30 min.	24h	12h
60 min.	24h	12h
120 min.	24h	12h

Graphic Trend Scale

Select the BP scale for the graphic trend from **Auto**, **100**, **150**, **200**, **250**, **300**.

Auto will automatically set the appropriate BP scale. (The scale corresponding to the maximum value plotted on the graph will be set.) (Default: Auto)

<i>Maximum Value Plotted on the Graph [mmHg]</i>	<i>BP Scale for Auto [mmHg]</i>
0 ~ 95	100
96 ~ 142	150
143 ~ 190	200
191 ~ 237	250
238 ~	300

Ventilator Monitoring

→P8-6
“8. Installation
■Ventilator
Connection”

By connecting the ventilator to this monitor, ventilator information is input and ventilator message such as communication status and alarm can be displayed on the screen for monitoring.

- The SIEMENS ventilator, SV-900, SV-300, and Servo-i, Servo-s can be connected.
- The PURITAN-BENNETT ventilator, PB-740, PB-760, and PB-840 can be connected.
- The BIRD ventilator, VELA can be connected.
- The Dräger Medical® ventilator, Evita 2 dura / Evita 4 / Evita XL can be connected.
- The Newport ventilator, E200 can be connected.
- The alarm generated at the ventilator will be also generated on the monitor.
- The ventilator information can be transmitted to the central monitor.
For the SV-300, Servo-i, Servo-s, a detailed alarm message can be also transmitted.



This section describes the monitoring procedure of the ventilator information.



CAUTION

- When connecting the ventilator, check the corresponding version of the ventilator. (Refer to the following table.)
- As ventilator message will be displayed at the upper right of the screen during ventilator monitoring, synchronized tone and synchronized lamp information will not be displayed. Verify each setup on the tone setup menu and lamp setup menu.

[Corresponding Version of the Ventilator]

<i>Ventilator</i>	<i>Corresponding Version</i>
SV900	not specified
SV300	not specified
Servo-i	v1.5 / v2.0
Servo-s	v2.0
PB-740	M
PB-760	H
PB-840	K
VELA	Main software : MSP:VH2.07.00 IO software : IOP:V0.01.00
Evita 2 dura	04.14
Evita 4	04.14
Evita XL	05.10
E200	5.2.0

Precautions for Ventilator Monitoring

→P8-2

"8. Installation
■ Precautions for
Installing the
Equipment"



- The DS-7001 may not be able to properly receive the alarm information from the ventilator due to causes such as communication error, using environment, usage procedure, etc. Therefore, always check the devices (ventilator, communication status of ventilator and DS-7001, etc.) and safety of the patient. If any abnormality is found on the devices or patient, take appropriate actions such as ceasing the operation of the devices in the safest way for the patient.
- When connecting the servo ventilator to the monitor, using them under adverse environmental condition will not only disallow the devices to deliver their maximum performance, but also the devices may be damaged and safety cannot be ensured.
- When transmitting the ventilator information to the central monitor using the medical telemetry, read the "Precautions for Safe Operation of Medical Telemetry" in the Preface.
- When monitoring the ventilator information on the central monitor, use the DS-7600 system, DS-5700 Central Monitor. Do not use the DS-5800N/NX/NX^{MB} Central Monitor. For use of other central monitors, contact our service representative.
- When monitoring ventilator information, pulse oximetry (SpO₂) can be also simultaneously monitored.

Ventilator Message

→P5-7
 “Alarm Function
 ■Description of
 Alarm Message and
 Alarm Sound
 ●Ventilator
 Message”

Depending on the communication condition with the ventilator and alarm condition, the following ventilator message will be displayed.

Message	Description	Alarm Group	Indicator	Alarm Sound	Transmit
Normal (Blue)	Properly communicating with the ventilator, and alarm is not generated.	4	No light	—	“Normal”
Alarm (Red/Yellow)	Properly communicating with the ventilator and parameter alarm (minute ventilation alarm, etc.) is generated at the ventilator.				“Alarm”
Failure (Red/Yellow)	Communication with the ventilator cannot be verified. Cable connection failure, ventilator power OFF, ventilator standby can be considered.				“Alarm”
Suspend (Red/Yellow)	<p>[Suspend] is selected on the ventilator display when Failure message is displayed.</p> <p>The suspend time is 2 min.</p> <p>The suspend condition will be cancelled when proper communication with the ventilator is achieved.</p>	4	No light	—	“Normal”
Wait (Blue)	<ul style="list-style-type: none"> Waiting condition for proper communication with the ventilator. Waiting condition for proper communication with the ventilator after the DS-7001 power is turned ON. [Wait] is selected on the ventilator display when Failure message is displayed. <p>The invalid condition will be cancelled when proper communication with the ventilator is achieved.</p>	4	No light	—	“Normal”

During **Alarm** or **Failure** condition, ventilator alarm will generate only when the ventilator “Alarm Tone” is set to **ON** on the preset menu. The indicator color will also differ depending on this ON/OFF setup.

<i>Ventilator Message</i>	<i>Ventilator "Alarm Tone"</i>	<i>Alarm Message</i>	<i>Alarm Group</i>	<i>Indicator</i>	<i>Alarm Sound</i>
Alarm (Red/Yellow)	ON	Ventilator Alarm	1	Red Flash	○ (Sound will generate.)
	OFF	(No display)		Red Flash	×
Failure (Red/Yellow)	ON	Ventilator Alarm	1	Red Flash	○ (Sound will generate.)
	OFF	(No display)		Orange Flash	×

Ventilator Alarm Factor

For the SV-300, Servo-i, Servo-s, ventilator alarm factor can be transmitted to the central monitor.

<i>Transmitted Alarm Message</i>	<i>Description</i>
VENT AWP	Airway pressure alarm
VENT MV	Minute ventilation alarm
VENT APNEA	Apnea alarm
VENT CONT. HP	Continuous high pressure alarm
VENT Upper FiO ₂	FiO ₂ upper limit alarm
VENT Lower FiO ₂	FiO ₂ lower limit alarm
VENT Upper CO ₂	CO ₂ upper limit alarm
VENT Lower CO ₂	CO ₂ lower limit alarm
VENT Upper RR	RR upper limit alarm
VENT Lower 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
VENT	Other ventilator alarm

 CAUTION	<ul style="list-style-type: none"> For the SV-900, PB, VELA, Evita, E200 ventilator, 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.
---	--

Ventilator Alarm

When the ventilator alarm generates, **Alarm** or **Failure** message will be displayed and alarm sound will generate.



WARNING

- If the DS-7001 does not generate an alarm even though the ventilator is generating an alarm, or if any other malfunction occurs, immediately check the ventilator, monitor, and the cable, and replace the cable if necessary.
- The alarm generation on the DS-7001 is not assured if the alarm other than the following generates at the ventilator (SV-900, SV-300, Servo-i/s).
 - SV-900
gas supply alarm, power failure alarm, expiratory minute volume alarm, airway pressure upper limit alarm, apnea alarm, O₂ concentration alarm
 - SV-300
airway pressure upper limit alarm, high continuous pressure alarm, O₂ concentration lower limit alarm, expiratory minute volume upper/lower limit alarm, apnea alarm, gas supply alarm, air supply alarm, O₂ supply alarm, battery alarm, limited battery alarm, no battery alarm, overrange alarm
 - Servo-i
airway pressure upper limit alarm, high continuous pressure alarm, O₂ concentration lower limit alarm, expiratory minute volume upper/lower limit alarm, apnea alarm, gas supply alarm, O₂ supply alarm, battery alarm, no battery alarm, limited battery alarm, overrange alarm, expiratory cassette disconnected alarm, backup ventilation alarm, regulation pressure limited alarm, respiratory rate alarm, PEEP low alarm, EtCO₂ upper limit alarm, EtCO₂ lower limit alarm
- Precautions about PB-740/PB-760/PB-840/VELA
 - The PB-740/PB-760/PB-840/VELA ventilator acquires alarm information from nurse call port. The ventilator alarm that cannot be acquired from nurse call port is not guaranteed. For corresponding alarm, refer to the service representative of the ventilator manufacturer.

 **WARNING**

- Precautions about Evita2dura / Evita4 / EvitaXL
 - The Evita2dura / Evita4 / EvitaXL acquires alarm information from the serial port. The ventilator alarm that cannot be acquired from the serial port is not guaranteed.
For corresponding alarm, refer to the service representative of the ventilator manufacturer.
 - The DS-7001 will not correspond to the following alarm generated at Evita2dura / Evita4 / EvitaXL.
 - O₂ monitoring disabled alarm
 - CO₂ alarm disabled alarm
 - Oximeter alarm disabled alarm
 - Neo. volume measurement inoperable alarm
 - Minute volume alarm disabled alarm
 - Minute volume alarm low off alarm
 - Tidal volume alarm high off alarm
 - Apnea alarm off alarm
 - Nebulizer active alarm
- Precautions about E200
 - The E200 acquires alarm information from serial port.
The ventilator alarm that cannot be acquired from the serial port is not guaranteed. For corresponding alarm, refer to the service representative of the ventilator manufacturer.
 - The ventilator alarm display on the DS-7001 is not assured if the alarm other than the following generates at the ventilator.
 - Upper and lower airway pressure alarm
 - Upper and lower minute ventilation alarm
 - The “gas supply source failure” alarm generated on the E200 will not be generated on the DS-7001.
 - The apnea alarm (30 seconds of apnea) generated on the E200 will be also generated on the DS-7001.
 - When monitoring the alarm of the E200, verify that the power of the E200 is OFF before turning ON the power of the DS-7001. Otherwise, confirmation screen will be displayed on the DS-7001. In such case, check that the ventilator is not in alarm condition before monitoring the alarm.
 - If "Compass VM200"(optional accessory of E200) is connected to the E200, do not use the DS-7001. The alarm generated on the VM200 will not be transmitted to the DS-7001.

 **CAUTION**

- The ventilator alarm will continue for 5 seconds even after the alarm cause is resolved.
- When the 2min alarm silence button on the SV-900 is pressed, the ventilator alarm on the DS-7001 will be also silenced. However, airway pressure upper limit alarm will be generated even when the 2min alarm silence button is pressed.

When **Alarm** is displayed

Alarm will be displayed when the DS-7001 is properly communicating with the ventilator, and the parameter alarm (minute ventilation alarm, etc.) is generated at the ventilator.

Check the ventilator alarm cause and take appropriate action.



CAUTION

When the SV-300, Servo-i, or Servo-s is operated by battery, **Alarm** will be displayed for the ventilator message on the DS-7001.
Do not use the DS-7001 when the ventilator is operated by battery.

When **Failure** is displayed

Failure will be displayed at communication failure in such case when the power of the ventilator is turned OFF or turned to standby mode, or the cable connecting the DS-7001 and the ventilator is disconnected.

The ventilator display will be also shown.

Check the ventilator, DS-7001, connection cable, and take appropriate action.



Continue will continue the ventilator alarm.
Suspend will suspend the alarm for 2 minutes.
After 2 minutes, alarm will resume if communication with the ventilator is not still verified.
When proper communication with the ventilator is resumed, the suspend condition will be cancelled.
Wait will display the confirmation message.



When selecting **OK** on this confirmation display, alarm will be ineffective until a proper communication with the ventilator is achieved.



CAUTION

- The ventilator display will be displayed until the proper communication with the ventilator is resumed. When the communication is resumed, the screen will automatically return to the home display.
However, if the ventilator display was accessed by selecting **Ventilator** key on the menu display, the screen will not automatically return to the home display unless the key is not pressed for 30 seconds.
- When **Failure** condition is detected during the sleep mode, the sleep mode will be cancelled, and ventilator display will be shown.

When “Incorrect data has been received.” message is displayed (For E200)

When the E200 is connected, a confirmation message, “Incorrect data has been received.” will be displayed for the following case.

- When improper data is received from the E200 ventilator.
- When the power of the DS-7001 has been turned ON while the power of the E200 ventilator is ON.



Verify that the alarm is not generated on the E200 and press the [OK] key.

If the [OK] key is pressed with the alarm generated on the E200, alarm monitoring will not be properly performed.



When monitoring alarm of the E200, verify that the power of the E200 is OFF before turning ON the power of the DS-7001. Otherwise, confirmation screen will be displayed on the DS-7001. In such case, check that the ventilator is not in alarm condition before monitoring the alarm.

Chapter 4

Recording Function

The recording procedure for the waveform, numeric data and list data is explained.

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Types of Recording

The following types of recording can be performed for the DS-7001.

Recording Type	Output Recorder
Manual Recording	Recorder selected for “Rec. Mode” (soft switch)
Alarm Recording	CF card
Periodic Recording	CF card
Alarm List Recording	CF card
NIBP List Recording	CF card

→P4-8
“■Recording Mode Selection”

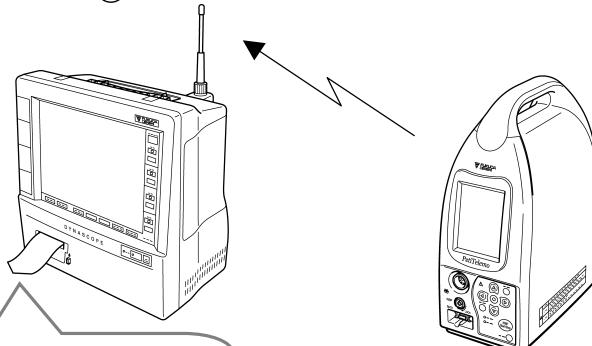
By pressing the  key, recording on the central monitor recorder or compact flash card (CF card), or recording on both can be performed.
The recording mode can be selected on the soft switch of the preset menu.



Use only the specified IC card (FCF-32/FCF-64/
FCF-128).

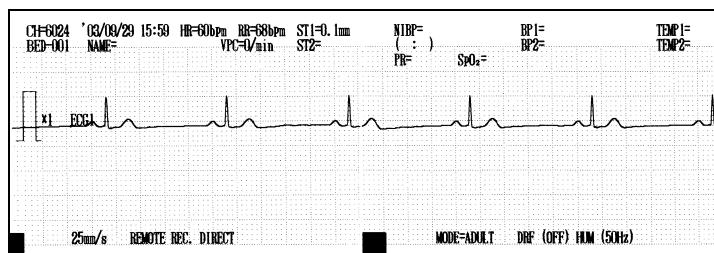
Recording on the Central Monitor Recorder

Pressing the  key will record the waveform on the central monitor recorder.



The data will be recorded on the central monitor recorder.

[The Recording Example of the DS-4600 Central Monitor]



Recording on the CF Card

There are 3 types of recording (manual, alarm, and periodic) for the CF card recording.

Manual Recording

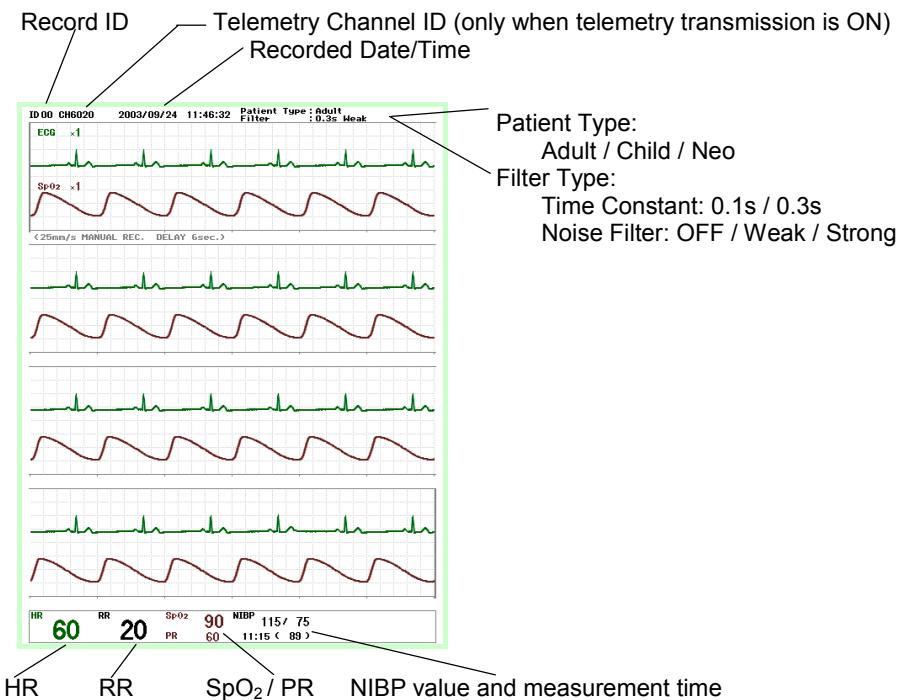
Pressing the  key will record the waveform (6 seconds delay) and numeric data on the CF card in bitmap format.

The recorded file name will be in “ΔΔMxxxxx.BMP” format.

(ΔΔ:patient recording ID, xxxxx: recorded serial no.)

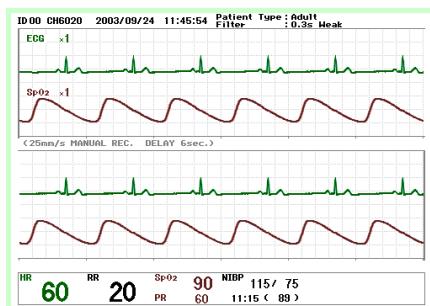
The data will be saved in a bitmap format which allows the data to be read on the personal computer and displayed on the personal computer display, or output on the printer.

[24 sec. Recording]



The measurement at the time when the  key is pressed will be output on the printer. These alarm data will be output in white with red background color.

【12 sec. Recording】



NOTE

The parameter displayed in yellow will be recorded in brown.

Alarm Recording

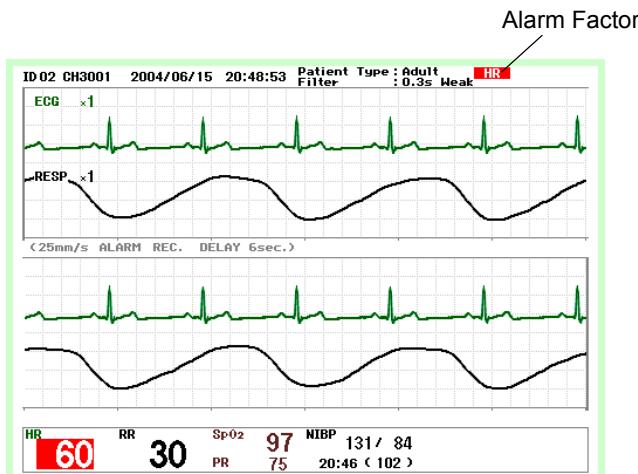
The waveform and numeric data at alarm occurrence can be saved on the CF card in bitmap format.

The recorded file name will be in “ΔΔAxxxx.BMP” format.

(ΔΔ: patient recording ID, xxxx: recorded serial no.)

The data will be saved in a bitmap format which allows the waveform data to be read on the personal computer and displayed on the personal computer display, or output on the printer.

【Example of Alarm Recording】



Periodic Recording

The waveform and numeric data can be automatically recorded at the preprogrammed interval, and saved on the CF card in bitmap format.

The recorded file name will be in “ΔΔTxxxxx.BMP” format.

(ΔΔ: patient recording ID, xxxx: recorded serial no.)

The data will be saved in a bitmap format which allows the waveform data to be read on the personal computer and displayed on the personal computer display, or output on the printer.

[Example of Periodic Recording]



List Recording on the CF Card

The NIBP list, or alarm list can be saved on the CF card.

The data will be saved in a bitmap format which allows the data to be read on the personal computer and displayed on the personal computer display, or output on the printer.

Alarm List Recording

Press the  key on the alarm list display. Maximum of 40 data (5 pages) from the displayed pages will be saved on the CF card.
The recorded file name will be in “ΔΔRxxxxx.BMP” format.
(ΔΔ: patient recording ID, xxxx: recorded serial no.)
If the data is less than 40, the column after the last data will be left blank.

Telemetry Ch. ID (Printed only when telemetry transmission is ON)			
Record ID	Patient Type: Adult / Child / Neo	Recorded Date/Time	Page No.
ID 01 CH3001	2004/06/14 12:36:57	Patient Type : Adult	Page 106/125
Date	Time	Alarm	Rec
6/13	13:51	HR	FULL
6/13	13:50	PR	FULL
6/13	13:50	NIBP	FULL
6/13	13:49	HR	FULL
6/13	13:47	HR	PR
6/13	13:45	HR	FULL
6/13	13:43	HR	667
6/13	13:41	HR	666
6/13	13:40	PR	Used
6/13	13:40	NIBP	665
6/13	13:39	HR	664
6/13	13:37	HR	663
6/13	13:35	HR	662
6/13	13:33	HR	661
6/13	13:31	HR	660
6/13	13:30	PR	Used
6/13	13:30	NIBP	659
6/13	13:29	HR	658
6/13	13:27	HR	657
6/13	13:25	HR	656
Meas. Date/Time		Alarm Factor	Alarm Rec. File No.

The measurement date/time, alarm factor (max. 3), alarm rec. file no. (xxxxxx of “ΔΔAxxxxx.BMP”) will be recorded as shown above.

The messages which will be recorded on the “Rec” column are as follows.

- No. : Corresponded to alarm recording file no. (max. 5 digits)
 - ---- : Alarm recording was not generated.
(Alarm recording is not set, or the alarm not set as recording factor has been generated.)
 - **FULL** : Not enough capacity to record on the CF card.
 - **Used** : The CF card is occupied by other recording such as manual recording.
 - **CF?** : The CF card is not inserted although the alarm recording is set.
 - **Stop** : CF card recording has been interrupted by the user.
 - **Error** : Error has occurred on the CF card.

NIBP List Recording

Press the  key on the NIBP list display. Maximum of 40 data (5 pages) from the displayed pages will be saved on the CF card.

The recorded file name will be in “ΔΔNxxxxx.BMP” format.

(ΔΔ: patient recording ID, xxxxx: recorded serial no.)

If the data is less than 40, the column after the last data will be left blank.

