

DynaScope 7000 Series

Patient Monitor

DS-7000 System

Ver.06

Operation Manual

《 General Description 》



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

This operation manual is for the DS-7000 System Version 06.

⚠CAUTION

FEDERAL LAW RESTRICTS THIS DEVICE TO SALE
BY OR ON THE ORDER OF A PHYSICIAN.

CAUTION:

- The company and product names used in this manual are trademarks or registered trademarks.
- 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.

Blood pressure measurements determined with this device are equivalent to those obtained by a trained observer using the cuff/stethoscope auscultation method, within the limits prescribed by the American National Standard, Electronic or automated sphygmomanometers.

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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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Composition of This Operation Manual

The DS-7000 Operation Manual is composed of the following 2 sections.

<<General Description>>

This section is composed of the chapters stating the general description of the device and basic operation procedure.

- | | |
|------------------------|---|
| 1. General Description | : Describes the outline of this equipment. |
| 2. Basic Operation | : Describes the basic operation for monitoring. |
| 3. Vital Application | : Describes the procedure for vital application, etc. |

<<Monitoring Operation>>

This section is composed of the chapters explaining the detailed monitoring procedures, setup procedures, maintenance, specification, accessories, etc.

- | | |
|-----------------------------------|--|
| 4. Monitoring Setup | : Describes the procedures to set the monitor according to the monitoring purpose. |
| 5. Admit / Discharge of a Patient | : Describes the procedure to admit or discharge a patient. |
| 6. Parameter Setup | : Describes the procedure to set the measurement condition, size, scale, etc. for each parameter. |
| 7. Function | : Describes about the functions such as arrhythmia analysis, trend, recall, etc. |
| 8. Installation | : Describes about the environment for use, wireless system, etc. |
| 9. Initial Settings | : Describes the procedure to set the initial settings which should be preprogrammed before monitoring a patient. |
| 10. Maintenance | : Describes about the maintenance, troubleshooting of this equipment. |
| 11. Technical Information | : Lists the specification, default settings, pin assignments of external connector, etc. |
| 12. Accessories | : Lists the accessories and optional accessories for this equipment. |

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 important descriptions for handling and operating the unit properly and safely. A damaged label may compromise safe operation.

DS-7000 Patient Monitor

DANGER

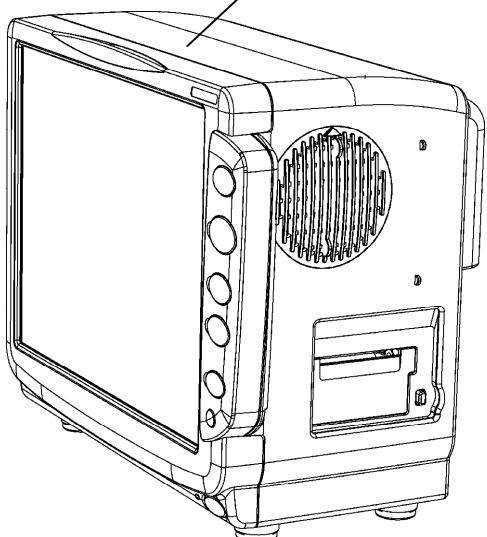
Risk of explosion if used in the presence of flammable anesthetics.

CAUTION

Before connecting, read instruction manual.

CAUTION

To reduce the risk of electric shock, do not remove the cover.
Refer servicing to qualified service personnel.



HU-71/HU-72/HU-73 Option Unit

DANGER

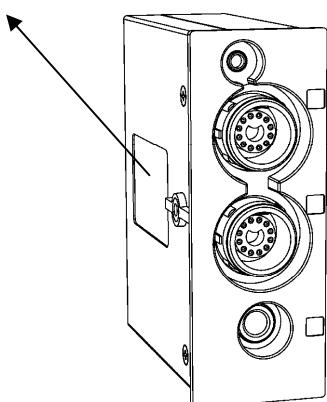
Risk of explosion if used in the presence of flammable anesthetics.

CAUTION

Before connecting, read instruction manual.

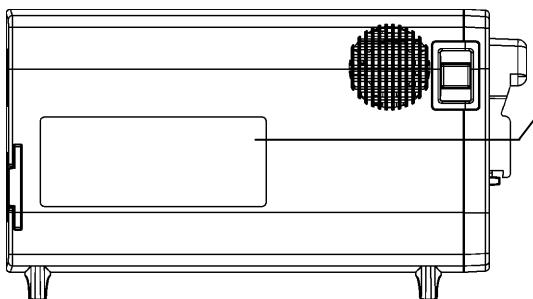
CAUTION

To reduce the risk of electric shock, do not remove the cover.
Refer servicing to qualified service personnel.



<HU-71>

MGU-701/MGU-702 Multigas Unit (Optional)



⚠ DANGER

Risk of explosion if used in the presence of flammable anesthetics.

⚠ CAUTION

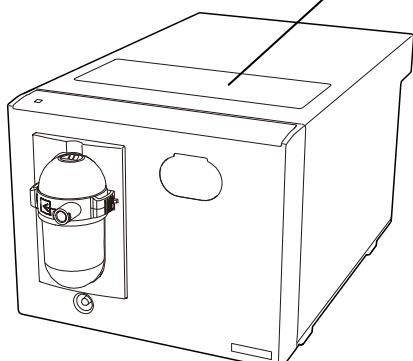
Before connecting, read instruction manual.

⚠ CAUTION

To reduce the risk of electric shock, do not remove the cover.
Refer servicing to qualified service personnel.

<MGU-701>

MGU-801P/MGU-802/MGU-803 Multigas Unit (Optional)



<MGU-801P>

⚠ DANGER

Risk of explosion if used in the presence of flammable anesthetics.

⚠ CAUTION

Before connecting, read instruction manual.

⚠ CAUTION

To reduce the risk of electric shock, do not remove the cover.
Refer servicing to qualified service personnel.

Measurement Unit for Each Parameter

The measurement units for this equipment are as follows.

Detail	Parameter	Display	Unit	Default
Heart Rate / Pulse Rate	ECG	HR	bpm (beats per minute)	
	Invasive Blood Pressure	PR-IBP	bpm (beats per minute)	
	SpO ₂	PR-SpO ₂	bpm (beats per minute)	
	Non-Invasive Blood Pressure	PR-NIBP	bpm (beats per minute)	
ST Level	ECG	ST	mm, mv	mm
VPC	ECG	VPC	bpm (beats per minute)	
Respiration Rate	Impedance Respiration	RR-IMP	Bpm (breaths per minute)	
	CO ₂	RR-CO ₂	Bpm (breaths per minute)	
	Ventilator	RR-VENT	Bpm (breaths per minute)	
Apnea	Impedance Respiration	APNEA	s (second)	
	CO ₂	APNEA	s (second)	
	Ventilator	APNEA	s (second)	
Invasive Blood Pressure	Invasive Blood Pressure	BP	mmHg, kPa cmH ₂ O (CVP only)	mmHg
Non-Invasive Blood Pressure	Non-Invasive Blood Pressure	NIBP	mmHg, kPa	mmHg
Arterial Oxygen Saturation	SpO ₂	SpO ₂	%	
	Perfusion Index	PI	%	
Temperature	Temperature	TEMP	°C / °F	°C
Cardiac Output	Cardiac Output	CO	L/minute	
	Cardiac Index	CI	L/minute/m ²	
Blood Temperature	Blood Temperature	Tb	°C / °F	°C
Injectate Temperature	Injectate Temperature	Ti	°C / °F	°C
Airway Flow	Airway Flow	AWF	L/minute	
Airway Pressure	Airway Pressure	AWP	cmH ₂ O	
Tidal Volume	Inspiratory Tidal Volume	I-TV	mL	
	Expiratory Tidal Volume	E-TV	mL	
	Tidal Volume	TV	mL	
Minute Volume	Minute Volume	MV	L/minute	
Compliance	Compliance	COMP	mL/cmH ₂ O	
Airway Resistance	Inspiratory Resistance	I-RES	cmH ₂ O/L/Sec	
	Expiratory Resistance	E-RES	cmH ₂ O/L/Sec	
Airway Pressure	Mean Airway Pressure	MEAN	cmH ₂ O	
	Maximum Airway Pressure	PEAK	cmH ₂ O	
	Pause Airway Pressure	PAUSE	cmH ₂ O	
	Peak End Expiratory Pressure	PEEP	cmH ₂ O	
	Fraction of Inspiratory Oxygen	VFiO ₂	%	

Detail	Parameter	Display	Unit	Default
Vigilance Data • Vigilance • Vigilance CEDV • VigilanceII • Vigileo	Mixed Venous Oxygen Saturation	SvO ₂	%	
	Central Venous Oxygen Saturation	ScvO ₂	%	
	Arterial Oxygen Saturation	SaO ₂	%	
	Oxygen Uptake Index	O ₂ EI	%	
	Oxygen Transport	DO ₂	mL/minute	
	Oxygen Consumption	VO ₂	mL/minute	
	Stroke Volume	SV	mL	
	Stroke Volume (STAT Mode)	SV-STAT	mL	
	Stroke Volume Index	SVI	mL/m ²	
	Stroke Volume Index (STAT Mode)	SVI-STAT	mL/m ²	
	Heart Rate	HR	bpm (beats per minute)	
	Mean Arterial Pressure	MAP	mmHg	
	Central Venous Pressure	CVP	mmHg	
	Continuous Cardiac Output	CCO	L/minute	
	Continuous Cardiac Output (STAT Mode)	CCO-STAT	L/minute	
	Continuous Cardiac Index	CCI	L/minute/m ²	
	Continuous Cardiac Index (STAT Mode)	CCI-STAT	L/minute/m ²	
	Systemic Vascular Resistance	SVR	dynes-sec/cm ⁵	
	Systemic Vascular Resistance Index	SVRI	dynes-sec/cm ⁵	
	Blood Temperature	B-Temp	°C	
	Ejection Fraction	EF	%	
	Ejection Fraction (STAT Mode)	EF-STAT	%	
	End-Diastolic Volume	EDV	mL	
	End-Diastolic Volume (STAT Mode)	EDV-STAT	mL	
	End-Diastolic Volume Index	EDVI	mL/m ²	
	End-Diastolic Volume Index (STAT Mode)	EDVI-STAT	mL/m ²	
	End-Systolic Volume	ESV	mL	
	End-Systolic Volume Index	ESVI	mL	
	Stroke Volume Variance	SVV	%	
Gas Unit Data	End Tidal Carbon Dioxide	EtCO ₂	mmHg, kPa, %	mmHg
	Inspired Carbon Dioxide	In-CO ₂	mmHg, kPa, %	mmHg
	Expired Oxygen	Ex-O ₂	%	
	Inspired Oxygen	FiO ₂	%	
	Expired Nitrous Oxide	Ex-N ₂ O	%	
	Inspired Nitrous Oxide	In-N ₂ O	%	
	Expired Agent Gas	Ex-AGT	%	
	Inspired Agent Gas	In-AGT	%	
	MAC Value	MAC	No unit	

Detail	Parameter	Display	Unit	Default
NICO Monitor Data	Cardiac Output (Average Mode)	CO	L/min	
	Cardiac Index	CI	L/min/m ²	
	Cardiac Output (Fast Mode)	CO-F	L/min	
	Carbon Dioxide Emission	VCO ₂	mL/min	
	Minute Ventilation	MV	L/min	
	Alveolar Minute Ventilation	MVAL	L/min	
	Expiratory Tidal Volume	TV-E	mL	
	Inspiratory Tidal Volume	TV-I	mL	
	Peak Inspiratory Pressure	PIP	cmH ₂ O	
	Mean Airway Pressure	MAP	cmH ₂ O	
	Peak End Expiratory Pressure	PEEP	cmH ₂ O	
	Dynamic Compliance	CDYN	mL/cmH ₂ O	
	Airway Resistance	RAW	cmH ₂ O/L/sec	
	End-Tidal CO ₂ Concentration	EtCO ₂	mmHg	
	Respiration Rate	RR	Bpm	
	Arterial Oxygen Saturation	SpO ₂	%	
	Pulse Rate	PR	bpm	
	Stroke Volume	SV	mL	
	Expired Carbon Dioxide Partial Pressure	PECO ₂	mmHg	
	Airway Deadspace Volume	VDAW	mL	
	Alveolar Tidal Volume	VTALV	mL	
BIS Monitor Data	Bispectral Index	BIS	(no unit)	
	Signal Quality Index	SQI	%	
	Electromyograph	EMG	dB	
	Suppression Ratio	SR	%	
	Spectral Edge Frequency	SEF	Hz	
	Total Power	TOTPOW	dB	
	Impedance	IMP	Kohms	
Radical-7 Monitor Data	Arterial Oxygen Saturation	SpO ₂ (R)	%	
	Pulse Rate	PR(R)	bpm (beats per minute)	
	Perfusion Index	PI (R)	%	
	Pleth Variability Index	PVI (R)	%	
	Carboxyhemoglobin Concentration	SpCO (R)	%	
	Methemoglobin Concentration	SpMet (R)	%	
	Total Hemoglobin Concentration	SpHb (R)	g/dL	
	Oxygen Content	SpOC (R)	mL/dL	

Graphic Symbols

The following symbols are used for this equipment.

DS-7000 Main Unit

Symbol	Description
	Caution; refer to accompanying documents Indicates the need to refer to related accompanying documents before operation.
	Potential Equalization Terminal Indicates the terminal to equalize the potential difference when interconnecting the devices.
	Type CF Applied Part with Defibrillation-Proof Indicates the degree of protection against electric shock is Type CF Applied Part with defibrillation-proof.
	Type BF Applied Part with Defibrillation-Proof Indicates the degree of protection against electric shock is Type BF Applied Part with defibrillation-proof.

DS-7000 : Symbols displayed on the screen

Symbol	Description
	Alarm OFF Indicates the alarm is OFF.
	Heart Rate Synchronization Mark This mark flashes synchronizing to the heartbeat.
	Respiration Synchronization Mark This mark flashes synchronizing to the inspiration.
	Event Key Mark Displayed when an alarm generates. Whether or not to display this icon can be selected on the display setup menu.
	Message Icon Displayed in the numeric data box when an alarm message is present for that parameter. Whether or not to display this icon can be selected on the monitor setup menu.

Precautions for Safe Operation of Medical Electrical Equipment

⚠ CAUTION	<p>Read the following precautions thoroughly to correctly operate the device.</p> <ul style="list-style-type: none">● Users should have a thorough knowledge of the operation before using this system.● Pay attention to the following when installing and storing the equipment.<ul style="list-style-type: none">• 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.<ul style="list-style-type: none">• Verify the power voltage.• Check the cable connection and polarity to ensure proper operation of the equipment.• Make sure the power system has adequate earth ground.• Ensure that all cables are firmly and safely connected.• Pay special attention when the device is used in conjunction with other equipment as it may cause erroneous judgment and danger.• Ensure all patient connections are proper and secure.● During operation of the system, verify the following items.<ul style="list-style-type: none">• 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.<ul style="list-style-type: none">• 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.● Maintenance Check<ul style="list-style-type: none">• 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 knives or defibrillator with this equipment, verify proper attachment of patient ground plate, ECG electrode type for the electrosurgical knives, and paste volume, output energy for the defibrillator. Also, verify that proper ground is selected.
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Precautions for Safe Operation of Medical Telemetry

CAUTION	<p>Precautions for Safe Operation of Medical Telemetry To operate the device correctly, read the following precautions carefully.</p> <ul style="list-style-type: none">● 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 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. <p>In managing, be sure to follow the precautions below.</p> <ul style="list-style-type: none">● 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.● 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.
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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.



Refer to "10. Maintenance" for details.



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-7000 is available from your local Fukuda Denshi representative.

Precautions about the Pacemaker

 WARNING	<ul style="list-style-type: none">● 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.)● Reference “Minute Ventilation Rate-Adaptive Pacemakers” FDA alerts health professionals that minute ventilation rate-adaptive implantable pacemakers can occasionally interact with certain cardiac monitoring and diagnostic equipment, causing pacemakers to pace at their maximum programmed rate. [Based on a safety bulletin issued by FDA Center for Devices and Radiological Health on October 14, 1998]● Rate meters may continue to count the pacemaker rate during occurrences of cardiac arrest or some arrhythmias. Do not rely entirely upon rate meter alarms. Keep pacemaker patients under close surveillance. See this manual for disclosure of the pacemaker pulse rejection capability of this equipment.
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Non-Explosion Proof

 DANGER	Never operate the equipment in the presence of flammable anesthetics, high concentration of oxygen, or inside hyperbaric chamber. Also, do not operate the equipment in an environment in which there is a risk of explosion. Explosion or fire may result.
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Defibrillation Safety

 WARNING	<ul style="list-style-type: none">● When using the defibrillator, keep away from the electrodes or medicament applied to the patient chest. If this is not possible, remove the electrodes or medicament before using it. If the defibrillator paddles are directly in contact with the electrodes or medicament, electrical shock may result by the discharged energy.● When using the defibrillator, 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 using the defibrillator, do not touch the patient and the metal part of the device or cables. Electric shock may result by the discharged energy.
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Electrosurgery Safety

 WARNING	<p>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:</p> <p><u>Location</u></p> <p>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.</p> <p><u>Power Supply</u></p> <p>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.</p> <p><u>Electrode Placement</u></p> <p>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.</p> <p><u>Ground Plate</u></p> <p>When using electrosurgical instruments, make sure the contact between the patient and the ground plate is secure. If the contact is poor, the patient may suffer a burn at the electrode site.</p>
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Precautions about Magnetic Resonance Imaging

 WARNING	<ul style="list-style-type: none">● 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). <p>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.</p>
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Precautions about Connections to Peripheral Devices

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

 WARNING	For the connector with  mark, only the peripheral devices specified by Fukuda Denshi should be connected with the given procedure. Use of an unspecified device may cause electric shock to the patient and/or operator due to excessive leakage current.
 CAUTION	All the peripheral device connectors on the DS-7000 are isolated from the power supply, but the peripheral devices are not isolated. To prevent danger of electric shock, always position the peripheral devices away from the patient.

When connecting peripheral devices to DS-7000, it is the user's responsibility to verify that the overall system complies with IEC 60601-1-1, "Collateral Standard: Safety Requirements for Medical Electrical Systems".

Precautions about the Fuse

 DANGER	If the fuse blows, contact Fukuda Denshi Service Representative. Do not continue using it as internal damage to the equipment may be considered.
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Accessories and Optional Accessories

 WARNING	Use only the cables specified by Fukuda Denshi. Not only the DS-7000 cannot deliver its maximum performance but may also result in increase in emission or decrease in immunity.
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Precautions about the DS-7000

DANGER

When connecting to other device, contact Fukuda Denshi service representative.
Danger such as electric shock may result to the patient and operator.

WARNING

- The DS-7000 is not a life-support equipment.
- The DS-7000 is not intended for use during patient transport outside a healthcare facility, and is not considered as mobile or portable equipment.
- The DS-7000 is not intended for use with flammable anesthetic agents.
- Do not connect unit or cable not authorized by Fukuda Denshi to any I/O connector. If done so by mistake, the DS-7000 cannot deliver its maximum performance and the connected units may be damaged, resulting in a safety hazard.
- If the DS-7000 is used under an environment not fulfilling the specified condition, not only that the equipment cannot deliver its maximum performance, the equipment may be damaged and safety cannot be ensured. If using the equipment under condition other than specified, contact our service representative.
- 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 connected to hospital grade outlet.
- When using multiple ME equipment simultaneously, perform equipotential grounding to prevent potential difference between the equipment. Even a small potential difference may result in electric shock to the patient and the operator.
- Make sure to set the patient classification and pacemaker usage. These settings influence the precision of the QRS detection and NIBP measurement. Make sure the correct selection is made.
- The pacemaker usage selection influences the precision of the QRS detection and arrhythmia analysis. Make sure the correct selection is made.
- If the QRS pace mask function is set to **OFF**, **10ms**, or **20ms**, the pace pulse may be erroneously be detected as a QRS complex and HR/Asystole Alarms may not generate due to incorrect HR (counting pace pulse as QRS complex). Select **OFF**, **10ms** or **20ms** only if you are sure that pacing failure will not occur, or when the patient can be constantly monitored.
- When measuring the SpO₂ of patient with high fever or peripheral circulatory insufficiency, check the sensor attachment periodically and change the attachment site. The temperature of attachment site will rise 2 to 3°C due to the sensor heat which may result in burn injury.
- For the following case, accurate measurement of SpO₂ may not be possible.
 - Patient with excessive abnormal hemoglobin (COHb, MetHb)
 - Patient with 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
- Be cautious when setting the "SpO₂ Averaging" duration as the SpO₂ alarm is based on the displayed SpO₂ value which is averaged from the duration set in "SpO₂ Averaging". The alarm occurrence time will be affected or may not occur for the transient value of SpO₂ depending on the set duration.
- Before the measurement, make sure the patient classification (**Adult** / **Child** / **Neonate**) is properly selected. Otherwise, correct measurement cannot be performed, and congestion or other injury may result.
- When monitoring multigas concentration, use the specified gas sampling products such as sampling line, airway adapter, and water trap.

 **WARNING**

- When using the airway adapter, always consider the circumference of the intubation tube. If inappropriate airway adapter is used for a patient with low ventilation, CO₂ may mix in to the inspired air resulting in incorrect measurement, or apnea detection may become difficult.
- When the multigas unit (MGU-701/MGU-702/MGU-801P/ MGU-802/ MGU-803) is used, the sampling line may get clogged by internal condensation.
- Precautions for MGU-701/MGU-702
 - Adverse affects of humidity
 - Given the small effect of water vapor on agent gas and CO₂ measurements, the method of agent gas analysis is ATPS (Ambient Temperature and Pressure, Saturated; 21°C, 750 mmHg, 100% Humidity Saturated).
 - The effect of humidity on oxygen measurements is negligible.
 - Adverse affects of leaks and internal venting
 - Environmental pollution of nitrous oxide and halogenated agents may cause accuracy errors.
 - Always use anesthetic gas scavenging systems (AGSS) with the monitoring system.
 - Return of sampled gas
 - Infectious agents may be transferred between patients through the sampled gas exhaust port to the patient's breathing circuit.
 - Always use a scavenging line connected to the exhaust port and to the facility scavenging system.
 - Never attach intravenous tubes to gas sampling connections. Gas sampling lines may be inadvertently connected to intravascular fluid systems, allowing air into a blood vessel.
 - Never place the MGU-701/MGU-702 or monitor inside an oxygen tent or any gas containment apparatus.
- Precautions for MGU-801P/MGU-802/MGU-803
 - If the water trap should break or become damaged during operation, there is a risk that bacteria and/or mucus may contaminate the MGU-801P/MGU-802/MGU-803.
 - The airway adapter and sampling line are intended for single patient use only, and must not be reused in order to avoid cross infection.
 - Connection of the MGU-801P/MGU-802/MGU-803 exhaust outlet to the hospital's waste gas scavenging system is strongly recommended to prevent exposure of hospital personnel to the patient's respiratory sample.
 - MGU-801P/MGU-802/MGU-803 must not be used with flammable anesthetic agents.
 - Do not use Adult/Pediatric type water traps and/or sampling lines with neonates to avoid high sampling flow.
 - Connect only DRYLINE™ gas sampling lines to the water trap. Note that there may be other compatible tubing present, e.g. IV-lines.
 - Do not use DRYLINE™ Neonatal sampling lines (blue Luer lock nuts) with DRYLINE™ Adult/Pediatric water traps as this could result in incorrect measurement data.
 - Do not use DRYLINE™ Adult/Pediatric sampling lines (colorless Luer lock nuts) with DRYLINE™ Neonatal water traps as this could result in incorrect measurement data.
 - When emptying the DRYLINE™ Water Trap, its contents should be handled as a potential infection hazard.
- If the upper/lower alarm limit of the parameter is set to OFF, or arrhythmia alarm is set to OFF, alarm will not function even if the system alarm is set to ON. Pay attention when setting them OFF.
- Objective and constant arrhythmia detection is possible through the fixed algorithm incorporated in this monitor. However, excessive waveform morphology change, motion artifact, or the inability to determine the waveform pattern may cause an error, or fail to make adequate detection. Therefore, physicians should make final decisions using manual recording, alarm recording and recall waveform for evaluation.

 **WARNING**

- The HR/PR alarm will not be generated unless the numeric data box corresponded to the selected HR/PR alarm source is displayed. When HR/PR alarm source selection is changed, be sure to display the numeric data box corresponding to the selected HR/PR source.
- The purpose of the apnea alarm is to alert the user to evaluate for the possible occurrence of apnea events by identifying the absence of respiration. It is not intended to be classified as an "Apnea Monitor" and will not identify the condition creating the possible event. (Central, Obstructive or Mixed.)
- The RR and apnea alarm will not be generated unless the numeric data box corresponded to the selected RR source is displayed. If the RR source is changed, make sure to display the numeric data box corresponding to the RR source.
- When selecting **Silence** or **Time Only** for the night mode, pay attention not to miss any important alarm by simultaneously monitoring the bed on other monitors such as central monitor.
- When lifting this device, hold the bottom part of the main unit.
- About the Air Filter used for the Cooling Fan (DS-7000, MGU-701/ 702)
 - When the air filter is washed with neutral detergent, dry it completely before reattaching. If moisture remains on the air filter, it may damage the equipment.
 - The air filter must be attached at all time. If the equipment is used without it, damage to the equipment can occur.

CAUTION

- Systems
 - This equipment is intended to be used for only one patient.
 - The installation of this equipment should be performed by our service representative or a person who is well acquainted with this equipment.
 - The internal switch setting will be performed by our service representative. Users should not open the maintenance cover.
 - The software upgrading will be performed by our service representative. The users should not attempt it.
 - Use only the accessories specified for this device. Otherwise, proper function cannot be executed.
 - When the product is used in regions whose voltage is other than 110-120V, a cable appropriate to the regulations and voltage of the country in which the product is being used shall be used.
 - For quality improvement, specifications and accessories are subject to change without prior notice.
 - The touch panel utilizes exclusive fluorescent light for the backlight. Since this fluorescent light deteriorates with its life cycle, the display may become dark, scintillate, or may not light in long term use. In such case, contact your nearest service representative.
 - Always operate the touch panel with fingers or a touch panel pen. Do not touch with a pen-point or other hard-edged instruments. It may cause malfunction or damage the touch panel. In addition, do not apply pressure for a prolonged time to any part of the panel.
 - Do not use the touch panel with the film or adhesive tape attached. Malfunction of the touch panel or damage may result.
 - As the touch panel is made of glass, a strong impact may cause damage. Pay attention not to hit or drop the touch panel.
 - Do not press the touch panel with strength or twist your finger on the panel. It may cause malfunction or damage the touch panel.
 - Due to its material characteristic, the touch panel expands/contracts depending on the temperature/humidity. When the touch panel is left unused for a while, or when the ambient temperature is low, the surface film of the touch panel may expand, but this is not an abnormal condition. This expansion will be reduced in few hours or half a day after the power is turned ON.
 - If the power supply is interrupted due to power failure, etc., the following will occur.
 - For the DS-7000, if the power supply is resumed within 5 minutes, setup data are backed up and monitoring before the power failure can be resumed. If the power failure continues for more than 5 minutes, all data will be initialized.
 - For the multigas unit, it will be initialized and enter into warm-up state even if the power failure is within 30 seconds.
- ECG Monitoring
 - Use only the specified relay cable, lead cable and electrodes.
 - The conductive parts of electrodes and associated connectors for applied parts, including the neutral electrode, should not contact other conductive parts including earth.
 - 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.
 - For stable arrhythmia detection and ECG monitoring, verify proper electrode placement, lead, waveform size, and filter mode selection. If not properly selected, it may cause erroneous detection.
 - The threshold level for arrhythmia detection changes with ECG waveform size. Set a proper waveform size for monitoring.
When the waveform size is $\times 1/4$, $\times 1/2$, or $\times 1$, the detection threshold is 250 μ V. When the waveform size is $\times 2$ or $\times 4$, the detection threshold is 150 μ V.

 CAUTION

- When arrhythmia is present, HR measurement accuracy may be degraded.
- Select the appropriate lead for ECG1, 2 to be used for arrhythmia detection, telemeter, central monitor transmission, and recording.
- The selected lead for ECG 1, 2 will be used for recall waveform and recording waveform as well as for arrhythmia analysis.
- While the "LEAD OFF" message is displayed, HR alarm and arrhythmia alarm will not function. Leaving this condition unresolved may result in missing a sudden change of the patient. Promptly check the electrodes when this message is displayed.
- The arrhythmia detection leads, monitoring leads on the central monitor, recording leads are fixed as ECG1 and ECG2 leads. Especially for arrhythmia detection, set the most appropriate leads with high QRS for ECG1 and ECG2.
- Automatic size/position of the ECG is effective only at the time the **AUTO** key is pressed. This does not continually adjust size and position.
- The ESIS mode can largely reduce the artifact such as electrosurgery noise and EMG, but it may also reduce the QRS amplitude. The ESIS mode should be selected only during electrosurgery.
- There are some cases when pacemaker pulse cannot be detected depending on the pacemaker type, pulse voltage, pulse width, electrode lead type (unipolar, bipolar), or electrode placement which causes the pacemaker pulse amplitude to decrease and disables pacemaker pulse detection.
- If signals similar to a pacemaker pulse are present, such as electric blanket noise or excessive AC frequency noise, these may be erroneously detected and displayed as a pacemaker pulse.
- When spontaneous QRS and pacemaker pulse overlap (ex. fusion beat, etc.), QRS detection cannot be performed properly. In this case, the heart rate is degraded.
- When continuously detecting AC noise artifact as pacemaker pulses, QRS detection stops and heart rate is extremely degraded. Also arrhythmia cannot be detected.
- Respiration Monitoring
 - When the following relay cables are used, respiration cannot be measured.
 - Relay Cable CI-700E-3 (FA) (defibrillation and electrosurgery-proof, 3-electrode)
 - Relay Cable CI-700E-4 (FA) (defibrillation and electrosurgery-proof, 4-electrode)
 - Relay Cable CI-700E-5 (FA) (defibrillation and electrosurgery-proof, 5-electrode)
 - When a defibrillator is used during respiration monitoring, a large offset voltage will be placed on the ECG electrodes, which may cause interruption of monitoring for a few seconds.
- SpO₂ Monitoring
 - 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 fixing the sensor with a tape, do not wind the tape too tight. At the same time, check the blood flow constantly so that congestion is not generated at the peripheral.
 - Even a short duration of attachment may inhibit the blood flow and generate compression necrosis and burn injury.
 - Change the sensor attachment site constantly (every 4 hours). As the temperature of sensor attachment site normally rises 2 to 3°C, compression necrosis and burn injury may generate.
 - As skin for neonate / low birth weight infant is immature, change the sensor attachment site more frequently depending on the condition.

CAUTION

- 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.
- The DS-100A is intended for use on finger of adults weighing over 40 kg (approximate). Do not use them on children or neonates. Also do not apply them on the thumb or foot.
- The light-emitting part of the sensor should be over the root of the fingernail. Do not insert the finger too far into the sensor as it may hurt the patient.
- Measuring on a limb with NIBP cuff, arterial catheter, or intracatheter may result in incorrect measurement.
- The pulse wave is normalized for SpO₂ measurement. It does not indicate perfused blood volume. Check proper probe attachment by observing the pulse wave.
- If **High** is selected for pulse wave sensitivity on the SpO₂ setup menu for DS-700M MASIMO® Model, sensor-detached detection will become somewhat inaccurate.
- NIBP Monitoring
 - Select the appropriate cuff size which best fits the arm circumference. If the cuff size is inappropriate, it may cause measurement error.
 - Pay attention when measuring the NIBP of patient with bleeding disorders or hyper coagulation. The cuff inflation may cause petechia or circulatory failure by blood clot.
 - Do not apply the cuff to the arm or thigh where vein is secured. The blood may backflow causing the chemical injection to cease.
 - Pay attention not to bend the cuff hose.
 - Check the condition of cuff-applied part on the patient during measurement so that the blood circulation will not be blocked over long period of time by the squashed or bent cuff hose.
 - Check the patient's condition constantly while measuring over long period of time with interval of 2.5 minutes or less. Also, periodically check the blood circulation while performing periodic measurement over long period of time. Congestion may occur at the measuring site.
 - The following factors may affect the NIBP value.
 - Body motion, arrhythmia, convulsion
 - Continuous noise such as cardiac massage
 - Periodic electromagnetic noise
 - If the NIBP measurement has not been performed since the power was turned ON, the "NIBP measurement at alarm occurrence" function will not be effective.
 - For the following situation, measurements will be terminated.
When the measurement time has exceeded 160 seconds for adult and child, 80 seconds for neonate.
When the inflation value has exceeded 300mmHg for adult, 210mmHg for child, and 150mmHg for neonate.
 - If used with the incorrect patient classification, it will not only cause erroneous measurement, but the inflating level for the adult may be applied to a child or neonate causing dangerous situation to the patient.
 - When a PTG (SpO₂) sensor is applied to the toe or forehead, the Dyna Alert may not function depending on the patient's condition.
 - After the Dyna Alert NIBP measurement, the next Dyna Alert NIBP measurement cannot be performed for 2.5 minutes.
 - The Dyna Alert will not properly function for the following cases.
 - If peripheral circulatory insufficiency or very low BP is developed.
 - If highly-frequent arrhythmia is generated.
 - If an artificial heart lung machine is used.
 - If a large noise from body movement or electric surgery equipment is interfering.
 - If autonomic nerve or circulatory dynamics is largely affected by medication.
 - When using the Dyna Alert function, be aware of these risks and do not increase the NIBP interval time by relying only on the Dyna Alert function.

 CAUTION

- BP Monitoring
 - When the main power is turned ON, the BP value will not be displayed until zero balance is performed. However, if the power is turned ON within 30 seconds from power OFF, the previous zero balance information is retained and the BP value will be displayed.
 - Each time the blood pressure transducer or tubing is replaced, the zero balance procedure is required to ensure accurate measurements.
 - “Perform zero balance” message will not be displayed unless the three-way valves of all pressure transducers are opened to air. If the status is not displayed, or if “Open stop cock to air” message is displayed, check if the three-way valve of pressure transducers are opened to air.
 - The zero balance procedure is required for the following case.
 - When starting the measurement.
 - When the position of the heart has changed due to body movement.
 - When the position of the transducer has changed.
 - When measuring for a long period of time and there is a possibility of measurement error due to change in ambient temperature, etc.
 - When the connector is connected / disconnected, or transducer is replaced.
 - When the power has been turned OFF for more than 30 seconds.
 - Note that Systolic Pressure (SYS) = Peak Systolic Pressure (PSP) for trend, data base, and alarm setup.
 - When ECG is not measured, PDP cannot be calculated.
 - The BP data (S/D/M) not displayed will not generate BP alarm or be displayed in the table. Select the appropriate display type according to the monitoring purpose.
- Multigas Monitoring (MGU-701/MGU-702)
 - The MGU-701/MGU-702 requires at least 20 minutes of warm up period to perform correct measurement.
 - If the power supply is interrupted due to reason such as power failure, the MGU-701/MGU-702 will be initialized and enter into warm-up state even if the power failure is within 30 seconds.
 - In an environment where there is alcohol vapor, some errors may be observed to the measurement.
 - The MGU-701/MGU-702 complies with standards for cyclical pressure up to 10kPa.
 - The accuracy of MGU-701/MGU-702 may be affected at extreme temperatures. Do not store them at extreme temperature. Temperatures exceeding specified storage temperatures (-5 to 50°C) could damage the units.
 - After the MGU-701/MGU-702 is stored in low temperature, when turning on the device, it may require additional warm-up time.
- Multigas Monitoring (MGU-801P/MGU-802/MGU-803)
 - The MGU-801P/MGU-802/MGU-803 requires at least 10 minutes of warm up period to perform full accuracy measurement.
 - If the power supply is interrupted due to reason such as power failure, the MGU-801P/MGU-802/MGU-803 will be initialized and enter into warm-up state even if the power failure is within 30 seconds.
 - In an environment where there is alcohol vapor, some errors may be observed to the measurement.
 - While the MGU-801P/802/803 is in the process of warming up, the date of the last measurement check cannot be updated. Perform the update after the warming up process is completed.
 - If the gas measurement accuracy check is performed using a low pressure gas, the accuracy of the gas measurement will be reduced. Make sure to check the gas measurement accuracy using the specified calibration gas before its expiration date.
 - Contamination with CO₂, N₂O or Anesthetic Agent in the air surrounding the MGU-801P/MGU-802/MGU-803 may cause significant measurement errors.
 - The MGU-801P/MGU-802/MGU-803 complies with standards for cyclical pressure up to 10kPa.

