



## REVISION HISTORY

Revision No.	Date	Contents	Page
1.21	2016-08-17	1. BA-oriented manual production	All
		-	
1.35	2022-07-26	1. Added NTP warnings	74p
1.36	2023-07-04	1. New logo change 2. Translation reflection 3. Delete label	All All 26p

**CAUTION**

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

※ In the event of a malfunction or failure, contact Service Dept. Of Bionet Co., Ltd. along with the model name, serial number, date of purchase and explanation of failure.

## Paid Services

**A fee will be charged for all services except for breakdowns, so be sure to read this operation manual below before putting in a request.**

<ul style="list-style-type: none"> <li>- Usage description and simple inspection without disassembly</li> <li>- In case of reinstallation due to poor installation by a distributor</li> </ul>	<p style="text-align: center;">Free the 1<sup>st</sup> time Charged starting the 2nd time</p>
<ul style="list-style-type: none"> <li>- Inadequate installation or loosening due to physical product movement, relocation, etc.</li> <li>- When re-installing after the first installation requested by the customer at the time of purchase</li> <li>- When reinstallation is required due to inexperienced installation by the customer</li> <li>- When a service is requested due to the input of foreign substances or improper cleaning</li> </ul>	<p style="text-align: center;">Charged starting the 1<sup>st</sup> time</p>

### **1. Equipment cleaning, adjustment, and usage description are not product breakdowns.**

(Unfeasible repairs are subject to separate standards.)

### **2. Breakdowns caused by consumer negligence**

Breakdowns and damage due to careless handling by the customer or incorrect repair are caused by:

- Using incompatible electric capacity.
- Mishaps such as dropping the product.
- Using the third party replacements or options not specified by our company.
- Non-ECONET technicians or agency technicians in the process of repair.

### **3. Other cases**

- Breakdowns by natural disasters (fire, salt damage, flood damage, earthquake, etc.)
- When a consumable part has reached the end of its life (accessories)

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## Warnings, Cautions, and Notes

- The following terms are used throughout this manual to emphasize important and critical information. You must read these statements to help ensure safety and to prevent product damage.
- The manufacturer or the product distributor is not liable for any loss or damage to the product caused by incorrect use or negligence in product maintenance.

WARNING
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<b>WARNING</b> Failure to follow this message may cause severe injuries, casualty or physical damage to patients.
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CAUTION
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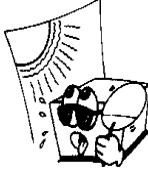
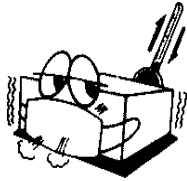
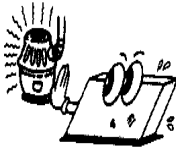
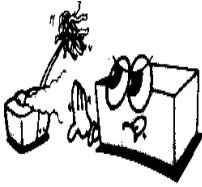
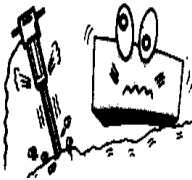
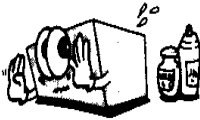
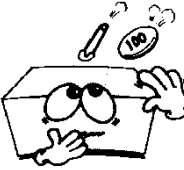
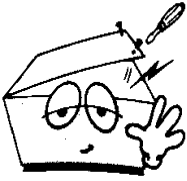

<b>CAUTION</b> Failure to follow this message may cause in non-life-threatening injury or damage to the equipment.
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NOTE
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<b>NOTE</b> indicates some important information and tips, which are not dangerous, about installation, operations and maintenance.
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## General Precautions on Environment

DO NOT store or operate the equipment in the places listed below.

	<p>A place exposed to moisture (DO NOT touch the equipment with wet hands.)</p>		<p>A place under direct sunlight</p>
	<p>A place in areas with highly fluctuating temperatures.</p>		<p>A place in the vicinity of Electric heater</p>
	<p>A place with excessive humidity rise or poor ventilation</p>		<p>A place with sources that cause excessive shock or vibration</p>
	<p>A place exposed to chemicals or at risk of gas leakage</p>		<p>Avoid the invasion of small objects/ particles such as dust, and especially avoid metallic material.</p>
	<p>DO NOT disjoint or disassemble the equipment. (Bionet is not liable for broken products caused by attempted disassembly.)</p>		<p>DO NOT connect power until the product is completely installed. It may cause damage to the product.</p>

## Safety Instructions for Electricity

**Please note the following precautions before using the product.**

- Is the power supply cord proper? (100 - 240V AC)
- Is every cord connected properly to the product?
- Is the product fully grounded? (Otherwise, noise may occur.)
- There is a risk of electric shock if the Rest stand of the equipment is damaged or not be fixed to the equipment body. Do not use the product and immediately ask the manufacturer or seller for repairs.