Record ID	Telemetry Ch. ID (Printed only when telemetry transmission is ON)			
Patient Type: Adult / Child / Neo	Page No.			
Recorded Date/Time				
ID 01 CH3001	2004/06/14 12:46:00			
Patient Type : Adult	Page 1/15			
Date	Time	NIBP	HR	SpO ₂
6/14	9:50	113/ 76 (90)	0	0
6/14	9:40	113/ 76 (90)	60	0
6/14	9:30	113/ 76 (90)	0	0
6/14	9:20	113/ 76 (90)	60	0
6/14	9:10	113/ 76 (90)	0	0
6/14	9:00	113/ 78 (90)	60	0
6/14	8:50	113/ 76 (90)	0	95
6/14	8:40	113/ 76 (90)	60	95
6/14	8:30	113/ 76 (90)	0	95
6/14	8:20	113/ 78 (90)	60	95
6/14	8:10	113/ 76 (90)	0	95
6/14	8:00	113/ 76 (90)	60	95
6/14	7:50	113/ 76 (90)	0	95
6/14	7:40	113/ 76 (90)	60	95
6/14	7:30	113/ 76 (90)	0	95
6/14	7:20	113/ 76 (90)	60	95
6/14	7:10	113/ 76 (90)	0	95
6/14	7:00	113/ 76 (90)	84	95
6/14	6:50	113/ 76 (90)	12	95
6/14	6:40	113/ 76 (90)	120	95
Date	Time	NIBP	HR	SpO ₂
6/14	6:30	113/ 76 (90)	120	95
6/14	6:20	113/ 76 (90)	120	95
6/14	6:10	113/ 76 (90)	120	95
6/14	6:00	113/ 76 (90)	120	95
6/14	5:50	113/ 76 (90)	120	95
6/14	5:40	113/ 76 (90)	120	95
6/14	5:30	113/ 76 (90)	120	95
6/14	5:20	113/ 76 (90)	120	95
6/14	5:10	113/ 76 (90)	120	95
6/14	5:00	113/ 76 (90)	120	95
6/14	4:50	113/ 76 (90)	120	95
6/14	4:40	113/ 76 (90)	120	95
6/14	4:30	113/ 76 (90)	120	95
6/14	4:20	113/ 76 (90)	120	95
6/14	4:10	113/ 77 (91)	120	95
6/14	4:00	114/ 76 (90)	120	95
6/14	3:50	113/ 76 (90)	120	95

The measurement date/time, NIBP value, HR, SpO₂ value will be recorded as shown above.

Recording Mode Selection

Select the output recorder (central monitor / CF card) for manual recording.

1 Select  →  →  → enter password → .

The soft switch menu will be displayed. Set the “Rec. Mode”.



Selecting **CF Tele.** will record on both CF card and central monitor recorder.

Selecting **Tele.** will record on the central monitor recorder.

Selecting **CF** will record on the CF card.

NOTE

- Pressing the  key on the NIBP list or alarm list display will perform the list recording only. The waveform will not be recorded on the central monitor even if the **CF Tele.** is selected for “Rec. Mode” on the soft switch menu.
- The selection of “Rec. Mode” applies to manual recording only. Alarm recording and periodic recording will be output to the CF card.

CF Card Status and Formatting

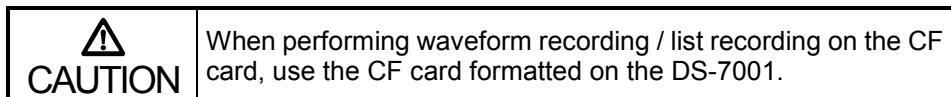
The waveform recording and list recording on the CF card will be in bitmap format.

The number of recordable files according to each card capacity are as follows.

- For the waveform recording, the number of recordable waveforms depends on the recording duration. (24 sec. or 12 sec.)
- The 12 sec. recording also includes alarm list / NIBP list recording data.
1 file = 40 data (5 pages of display)

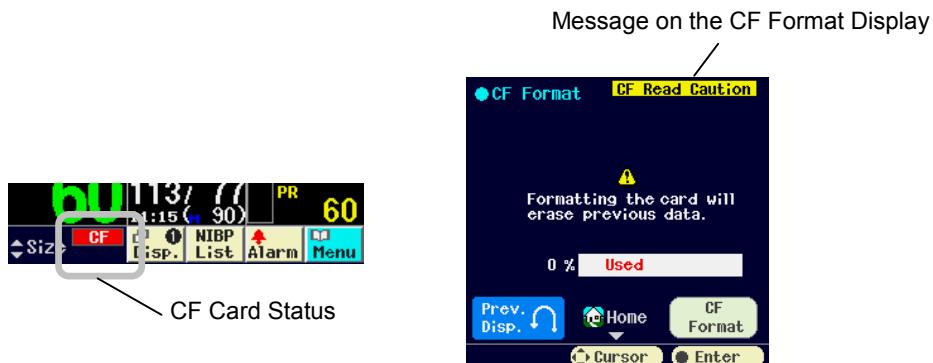
<i>Card Capacity</i>	<i>No. of Recordable File</i>	
	<i>24 sec. Rec.</i>	<i>12 sec. Rec.</i>
32MB	93	166
64MB	187	333
128MB	374	667

The data will be saved in a bitmap format which allows the data to be read on the personal computer and displayed on the personal computer display, or output on the printer.



CF Card Status

If “CF Card” is selected for the recording setup, the CF card status will be displayed at the bottom of the home display.



Depending on the CF card status, the background color of **CF** display will change as follows. A message may be also displayed.

When an error occurs, an error message will be also displayed on the CF format display.

→P9-14
"9. Maintenance
■Troubleshooting
●CF Card"

<i>Color of CF</i>	<i>Home Display</i>	<i>CF Format Display</i>	<i>Detail</i>
CF : White			The CF card is formatted and valid. Waveform recording can be performed.
—		CF Read Caution	Due to CF card failure, it may take time to read (write) data.
CF : Red			Accessing to CF card.
"REC."	—		Recording the waveform data.
"CHECK"	—		Performing card check procedure at CF card insertion.
"FORM."	—		Formatting
CF : Yellow			The CF card is invalid. Format the CF card.
"ERR."	ERROR 001RecDir (The 3-digit number will differ according to the error condition.)		There is no REC directory on the CF card.
	ERROR 003Format		The CF card is not formatted.
	ERROR 010NoInit		The card check procedure at CF card insertion has not been performed.
	ERROR 016OverWk		The number of recording times has exceeded 30,000 times.
	ERROR 002TimeEr		Reading (writing) the data on the CF card has taken too much time. This message may be also displayed when the CF card was removed during recording.
	ERROR 031CF 32M		The CF card capacity is below 32MB.
	"FULL"	—	There is no more space on the CF card to write data.

CAUTION

- Never remove the CF card when the background color of the CF display is red.
- When the CF card status is "ERR." or "FULL", format the CF card.
- When deleting the data on the CF card, format the CF card. The file can not be completely deleted by the delete process on the PC.

Formatting the CF Card

1 Insert the CF card into CF card slot.

When the CF card is inserted, whether the card is valid or not will be checked. The message, "CHECK" will be displayed during this procedure. This will take about 10 seconds.

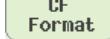
→P7-7
"7. Monitoring Setup
■Tone/Volume"

Reference

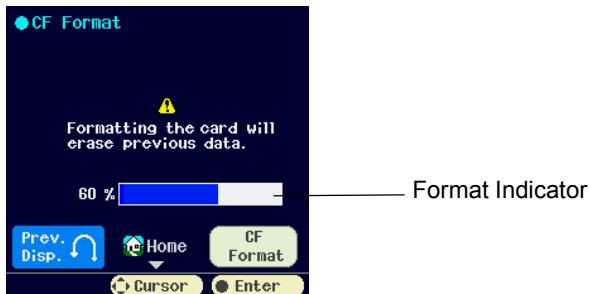
On the "CF End Tone" of the Tone/Volume Setup menu, whether to generate a tone when the CF process (recording, checking, etc.) completes can be selected.

2 Select → → → .

The confirmation message will be displayed.

Pressing the  again will start formatting.

When the format indicator reaches 100%, formatting is complete.



CF Card Recording Procedure

Manual Recording

The recording duration (24 sec. / 12 sec.) and the waveform parameters (max. 2 waveforms) can be selected.

- 1 Set the recording duration (12 sec. or 24 sec.) and recording waveform in advance.

Select → → → .

The CF card recording setup menu will be displayed.



Rec. Duration :

Select from **12s** or **24s**.

Wave 1 or Wave 2 :

Select the recording waveform.

The manual recording setup is complete with the above procedure.

- 2 Select to return to the home display and continue monitoring.

- 3 Press the key to record the displayed waveform.

The waveform will be recorded on the CF card.

The bitmap file of the recorded waveform will be automatically created on the CF card.

The file name will be “**ΔΔMxxxxx.BMP**”.

(ΔΔ: patient recording ID, xxxx: recorded serial no.)

Alarm Recording

1 Set the alarm recording condition in advance.

Select → → → .

The alarm recording setup menu will be displayed.



Record : Select **ON** or **OFF** for alarm recording.

Rec. Duration :

Select from **12s** or **24s**.

Wave 1 or Wave 2 :

Select the recording waveform.

Factor : Select the alarm factor to perform alarm recording.

ALL will start alarm recording for all alarm factors (HR, RR, APNEA, NIBP, SpO₂, PR, Ventilator).

HR/PR will start alarm recording only when HR alarm and PR alarm occurs.

Other will start alarm recording for alarm factors other than HR and PR. (RR, APNEA, NIBP, SpO₂, Ventilator).

→P5-16
"5. Alarm Function
■Silencing the
Alarm"

NOTE

The alarm recording will not be performed if another alarm occurs for the parameter during the alarm is silenced.

The alarm recording setup is complete with the above procedure.

- 2 Select to return to the home display and continue monitoring.
- 3 When the set alarm recording condition is met, the alarm recording will automatically start.

The bitmap file of the recorded waveform will be automatically created on the CF card.

The file name will be “ΔΔAxxxxx.BMP”.

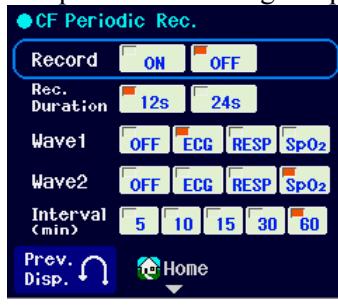
(ΔΔ: patient recording ID, xxxx: recorded serial no.)

Periodic Recording

1 Set the periodic recording condition in advance.

Select  →  →  → .

The periodic recording setup menu will be displayed.



Record : Select **ON** or **OFF** for periodic recording.

Rec. Duration :

Select from **12s** or **24s**.

Wave 1 or Wave 2 :

Select the recording waveform.

Interval : Select the periodic interval from

5 / **10** / **15** / **30** / **60** (min.).

The periodic recording setup is complete with the above procedure.

2 Select to return to the home display and continue monitoring.

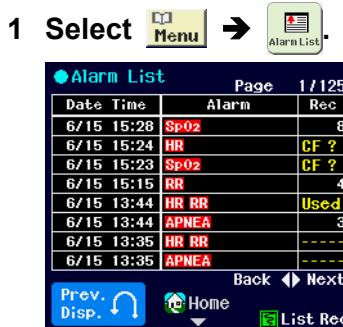
3 The periodic recording will automatically start with the set interval.

The bitmap file of the recorded waveform will be automatically created on the CF card.

The file name will be “ΔΔTxxxxx.BMP”.

(ΔΔ: patient recording ID, xxxx: recorded serial no.)

Alarm List Recording



The alarm list menu will be displayed.

- 2 Press the key.

40 data (5 pages) from the displayed pages will be saved on the CF card.
The bitmap file of the recorded waveform will be automatically created on the CF card.
The file name will be “ΔΔRxxxxx.BMP”.
(ΔΔ: patient recording ID, xxxx: recorded serial no.)

NIBP List Recording



The NIBP list will be displayed.

- 2 Press the key.

40 data (5 pages) from the displayed pages will be saved on the CF card.
The bitmap file of the recorded waveform will be automatically created on the CF card.
The file name will be “ΔΔRxxxxx.BMP”.
(ΔΔ: patient recording ID, xxxx: recorded serial no.)

To See the CF Card Data on the PC

The Recorded File Name

The file name will be assigned as follows according to the recording type.

Manual Recording : ΔΔMxxxxx.BMP

Alarm Recording : ΔΔAxxxxx.BMP

Periodic Recording : ΔΔTxxxxx.BMP

Alarm List Recording : ΔΔRxxxxx.BMP

NIBP List Recording : ΔΔNxxxxx.BMP

→P2-18

"2. Basic Operation

■ To Start Monitoring

● To Admit a Patient"

xxxxx : The number assigned from 00001 according to the recorded order.

ΔΔ : The patient recording ID assigned for each patient.

The patient recording ID will increase by 1 (in the range of 00~99) as the discharging procedure is performed. When 99 is reached, it returns to 00, and the number is assigned from 00 again.

Procedure to See the CF Card Data on the PC



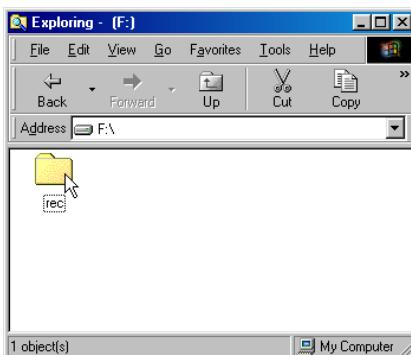
- To see the waveform on the PC, use the application software, "Microsoft® Paint" on a PC with OS of Microsoft® Windows® 95, 98, XP, or 2000 loaded. Other application may not properly display the waveform.
- The BMP file recorded on the CF card is read only file.
 - Do not edit the file.
 - Do not perform procedure such as "Save as" on the "Paint" software.



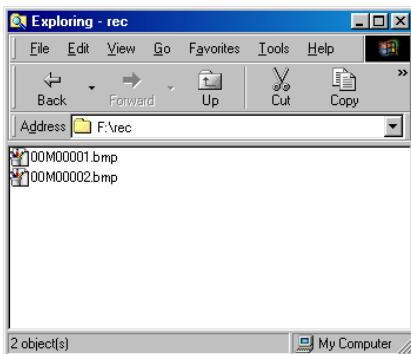
NOTE Be cautious when removing the CF card from the card slot just after recording, as the card may be heated.

1 Insert the CF card drive into the card drive of the PC.

2 Display the card drive folder.



The recorded waveform data can be found in the “rec” folder.



Double-click the “rec” folder. The recorded waveform data can be found in bitmap format.

→P2-18
“2. Basic Operation”
■ To Start Monitoring
● To Admit a Patient”



- Do not delete the REC folder.
- Do not create other folder or file in the CF card.
- When deleting the data on the CF card, format the CF card. The file can not be completely deleted by the delete process on the PC.
- When removing the CF card (media) from the PC, refer to the operation manual of the PC, OS, and card reader, and follow the correct procedure.

- 3 Double-click the BMP file to see the waveform or list data on the PC. These data can be also printed on the printer.
- 4 By inserting the CF card again into the CF card slot of the DS-7001 after seeing the data on the PC or printing the data, the next waveform or list can be recorded on the CF card.

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Chapter 5

Alarm Function

Alarm setup procedure and displayed alarm messages will be explained.

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General Description

The alarm threshold for the monitored parameter can be preprogrammed to notify the alarm by message, sound, and flashing of lamp when the alarm threshold is exceeded.

The following alarm setups can be performed.

- Alarm function (Non-Latch/Latch)
- All alarm ON/Suspend
- Individual parameter alarm ON/OFF
- Alarm suspend time
- Alarm silence, and silence time
- ON/OFF of LEAD OFF alarm at power ON
- Alarm backup at power ON and patient discharge
- Alarm List Display

Description of Alarm Message and Alarm Sound

The alarm messages displayed on the home display are explained below. There are parameter alarm message and equipment status alarm message.

NOTE	When the setup menu is displayed, alarm message will not be displayed.
-------------	--

Alarm Group and Notification

The alarms are classified to 4 groups according to the alarm priority.

<i>Alarm Group</i>	<i>Notification</i>	<i>Displayed Color</i>
Group 1	Continuous beep tone	Red
Group 2	Beep tone every 5 seconds	Yellow
Group 3	Single beep tone	Yellow or Blue
Group 4	Display only	

→P5-9

"■Non-Latch and Latch Alarm"



- When the alarm of the same alarm group generates, the alarm message for the newer alarm will be displayed.
- As the ventilator alarm is a life-threatening alarm, the rhythm pattern differs with other alarms. However, the latched ventilator alarm (ventilator alarm that continues the alarm sound until the alarm silence key is pressed) will generate a Group 1 rhythm pattern.

Alarm for Each Parameter

The parameter alarm message will generate when each alarm threshold level is exceeded.



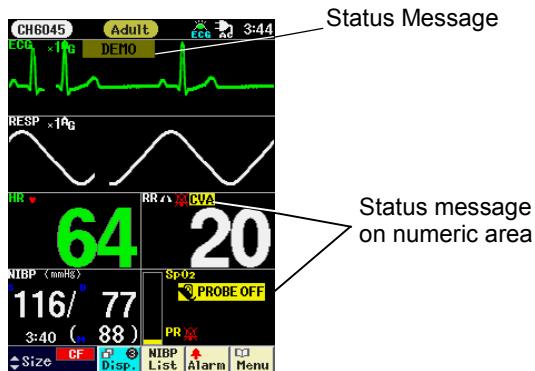
Parameter Alarm Message

<i>Parameter</i>	<i>Displayed Message</i>	<i>Alarm Group</i>	<i>Indicator</i>
ECG	HR	1	Red Flash
RESP	RR		
	APNEA		
	NIBP		
SpO ₂	SpO ₂		
	PR		
	Ventilator Alarm*		
Lead Off	LEAD OFF	2	Orange Flash
Pulse Detection	Check sensor		

*1 This message will be displayed only when the Ventilator “Alarm Tone” is set to [ON] on the preset menu. If set to [OFF], this will not be displayed. For details, refer to P3-23 “3. Vital Application Ventilator Monitoring”

Equipment Status Alarm Message

The equipment status alarm message will be displayed when proper monitoring can not be performed. Some messages will be displayed at the numeric data display area.



Status Message

The message will be displayed according to the priority.
If two or more alarms are generated at the same time, up to two high priority alarms will be displayed alternately.



CAUTION

While the “LEAD OFF” message is displayed, the HR alarm will not generate. Leaving this condition unresolved may result in missing a sudden change of the patient. Promptly check the electrodes when this message is displayed.

Priority	Message	Alarm Group	Displayed Color	Indicator	Description
High ↑ ↓ Low	DEMO	4	Yellow	—	The monitor is in DEMO mode.
	BATTERY	3		—	The remaining battery capacity is less than 10 minutes.
	TELE. ER	4		—	Telemetry module error
	NO CARD	4		—	CF card is not inserted for recording.
	Com Err	4		—	Communication error with the SpO ₂ hardware.
	Sensor Err	4		—	Sensor failure
	PULSE ?	4		—	Searching pulse.
	MOTION	4		—	Body motion artifact is present during SpO ₂ measurement.
	NIBP ERR	4	Blue	—	Measurement error is detected. (Ex. cuff inflation pressure / measurement duration has exceeded the upper limit)
	CF FULL	4		—	CF card capacity is full.
	CF REC	4		—	In process of recording data on the CF card.
	CF INIT	4		—	In process of checking the inserted card.

Status Message on the Numeric Data Area

The following message will be displayed in the numeric data area.

“PULSE?” and “MOTION” will not be displayed for the area with all numeric data display (If **ALL** is selected for the display configuration). These will be displayed for the area with SpO₂-only display.

The “CVA” message will not be displayed for the area with all numeric data display. This will be displayed for the area with RR-only display.

<i>Displayed Message</i>	<i>Alarm Group</i>	<i>Indication</i>	<i>Description</i>
LEAD OFF	2	Orange Flash	ECG electrode is off.
PROBE OFF	3	—	The probe is disconnected from the DS-7001 or from the patient.
PULSE ?	4	—	Searching pulse.
MOTION	4	—	Body motion artifact is present during SpO ₂ measurement.
CVA	3	—	ECG waveform is superimposed on the respiration waveform.

Ventilator Message

→P3-25
“3. Vital Application
■Ventilator
Monitoring”

Depending on the communication condition with the ventilator and alarm condition, the following ventilator message will be displayed.



Ventilator Message

Message	Description	Alarm Group	Indicator	Alarm Sound	Transmit
Normal (Blue)	Properly communicating with the ventilator, and alarm is not generated.	4	No light	—	“Normal”
Alarm (Red/Yellow)	Properly communicating with the ventilator and parameter alarm (minute ventilation alarm, etc.) is generated at the ventilator.			“Alarm”	
Failure (Red/Yellow)	Communication with the ventilator can not be verified. Cable connection failure, ventilator power OFF, ventilator standby can be considered.			“Alarm”	(Refer to the following table.)
Suspend (Red/Yellow)	[Suspend] is selected on the ventilator display when Failure message is displayed. The suspend time is 2 min. The suspend condition will be cancelled when proper communication with the ventilator is achieved.	4	No light	—	“Normal”
Wait (Blue)	<ul style="list-style-type: none"> Waiting condition for proper communication with the ventilator. Waiting condition for proper communication with the ventilator after the DS-7001 power is turned ON. [Wait] is selected on the ventilator display when Failure message is displayed. The invalid condition will be cancelled when proper communication with the ventilator is achieved. 	4	No light	—	“Normal”

During **Alarm** or **Failure** condition, ventilator alarm will generate only when the ventilator “Alarm Tone” is set to **ON** on the preset menu. The indicator color will also differ depending on this ON/OFF setup.

<i>Ventilator Message</i>	<i>Ventilator “Alarm Tone”</i>	<i>Alarm Message</i>	<i>Alarm Group</i>	<i>Indicator</i>	<i>Alarm Sound</i>
Alarm (Red/Yellow)	ON	Ventilator Alarm	1	Red Flash	○ (Sound will generate.)
	OFF	(No display)		Red Flash	×
Failure (Red/Yellow)	ON	Ventilator Alarm	1	Red Flash	○ (Sound will generate.)
	OFF	(No display)		Orange Flash	×

For the SV-300, Servo-i, Servo-s, ventilator alarm factor can be transmitted to the central monitor.