CAUTION

- The accuracy of MGU-801P/MGU-802/MGU-803 may be affected at extreme temperatures. Do not store them at extreme temperature. Temperatures exceeding specified storage temperatures (-10 to 60°C) could damage the units.
- After the MGU-801P/MGU-802/MGU-803 is stored in low temperature, when turning on the device, it may require additional warm-up time.
- Alarm
 - Pay attention not to set the alarm volume too low to avoid missing any important alarms.
 - Alarm messages will be displayed according to the priority. (Level 1 → Level 2 → Level 3 → Level 4)
 - For the same alarm level, the alarm message for the newer alarm will be displayed.
 - On the DS-7000, HR alarm and PR alarm cannot be set to ON at the same time.
 - Whether to use the SEC alarm function and its threshold selection should be based on the patient's clinical indication portent and medical evaluation.
 - If the SpO₂ alarm and SEC alarm setup is set to OFF, the SEC alarm integral value will be set to 0.
- System Configuration
 - If the time/date is not correctly set, or if changed during monitoring, malfunction may occur to NIBP measurement, periodic recording, trend, NIBP list data, and age calculation from the birth date.
 - When the waveform and numeric data display for each parameter is set to OFF, the alarm generation and table/trend input for the corresponded parameter will be also set to OFF.
 - If the display of waveform / numeric data labeled as BP1 or ART is set to OFF, the pulse rate derived from BP will not be displayed either.
 - When the waveform and numeric data display for SpO₂ is set to OFF, the pulse rate derived from SpO₂ will not be displayed either.
 - When the waveform and numeric data display for CO₂ is set to OFF, the respiration rate derived from CO₂ will not be displayed either. When the waveform and numeric data display for the gas module is set to OFF, the respiration rate measured by the gas module will not be displayed.
 - If "Save Data to Table" is set to OFF on the alarm setup menu, data at alarm occurrence will not be stored in the table.
 - Depending on the data stored in the table (alarm data, NIBP manual measurement data, or NIBP continuous measurement data), the total duration of the table will differ.
 - Do not set the same remote control bed ID to more than one monitors on the same floor. Otherwise, it may cause to control more than one monitors at the same time.
 - After the remote control setup, check that the remote control unit is properly operating.
- Patient Admit / Discharge
 - 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.
 - The setup for the alarm mode and display mode remains stored even when the power is turned off or when discharging procedure is performed. Before monitoring, make sure the current monitoring mode is suitable for the patient's condition.
 - On a wired network (DS-LANII/III) system, if the discharge procedure is performed on the central monitor, the alarm setting on the bedside monitor will be initialized to the value set on the "Admit Setup" of the central monitor.
- ST Measurement
 - For the lead which the electrode is detached, the reference waveform setup cannot be performed. Check if the electrode is correctly attached, and perform the setup again.
 - When the electrodes are properly attached, the reference waveform setup will be automatically performed. To display the correct ST data, the reference point and measurement point must be set.

 CAUTION

- CF Card
 - Use only the specified CF card.
 - Use only the CF card formatted with this device.
 - Restart the system after reading the setup data from the CF card. The setup data will become effective after the system is restarted.
 - Reading the patient data from the CF card will erase all previous patient data stored in the patient monitor.
 - Maintenance
 - If stains cannot be removed from the touch panel surface, wipe softly with a dry or ethanol dampened cleaning cloth. Never use strong-acidic cleaning solution. Neither is it recommended to use mild acidic or alkaline cleaning solution.
 - A special coating is applied to the surface of the touch panel. Do not wipe the surface with a cloth or gauze with coarse texture. Wipe the surface with a soft cleaning cloth provided as optional accessory or with an eyeglass cleaning cloth.
 - Clean the equipment frequently so stains can be removed easily.
 - To prevent injury, it is recommended to wear gloves when cleaning the equipment.
 - Do not use organic solvents, thinner, toluene and benzene to avoid damaging the resin case.
 - Do not polish the housing with abrasive or chemical cleaner.
 - When sterilizing the entire room using a spray solution, pay close attention not to have liquids get into the equipment or connectors.
 - 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, toluene, 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.
 - For MGU-701/MGU-702, do not sterilize the airway adapter using autoclave methods.
 - For MGU-701/MGU-702, do not reuse / re-sterilize the disposable airway adapter.
 - For MGU-701/MGU-702, water traps are single use only. Do not attempt to drain the water trap when full.
 - For MGU-801P/MGU-802/MGU-803, do not use other than specified cleaning methods for the water trap.
 - For MGU-801P/MGU-802/MGU-803, do not clean or wash the filter housing of the water trap.
 - For MGU-801P/MGU-802/MGU-803, never allow alcohol to enter the filter housing.
 - For MGU-801P/MGU-802/MGU-803, never force air through the water trap.
 - Do not open the housing.
 - Do not allow liquids such as alcohol or cleaning solution enter the equipment or connectors.
 - If you accidentally wet the device, dry it completely and verify it operates safely before usage.
- Replace the components periodically as specified.

Precautions about the Wired Network System (DS-LAN II/DS-LAN III)

 WARNING	<ul style="list-style-type: none">● Do not connect unspecified device to a wired network.● Do not mix devices with DS-LANII and DS-LANIII setting in the same wired network. The network may cease and proper monitoring may not be possible.● Before setting the bed ID, make sure that the DS-LAN (DS-LANII/DS-LANIII) is correctly set on the Initial Settings menu. If not correctly set, the network may cease which may lead to accidents such as not transmitting life threatening alarms to the central monitor.
 CAUTION	<ul style="list-style-type: none">● If performing wired network transmission, configure the display so that the numeric data corresponded to the waveform is displayed. If not, the displayed waveform or numeric data may not be transmitted.● The Operation Room ID is factory set to 000. If connected to the wired network with the ID unchanged, monitoring on the central monitor will not be possible.● When connected to the wired network, verify that the Operation Room ID is not duplicated with other monitors. Otherwise, monitoring on the central monitor for both monitors will not be possible.● Make sure to set the Monitor ID in the following range.<ul style="list-style-type: none">• For DS-LANII network: 001 to 048• For DS-LANIII network: 001 to 100● Precautions about the DS-LANII Network System<ul style="list-style-type: none">• Arrhythmia alarm of TACHY, BRADY, COUPLET, PAUSE, TRIGEMINY will not be transmitted.• Arrhythmia alarm of "SLOW VT" will be transmitted as "VT".• On a wired network, waveform, numeric data, alarm of TEMP3 will not be transmitted. Also, the displayable waveform, numeric data, alarm differs depending on the connected central monitor. Refer to the operation manual for the respective central monitor.• If "HR/PR Alarm Source" is PR, and "PR Source" is BP, ECG waveform will not be transmitted on a wired network. On the central monitor, PR-IBP value will be displayed for HR. However, HR value from ECG will be displayed for the NIBP list and ST measurement table.• If the "RR Alarm Source" selection is other than Impedance, respiration waveform will not be transmitted on a wired network.• If the "RR Alarm Source" selection is other than GAS, CO₂ waveform will not be transmitted on a wired network.• For numeric data displayed as "xxx", maximum or minimum value of measurable range will be transmitted.• The numeric data displayed as "—" will be treated as not measured data.

 CAUTION

- Precautions about the DS-LANIII Network System
 - In order to connect to the DS-LANIII network, the software version needs to be the version which supports the DS-LANIII. For details, refer to our service representative.
 - Make sure that “DS-LAN Setup” for all bedside monitors and central monitors are set to DS-LANII before connecting the monitor to the network.
 - If the measurement unit for BP (mmHg/kPa) and temperature (°C/°F) is different between the bedside monitor and the central monitor, the corresponding waveform and numeric data will not be displayed on the central monitor.
 - If using a HUB for the DS-LAN III network construction, make sure to use a switching HUB recommended by Fukuda Denshi.
 - The displayable waveform, numeric data, and alarm will differ depending on the central monitor model type. Refer also to the operation manual for the respective central monitor.
 - On the DS-LANIII system, the patient data search function using the patient data server can be used depending on the monitor model type and software version. For details, refer to our service representative.
- When DS-5800N/NX/NX^{MB} is used as a central monitor, recall, trend/table, data will not be displayed. Also, Σ recording cannot be performed. For the ST display, overlap waveform will not be displayed on the DS-5800N/NX/NX^{MB} until 15 minutes elapses since the reference waveform is set on the DS-7000.
- As the DS-7000 do not have the arrhythmia template display and 12-lead ST display function, these display on the central monitor will not be supported.
- If connected to a wired network, time/date will be the same with the central monitor. Even if the time/date is changed on the DS-7000, it will be synchronized with the time/date of the central monitor.
- If ECG lead (ECG1 or ECG 2) is changed on the DS-7000 while monitoring ST display on the central monitor, the ST display will be distorted. Redrawing the ST display will return the display to normal.
- The respiration waveform and RR value based on the RR source selected on the DS-7000 will be displayed on the central monitor. The monitoring RR and APNEA will be the same as the one monitored on the DS-7000.

⚠ CAUTION

- There are following restrictions when recording the DS-7000 data on the central monitor recorder or the AU-5500N 8ch Recorder.
 - Only manual recording, alarm recording, periodic recording, and recall recording can be performed on the AU-5500N.
 - When a parameter is not measured, the waveform for that parameter will not be recorded, and measurement data will be recorded as “---” or blank.
 - The measurement data displayed as “xxx” will be recorded as “---” on the central monitor recorder.
 - The QRS symbol, “S” printed on the built-in recorder will be printed as “N” on the central recorder and AU-5500N.
 - For the waveform recording and trend recording, some parameters may not be able to be recorded depending on the scale.
 - When performing table recording or trend recording on the central recorder, some numeric data may not be recorded depending on the parameter. Also, there are some trend scales that cannot be recorded.
 - If **[PR]** is set for the “HR Alarm Source” and **[BP]** is set for the “PR Source”, ECG will not be recorded on the central recorder. PR-IBP value will be printed instead for the HR value.
 - If the measurement unit of BP is kPa, the BP waveform, BP numeric data, and NIBP numeric data will be treated as not measured data.
 - If the measurement unit of temperature is °F, the temperature data will be treated as not measured data.
 - If the “RR Alarm Source” selection is other than **[Impedance]**, respiration waveform will not be output on the central recorder.
 - If the “RR Alarm Source” selection is other than **[GAS]**, CO₂ waveform will not be output on the central recorder.
 - When trend recording, table recording, or NIBP list recording is output on the central monitor recorder from the DS-7000, HR value derived from ECG will be recorded for the HR value and ST trend.

Precautions about the Wireless Network System

DANGER

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

WARNING

- A password can be set to access the channel ID setup menu to allow only the telemetry channel administrator to change the channel ID.
- Some 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

- If performing telemetry transmission, configure the display so that the numeric data corresponds to the waveform displayed. If not, the displayed waveform or numeric data may not be transmitted.
- The setup of channel ID and group ID should be performed only by our service representative. Users should not perform this procedure as malfunction of the equipment may occur.
- BP waveform with a scale above the programmed scale cannot be properly transmitted. When transmitting the BP waveform, check the displayed BP waveform scale.
- On a wireless network system, O₂, N₂O, AGT alarm will not be transmitted to the central monitor.
- On a wireless network system, the alarm generated on the DS-7000 will be transmitted to the central monitor with some delay. For details, refer to the operation manual for the central monitor.

Precautions about the Ventilator Monitoring

⚠ WARNING	<ul style="list-style-type: none">● The ventilator alarm on this monitor should be used as supplementary function. Check the patient's condition, ventilator alarm sound and message occasionally.● The ventilator alarm sound is set to OFF at factory default setting. The alarm sound can be turned ON on the volume setup menu.● If the DS-7000 does not generate an alarm even though the ventilator is generating an alarm, or if any other malfunction occurs, immediately check the ventilator, DS-7000, cable, and replace the cable if necessary. If the malfunction persists, stop using the device.● After connecting the ventilator and the DS-7000, ensure that "Vent. Online" message is displayed for the connection status. Otherwise, the DS-7000 will not detect the ventilator alarm.● The alarm generation on the DS-7000 is not assured if the alarm other than specified generates on the Servo-i.<ul style="list-style-type: none">• 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
⚠ CAUTION	<ul style="list-style-type: none">● The ventilator operation should be performed by well-trained and authorized personnel.● For connecting the DS-7000 and ventilator, use only the specified connection cable.● Verify that the DS-7000 and the ventilator are properly connected.● When connecting the cable, verify that the main power of the DS-7000 and the ventilator is OFF.● Check occasionally the communication status of the DS-7000 and the ventilator.● Verify that the ventilator alarm is not generated, and the "Vent. Online" message is displayed.● The "Check external alarm" will be displayed until proper communication with the ventilator is resumed. When the communication is resumed, the screen will automatically return to the home display.● When disconnecting the ventilator and the DS-7000, make sure to select OFF on the "Check external alarm" display which appears when the power of the ventilator is turned OFF, or when the cable is disconnected.

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 Masimo® Model: DS-7000M

⚠ CAUTION	No Implied License Possession or purchase of this device does not convey any express or implied license to use the device with unauthorized sensors or cables which would, alone, or in combination with this device, fall within the scope of one or more of the patents relating to this device.
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Precautions for Use of NIBP Cuff

⚠ CAUTION	Some of the NIBP cuffs used for this equipment contain natural rubber latex which may cause allergic reactions. (FDA: Medical Alert on Latex Products, "Allergic Reactions to Latex-Containing Medical Devices", Food & Drug Administration, 9200 Corporate Blvd., Rockville, MD 20850, 1991.)
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Disposing of Equipment, Accessories, or Components

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

For transporting the DS-7000, pack it up with the specified packing materials.



Refer to "11. Technical Information Specification / Performance" for environmental condition during transportation.

Precautions about RTC or Data Backup

⚠ CAUTION	<ul style="list-style-type: none">The DS-7000 is equipped with a built-in clock. When the power of the DS-7000 is turned off, this clock is backed up by a lithium primary battery. If incorrect time is displayed when turning on the power, a low battery may be the cause. In such case, contact Fukuda Denshi service representative for replacing the battery.To protect the data during voltage dip, short interruptions and voltage variations on power supply input lines or during short duration of power turned OFF, this monitor performs 5-minute (approx.) data backup using the secondary battery. The data may not be protected if the power is turned off within 30 minutes from power on.
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To Prepare for Emergency Use

Accessories / Optional Accessories

- (1) The ECG electrodes are consumables. Always prepare extra supplies of electrodes.
- (2) Check if there is any damage on the patient cables once a week.

Electromagnetic Compatibility

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

Precautions for Safe Operation under Electromagnetic Influence

 CAUTION	<p>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.</p> <p>The following are examples of the common cause and countermeasures.</p> <ul style="list-style-type: none">● <u>Cellular Phone</u> 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.● <u>Static Electricity</u> In a dry environment (room), static electricity is likely to occur. Take the following countermeasures.<ul style="list-style-type: none">• Both operator and patient should remove any static electricity before entering the room.• Humidify the room.● <u>Lightning</u><ul style="list-style-type: none">• A lightning nearby may induce excessive voltage to the equipment. If any danger is suspected, use the uninterruptible power supply system.● <u>High frequency noise interference from other device through the power outlet</u><ul style="list-style-type: none">• 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.
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EMC Guidance

This equipment complies with IEC 60601-1-2 (2007). However, if portable transmitter or wireless LAN equipment is used extremely nearby, the electromagnetic influence may largely exceed the compliance level and may cause unexpected phenomenon such as noise interference on the waveform, etc. Therefore, this equipment should be used in a location specified by each medical institution. If any unexpected noise interferes with 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-7000 is tested under the following electromagnetic environment.

Emissions Test	Compliance	Electromagnetic Environment – Guidance (The DS-7000 is intended for use in the electromagnetic environment specified below.)
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 purposes.
Harmonic Emissions IEC 61000-3-2	Not applicable	
Voltage Fluctuations/ Flicker Emissions IEC 61000-3-3	Not applicable	

●Compliance to the Electromagnetic Immunity (1)

The DS-7000 is tested under the following electromagnetic environment.

Immunity Test	IEC60601-1-2 Test Level	Compliance Level	Electromagnetic Environment – Guidance (The DS-7000 is intended for use in the electromagnetic environment specified below.)
Electrostatic Discharge (ESD) IEC 61000-4-2	±2, 4, 6kV contact ±2, 4, 8kV air	±2, 4, 6kV contact ±2, 4, 8kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient / burst IEC 61000-4-4	±2kV for power supply lines ±1kV for input/output lines	±2kV for power supply lines ±1kV input/output lines	Power supply quality should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Surge IEC 61000-4-5	±0.5, 1kV : differential mode ±0.5, 1, 2kV : common mode	±0.5, 1kV: differential mode ±0.5, 1, 2kV: 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. IEC 61000-4-11	<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 5sec.	<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 5sec.	Power supply quality should be at levels characteristic of a typical location in a typical commercial or hospital environment. If it is required to continuously operate the DS-7000 during power failure, it is recommended to operate on an uninterrupted power supply.
Power Frequency (50/60Hz) Magnetic Field IEC 61000-4-8	3A/m	3A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

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

●Compliance to the Electromagnetic Immunity (2)

The DS-7000 is tested under the following electromagnetic environment.

Immunity Test	IEC60601-1-2 Test Level	Compliance Level	Electromagnetic Environment - Guidance (The DS-7000 is intended for use in the electromagnetic environment specified below.)
Conducted RF IEC 61000-4-6	3Vrms 150kHz to 80MHz	3Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the DS-7000, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended Separation Distance $d = 1.2 \sqrt{P}$

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-7000

The DS-7000 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-7000 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>		
	150kHz to 80MHz $d = 1.2\sqrt{P}$	80MHz to 800MHz $d = 1.2\sqrt{P}$	800MHz to 2.5GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

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

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

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

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6. Parameter Setup	Describes the procedure to set the measurement condition, size, scale, etc. for each parameter.	6
7. Function	Describes about the functions such as arrhythmia analysis, trend, recall, etc.	7
8. Installation	Describes about the environment for use, wireless system, etc.	8
9. Initial Settings	Describes the procedure to set the initial settings which should be preprogrammed before monitoring a patient.	9
10. Maintenance	Describes about the maintenance, troubleshooting of this equipment.	10
11. Technical Information	Lists the specification, default settings, pin assignments of external connector, etc.	11
12. Accessories	Lists the accessories and optional accessories for this equipment.	12

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Chapter 1

General Description

This chapter explains the general description of this equipment.

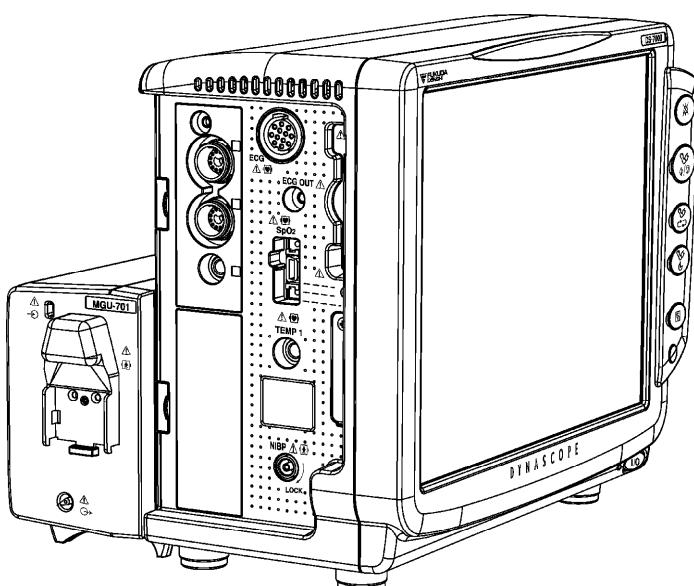
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General Description

The DS-7000 is a patient monitor with a 12.1-inch color LCD which measures ECG, heart rate, non-invasive blood pressure (NIBP), pulse rate, arterial oxygen saturation (SpO_2), pulse wave, temperature, blood pressure, cardiac output. By using the built-in 3ch recorder, waveforms, list data, and trend data can be output to the recorder. The SpO_2 measurement device can be selected from either Nellcor® or Masimo®.

By using the Multigas Unit (MGU-701/MGU-702/MGU-801P/MGU-802/MGU-803, optional), monitoring of carbon dioxide concentration (CO_2), nitrous oxide concentration (N_2O), oxygen concentration (O_2), and anesthetic agent concentration (AG) are also possible. By using the Option Unit (HU-71/HU-72/HU-73), blood pressure (up to 6 channels), cardiac output, temperature (up to 3 channels) can be additionally monitored.

Network connection with the central monitor using the Ethernet LAN and telemetry transmitter module is also possible.



<Composition of DS-7000, HU-71, and MGU-701>

Combination of Option Unit and Measurement Parameter

The following 3 types of option unit (maximum of 2 units) can be attached to the DS-7000 simultaneously. (However, only one unit for the HU-73.)

【Lineup of Option Unit】

Model Type	Measurement Parameter		
	BP	TEMP	Cardiac Output
HU-71	2ch	1ch	No
HU-72	3ch	No	No
HU-73	1ch	1ch	Yes

The parameters that can be measured with the respective option unit are as follows.
The multigas unit can be attached with any combination of the option unit.

Model Type	Additional Option Unit		Measurement Parameters				
	Unit 1	Unit 2	Fixed Parameters	Additional Measurement Parameters			
				BP	TEMP ^{*2}	Cardiac Output	Gas Unit ^{*3}
DS-7000 or DS-7000M ^{*1}	(none)	(none)	ECG RESP×1 TEMP ×1 NIBP ×1 SpO ₂ ×1	No	1ch	No	MGU-701/ MGU-702/ MGU-801P/ MGU-802/ MGU-803
	HU-71	(none)		2ch	2ch	No	
	HU-72	(none)		3ch	1ch	No	
	HU-73	(none)		1ch	2ch	Yes	
	HU-71	HU-71		4ch	3ch	No	
	HU-71	HU-72		5ch	2ch	No	
	HU-72	HU-72		6ch	1ch	No	
	HU-73	HU-71		3ch	3ch	Yes	
	HU-73	HU-72		4ch	2ch	Yes	

*1 DS-7000: SpO₂ measurement is performed with built-in Nellcor® module.

DS-7000M: SpO₂ measurement is performed with built-in Masimo® module.

*2 The number of channels include 1 channel incorporated in the main unit.

*3 MGU-701/MGU-702: Gas measurement concentration measurement is performed with built-in agent module of Criticare Systems Inc® (CSI) (Sidestream Method)

MGU-801P/MGU-802/MGU-803: Gas measurement concentration measurement is performed with built-in agent module of ARTEMA Medical AB (Sidestream Method)

【Lineup of Gas Unit】

Model Type	Measurement Parameters			
	CO ₂	O ₂	N ₂ O	AGT
MGU-701 : AGO ₂ Gas Unit	Yes	Yes	Yes	Yes
MGU-702 : AG Gas Unit	Yes	No	Yes	Yes
MGU-801P : AGO ₂ Gas Unit P	Yes	Yes ^{*4}	Yes	Yes
MGU-802 : AG Gas Unit	Yes	No	Yes	Yes
MGU-803 : CO ₂ Gas Unit	Yes	No	Yes	No

*4 with the Servomex Paramagnetic Oxygen Sensor

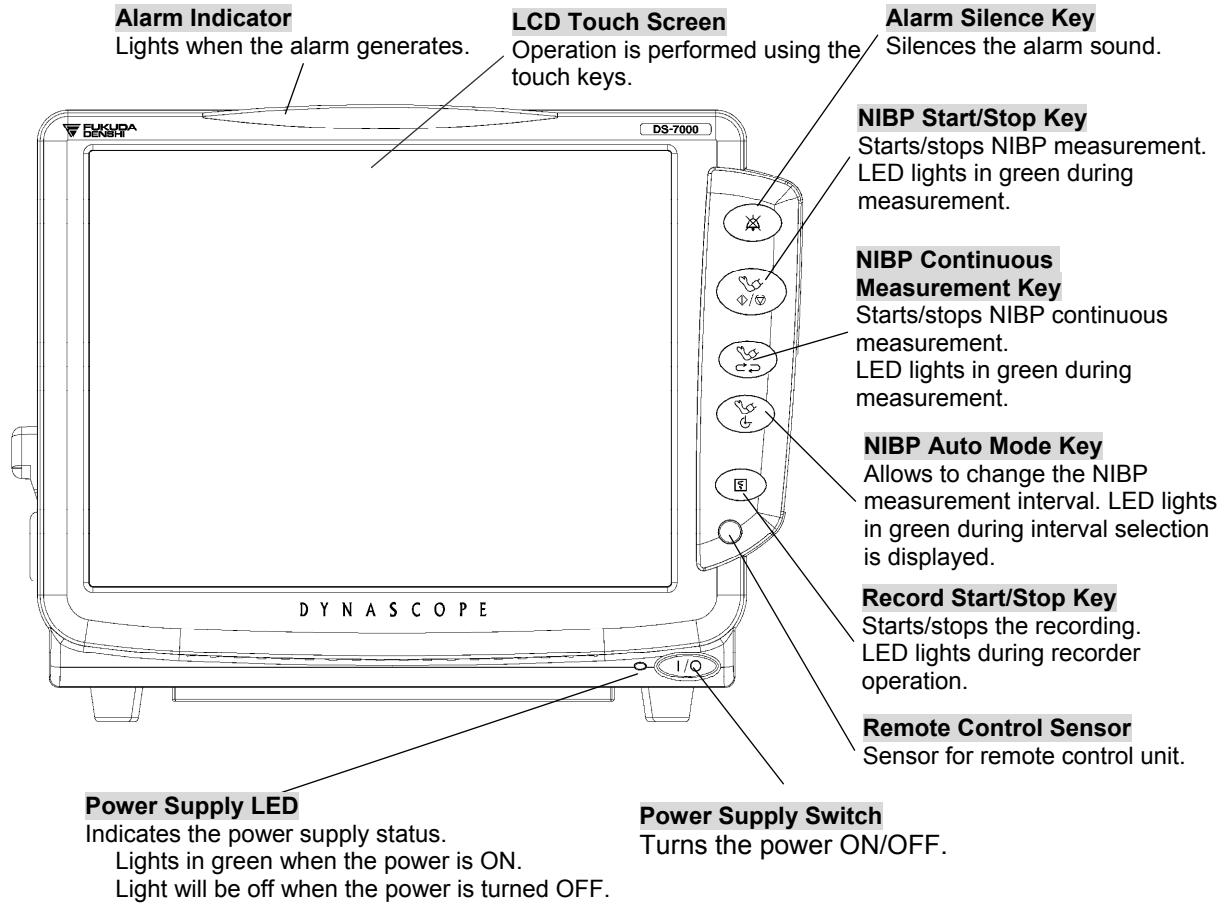
Features

- The DS-7000 is a compact and light-weight patient monitor of all-in-one type which consists of a display part, recording part, and measurement part.
- On the 12.1-inch color LCD, a maximum of 12 waveforms can be displayed. The numeric data display can be enlarged for easier view. Table data, trend data, and ventilator data can be also displayed.
- 5 fixed keys and touch keys are used for monitor control. 6 frequently used touch keys can be preprogrammed.
- The DS-7000 is equipped with an alarm indicator which notifies the alarm by 3 flashing patterns corresponding to the alarm level.
- Remote control function is available. (Optional)
- Wired network (DS-LANII/DS-LANIII) is possible via the Ethernet LAN cable.
DS-LANII is a network based on 10BASE-T with transmission speed of 10Mbps and maximum transmission distance of 100m.
DS-LANIII is a network based on 100BASE-TX with transmission speed of 100Mbps and maximum transmission distance of 100m.
- Wired network construction is possible using the DS-LAN II (Ethernet LAN).
- Wireless network construction is possible using the optional telemetry transmitter module (HLX-561).
- By connecting a ventilator (Servo-i), airway flow, airway pressure waveform, minute ventilation, airway resistance, etc. can be monitored. Also, ventilator alarm can be notified to the central monitor via telemetry system and wired network.
- By connecting an oximeter, SvO_2 , CO, etc, can be monitored. The following device can be connected.
 - Oximeter / CCO Measurement Device; Vigilance, Vigilance CEDV, Vigilance II, Vigileo
 - SO_2 /CO Computer; OXIMETRIX3
 - CCO/CO Computer; Q-vue
 - CCO/ SO_2 Monitor; Q2 Computer
- By connecting the optional Multigas Unit (sidestream method), CO_2 concentration, anesthetic gas concentration, O_2 concentration, N_2O concentration can be measured. The anesthetic gas that can be measured are halothane, isoflurane, sevoflurane, desflurane, and enflurane.
- By connecting the A-2000 BIS Monitor manufactured by ASPECT® MEDICAL SYSTEMS to the main unit, the patient's wakeful state can be monitored.
- By connecting the NICO-7300 Monitor (NOVAMETRIX®), continuous cardiac measurement can be monitored.
- By connecting the Fabius GS anesthesia system (Drager®), ventilator data can be monitored.
- By connecting the Radical-7 Pulse Oximeter (Masimo®), oxygen saturation, carboxyhemoglobin, methemoglobin can be monitored.

Names of Parts and Their Functions

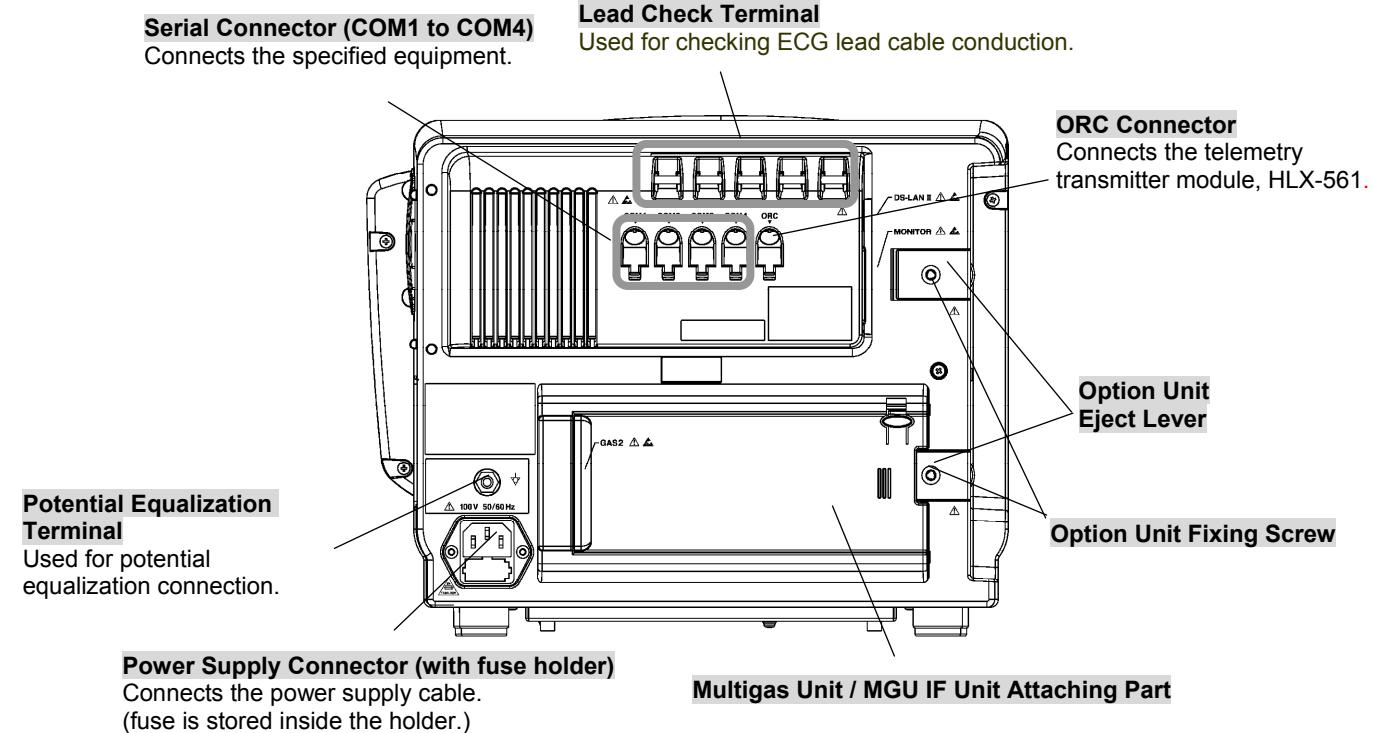
DS-7000 Main Unit

[Front Side]

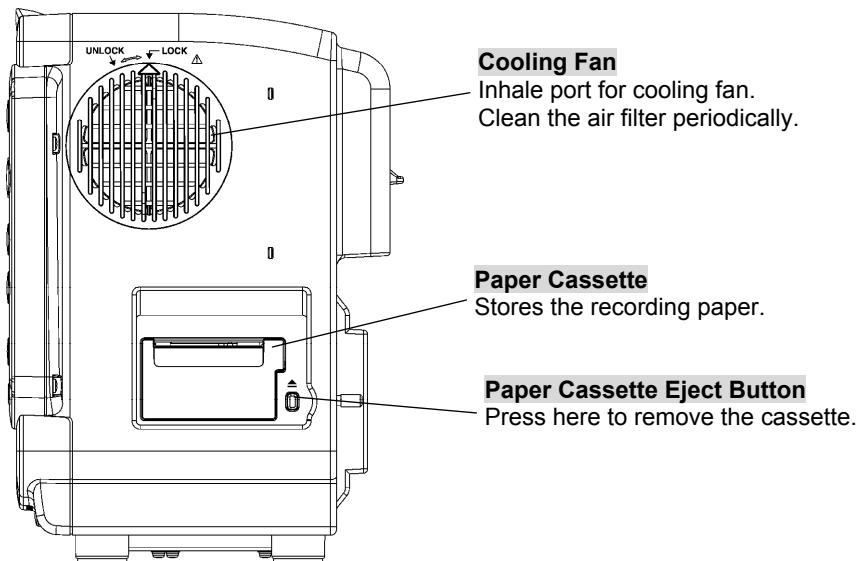


NOTE	The display panel utilizes exclusive fluorescent light for the backlight. Since this fluorescent light deteriorates with the life cycle, the display may become dark, flicker, or may not light with long term use. In such case, contact your nearest service representative.
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【Rear Side】



【Left Side】



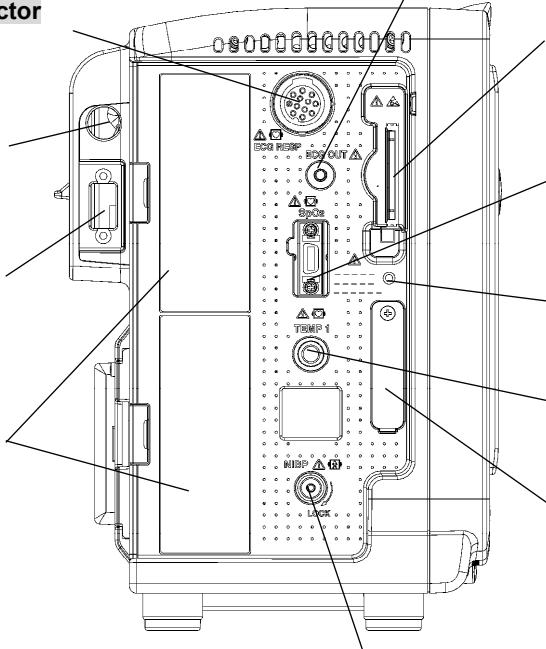
【Right Side】

ECG/Respiration Input Connector
Connects ECG relay cable.

LAN Connector
Connects to the wired network using the branch cable (CJ-530, CJ-522)

External Monitor Connector
Connects the external monitor.

Option Unit Slot
Option Unit can be attached here.



Analog Output Connector
Outputs the ECG waveform.

CF Card Slot
Insert the specified compact flash memory card here.

SpO₂ Input Connector
Connects the SpO₂ sensor cable.

CF Card Access Indicator
Indicates CF card access status.

Body Temperature Input Connector
Connects the TEMP sensor cable.