<i>Transmitted Alarm Message</i>	<i>Description</i>
VENT AWP	Airway pressure alarm
VENT MV	Minute ventilation alarm
VENT APNEA	Apnea alarm
VENT CONT. HP	Continuous high pressure alarm
VENT Upper FiO ₂	FiO ₂ upper limit alarm
VENT Lower FiO ₂	FiO ₂ lower limit alarm
VENT Upper CO ₂	CO ₂ upper limit alarm
VENT Lower CO ₂	CO ₂ lower limit alarm
VENT Upper RR	RR upper limit alarm
VENT Lower 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
VENT	Other ventilator alarm

 CAUTION	<ul style="list-style-type: none"> For the SV-900, PB, VELA, Evita, E200 ventilator, ventilator alarm message 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.
---	---

Non-Latch and Latch Alarm

The alarm can be selected from non-latch and latch alarm.
(Default: non-latch alarm)

Non-Latch Alarm : The alarm generation will automatically stop when the alarm cause is resolved.

Latch Alarm : The alarm generation will continue until the alarm silence key is pressed.

1 Select  →  → .

The alarm preset menu will be displayed.



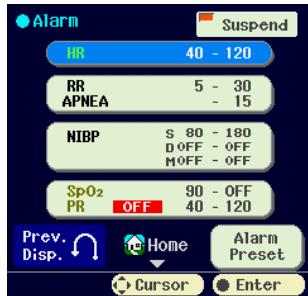
Function:

Select from **Non-Latch** or **Latch**.

Turning ON All Alarm

The alarm will generate according to the alarm condition set for each parameter.

1 Select  → .



The alarm setup menu will be displayed.

If **Suspend** is not selected, all alarm will be turned ON.

Individual Parameter Alarm

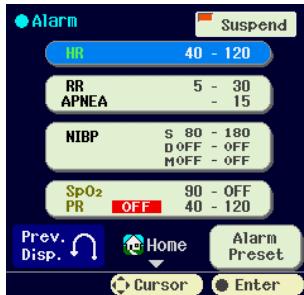
ON/OFF of alarm and alarm limit setup can be performed individually for each parameter.

If the individual parameter alarm is set to OFF, the alarm OFF symbol “☒” will be displayed inside the corresponded numeric data display area.



If the upper/lower alarm threshold is set to OFF, alarm will not generate even if all alarm is set to ON. Pay attention when setting the threshold OFF.

1 Select → .

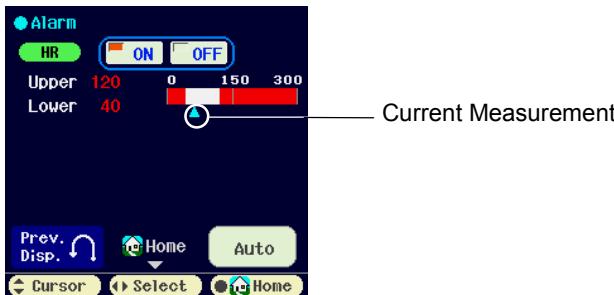


The alarm setup menu will be displayed.

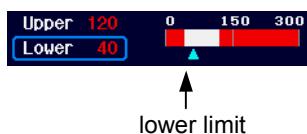
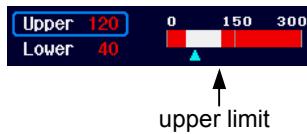
2 Select the parameter to set the alarm.

For example, select and press .

The HR alarm setup menu will be displayed.



3 Select ON/OFF of the individual alarm and set the alarm limits.



ON will generate the alarm.

OFF will not generate the alarm. The alarm OFF mark “” will be displayed inside the numeric data display area for the corresponded parameter.

Move the cursor using the keys and select “Upper”.

Use the keys to set the upper limit. Selecting a value above the limit for each parameter will set the upper limit OFF.

Set the lower limit using the same procedure with the upper limit setup.

Selecting a value below the limit for each parameter will set the lower limit OFF.

Automatically sets the upper and lower limit. However, the turned off limit remains OFF.

[Reference]

【Adjustable Range for the Automatic Setting】

Each parameter has an adjustable range for the upper/lower limit. If the automatically set value exceeds the adjustable range, it will be set to the minimum or maximum adjustable range.

For example, if automatically adjusted when the HR is 50bpm;
 Upper limit is $50\text{bpm} + 40\text{bpm} = 90\text{bpm}$.

Lower limit is $50\text{bpm} - 40\text{bpm} = 10\text{bpm}$, but as the adjustable range is $20\sim 295\text{bpm}$, the lower limit will be set to 20bpm .

The Alarm Values for the DS-7001

HR	40 - 120	HR Alarm
Setup Range	upper limit lower limit	21~300bpm 20~295bpm
Setup Increments		5bpm increments if 60bpm or above 1bpm increments if below 60bpm
If is set	upper limit lower limit	current value + 40bpm current value - 40bpm

**RR
APNEA** **5 - 30
- 15** RR Alarm, APNEA Alarm

RR Alarm		
Setup Range	upper limit	Adult: 10~150Bpm Child, Neonate: 4~150Bpm
	lower limit	Adult: 5~145Bpm Child, Neonate: 2~148Bpm
Setup Increments		Adult, Child: 5Bpm Neonate: 2Bpm
If Auto is set	upper limit	current value + 20Bpm
	lower limit	current value – 20Bpm

APNEA Alarm

Setup Range	upper limit	5~20 sec.
Setup Increments		1 sec.
If Auto is set	upper limit	15 sec.

NIBP **S 80 - 180
D OFF - OFF
M OFF - OFF** NIBP Alarm

Setup Range	upper limit	2~300mmHg
	lower limit	0~295mmHg
Setup Increments		1mmHg increments if 0~50mmHg 5mmHg increments if 50mmHg or above
If Auto is set	upper limit	current value + 40mmHg
	lower limit	current value – 20mmHg

**SpO₂
PR** **90 - OFF
40 - 120** SpO₂ Alarm, PR Alarm

SpO ₂ Alarm		
Setup Range	upper limit	51~100%
	lower limit	50~99%
Setup Increments		1%
If Auto is set	upper limit	OFF
	lower limit	90%

PR Alarm

Setup Range	upper limit	21~300bpm
	lower limit	20~295bpm
Setup Increments		5bpm increments if 60 bpm or above 1bpm increments if below 60bpm
If Auto is set	upper limit	Current Value + 40bpm
	lower limit	Current Value – 40bpm

Suspending the Alarm

This function temporarily suspends all alarm. During the suspend time, the “ALARM SUSPEND” message will be displayed. Alarm will not generate even if the individual parameter alarm is set to ON.

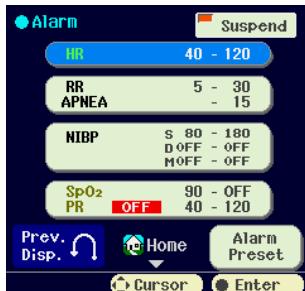
When the preprogrammed suspend time completes, or when the individual alarm setup is changed to ON, it will automatically return to “all alarm ON” condition. Use this function when alarm occurrence is inevitable such as when replacing ECG electrodes or sensors.



Even if the individual parameter alarm is set to ON, all the alarms will not generate during the alarm suspend time. Check the patient's condition frequently.

- 1 Select  → .

The alarm setup menu will be displayed.



- 2 Select  and press .

- 3 Check the message.

When the alarm is suspended, the message “ALARM SUSPEND” message will be displayed.



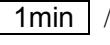
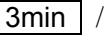
Alarm Suspend Time Selection

The alarm suspend time can be selected from 1min / 3min / 5min.
(Default: 3min)

1 Select  →  → .

The alarm preset menu will be displayed.



Suspend Time
Select from  /  / .

5

Silencing the Alarm

Pressing the  during alarm generation will silence the alarm sound for preprogrammed duration. This function will not affect the alarm message display or indicator lamp (red flash).

If the alarm cause is not resolved at the completion of the alarm silence time, alarm sound will resume. Also, if another alarm with the same or higher priority occurs during the alarm silence time, the alarm sound will be generated.

Precautions for Silencing the Alarm

- Alarm silence will be functional for each parameter. If an alarm condition of the selected parameter is resolved for a moment but is generated again during the alarm silence time, the alarm sound will remain silenced.
- If another alarm event with lower priority occurs during the alarm silence time, alarm sound will not be generated.
- If the alarm silence  key is pressed to silence the alarm for another parameter which occurred during the alarm silence time, the alarm silence time for the first alarm will not be extended.
- The alarm silence condition for all parameters will be ceased in the event of any of the following.
 - When the main power is turned ON.
 - When the all alarm setup has been changed. (ON / Suspend)
 - When the discharge process has been performed.
- The alarm silence condition for each parameter will be ceased in the event of any of the following.
 - When the alarm silence time for the parameter completes.
 - When the alarm is turned OFF for the parameter.

Alarm Silence Time

The alarm silence time when the alarm silence  key is pressed can be selected from 1min / 3min / 5min. (Default: 3min)

1 Select  →  → .

The alarm preset menu will be displayed.



Silence Time
Select from  /  / .

Lead-Off Alarm at Power ON

When the monitor is turned ON, and the electrodes are not still attached to the patient, the lead-off alarm will generate.

On the soft switch setup, lead-off alarm can be set to not generate until the electrodes are attached after power ON.

(Default: OFF)



The second page of the soft switch menu will be displayed. Set the “Lead Off Alarm at Power ON”.



ON : Sets the lead-off alarm ON.

OFF : Sets the lead-off alarm OFF which will stop the lead-off alarm generation.

However, “Lead Off” message will be displayed.

When one of the following conditions is met, this function will be cancelled, and lead off alarm will generate again at power ON.

- When the electrodes are attached.
- When **ON** is selected for “Lead Off Alarm at Power ON”.

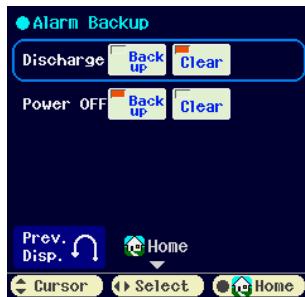
Once this function is cancelled, it will remain cancelled until the next time the power is turned ON.

Backup of Alarm Setup

By selecting **Backup** for “Discharge” and “Power OFF” on the alarm backup menu, alarm setup will not be initialized when a patient is discharged or when a power is turned off. (Default: Discharge=Clear, Power OFF=Backup)

1 Select  →  →  → enter password → .

The alarm backup menu will be displayed. Select **Backup** or **Clear** for “Discharge” and “Power OFF”.



Backup :

Alarm value setup will be backed up.

The monitoring with the same setup can be performed even after discharging or power off.

Clear :

Alarm value setup will be initialized.

Alarm List Display

The latest 1000 alarm event will be displayed in list format.

The parameters displayed on the alarm list are as follows.

- HR
- RR
- APNEA
- NIBP
- SpO₂
- PR
- VENT

The following will be displayed on the “Rec” column.

- Number : Alarm recording file no.
Corresponds to “xxxxx” of “ΔΔAxxxx.BMP” (max. 5 digits)
- ----- : Alarm recording was not generated.
(Alarm recording is not set, or the alarm not set as recording factor has been generated.)
- **FULL** : Not enough capacity to record on the CF card.
- **Used** : The CF card is occupied by other recording such as manual recording.
- **CF?** : The CF card is not inserted although the alarm recording is set.
- **Stop** : CF card recording has been interrupted by the user.
- **Error** : Error has occurred on the CF card.

1 Select →

→P7-14
“7. Monitoring Setup
■Preset Menu
●Date Format”

The alarm list menu will be displayed. The date/time display format can be changed.

Date/Time at Alarm Occurrence	Alarm Event	CF Card Recording Information
● Alarm List		
	Page 1 / 125	
Date Time	Alarm	Rec
6/15 15:28	SpO ₂	8
6/15 15:24	HR	CF ?
6/15 15:23	SpO ₂	CF ?
6/15 15:15	RR	4
6/15 13:44	HR RR	Used
6/15 13:44	APNEA	3
6/15 13:35	RR RR	-----
6/15 13:35	APNEA	-----
Back ▲ Next		
Prev. Disp.	Home	List Rec.

To display back or next page, use the   keys respectively.

Back () page will display newer data, and next () page will display older data.

2 Start the list recording as necessary.

→
“4. Recording Function”

If the CF card is inserted in the card slot, pressing the  key will record the alarm list on the CF card.



If the CF card with the alarm list recorded is removed, and another CF card is inserted, the alarm list recording file no. will be deleted.

Alarm Recording

→
"4. Recording Function"

The waveform and numeric value at alarm occurrence can be saved on the CF card in bitmap format.

1 Set the alarm recording condition in advance.

Select → → → .

The alarm recording setup menu will be displayed.



Record : Select **ON** or **OFF** for alarm recording.

Rec. Duration :

Select from **12s** or **24s**.

Wave 1 or Wave 2 :

Select the recording waveform.

Factor : Select the alarm factor to perform alarm recording.

ALL will start alarm recording for all alarm factors (HR, RR, APNEA, NIBP, SpO₂, PR, Ventilator).

HR/PR will start alarm recording only when HR alarm and PR alarm occurs.

Other will start alarm recording for alarm factors other than HR and PR. (RR, APNEA, NIBP, SpO₂, Ventilator).

The alarm recording setup is complete with the above procedure.

→P5-16
"5. Alarm Function
■Silencing the Alarm"

2 Select to return to the home display and continue monitoring.

3 When the set alarm recording condition is met, the alarm recording will automatically start.

The bitmap file of the recorded waveform will be automatically created on the CF card.

The file no. of the alarm recording ("xxxxx" of "ΔΔAxxxxx.BMP") will be also displayed on the "Rec" column of the alarm list.

Chapter 6

Parameter Setup

The setup procedure for monitoring parameter will be explained.

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Gain / Position Setup

The gain of ECG, RESP, SpO₂ waveform and baseline position of ECG waveform can be adjusted.

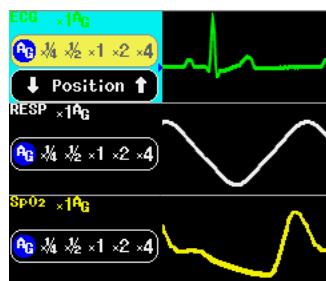
The waveform gain / position adjustment can be performed directly on the home display without accessing the menu display.

Gain / Position Adjustment

1 Press or while displaying the home display.

The cursor to adjust the gain and position will be displayed on the waveform.

2 Select gain or position using keys.



The background color of the adjustable gain or position will be displayed in yellow, and the background color of the waveform and numeric data will be displayed in light blue.

Pressing the keys will move the yellow background color up and down.

Press the keys until the background color of the desired gain/position selection turns to yellow.

Reference

Pressing while adjusting the gain / position will display the parameter setup menu or return to the home display depending on where the light blue background is displayed.

① When the waveform area is light blue.

→ Returns to the home display.

For the display above, the home display will be displayed when is pressed.

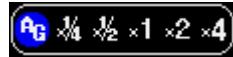
② When the numeric data area is light blue.

→ The parameter setup menu for that parameter (HR/RR/SpO₂/NIBP) will be displayed.

③ When the all numeric data area (the area which is selected for the display configuration) is light blue.

→ The parameter setup selection will be displayed.

3 Adjust the gain / position.



Gain : Select one from (Auto Gain) / /

/ / / .

will automatically adjust to the gain appropriate to the waveform amplitude.

will decrease, and will increase the gain.



Position : Use the keys to adjust the baseline position of the ECG waveform.

will lower, and will raise the position.

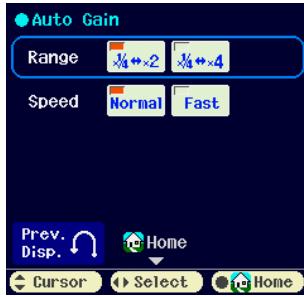
Automatic Gain Range

If **AG** (Auto Gain) is selected for the waveform size, the size will be automatically adjusted according to the amplitude.

The size will be adjusted to the following 5 selections, $\times 1/4$, $\times 1/2$, $\times 1$, $\times 2$, $\times 4$.

- 1 Select **Menu** → **Config.** → **Preset** → enter password → **Auto Gain**.

The automatic gain setup menu will be displayed.



X1/4↔X2 :

The automatic gain range will be set to $\times 1/4$, $\times 1/2$, $\times 1$, $\times 2$.

Adjustment to $\times 4$ will not be performed.

This is to avoid misdetection as the gain influences the HR and RR detection level, and setting the gain too large may cause misdetection.

X1/4↔X4 :

The automatic gain range will be set to $\times 1/4$, $\times 1/2$, $\times 1$, $\times 2$, $\times 4$.

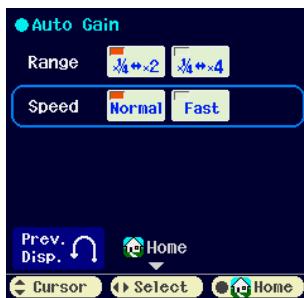
Automatic Gain Speed

When **AG** (Auto Gain) is selected for the waveform size, the speed to automatically adjust the gain can be selected.

The gain adjustment will be performed when the waveform trace comes to the edge of the display.

- 1 Select **Menu** → **Config.** → **Preset** → enter password → **Auto Gain**.

The automatic gain setup menu will be displayed.



Normal :

It will take min. 7.68 sec. to change the gain.

However, if the gain continuously gets small or large, changing the gain will take min. 3.84 sec.

Fast :

It will take min. 3.84 sec. to change the gain.

NOTE	<p>About the automatic gain</p> <ul style="list-style-type: none">• The gain will be automatically changed corresponding to the waveform amplitude.• The gain adjustment will be performed when the waveform trace comes to the edge of the display. When the waveform trace is at the center of the display, the gain will not be adjusted.• The position of ECG and SpO₂ waveform will be also automatically adjusted to high or low position. If AG is selected after setting the position manually, the position will be automatically adjusted. If this does not adjust to a suitable position, select a fixed gain and adjust the position.• If the automatic gain function does not adjust to a suitable gain or position, select a fixed gain and adjust manually. The automatic gain function will be also affected by QRS detection result. The automatic gain may not function for some patient due to QRS detection result. In such case, select a fixed gain.
-------------	--

ECG

The following setup can be performed for the ECG monitoring.

- HR Alarm
- Lead-Off Alarm at Power ON
- Tone Source
- Lamp Source
- Noise Filter (OFF / Weak / Strong)
- Time Constant (0.1s / 0.3s)
- Pacemaker Pulse Display
- Display ON/OFF

HR Alarm Setup

ON/OFF of HR alarm, and alarm threshold levels can be set on this menu.

When the programmed threshold is exceeded, alarm will generate.

1 Select → → 40 - 120.

The HR alarm setup menu will be displayed.

Select ON/OFF of HR alarm, and set the upper and lower alarm limits.



HR: **ON** will generate the HR alarm.
OFF will not generate the HR alarm.
The alarm OFF mark “☒” will be displayed inside the numeric data display area.

Upper: Move the cursor using the keys and select “Upper”.
Use the keys to set the upper limit.
(21 ~ 300bpm)

Selecting 300bpm or above will set the upper limit OFF.

Lower: Set the lower limit (20 ~ 295bpm) using the same procedure with the upper limit setup.
Selecting 20bpm or below will set the lower limit OFF.

The upper and lower limits can be set in 5bpm increments for the value 60bpm or above, and in 1bpm increments for the value below 60bpm.

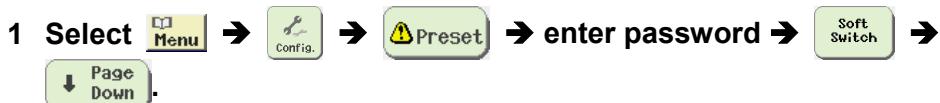
Auto: Automatically sets the upper and lower limit to +40bpm and -40bpm to the current value respectively. If this value exceeds the adjustable range, it will be set to the minimum or maximum adjustable range.

The turned off limit remains OFF.

To Inhibit Lead-Off Alarm at Power ON

If electrodes are not yet attached to the patient when the monitor power is turned ON, lead-off alarm will generate.

This alarm can be inhibited until the electrodes are attached by selecting OFF for “Lead Off Alarm at Power ON” on the soft switch menu. (Default: OFF)



The second page of the soft switch menu will be displayed. Set the “Lead Off Alarm at Power ON”.



ON :

Sets the lead-off alarm ON.

OFF :

Sets the lead-off alarm OFF which will stop the lead-off alarm generation.

However, “Lead Off” message will be displayed.

When one of the following conditions is met, this function will be cancelled, and lead off alarm will generate again at power ON.

- When the electrodes are attached.
- When **ON** is selected for “Lead Off Alarm at Power ON”.

Once this function is cancelled, it will remain cancelled until the next time the power is turned ON.

Tone Source

A tone synchronized to the heartbeat or pulse can be generated. (Default: OFF)

1 Select  →  → .

The volume can be adjusted on the tone/volume setup menu.

→P7-7

"7. Monitoring Setup
■Tone / Volume"

The ECG parameter setup menu will be displayed.



Tone Source :

ECG will generate a tone synchronized to the heartbeat.

SpO₂ will generate a tone synchronized to the pulse. A higher tone will be generated for the larger SpO₂ value, and a lower tone will be generated for the smaller SpO₂ value.

OFF will not generate a synchronized tone.

Reference

The ECG parameter setup menu can be also displayed by the following procedure.

1. Press  or  while the home display is displayed, and display the gain/position adjustment cursors.
2. Use   to make the background color of the HR numeric data to light blue.
3. Press .

6

ECG

Lamp Source

The lamp on the handle can be set to flash synchronized to the heartbeat or pulse. (Default: ECG)

1 Select  →  → .

The ECG parameter setup menu will be displayed.

Changing the lamp source on this menu will also change the lamp source on the lamp setup menu.

→P7-10

"7. Monitoring Setup
■Lamp"



Lamp Source :

ECG will flash the lamp on the handle in green synchronized to the heartbeat.

SpO₂ will flash the lamp on the handle in green synchronized to the pulse.

OFF will not flash the lamp.

Noise Filter

A noise interfered to the ECG waveform can be removed. (Default: Weak)

<i>Noise Filter</i>	<i>Frequency Characteristic</i>
OFF	0.5/1.5* ~ 40Hz
Weak	0.5/1.5* ~ 25Hz
Strong	0.5/1.5* ~ 15Hz

*1.5Hz, 0.5Hz will be applied to the time constant of “0.1s”, “0.3s” respectively.

OFF

A filter to remove the noise will not be used and influence to the QRS amplitude will be less. Use this mode if you wish to monitor more detailed waveform, but noise may interfere.