Maintenance Cover
Internal switch for maintenance is inside this cover

WARNING

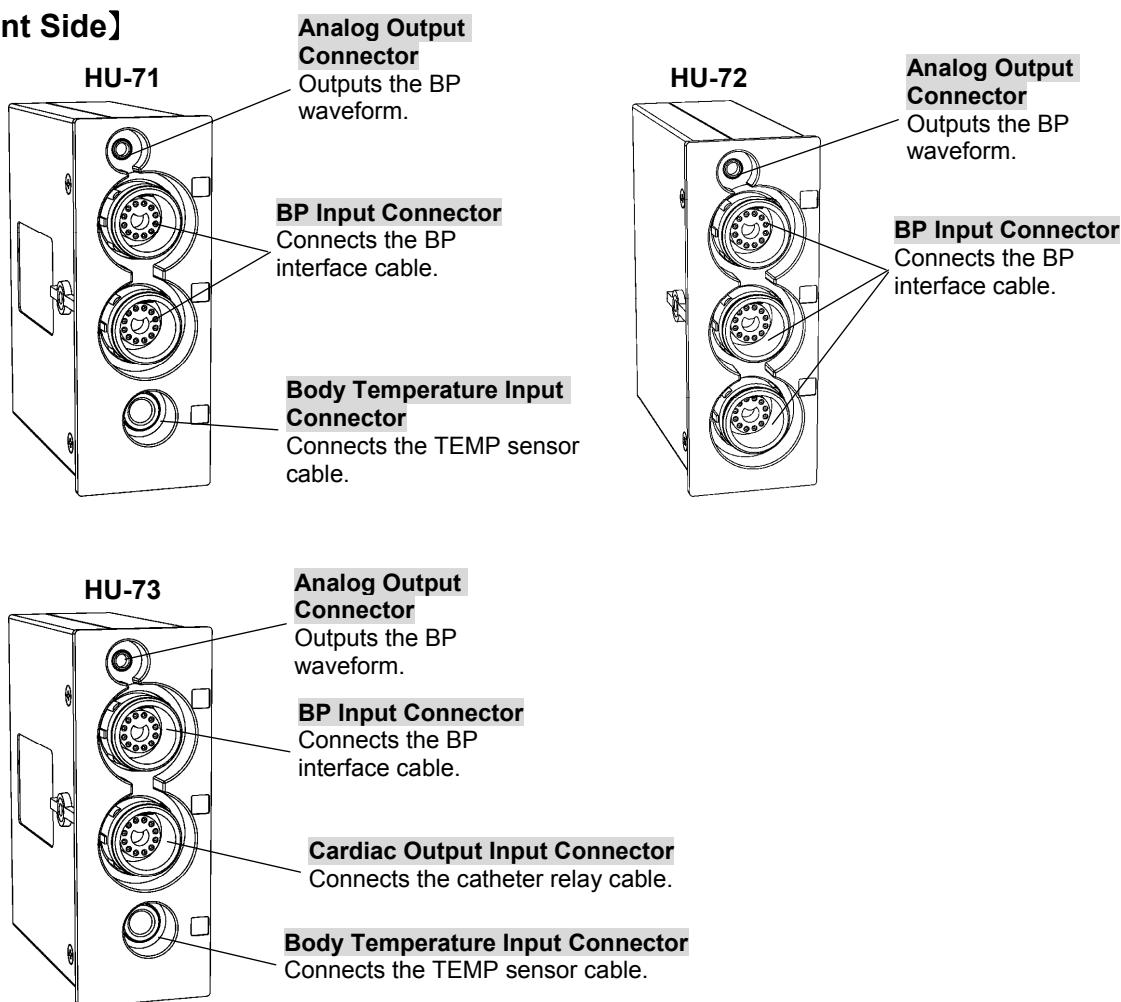
Do not connect a unit or cable not authorized by Fukuda Denshi to any I/O connector. If done so by mistake, the device cannot deliver its maximum performance and the connected units may be damaged, resulting in a safety hazard.

CAUTION

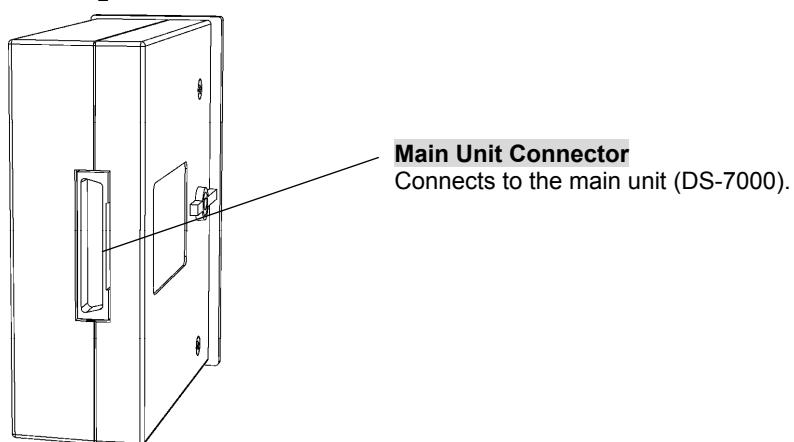
The internal switch setting will be performed by our service representative. Users should not open the maintenance cover.

HU-71/HU-72/HU-73 Option Unit

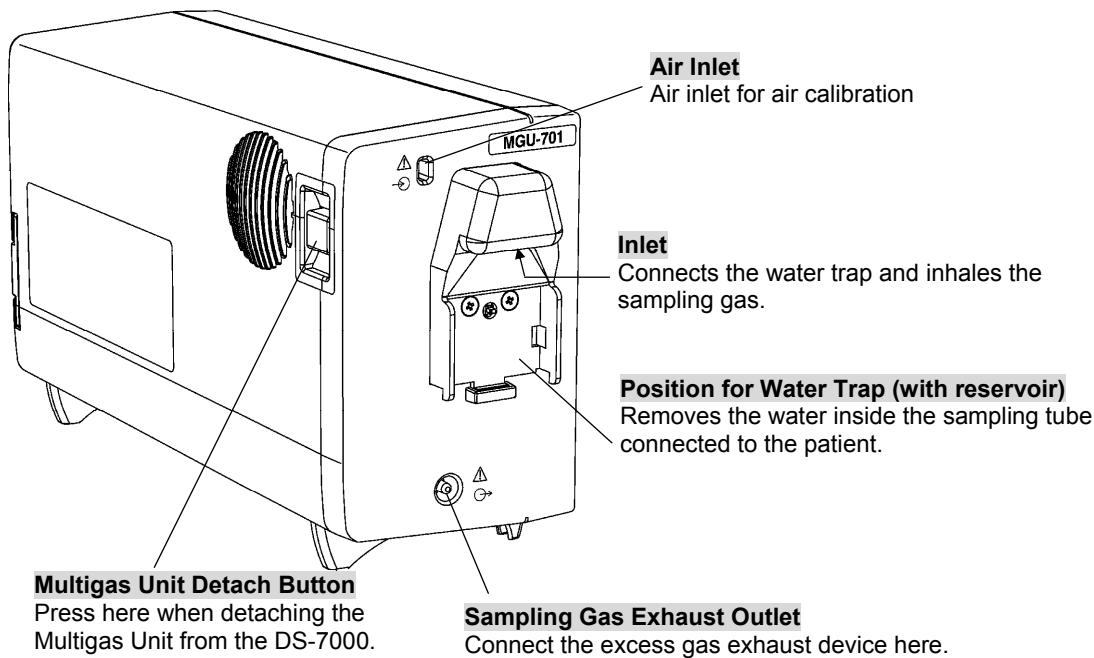
【Front Side】



【Rear Side】



MGU-701/MGU-702 Multigas Unit (Optional)



Multigas Unit Detach Button
Press here when detaching the Multigas Unit from the DS-7000.

Air Inlet
Air inlet for air calibration

Inlet

Connects the water trap and inhales the sampling gas.

Position for Water Trap (with reservoir)
Removes the water inside the sampling tube connected to the patient.

Sampling Gas Exhaust Outlet
Connect the excess gas exhaust device here.

Main Unit Connector
Connects to the main unit (DS-7000).

Ventilation Opening
Ventilation opening for cooling fan.

Fan Filter
Protects the Multigas Unit from suspended particles of dust.
Remove and clean the filter periodically.

MGU-801P/MGU-802/MGU-803 Multigas Unit (Optional)

Power Supply Indicator

Indicates the power supply status.

Lights in green when power is supplied from DS-7000.

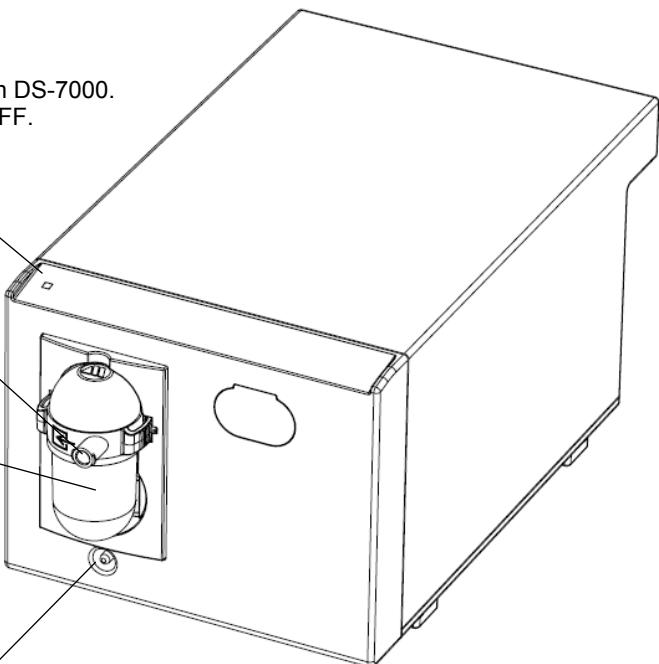
Light will be off when the power is turned OFF.

Inlet

Connects the sampling line to inhale sampling gas.

DRYLINE™ Water Trap (with container)

Removes water inside the sampling line connected to the patient.



Exhaust Outlet

Connects gas exhaust system and exhausts sampling gas.

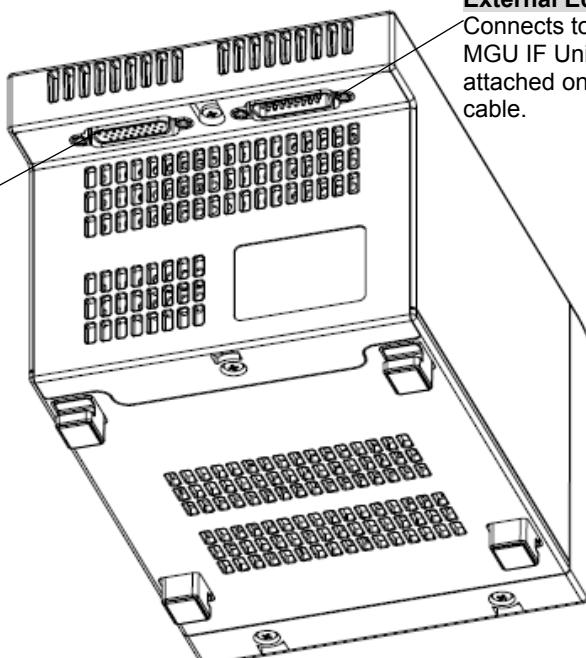
External Equipment Connector 1

Connects to the MGU-800 connector on the MGU IF Unit (Model: OAO-41B), which is attached on the main unit (DS-7000), via I/F cable.

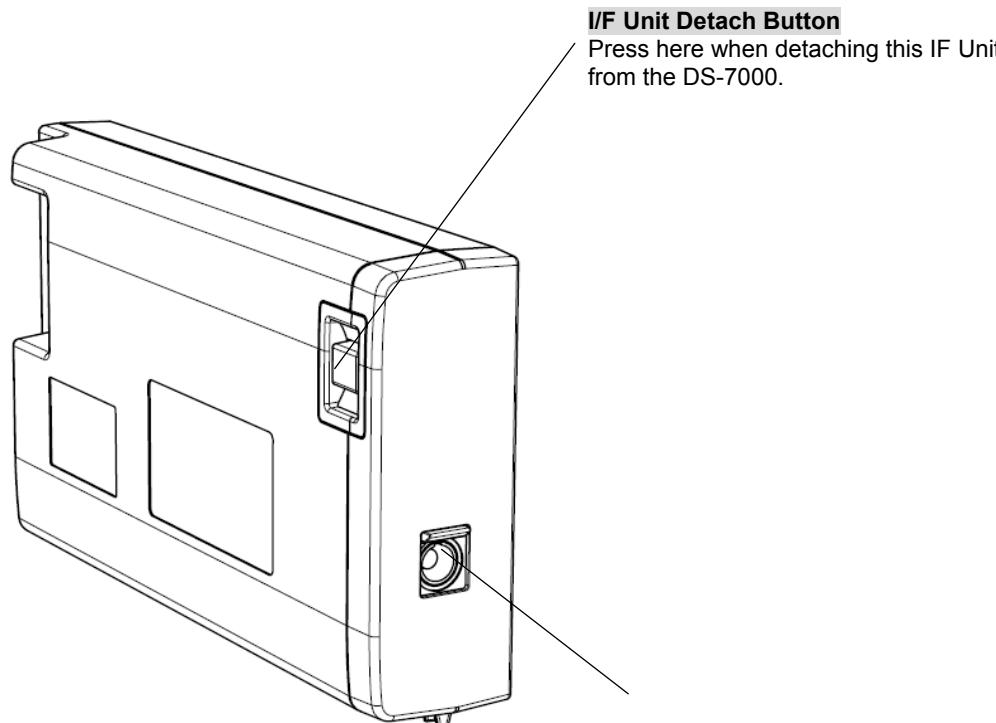
External Equipment Connector 2

Connects the specified equipment.

*This connector is not used for the DS-7000 System.



OAO-41B MGU IF Unit (Optional)

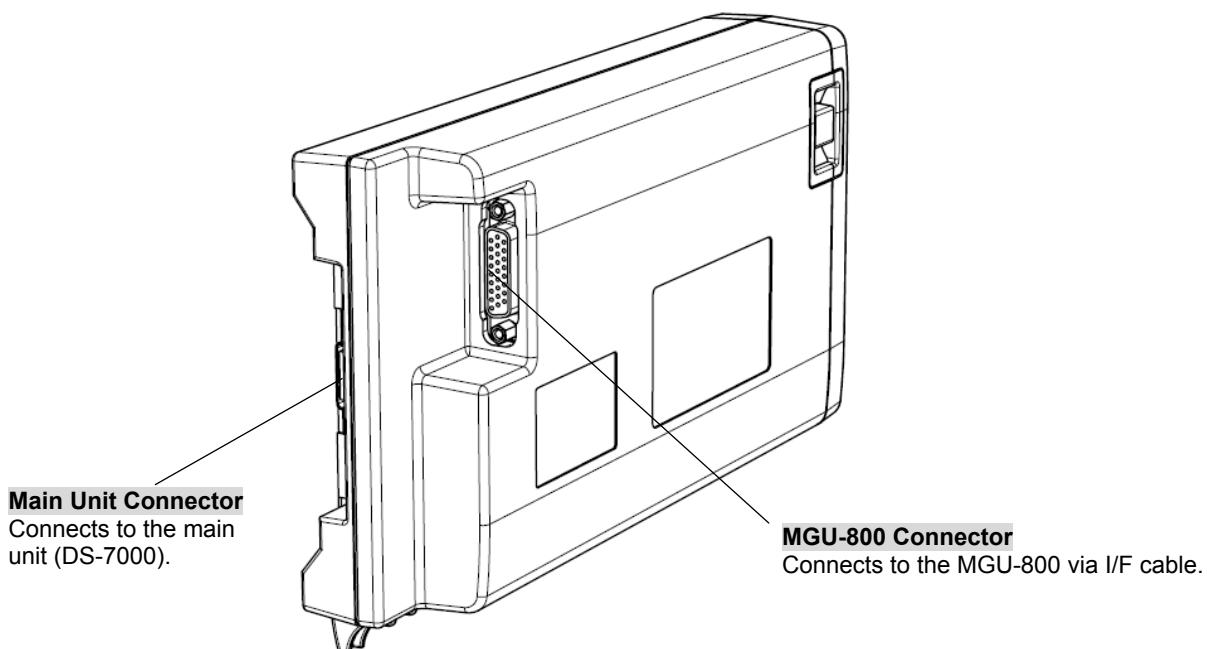
**I/F Unit Detach Button**

Press here when detaching this IF Unit from the DS-7000.

Expansion Connector

Connects the specified equipment.

*This connector is not used for the DS-7000 System.

**Main Unit Connector**

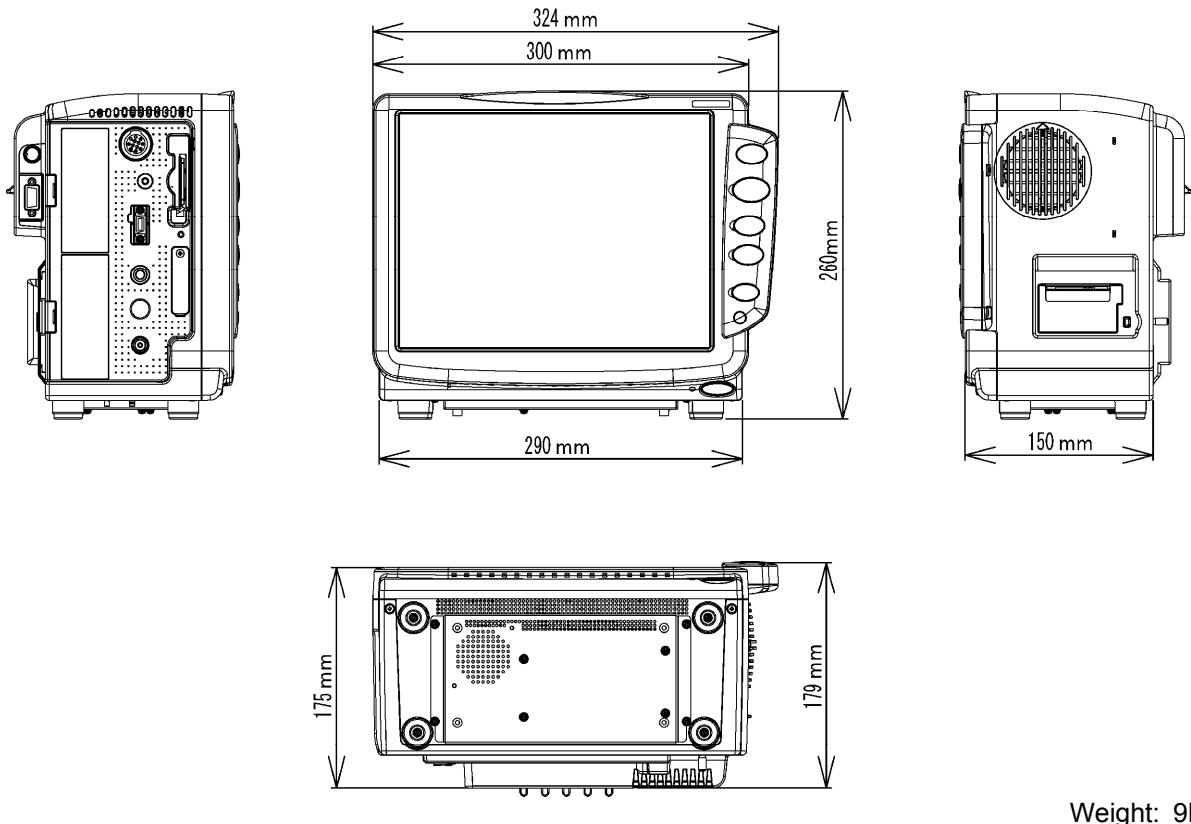
Connects to the main unit (DS-7000).

MGU-800 Connector

Connects to the MGU-800 via I/F cable.

External Appearance

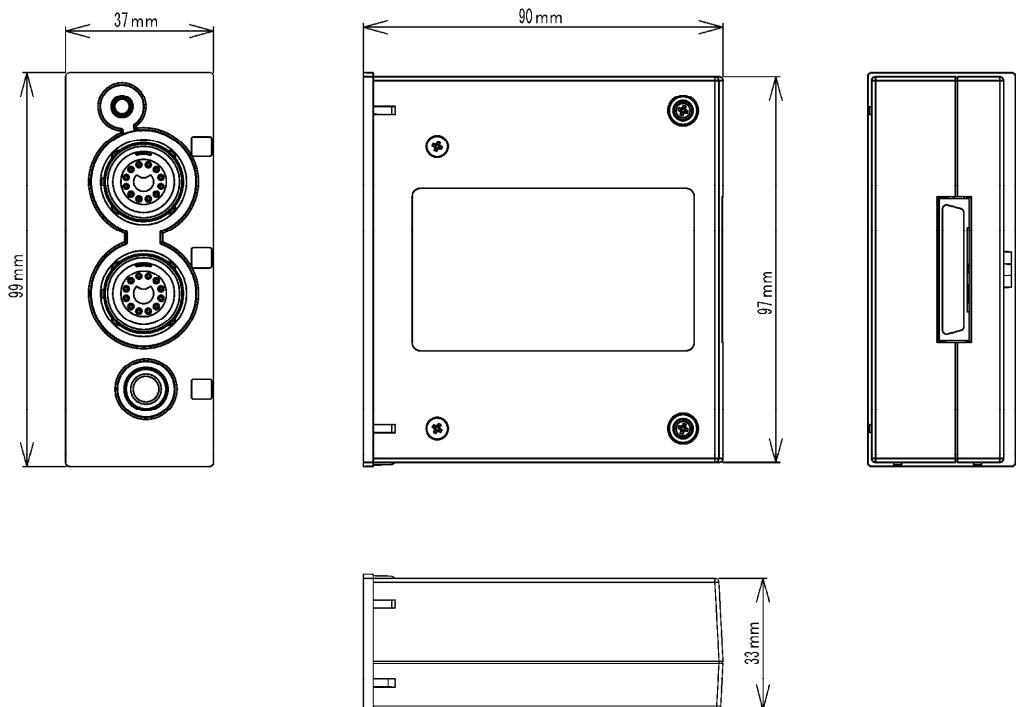
DS-7000 Main Unit



Weight: 9kg

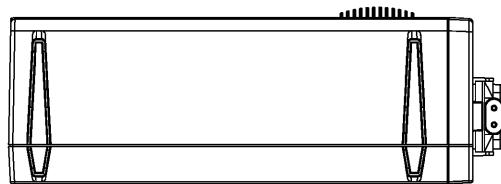
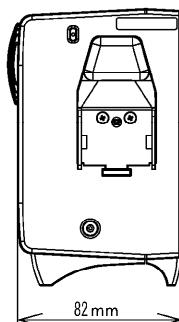
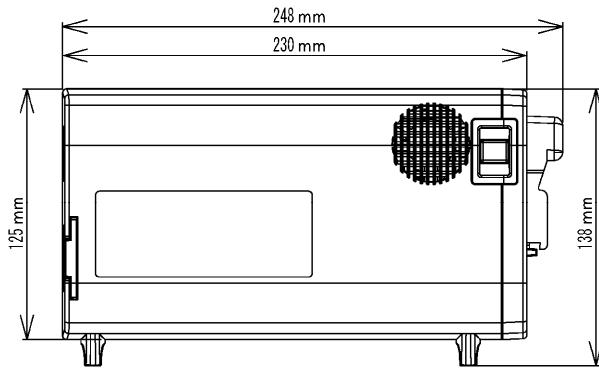
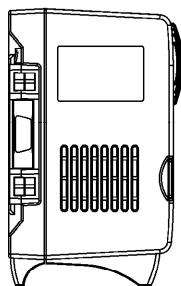
HU-71/HU-72/HU-73 Option Unit

The illustration is HU-71.



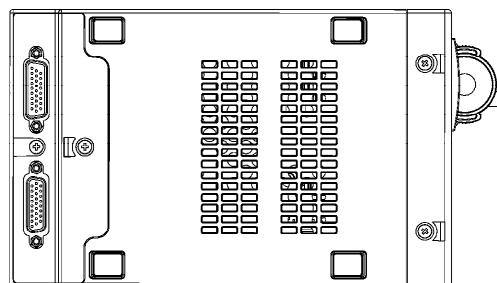
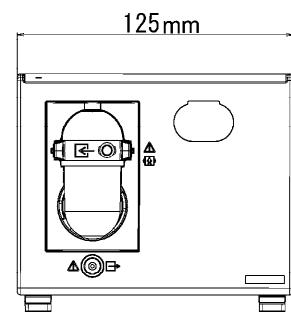
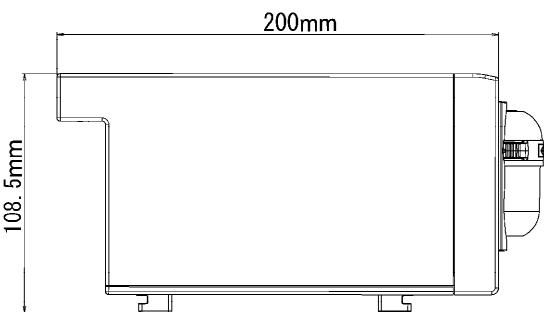
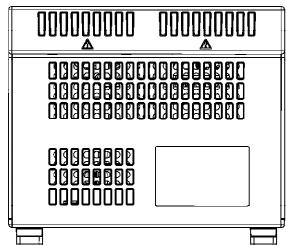
Weight: 180g

MGU-701/MGU-702 Multigas Unit (Optional)



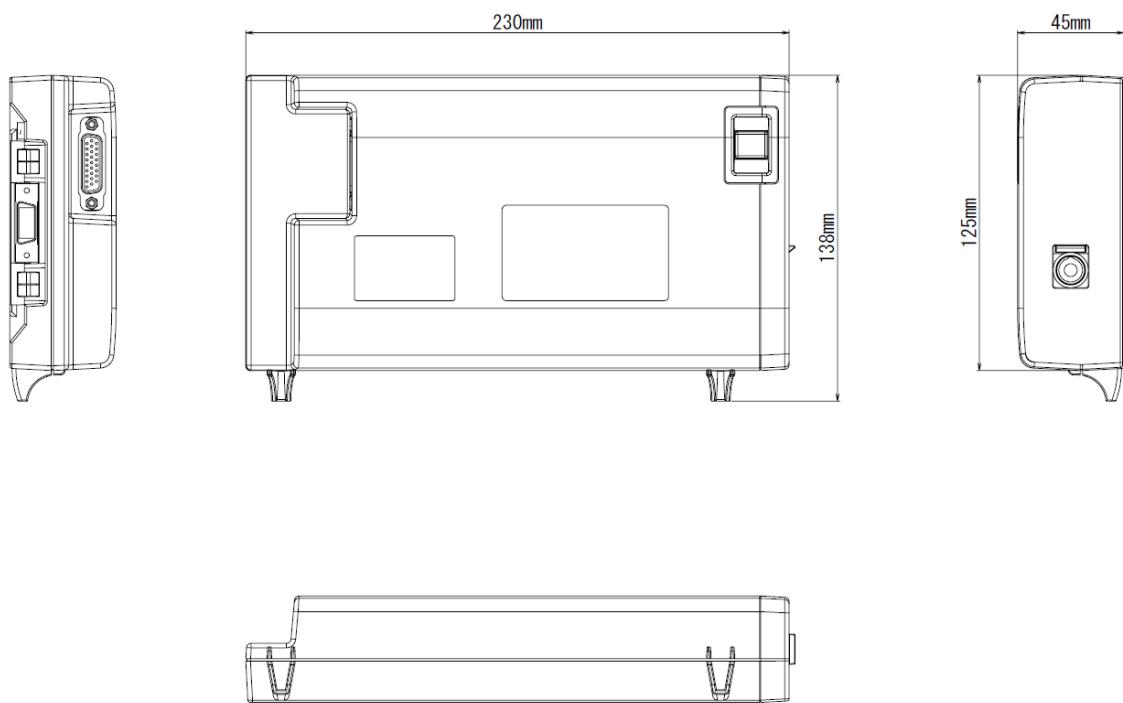
Weight: 1.8kg

MGU-801P/MGU-802/MGU-803 Multigas Unit (Optional)



Weight: 1.8kg

OAO-41B MGU IF Unit (Optional)



Weight: 0.6kg

Chapter 2

Basic Operation

This chapter describes the basic operation for monitoring.

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Before Usage

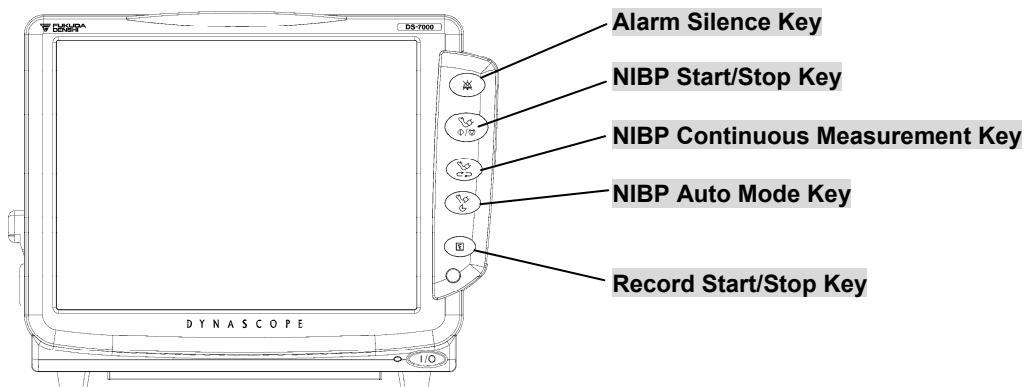
Basic Operation for Monitoring

To control the DS-7000, 5 fixed keys located at the right side of the display and touch keys displayed on the screen can be used.

About the Fixed Keys

There are 5 fixed keys located at the right side of the display.

As these keys can be directly controlled regardless of the displayed screen, frequently used functions during monitoring and important functions are assigned to these fixed keys.



Alarm Silence Key

When an alarm generates, pressing this key will silence the generating alarm for preprogrammed duration (1min/3min/5min).

Also, by pressing this key for more than 3 seconds, all alarms will be silenced for preprogrammed duration (10min/30min/60min/90min/120min). Alarm monitoring will continue during alarm silence duration.

NIBP Start/Stop Key

Starts/stops the NIBP measurement.

If the measurement interval is set, pressing this key will start the measurement with the set interval.
<LED Indicator> During NIBP measurement : lights in green

NIBP Continuous Measurement Key

Starts/stops the NIBP continuous measurement.

This key will start the continuous measurement regardless of the measurement interval selection. If this key is pressed during the continuous measurement, the measurement in progress will cease and the continuous measurement will be cancelled. When the continuous measurement is completed or cancelled, the measurement interval will be set to 2.5 minutes.

<LED Indicator> During continuous measurement : lights in green

NIBP Auto Mode Key

Pressing this key allows to change the NIBP measurement interval. When this key is pressed, the interval selection will be displayed. Select the interval using the touch key.

<LED Indicator> When interval selection is displayed: lights in green.

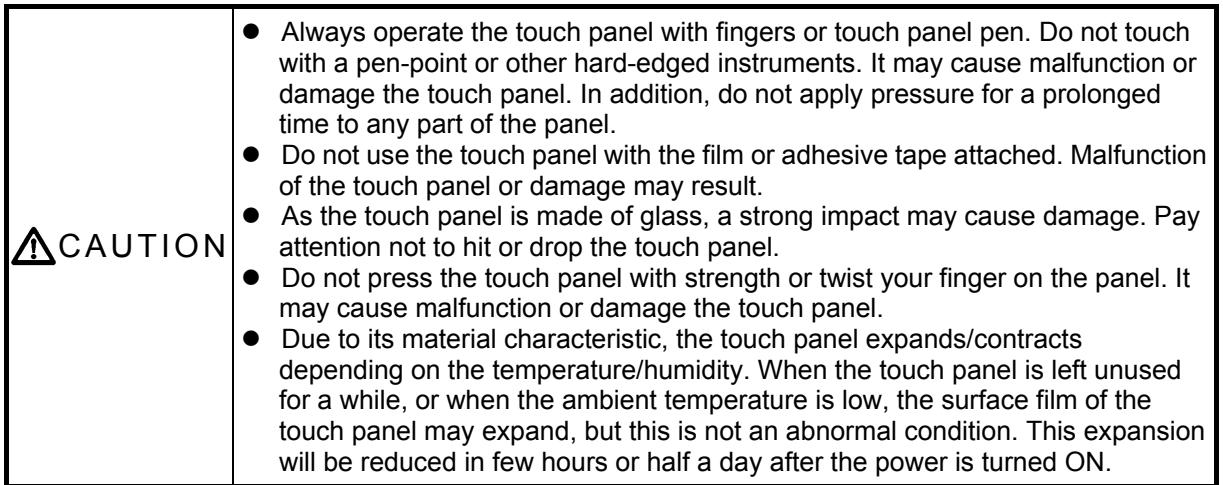
Record Start/Stop Key

Starts/stops the built-in recorder operation.

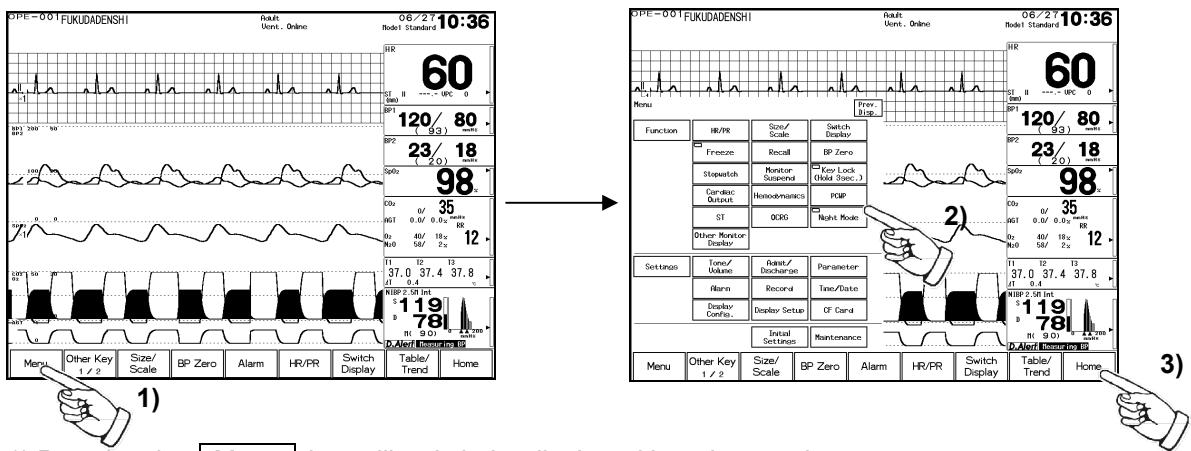
<LED Indicator> During recorder operation : lights in green
 Paper out condition : lights in orange

Touch Keys

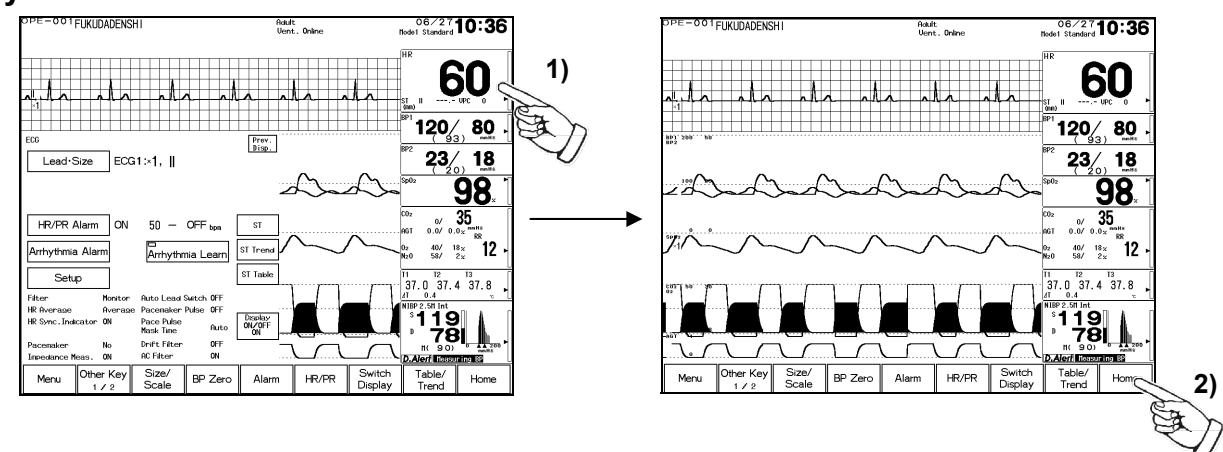
All operation of this equipment is performed using touch keys.



● General Key Control



● Key Control for Each Parameter



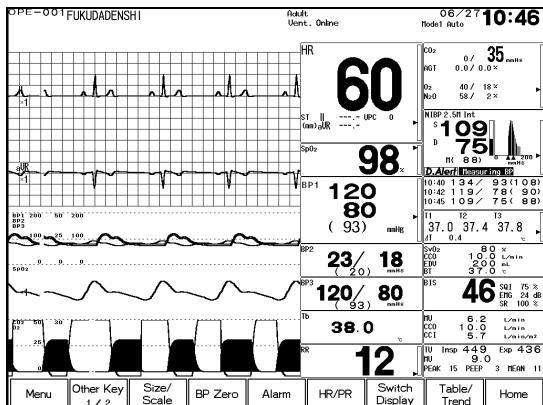
Frequently used keys can be set as user key. (Maximum 12 keys on 2 pages, 6 keys/page)
Refer to "4. Monitoring Setup Key Setup To Set the User Keys" for details.

Before Usage

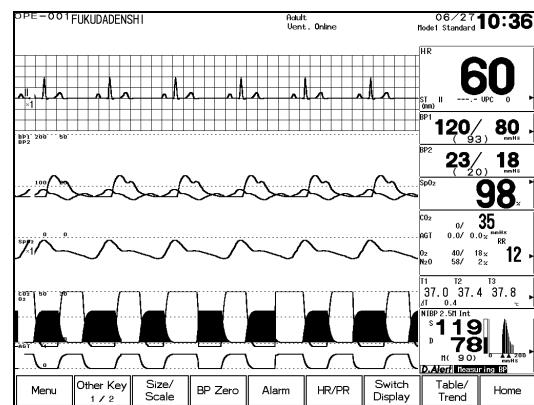
Home Display and Table/Trend Display

About the Home Display

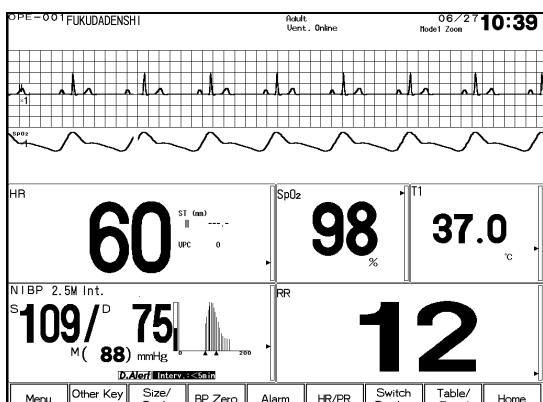
The display can be configured according to the monitoring purpose. There are 4 basic types of Home Display configuration which are (1) Auto Mode, (2) Standard Mode, (3) Zoom Mode, (4) Extended Mode.



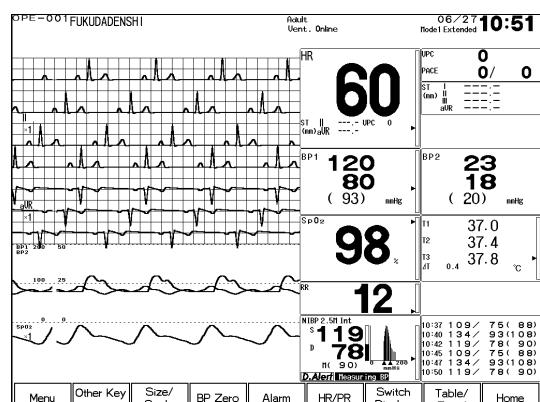
(1) Auto Mode



(2) Standard Mode



(3) Zoom Mode



(4) Extended Mode

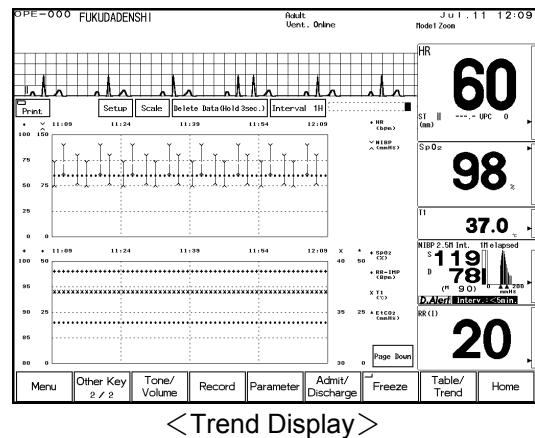
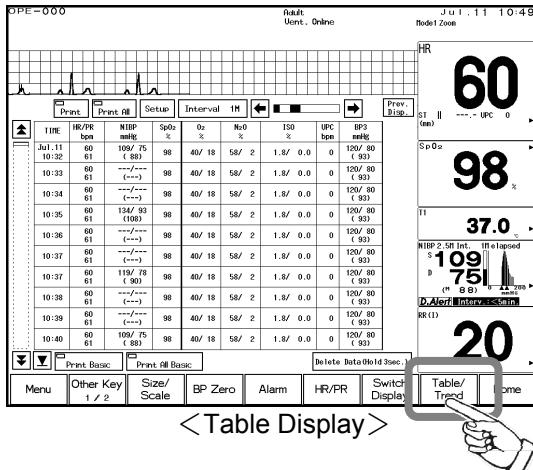
Pressing the **Switch Display** key will switch the Home Display configuration in the order of (1)→(2)→(3)→(4)→(1).



The display can be configured by selecting the waveform and numeric data to be displayed. The configured display can be programmed. Refer to "4. Monitoring Setup Display Configuration" for details.

About the Table /Trend Display

Pressing the **Table/Trend** key will switch the display to table display or trend display.

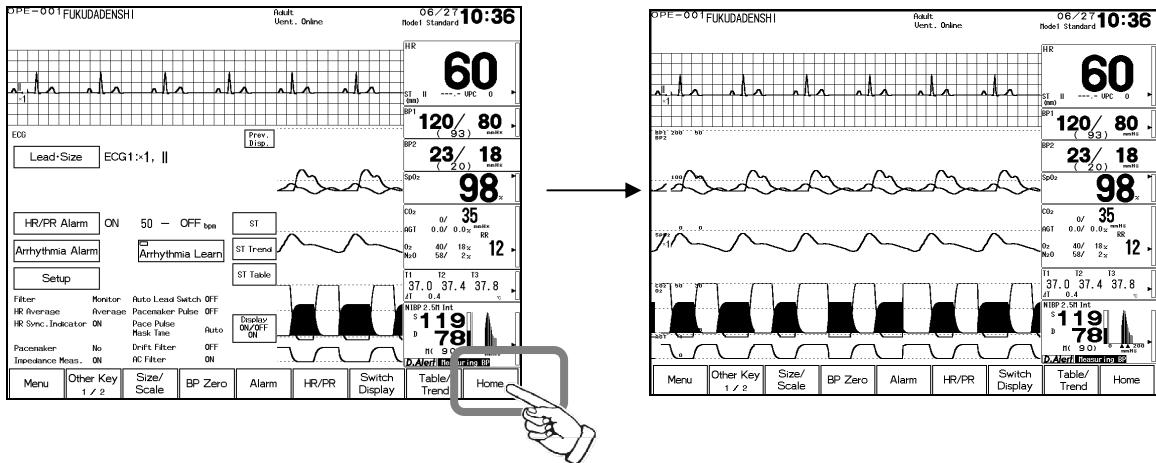


For details of table and trend display, refer to "7. Function –Table/Trend–".

To Return the Display

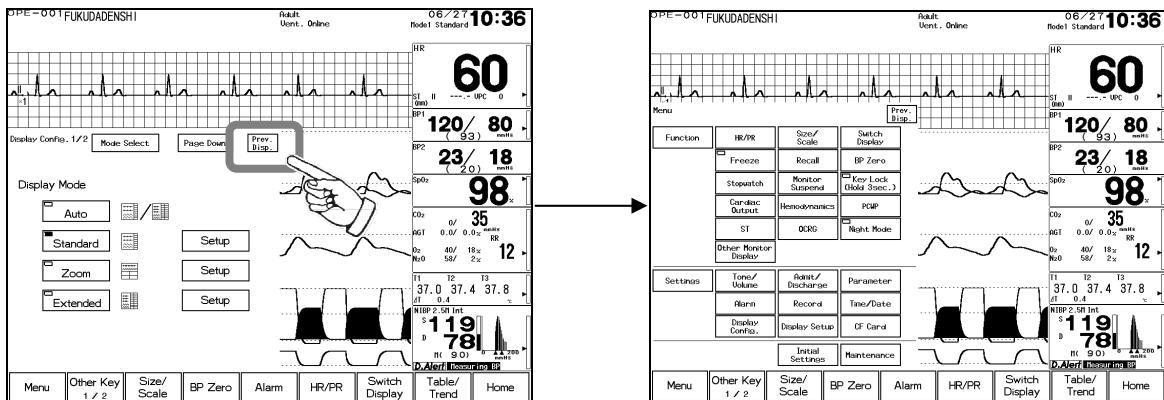
[To Return to the Home Display]

By pressing the **Home** key at any time, the display will return to the home display.



[To Return to the Previous Display]

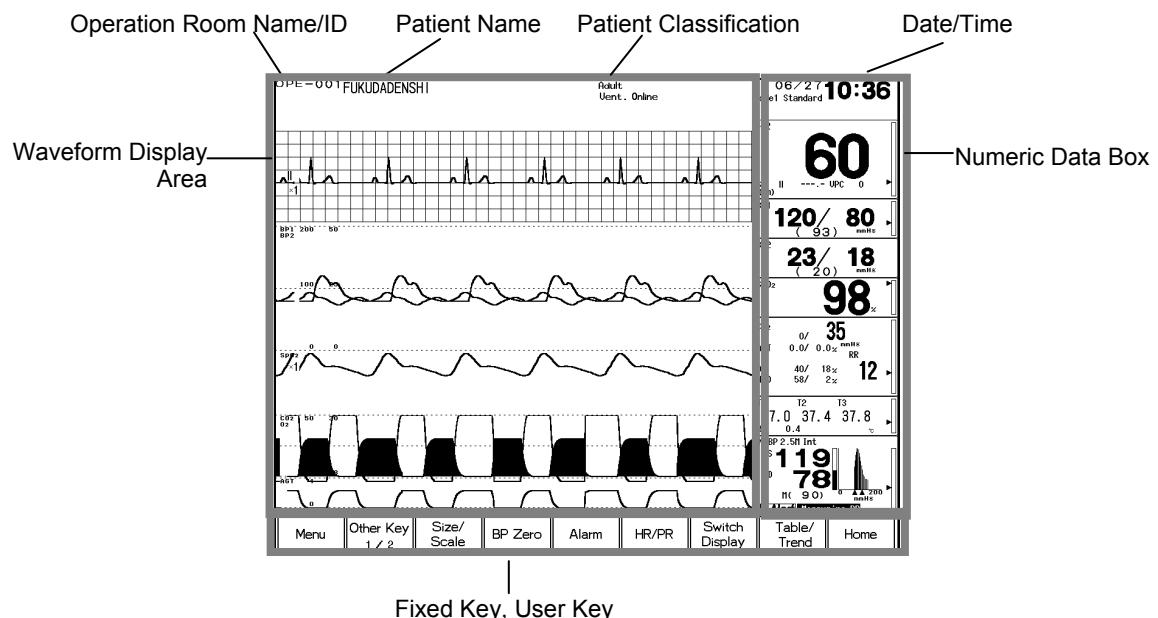
By pressing the **Prev. Disp.** key which will be displayed on each setup window, the previous display will appear.



The Description of the Display

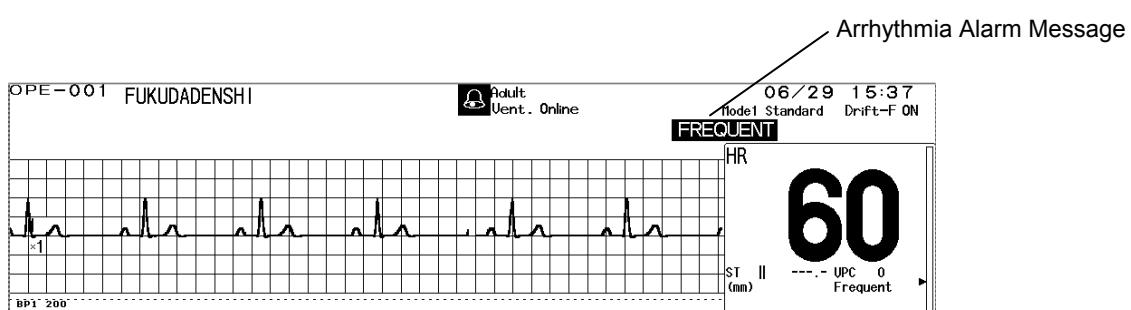
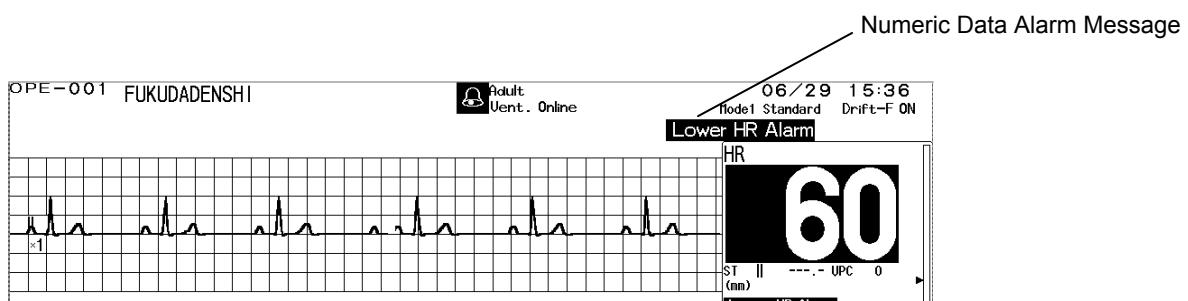
Other than waveforms and numeric data, patient name, alarm message, status message, etc. will be displayed on the screen.

● Numeric Data, Waveform, Patient Name, etc.



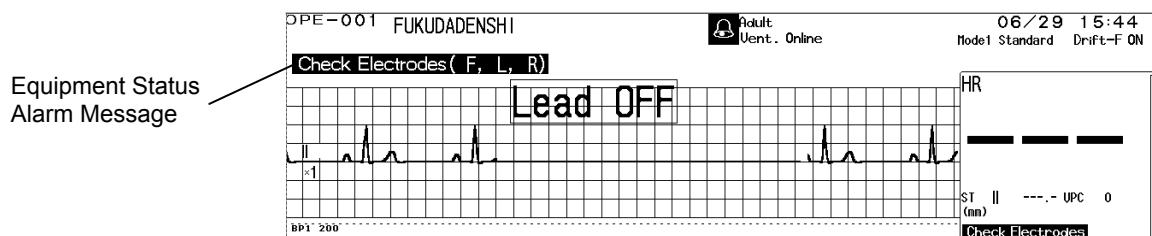
● Alarm Message for Numeric Data / Arrhythmia

There are 2 types of alarm messages, numeric data alarm message and arrhythmia alarm message. If both alarms occur at the same time, the numeric alarm message and arrhythmia alarm message will be displayed alternately in 2-seconds intervals.



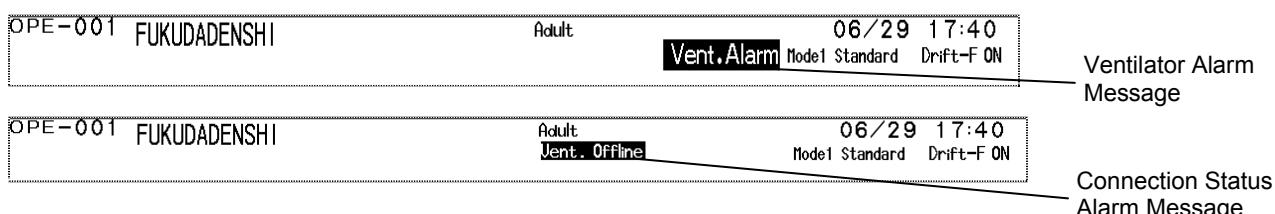
● Equipment Status Alarm Message

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



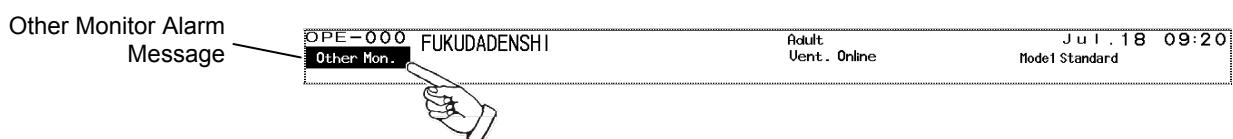
● Ventilator Alarm Message

When ventilator is connected, ventilator alarm and connection status alarm message will be displayed.

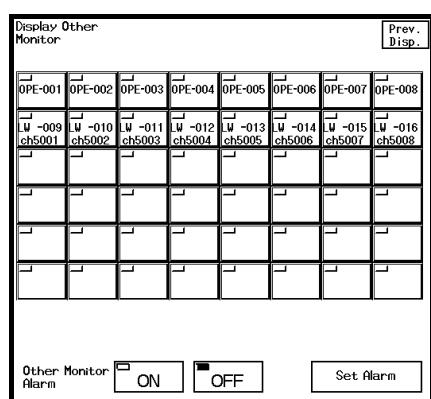


● Other Monitor Alarm Message

When the monitor is connected to a network, and other monitor alarm is turned ON, the alarm occurring at the other monitors will be notified.



The other monitor alarm message will function as a control key. By pressing the message display, the window to select the alarm generating monitor will appear.



The Operation Room ID key for the alarm generating monitor will be indicated in red.

By pressing the Operation Room ID key for the alarm generating monitor, the numeric data and waveforms will be displayed.



Refer to "7. Function –Other Monitor Display—" for details.

● Gas Alarm Message

When the Multigas Unit is connected, the alarm generated by the Multigas Unit will be notified on the monitor display.



Preparation for Monitoring

To Turn On the Power

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 connected to hospital grade outlet.
- When using multiple ME equipment simultaneously, perform equipotential grounding to prevent potential difference between the equipment. Even a small potential difference may result in electric shock to the patient and the operator.

CAUTION

If the power supply is interrupted due to power failure, etc., the following will occur.

- For the DS-7000, if the power supply is resumed within 5 minutes, setup data are backed up and monitoring before the power failure can be resumed. If the power failure continues for more than 5 minutes, all data will be initialized.
- For the multigas unit, it will be initialized and enter into warm-up condition even if the power failure is within 30 seconds.

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 connected to these devices. 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 potential equalization terminal to the same ground terminal. This is called equipotential grounding.

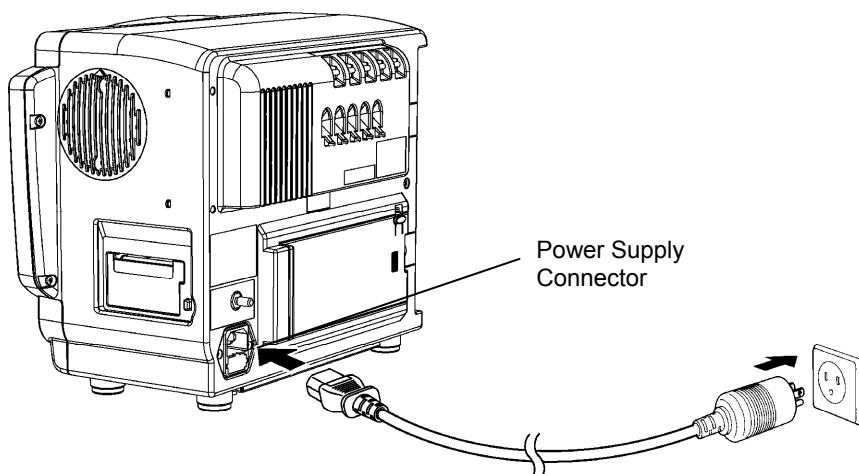


For procedures to connect each part, refer to "9. Installation System Construction".

Connecting the Power Cable

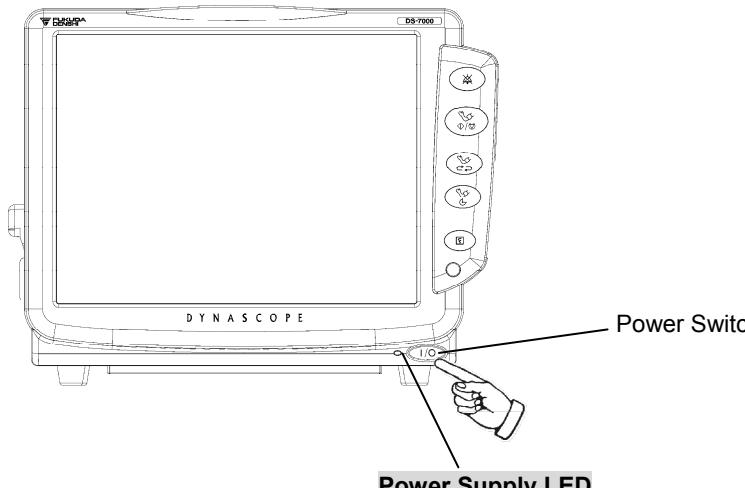
● Main Unit

Connect the accessory power cable (CS-24) to the power supply connector on the rear side of the main unit. Connect the other end of the power cable to the 3-way outlet with ground terminal.



To Turn On the Power Switch

Turn ON the power switch of the main unit. The monitoring display will appear, and monitoring will start. The power supply LED on the front side of the main unit will light in green to indicate that the power is ON.

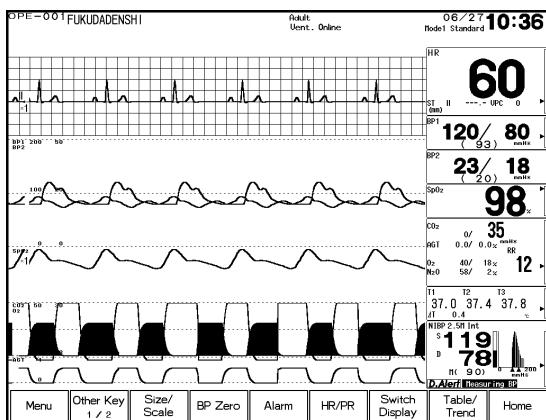


Power Supply LED

Lights in green when the power is ON.

Light will be off when the power is turned OFF.

When the power is turned ON, "Initializing NIBP" message will be displayed inside the NIBP numeric data box. When the initializing process completes, "Press the NIBP START/STOP key." message will be displayed.



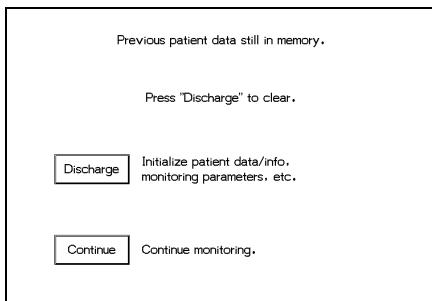
Turn OFF the power supply switch of the main unit. The display will be turned OFF, and monitoring will stop.

To Start Monitoring

Discharge Confirmation at Power ON

The monitor retains the trend and table data for a fixed amount of time even when the power is turned OFF. To start monitoring a new patient, discharge procedures on the patient admit / discharge menu should be performed.

If "Check Discharge at Power ON" is set to ON for the "Discharge Mode" of Initial Settings, the following display will appear if previous patient data remains on the monitor.



To start monitoring a new patient, press the **Discharge** key. The data before turning ON the power will be erased and monitoring will start.
Pressing the **Continue** key will retain the data before turning ON the power and monitoring will start.



ON/OFF of this confirmation display can be selected.
Refer to "9. Initial Settings Operation at Discharge" for details.

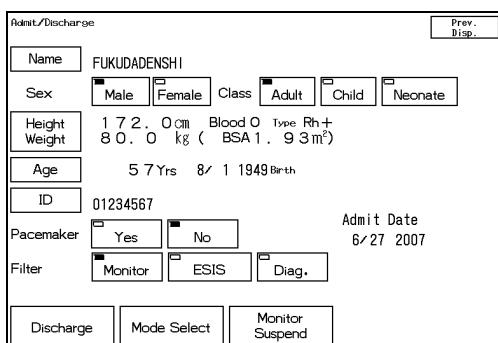


The discharge procedure will be automatically performed at power ON if the power has been turned off for more than 10 minutes or 60 minutes depending to the setup for "Discharge Automatically at Power ON" (10min/60min) on the Discharge Setup Menu.

To Admit a Patient

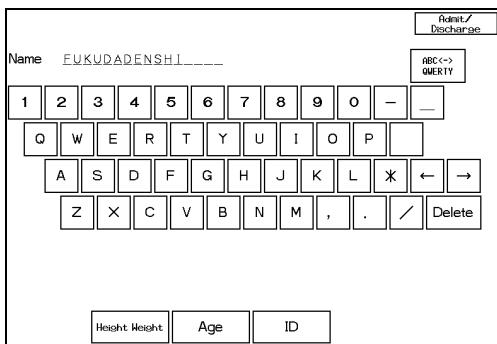
Enter the patient information on the patient admit/discharge menu.

●Display the patient admit / discharge menu.



Press the **Menu** → **Admit/Discharge** key.
The patient admit / discharge menu will be displayed.

●Enter the patient name.



Press the **Name** key.
Enter the name using the displayed keypad.
The entered name will be displayed large on the upper part of the display.

● Enter the patient ID.

The keypad interface shows a numeric keypad with columns labeled 1 through 0 and a decimal point. Above the keypad are function keys: 'ID' (highlighted), 'ABC<-> QUERY', and 'Delete'. Below the keypad are buttons for 'Name', 'Height Weight', 'Age', and 'Search Patient'.

Press the **ID** key.
Enter the ID number using the displayed keypad.

● Enter the patient's birth date.

The keypad interface shows a numeric keypad with columns labeled 1 through 9 and a decimal point. Above the keypad are function keys: 'Age' (highlighted), 'Birth Date', '8 Mo', '1 Dy', and 'Clear'. Below the keypad are buttons for 'Name', 'Height Weight', and 'ID'.

Press the **Age** key.
Enter the birth date using the numeric keypad.
The age will be automatically calculated from the birth date.

● Enter the patient's height and weight.

The keypad interface shows a numeric keypad with columns labeled 1 through 9 and a decimal point. Above the keypad are function keys: 'Height Weight' (highlighted), 'BSA', 'BMI', and 'Blood Rh'. Below the keypad are buttons for 'Name', 'Age', and 'ID'.

Press the **Height Weight** key
Enter the height and weight from the displayed keypad.
BSA and BMI will be automatically calculated.
The display can be selected from either BSA or BMI.
Select the blood type and Rh.

● Select the patient classification and pacemaker use.

The screen displays patient information: Name (FUKUDADENSHI), Sex (Male), Height (172.0 cm), Weight (80.0 kg), Age (57 Yrs), ID (01234567), and Pacemaker (Yes). It also shows BSA (1.93 m²) and BMI (1.93). Buttons include 'Prev. Disp.', 'Admit/Discharge', 'Class Adult', 'Child', 'Neonate', 'Blood O Type Rh+', 'Filter Monitor', 'ESIS', 'Diag.', 'Mode Select', 'Monitor Suspend', and 'Discharge'.

Select the patient classification from **Adult**, **Child**, or **Neonate**.

Select the pacemaker use from **Yes** or **No**.



The patient classification and pacemaker use must be selected. The patient classification selection influences the precision of the QRS detection and NIBP measurement. Make sure the correct selection is made.

To Suspend Monitoring

When not monitoring for a while, turning OFF the power will erase the recall data, ST measurement, OCRG data.

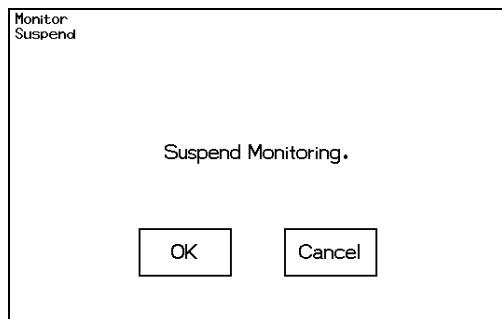
However, using the cease monitoring function allows suspension of data measurement, alarm generation, automatic measurement, and automatic recording without erasing the data or setup details.

1 Press the **Monitor Suspend** key on the admit/discharge menu.

The screenshot shows the 'Admit/Discharge' menu. It includes fields for Name (FUKUDADENSHI), Sex (Male), Height (172 cm), Weight (80 kg), Age (57 years), ID (01234567), Pacemaker (No), Filter (Monitor), and Admit Date (6/27 2007). At the bottom, there are three buttons: 'Discharge', 'Mode Select', and 'Monitor Suspend'. A hand icon points to the 'Monitor Suspend' button.

Press the **Menu** → **Admit/Discharge** → **Monitor Suspend** key.

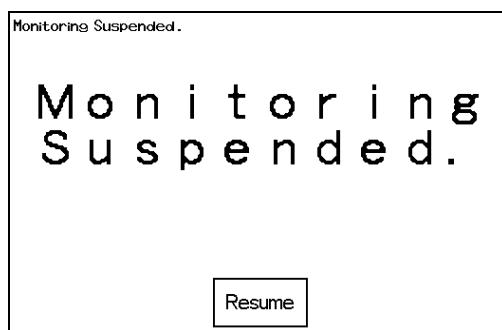
2 Suspend monitoring.



Pressing the **OK** key on the confirmation display will interrupt monitoring.

Pressing the **Cancel** key will return to the previous display.

3 Verify that the monitoring is suspended.



The **Resume** key will be displayed on the home display. On the home display, numeric data and waveform display will be suspended, and all the key operation except the **Resume** key will become ineffective.

NOTE

When the optional telemetry transmitter module is used, suspending the monitoring will cease the telemetry transmission. Note that the square wave will be displayed on the central monitor indicating the too far condition of the telemetry transmission.

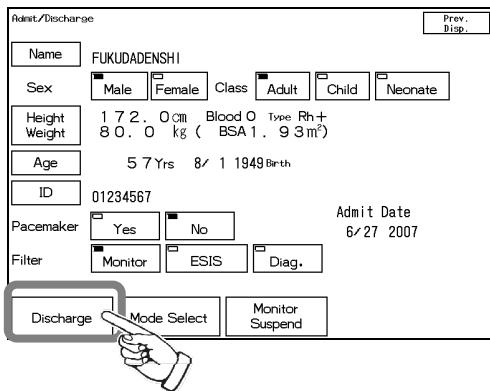
2

To Start Monitoring

Discharging Procedure

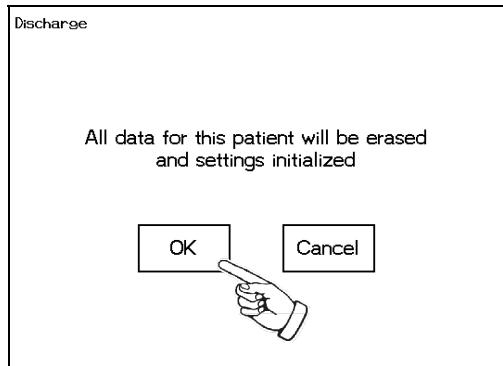
This procedure will erase the past data, such as patient name, ID, age, table/trend, and recall.

- 1 Press the **Discharge** key on the admit/discharge menu.



Press the **Menu** → **Admit/Discharge** → **Discharge** key.

- 2 Perform the discharge procedure.



OK key will discharge the patient.
Cancel key will return to the previous display.

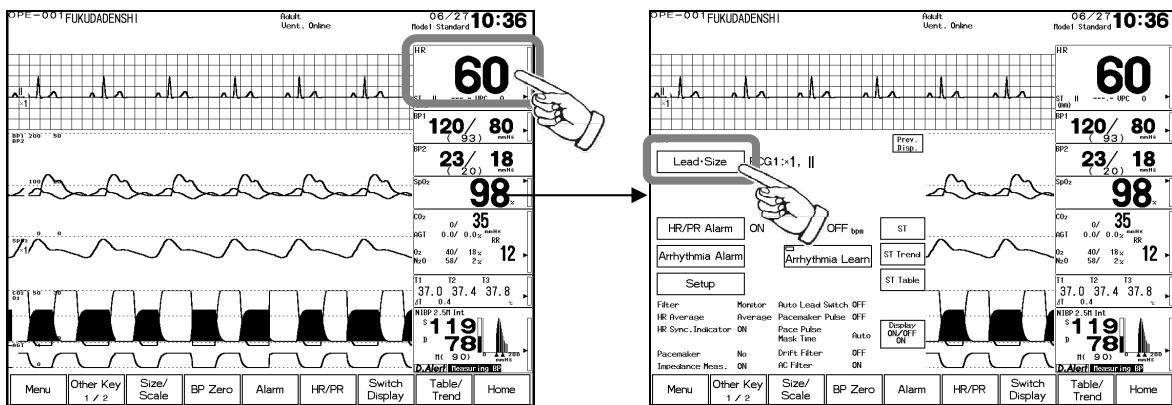
Basic Operation

Adjusting the Waveform Size, Baseline Position

● Operation Using the Numeric Data Box

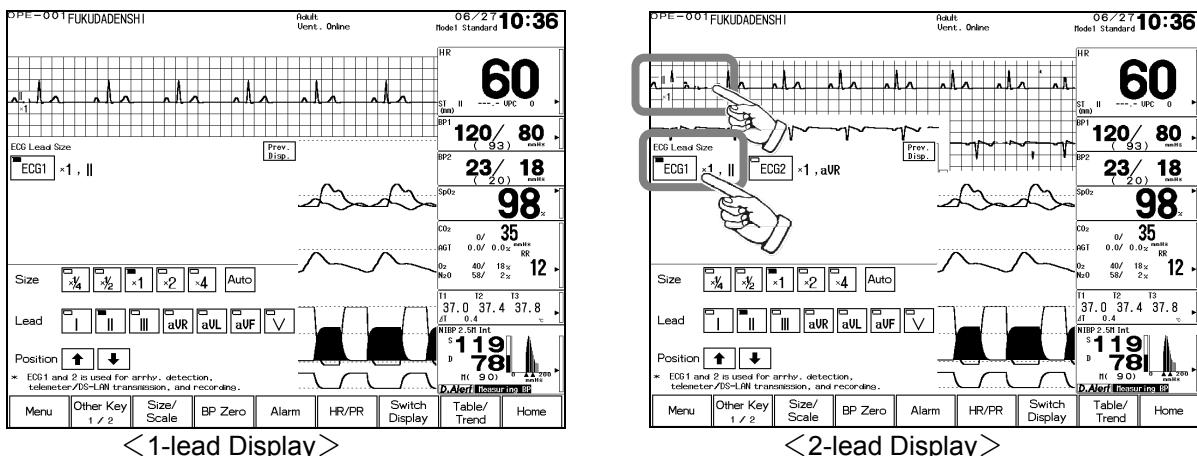
1 Select the parameter to perform the setup. (Ex.: ECG)

Press the numeric data box where the HR is displayed.



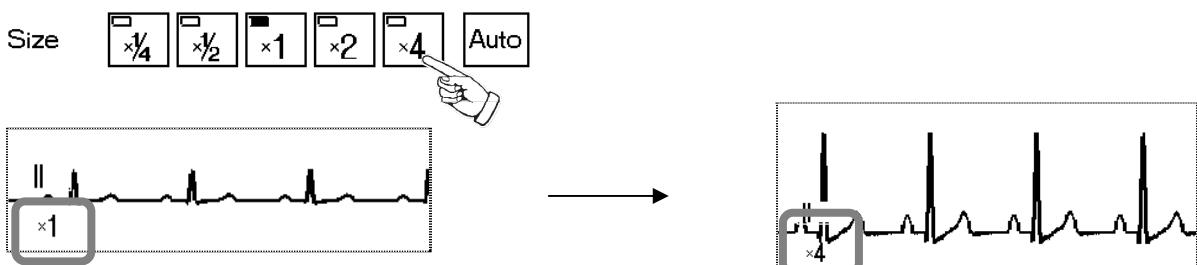
2 Adjust the waveform size and baseline position.

Press the **Lead/Size** key to display the lead, size setup menu. Select the ECG channel to perform the setup.



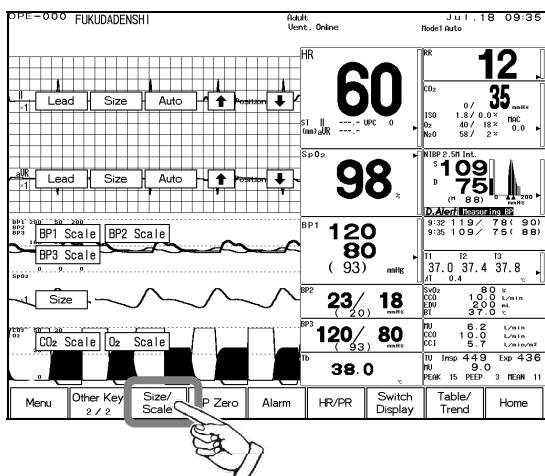
3 Adjust the waveform size.

Select an appropriate waveform size for monitoring.



Scale, Lead, Baseline Position Setup

● Operation Using the User Key and Menu Key



Pressing the **Size/Scale** key will display the arrow keys on the home display to adjust waveform size, scale, lead, baseline position.

Pressing the **Menu** → **Function** → **Size/Scale** keys will also display the same arrow keys.

1 Select the waveform size, lead, baseline position for ECG waveform.

Adjust the waveform suitable for monitoring.



Pressing the **Lead** key will sequentially change the lead in the following order.

3-electrode: I→II→III→I

4-electrode: I→II→III→aVR→aVL→aVF→I

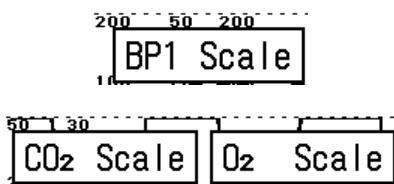
5-electrode: I→II→III→aVR→aVL→aVF→V→I

Pressing the **Size** key will sequentially change the size in the following order.

×1/4→×1/2→×1→×2→×4→×1/4

Use the **↑**, **↓** keys to adjust the baseline position up or down.

2 Select the scale for BP, CO₂ waveform.



Pressing the **Scale** key will sequentially switch the scale.

3 Select the waveform size for impedance respiration waveform, SpO₂ waveform.

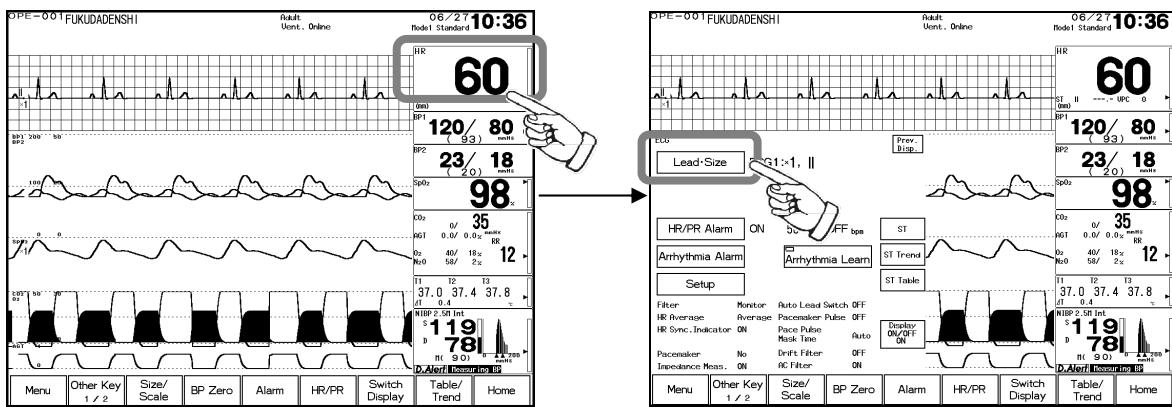


Pressing the **Size** key will sequentially change the size in the following order.