Weak

This is the standard noise filter for ECG monitoring on the DS-7001. As the upper frequency is set to 25Hz, QRS amplitude will be slightly reduced but influence to the monitoring is small.

Strong

As the upper frequency is set to 15Hz, it will largely remove the high frequency noise. However, QRS amplitude will be also largely reduced. Use this mode only when the noise interference is large.

→P7-13

“7. Monitoring Setup

■Preset Menu

●AC Filter”

About the AC Filter

The AC filter is always set to ON. But if AC interference occurs, first check the following before changing the AC filter setup.

- The DS-7001 and connected ME equipment are properly grounded.
- Power cable is away from the patient.
- Electrodes are firmly attached.
- Electrodes are not dried from the long term use.
- Electrode and lead cable is firmly connected.
- The lead cable wire is not broken.
- Noise source, such as an electric blanket is not placed near the patient.

→P7-14

“7. Monitoring Setup

■Preset Menu

●Wide AC Filter”

Reference

A noise interference on the ECG waveform such as electrosurgical equipment, electric blanket, etc. can be considered. Select the noise filter according to the environment.

Also, when AC noise interferes, set the “Wide AC Filter” of the soft switch menu to “wide” or “adapt wide”.

1 Select  →  → .

The ECG parameter setup menu will be displayed.



Noise Filter :

Select from **OFF** / **Weak** / **Strong**.

Time Constant

1 Select  →  → .

The ECG parameter setup menu will be displayed.



Time Constant :

0.1s will allow relatively stable ECG monitoring.

The waveform will stabilize at the baseline and the large waveform such as R wave will be emphasized.

0.3s will allow monitoring emphasized on the small waveform such as P wave and ST wave.

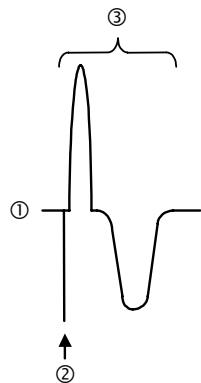
Artificial Pacemaker Pulse Display

→P2-18

"2. Basic Operation
■To Start Monitoring
●To Admit a Patient"

The artificial pacemaker pulse can be displayed superimposed to the ECG waveform by selecting **ON** or **Color** for "Pace. Pulse" on the admit menu. (Default: OFF)

Pacemaker Pulse Detection Algorithm



①ECG Signal Input
Inputs ECG signal.

②Suspension of Pacemaker Pulse and QRS Detection
Signals with high frequency and large amplitude will be detected as a pacemaker pulse. When a pacemaker pulse is detected, QRS detection will be suspended for a certain amount of time to prevent the pacemaker pulse erroneously detected as QRS.

③Cancelling Arrhythmia Detection
Arrhythmia detection will be cancelled to avoid detecting the waveform succeeding the pacemaker pulse as an abnormal beat.

Precautions about Pacemaker Pulse Detection

ECG Signal Input

- There are some cases when pacemaker pulse can not be detected depending on the pacemaker type, pulse voltage, pulse width, lead cable (unipolar, bipolar), electrode site, or lead type which causes the pacemaker pulse amplitude to decrease and disables 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.
- During telemetry transmission, a noise may interfere depending on the transmission condition and be erroneously detected and displayed as a pacemaker pulse.

QRS Detection

- When the spontaneous QRS and pacemaker pulse overlaps (as in a fusion beat), QRS detection will be disabled which will reduce the heart rate.
- If a pacemaker pulse is continuously detected due to AC frequency interference, QRS detection will remain suspended which will reduce the heart rate.

Turning OFF the Display of ECG Waveform and Numeric Data

The ECG waveform and numeric data display can be turned ON or OFF. By turning OFF the display using this function, the measurement can be turned OFF without changing the setup items.

If ECG measurement is not performed when the ECG relay cable is connected to the monitor, HR alarm and lead-off alarm will be generated. Using this function allows to prevent such alarm without changing the HR alarm setup.



OFF message will be displayed in the numeric data display area.

CAUTION 	The display OFF function will inactivate the alarm generation and lamp function.
--------------------	--

However, if the electrode is properly attached to the patient (when not in lead-off condition), the turned OFF display will automatically turn ON after 30 seconds.

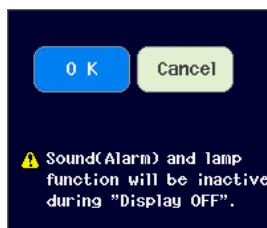
- 1 Select → → .

The ECG parameter setup menu will be displayed.

If the mark on the key is red, it indicates that the display is already OFF. And if it is green, it indicates that the display is ON.

- 2 Check that the mark is green, select , and press .

The confirmation message will be displayed.



Select **OK** to turn OFF the display.

Select **Cancel** if not turning OFF the display.

- 3 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 30 seconds.

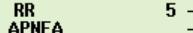
Respiration

The following setup can be performed for the respiration monitoring.

- RR alarm and apnea alarm
- Impedance Respiration Measurement ON/OFF
- Respiration Synchronized Indicator
- Respiration filter
- CVA (heartbeat filter) ON/OFF

RR, Apnea Alarm Setup

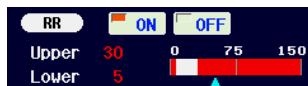
ON/OFF of RR alarm and apnea alarm, and alarm threshold levels can be set on this menu. When the programmed threshold is exceeded, alarm will generate.

1 Select  →  → .



The RR / APNEA alarm setup menu will be displayed.

2 Select ON/OFF for the RR alarm, and set upper and lower limits.



RR Alarm :

ON will generate the RR alarm.

OFF will not generate the RR alarm. The alarm OFF mark “

Upper : Move the cursor using the   keys and select “Upper”.

Use the   keys to set the upper limit.
(10 ~ 150Bpm, 4 ~ 150Bpm for neonate)

Selecting 150Bpm or above will set the upper limit OFF.

Lower : Set the lower limit (5 ~ 145Bpm, 2 ~ 150Bpm for neonate) using the same procedure with the upper limit setup.
Selecting 5Bpm (2Bpm for neonate) or below will set the lower limit OFF.

The upper and lower limits can be set in 5Bpm (2Bpm for neonate) increments.

Auto : Automatically sets the upper and lower limit to +20Bpm and -20Bpm to the current value respectively. If this value exceeds the adjustable range, it will be set to the minimum or maximum adjustable range.

The turned OFF limit remains OFF.

3 Select ON/OFF for the alarm and set the upper limit.



APNEA Alarm :

ON will generate the APNEA alarm.

OFF will not generate the APNEA alarm.

Upper : Move the cursor using the **▲** **▼** keys and select "Upper".

Use the **◀** **▶** keys to set the upper limit. (5 ~ 20sec, 1sec. increment)

Selecting 20sec. or above will set the upper limit OFF.

Auto : Sets the upper limit to 15 seconds.

However, the turned OFF limit remains OFF.

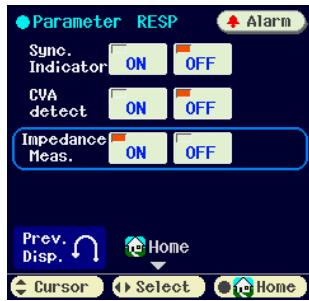
Impedance Respiration Measurement

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 a 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.

If the patient is using an adaptive (minute ventilation) pacemaker, set the impedance respiration measurement OFF. (Default: ON)

1 Select **Menu** → **Parameter** → **RESP**.

The respiration parameter setup menu will be displayed.



Impedance Meas. :

- ON** will perform standard impedance respiration measurement.
OFF will stop the impedance respiration measurement and will not display the impedance respiration waveform and RR. A high frequency electric discharge which is a measurement signal will be also ceased.

Reference

The respiration parameter setup menu can be also displayed by the following procedure.

1. Press **▲** or **▼** while the home display is displayed, and display the gain/position adjustment cursors.
2. Use **▲** **▼** to make the background color of the RR numeric data to light blue.
3. Press **●**.

Respiration Synchronized Indicator

The respiration synchronized mark “” can be set to display in the respiration numeric data area. (Default: OFF)

1 Select **Menu** → **Parameter** → **RESP**.

The respiration parameter setup menu will be displayed.



Sync. Indicator :

- ON** will display the respiration synchronized mark.
OFF will not display the respiration synchronized mark.

NOTE

If **ALL** is selected for the numeric data display configuration, the respiration mark will not be displayed.



Respiration Filter Selection

There are following selections for the respiration filter.

0.09 ~ 2.5Hz (Neonate)

0.09 ~ 1.5Hz (Adult / Child)

The respiration filter changes according to the patient type selected on the patient admit menu.

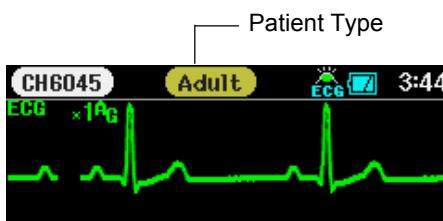
Generally, neonates have a lower amplitude waveform, and higher respiration rates as compared to adults. To compensate for these differences and to continuously monitor the appropriate waveform size and RR measurement by eliminating the artifact, select the appropriate filter according to the patient type. (Default: Adult)

→

For patient type selection, see P2-18
“2. Basic Operation”

- To Start Monitoring
- To Admit a Patient

The currently selected patient type can be verified on the home display. If incorrect patient type is selected, set the correct patient type on the admit menu.



CVA Alarm and Algorithm

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. 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 the CVA detection function set to ON (Default: OFF), the “CVA detected” message will be displayed, and an alarm sound will be generated.

1 Select → → .

The respiration parameter setup menu will be displayed.



CVA detection :

ON will perform CVA detection.

OFF will not perform CVA detection.

Non-Invasive Blood Pressure (NIBP)

The following setup can be performed for the NIBP monitoring.

- NIBP Alarm
- NIBP End of Measurement Tone
- NIBP Cuff Inflation Speed
- ON/OFF of NIBP list display in the numeric data display area
- NIBP Automatic Interval Measurement at Power ON

Also, the latest 120 data will be listed on the NIBP list display.

NIBP Alarm Setup

ON/OFF of NIBP alarm and alarm threshold levels for systolic, diastolic, mean BP can be set on this menu. When the programmed threshold is exceeded, alarm will generate.

1 Select → →

The NIBP alarm setup menu will be displayed.



NIBP Alarm:

ON will generate the NIBP alarm.

OFF will not generate the NIBP alarm.

The alarm OFF mark “” will be displayed inside the numeric data display area.

Upper: Move the cursor using the keys and select “Upper”.

Use the keys to set the upper limit. (2 ~300mmHg)

Selecting a value above 300mmHg will set the upper limit OFF.

Lower: Set the lower limit (0~295mmHg) using the same procedure with the upper limit setup. Selecting a value below 0mmHg will set the lower limit OFF.

The upper and lower limits can be set in 1mmHg increments for the value 50mmHg or below, and in 5mmHg increments for the value above 50mmHg.

Auto: Automatically sets the upper and lower limit to +40mmHg and -20mmHg to the current value respectively. If this value exceeds the adjustable range, it will be set to the minimum or maximum adjustable range. The turned off limit remains OFF.

NIBP End of Measurement Tone

By setting the NIBP End of Measurement tone, a tone will be generated when the measurement completes. (Default: ON)

1 Select → → → .

The second page of the tone/volume setup menu will be displayed.



NIBP End Meas.:

ON will generate a tone when the measurement completes.

OFF will not generate a tone when the measurement completes.

Reference ON/OFF of NIBP periodic measurement start tone can be also set on the "Key" selection.

ON will generate a start tone.

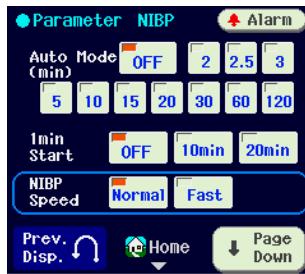
OFF will not generate a start tone.

NIBP Cuff Inflation Speed

The NIBP cuff inflation speed can be selected from normal or fast speed.

1 Select → → .

The NIBP parameter setup menu will be displayed.



Select an appropriate speed from **Normal** or **Fast**.

When **Normal** is selected, it will take about 10 seconds to inflate to 300mmHg with 500cc tank connected.

When **Fast** is selected, it will take about 6 seconds to inflate to 300mmHg with 500cc tank connected.

When an adult cuff is wrapped around an arm with a space allowing one finger fitting in between the cuff and arm, the speed to inflate to 190mmHg is within 12 seconds for normal speed, and within 8 seconds for fast speed.

Reference

The NIBP parameter setup menu can be also displayed by the following procedure.

1. Press **▲** or **▼** while the home display is displayed, and display the gain/position adjustment cursors.
2. Use **▲** **▼** to make the background color of the NIBP numeric data to light blue.
3. Press **●**.

To Display NIBP List / Graphic Trend in the NIBP Data Area

On the NIBP numeric data display area, NIBP list, graphic trend, or both NIBP list and graphic trend can be displayed.

When the NIBP list display is selected, the 5 latest NIBP data will be displayed in list format. When the NIBP graphic trend display is selected, the NIBP data will be displayed in graphic format.

However, the NIBP list and graphic trend can be displayed only when the display layout is set to Display 4 or 5.

For Display 1~3, only the latest NIBP data will be displayed.

Reference

To display the NIBP list and graphic trend for Display 4, it is necessary to configure the display so that NIBP is displayed in the larger display area.

NIBP Data Display ([OFF])



NIBP List Display ([L])



NIBP Graphic Trend Display ([G])



NIBP List/Graphic Trend Display ([L/G])



1 Select → → → .

The second page of the NIBP parameter setup menu will be displayed.



List / Graph (L/G)

Select the list / graph display from **OFF** / **L** / **G** / **L/G**.

Reference

【About the Graphic Trend】

On the graphic trend, NIBP list data (total 120 data) will be plotted.

36 data for G, 18 data for L/G can be plotted. The plotting interval differs depending on the time span as shown in the following table.

The latest NIBP data of the corresponding time interval will be plotted.

<i>Time Span</i>		<i>Time Interval for Each Plot</i>
G	L/G	
30m	15m	50 sec.
1h	30m	100 sec. (1 min. 40 sec.)
2h	1h	200 sec. (3 min. 20 sec.)
4h	2h	400 sec. (6 min. 40 sec.)
8h	4h	800 sec. (13 min. 20 sec.)
12h	6h	1600 sec. (26 min. 40sec.)
24h	12h	3200 sec. (53 min. 20sec.)

Graphic Trend Time Span

Select the graphic trend time span from **Auto**, **30m**, **1h**, **2h**, **4h**, **8h**, **12h**, **24h**, **List**.

List will plot the value each time the measurement is performed. The latest 36 data for G, 18 data for L/G will be plotted.

Auto will automatically set the time span from 30m, 1h, 2h, 4h, 8h, 12h, 24h so that all data on the NIBP list can be displayed.

For example, if the data from 12:00 to 1700 is listed on the NIBP list, **8h** will be selected to plot 5 hours of data.

However, during the automatic measurement, the time span will be automatically set according to the auto mode interval as shown in the following table.
(Default: Auto)

Auto Mode Interval	Time Span for Auto	
	G	L/G
1 min.	30m	15m
2 min.	1h	30m
2.5 min.	2h	1h
3 min.	2h	1h
5 min.	4h	2h
10 min.	8h	4h
15 min.	12h	6h
20 min.	12h	6h
30 min.	24h	12h
60 min.	24h	12h
120 min.	24h	12h

Graphic Trend Scale

Select the BP scale for the graphic trend from **Auto**, **100**, **150**, **200**, **250**, **300**.

Auto will automatically set the appropriate BP scale. (The scale corresponding to the maximum value plotted on the graph will be set.)
(Default: Auto)

Maximum Value Plotted on the Graph [mmHg]	BP Scale for Auto [mmHg]
0 ~ 95	100
96 ~ 142	150
143 ~ 190	200
191 ~ 237	250
238 ~	300

- 2 Return to the home display.
- 3 Use the  key to switch the display layout to Display 4 or Display 5.

NIBP List Display

The latest 120 data will be displayed in a list format. The displayed parameters are HR, SpO₂, NIBP (SYS, DIA, MEAN).

1 Select  → .

The NIBP list will be displayed.
The date format can be selected.

→P7-14
"7. Monitoring Setup
■Preset Menu
●Date Format"

NIBP List				Page 1 / 15
Date	Time	NIBP	HR	SpO ₂
04/17	11:20	118 / 75 < 93 >	60	90
04/17	11:15	113 / 77 < 90 >	60	---
04/17	10:45	110 / 77 < 90 >	60	---
04/17	10:38	114 / 78 < 90 >	60	---
04/17	10:37	116 / 82 < 90 >	60	90
04/17	10:36	115 / 78 < 89 >	60	90
04/17	10:35	116 / 77 < 93 >	60	90
04/17	10:35	114 / 76 < 92 >	60	90

Back ⏪ ⏩ Next

Prev. Disp. Home Page Enter

Use ⏪ ⏩ to switch the page.

⏪ will display the previous page (newer data) and ⏩ will display the next page (older data).

2 Start the list recording as necessary.

→
"4. Recording Function"

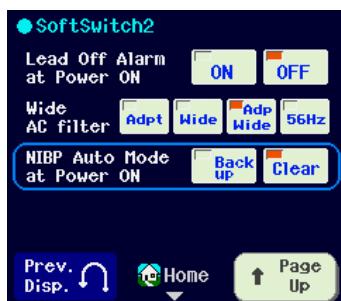
If the CF card is inserted in the card slot, pressing the  key will record the NIBP list on the CF card.

NIBP Automatic Interval Measurement at Power ON

By selecting **Backup** for “NIBP Auto Mode at Power ON”, the setup for the NIBP automatic interval measurement will be backed up and the previously set measurement can be performed when the power is turned ON again.
(Default: Clear)



The second page of the soft switch menu will be displayed. Set the “NIBP Auto Mode at Power ON”.



Backup :

NIBP automatic measurement setup will be backed up. The measurement with the previous setup can be performed after turning ON the power again.

Clear :

NIBP automatic measurement setup will be initialized and turned OFF.



The 1-minute periodic measurement setup cannot be backed up. It will be always turned OFF when the power is turned ON again.

Arterial Oxygen Saturation (SpO₂)

The following setup can be performed for the ECG monitoring.

- SpO₂ / PR Alarm
- Tone Source
- Lamp Source
- Bar Graph ON/OFF
- Ignore NIBP ON/OFF
- Display ON/OFF

SpO₂, PR Alarm Setup

The ON/OFF and alarm threshold levels of SpO₂ alarm and PR alarm can be set. When the preprogrammed threshold is exceeded, an alarm will generate.

1 Select → → .



The SpO₂ / PR alarm setup menu will be displayed.

2 Select ON/OFF for the SpO₂ alarm, and set upper and lower limits.



SpO₂ Alarm:

ON will generate the SpO₂ alarm.

OFF will not generate the SpO₂ alarm.

The alarm OFF mark “” will be displayed inside the numeric data display area.

Upper: Move the cursor using the keys and select “Upper”.

Use the keys to set the upper limit. (51 ~ 100%)

Selecting 100% or above will set the upper limit OFF.

Lower: Set the lower limit (50 ~ 99%) using the same procedure with the upper limit setup.

Selecting 50% or below will set the lower limit OFF.

The upper and lower limits can be set in 1% increments.

Auto: Automatically sets the upper limit to OFF, and lower limit to 90%.
However, the turned off limit remains OFF.

3 Select ON/OFF for the PR alarm, and set the upper and lower limits.



PR Alarm: **ON** will generate the PR alarm.
OFF will not generate the PR alarm.
The alarm OFF mark “⊗” will be displayed inside the numeric data display area.

Upper: Move the cursor using the **▲** **▼** keys and select “Upper”.

Use the **◀** **▶** keys to set the upper limit.
(21 ~ 300bpm)

Selecting 300bpm or above will set the upper limit OFF.

Lower: Set the lower limit (20 ~ 295bpm) using the same procedure with the upper limit setup.
Selecting 20bpm or below will set the lower limit OFF.

The upper and lower limits can be set in 5bpm increments for the value 60bpm or above, and in 1bpm increments for the value below 60bpm.

Auto: Automatically sets the upper and lower limit to +40bpm and -40bpm to the current value respectively. If this value exceeds the adjustable range, it will be set to the minimum or maximum adjustable range.

The turned off limit remains OFF.

Tone Source

A tone can be set to generate synchronized to the heartbeat or pulse. (Default: OFF)

1 Select  →  → .

The ECG parameter setup menu will be displayed.



Tone Source:

ECG will generate a tone synchronized to the heartbeat.

SpO₂ will generate a tone synchronized to the pulse. A higher tone will be generated for the larger SpO_2 value, and a lower tone will be generated for the smaller SpO_2 value.

OFF will not generate a synchronized tone.

Lamp Source

The lamp on the handle can be set to flash synchronized to the heartbeat or pulse. (Default: ECG)

1 Select  →  → .

The ECG parameter setup menu will be displayed.

Changing the lamp source on this menu will also change the lamp source on the lamp setup menu.
→P7-10
“7. Monitoring Setup
■ Lamp”



Lamp Source:

ECG will flash the lamp on the handle in green synchronized to the heartbeat.

SpO₂ will flash the lamp on the handle in green synchronized to the pulse.

OFF will not flash the lamp.

Bar Graph Display

1 Select  →  → .

The SpO₂ parameter setup menu will be displayed.



Bar Graph:

ON will display the bar graph of the pulse waveform in the SpO₂ numeric data display area.

OFF will not display the bar graph.

Reference

The SpO₂ parameter setup menu can be also displayed by the following procedure.

1. Press  or  while the home display is displayed, and display the gain/position adjustment cursors.
2. Use   to make the background color of the SpO₂/PR numeric data to light blue.
3. Press .

SpO₂ Alarm during NIBP Measurement (Ignore NIBP)

This function is used when the SpO₂ sensor and NIBP cuff is placed on the same limb for measurement.

During the NIBP measurement, the cuff inflation restricts the blood flow which disables the correct detection of the SpO₂ value and PR, and may generate improper alarm.

Setting **OFF** for "Ignore NIBP" will not generate the SpO₂/PR alarm and SpO₂ sensor check alarm until the NIBP measurement is complete. (Default: OFF)

1 Select  →  → .

The SpO₂ parameter setup menu will be displayed.