×1/4→×1/2→×1→×2→×4→×1/4

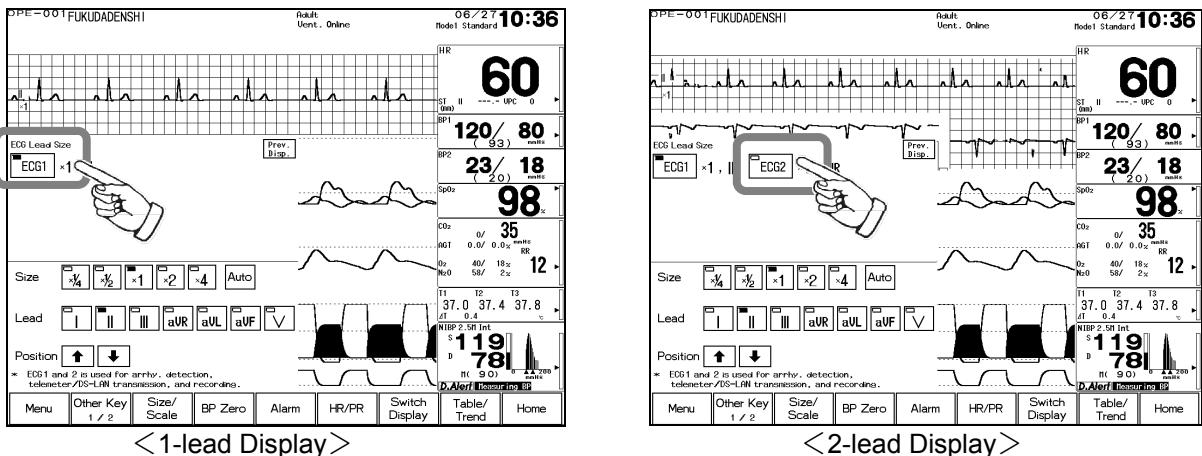
●Selecting the ECG Lead (Operation Using the Numeric Data Box)

1 Press the numeric data box where the HR is displayed.

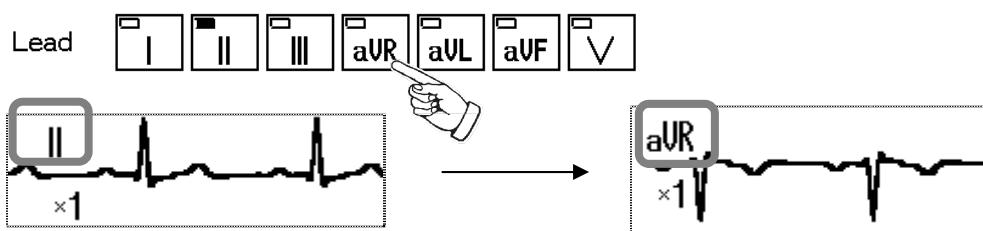


2 Press the [Lead/Size] key to display the lead, size setup menu.

Select the ECG channel to perform the setup.



3 Select the appropriate lead for monitoring.

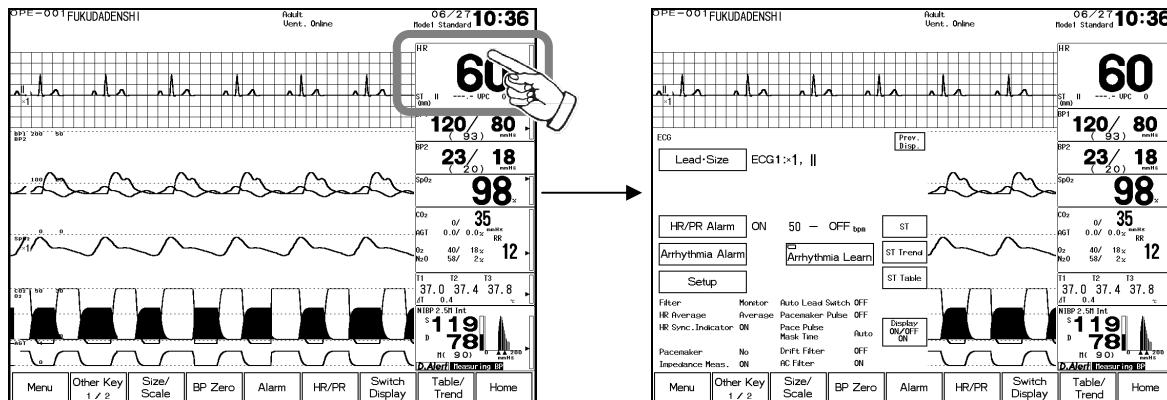


CAUTION	<ul style="list-style-type: none"> Select the appropriate lead for ECG1, 2 to be used for arrhythmia detection, telemeter, central monitor transmission, and recording. The selected lead for ECG I, 2 will be used for recall waveform and recording waveform as well as for arrhythmia analysis.
----------------	--

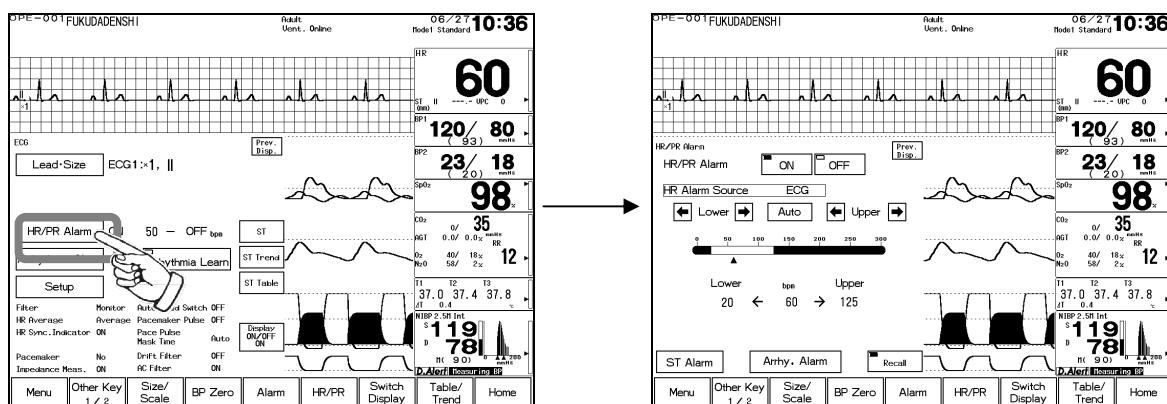
Alarm Setup for Each Parameter

The alarm can be set for each parameter. By pressing the selected numeric data box, upper and lower alarm limit and ON/OFF of alarm can be set.

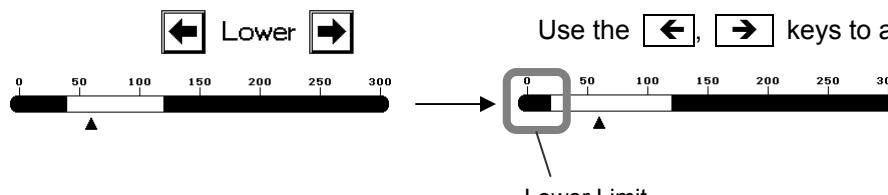
1 Select the parameter to set the alarm. (Ex.: HR alarm)



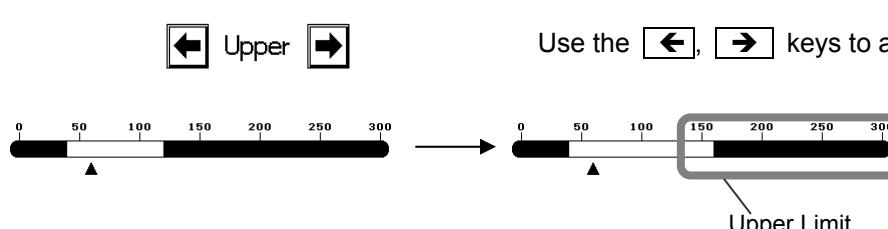
2 Press the **HR/PR Alarm** key. The menu to adjust the alarm limit will be displayed.



3 Set the upper and lower alarm limit.



Use the **◀**, **▶** keys to adjust the lower limit.



Use the **◀**, **▶** keys to adjust the upper limit.



Use the same procedure for the setup of each parameter.
Refer to the corresponding section in "6. Parameter Setup".

ON/OFF of Parameter Display

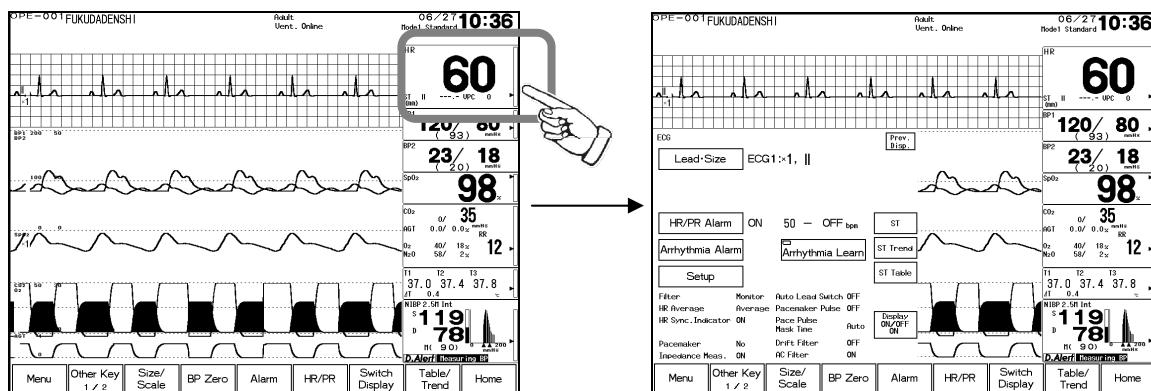
Waveform/Numeric Data Display

The waveform and numeric data display for each parameter can be turned ON or OFF without changing the display configuration.

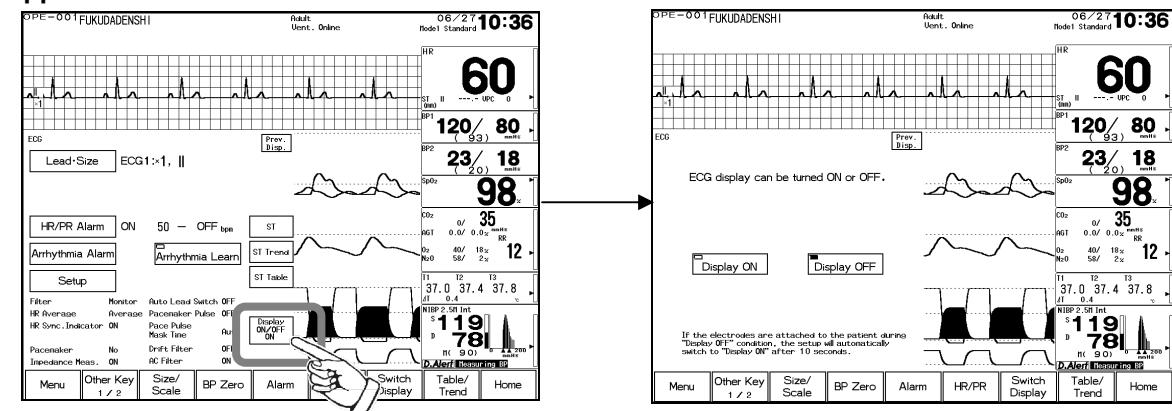
If not performing the ECG or SpO₂ measurement while the ECG cable or SpO₂ sensor is connected to the monitor, the equipment status alarm such as "Lead Off" will generate. Removing ECG or SpO₂ from the display configuration will not generate such alarm, but this function may be more useful as it allows to turn off the measurement without changing the display configuration.

This function is not available for NIBP monitoring.

1 Select the parameter to turn ON/OFF the display. (Ex.: ECG)



2 Press the [Display ON/OFF] key. The confirmation display for ON/OFF of ECG display will appear.



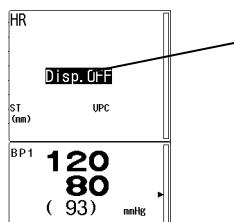
3 Select [Display ON] or [Display OFF].

Display ON

Display OFF

Display ON key will display the waveform and numeric data.

Display OFF key will not display the waveform and numeric data.



The Display OFF message will be displayed inside the numeric data box.

4 The Display OFF function will automatically reset for the following case.

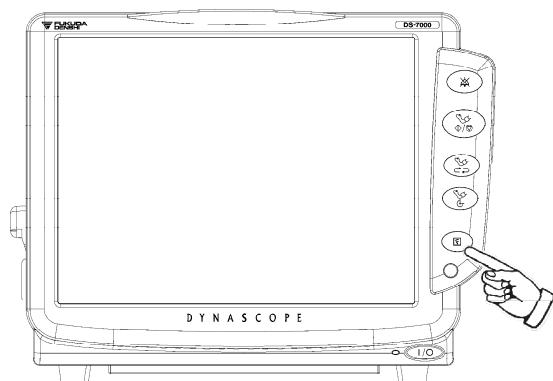
For ECG, impedance RESP, SpO₂, properly connecting the electrode or sensor will automatically set the display ON/OFF function to "Display ON".



For automatic reset condition, refer to Display ON/OFF section for each parameter in "6. Parameter Setup".

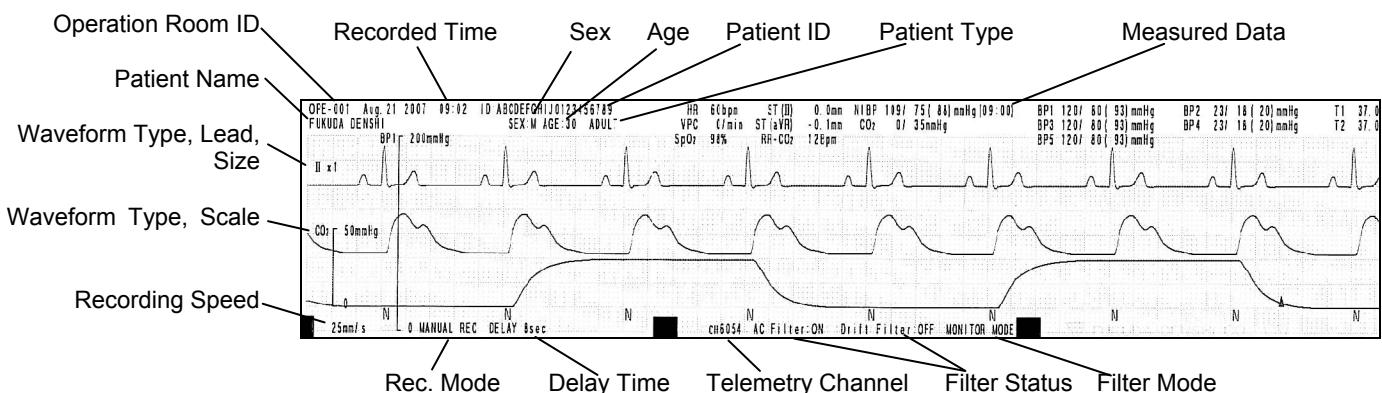
Recording

●Start / Stop of Waveform Recording



Pressing the (Record Start/Stop) key will start the waveform recording.
Up to 3 waveforms can be recorded.

【Example of Recording】



For the manual recording, number of recording waveforms and recording duration can be set.
Refer to "4. Monitoring Setup Manual Recording" for details.

For the alarm recording, number of recording waveforms, recording duration, alarm factor can be set.

Refer to "4. Monitoring Setup Alarm Recording" for details

For the periodic recording, number of recording waveforms, recording duration, recording intervals can be set.

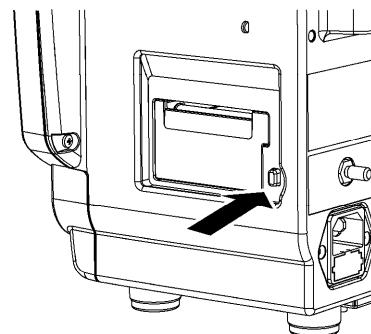
Refer to "4. Monitoring Setup Periodic Recording" for details.

The monitoring data of the patient such as graphic trend and tabular trend can be recorded.
Refer to sections on graphic trend and tabular trend in "7. Function".

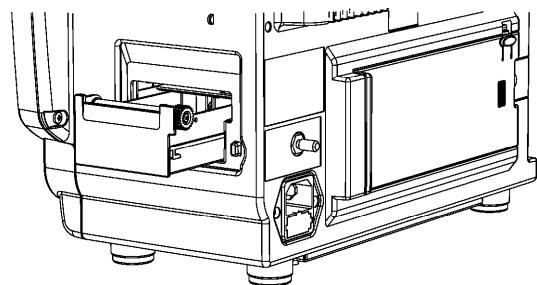
Reference

●To Install the Paper

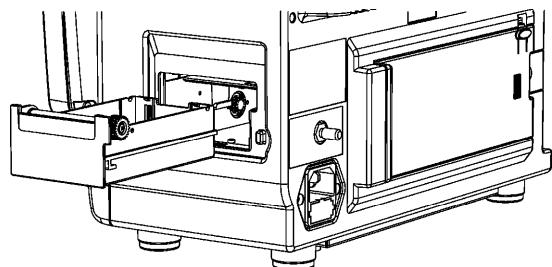
- 1 Press the button located at the right side of the recorder cassette.



- 2 The cassette will come out.

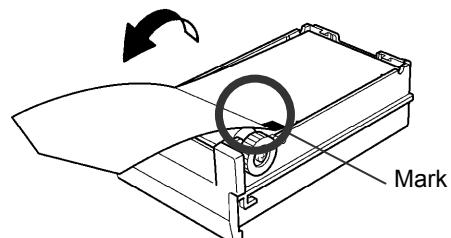
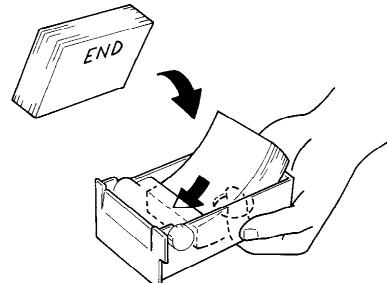


- 3 Pull out the cassette from the DS-7000 main unit.

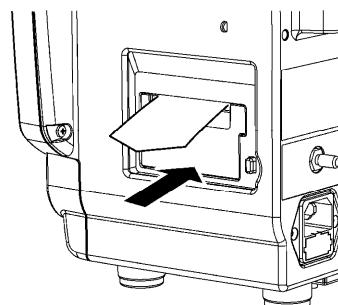


- 4 Set the recording paper.

The side with "END" printed is the backside of the recording paper. Face the backside to the bottom of cassette and place under the holding plate. Flip the top page, and check if the thermal printing side (side with black mark) is at the right on the front side of paper.



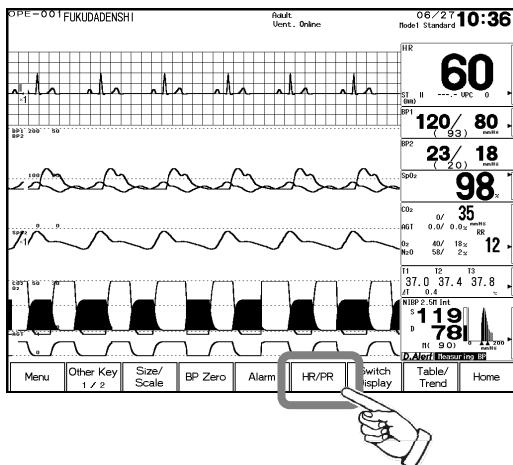
- 5 Place the cassette back into the DS-7000 main unit. Push in until it locks into place with a click sound.



To Switch the HR/PR Display

Pressing the **[HR/PR]** key preprogrammed as user key, or pressing the **[Menu] → [Function] → [HR/PR]** keys HR and PR display can be switched.

For PR display, "PR-IBP" (PR measured from BP waveform) or "PR-SpO₂" (PR measured from SpO₂ waveform) will be displayed depending on the "PR Source Setup" on the BP setup menu or SpO₂ setup menu.



HR Display



PR-IBP Display



PR-SpO₂ Display



NOTE

If **[Auto]** is set for "Display Config.", pressing the **[HR/PR]** key will switch the display to "PR-IBP", but not to "PR-SpO₂".

Freeze

This function ceases the waveform trace for 30 seconds.

Pressing the (Record Start/Stop) key during the freeze condition will record the waveform starting from 12 seconds before the frozen position.

The waveform of the parameter selected on manual recording setup will be recorded. The recording duration is fixed as 12 seconds.

- 1** To freeze the waveform trace, press the **[Menu] → [Function] → [Freeze]** keys.
- 2** To record the displayed frozen waveform, press the (Record Start/Stop) key.
- 3** The waveform trace will resume automatically after 30 seconds has elapsed (the time when the waveform was frozen).

By connecting the Servo-i ventilator to the serial connector (COM1 to 4) of this device, ventilator data can be monitored, and ventilator alarm can be notified to the central monitor via wireless or wired network.

⚠ WARNING

- The ventilator alarm on this monitor should be used as supplementary function. Check the patient's condition, ventilator alarm sound and message occasionally.
- If the DS-7000 does not generate an alarm even though the ventilator is generating an alarm, or if any other malfunction occurs, immediately check the ventilator, DS-7000 system, cable, and replace the cable if necessary. If the malfunction persists, stop using the device.
- The alarm generation on the DS-7000 is not assured if the alarm other than the following generates at the 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

⚠ CAUTION

- The ventilator operation should be performed by well-trained and authorized personnel.
- For connecting the DS-7000 and ventilator, use only the specified connection cable.
- Verify that the DS-7000 and the ventilator are properly connected.
- When connecting the cable, verify that the main power of the DS-7000 and the ventilator is OFF.



For connecting procedure, refer to "9. Installation Ventilator Data and Alarm".

● Ventilator Alarm Message

Ventilator alarm and ventilator connection status alarm will be generated.

When wired or wireless network is constructed, ventilator alarm can be notified to the central monitor.

【Ventilator Alarm Message】

OPE-001 FUKUDADENSHI	Adult	06/29 17:40
	Vent. Alarm	Model Standard Drift-F ON

Life Threatening Alarm (Alarm Level 1)

Equipment	Message
Ventilator	"Vent. Alarm"

⚠ WARNING	The ventilator alarm sound is set to OFF at factory default setting. For procedure to turn ON the alarm sound, refer to "4. Monitoring Setup Tone/Volume Setup".
------------------	---

【Connection Status Alarm Message】

OPE-001 FUKUDADENSHI	Adult	06/29 17:40
	Jent. Offline	Model Standard Drift-F ON

Life Threatening Alarm (Alarm Level 1)

Equipment	Message
Ventilator	"Vent. Offline"

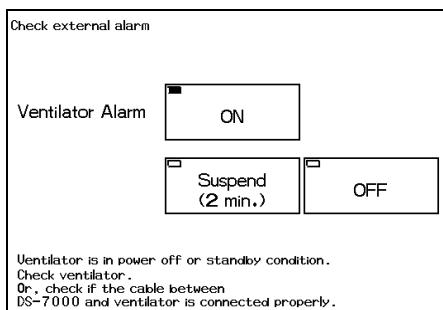
Notification Alarm (Alarm Level 4)

Equipment	Message
Ventilator	"Vent. Disable 
	"Vent. Online"

⚠ WARNING	After connecting the ventilator and the DS-7000, ensure that "Vent. Online" message is displayed for the connection status. Otherwise, the DS-7000 will not detect ventilator alarms.
------------------	---

●Check External Alarm

A confirmation display will appear when ventilator cable is disconnected from the multiport relay cable or ventilator, or when power of the ventilator is turned OFF.



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

Suspend (2 min.) will suspend the ventilator alarm for 2 minutes. If the ventilator alarm condition remains after 2 minutes, the alarm will generate again.

OFF will cancel the ventilator alarm until the ventilator connection condition returns to normal condition.

⚠ CAUTION

- Check occasionally the communication status of the DS-7000 and the ventilator.
- Verify that a ventilator alarm is not generated, and that the “Vent. Online” message is displayed.
- The “Check external alarm” 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.
- When disconnecting the ventilator and the DS-7000, make sure to select **OFF** on the “Check external alarm” display which appears when the power of the ventilator is turned OFF, or when the cable is disconnected.

Operation Flow

The operation flow of this system is as follows.

【Menu】

Function	Function menu display
Settings	Settings menu display
Initial Settings	Initial settings menu display
Maintenance	Maintenance menu display

【Function Menu】

Size/Scale	Waveform size, scale, lead, baseline position adjustment
BP Zero	BP Zero Balance
HR/PR	Switches HR/PR display
Switch Display	Switches the Home Display (Auto, Standard, Zoom, Extended)
Freeze	Freezes the waveform trace.
Recall	Recall Zoom Display Display Selection, Recall Setup
Stopwatch	
Key Lock (Hold 3 sec.)	Invalidates the touch key operation.
Monitor Suspend	Suspends Monitoring
ST	ST Waveform, ST Graphic Trend
	Reference Waveform Setup
	ST Alarm
ST Table	
ST Trend	ST Graphic Trend
	Group Setup
OCRG	
Cardiac Output	CO measurement, CO edit, CO measurement configuration
Hemodynamics	
PCWP	
BIS Table	
Vigilance Table	Vigilance Table Setup
Respiration Table	Respiration Table
	Respiration Table Setup
NICO Table	NICO Table Setup
Other Monitor Display	Other Monitor Display
	Set Alarm
Night Mode	
Ventilator	P-V Loop, F-V Loop, Numeric Data
Full Disc. Wave Rec.	Waveform display, Time Search, Alarm Search, Admit/Disch. Search, Enlarged Display
Calculator	

【Settings】

Admit/Discharge	Patient Name, Patient ID, Patient Classification, Sex, Age, Height, Weight, Blood Type
	Discharge
	Monitor Suspend
	Mode Select
Parameter	ECG, NIBP, SpO ₂ , Respiration, T1 to 3, BP1 to 6, CO ₂ , O ₂ , N ₂ O, AGT, Vigilance, Ventilator
Alarm	Main Alarm Setup (HR/PR, NIBP-SYS, SpO ₂)
	Basic Alarm Setup (HR/PR, NIBP, SpO ₂ , T1, CO ₂ , RR, ST, Arrhythmia)
	Other Alarm (BP1 to 6, T2 to 3, Tb, O ₂ , N ₂ O, AGT, MAC)
	Mode Config., Alarm Recording Setup, Setup
Record	Manual Record, Alarm Record, Periodic Record, Setup

Tone/Volume	Pulse, Key, Alarm, Other Monitor, Other, Ventilator Alarm
Time/Date	Time/Date (year, month, day, hour, minute), Date Format
Alarm Auto	Automatically sets the alarm for all monitored parameters.
Display Config.	Auto/Standard/Zoom/Extended, Mode Selection (Short Trend, Grid, Waveline Thickness, GAS CO ₂ Waveform Fill/Unfill)
Display Setup	Brightness, Sweep Speed, Drift Filter display/Zoom Clock Display, Message Icon, Event Key Display
Color	
CF Card	CF Card Format, DS-7000→CF Card, CF Card→DS-7000
Other Monitor Alarm	

【Initial Settings】

Serial Comm.	GAS Unit Selection, ORC Comm. Port Function, External Connector (COM1 to 4)
Alarm Mode	Alarm Mode Setup (1 to 5)
Display Mode	Display Mode Setup (1 to 5)
User Key	User Key Selection
Menu Setup	Menu Key Selection
Key Mask	Mask Key Selection
BP User Label	BP User Label Setting
TEMP User Label	TEMP User Label Setting
Unit	BP (mmHg, kPa), CVP (mmHg/kPa, cmH ₂ O), ST (mv, mm), TEMP (°C, °F), CO ₂ (mmHg, kPa, %)
Telemeter	Telemeter Function ON/OFF, Channel No., Group ID
Telemetry Wave	Telemetry Wave Setup
Remote Control	Remote Control Monitor ID, Function Key Setup
Alarm Indicator	ON/OFF, Output Alarm, Flash Pattern Setup
Set Password	
OR ID Setup	Hospital Name and OR ID Setup, DS-LAN Pat. ID Tx
Discharge	Check discharge at power ON, Erase Data Automatically, Backup at discharge, NIBP Auto Mode at Power ON/Discharge, Label Setup at Discharge/Change of Disp. Mode
Night Mode	Manual/Auto, Auto Start Time, Auto End Time, Night Mode Volume/Display, Alarm Indicator
F-Key Color	Color Selection for the Function Keys
Arrhythmia Analysis Setup	Arrhythmia Analysis Filter, Suspend Arrhy. Analysis during Noise Interference
Magnetic Card Reader	Setup for starting/ending position of patient ID/name of the magnetic card and bar code
DS-LAN Setup	DS-LAN II/DS-LAN III selection
Source Setup	PR Source Auto Switch, HR/PR Auto Alarm Source Priority

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Chapter 3

Vital Application

This chapter describes the procedure for vital application.

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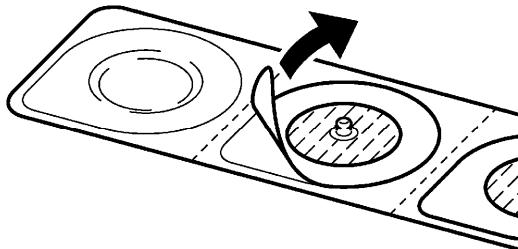
To Acquire ECG Waveform

Before Attaching the Electrodes

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



- 2 Peel off the backing of disposable electrode.



Pay attention not to touch the electrode gel.

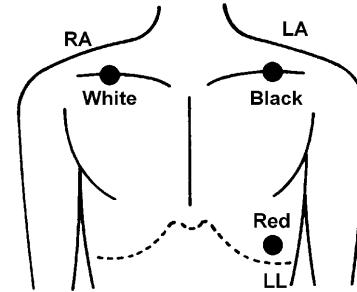
Electrode Placement

There are 3-electrode, 4-electrode, 5-electrode application depending on the cable type.
Using the 4-electrode or 5-electrode application allows simultaneous monitoring of 2 ECG waveforms, and high accuracy of arrhythmia analysis can be attained.
Also, the displayed lead type can be changed.

For 3-electrode lead (1 waveform monitoring)

Lead Type I / II / III

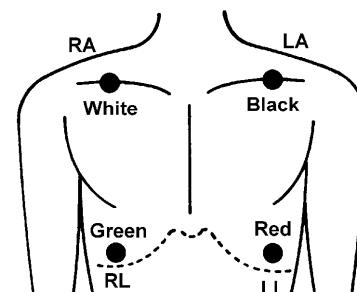
Symbol	Color	Electrode Site
RA	White	On the right infraclavicular fossa
LA	Black	On the left infraclavicular fossa
LL	Red	On the left midclavicular line, near the suprasternal line.



For 4-electrode lead (Max. Simultaneous 6 waveforms monitoring)

Lead Type I / II / III / aVR / aVL / aVF

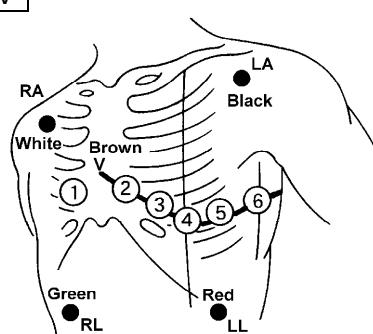
Symbol	Color	Electrode Site
RA	White	On the right infraclavicular fossa
LA	Black	On the left infraclavicular fossa
LL	Red	On the left midclavicular line, near the suprasternal line.
RL	Green	On the right midclavicular line at the same height as LL.



For 5-electrode lead (Max. Simultaneous 7 waveforms monitoring)

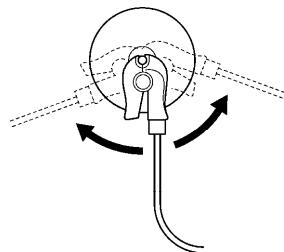
Lead Type I / II / III / aVR / aVL / aVF / V

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



Connection to the Patient Monitor

1 Connect the lead cable to the electrode.

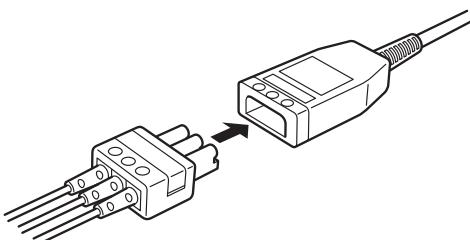


Attach the lead cable end to the electrode (convex part). Turn right and left to verify that it is securely attached.

CAUTION

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

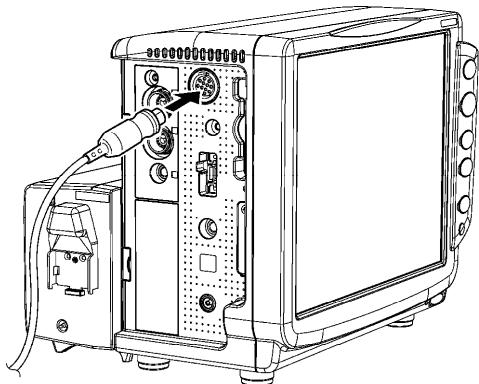
2 Connect the lead cable to the relay cable.



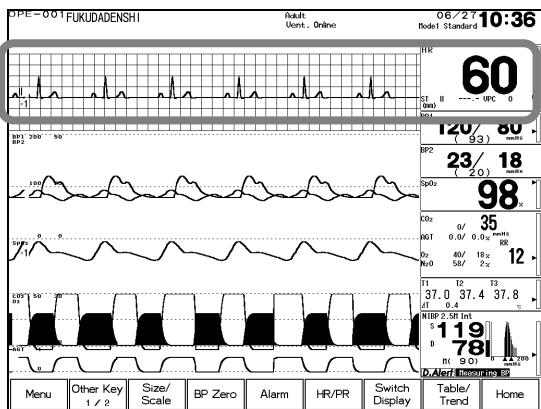
CAUTION

Use only the ECG lead/relay cable specified by Fukuda Denshi. If the specified lead/relay cable is not used when using a defibrillator, performance degradation or damage of the equipment may be caused.

3 Plug in the relay cable to the ECG input connector (green) of the main unit.



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



Adjust the waveform size and position.
The monitoring lead can be also changed.



Refer to "6. Parameter Setup ECG" for waveform size / lead setup.

About the Arrhythmia Analysis

Arrhythmia Analysis Flow



The arrhythmia detection algorithm learns the normal waveform of the patient and compares the waveform (QRS pattern) and RR interval for each heartbeat to determine the VPC. It compares the parameters such as QRS amplitude, QRS width, QRS polarity, RR interval, and selects abnormal QRS. Then the QRS with suspected VPC is pattern matched to distinguish the noise and VPC. This will finally determine the VPC and generate the arrhythmia alarm.

●QRS Classification

Each QRS will be classified to the following pattern.

N (Normal)	Normal QRS beat
V (VPC)	Ventricular Extrasystole
S (SVPC)	Supraventricular Extrasystole
P (Pacing Beat)	Pacing beat
F (Fusion Beat)	Fusion beat of pacing and spontaneous beat
? (Undetermined Beat)	Learning arrhythmia, or beat not matching any pattern

●Arrhythmia Type

With the above QRS judgment, the following 12 types of arrhythmia alarm can be generated.

Type	Meaning	Detection Criteria
ASYSTOLE	Cardiac Arrest	Cardiac arrest is detected for more than the preprogrammed time.
VF	Ventricular Fibrillation	A random, rapid electrical activity of the heart is detected.
VT	Ventricular Tachycardia	9 or more continuous ventricular beats are detected. (HR: 140bpm or over / 120bpm or over)
SLOW VT		9 or more continuous ventricular beats are detected. (HR: 100 to 140bpm or 100 to 120bpm)
TACHY	Tachycardia	HR is over the upper alarm limit.
BRADY	Bradycardia	HR is below the lower alarm limit.
RUN	Consecutive VPC	Continuous VPC exceeding the preprogrammed value is detected.
COUPLET	Couplet Ventricular Extrasystole	2 continuous beats of VPC are detected.
PAUSE		Cardiac arrest exceeding the preprogrammed value is detected.
BIGEMINY	Ventricular Bigeminy	3 or more continuous QRS pattern of V-N is detected.
TRIGEMINY	Ventricular Trigeminy	3 or more continuous QRS pattern of V-N-N is detected.
FREQUENT	Frequent VPC	VPC exceeding the preprogrammed value is detected within 1 minute.

CAUTION	When arrhythmia is present, HR measurement accuracy may be degraded.
---------	--

Filter Selection

● Filter Mode Setup

The waveform frequency characteristic can be selected from Monitor Mode, ESIS Mode, or Diagnosis Mode according to the monitoring purpose.

1. Monitor Mode Frequency Characteristic Adult / Child: 0.5 to 40Hz Neonate: 1.6 to 40Hz

This is the standard mode for ECG monitoring. The upper frequency is set to 40Hz to reduce artifact caused by EMG, etc.

2. ESIS Mode Frequency Characteristic Adult / Child: 1.6 to 15Hz Neonate: 1.6 to 15Hz

By selecting this mode when using electrosurgical instrument or electric blanket, electrical noise can be largely reduced.



The ESIS mode can largely reduce the artifact such as electrosurgery noise and EMG, but it may also reduce the QRS amplitude. The ESIS mode should be selected only during electrosurgery.

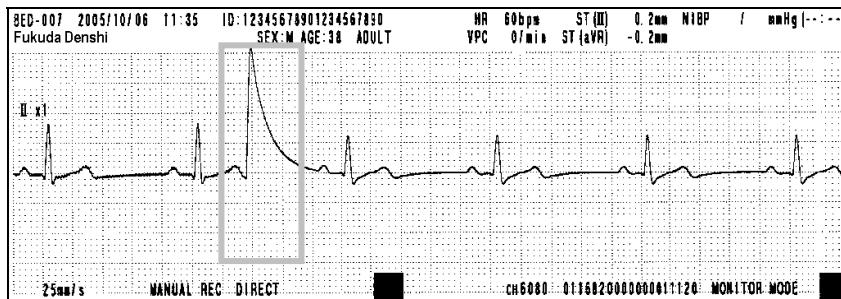
3. Diagnosis Mode Frequency Characteristic Adult / Child: 0.05 to 100Hz Neonate: 1.6 to 100Hz

Select this mode when monitoring ECG with high frequency characteristic.

NOTE

When the filter setup is changed, a notch will appear on the ECG waveform due to the change in frequency characteristic.

This will appear on the display, recording, and recall waveform.

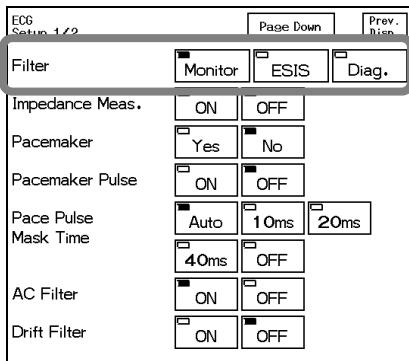


Refer to "6. Parameter Setup –ECG–" for details of filter mode.

●Procedure for Filter Mode Selection

1 Press the ECG numeric data box to display the ECG configuration menu.

2 Press the **Setup** key.



<Defibrillation-proof ECG relay cable>

3 Select the filter mode from the 3 selections.

●AC Filter

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

Lead Cable Types

There are various combinations of lead cable connecting type and electrode material. Contact our service representative for details and select the appropriate electrode.

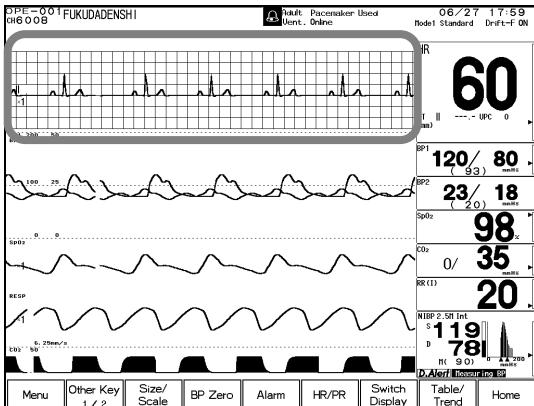
【for 3-electrode】	ECG Relay Cable (defibrillation-proof)	CI-700D-3 (FA)
	ECG Relay Cable (defibrillation and electrosurgery-proof)	CI-700E-3 (FA)
	ECG Lead Cable (hook type)	3380.0648.13
【for 4-electrode】	ECG Relay Cable (defibrillation-proof)	CI-700D-4 (FA)
	ECG Relay Cable (defibrillation and electrosurgery-proof)	CI-700E-4 (FA)
	ECG Lead Cable (hook type)	500398800
【for 5-electrode】	ECG Relay Cable (defibrillation-proof)	CI-700D-5 (FA)
	ECG Relay Cable (defibrillation and electrosurgery-proof)	CI-700E-5 (FA)
	ECG Lead Cable	3380.0661.13

3

To Acquire ECG Waveform

Respiration (Impedance Measurement)

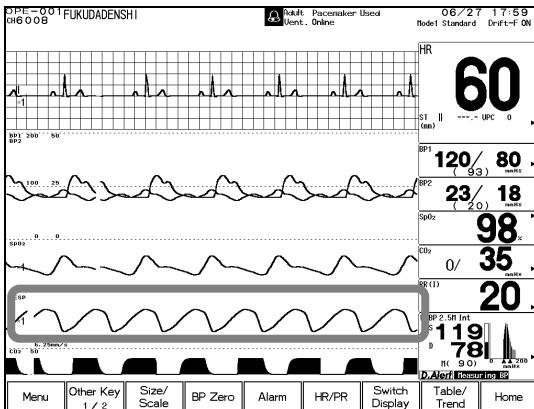
1 Verify that the ECG waveform is properly acquired.



The respiration waveform is detected from lead II of ECG mentioned in the previous section.

Between Lead II \Rightarrow Between R (red) – F (green)

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



Adjust the waveform size, baseline position and sweep speed.



Refer to "6. Parameter Setup –Respiration–" for waveform scale/baseline setup.
Refer to "4. Monitoring Setup –Display Setup–" for waveform sweep speed setup.

To Measure the SpO₂

(Nellcor® Model: DS-7000)

1 Prepare an appropriate probe or sensor for the patient.

Sensor Types

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 patient use type.

Single Patient Use Type



OxiMax® MAX-N (for neonate toe/adult finger)

For neonate with weight of less than 3kg or adult with weight of 40kg and over



OxiMax® MAX-I (for infant toe)

For pediatric with weight of 3 to 20kg



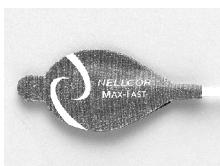
OxiMax® MAX-P (for pediatric finger)

For pediatric or adult with weight of 10 to 50kg



OxiMax® MAX-A (for adult finger)

For adult with weight of 30kg and over.



OxiMax® MAX FAST (for adult/pediatric forehead)

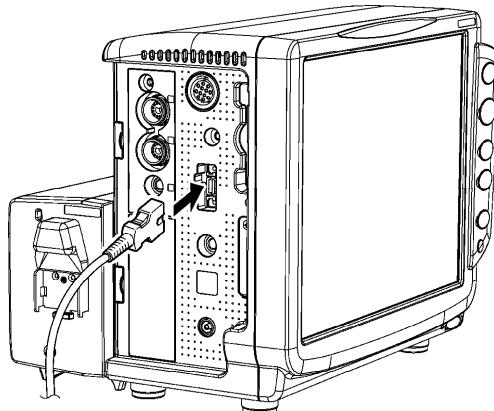
For adult/pediatric with weight of 10kg and over.

With the use of new technology of NELLCOR®, OxiMax®, stable monitoring during body motion / low perfusion is possible.

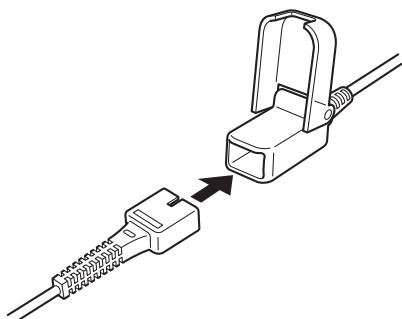
3

To Measure the SpO₂ (Nellcor® Model: DS-7000)

2 Connect the sensor to the main unit.



- (1) Connect the SpO₂ relay cable (DOC-10) to the SpO₂ connector on the DS-7000.

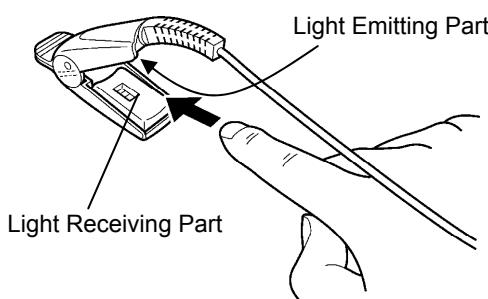


- (2) Insert the sensor into the SpO₂ relay cable connector, and lock it with the transparent cover.

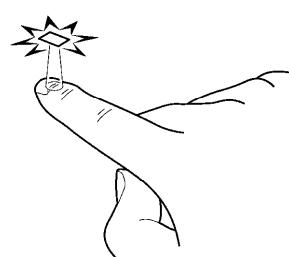
3 Attach the sensor to the patient.

CAUTION	<ul style="list-style-type: none">• 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.• The Dyna Alert estimates the change in circulatory dynamics from the photoplethysmogram (SpO₂) of the finger. (Refer to "6. Parameter Setup/Non-Invasive Blood Pressure/NIBP Monitoring Condition Setup/Dyna Alert Function".) Therefore, if the photoplethysmogram (SpO₂) is measured on the toe or forehead (with MAX Fast), the Dyna Alert may not function depending on the patient's condition.
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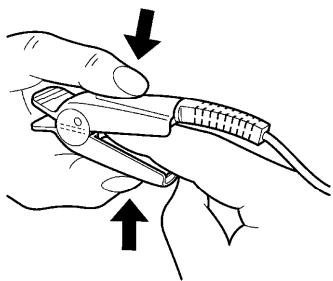
[Probe Type Sensor]



- (1) Attach the probe as shown on the left.
The probe cable should be on the nail side.



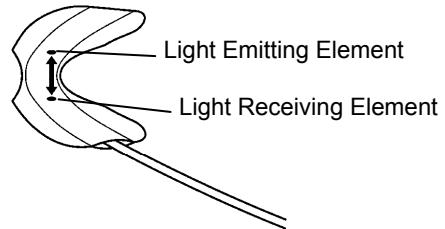
- (2) Adjust the sensor so that the light-emitting part (on cable side) touches the root of the nail, and close the probe.



- (3) Press the probe lightly so that the finger and the rubber cover are in contact.
This is to stabilize the probe, and to avoid ambient light to get in.

【Single Patient Use Type】

- (1) Clean the attachment site with alcohol, etc.
- (2) Align the light emitting element and light receiving element of the sensor with the measuring site in between when attaching the sensor to patient.
- (3) Secure the cable with surgical tape so that the sensor does not come off when the cable is pulled.

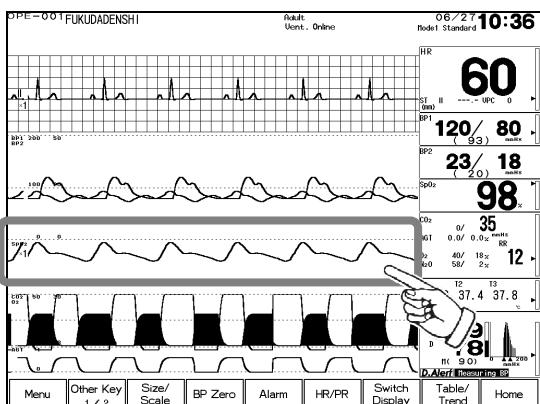


Attachment to the toe



Attachment to the finger

4 Verify that the SpO₂ data is displayed.



Press the [Home] key on the lower part of the display.
Verify that the SpO₂ measurement and pulse wave are displayed on the home display.

Average value during 6 seconds will be displayed as SpO₂ value.

WARNING	<ul style="list-style-type: none"> ● When measuring the SpO₂ of patient with high fever or peripheral circulatory insufficiency, check the sensor attachment periodically and change the attachment site. The temperature of the attachment site will rise 2 to 3°C due to the sensor heat which may result in burn injury. ● For the following case, accurate measurement may not be possible. <ul style="list-style-type: none"> • Patient with excessive abnormal hemoglobin (COHb, MetHb) • Patient with the pigment injected to the blood • Patient receiving CPR treatment • When a sensor is applied to a limb with NIBP cuff, arterial catheter, or intracatheter • When measuring at site with venous pulse • Patient with body motion • Patient with small pulse
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⚠ 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 attaching the sensor with a tape, do not wrap the tape too tight. At the same time, check the blood flow constantly so that congestion is not generated at the peripheral.
- Even a short duration of attachment may inhibit the blood flow and generate compression necrosis and burn injury.
- Change the sensor attachment site constantly (every 4 hours). As the temperature of sensor attachment site normally rises 2 to 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 measurements error. Place a black or dark cloth over the sensor.
- When not performing the measurement, unplug the relay cable and sensor from the SpO₂ connector. Otherwise, the measurement data may be erroneously displayed by the ambient light.

To Measure the SpO₂

(Masimo® Model: DS-7000M)

1 Prepare an appropriate probe or sensor for the patient.

Sensor Types

Reusable Sensor

This is intended for temporary use. Replace it every 4 hours.
If continually using for long hours, use the disposable sensor.

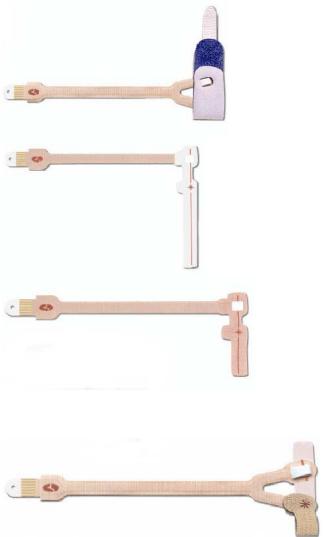


LNOP® DCI

For adult and pediatric weighing more than 30kg.
Attach to ring or middle finger of non-dominant hand.

Single Patient Use Sensor

Check the attachment position every 8 hours.



LNOP® NeoPt

For premature infant weighing less than 1 kg.
Attach across the foot or alternatively across the palm & back of hand.

LNOP® NeoPt-L

For premature infant weighing less than 1kg.
Attach across the foot or alternatively across the palm & back of hand.

LNOP® Inf-L

For infant weighing 3 to 10kg.
Attach to great toe or thumb.

LNOP® Neo

For neonates and infants weighing less than 10kg.
For neonates weighing under 3kg: Attach across the foot or alternatively across the palm & back of hand.
For infants weighing over 3kg: Attach to the thumb or the great toe.

LNOP® Neo-L

For neonates and infants weighing less than 10kg.
Attach across the foot or alternatively across the palm & back of hand.

LNOP® Pdt

For child or adult weighing 10 to 50kg.
Attach to the ring or middle finger of non-dominant hand.

LNOP® Adt

For adult and child weighing more than 30kg.
Attach to the ring or middle finger of non-dominant hand.

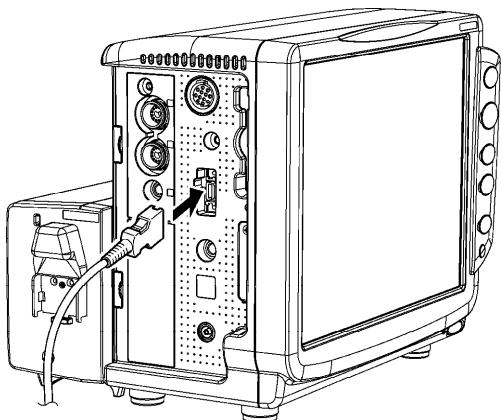
LNOP® Adt Long

For adult and child weighing more than 30kg.
Attach to the ring or middle finger of non-dominant hand.

3

To Measure the SpO₂ (Masimo® Model: DS-7000M)

2 Connect the patient cable to the monitor.



3 Select the sensor attachment site.

- Select a site with good perfusion, and where it will not obstruct the patient's movement. If possible, select a non-dominant hand.
- Verify the light receiving part of the sensor is completely covered by the finger.
- Before attaching the sensor, clean the attachment site.

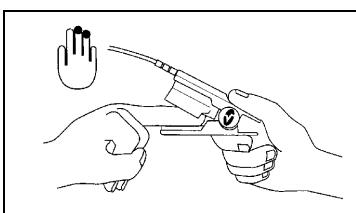
4 Attach the sensor to the patient.

The attachment procedure is different for each sensor.

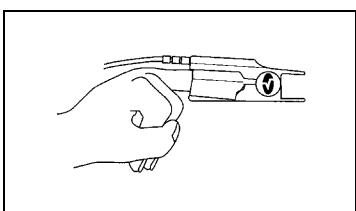
⚠ CAUTION

- 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.
- The Dyna Alert estimates the change in circulatory dynamics from the photoplethysmogram (SpO_2) of the finger. (Refer to "6. Parameter Setup/Non-Invasive Blood Pressure/NIBP Monitoring Condition Setup/Dyna Alert Function".) Therefore, if the photoplethysmogram (SpO_2) is measured on the toe, the Dyna Alert may not function depending on the patient's condition.

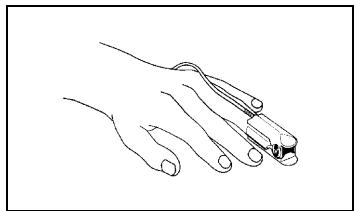
[For Reusable Type: LNOP® DCI]



(1) Press the hinge to open the sensor. Place the selected finger inside the opening of LNOP® DCI sensor. Fleshed part of the finger should cover the detecting element located at the lower part of the sensor. The upper half of the sensor connects to the cable. The fingertip should touch the finger stop (arched part) inside the sensor. If the nail is too long, it may go beyond the finger stop.



(2) Press the hinge and adjust it so that the sensor force is equally applied to the entire finger. To acquire correct data, the detecting element should be completely covered.

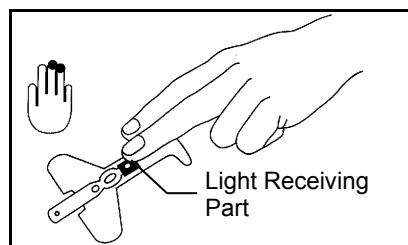


(3) Pass the sensor cable over the back of the hand.

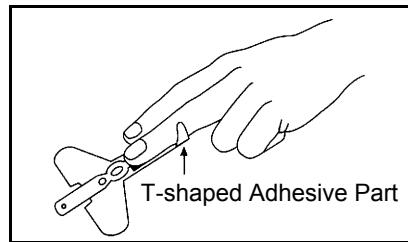
[For Single Patient Use Type: LNOP® Adt]

- (1) Take out the sensor from the bag, and face the yellow-brown printed-side downward.
- (2) Bend the sensor backward and peel off the adhesive backing.

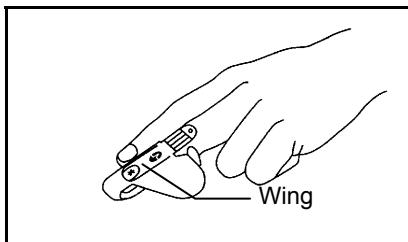
- (3) Position the sensor so that the light receiving part touches the finger.



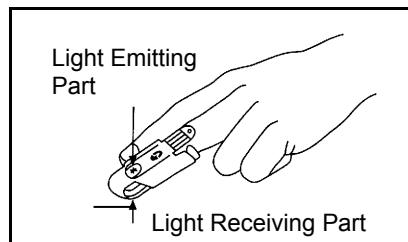
- (4) Place the fingertip over the light receiving part of the sensor.



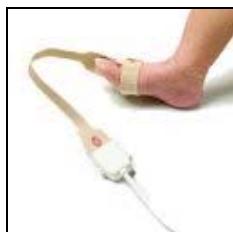
- (5) Press the T-shaped adhesive part to the finger.



- (6) Wrap the light emitting part and finger-printed part around the nail.



- (7) Fold the wings (adhesive) one at a time, and attach them around the finger.

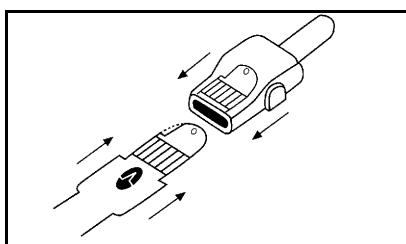


Attachment to the toe



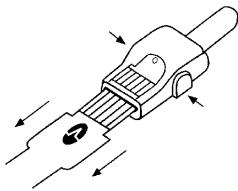
Attachment to the finger

5 Connect the patient cable and the sensor.



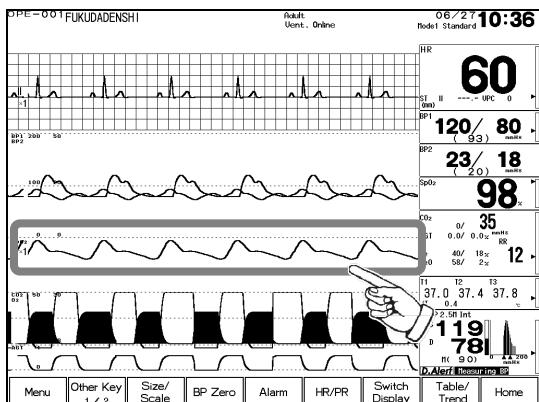
Face the metallic side of the sensor upward and align the logo with that of the patient cable.
Insert the sensor connector to the patient cable until a click sound is heard.

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



When disconnecting the patient cable and sensor, pull slowly while pressing the lock buttons on the patient cable.

6 Verify that the SpO₂ data is displayed.



Press the [Home] key on the lower part of the display.

Verify that the SpO₂ measurement and pulse wave are displayed on the home display.

Average SpO₂ value for the duration selected for "SpO₂ Averaging" will be displayed.

⚠ CAUTION

The pulse wave for the Masimo model (DS-7000M) generates a phase-lag of approximately 630msec.

⚠ 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 the attachment site will rise 2 to 3°C due to the sensor heat which may result in burn injury.
- For the following case, accurate measurement may not be possible.
 - Patient with excessive abnormal hemoglobin (COHb, MetHb)
 - Patient with the pigment injected to the blood
 - Patient receiving CPR treatment
 - When a sensor is applied to a limb with NIBP cuff, arterial catheter, or intracatheter
 - When measuring at site with venous pulse
 - Patient with body motion
 - Patient with small pulse

⚠ 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 attaching the sensor with a tape, do not wrap the tape too tight. At the same time, check the blood flow constantly so that congestion is not generated at the peripheral.
- Even a short duration of attachment may inhibit the blood flow and generate compression necrosis and burn injury.
- Change the sensor attachment site constantly (every 4 hours). As the temperature of sensor attachment site normally rises 2 to 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 measurements error. Place a black or dark cloth over the sensor.
- When not performing the measurement, unplug the relay cable and sensor from the SpO₂ connector. Otherwise, the measurement data may be erroneously displayed by the ambient light.

To Measure the NIBP

This device measures the non-invasive pressure using the oscillometric method.

Cuff Connection and Patient Application

1 Select the appropriate cuff type for the patient.

According to the AHA (American Heart Association) guideline, the appropriate cuff width is 40% of the arm circumference. Select the appropriate cuff on “12. Optional Accessories” from the list of specified NIBP cuffs.

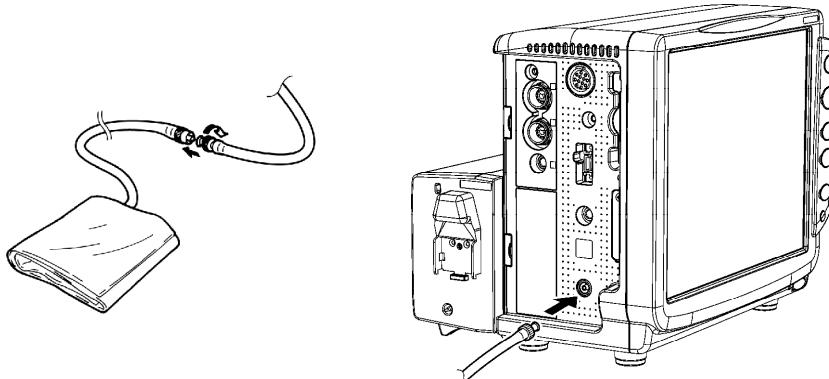
WARNING

Use only specified NIBP cuff. Refer to “12. Optional Accessories” for list of specified NIBP cuffs. These accessories may be purchased from Fukuda Denshi or NIBP cuff manufacturer that Fukuda Denshi recommends.

CAUTION

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

2 Connect the cuff to the air hose, and then connect the air hose to the cuff connector on the main unit.



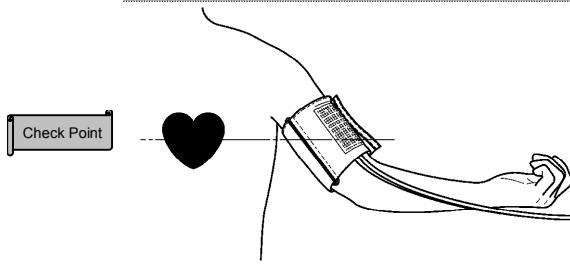
CAUTION

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

3 Apply cuff to the patient.

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

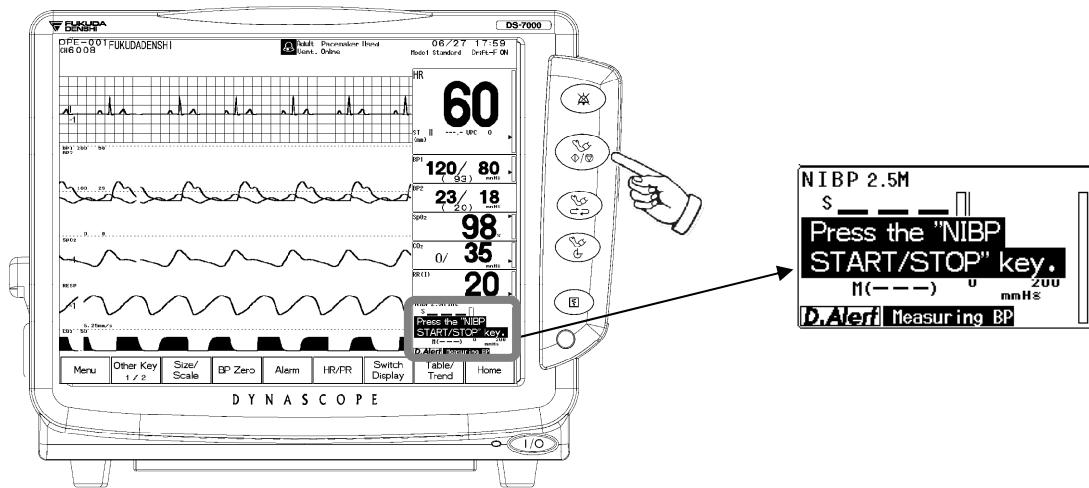




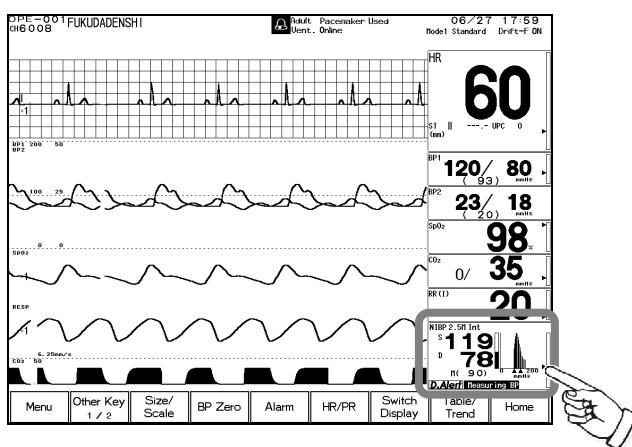
Align the cuff height and heart position to eliminate an error caused by the blood weight.
It is most appropriate to measure with the patient lying down and arms naturally extended.

4 Start the measurement.

When the power is turned ON, or when a patient is admitted, "Press the NIBP START/STOP key." will be displayed inside the NIBP numeric data box if NIBP measurement has not been performed before. The first measurement will start by pressing the (NIBP Start/Stop) key or setting the NIBP measurement interval.



Pressing the (NIBP Start/Stop) key will start inflating the cuff and starts the measurement. Upon completion, the measured value will be displayed inside the NIBP numeric data box.



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

CAUTION	<ul style="list-style-type: none"> ● Correct NIBP measurement cannot be performed if artificial heart lung machine is used or if the pulse is difficult to detect. ● Pay attention when measuring the NIBP of patient with bleeding disorders or hypercoagulation. The cuff inflation may cause petechia or circulatory failure by blood clot. ● Do not apply the cuff to the arm or thigh where vein is secured. The blood may backflow causing the chemical injection to cease. ● If the air hose is twisted, or weighed down, the cuff air cannot be exhausted. Properly arrange the cuff and air hose. ● Check the condition of cuff-applied part on the patient during measurement so that the blood circulation will not be blocked over long period of time by the squashed or bent cuff hose. ● Check the patient's condition constantly while measuring over a long period of time with interval of 2.5 minutes or less. Also, periodically check the blood circulation while performing periodic measurement over a long period of time. Congestion or rash may occur at the measuring site. ● The following factors may affect the NIBP value. <ul style="list-style-type: none"> • Body motion, arrhythmia, convulsion • Continuous noise such as cardiac massage • Periodic electromagnetic noise
NOTE	<p>When the cuff is not applied to the patient, pay attention not to leave the cuff unattended. If periodic or continuous measurement is set, the cuff will automatically inflate and may cause the rubber bag inside the cuff to burst. When not performing the NIBP measurement, set the NIBP measurement interval OFF and disconnect the air hose from the NIBP connector.</p>

【About the Oscillometric Method】

The oscillometric method measures the blood pressure by detecting the pulse oscillation change by the cuff pressure. The cuff connects to the NIBP cuff connector on the monitor via the air hose. The air pressure inside the cuff is converted to voltage by the pressure sensor, A/D converted, and transmitted to the CPU.

The measurement process is as follows.

- 1)The cuff inflates to the set value and inhibits the arterial blood flow at the measured site.
- 2)The cuff gradually deflates.
- 3)The arterial blood flow of the patient will return when the cuff pressure is decreased sufficiently.
- 4)The oscillation (pulse signal) caused by the restricted blood circulation is transmitted to the pressure sensor via the air hose, and converted to an electric signal.
- 5)From the pulse signal and cuff pressure detected at the pressure measurement circuit, the systolic, diastolic, average blood pressure and pulse rate will be measured at the CPU.

Memo

On the monitor, the value of systolic, diastolic, average blood pressure will be displayed.

The measurement will start with the following factor.

- 1)When the NIBP Start/Stop key is pressed.
- 2)At the set measurement interval.
- 3)When the NIBP continuous measurement key is pressed. (for duration of max. 15 minutes)
- 4)At alarm occurrence (When "NIBP Measurement at Alarm Occurrence" is set to ON)
- 5)When change in circulatory state is detected from the time difference of ECG waveform and Pulse wave.

Types of NIBP Measurement

The DS-7000 is provided with the following types of NIBP measurement function.

● Continuous Measurement

The NIBP measurement will continue for 12 minutes.

Pressing the  (NIBP Continuous Measurement) key will start the NIBP continuous measurement.

Continuous measurement can be also performed by pressing the  (NIBP Auto Mode) key and selecting **Cont.** from the interval selection.

If the patient classification is "Adult", provisional SYS (systolic pressure) can be displayed during the continuous measurement.

The measurement will automatically stop after 12 minutes, and the measurement interval will be set to 2.5 minutes.

● Periodic Measurement

The NIBP measurement will be automatically performed with the selected interval of 2 min / 2.5 min / 5 min / 10 min / 15 min / 30 min / 60 min / 120 min.

The measurement interval selection will be displayed by pressing the  (NIBP Auto Mode) key.

● 1-Minute Measurement

The NIBP measurement will be performed in 1-minute interval for duration of 12 minutes.

Pressing the  (NIBP Auto Mode) key and selecting **1M** from the interval selection will immediately start the 1-minute measurement.

The measurement will automatically stop after 12 minutes, and the measurement interval will be set to 2.5 minutes.

● Manual Measurement

The NIBP measurement can be started manually by pressing the  (NIBP Start/Stop) key.

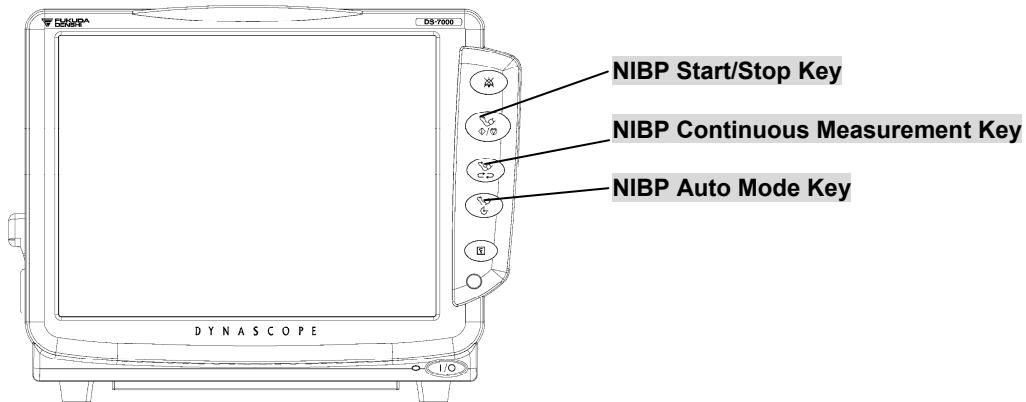
● Measurement at Alarm Occurrence

The NIBP measurement can be started at alarm generation of specified parameter.

It will be performed on the condition that at least one NIBP measurement is performed since the power is turned ON, and 10 seconds or more has elapsed since the last NIBP measurement.

NIBP Operation Using the Fixed Keys.

The following 3 fixed keys located on the right of the display are used for the NIBP measurement.



NIBP Start/Stop Key

Starts/stops the NIBP measurement.

If the measurement interval is set, pressing this key will start the measurement with the set interval.
<LED Indicator> During NIBP measurement : lights in green



NIBP Continuous Measurement Key

Starts/stops the NIBP continuous measurement.

This key will start the continuous measurement regardless of the measurement interval selection. If this key is pressed during the continuous measurement, the measurement in progress will cease and the continuous measurement will be cancelled. When the continuous measurement is completed or cancelled, the measurement interval will be set to 2.5 minutes.

<LED Indicator> During continuous measurement : lights in green



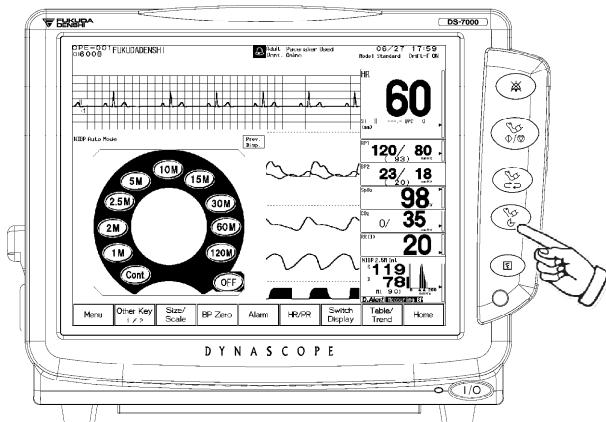
NIBP Auto Mode Key

Pressing this key allows to change the NIBP measurement interval. When this key is pressed, the interval selection will be displayed. Select the interval using the touch key.

<LED Indicator> When interval selection is displayed: lights in green.

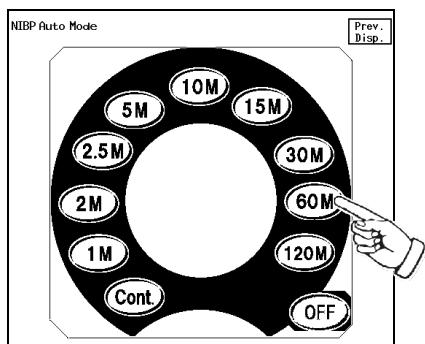
Procedure to Select the NIBP Measurement Interval

- 1 Press the  (NIBP Auto Mode) key.



The interval selection will be displayed.

- 2 Select the interval.



Press the key for the desired interval. The color of the selected interval will change.

The measurement will automatically start at the selected interval.

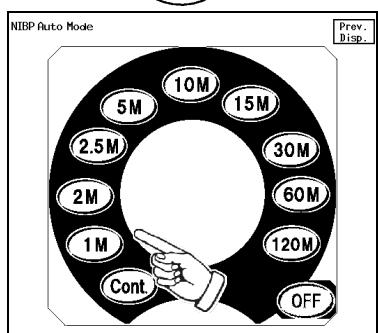
The measurement time will be integral multiple of the selected interval time starting from 0 minute.
Ex.) If the present time is 13:14, the measurement time will be as follows for each interval time.

2 min. : 13:16, 13:18, 13:20, ...
2.5 min. : 13:15, 13:17:30, 13:20, ...
5 min. : 13:15, 13:20, 13:25, ...

To Start the 1-Minute Measurement.

1-minute measurement will automatically stop after 12 minutes, and the measurement interval will be set to 2.5 minutes.

- 1 Press the  (NIBP Auto Mode) key.



The interval selection will be displayed.