Ignore NIBP:

Select **ON** or **OFF**.

Turning OFF the Display of SpO₂ Waveform and Numeric Data

The SpO₂ waveform and numeric data display can be turned ON or OFF. By turning OFF the display using this function, the measurement can be turned OFF without changing the setup items.

If SpO₂ measurement is not performed when the SpO₂ sensor is connected to the monitor, SpO₂/PR alarm and probe off alarm will be generated. Using this function allows to prevent such alarm without changing the SpO₂ alarm setup.



message will be displayed in the numeric data display area.

 CAUTION	The display OFF function will inactivate the alarm generation and lamp function.
---	--

However, if the SpO₂ sensor is properly attached to the patient (when not in probe-off condition), the turned OFF display will automatically turn ON after 30 seconds.

- 1 Select → → .

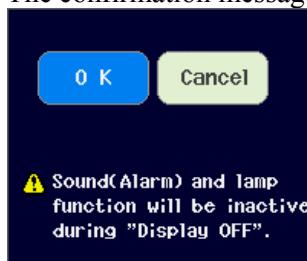
The SpO₂ parameter setup menu will be displayed.



The red mark on the key indicates that the display is already OFF. And if it is green, it indicates that the display is ON.

- 2 Verify that the mark is green, select , and press .

The confirmation message will be displayed.



Select OK to turn OFF the display.

Select Cancel if not turning OFF the display.

- 3 When SpO₂ sensor is attached to the patient with the SpO₂ display set to OFF, the SpO₂ display will automatically turned ON after 30 seconds.

Blank Page

Chapter 7

Monitoring Setup

The monitoring setup procedure will be explained in this chapter.
Set the most appropriate monitoring condition according to the used environment.

General Description	7-2
Display Configuration Setup	7-3
For Easier View	
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User Key Setup	7-6
For Easier Use	
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General Description

System Configuration



- Tone : Sets the heartbeat tone source, NIBP end of measurement tone, key sound, ON/OFF of sound at lead-off condition.
- Color : Sets the color of displayed waveform / numeric data, background color, and display brightness.
- Lamp : Sets the heartbeat lamp source.
- Telemeter : Sets the telemetry transmitter channel. (☞ Chapter 8 Installation)
- Waveform : Sets the sweep speed and wave line thickness of the displayed waveform.
- Display : Sets the display configuration for the home display.
- Clock : Sets the current date and time.
- CF Rec. : Sets the recording items for the CF card. (☞ Chapter 4 Recording Function)

Preset



- Soft Switch : Sets the following items.
- AC Filter
 - Date Format
 - Telemeter ON/OFF (☞ Chapter 8 Installation)
 - Recording Mode (☞ Chapter 4 Recording Function)
 - Power ON Lead Off Alarm (☞ Chapter 5 Alarm Function)
 - Wide AC Filter
- Auto Gain : Sets the range and speed of automatic gain switching. (☞ Chapter 6 Parameter Setup)
- Ventilator : Sets the ventilator type to be connected. (☞ Chapter 8 Installation)
- User Key : Assigns the frequently used key at the lower part of the display.
- Alarm Backup: Sets the alarm backup condition at discharge and power OFF. (☞ Chapter 5 Alarm Function)

The version information can be also checked on this menu.

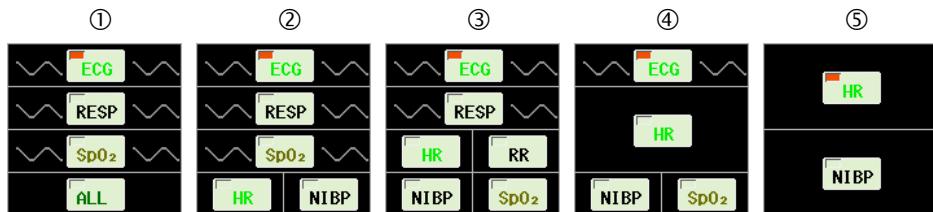
Display Configuration Setup

For Easier View

The display configuration of the waveform and numeric data can be selected according to the monitoring purpose.

There are 5 types of layout for the home display.

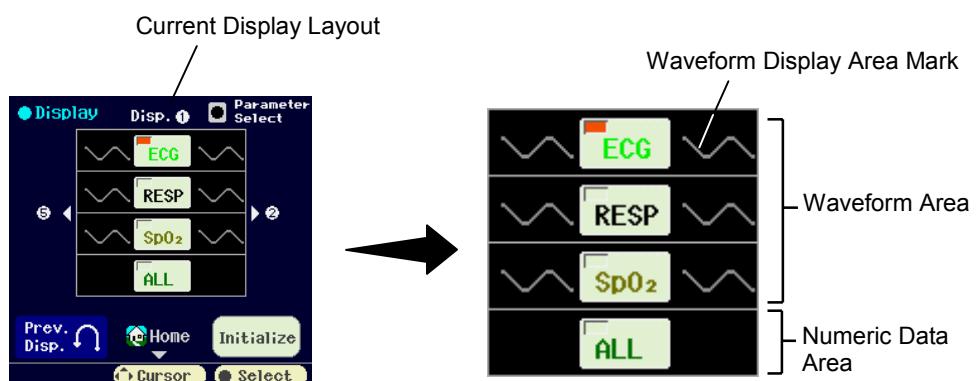
The parameters for the waveform display area and numeric data display area can be selected.



- 1 Select → → .