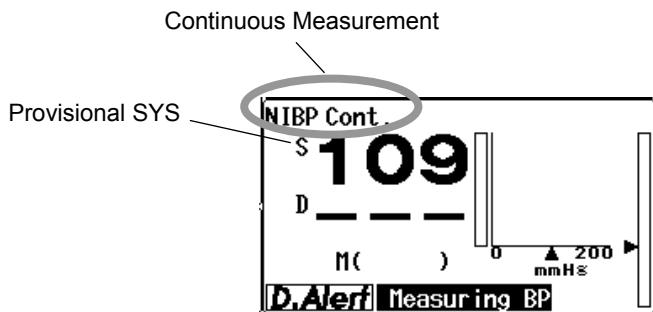
- 2 Press the **1M** key. 1-minute interval measurement will immediately start.

To cease the measurement before completion, press the  (NIBP Start/Stop) key.

To Start the Continuous Measurement

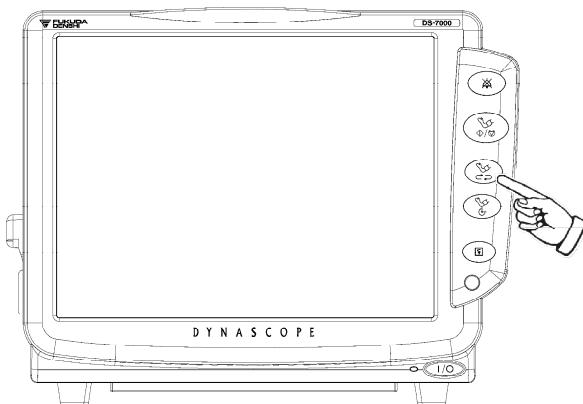
NIBP will be continuously measured for 12 minutes.

If any abnormality is found on the cuff hose during the continuous measurement, the measurement will immediately cease.



During continuous measurement, a provisional SYS (systolic pressure) will be displayed during the measurement if the patient classification is "Adult". It will not be displayed during the Quick Measurement (measurement duration of 20 to 25 seconds).

- 1 Press the  (NIBP Continuous Measurement) key.

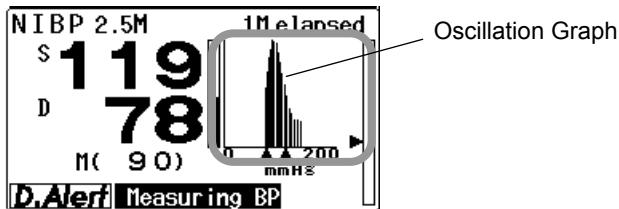


- 2 NIBP continuous measurement will start.

To cease the measurement before completion, press the  (NIBP Start/Stop) key, or press the  (NIBP Continuous Measurement) key again.

Oscillation Graph Display

When the NIBP numeric data box size is 2-box size or larger, and "Osc. Graph Display" is set to ON on the NIBP setup menu, the oscillation graph will be displayed inside the NIBP numeric data box.

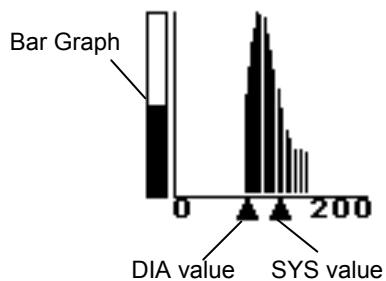


For setup procedure, refer to "6. Parameter Setup –Non-Invasive Blood Pressure– NIBP Setup ●Oscillation Graph Display".

The description of the oscillation graph is as follows.

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

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



Dyna Alert Function Status

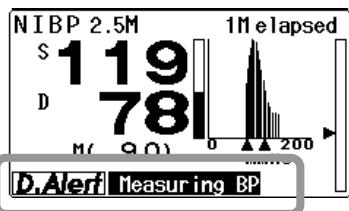
The Dyna Alert function is a technology to prevent accidents which may occur by the sudden BP change during the non-measured duration by estimating the variation of circulatory dynamics using the parameters obtained from ECG and pulse wave, and initiating a new NIBP measurement if a change in the circulatory dynamics is detected. It will operate on the following measurement condition.

Patient Classification : Adult (20kg or above)
Cuff Applied Site : Upper arm
SpO₂ Sensor Applied Site : Fingertip
NIBP Measurement Interval : 5 to 60 minutes



When a PTG (SpO₂) sensor is applied to the toe or forehead, the Dyna Alert may not function depending on the patient's condition.

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



For setup procedure and theory of Dyna Alert function, refer to "6. Parameter Setup -Non-Invasive Blood Pressure— NIBP Setup ●Dyna Alert Function".

Color of D.Alert	Message	Description	Dyna Alert Function Status ^{*1}
Gray	DA Setup: OFF	Dyna Alert (DA) is set to OFF.	Invalid
	Patient: Child	NIBP measurement is performed on child.	Invalid
	Patient: Neonate	NIBP measurement is performed on neonate.	Invalid
	Pacemaker: ON	Pacemaker setting is set to ON.	Invalid
	Interv.: <5min.	NIBP interval is set to Cont., 1min, 2min, or 2.5min.	Suspended
	Interv.: >60min.	NIBP interval is set to 120min.	Suspended
	Interv.: OFF	NIBP interval is set to OFF.	Suspended
	Measuring BP	Invasive blood pressure is measured.	Suspended
Yellow	Measure NIBP	Initialization of Dyna Alert is complete, and the NIBP measurement has not been performed since the power is turned ON.	Suspended
	Poor ECG Signal	ECG signal failure due to lead-off, noise, etc.	Invalid
	Poor PTG Signal	PTG (Plethysmogram) signal failure due to sensor off, noise, severe low perfusion, etc.	Invalid
	DA-NIBP Suspended	Within 2.5 minutes from previous Dyna Alert NIBP measurement.	Suspended
	Measuring NIBP	NIBP measurement other than Dyna Alert is in progress.	Invalid
	Initializing	Waiting for stable signal after starting Dyna Alert.	Invalid
Green	PTG Low Perfusion	PTG amplitude is 200unit or above, and below 800unit.	Valid
	Mon. Variation	Dyna Alert is properly monitoring circulatory dynamics variation.	Valid
Pink	Measuring DA-NIBP	Dyna Alert NIBP measurement is in progress.	Invalid

*1 Invalid : Circulatory dynamics variation is not monitored.

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

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

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

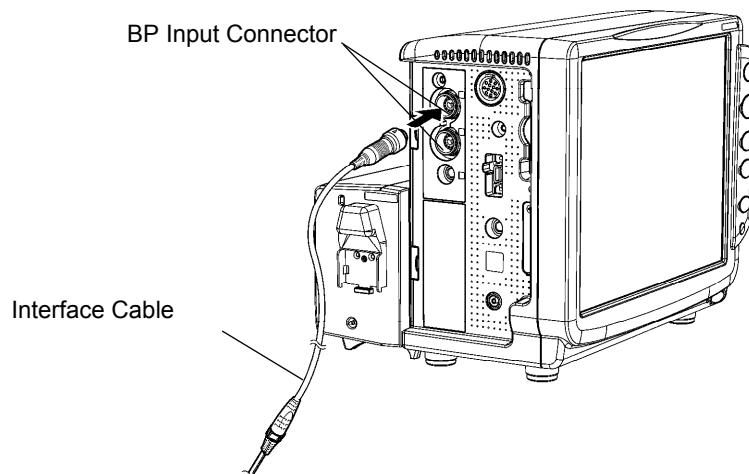
 CAUTION

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

To Measure the BP

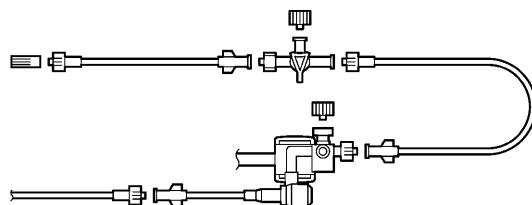
1 Connect the BP interface cable to the Option Unit (HU-71/HU-72/HU-73) attached to the DS-7000.

The interface cable can be directly connected to the BP input connector (orange).

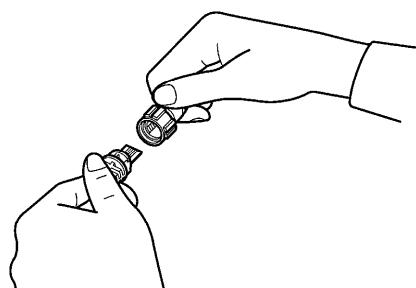


2 Assemble the BP measurement device.

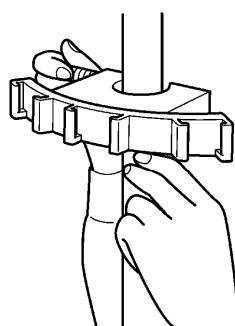
The following procedure explains the case when a BP transducer (CDX series) is used.
If using other transducers, refer to the operation manual for the corresponded transducer.



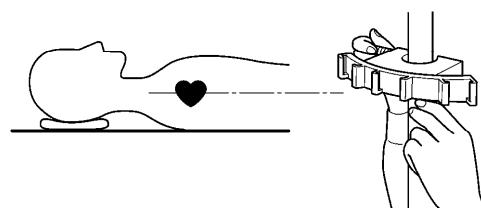
- (1) Inspect transducer packaging for damage prior to opening.
Verify that each connector is securely connected.

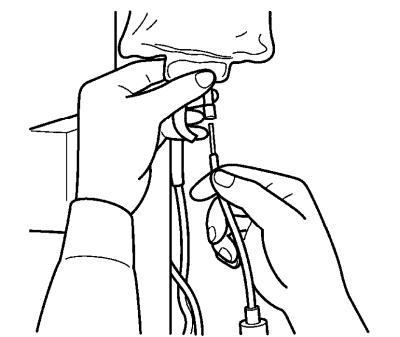


- (2) Connect the interface cable to the BP input connector (orange), and then to the transducer.

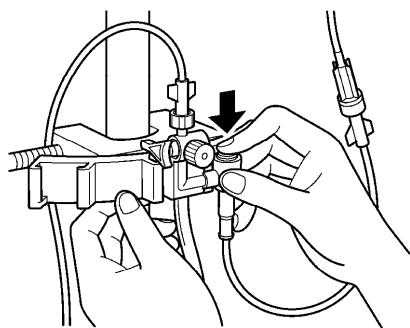


- (3) Align the bracket to patient's heart position (about 1/2 of the chest depth).

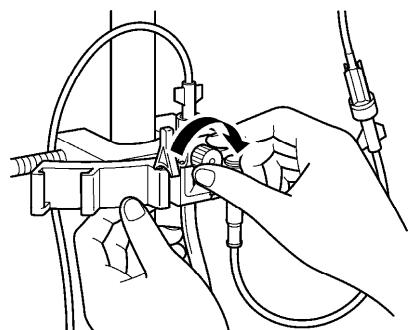




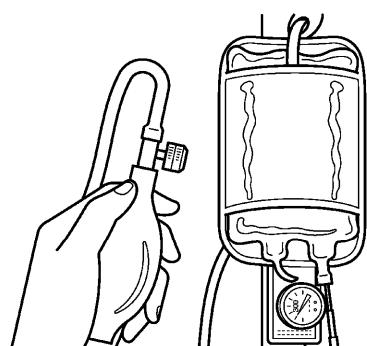
(4) Inject 1000 units of heparin into the saline bag, mix thoroughly and puncture the infusion line through the same hole. Set the saline bag inside a pressure bag, and hang it from the infusion device. Fill saline to about 1/3 of the drip.



(5) After loosening the zero-port cap, push the flash button to perform priming to remove air bubbles.



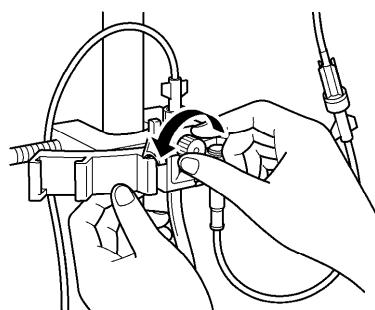
(6) Verify that all air bubbles are removed, and tighten the zero-port cap.
Close the 3-way valve to the patient (patient side OFF).



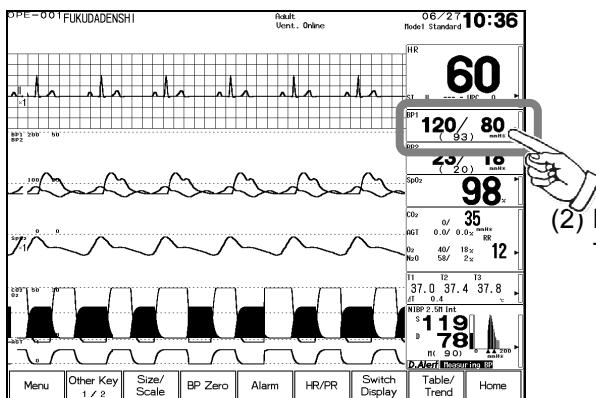
(7) Inflate the pressure bag to 300mmHg.

(8) Perform the zero balance process.

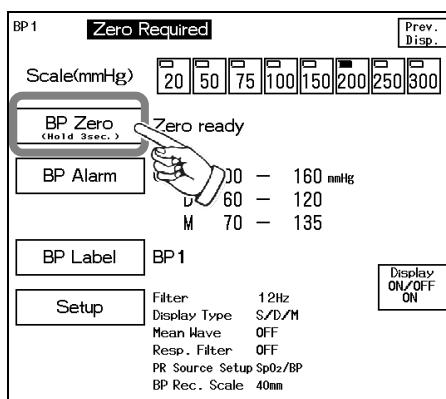
3 Perform zero balance.



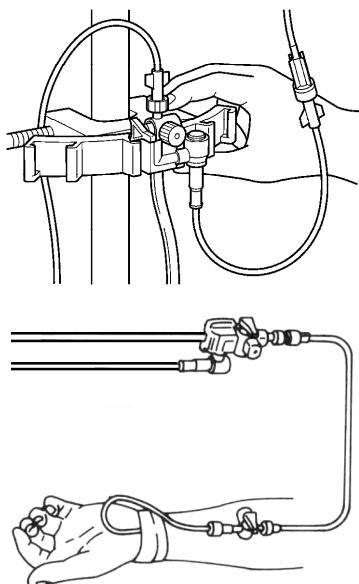
(1) Loosen the zero-port cap half a turn.



- (2) Press the BP numeric data box on the home display.
The display will proceed to BP setup menu.



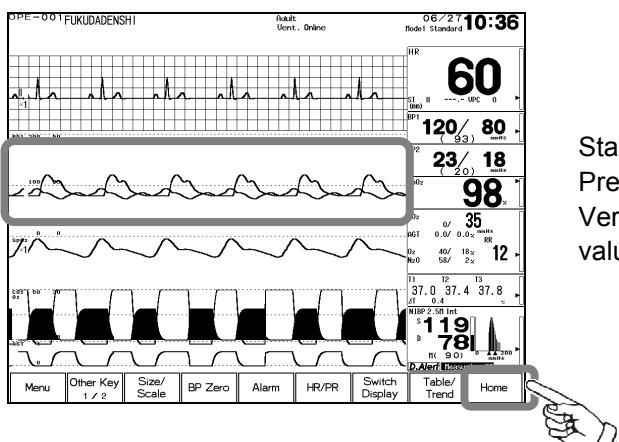
- (3) Press the **BP Zero** key on the BP setup menu for 3 seconds.
Zero balance will start.



- (4) Close the 3-way valve to the zero-port cap (zero-port cap side OFF).

- (5) Connect the catheter to the end of the monitoring line. The preparation for measurement is complete.

4 Start the BP monitoring.



Start the BP measurement.

Press the **Home** key.

Verify that the BP waveform and each measurement value are displayed on the home display.

 CAUTION

The zero balance procedure is required for the following case.

- When starting a measurement.
- When the heart position has changed due to body movement.
- When the transducer position has changed.
- When measuring for a long period of time and there is a possibility of measurement error due to change in ambient temperature, etc.
- When a connector is connected / disconnected, or a transducer is replaced.
- When the power has been turned OFF for 30 seconds or more.

To Measure the Multigas Concentration

(MGU-701/MGU-702)

The MGU-701/MGU-702 is a sidestream type multigas unit which measures concentrations of carbon dioxide, nitrous oxide, halothane, enflurane, isoflurane, sevoflurane, desflurane, and oxygen (MGU-701) based on the gas sampled from the endotracheal adapter or nasal cannula.

High IQ™ technology is used to identify and measure the gases.

The MGU-701/MGU-702 has an internal barometer and thermistor that allow compensation for changes over a range of temperature and atmospheric pressures.

* High IQ™: Trademark of Criticare System Inc.

Precautions for MGU-701/MGU-702

 WARNING	<ul style="list-style-type: none">● Adverse affects of humidity<ul style="list-style-type: none">• Given the small effect of water vapor on agent gas and CO₂ measurements, the method of agent gas analysis is ATPS (Ambient Temperature and Pressure, Saturated; 21°C, 750 mmHg, 100% Humidity Saturated).• The effect of humidity on oxygen measurements is negligible.● Adverse affects of leaks and internal venting<ul style="list-style-type: none">• Environmental pollution of nitrous oxide and halogenated agents may cause accuracy errors.• Always use anesthetic gas scavenging systems (AGSS) with the monitoring system.● Return of sampled gas<ul style="list-style-type: none">• Infectious agents may be transferred between patients through the sampled gas exhaust port to the patient's breathing circuit.• Always use a scavenging line connected to the exhaust port and to the facility scavenging system.● Never attach intravenous tubes to gas sampling connections. Gas sampling lines may be inadvertently connected to intravascular fluid systems, allowing air into a blood vessel.● Never place the MGU-701/MGU-702 or monitor inside an oxygen tent or any gas containment apparatus.
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 CAUTION	<ul style="list-style-type: none">● The MGU-701/MGU-702 requires at least 20 minutes of warm up period to perform correct measurement.● If the power supply is interrupted due to reason such as power failure, the MGU-701/MGU-702 will be initialized and enter into warm-up state even if the power failure is within 30 seconds.● About the auto-calibration<ul style="list-style-type: none">• When the MGU-701/MGU-702 is connected, auto-calibration will immediately start.• Auto-calibration will start at 30 to 60 minutes interval and upon change of ambient temperature.• Auto calibration will be performed at shorter intervals during warm up period.• Auto-calibration will last approximately 5 seconds, and measurement data will not be updated during this period.• No manual calibration is necessary during normal operation.• Auto-calibration requires water trap and sampling line.• Auto-calibration does not require calibration gas.● About the storage for MGU-701/MGU-702<ul style="list-style-type: none">• The accuracy of MGU-701/MGU-702 may be affected at extreme temperatures. Do not store them at extreme temperature. Temperatures exceeding specified storage temperatures (-5 to 50°C) could damage the units.• After the MGU-701/MGU-702 is stored in low temperature, when turning on the device, it may require additional warm-up time.
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NOTE

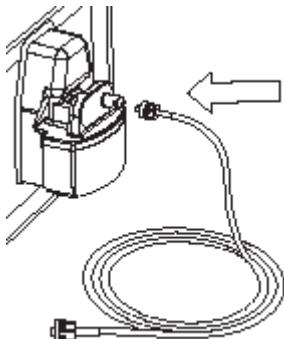
The MGU-701/MGU-702 and gas sampling accessories are free from latex in any location that may contact the patient.

Procedure to Attach the Water Trap

- 1** Attach the Water Trap (WaterChek™2⁺) to the Water Trap attachment location on the Multigas Unit. Place the cover over the unused receptacle if present.



- 2** Attach the sampling line to the Luer connector located on the front of the Water Trap (WaterChek™2⁺).



- 3** Make sure there are no kinks or occlusions on the sampling line.
- 4** Attach the sampling device to the sampling line.
Use either a nasal cannula, mask or ventilation tube adapter.
- 5** Replace the sampling device, sampling line, and the water trap if they become blocked.

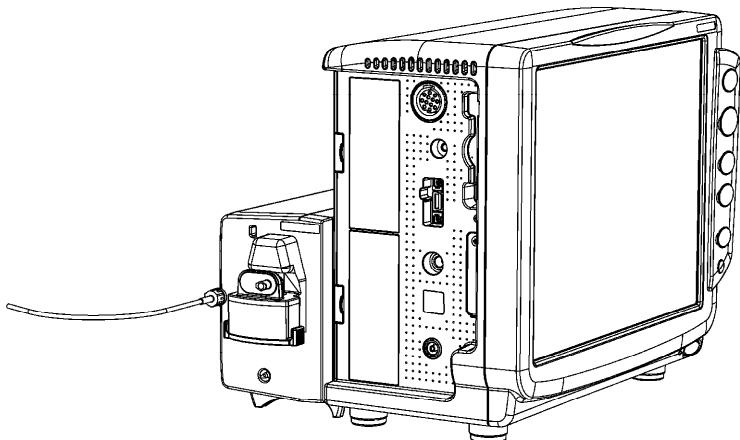
Patient Application and Monitor Display

3

To Measure the Multigas Concentration (MGU701/MGU-702)

1 For intubated patient

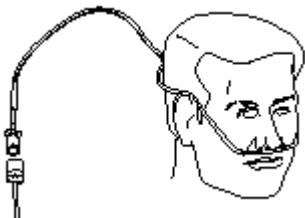
- (1) Attach the airway adapter to respiration circuit.
- (2) Remove the protective cap on the airway adapter, and connect to the sampling line.
Connect the other end of the sampling line to the sampling gas inlet on the MGU-701/702
Verify that all the tubes are properly connected.



The illustration is DS-7000 with the MGU-701.

2 Placement of nasal cannula

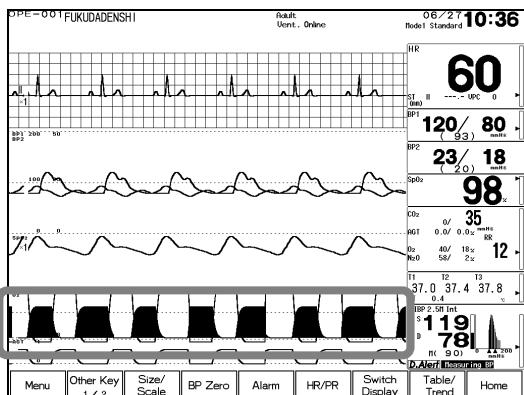
If using a nasal cannula, position directly under the patient's nose with the prongs extending into the nostrils. Slide the adjuster forward to close the loop around the head.



WARNING

- Use only the specified water trap and sampling line.
- Always consider the circumference of the intubation tube when using the airway adapter. If an inappropriate airway adapter is used for a patient with low ventilation, CO₂ may mix in with the inspired air resulting in incorrect measurement, or apnea detection may become difficult.
- The nasal cannula, airway adapter, and sampling line cannot be reused.

3 Start the CO₂ measurement.



Press the **Home** key.

Verify that the CO₂ waveform and multigas numeric data are displayed on the monitor.

Stable measurement can be achieved after about 20 minutes from power ON.



WARNING The sampling line may get clogged by internal condensation.



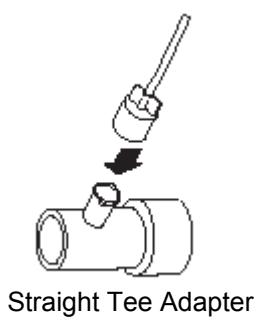
CAUTION In an environment where there is alcohol vapor, some errors may be observed in the measurement.

NOTE

- Connecting a water trap to the multigas unit will automatically start the sampling pump to operate. To prevent the pump from deteriorating, disconnect the water trap from the multigas unit when not measuring the CO₂ concentration.
- Water traps and sampling lines should be checked regularly.

Ventilation Circuit Adapters

There are two types of adapter for patient ventilation, which are Straight Tee Adapter and Mask Elbow Adapter. They come with a Luer lock sampling port for use with the sampling line. If additional adapters are required, they should be no longer than two inches. Extending the sampling line will cause a delay in response time.



Straight Tee Adapter



Mask Elbow Adapter



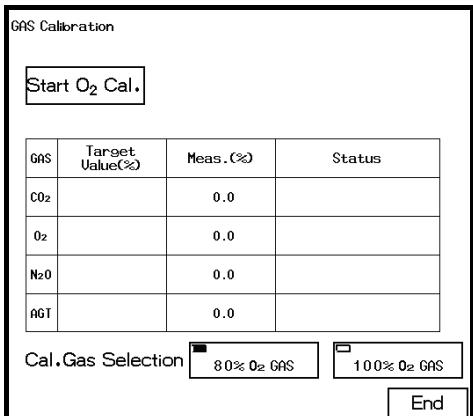
WARNING Cables, cords, and sampling lines may present a risk of entanglement or strangulation. Verify safe and proper positioning of these items after patient application.



CAUTION Use only with the specified accessories. Use of unapproved accessories may cause inaccurate readings.

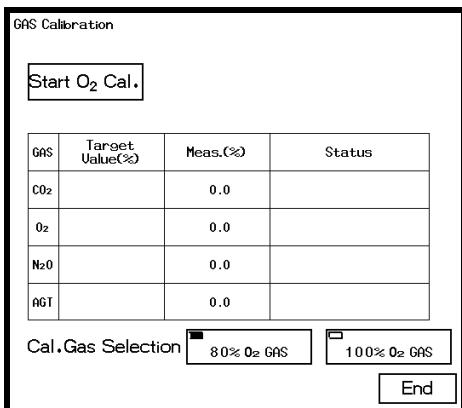
Calibration Procedure

- 1 Press the **Menu** → **Maintenance** → **GAS Calibration** keys.

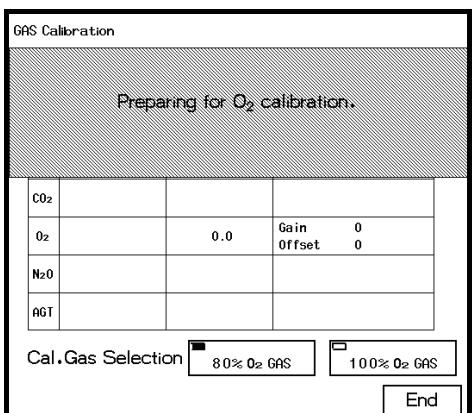


The GAS calibration screen will be displayed.

- 2 Select the calibration gas from **80% O₂ Gas** or **100% O₂ Gas**.



- 3 Press the **Start O₂ Cal** key.



The message, "Preparing for O₂ calibration." will be displayed.

During the preparation process, the O₂ calibration process cannot be cancelled.

NOTE

O₂ calibration cannot be started until the warm-up process of the multigas unit is completed.

- 4 Connect the specified calibration gas cylinder to the multigas unit according to the following procedure.

CAUTION

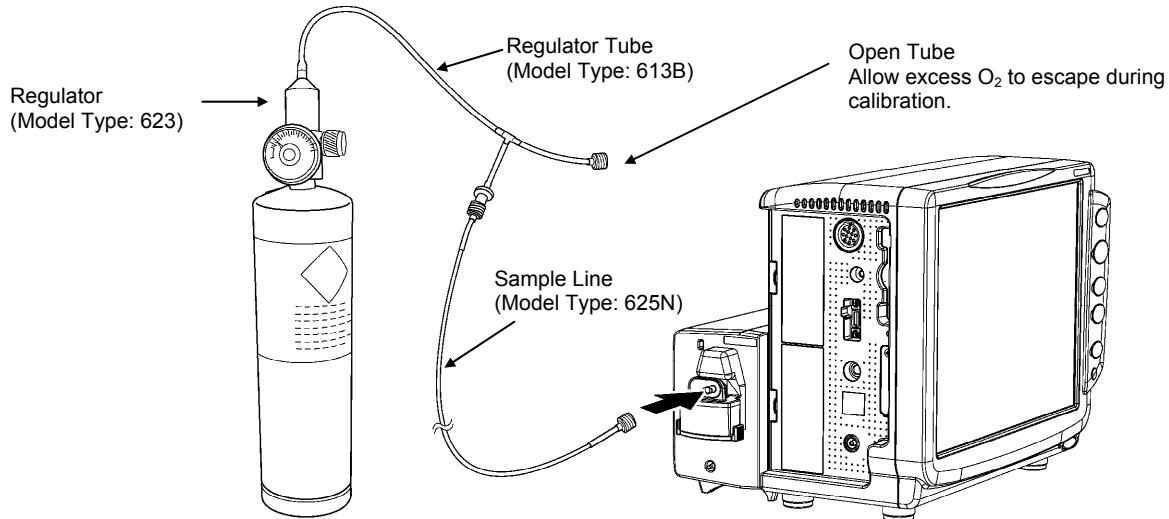
The O₂ concentration of the calibration gas should be the same with the setting. Otherwise, O₂ measurement accuracy will be degraded.

3

To Measure the Multigas Concentration (MGU-701/MGU-702)

[When Using the 80% O₂ Calibration Gas (Po-03046630AIPD)]

1. Screw a regulator (Model Type: 623) onto the cylinder.
2. Connect the regulator tube (Model Type: 613B) to the regulator.
3. Attach a sample line (Model Type: 625N) to the end of the regulator tube.
4. Install a new water trap on the multigas unit and then connect the other end of the sample line to the water trap.



The illustration is DS-7000 with the MGU-701.

[When Using the 100% O₂ Calibration Gas]

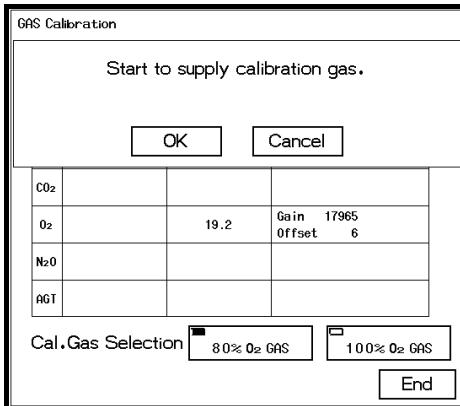
- (1) Connect the regulator tube (Model Type: 613B) to the regulator.
- (2) Attach a sample line (Model Type: 625N) to the end of the regulator tube.
- (3) Install a new water trap on the multigas unit and then connect the other end of the sample line to the water trap.

When using the 100% O₂ calibration gas, adjust the regulator so that the calibration gas will be supplied with the flow rate of 200mL/min or above.



CAUTION If the calibration is performed with the flow rate below 200mL/min, accuracy error will occur after the calibration.

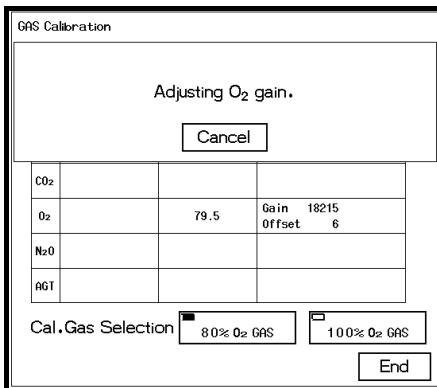
5 Adjust the O₂ gain.



When the preparation of O₂ calibration is complete, O₂ gain and O₂ offset value will be displayed, and the message, "Start to supply calibration gas." will appear.

Turn on the valve of the regulator to supply calibration gas. Verify that the gas escaping from the open tube can be heard, and press the **OK** key.

To cancel the O₂ calibration, press the **Cancel** key.



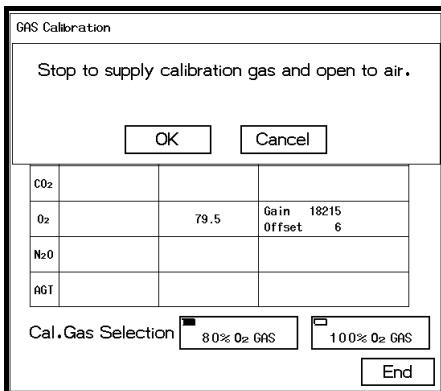
The message, "Adjusting O₂ gain." will be displayed.

To cancel the O₂ calibration, press the **Cancel** key.



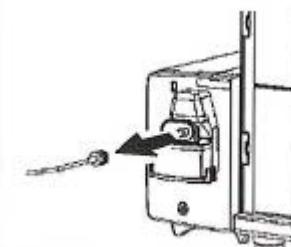
If O₂ gain adjustment is started without supplying the calibration gas, the message, "Check calibration gas." will be displayed and O₂ gain adjustment will cease.

6 Adjust the O₂ Offset.

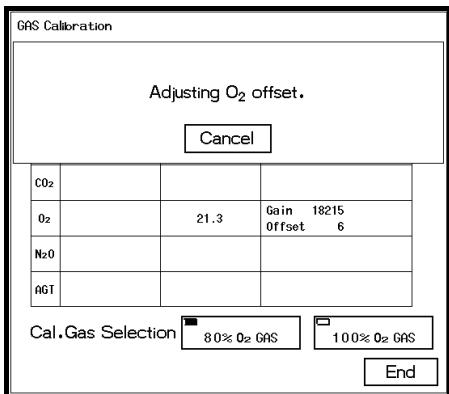


When the O₂ gain adjustment is complete, the message, "Stop to supply calibration gas and open to air." will be displayed.

Turn off the valve to stop supplying calibration gas. Remove the sampling line from the water trap, and press the **OK** key.



To cancel the O₂ calibration, press the **Cancel** key.



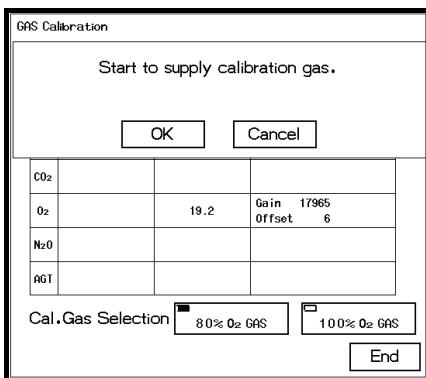
The message, "Adjusting O₂ offset." will be displayed.

To cancel the O₂ calibration, press the **Cancel** key.

⚠ CAUTION

If O₂ offset adjustment is started without opening to air, the message, "Check calibration gas." will be displayed and O₂ offset adjustment will cease.

7 Readjust the O₂ gain.

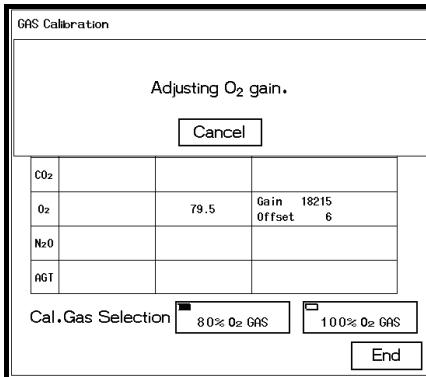


The message, "Start to supply calibration gas." will be displayed.

Connect the sampling line to the water trap.

Supply the calibration gas, and press the **OK** key.

To cancel the O₂ calibration, press the **Cancel** key.



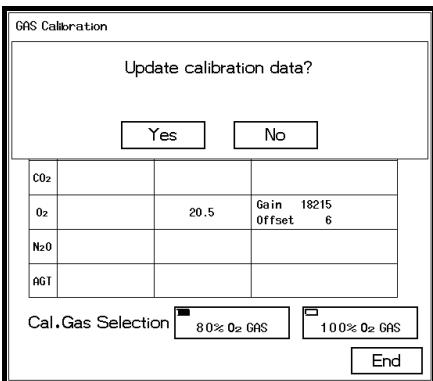
The message, "Adjusting O₂ gain." will be displayed.

To cancel the O₂ calibration, press the **Cancel** key.

⚠ CAUTION

If O₂ offset is adjusted, it is necessary to readjust the O₂ gain.
If O₂ offset adjustment was not necessary, O₂ gain readjusting screen will not be displayed.

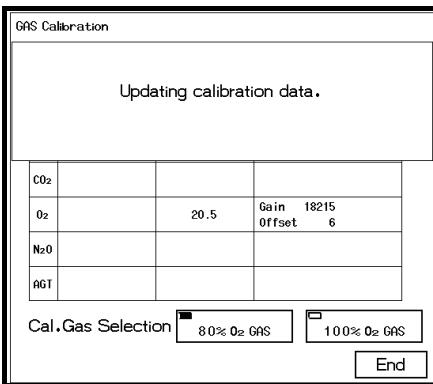
8 Update the O₂ calibration data.



When the O₂ gain adjustment is complete, the message "Update calibration data?" will be displayed.

Stop supplying the calibration gas, and press the **Yes** key.

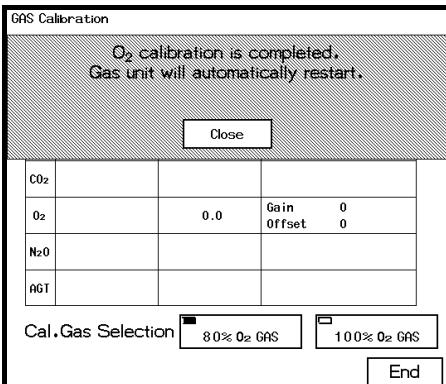
Pressing the **No** key will cancel the O₂ calibration.



The message, "Updating calibration data." will be displayed.

During the updating process, O₂ calibration process cannot be canceled.

9 O₂ calibration process is complete.



When the updating of O₂ calibration data is complete, the message, "O₂ calibration is completed." will be displayed.

Pressing the **OK** key will display the GAS calibration screen.

To Measure the Multigas Concentration (MGU-801P/MGU-802/ MGU-803)

The MGU-801P/MGU-802/MGU-803 is a sidestream type multigas unit which measures concentrations of carbon dioxide, nitrous oxide, halothane, enflurane, isoflurane, sevoflurane, desflurane, and oxygen (MGU-801P only) based on the gas sampled from the endotracheal adapter. The AION™ multigas analyzer technology is used to identify and measure the gases.

The MGU-801P/MGU-802/MGU-803 has an internal barometer and thermistor that allow compensation for changes over a range of temperature and atmospheric pressures.

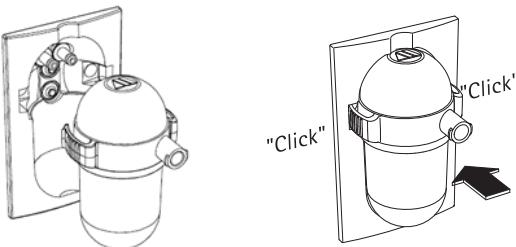
*AION™: Trademark of ARTEMA Medical AB

Precautions for MGU-801P/MGU-802/MGU-803

 WARNING	<ul style="list-style-type: none">● Use only specified gas sampling products manufactured by "ARTEMA Medical AB". Refer to "12. Optional Accessories", for list of specified "ARTEMA Medical AB" DRYLINE™ gas sampling products. These accessories may be purchased from Fukuda Denshi or any authorized "ARTEMA Medical AB" distributor.● Always consider the circumference of the intubation tube when using the airway adapter. If an inappropriate airway adapter is used for a patient with low ventilation, CO₂ may mix in with the inspired air resulting in incorrect measurement, or apnea detection may become difficult.● If the water trap should break or become damaged during operation, there is a risk that bacteria and/or mucus may contaminate the MGU-801P/ MGU-802/MGU-803.● The airway adapter and sampling line are intended for single patient use only, and must not be reused in order to avoid cross infection.● Connection of the MGU-801P/MGU-802/MGU-803 exhaust outlet to the hospital's waste gas scavenging system is strongly recommended to prevent exposure of hospital personnel to the patient's respiratory sample.● MGU-801P/MGU-802/MGU-803 must not be used with flammable anesthetic agents.
 CAUTION	<ul style="list-style-type: none">● The MGU-801P/MGU-802/MGU-803 requires at least 10 minutes of warm up period to perform full accuracy measurement.● If the power supply is interrupted due to reason such as power failure, the MGU-801P/MGU-802/MGU-803 will be initialized and enter into warm-up state even if the power failure is within 30 seconds.● About the auto zeroing<ul style="list-style-type: none">• When the MGU-801P/MGU-802/MGU-803 is connected, auto zeroing will immediately start.• After the warm-up is completed, auto-calibration will perform at 4-hour intervals on stable operation.• Auto zeroing will be performed at shorter intervals during warm up period.• During auto zeroing, measurement data will not be updated.• Auto zeroing does not require calibration gas.● About the storage for MGU-801P/MGU-802/MGU-803<ul style="list-style-type: none">• The accuracy of MGU-801P/MGU-802/MGU-803 may be affected at extreme temperatures. Do not store them at extreme temperature. Temperatures exceeding specified storage temperatures (-10 to 60°C) could damage the units.• After the MGU-801P/MGU-802/MGU-803 is stored in low temperature, when turning on the device, it may require additional warm-up time.
NOTE	The MGU-801P/MGU-802/MGU-803 uses a fixed correction of 11 hPa (i.e. 22 °C @40% RH ambient conditions) to compensate for the influence of water vapor in the gas sample, when converting the gas readings to ATPD. An increase in the ambient H ₂ O partial pressure to 30 hPa (i.e. 28 °C @80% RH or 33 °C @60% RH) will cause a general error for all gases of only -2% REL.

Procedure to Attach the Water Trap

- 1** To install the DRYLINE™ Water Trap, align the lugs with the corresponding holes in the receptacle and push gently into place (See below). Make sure that both barbs on the lugs are fully engaged by pulling the water trap, which should be firmly seated.



- 2** Connect a DRYLINE™ Sampling Line to the gas inlet connector of the water trap. Use either a DRYLINE™ Sampling Line, Adult (color-less Luerlock nuts) or Neonate (blue Luer-lock nuts).

WARNING

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

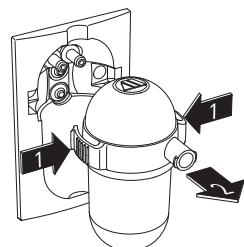
- 3** Make sure there are no kinks or occlusions on the sampling line.
- 4** Connect the other end of the sampling line to the sampling device.
- 5** Replace the sampling device, sampling line, and the water trap if they become blocked.

3

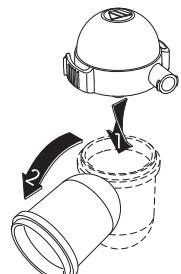
To Measure the Multigas Concentration (MGU-801P/MGU-802/MGU-803)

Procedure to Empty/Replace the Water Trap

- 1** Empty the water trap container when it is half full.
- 2** To remove the water trap from its receptacle, press the lugs on the sides of the trap and pull out.



- 3** Twist the container relative to the filter housing and then empty the container.



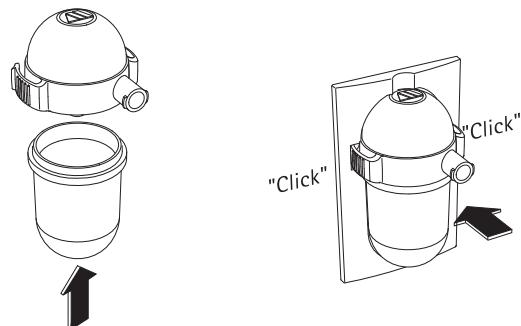
WARNING

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



For cleaning the water trap, refer to "10. Maintenance Cleaning Cleaning the DRYLINE™ Water Trap (MGU-801P/MGU-802/MGU-803)".

- 4** Re-install the water trap.

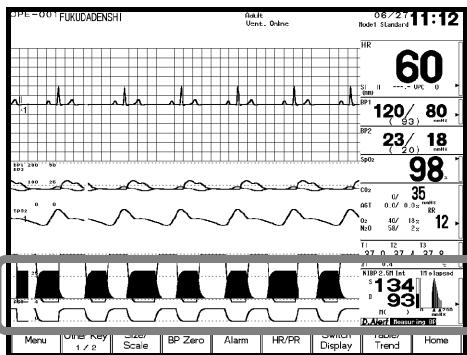


- 5** Replace the complete water trap every month or when the "Replace Water Trap" message appears on the patient monitor screen.

Patient Application and Monitor Display

3

- 1 For intubated patient, attach the airway adapter to respiration circuit.
- 2 Remove the protective cap on the airway adapter, and connect to the sampling line. Connect the other end of the sampling line to the sampling gas inlet on the MGU-801P/802/803. Verify that all the tubes are properly connected.
- 3 Start the CO₂ measurement.



Press the **Home** key.

Verify that the CO₂ waveform and multigas numeric data are displayed on the monitor.

Stable measurement can be achieved after about 10 minutes from power ON.



WARNING The sampling line may get clogged by internal condensation.



- In an environment where there is alcohol vapor, some errors may be observed in the measurement.
- Contamination with CO₂, N₂O or Anesthetic Agent in the air surrounding the MGU-801P/MGU-802/MGU-803 may cause significant measurement errors.

Gas Measurement Accuracy Check Procedure

To Measure the Multigas Concentration (MGU-801P/MGU-802/MGU-803)

The gas measurement accuracy of the MGU-801/MGU-802/MGU-803 should be checked every year. The date of the last measurement check will be displayed on the GAS Calibration screen.

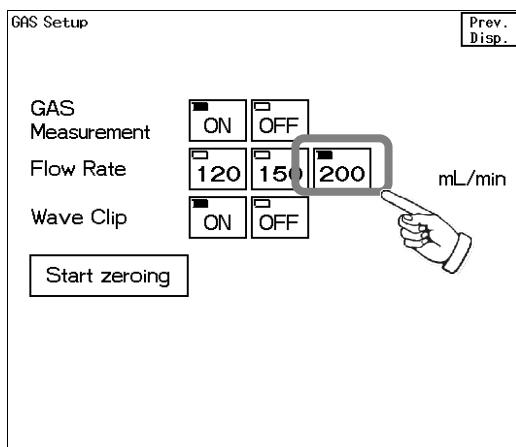


- While the MGU-801P/802/803 is in the process of warming up, the date of the last measurement check cannot be updated. Perform the update after the warming up process is completed.
- If the gas measurement accuracy check is performed using a low pressure gas, the accuracy of the gas measurement will be reduced. Make sure to check the gas measurement accuracy using the specified calibration gas before its expiration date.

Equipment

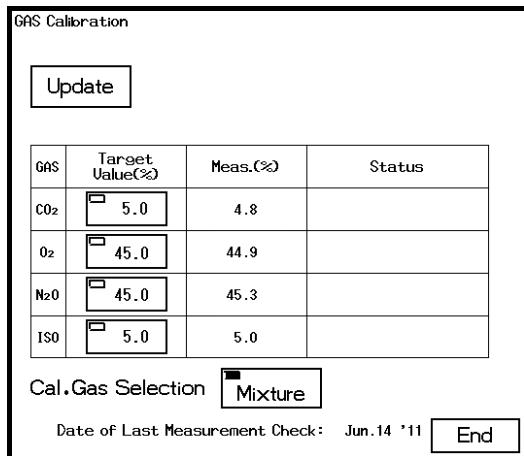
- Calibration gases
- T-piece with tubing
- A flow meter for 200mL/min, e.g. a rotameter

1 Set up the Flow Rate as “200mL/min”.



Press the **Menu** → **Parameter** → **CO₂** → **GAS Setup** to display GAS Setup screen and then select **200** mL/min.

2 Press the **Menu → **Maintenance** → **GAS Calibration** keys to display the GAS Calibration screen.**



3 Connect the calibration gas cylinder to multigas unit.

4 Supply the calibration gas, and wait for 30 seconds until the gas measurement value becomes stable.

5 Check the measurement accuracy of each gas.

The measurement accuracy depends on the used calibration gas.

Verify the measurement accuracy of the used calibration gas, taking in consideration the measurement accuracy, the concentration and the interference from other gases written in “11. Technical Information / Performance”, and also the error of the calibration gas itself.

- 6 When the measurement accuracy of each gas is within the acceptance criteria, press the **Update** key.**

The screenshot shows the "GAS Calibration" menu. At the top, there is a button labeled "Update" and a message "Date of last measurement check updated". Below this is a table with four rows, each representing a gas: CO₂, O₂, N₂O, and ISO. The table has four columns: "GAS", "Target Value(%)", "Meas.(%)", and "Status". For CO₂, the target value is 5.0 and the measurement is 4.8. For O₂, the target value is 45.0 and the measurement is 44.9. For N₂O, the target value is 45.0 and the measurement is 45.3. For ISO, the target value is 5.0 and the measurement is 5.0. At the bottom of the screen, there is a "Cal.Gas Selection" field set to "Mixture" and a "Date of Last Measurement Check:" field showing "Jun.14 '11". There is also an "End" button.

GAS	Target Value(%)	Meas.(%)	Status
CO ₂	5.0	4.8	
O ₂	45.0	44.9	
N ₂ O	45.0	45.3	
ISO	5.0	5.0	

The "Date of last measurement check updated" message will be displayed.

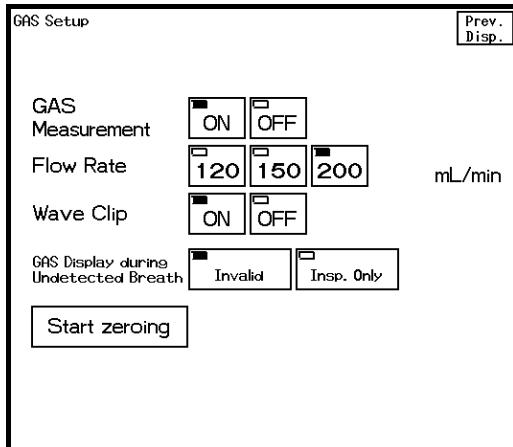
Verify that the date under "Date of Last Measurement Check" was updated.

- 7 Return the Flow Rate setting to the previous one.**

Manual Zero Calibration Procedure

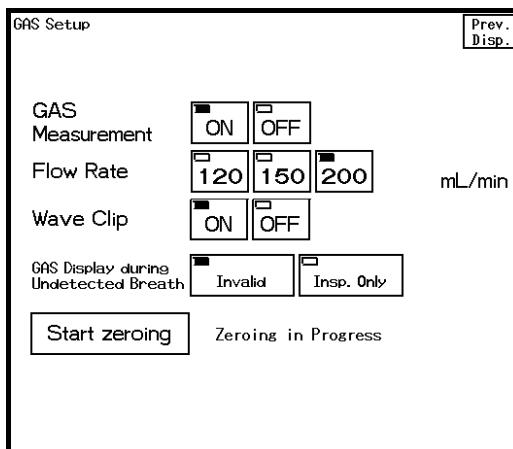
On the patient monitor, a zero calibration for the multigas measurement is periodically performed. However, it is possible to perform a zero calibration when necessary.

- 1 Press the **Menu** → **Parameter** → **CO₂** → **GAS Setup** keys.

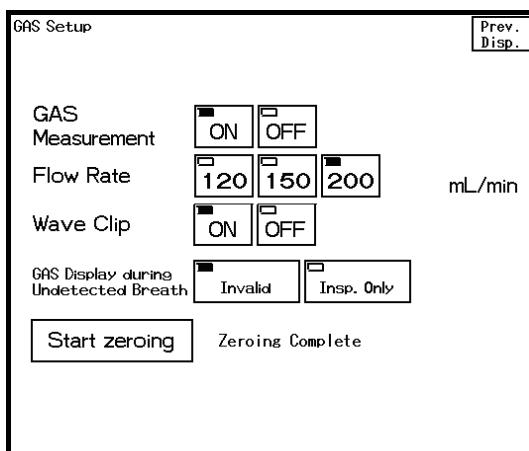


The "GAS Setup" screen will appear.

- 2 Press the **Start zeroing** key.



The "Zeroing in Progress" message will appear.



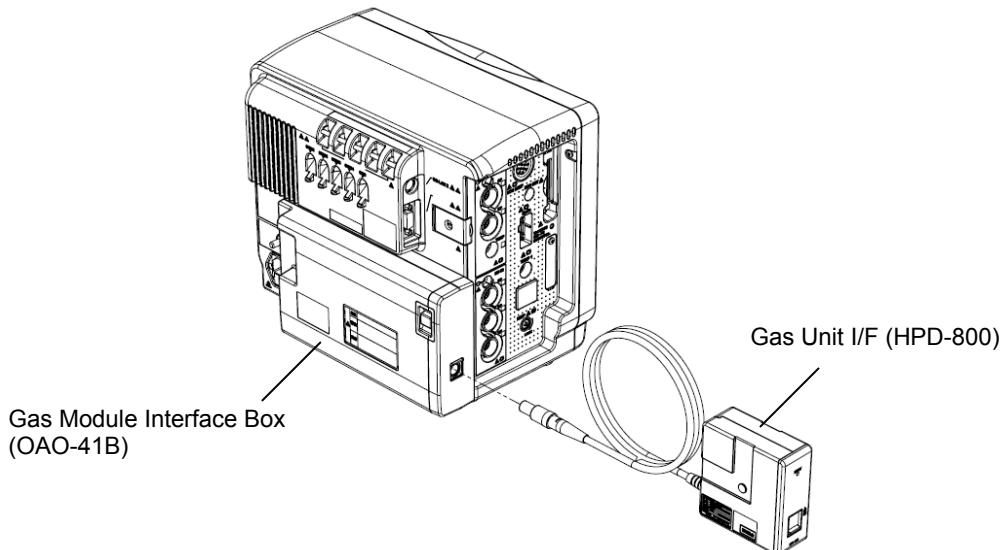
The "Zeroing Complete" message will appear.

To Measure the Multigas Concentration (HPD-800: Capnostat5)

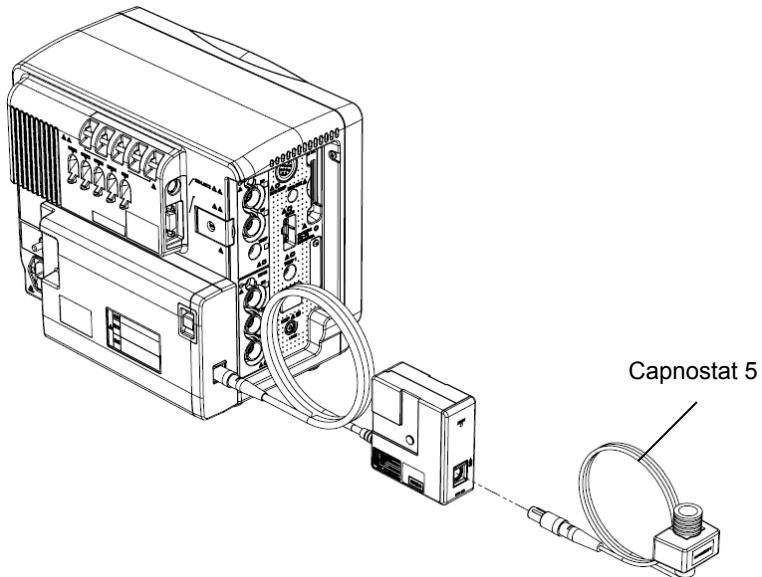
This section describes the procedure to measure the multigas concentration by using the optional gas unit interface, HPD-800 and connecting the RESPIRONICS® Capnostat 5 (Mainstream method).

Patient Application and Display

- 1 Attach the Gas Module Interface Box (OAO-41B) to the DS-7000 main unit, and connect the Gas Unit I/F (HPD-800) to the OAO-41B.



- 2 Connect the CO₂ sensor (Capnostat 5) to the CO₂ input connector.



CO₂ sensor will automatically begin warming up.

The sensor requires a warming up process to achieve stable operating temperature. This process is performed automatically in any of the following situation:

- When the power of the monitor is turned on.
- When the CO₂ sensor is plugged into the monitor.

During the warm up period, the message "CO₂ warm up" will be displayed on the monitor. Warm up process will require 2 minutes or more.

When the warm up completes, the message will disappear.

3

To Measure the Multigas Concentration (HPD-800: Capnostat 5)

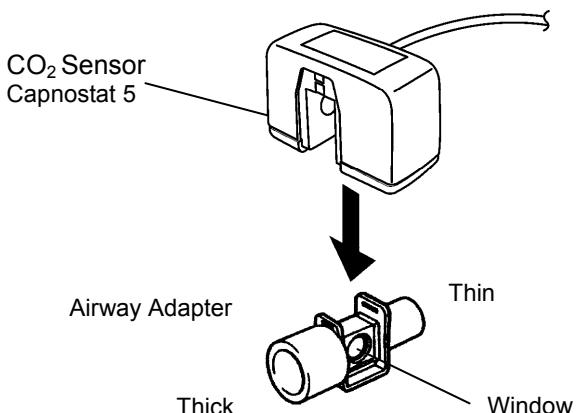
3 Prepare an airway adapter suitable for the patient.

There are 4 types of airway adapters. Select the appropriate adapter from "12. Accessories" according to the used endo-tracheal tube size.

⚠ WARNING	<ul style="list-style-type: none">● Use only specified airway adapter manufactured by "Respironics Novametrix, LLC". Refer to "12. Optional Accessories", for list of specified "Respironics Novametrix, LLC" airway adapters. These accessories may be purchased from Fukuda Denshi or any authorized "Respironics Novametrix, LLC" distributor.● Always consider the circumference of the intubation tube when using the airway adapter. If inappropriate airway adapter is used for a patient with low ventilation, CO₂ may mix in to the inspired air resulting in incorrect measurement, or apnea detection may become difficult.
⚠ CAUTION	<ul style="list-style-type: none">● The disposable airway adapter should be opened just before use. Do not sterilize it.● Do not reuse the disposable airway adapter.

4 Verify that the warm up is complete, and attach the CO₂ sensor to the airway adapter until a "click" sound is heard.

⚠ CAUTION	The airway adapter should be attached with the thicker side facing to the patient. If attached oppositely, it may damage the CO ₂ sensor or airway adapter.
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5 Input the following data.

- **O₂ Compensation**

Input the oxygen concentration value to be applied to the patient.

- **N₂O Compensation**

Select ON if N₂O is supplied to the patient.

Select OFF if not supplied.

- **Anesthetic Gas Compensation**

Input the anesthetic gas concentration value if supplied.

If not supplied, input "0 (zero)".

- **Atmospheric Pressure**

Input the current atmospheric pressure.

NOTE

Set these items each time the condition changes.



For details of setup procedure, refer to "6. Parameter Setup Multigas Data (MGU-701/702/Poet IQ, MGU-801P/802/803, HPD-800) Gas Setup (HPD-800: Capnostat5)"

6 Calibrate the airway adapter.

The airway adapter calibration must be performed before connecting to the respiration circuit. Calibration must be also performed for the following case.

- When the airway adapter is replaced

- When "CO₂ cal required" or "Check CO₂ Adapter" message is displayed on the monitor

Use a clean airway adapter.

When reusing, wash the adapter, wipe the window with a swab after air dry, and sterilize (EOG, etc.) before use.

NOTE

During the calibration, the measurement data will be displayed as "— —".

The measurement data during calibration may be included in the trend data causing discontinuity.

7 Press the **Menu** → **Parameter** → **CO₂** keys and display the CO₂ menu.

Press the **Cal. Airway Adpt key to start the calibration.**

The calibration process will start.

During calibration, "Zeroing CO₂" message will be displayed.

Upon completion of calibration, a tone will be generated and "Cal complete" message will be displayed.

If the calibration fails, an error tone will be generated and "Cal error" message will be displayed.

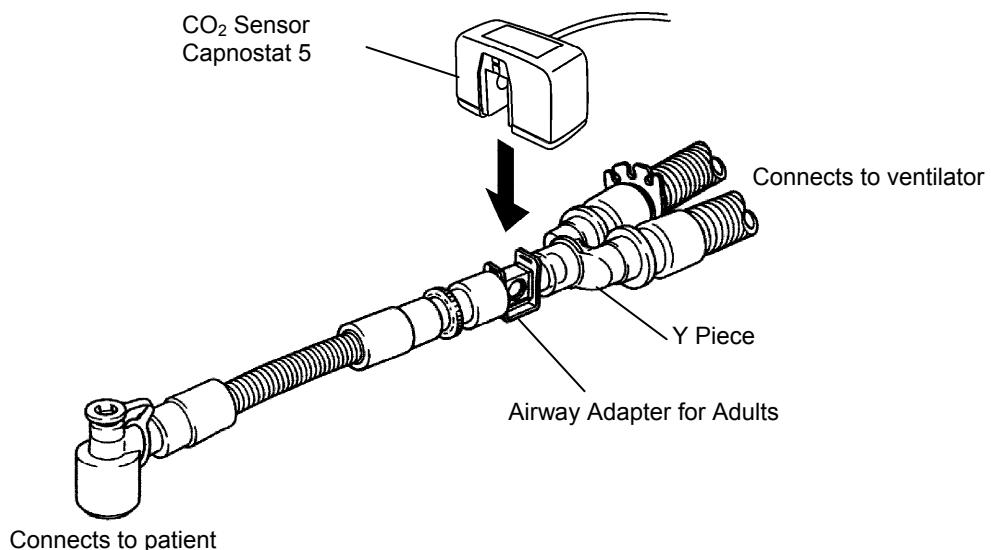
In such case, start the calibration process again.

NOTE

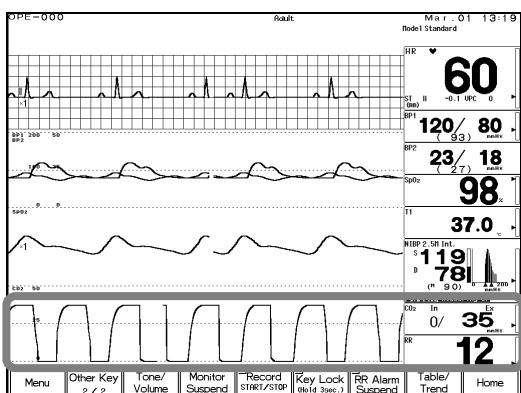
- Calibration cannot be performed if respiration is detected within 20 seconds before calibration. In such case, wait for next 20 seconds and perform calibration again.
- The airway adapter should be attached to the sensor when performing calibration.

8 Verify that the airway adapter calibration is properly completed, and attach the airway adapter to the patient's respiration circuit. Then, attach the CO₂ sensor to the airway adapter.

Attach the airway adapter between the patient's circuit wye and intubation tube. The CO₂ sensor should be facing upward.



9 Verify that the CO₂ waveform, EtCO₂ value, InspCO₂ value are displayed.



Adjust the scale, set the measurement unit, alarm, etc. as necessary.

To Measure the Temperature

- 1 Select the appropriate probe for the patient.

Probe Type

Reusable Type



Rectal Probe (adult) 401



Rectal Probe (pediatric) 402



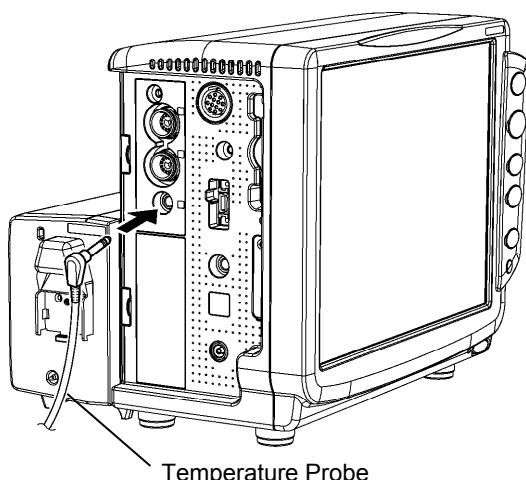
Body Surface Probe 409B

* 400 series general purpose temperature probe, manufactured by Measurement Specialties, Inc.

NOTE

For the DS-7000 system, the 700 series temperature probe (Measurement Specialties, Inc) cannot be used.

- 2 Connect the probe to the Option Unit (HU-71 or HU-73) which is attached to the DS-7000.

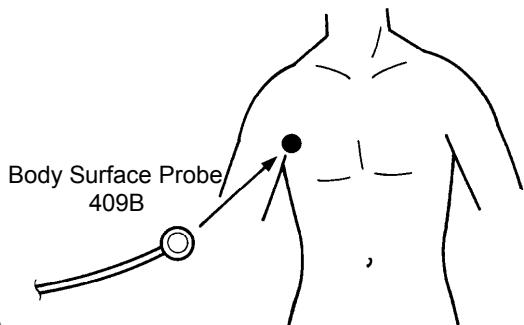


3

To Measure the Temperature

3 Attach the probe to the patient.

●Body Surface

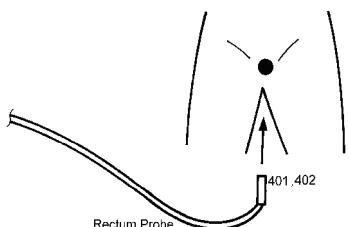


Attach the probe to the body surface, and secure with surgical tape.

NOTE

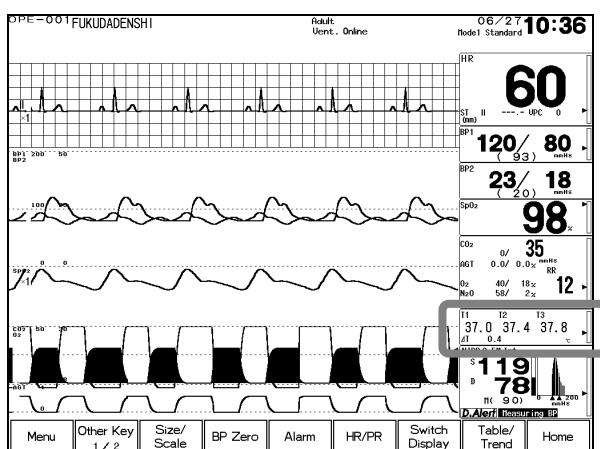
The probe location shown above is an example. Adjust the probe location according to the patient's condition.

●Rectum



- (1) Clean/Disinfect/Sterilize the probe according to the guidelines provided with the probe product.
- (2) Insert the probe into the rectum about 3 to 7cm deep.
- (3) Secure the probe to the inner thigh with surgical tape.

4 Check that the temperature is displayed.



Check that the temperature measurement is displayed on the home display.

To Measure the Cardiac Output

The CO measurement can be performed using the HU-73 Option Unit.



Refer to "7. Function –CO Measurement—" for procedure to measure and edit the CO data.

Connecting to the Option Unit

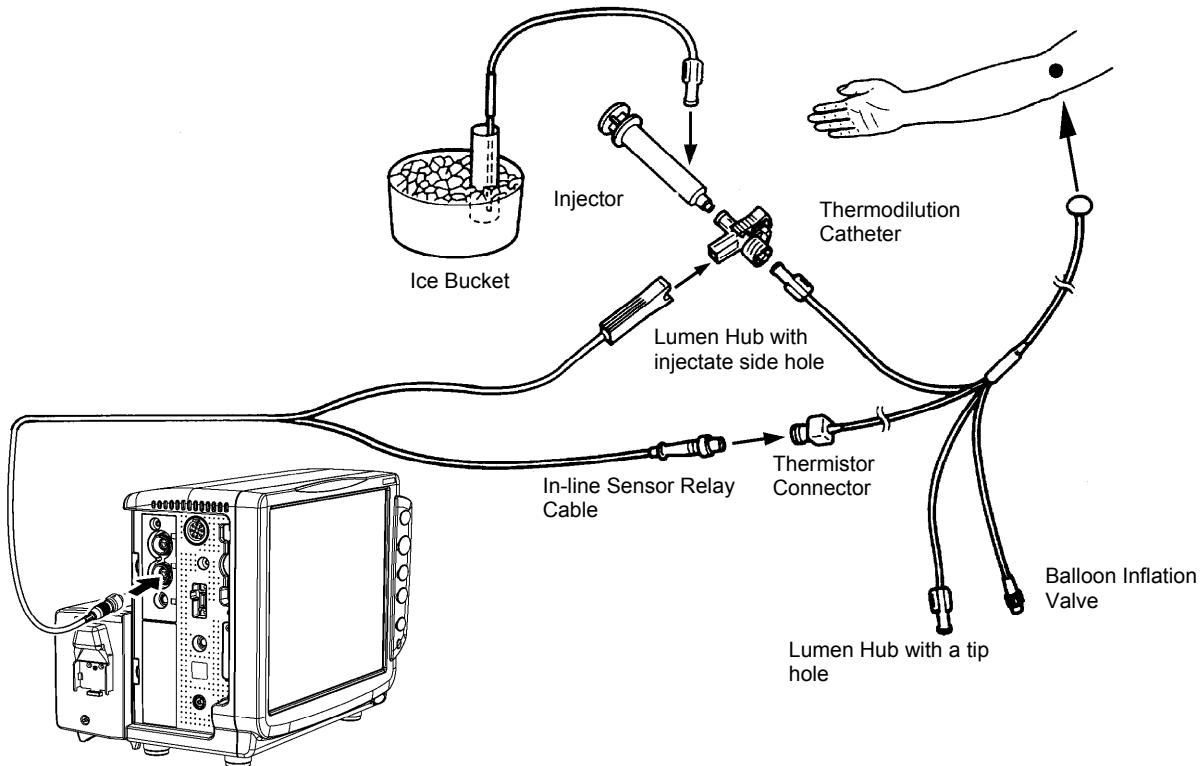
1 Select the catheter relay cable.

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

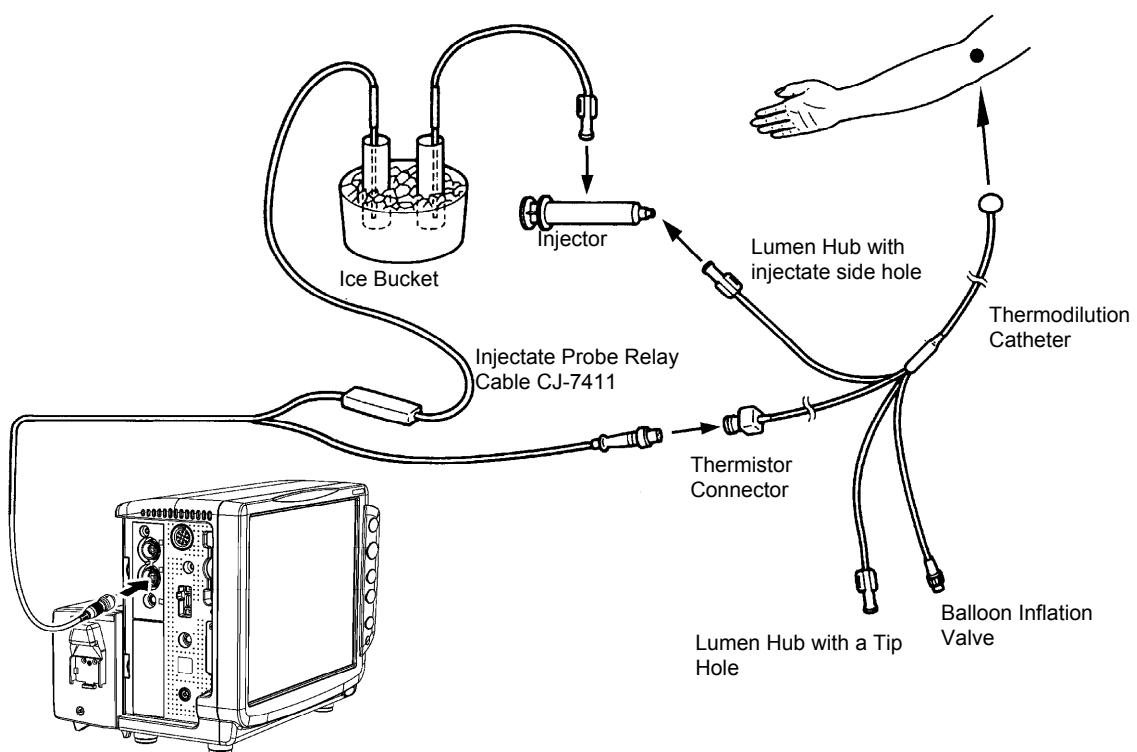
Measurement Method	Catheter Relay Cable
0°C/24°C Temperature	CJ-382
Flow-through Sensor	CJ-413
In-line Sensor	CJ-412
Injectate Temperature Probe	CJ-411

2 Connect the catheter to the catheter relay cable.

【Example of In-line System】



[Example of Injectate Probe]



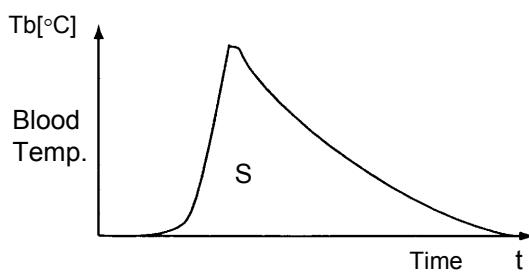
Cardiac Output Measurement Algorithm

Cardiac output is measured using the thermodilution method.

Thermodilution Method

The thermodilution catheter is inserted from the vein through the right atrium, right ventricle, to the pulmonary artery. From the side hole near the catheter tip, injectate is injected quickly to the right atrium. At this time, the heart contraction and heat diffusion mixes the injectate with blood, and causes blood temperature fall.

Variable initiated by these effects are measured as time function at the pulmonary artery, and the following thermodilution curve can be drawn. Cardiac output is calculated by applying this to the Stewart-Hamilton formula shown below.



$$CO = 60 \cdot Vi \cdot \frac{Si \cdot Ci}{Sb \cdot Cb} \cdot \frac{Ct(Tb - Ti)}{S} = CC \cdot \frac{Tb - Ti}{S}$$

CO : Cardiac Output [L/min]

Vi : Injectate Volume [L]

Tb : Blood Temperature [°C]

Ti : Injectate Temperature [°C]

Ct : Correction coefficient for injectate temperature rise inside catheter

60 : seconds

S : Area of thermodilution curve $\int_0^{\infty} \Delta Tb(t) dt$ [°C · sec]

$\Delta Tb(t)$: Temperature change of Tb after "t" seconds. [°C]

CC : Catheter Constant (Computation Constant: CC value)

Si : Specific Gravity of Injectate [g/cm³]

Sb : Specific Gravity of Blood [g/cm³]

Ci : Specific Heat of Injectate [cal/(g · °C)]

Cb : Specific Heat of Blood [cal/(g · °C)]

As shown above, cardiac output is directly proportional to the Injectate Volume (Vi) and the difference between Blood Temperature (Tb) and Injectate Temperature (Tb—Ti), and is inversely proportional to the area of the thermodilution curve (S).

Hematocrit Value

Hematocrit value of 45% ($Si \cdot Ci)/(Sb \cdot Cb)$ = 1.08) is programmed for this device.

NOTE

If the hematocrit value is different, an error may be caused in cardiac output measurement.

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