The display configuration setup menu will be displayed.

~~~~~ mark indicates the waveform display area.



- 2 Select the display layout using the keys.

Pressing the key will sequentially switch the number (④) of the key.

- 3 Select the parameter for waveform display.

Move the cursor to waveform area using the keys and press to select the parameter.

Pressing the key will sequentially select , , .

#### 4 Select the parameter for numeric data display.

Move the cursor to numeric data area using the keys and press to select the parameter.

Pressing the key will sequentially select **HR**, **RR**, **NIBP**, **SpO<sub>2</sub>·PR**, **ALL**.

Selecting **ALL** for the numeric display area will display all parameters in the following layout.



##### NOTE

- On the upper row of Display 5, SpO<sub>2</sub> display can not be selected.
- **ALL** can not be selected on the top row.

#### 5 Selecting will initialize the display layout of the home display.

→P10-8  
“10. Technical Information  
■Setup Item  
●System Configuration Menu”

# Waveform Setup

Sets the sweep speed of displayed waveform. The sweep speed can be set differently for ECG / SpO<sub>2</sub> and RESP waveform.  
The wave line thickness can be also set.

The displayed waveform duration will be determined according to the sweep speed.

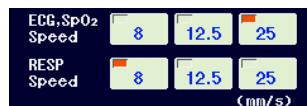
| <i>Sweep Speed</i> | <i>Displayed Duration</i> |
|--------------------|---------------------------|
| 8mm/s              | Approx. 6.6 sec.          |
| 12.5mm/s           | Approx. 4.2 sec.          |
| 25mm/s             | Approx. 2.1 sec.          |

1 Select  →  → .



The waveform setup menu will be displayed.

2 Select the sweep speed.



Select the sweep speed for ECG · SpO<sub>2</sub> waveform and RESP waveform from  
 /  /  (mm/s).

3 Select the wave line thickness.

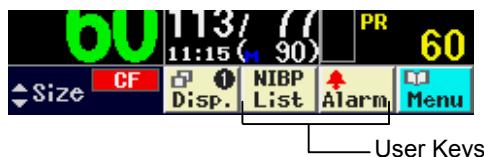


Select the wave line thickness from the 3 selections.

## User Key Setup

## For Easier Use

2 frequently used keys can be assigned on the lower part of the display. By setting the user keys, quick access to the frequently used function can be achieved.



The user key function can be selected from the following 13 selections.

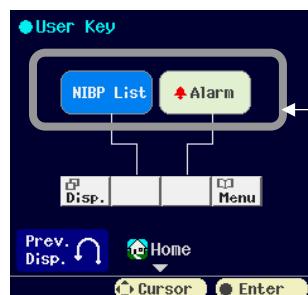
(Default: **NIBP List**, **Alarm**)

|                                 |                                               |
|---------------------------------|-----------------------------------------------|
| Admit                           | Displays patient admit menu.                  |
| Alarm                           | Displays alarm setup menu.                    |
| NIBP List                       | Displays NIBP list.                           |
| ECG/RESP/SpO <sub>2</sub> /NIBP | Displays setup menu for each parameter.       |
| ECG/RESP/SpO <sub>2</sub> /NIBP | Displays alarm setup menu for each parameter. |
| NIBP periodic                   | Sets the NIBP periodic interval.              |
| Alarm List                      | Displays alarm list.                          |

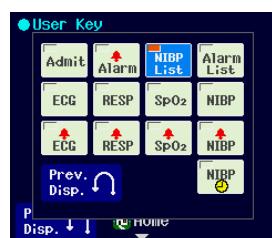
|             |                                                                                                                                                                                                       |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NOTE</b> | The preset menu includes important setup items. Therefore it is password protected to prevent unauthorized access to the preset menu. The user key setup should be performed by system administrator. |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

1 Select → → → enter password → .

The user key setup menu will be displayed.



First, select the location to assign the user key. For example, select **Admit** and press . The function selection menu will be displayed.



Select the function from the 13 selections and press .

The selected function will be assigned to the specified location.

## Tone / Volume

Sets the heartbeat tone source, NIBP end of measurement tone, key sound, ON/OFF of sound at lead-off condition.

1 Select → → .



The tone/volume setup menu will be displayed.

2 Set the alarm volume.



Adjust the volume using the keys.

3 Set the pulse tone (ECG/SpO<sub>2</sub>) volume.



Adjust the volume using the keys.

4 Set the volume for other sounds such as key sound and NIBP end tone.



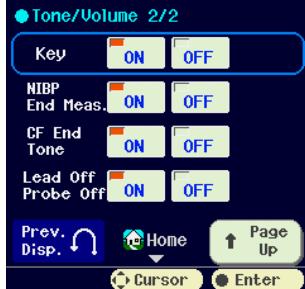
Adjust the volume using the keys.

5 Set the alarm tone.



Select from / / .

6 Select and display the second page of the tone/volume setup menu.



## 7 Set the key sound.



Key :  ON will generate a key sound.  
 OFF will not generate a key sound.

ON/OFF of NIBP periodic measurement start tone can be also set on the “Key” selection.

ON will generate a start tone.  
 OFF will not generate a start tone.

## 8 Set the NIBP end of measurement tone.



NIBP End Meas. :

ON will generate a tone when the measurement ends.  
 OFF will not generate a tone when the measurement ends.

## 9 Set the CF card end tone.



CF End Tone :

ON will generate a tone when the CF card process (recording, checking, etc) ends.  
 OFF will not generate a tone when the CF card process ends.

## 10 Set the alarm sound at lead-off or probe-off condition.



Lead Off, Probe Off :

ON will generate an alarm sound (single tone) at lead-off or probe-off condition.  
 OFF will not generate an alarm sound (single tone) at lead-off or probe-off condition.

## Color / Brightness

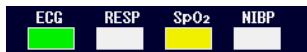
Sets the color of displayed waveform / numeric data, background color, and display brightness.

- 1 Select**  →  → .



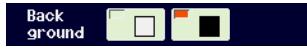
The color / brightness setup menu will be displayed.

- 2 Select the color for each parameter.**



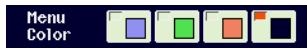
The color of waveform / numeric data can be selected for each parameter. First, select a parameter using the **◀** and **▶** keys. Pressing **●** will sequentially select a color. Select one color from 8 selections.

- 3 Select the background color for the home display.**



Select the background color of the home display from 2 selections.

- 4 Select the background color for the menu display.**



Select the background color of the menu from 4 selections.

- 5 Adjust the display brightness.**



Use the **◀** and **▶** keys to adjust the brightness. As the bar shifts to the left, the display darkens. And as the bar shifts to the right, the display brightens.

# Lamp

The lamp on the handle can be set to flash synchronized to heartbeat or pulse.

1 Select  →  → .



The lamp setup menu will be displayed.

## 2 Set the lamp source.

Changing the lamp source on this menu will also change the lamp source setup on the ECG setup menu.  
→P6-7  
“6. Parameter Setup  
■ECG  
●Lamp Source”

 **ECG** will flash the lamp in green synchronized to the heartbeat.

 **SpO<sub>2</sub>** will flash the lamp in green synchronized to the pulse.

 **OFF** will not flash the lamp.

## Lamp Indication

The lamp will light as follows according to the factor.

| Factor                        | Indicator    | Description                                                                                                                                                                            |
|-------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parameter Alarm               | Red Flash    | For the <b>Failure</b> condition of the ventilator alarm, the lamp indication differs according to the set condition. For details, refer to “3. Vital Application Ventilator Message”. |
| Lead-Off                      | Orange Flash | When ECG lead is OFF.                                                                                                                                                                  |
| Check SpO <sub>2</sub> sensor | Orange Flash | The pulse wave can not be detected. The sensor is not properly attached. The probe is disconnected.                                                                                    |
| Heartbeat Synchronization     | Green Light  | When <b>ECG</b> or <b>SpO<sub>2</sub></b> is selected for “Lamp Source” on the lamp setup menu.                                                                                        |

# Clock

Sets the clock to current time / date.

**CAUTION**

If the time/date is not correctly set, or changed during monitoring, erroneous condition may occur to NIBP measurement, CF card periodic recording and alarm list data. Set the clock before monitoring.

- 1 Select  →  → .

The clock setup menu will be displayed.



## 2 Set the year, month, day, hour, and minute.

The following is an example for setting the time / date of April 17, 2004, 11:53.

A.D. 20 **0 4 Yr**

Move the cursor to “Yr” using the   keys and enter the year using the   keys.

**4 Mo 1 7 Day**

Move the cursor to “Mo”, “Day” using the   keys and enter the date using the   keys.

**1 1 Hr 5 3 Min**

Move the cursor to “Hr”, “Min” using the   keys and enter the time using the   keys.

## 3 When the setup completes, move the cursor to and press .

The entered time / date will be effective.

## Telemetry Setup

→P8-3  
“8. Installation  
■ Telemetry  
System”

Sets the telemetry channel ID and group ID when monitoring the DS-7001 data on the central monitor.



- If the channel ID is changed without notifying, it may result in monitoring a different patient. Make sure the correct channel ID is set for the patient.
- Some wireless combinations of telemetry transmitters may generate interference with other devices.
- Before selecting the channel, verify it will not interfere with other channels.
- Make sure the telemetry manager of your system is aware of any changes to the telemetry channels.
- If transmitters are used in a neighboring medical facility, your facility and neighboring facility must make agreements on the setting of telemetry channels to prevent telemetry interference.



The setup of channel ID and group ID should be performed only by our service representative. Users should not perform this procedure as malfunction to the equipment may occur.

## Preset Menu

On the preset menu, setup of user key, AC filter frequency, range / speed of auto sizing, ventilator can be performed. Also, version information can be checked.

|             |                                                                                                                                                                                                            |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NOTE</b> | <p>The preset menu includes important setup items. Therefore it is password-protected to prevent unauthorized access to the preset menu. For password information, contact our service representative.</p> |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Selecting → → will display password input screen.



Enter the correct password using the keys, and press . The preset menu will be displayed.

## AC Filter

When the AC power noise is interfering with the ECG waveform, the AC frequency factor (50 or 60Hz) can be removed. The AC filter is always functioning.

|             |                                                                                                                          |
|-------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>NOTE</b> | <p>AC filter will not be effective for the power frequency other than 50Hz or 60Hz such as during battery operation.</p> |
|-------------|--------------------------------------------------------------------------------------------------------------------------|

1 Select → → → enter password → .

The soft switch menu will be displayed.



: Sets the AC filter frequency to 50Hz.  
 : Sets the AC filter frequency to 60Hz.

## Date Format

The date format can be selected from “12/26”, “Dec. 26”, or “26 Dec.”. The current date will be displayed for these keys. The selection can be made only for NIBP list and recording.

1 Select  →  →  → enter password → .

The soft switch menu will be displayed. Select the format for “Date”.



Select the date format for recording, NIBP list and alarm list display.

## Wide AC Filter

The DS-7001 constantly utilizes AC filter. But if the AC noise interference is still large, several types of wide AC filter can be selected.

### Adapt (Adaptive Filter)

This is the standard mode of AC filter.

This mode is intended to eliminate only the 50Hz/60Hz noise.

ECG waveform will not be affected by using this filter.

### Wide (Band Eliminate Filter)

This mode can be used when there is large AC noise interference.

The noise around 50Hz/60Hz will be eliminated.

This may influence other frequency band, which causes the R-wave amplitude to be reduced compared to when adaptive filter is used. This selection should be made by a well-experienced person.

### Adapt Wide

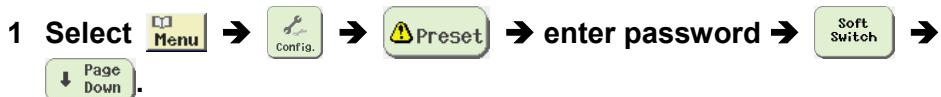
The above 2 modes of AC filter are used simultaneously. Use this mode if there is excessive AC noise interference.

### 56Hz

This mode is intended to eliminate the noise around 56Hz.

This mode can be used when the power frequency is other than 50Hz/60Hz such as uninterruptible power supply system.

Use this mode only when instructed by our service representative.



The second page of the soft switch menu will be displayed. Select the filter for “Wide AC filter”.



Select from / / / .

Blank Page

# Chapter 8

## Installation

Precautions for installation, procedure for telemetry transmission  
and ventilator connection will be explained.

|                                                |     |
|------------------------------------------------|-----|
| Precautions for Installing the Equipment ..... | 8-2 |
| Telemetry System .....                         | 8-3 |
| Telemetry Transmission ON/OFF .....            | 8-4 |
| Channel ID Setup .....                         | 8-5 |
| Ventilator Connection .....                    | 8-6 |

## Precautions for Installing the Equipment

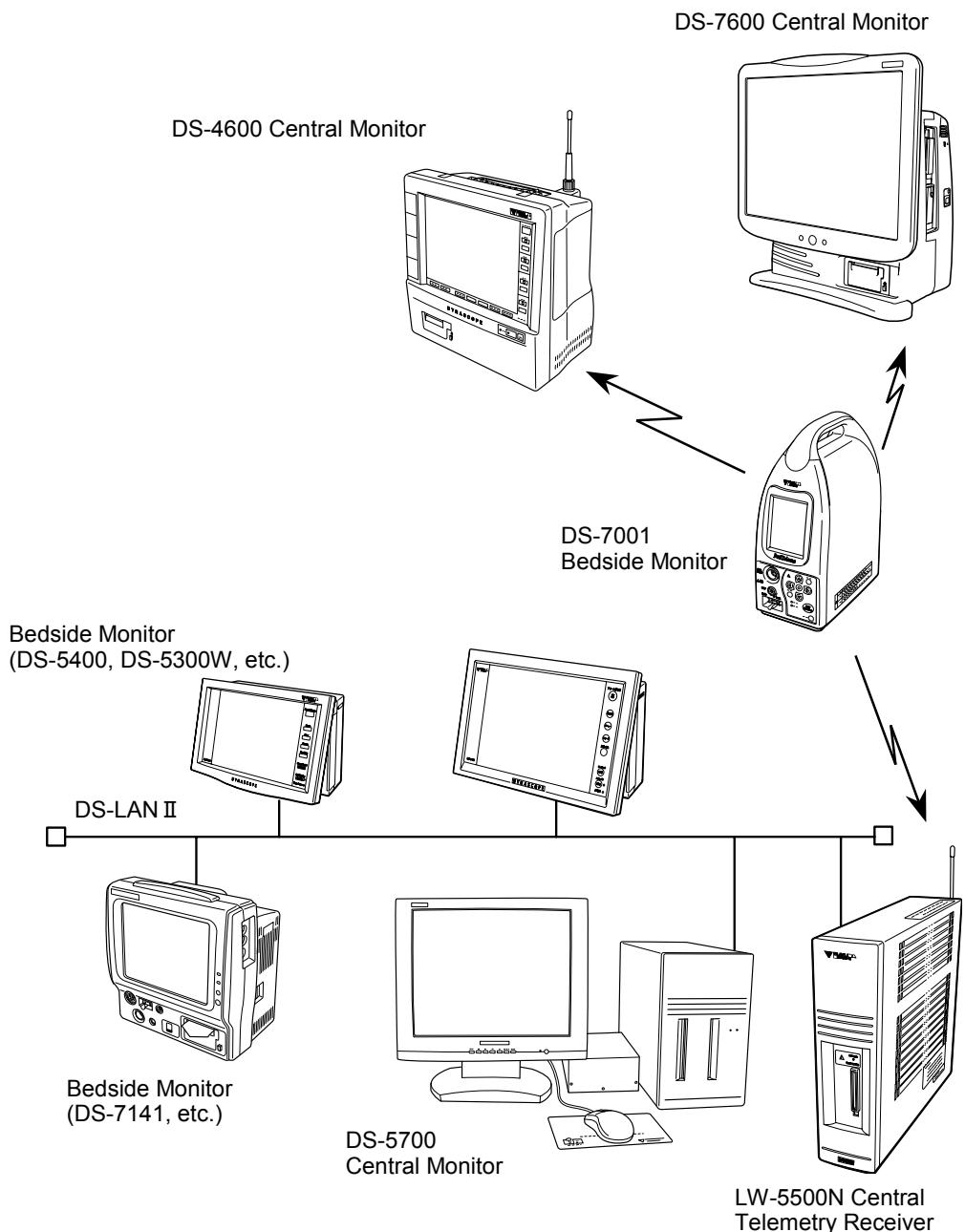
- The following environmental conditions should be observed when operating the DS-7001.
  - Surrounding Temperature : 10 ~ 40°C
  - Relative Humidity : 30 ~ 85% (non-condensing)
- The DS-7001 is intended for patient monitoring in the general ward, ICU, CCU, OR and during in-hospital transportation. Do not use in the MRI environment, inside hyperbaric chamber, flammable anesthetic gas and outside hospital (including inside ambulance).
- The power source should fulfill the following condition.
  - Always use a hospital grade, 3 prong grounded power cable.
  - Verify the power voltage and frequency before connecting to an AC power source.
  - Use the power source that can provide adequate power to the device.
- Pay attention when installing or storing the device. Do not install or store in the following locations.
  - Where chemicals are stored or gas may generate
  - Where the equipment will be subject to splashing water or humidity from a nebulizer or vaporizer
  - Where the equipment will be subject to direct sunlight
  - Unstable place with inclination, vibration, or shock
- Proper ventilation is required to cool the device.
  - Do not cover the vent hole located at the rear side of the monitor. A minimum space of 3 cm is required between the monitor and the wall.
  - If the monitor is embedded in a wall or surrounded by a wall, a minimum space of 3 cm is required above the monitor.



- Do not cover the vent hole located at the rear side of the monitor.
- If this device is used under adverse environmental conditions, not only that the device can not deliver its maximum performance, the device may be damaged and safety cannot be ensured.
- If using the device under condition other than specified above, contact our service representative.

# Telemetry System

This section explains the procedure to use this equipment with telemetry system. The DS-7001 incorporates a telemetry transmitter. As antenna is also incorporated, external antenna is not required.



Telemetry System

**WARNING**

- If the channel ID is changed without notifying, it may result in monitoring a different patient. Make sure the correct channel ID is set for the patient.
- Some wireless combinations of telemetry transmitters may generate interference with other devices.
- Before selecting the channel, verify it will not interfere with other channels.
- Make sure the telemetry manager of your system is aware of any changes to the telemetry channels.
- If transmitters are used in a neighboring medical facility, your facility and neighboring facility must make agreements on the setting of telemetry channels to prevent telemetry interference.

**CAUTION**

The setup of channel ID and group ID should be performed only by our service representative. Users should not perform this procedure as malfunction to the equipment may occur.

## Telemetry Transmission ON/OFF

ON/OFF of telemetry transmission to the central monitor can be selected.

1 Select  →  →  → enter password → .

The soft switch menu will be displayed. Select ON/OFF for “Telemeter”.



If **OFF** is selected, telemetry transmission will not be performed. The channel ID on the home display will be displayed as **CH OFF**.

To perform telemetry transmission, select **ON**.

# Channel ID Setup

- 1 Select  →  → .

The telemeter setup menu will be displayed.



- 2 To set the telemetry channel ID, a password must be input. First, enter the password.

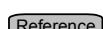
 7 0 0 1

Enter the 4-digit password, “7001” using the   keys.

- 3 Enter the channel ID.

 6 0 1 5

Enter the 4-digit medical telemetry channel ID. The channel ID other than medical telemetry will not be set.



【Adjustable Range of Telemetry Channel】

ch3001 ~ ch6979

(\*\*80~\*\*99: not adjustable)

- 4 Enter the group ID.

 0 0

Enter the group ID in the range from 00 to 60.

- 5 Save the channel ID and group ID.

Select , and press .

|             |                                                                                                                                                                                                                                                                                                                           |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NOTE</b> | When the monitor indicates that the measurement data is out of range (“xxx” display), the minimum or maximum value of the range will be displayed at the telemetry center.<br><br>【Out of Range】 【Telemetry Center】<br>HR            301bpm or above            300bpm<br>RR            151bpm or above            150bpm |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



## Ventilator Connection

By connecting the ventilator to this monitor, ventilator information is input and ventilator message such as communication status and alarm can be displayed on the screen for monitoring.

This section explains the procedure to connect the DS-7001 to the ventilator and generate an alarm.

When connecting the ventilator, check the corresponding version of the ventilator.

| <i>Ventilator</i> | <i>Corresponding Version</i>                                |
|-------------------|-------------------------------------------------------------|
| SV900             | not specified                                               |
| SV300             | not specified                                               |
| Servo-i           | v1.5 / v2.0                                                 |
| Servo-s           | v2.0                                                        |
| PB-740            | M                                                           |
| PB-760            | H                                                           |
| PB-840            | K                                                           |
| VELA              | Main Software : MSP:VH2.07.00<br>IO Software : IOP:V0.01.00 |
| Evita 2 dura      | 04.14                                                       |
| Evita 4           | 04.14                                                       |
| Evita XL          | 05.10                                                       |
| E200              | 5.2.0                                                       |

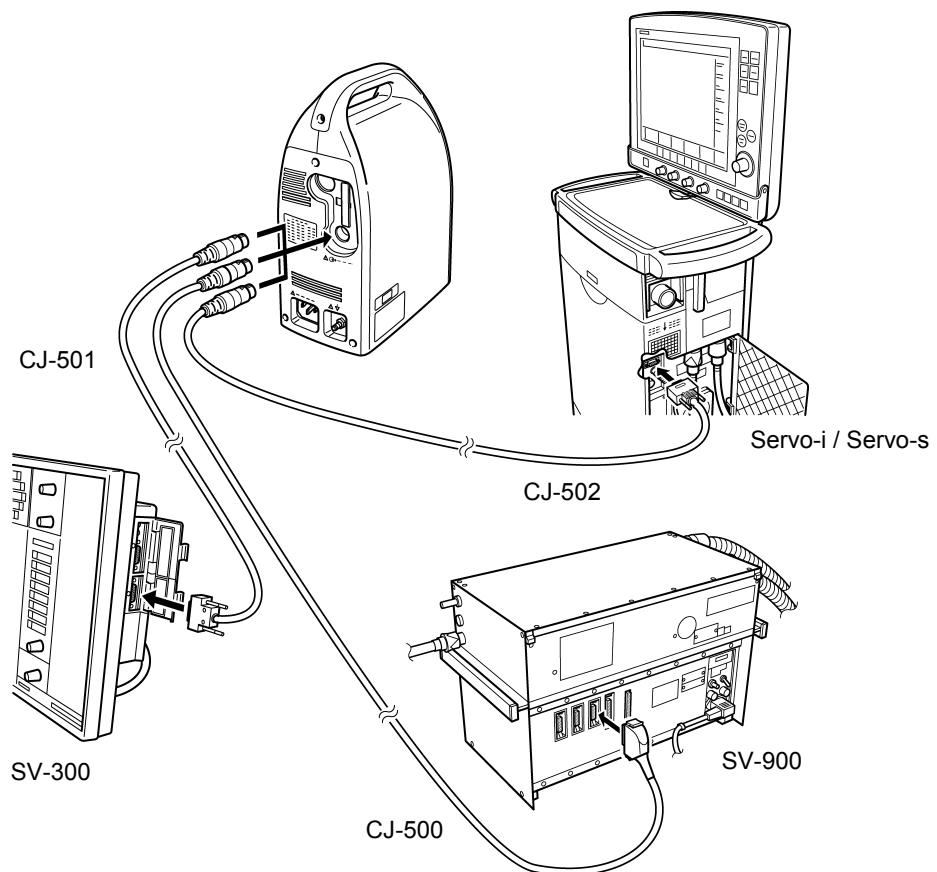
### CAUTION

- The ventilator operation should be performed by well-trained and authorized personnel.
- For connecting the DS-7001 and ventilator, use only the specified connection cable.
- Verify that the DS-7001 and the ventilator are properly connected.
- When connecting the cable, verify that the main power of the DS-7001 and the ventilator is OFF.

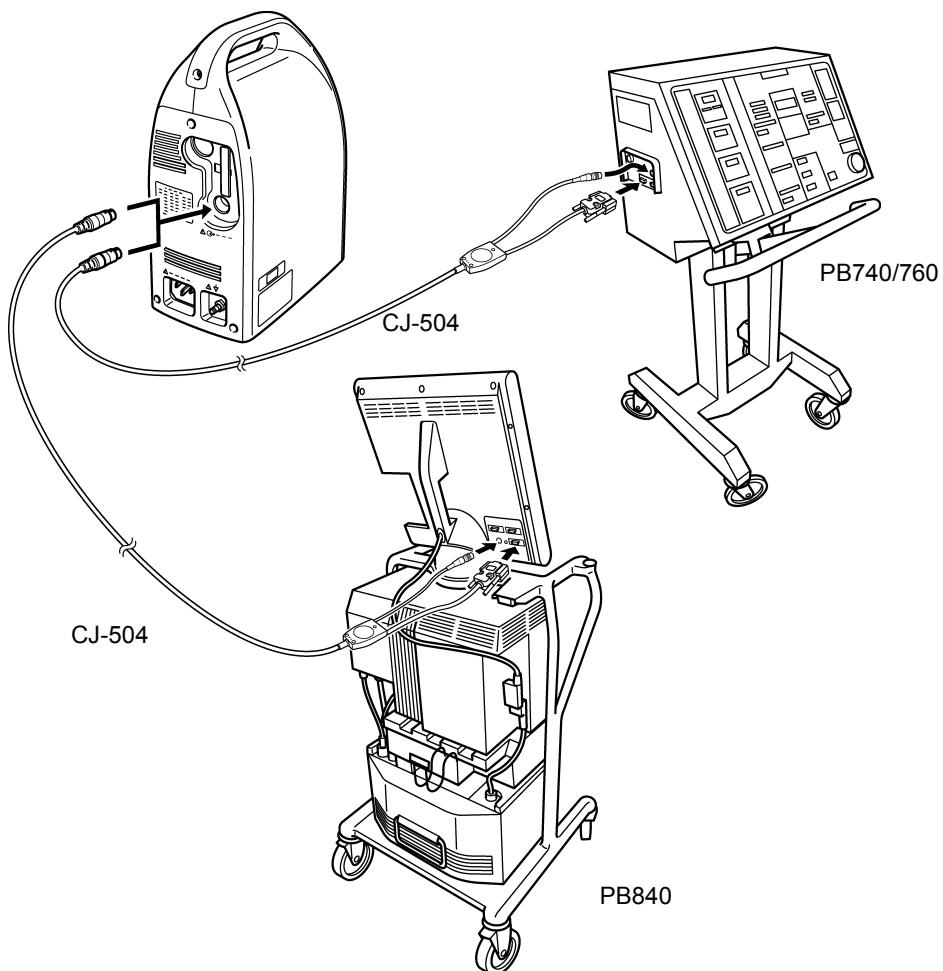
### 1 Connect the ventilator to the I/O port located on the backside of DS-7001 using the optional connection cable.

| <i>Ventilator</i>                 | <i>Connection Cable</i> |
|-----------------------------------|-------------------------|
| SV-900                            | CJ-500                  |
| SV-300                            | CJ-501                  |
| Servo-i                           | CJ-502                  |
| PB-740 / PB-760 / PB-840          | CJ-504                  |
| VELA                              | CJ-505                  |
| Evita 2 dura / Evita 4 / Evita XL | CJ-502                  |
| E200                              | CJ-506                  |

**[SV-900, SV-300, Servo-i, Servo-s]**



## 【PB-740, PB-760, PB-840】

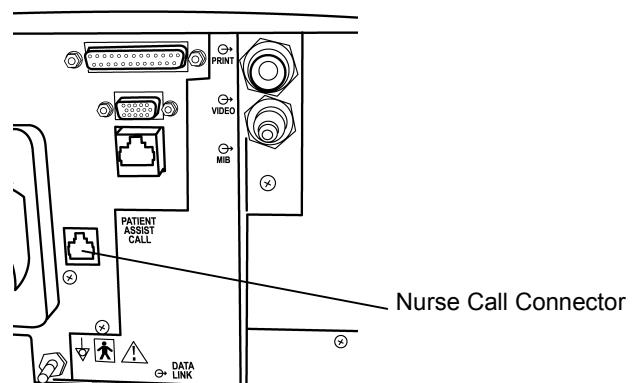
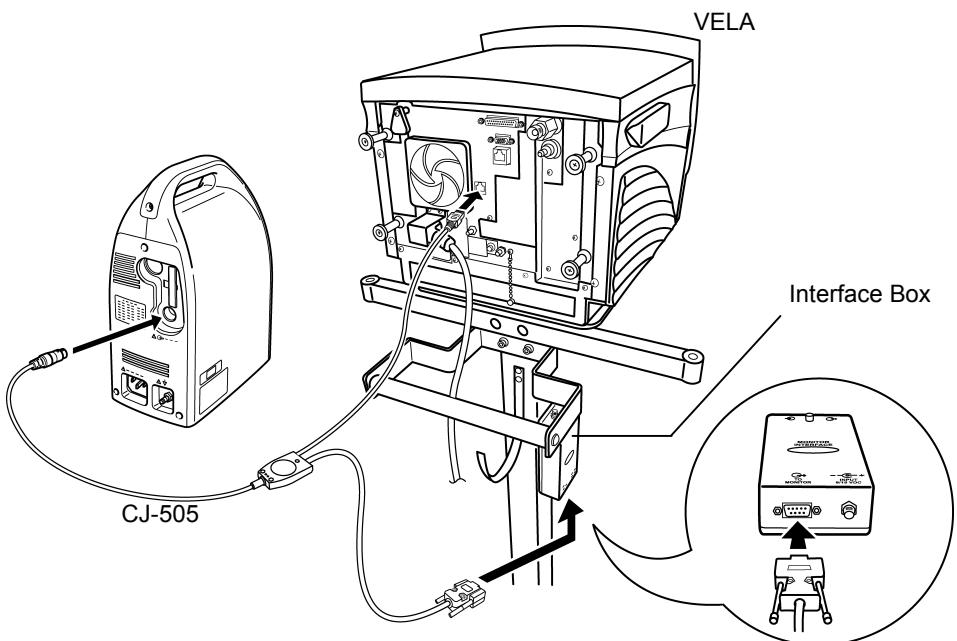


**CAUTION**

- When connecting the PURITAN-BENNETT ventilator, follow the precautions below.
  - The serial port (RS-232C) of the ventilator should be set as follows. Refer to the service representative of the ventilator manufacturer.

Baud Rate : 9600bit/s  
Data Bit : 8bit  
Parity Bit : none  
(Stop Bit) : (1bit)
  - The DS-7001 detects the “ventilator alarm” when the nurse call port on the ventilator outputs the alarm signal. For details of ventilator setup and alarm signal output condition from the nurse call port, refer to the service representative of the ventilator manufacturer.

## [VELA]

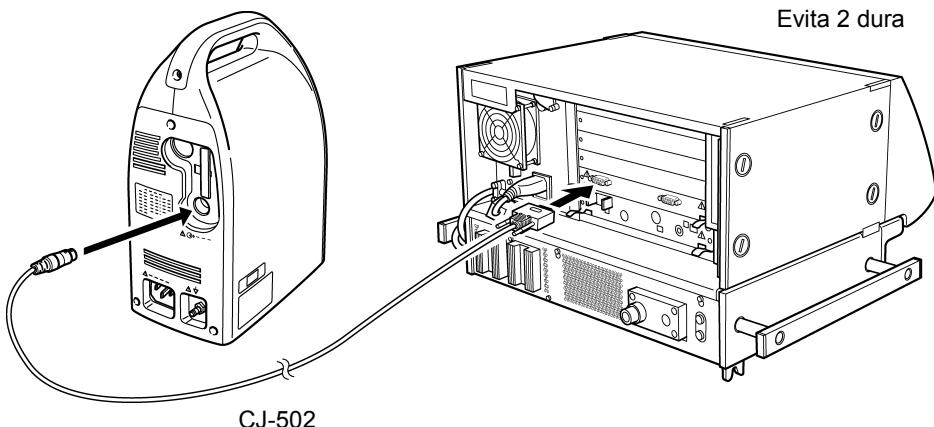


**CAUTION**

The cable must be connected to the "nurse call connector" on the rear side of VELA. Do not connect to the "PATIENT ASSIST CALL".



## [Evita 2 dura]



### **WARNING**

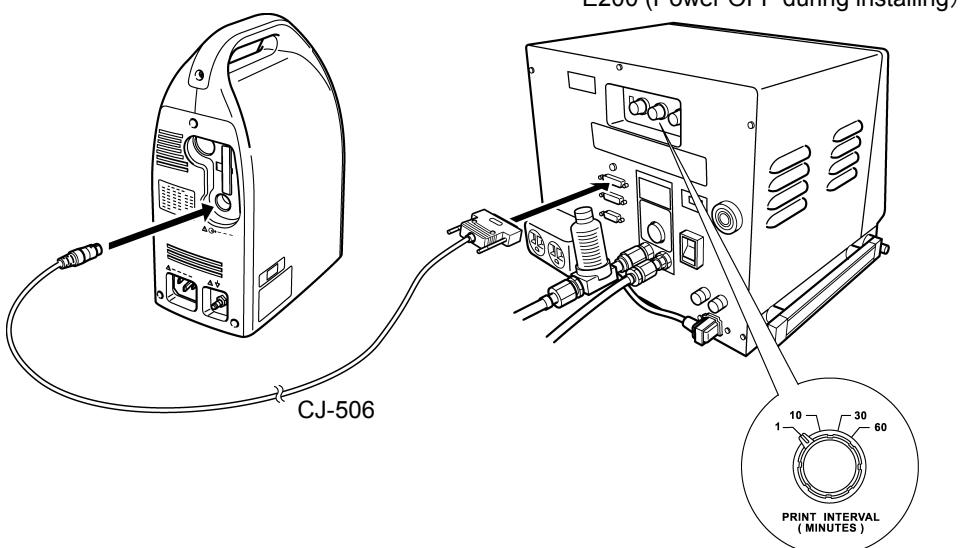
When connecting the Evita2dura / Evita4 / Evita XL ventilator, follow the precautions below.

- The serial port (RS-232C) setup of the ventilator should be as follows. Refer to the service representative of the ventilator manufacturer.

Protocol : Medibus  
Baud Rate : 19200bit/s  
Data Bit : 8bit  
Parity Bit : Even  
Stop Bit : 1bit

- The DS-7001 will not correspond to the following alarm generated at the ventilator.

O<sub>2</sub> monitoring disabled alarm  
CO<sub>2</sub> alarm disabled alarm  
Oximeter alarm disabled alarm  
Neo. volume measurement inoperable alarm  
Minute volume alarm disabled alarm  
Minute volume alarm low off alarm  
Tidal volume alarm high off alarm  
Apnea alarm off alarm  
Nebulizer active alarm

**[E200]**

**WARNING**

When connecting the E200 ventilator, follow the precautions below.

- When connecting the cable, the power of the E200 should be turned OFF. It should be also turned OFF when performing ventilator setup on the DS-7001. Otherwise, proper alarm monitoring cannot be performed.
- The ventilator alarm display on the DS-7001 is not assured if the alarm other than the following generates on the E200.  
Upper / lower airway pressure alarm  
Upper / lower minute ventilation alarm
- The "gas supply source failure" alarm generated on the E200 will not be generated on the DS-7001.
- The apnea alarm (30 seconds of apnea) generated on the E200 will be also generated on the DS-7001.
- When monitoring the alarm of the E200, verify that the power of the E200 is OFF before turning ON the power of the DS-7001. Otherwise, confirmation screen will be displayed on the DS-7001. In such case, check that the ventilator is not in alarm condition before monitoring the alarm.
- If "Compass VM200"(optional accessory of E200) is connected to the E200, do not use the DS-7001. The alarm generated on the VM200 will not be transmitted to the DS-7001.

**CAUTION**

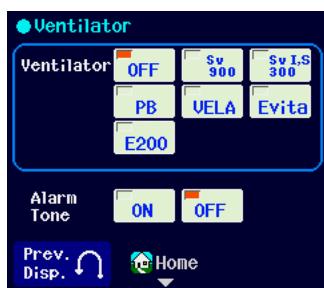
- The PRINT INTERVAL dial on the rear side of the ventilator should be set to 1 minute. (See illustration above.) Refer to the service representative of the ventilator manufacturer.
- The DS-7001 detects the "Ventilator Alarm" when the alarm signal is output from the serial port of the E200. For output condition of the alarm signal, refer to the service representative of the ventilator manufacturer.

**2 Turn ON the power of the DS-7001 and the ventilator.**

**3 Select the ventilator type.**

Select  →  →  → enter password → .

The ventilator setup menu will be displayed.



- |                                                                                   |                                                                                             |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
|  | : Select when not connecting the ventilator.                                                |
|  | : Select when connecting the SV-900.                                                        |
|  | : Select when connecting the SV-300, Servo-i, or Servo-s.                                   |
|  | : Select when connecting the PURITAN-BENNETT ventilator, PB-740, PB-760, PB-840.            |
|  | : Select when connecting the BIRD ventilator, VELA.                                         |
|  | : Select when connecting the Dräger Medical® ventilator, Evita 2 dura / Evita 4 / Evita XL. |
|  | : Select when connecting the Newport ventilator, E200.                                      |

**WARNING**

- When selecting , the power of the E200 ventilator should be turned OFF. Proper alarm monitoring will not be performed if installing or setup of the E200 is performed without the power being turned OFF.
- If  is selected for ventilator, ventilator message will not be displayed on the screen and ventilator alarm will not be generated. A proper selection should be made when connecting a ventilator.

**4 Select ON/OFF of ventilator alarm sound.**

- |                                                                                     |                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | : Ventilator alarm sound will be generated on the DS-7001.                                                                                                                                              |
|  | : Ventilator alarm sound will not be generated on the DS-7001.<br>The "VENT" message will not be displayed either.<br>However, ventilator alarm information will be transmitted to the central monitor. |

**WARNING**

If  is selected, the "VENT" message will not be displayed at the alarm message area even if the ventilator alarm is generated.

**5 Check that the alarm is not generated on the ventilator and **Normal** is displayed at the upper right of the DS-7001 screen for the ventilator message.**

|                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>CAUTION</b> | <ul style="list-style-type: none"><li>● When turning ON the power of the SV-300, it will take about 30 seconds to start communication.</li><li>● When the ventilator is in alarm condition, <b>Alarm</b> will be displayed for the ventilator message.</li><li>● When the SV-300, Servo-i, Servo-s is operated by battery, alarm will be generated on the DS-7001. Do not use the DS-7001 when the ventilator is operated by battery.</li></ul> |
|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**6 Start monitoring the ventilator information.**

|                                                                                                     |                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>CAUTION</b> | During monitoring, always verify the proper communication of the DS-7001 and the ventilator. Check that the alarm is not generated at the ventilator, and <b>Normal</b> is displayed for the ventilator message on the DS-7001. |
|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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# Chapter 9

## Maintenance

The maintenance of the equipment and troubleshooting will be explained.

|                                                                 |      |
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## **Handling and Storage**

---

This section describes precautions for handling and storing the equipment.

### **Handling After Use**

---

- Do not apply excessive force when disconnecting the cables. Always pull on the connector housing and not on the cable.
- Clean the unit, accessories, and cables, and keep them together in one place for next use.
- Always check for adequate supply of disposable accessories such as ECG electrodes. If any shortage, contact our service representative and supply as necessary.

### **Handling the Display Panel**

---

- The display panel utilizes white LED for the backlight. As this LED has product life cycle, it needs to be replaced periodically. If the display becomes dark, scintillates, or does not light, contact your nearest service representative.
- Although the LCD utilizes highly accurate picture elements, occasionally, there may be few pixels which does not light or constantly lights. Please note that this is not an equipment failure, and will not affect monitoring operation.

### **Storage**

---

- Store in a place where the device will not be exposed to splashing water.
- Store in a place where the device will not be adversely affected by atmospheric pressure, temperature, humidity, ventilation, sunlight, dust or atmosphere containing salt or sulfur.
- Store in a level area where the device is not exposed to vibration and shock (including during transportation).

# Cleaning

## Cleaning the Housing

Clean the housing using tightly squeezed gauze or an absorbent cotton cloth dampened with alcohol or a neutral cleanser.



### CAUTION

- 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 monitor 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 monitor or connectors.
- Use only neutral detergent to clean the housing. 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. The surface resin coating may be damaged, resulting in discoloration, scratches, and other problems.

## Cleaning and Disinfecting the SpO<sub>2</sub> Transducer

- Do not soak the sensor in water or antiseptic solution.
- Wipe the DURASENSOR with disinfectant such as 70% alcohol. Do not disinfect by applying radioactive rays, steam, or ethylene oxide.
- OXISENSOR is a disposable sensor. Do not reuse or attempt resterilization.

# Battery

This section describes about the handling and storage of the battery pack.

## Handling the Battery

- The battery pack can be continually used for more than 300 times (or about 2 year) under normal temperature, but the continuous use will degrade the battery and shortens the usable time.
- When the battery operation time becomes short even after it is fully charged, the battery pack needs to be replaced.
- When the charge time of the battery pack becomes short, the battery pack needs to be replaced.
- When the battery pack level becomes low, charge the battery well in advance for the next use.

## Storing the Battery

To take advantage of the characteristic of battery pack, pay attention to the following when storing.

### Storage Temperature and Humidity

- Store in an environment specified below without corrosive gas.

| <i>Storage Period</i> | <i>Storage Temperature</i> | <i>Storage Humidity</i> |
|-----------------------|----------------------------|-------------------------|
| Within 30days         | -20 ~ 50°C                 |                         |
| 30 days ~ 90 days     | -20 ~ 40°C                 | 65±20%                  |
| 90 days ~ 1year       | -20 ~ 30°C                 |                         |

- Do not store in an environment outside the specified temperature range or excessive high humidity. This may result in leakage caused by expansion/contraction inside the battery pack, or rusting of the metal part.

### Long-term Storage

- If left installed in the monitor for long period of time, the electrolyte may leak, or inactivate the battery which degrades the capacity recovery after storage. Therefore, always remove the battery from the monitor when storing for long period of time. Contact our service representative when removing the battery.

# Maintenance Check

This section explains the daily check and periodic check items of the device.

## About the Maintenance Check

Periodic inspection must be performed. When reusing the device which was left unused for a while, always check that the device operates properly and safely before use.

To ensure safety, reliability, and high performance, a “Daily Check” and “Periodic Inspection” must be performed. We are not liable for any accident arising from lack of maintenance.

|                                                                                                     |                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>CAUTION</b> | <ul style="list-style-type: none"><li>● Do not open the housing of this device.</li><li>● Avoid alcohol or other liquids from getting into the equipment.</li></ul> |
|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Daily Check

Perform daily inspection using the “Daily Check List”.

## Periodic Check

Periodic inspection of medical electronic equipment is mandatory to prevent failures and accidents and to ensure safety and reliability.

Periodic maintenance may be performed by each medical institution or by a third party by concluding a “Maintenance Contract”.

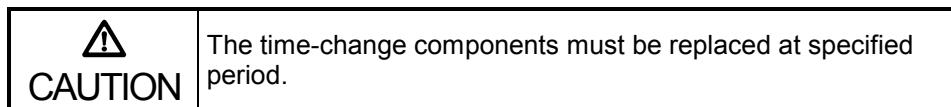
For more details, contact your nearest service representative.

## Time-Change Components

---

To ensure reliability of safety, function, and performance of this device, the time-change components must be replaced periodically. When replacing, contact our service representative.

| <i>Component</i> | <i>Replacing Period</i>                                            |
|------------------|--------------------------------------------------------------------|
| LCD Unit         | 10,000 hours or more of continuous use, or 2 years or more of use. |
| Battery Pack     | 2 years, or 300 times of charging / discharging.                   |



# Daily Check List

No. \_\_\_\_\_

Inspected Date \_\_\_\_\_

Inspected by \_\_\_\_\_

Location \_\_\_\_\_

Device DS-7001 \_\_\_\_\_

Serial No. \_\_\_\_\_

Date of Purchase \_\_\_\_\_

| <b>Item</b>                | <b>Details</b>                                                                                                       | <b>Criteria</b>                                                                                                                                                | <b>Judgement</b>                                           |
|----------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| <i>Appearance</i>          | Visually check the exterior for scratches, cracks, deformation, and rust                                             | No abnormality should be found.                                                                                                                                | <input type="checkbox"/> OK<br><input type="checkbox"/> NG |
| <i>Installation</i>        | Check whether the unit is installed on a level surface.                                                              | The installation area must be level and free from vibration and shock.                                                                                         | <input type="checkbox"/> OK<br><input type="checkbox"/> NG |
|                            | Check whether the unit is installed in a place susceptible to adverse environment.                                   | The environmental condition (ex. temperature, humidity) of the installed place should be as specified.<br>The unit should not be subjected to splashing water. | <input type="checkbox"/> OK<br><input type="checkbox"/> NG |
| <i>Functions</i>           | Turn ON the monitor, and check whether it operates normally.                                                         | The home display appears.                                                                                                                                      | <input type="checkbox"/> OK<br><input type="checkbox"/> NG |
|                            |                                                                                                                      | Pressing the  key displays the menu.                                                                                                                           | <input type="checkbox"/> OK<br><input type="checkbox"/> NG |
| <i>Telemetry Channel</i>   | Check the channel ID and group ID at the receiver side if they are as specified by the telemetry channel manager.    | It should conform to telemetry channel check list.                                                                                                             | <input type="checkbox"/> OK<br><input type="checkbox"/> NG |
| <i>Zone Location</i>       | Visually check the location label color and used location if they are as specified by the telemetry channel manager. | It should conform to telemetry channel check list.                                                                                                             | <input type="checkbox"/> OK<br><input type="checkbox"/> NG |
| <i>Telemetry Function</i>  | Turn the power ON and check the function and operation of the monitor at the receiving device.                       | The waveform and numeric data should be properly received at the central monitor.                                                                              | <input type="checkbox"/> OK<br><input type="checkbox"/> NG |
| <i>Cables</i>              | Visually check all cables for any damage.                                                                            | No damage should be found.                                                                                                                                     | <input type="checkbox"/> OK<br><input type="checkbox"/> NG |
| <i>Periodic Inspection</i> | Check the date of previous periodic inspection.                                                                      | Should be within 1 year.                                                                                                                                       | <input type="checkbox"/> OK<br><input type="checkbox"/> NG |

**Comment**

# Troubleshooting

The following troubleshooting tips are for the DS-7001 Bedside Monitor. Other than the following, problems of other devices such as the central monitor can be considered.

Refer also to the operation manual for the used devices.

## ECG

### **ECG waveform contains noise.**

Cause 1 : The electrode contact is poor.

Electric blanket or other noise source is near the patient.

Solution : • Attach the electrodes firmly.

• Replace the lead cable if defective.

• If any noise source is near the patient, locate it away from the patient as much as possible.

• Set the “Wide AC Filter” to **Wide** or **Adp Wide**.

• Change the noise filter mode. (Default: Weak)

Note : Selecting **Strong** for the noise filter mode will decrease the QRS amplitude and may result in not counting the heart rate.

Cause 2 : EMG is interfering.

Solution : Change the electrode site to a location where EMG will less likely to interfere.

### **Heart rate is not counted. Heart rate is low.**

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

Solution : Change the electrode site, or select a lead with higher QRS amplitude.

### **Heart rate is not counted, and “LEAD OFF” message is displayed.**

Cause : The electrode of the displayed lead type is detached, or is not making good electrical contact with the skin. If the lead type is not displayed, 2 or more electrodes are detached.

Solution : • Check the electrode application.

• Replace the electrode, or check the lead cable.

### **Artificial pacemaker is not displayed.**

Cause 1 : On the admit menu, **No** is selected for the pacemaker use.

Solution : Select **Yes** for the pacemaker use.

Cause 2 : On the ECG configuration menu, “Pace. Pulse” is set to **Color**.

Solution : Select **ON** or **Color** for “Pace. Pulse”.

### **Automatic gain is not properly performed.**

Cause : The automatic gain is influenced by QRS detection result. If QRS

detection fails, proper automatic gain can not be performed.

Solution : Select a fixed gain for the waveform.

---

## **Respiration**

---

### **“0” is displayed for respiration rate.**

Cause : The respiration waveform amplitude is below the automatic detection level ( $0.2\Omega$ ).

Solution : Change the electrode site where large ECG amplitude can be acquired. As the respiration detection by impedance method shares the same ECG electrodes, RR value will not be properly displayed when in “lead off” condition or when electrode condition is unstable.

---

## **NIBP**

---

### **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 is not corresponded to the selected patient type.

Solution : Check if the cuff size is corresponded to the selected patient type.

### **“ERROR” message is displayed and the measurement is ceased.**

Cause 1 : The measurement accuracy is not reliable due to body motion artifact.

Solution : Have the patient stay still as much as possible during the measurement.

Cause 2 : The pulse is too small to acquire reliable measurement accuracy.

Solution : Check if the cuff application is proper, and if the cuff size is corresponded to the selected patient type.

Cause 3 : The applied pressure to the cuff has exceeded the maximum limit.

Solution : Check if the cuff application is proper, if the cuff size is corresponded to the selected patient type, or if the air hose is not bent. After checking the above, perform the measurement again.

If the “ERROR” message is displayed again, a failure of the equipment can be considered. Cease the measurement, and contact our service representative.

Cause 4 : The measurement duration has exceeded the maximum duration.

Solution : Check if the cuff application is proper, or if the cuff size is corresponded to the selected patient type. Also, a body motion may extend the measurement duration. Perform the measurement again. If the “ERROR” message is displayed again, a failure of the equipment can be considered. Cease the measurement, and contact our service representative.

Cause 5 : The measurement is ceased during pressurization.

Solution : Check if the air hose is properly connected. Also, check if the cuff application is proper, or if the cuff size is corresponded to the selected patient type. If the “ERROR” message is displayed again, a failure of the equipment can be considered. Cease the measurement, and contact our service representative.

|             |                                                                                                                                                                                                                                                                                                                                        |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NOTE</b> | For the following situation, measurements will be terminated. <ul style="list-style-type: none"><li>• When the measurement time has exceeded 120 seconds for adult, 90 seconds for child, 60 seconds for neonate.</li><li>• When the inflation value has exceeded 310mmHg for adult, 210mmHg for child, 160mmHg for neonate.</li></ul> |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## **SpO<sub>2</sub>**

---

### **The pulse waveform is not displayed.**

Cause 1 : The amplitude of the pulse waveform is low, or the sensor is not positioned correctly.

Solution : Check if the light emitting part and light receiving part of the sensor LED is aligned.

Cause 2 : Sensor is defective.

Solution : Replace the sensor.

Cause 3 : SpO<sub>2</sub> sensor is not firmly connected to the SpO<sub>2</sub> input connector.

Solution : Make sure the SpO<sub>2</sub> sensor is securely connected.

Cause 4 : Sensor is exposed to light.

Solution : Place a black or dark cloth over the sensor to avoid direct sunlight. Also when not used, avoid placing the sensor in light or unplug the sensor from the connector.

### **The SpO<sub>2</sub> value is unstable.**

Cause : There is excessive body motion of the patient which disables correct measurement.

Solution : 1. Have the patient lie still as much as possible.

2. Relocate the sensor, or change the sensor to which the body motion will have less influence.

### **“Com Err” is displayed in the SpO<sub>2</sub> numeric data area, and the measurement is ceased.**

Cause : The hardware is not properly operating due to static electricity, etc.

Solution : Wait for about 2 minutes until the “Com Err” message disappears.

If the message does not disappear, restart the system.

If the “Com Err” message is displayed again, cease the measurement and contact our service representative.

### **“Sensor Err” is displayed in the SpO<sub>2</sub> numeric data area, and the measurement is ceased.**

Cause : Sensor is defective.

Solution : Replace the sensor. If the situation does not improve even after the replacement, contact our service representative.

## **Alarm**

---

### **Alarm sound does not generate. Alarm is not displayed.**

Cause 1 : The alarm is suspended.

Solution : While the alarm is suspended, the message “ALARM SUSPEND” is displayed and alarm will not generate even if the individual parameter alarm is set to ON. When the suspend time completes, the system alarm automatically resets to ON. To set the system alarm ON, cancel the alarm suspend function on the alarm setup menu.

Cause 2 : The individual parameter alarm is set to OFF.

Solution : Even if “All Alarm” is set to ON, if individual parameter alarm is set to OFF, the alarm will not generate. Turn ON the alarm on the alarm setup menu for each parameter.

Reference

For the parameter which the alarm is set OFF, the alarm off symbol “☒” is displayed in the numeric display area

Cause 3 : Individual parameter alarm limits are not set.

Solution : Set the individual parameter alarm limits.

Reference

Even if the individual parameter alarm is [ON], if the parameter limits are [OFF], the alarm off symbol “☒” is displayed in the numeric display area.

## Ventilator Alarm

---

### **Wait** is displayed for the ventilator message.

- Cause : It indicates one of the following conditions.
- Waiting condition for proper communication with the ventilator.
  - The monitor power is turned ON, and in waiting condition for proper communication with the ventilator.
  - **Failure** is indicated and **Wait** is selected on the ventilator display.
- Solution : When proper communication is resumed, **Normal** will be displayed for the ventilator message.

### **Alarm** is displayed for the ventilator message.

- Cause : The following alarm is generated on the ventilator.
- The parameter alarm such as airway pressure, minute ventilation, FiO<sub>2</sub> is generated.
  - The technical alarm of the ventilator such as “Replace O<sub>2</sub> cell” is generated.
- Solution : Check the cause of the alarm generated at the ventilator and take appropriate action.

### **Failure** is displayed for the ventilator message. The ventilator display is also displayed.

- Cause : The monitor can not properly communicate with the ventilator due to the following cause.
- The ventilator power is turned OFF.
  - The ventilator is in standby mode.
  - The cable connecting the ventilator and the monitor is disconnected or is not firmly connected.
- Solution : Check the alarm cause and take appropriate action.  
When proper communication is resumed, **Normal** will be displayed for the ventilator message.

## Waveform Display

---

### A noise interferes on the waveform, or waveform suddenly changes.

- Cause 1 : The AC filter is not selected correctly.
- Solution : Select the proper frequency ( **50Hz** or **60Hz** ) for the AC filter in the preset menu.
- Cause 2 : The noise filter is set to OFF.
- Solution : Select **Weak** or **Strong** for the “Noise Filter” on the ECG setup menu.

### **The waveform transmission has stopped. Waveform is not displayed.**

Cause : The antenna cable inside the device is disconnected.

Solution : Firmly connect the antenna cable.

## **General**

---

### **Numbers are displayed in the center of the screen.**

Cause : The monitor is in test mode. Stop using the monitor immediately.

Solution : The internal switch needs to be switched to standard mode. Contact our service representative. Turn off the DIP switch No.5 and No.6.

### **The clock is often delayed or showing incorrect time.**

Cause : The lithium battery for data backup is depleted.

Solution : The battery needs to be replaced. Contact our service representative.

## **Battery**

---

### **Charging can not be performed. Even when charged, it discharges quickly and does not operate.**

Cause 1 : The battery life has expired.

Solution : The battery is a consumable product. Replace every 2 years.

Cause 2 : The ambient temperature is too high or too low.

Solution : Charge the battery in an ambient temperature of 10 ~ 30°C.

Cause 3 : The AC power is not turned ON.

Solution : Connect the power cable, turn the power switch ON, and press the  key on the front panel to turn off the display.

### **The operation time is short although the battery is charged.**

Cause 1 : The ambient temperature is too low.

Solution : When the battery is used in excessively low temperature, the operation time becomes short.

Cause 2 : The battery life has expired.

Solution : The battery is a consumable product. Replace every 2 years.

### **The charge lamp on the patient monitor does not light.**

Cause : The battery temperature is too high.

Solution : When charging is repeated in short duration, the battery temperature rises. For safety, the charging operation will be in a standby mode until the battery temperature decreases.

The charging will automatically resume when appropriate temperature is reached.

### **The AC power cable is connected, but charging can not be performed.**

#### **The battery lamp does not light.**

Cause : The battery is not installed.

Solution : Remove the bottom cover and check the battery cable. Connect the battery cable if disconnected.

|                                                                                                     |                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>WARNING</b> | The battery installation is to be performed by our service representative. Users should not attempt the procedure as electric shock or malfunction of the device may result. |
|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## **CF Card**

### **The background color of **CF** is yellow, and “ERR.” message is displayed.**

Situation 1 : “ERROR xxxRecDir” is displayed on the CF format menu.

Cause : There is no REC directory on the CF card.

Solution : Format the card.

Situation 2 : “ERROR xxxFormat” is displayed on the CF format menu.

Cause 1 : The CF card is not formatted.

Solution : Format the card.

Cause 2 : The CF card is not fully inserted.

Solution : Remove the CF card, and reinsert the card correctly.

Situation 3 : “ERROR xxxNolnit” is displayed on the CF format menu.

Cause : Card check procedure has not been performed at CF card insertion.

Solution : Remove the card from the monitor and insert again. The card check procedure will automatically start.

Situation 4 : “ERROR xxxOverwk” is displayed on the CF format menu.

Cause : The number of recording times has exceeded 30,000 times.

If recording is continued, the card condition will become unstable.

Solution : Format the card.

Situation 5 : "ERROR xxxTimeEr" is displayed on the CF format menu.

Cause 1 : Due to CF card failure, reading (writing) is taking too much time.  
Solution : Do not use this card. Prepare a new card.

Cause 2 : The CF card was removed during recording.

Solution : Do not remove the CF card during recording. It may damage the CF card.

Situation 6 : "ERROR xxxCF 32M" is displayed on the CF format menu.

Cause : The card capacity is lower than 32MB.

Solution : Use the specified CF card (32MB or above).

**The background color of  is yellow, and “FULL” message is displayed.**

Cause : There is no space on the CF card to write data.

Solution : Format the card.

If you do not want to erase the data on the CF card, prepare an another card.

|                                                                                                     |                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>CAUTION</b> | When deleting the data on the CF card, format the CF card on the DS-7001. The file can not be completely deleted by the delete process on the PC. |
|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|

**“CF Read Caution” is displayed on the CF format menu.**

Cause : The CF card is beginning to damage. It may take time to read and write data on the CF card.

Solution : Prepare a new card well in advance, and avoid using the old card.

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# Chapter 10

## Technical Information

The technical information of this equipment is explained.

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# Specification/Performance

This section states the specification and performance of this equipment.

## Specification

### Size/Weight

Size : 110(W) × 200(D) × 280(H) mm \*not including the protrusion  
Weight : Approx. 2.5 kg

### Environmental Conditions

Operating Temperature : 10 ~ 40°C  
Operating Humidity : 30 ~ 85 % (non-condensing)  
Transport / Storage Temperature : -10 ~ 60°C  
Transport / Storage Humidity : 10 ~ 95 % (60°C) (non-condensing)

### Safety

Standards : IEC60601-1-2 (2001)  
(Medical Electrical Equipment- Part 1:  
General Requirements for Safety-2.  
Collateral Standard: Electromagnetic Compatibility-Requirements  
and Tests)

### Classification

The type of protection against electric shock :  
Class I and Internally Powered Equipment

The degree of protection against electrical shock :

Type CF Applied Part

The degree of protection against harmful water invasion :  
IPX0 (no protection)

Method of sterilization or disinfection :

Cleaning only

For use in the presence of flammable gas :

Equipment not suitable for use in the presence of a  
flammable anaesthetic mixture with air or with  
oxygen or nitrous oxide

The Mode of Operation : Continuous Operation

### Power

AC Power Operation

Input Voltage : 230VAC±10%  
Frequency : 50/60Hz  
Power Consumption : 40VA (max.)

|                   |                                                                                                                  |
|-------------------|------------------------------------------------------------------------------------------------------------------|
| Battery Operation |                                                                                                                  |
| Input Voltage     | : 12VDC                                                                                                          |
| Battery           | : Nickel hydride battery                                                                                         |
| Power Consumption | : 20W                                                                                                            |
| Charge Time       | : Normal Charge approx. 16 hrs<br>(when monitoring)<br>Quick Charge approx. 2.5 hrs<br>(when monitor not in use) |
| Operation Time    | : 60 min. (Fully charged, not using NIBP function)                                                               |

## Performance

---

### Display Panel

|                     |                                                                                      |
|---------------------|--------------------------------------------------------------------------------------|
| Display Type        | : TFT Color LCD                                                                      |
| Screen Size         | : Approx. 3.5 inch                                                                   |
| Resolution          | : 240 × 320 pixel                                                                    |
| No. of Waveforms    | : Max. 3 waveforms                                                                   |
| No. of Numeric Data | : Max. 7 numeric data (HR, RR, SpO <sub>2</sub> , PR, NIBP_SYS, NIBP_DIA, NIBP_MEAN) |
| Trace Method        | : Stationary Trace                                                                   |
| Waveform Duration   | : Approx. 2.1 sec. (25mm/s)                                                          |
| Sweep Speed         | : ECG, BP        8, 12.5, 25 (mm/s)<br>Respiration    8, 12.5, 25 (mm/s)             |

### Input / Output Connector

I/O Port : Multipurpose Data Output

### ECG

|                             |                                           |
|-----------------------------|-------------------------------------------|
| Input Impedance             | : 5MΩ and above                           |
| Max. Input Voltage          | : ±5mV                                    |
| Polarization Voltage        | : ±400mV and above                        |
| Waveform Size               | : 10mm/1mV (for displaying and recording) |
| Common Mode Rejection Ratio | : 80dB and above                          |
| HR Range                    | : 0, 12 ~ 300bpm±3bpm                     |
| ECG Size Selection          | : 1/4, 1/2, 1, 2, 4                       |
| Lead Type                   | : Lead II using 3-electrode method        |
| Transient Characteristics   | : 0.3sec, 0.1sec                          |
| Frequency Characteristics   | : 40Hz/15Hz                               |
| AC Filter                   | : 50Hz/60Hz                               |
| Defibrillator Protection    | : Provided                                |

### Respiration

|             |                    |
|-------------|--------------------|
| Measurement | : Impedance Method |
| RR Range    | : 0, 4 ~ 150Bpm    |
| Accuracy    | : ±3Bpm            |
| Current     | : 100μA and below  |

## **NIBP**

|                  |                                                                    |
|------------------|--------------------------------------------------------------------|
| Measurement      | : Oscillometric Method                                             |
| NIBP Range       | : 0 ~ 300mmHg                                                      |
| NIBP Accuracy    | : $\pm 4\text{mmHg}$                                               |
| Zero Calibration | : Automatic calibration at start of measurement                    |
| Measurable Range | : Adult 10 ~ 280mmHg<br>Child 10 ~ 180mmHg<br>Neonate 10 ~ 120mmHg |

### Safety

Forced air release for adult mode:

Pressurization of 310mmHg for 1 sec. or more  
Measurement duration of 120 sec. or more  
120 sec. of pressurization of 15mmHg or more

Forced air release for child mode:

Pressurization of 210mmHg for 1 sec. or more  
Measurement duration of 90 sec. or more  
120 sec. of pressurization of 15mmHg or more

Forced air release for neonate mode:

Pressurization of 160mmHg for 1 sec. or more  
Measurement duration of 60 sec. or more  
80 sec. of pressurization of 5mmHg or more

## **Arterial Oxygen Saturation ( $\text{SpO}_2$ )**

Measurement : 2 Wavelength Pulse Wave Method

### Oxygen Saturation

|            |                                                              |
|------------|--------------------------------------------------------------|
| Range      | : 1 ~ 100%                                                   |
| Resolution | : 1%                                                         |
| Accuracy   | : Adult at 70 ~ 100% $\pm 2\%$<br>at 0 ~ 69% not specified   |
|            | : Neonate at 70 ~ 100% $\pm 3\%$<br>At 0 ~ 69% not specified |

### Pulse Rate

Range : 20 ~ 250bpm

Accuracy :  $\pm 3\text{bpm}$

### Sensor

Model Type : Nellcor ® DURASENSOR, OXISENSOR III

Wavelength : 660nm (red, nominal value)

890nm (infrared, nominal value)

## Telemetry

|                                   |                                             |
|-----------------------------------|---------------------------------------------|
| Transmitting Waveform             | : ECG, RESP, Pulse Waveform                 |
| Transmitting Numeric Data         | : HR, RR, SpO <sub>2</sub> , PR, NIBP       |
| Status Data                       | : Lead Off, Probe Off, Low Battery, etc.    |
| Medical Telemetry Type            | : Type A                                    |
| Occupied Frequency Range          | : 8.5kHz and below                          |
| Communication                     | : Unidirectional                            |
| Oscillation                       | : Crystal controlled PLL synthesizer        |
| Antenna Power                     | : 1.0mW                                     |
| Radio Wave Type                   | : F7D                                       |
| Transmission Frequency            | : One wave within 420.0500 ~<br>449.6625MHz |
| Leakage Power of Adjacent Channel | : -40dB or below                            |
| Spurious Emission                 | : 2.5μW or below                            |
| Carrier Frequency Accuracy        | : ±4 × 10 <sup>-6</sup> or below            |

## Setup Item

## Default and Backup

This section lists selection, default setting, and backup status for each setup item.

### Backup Item

- P5-18  
“5. Alarm Function  
■Backup of Alarm Setup”
- “○” : Setup item will be retained even when the power is turned OFF.
  - “△” : Setup item will be retained even when the power is turned OFF.
  - “—” : The value will be reset to initial setting according to the alarm backup setup.
  - “—” : Setup item will be reset to initial setting when the power is turned OFF.

## Patient Admit / Discharge

| Item         | Selection         | Default | Backup |
|--------------|-------------------|---------|--------|
| Patient Type | Adult, Child, Neo | Adult   | ○      |
| Pacemaker    | No, Yes           | No      | ○      |
| Pace. Pulse  | OFF, ON, Color    | OFF     | ○      |

## Alarm Setup

| Item             | Selection            | Default                                               | Backup |
|------------------|----------------------|-------------------------------------------------------|--------|
| All Alarms       | Suspend, ON          | Suspend                                               | —      |
| HR               | ON, OFF 20 ~ 300bpm  | ON 40 ~ 120                                           | △      |
| RR               | ON, OFF 5 ~ 150Bpm   | ON 5 ~ 30                                             | △      |
| APNEA            | ON, OFF 5 ~ 20sec.   | ON 15sec.                                             | △      |
| SpO <sub>2</sub> | ON, OFF 50 ~ 100%    | ON 90 ~ OFF                                           | △      |
| NIBP             | ON, OFF 10 ~ 300mmHg | ON<br>SYS 80 ~ 180<br>DIA OFF ~ OFF<br>MEAN OFF ~ OFF | △      |

## Parameter Setup

| <i>Item</i>            | <i>Selection</i>                             | <i>Default</i> | <i>Backup</i>                        |
|------------------------|----------------------------------------------|----------------|--------------------------------------|
| <b>ECG</b>             |                                              |                |                                      |
| Gain                   | AG (Auto Gain), ×1/4, ×1/2, ×1, ×2, ×4       | AG             | <input type="radio"/>                |
| Tone Source            | ECG, SpO <sub>2</sub> , OFF                  | OFF            | <input type="radio"/>                |
| Lamp Source            | ECG, SpO <sub>2</sub> , OFF                  | ECG            | <input type="radio"/>                |
| Noise Filter           | OFF, Weak, Strong                            | Weak           | <input type="radio"/>                |
| Time Constant          | 0.1s, 0.3s                                   | 0.3s           | <input type="radio"/>                |
| <b>RESP</b>            |                                              |                |                                      |
| Gain                   | AG (Auto Gain), ×1/4, ×1/2, ×1, ×2, ×4       | AG             | <input type="radio"/>                |
| Sync. Indicator        | ON, OFF                                      | OFF            | <input type="radio"/>                |
| CVA Detect             | ON, OFF                                      | OFF            | <input type="radio"/>                |
| Impedance Meas.        | ON, OFF                                      | ON             | <input type="radio"/>                |
| <b>SpO<sub>2</sub></b> |                                              |                |                                      |
| Gain                   | AG (Auto Gain), ×1/4, ×1/2, ×1, ×2, ×4       | AG             | <input type="radio"/>                |
| Bar Graph              | ON, OFF                                      | ON             | <input type="radio"/>                |
| Ignore NIBP            | ON, OFF                                      | OFF            | <input type="radio"/>                |
| <b>NIBP</b>            |                                              |                |                                      |
| Auto Mode              | OFF, 2, 2.5, 3, 5, 10, 15, 30, 60, 120 (min) | OFF            | <input type="radio"/> * <sup>1</sup> |
| 1min Start             | OFF, 10min, 20min                            | OFF            | —                                    |
| NIBP Speed             | Normal, Fast                                 | Normal         | <input type="radio"/>                |
| List / Graph           | OFF, L, G, L/G                               | OFF            | <input type="radio"/>                |
| Graph Time Span        | Auto, 30m, 1h, 2h, 4h, 8h, 12h, 24h, List    | Auto           | <input type="radio"/>                |
| Graph Scale            | Auto, 100, 150, 200, 250, 300                | Auto           | <input type="radio"/>                |

\*<sup>1</sup>: Only if **Backup** is selected for the soft switch, “NIBP Auto Mode at Power ON”.

## System Configuration Menu

| <i>Item</i>                 | <i>Selection</i>                      | <i>Default</i> | <i>Backup</i>         |
|-----------------------------|---------------------------------------|----------------|-----------------------|
| <b>Tone/Volume</b>          |                                       |                |                       |
| Alarm Volume                | 8 levels                              | 6th level      | <input type="radio"/> |
| Pulse Volume                | 8 levels                              | 5th level      | <input type="radio"/> |
| Other Volume                | 8 levels                              | 5th level      | <input type="radio"/> |
| Alarm Tone                  | Low, Middle, High                     | Middle         | <input type="radio"/> |
| Key                         | ON, OFF                               | ON             | <input type="radio"/> |
| NIBP End Meas.              | ON, OFF                               | ON             | <input type="radio"/> |
| CF End Tone                 | ON, OFF                               | ON             | <input type="radio"/> |
| Lead Off, Probe Off         | ON, OFF                               | ON             | <input type="radio"/> |
| <b>Color/Brightness</b>     |                                       |                |                       |
| ECG, HR                     | 8 colors                              | Green          | <input type="radio"/> |
| RESP                        |                                       | White          | <input type="radio"/> |
| SpO <sub>2</sub>            |                                       | Yellow         | <input type="radio"/> |
| NIBP                        |                                       | White          | <input type="radio"/> |
| Background                  | White, Black                          | Black          | <input type="radio"/> |
| Menu Color                  | 4 colors                              | Navy Blue      | <input type="radio"/> |
| <b>Lamp</b>                 |                                       |                |                       |
| Lamp Source                 | ECG, SpO <sub>2</sub> , OFF           | ECG            | <input type="radio"/> |
| <b>Telemeter</b>            |                                       |                |                       |
| Channel                     | 4-digit medical telemetry channel no. | 6020           | <input type="radio"/> |
| Group                       | 00 ~ 60                               | 00             | <input type="radio"/> |
| <b>Waveform</b>             |                                       |                |                       |
| ECG, SpO <sub>2</sub> Speed | 8, 12.5, 25mm/s                       | 25mm/s         | <input type="radio"/> |
| RESP Speed                  | 8, 12.5, 25mm/s                       | 8mm/s          | <input type="radio"/> |
| Wave Line Thickness         | Thin, Medium, Thick                   | Medium         | <input type="radio"/> |

| <b>Item</b>                                            | <b>Selection</b>                   | <b>Default</b>                                                        | <b>Backup</b>         |
|--------------------------------------------------------|------------------------------------|-----------------------------------------------------------------------|-----------------------|
| <b>Display Configuration</b>                           |                                    |                                                                       |                       |
| Display                                                | ①②③④⑤                              | ④                                                                     | <input type="radio"/> |
| Programmed Display<br>(W: Waveform<br>N: Numeric Data) | Layout ①                           | ECG (W)<br>RESP(W)<br>SpO <sub>2</sub> (W)<br>ALL (N)                 | <input type="radio"/> |
|                                                        | Layout ②                           | ECG (W)<br>RESP (W)<br>SpO <sub>2</sub> (W)<br>HR (N) NIBP (N)        | <input type="radio"/> |
|                                                        | Layout ③                           | ECG (W)<br>RESP (W)<br>HR (N) RR (N)<br>NIBP (N) SpO <sub>2</sub> (N) | <input type="radio"/> |
|                                                        | Layout ④                           | ECG (W)<br>HR (N)<br>NIBP (N) SpO <sub>2</sub> (N)                    | <input type="radio"/> |
|                                                        | Layout ⑤                           | HR (N)<br>NIBP (N)                                                    | <input type="radio"/> |
| <b>CF Card Recording</b>                               |                                    |                                                                       |                       |
| <b>Manual Recording</b>                                |                                    |                                                                       |                       |
| Rec. Duration                                          | 12s, 24s                           | 12s                                                                   | <input type="radio"/> |
| Wave 1                                                 | OFF, ECG, RESP, SpO <sub>2</sub>   | ECG                                                                   | <input type="radio"/> |
| Wave 2                                                 | OFF, ECG, RESP, SpO <sub>2</sub>   | SpO <sub>2</sub>                                                      | <input type="radio"/> |
| <b>Alarm Recording</b>                                 |                                    |                                                                       |                       |
| Record                                                 | ON, OFF                            | OFF                                                                   | <input type="radio"/> |
| Rec. Duration                                          | 12s, 24s                           | 12s                                                                   | <input type="radio"/> |
| Wave 1                                                 | Alarm, ECG, RESP, SpO <sub>2</sub> | Alarm                                                                 | <input type="radio"/> |
| Wave 2                                                 | OFF, ECG, RESP, SpO <sub>2</sub>   | OFF                                                                   | <input type="radio"/> |
| Factor                                                 | ALL, HR/PR, Other                  | ALL                                                                   | <input type="radio"/> |
| <b>Periodic Recording</b>                              |                                    |                                                                       |                       |
| Record                                                 | ON, OFF                            | OFF                                                                   | <input type="radio"/> |
| Rec. Duration                                          | 12s, 24s                           | 12s                                                                   | <input type="radio"/> |
| Wave 1                                                 | OFF, ECG, RESP, SpO <sub>2</sub>   | ECG                                                                   | <input type="radio"/> |
| Wave 2                                                 | OFF, ECG, RESP, SpO <sub>2</sub>   | SpO <sub>2</sub>                                                      | <input type="radio"/> |
| Interval (min.)                                        | 5, 10, 15, 30, 60                  | 60                                                                    | <input type="radio"/> |

## Preset Menu

| <i>Item</i>                | <i>Selection</i>                                                                                                                                                         | <i>Default</i>                        | <i>Backup</i>         |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------------|
| <b>Soft Switch</b>         |                                                                                                                                                                          |                                       |                       |
| AC Filter                  | 50Hz, 60Hz                                                                                                                                                               | 50Hz                                  | <input type="radio"/> |
| Date                       | 12/26, Dec. 26, 26 Dec.                                                                                                                                                  | 12/26 format                          | <input type="radio"/> |
| Telemeter                  | ON, OFF                                                                                                                                                                  | ON                                    | <input type="radio"/> |
| Rec. Mode                  | CF Tele., Tele, CF                                                                                                                                                       | CF Tele.                              | <input type="radio"/> |
| Lead Off Alarm at Power On | ON, OFF                                                                                                                                                                  | OFF                                   | <input type="radio"/> |
| Wide AC filter             | Adapt, Wide, Adapt Wide, 56Hz                                                                                                                                            | Adapt Wide                            | <input type="radio"/> |
| NIBP Auto Mode at Power ON | Backup, Clear                                                                                                                                                            | Clear                                 | <input type="radio"/> |
| <b>Auto Gain</b>           |                                                                                                                                                                          |                                       |                       |
| Range                      | $\times 1/4 \leftrightarrow \times 2$ , $\times 1/4 \leftrightarrow \times 4$                                                                                            | $\times 1/4 \leftrightarrow \times 2$ | <input type="radio"/> |
| Speed                      | Normal, Fast                                                                                                                                                             | Normal                                | <input type="radio"/> |
| <b>Ventilator</b>          |                                                                                                                                                                          |                                       |                       |
| Ventilator                 | OFF, Sv900, Sv I, S, 300, PB, VELA, Evita, E200                                                                                                                          | OFF                                   | <input type="radio"/> |
| Alarm Tone                 | ON, OFF                                                                                                                                                                  | OFF                                   | <input type="radio"/> |
| <b>User Key</b>            |                                                                                                                                                                          |                                       |                       |
| Left Key                   | Admit, Alarm, NIBP List, Alarm List, ECG setup, RESP setup, SpO <sub>2</sub> setup, NIBP setup, ECG alarm, RESP alarm, SpO <sub>2</sub> alarm, NIBP alarm, NIBP periodic | NIBP List                             | <input type="radio"/> |
| Right Key                  |                                                                                                                                                                          | Alarm                                 | <input type="radio"/> |
| <b>Alarm Backup</b>        |                                                                                                                                                                          |                                       |                       |
| Discharge                  | Backup, Clear                                                                                                                                                            | Clear                                 | <input type="radio"/> |
| Power OFF                  | Backup, Clear                                                                                                                                                            | Backup                                | <input type="radio"/> |

## External Connection

## Pin Assignments

This section explains the connector pin assignments.

### I/O Port

| No. | Signal Type     | Description                     | Signal Level             |
|-----|-----------------|---------------------------------|--------------------------|
| 1   | NC              | No Connection                   | —                        |
| 2   | EXT IN+ (Logic) | External Input +                | Logic Input              |
| 3   | TxD             | Serial Transmission Data Output | RS232C                   |
| 4   | SG              | Signal GND                      |                          |
| 5   | RxD             | Serial Reception Data Input     | RS232C                   |
| 6   | +5V             | +5V                             | +5V power supply (150mA) |
| 7   | GND             | GND                             | —                        |
| 8   | GND             | GND                             | —                        |

\* This connector is isolated.

\* The power capacity is max. 150mA.

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# Chapter 11

## Accessories

The consumables and spare parts for this equipment is explained.

|                                   |      |
|-----------------------------------|------|
| Accessories .....                 | 11-2 |
| Accessories .....                 | 11-2 |
| NSK-506D Disposable Kit .....     | 11-3 |
| NIBP Monitoring .....             | 11-3 |
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| ECG, Impedance Respiration .....  | 11-4 |
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| Others .....                      | 11-5 |

## Accessories

This section lists the accessories for the DS-7001.



- Use only the accessories specified for this device.  
Otherwise, proper function cannot be executed.
- For quality improvement, specifications are subject to  
change without prior notice.

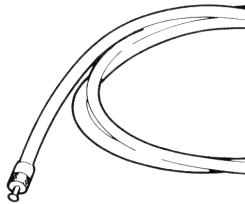
## Accessories

|                           |       |
|---------------------------|-------|
| Power Cable: CS-18        | Qty 1 |
| Battery Replacement Label | Qty 5 |
| This Operation Manual     | Qty 1 |

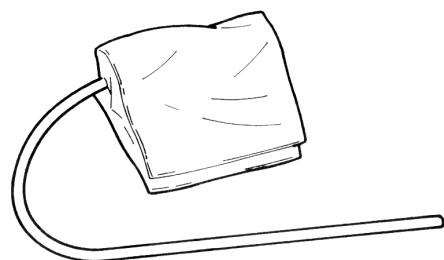
## NSK-506D Disposable Kit

### NIBP Monitoring

Air Hose (3.5m): OA-7109B  
Qty 1



Adult Cuff (Medium): CUF-7102A  
Qty 1

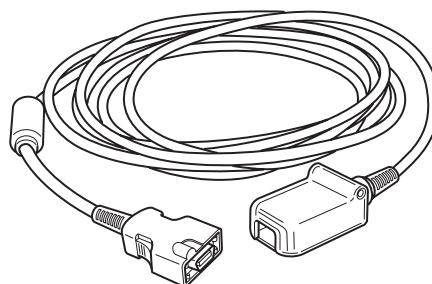


**CAUTION**

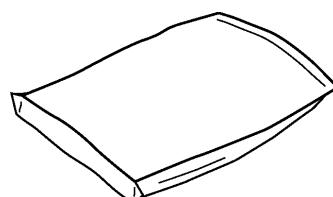
This product contains natural rubber latex which may cause allergic reactions.

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

SpO<sub>2</sub> Relay Cable: DOC-10 Qty 1



MAX-PAC i: Qty 1  
OXISENSOR (for adult) Qty 2  
OXISENSOR (for child) Qty 2



## Optional Accessories

The following products are available as optional accessories for the DS-7001.  
Purchase them as required.

**CAUTION**

- Use only the accessories specified for this device.  
Otherwise, proper function cannot be executed.
- For quality improvement, specifications are subject to change without prior notice.

## ECG, Impedance Respiration

| <i>Item</i>     | <i>Model Type</i> | <i>Note</i>          |
|-----------------|-------------------|----------------------|
| ECG Relay Cable | CI-162            |                      |
| ECG Relay Cable | CI-164            | for electrosurgery * |
| ECG Relay Cable | CI-161            |                      |
| Lead Cable      | #3380.0654.04     |                      |
| Lead Cable      | #3382.0654.11     | for electrosurgery * |
| Lead Cable      | CM-61             |                      |

**CAUTION**

\* When using the electrosurgery-proof type ECG relay cable,  
respiration measurement can not be performed.

## Non-Invasive Blood Pressure

| <i>Item</i>         | <i>Model Type</i> | <i>Note</i> |
|---------------------|-------------------|-------------|
| Adult Cuff (Large)  | CUF-7101          |             |
| Adult Cuff (Medium) | CUF-7102A         |             |
| Adult Cuff (Small)  | CUF-7103          |             |
| Child Cuff          | CUF-7104          |             |
| Infant Cuff         | CUF-7105          |             |
| Air Hose            | OA-7109A          | 1.5m        |
| Air Hose            | OA-7109B          | 3.5m        |
| Extension Hose      | OA-7110A          | 1.5m        |
| Extension Hose      | OA-7110B          | 3.5m        |

## **SpO<sub>2</sub>**

| <i>Item</i>                  | <i>Model Type</i> | <i>Note</i> |
|------------------------------|-------------------|-------------|
| NELLCOR® DURASENSOR          |                   |             |
| NELLCOR® OXISENSOR           |                   |             |
| SpO <sub>2</sub> Relay Cable | DOC-10            |             |

## **Others**

| <i>Item</i>                 | <i>Model Type</i> | <i>Note</i>                                              |
|-----------------------------|-------------------|----------------------------------------------------------|
| Battery                     | T10HRAAC-4781     |                                                          |
| Compact Flash Card          | FCF-32            | 32MB                                                     |
|                             | FCF-64            | 64MB                                                     |
|                             | FCF-128           | 128MB                                                    |
| Mounting Adapter            | OA-445            |                                                          |
| Ventilator Connection Cable | CJ-500            | For SV-900 Servo Ventilator                              |
|                             | CJ-501            | For SV-300 Servo Ventilator                              |
|                             | CJ-502            | For Servo-i Ventilator                                   |
|                             | CJ-504            | For PURITAN-BENNETT Ventilator<br>PB-740, PB-760, PB-840 |
|                             | CJ-505            | For BIRD Ventilator,<br>VELA                             |
|                             | CJ-502            | For Evita 2 dura, Evita 4,<br>Evita XL                   |
|                             | CJ-506            | For E200                                                 |

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39-4, Hongo, 3-chome, Bunkyo-ku, Tokyo, Japan  
Phone:+81-3-3815-2121 Fax:+81-3-3814-1222