### Classification

- This equipment is classified in accordance with IEC 60601-1 as follows.
- Class I protection against electric shock and Type CF defibrillation-proof
- Compatibility Requirements standard:- Parts
- Degree of protection against harmful ingress of water: Ordinary
- DO NOT use this product near flammable anesthetic or solvents.
- Continuous operation
- IEC/EN 60601-1-2 (Electromagnetic Compatibility Requirements) standard:

Type	Description
Class A	The equipment or system is suitable for use in all establishments. It requires a higher amount of power than the public low-voltage power supplied to typical residential buildings. Mains power should be typical commercial or hospital environment.

#### NOTE

Diagnosis provided by Cardio7 must be confirmed by a qualified medical professional.

#### NOTE

The EMISSIONS characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment.

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## Safety Messages

The following messages are applied throughout the product. Certain statements may also appear elsewhere in the manual.

**WARNING:**

ACCIDENTAL SPILLS — If the equipment is penetrated with liquid, take it out of service and have it checked by a service technician before using it again.

DO NOT allow liquids to enter the equipment to prevent electric shock or equipment malfunction.

**WARNING:**

BATTERY OPERATION - If the integrity of the electrical grounding is doubtful, use battery to operate the equipment.

**WARNING:**

CABLES — To avoid possible strangulation, route all cables away from the patient's throat.

**WARNING:**

CONNECTION TO MAINS — This is class I equipment.

Connect the mains power plug to an appropriate power supply.

**WARNING:**

DEFIBRILLATOR PRECAUTIONS - Avoid physical contact with the patient during defibrillation, as it may cause serious injury or death.

Patient signal inputs labeled with the CF symbols with paddles are protected against damage resulting from defibrillation voltages.

The defibrillator paddles in relation to the electrodes should be placed properly to assure successful defibrillation.

Use only recommended cables and leads to ensure adequate defibrillation protection.

**WARNING:**

ELECTRODES - Polarized electrodes (stainless steel or silver constructed) may cause the electrodes to retain a residual charge after defibrillation. Residual charge blocks ECG signal acquisition.

Use non-polarized electrodes (silver or silver chloride construction) for ECG monitoring with each defibrillation.

**WARNING:**

MAGNETIC AND ELECTRICAL INTERFERENCE - Magnetic and electric fields may interfere with the proper operation of the equipment.

Therefore, make sure that all external devices operated in the vicinity of the equipment comply with the relevant EMC requirements.

X-ray equipment or MRI devices are possible sources of interference as they may emit higher levels of electromagnetic radiation.

**WARNING:**

Use of this equipment adjacent to or stacked with other devices should be avoided because it could result in improper operation. If such use is unavoidable, this equipment and other devices should be observed to verify that they are operating normally.

**WARNING:**

EXPLOSION HAZARD - Do not use this equipment in the presence of anesthetics vapors or liquids.

**WARNING:**

INTERPRETATION HAZARD — Computerized interpretation is only significant when used in conjunction with clinical findings.

All computer-generated diagnostics are subject to be verified by a qualified physician.

**WARNING:**

OPERATOR — Medical technical equipment such as this system must be used only by qualified and trained personnel.

**WARNING:**

SHOCK HAZARD - Improper use of this equipment may cause electric shock.

Strictly observe the following guidelines.

Failure to do so may endanger the lives of the patient, user, and bystanders.

To disconnect the equipment from the power line, first remove the power plug from the wall outlet before disconnecting the cables from the equipment; Otherwise, there is a risk that metal parts inadvertently inserted into the power cord socket will come into contact with line voltage.

Additional devices connected to medical electrical equipment shall comply with the respective IEC or ISO standards (e.g., IEC 60950 for data processing equipment).

Additionally, all configurations must comply with the requirements for medical electrical system. (See IEC 60601-1-1 or Clause 16 of IEC 60601-1)

Anyone who connects additional devices to medical electrical equipment is in the position of configuring medical system, and is responsible for complying with the requirements of medical electrical system.

Keep in mind that local legislation takes precedence over the above-mentioned requirements.

If in doubt, consult your local distributor or the technical service department.

**WARNING:**

SITE REQUIREMENTS - Improper placement of equipment and/or accessories may result in a hazard to the patient, operator, or bystanders.

DO NOT route cables in a way that they may present a stumbling hazard.

To ensure safety, all connectors on patient cables and lead-wires are designed to prevent inadvertent disconnection, should someone pull on them.

For equipment installed above the patient, take appropriate measures to prevent them from dropping on the patient.

**WARNING:**

TREADMILLS — Avoid rapid changes in treadmill speed and/or grade during a stress test.

**WARNING:**

Use of accessories, transducers and cables other than those specified or provided by the manufacturer of this equipment may increase electromagnetic emission or reduce electromagnetic susceptibility, causing it to malfunction.

**WARNING:**

Portable RF communications equipment - including antenna cables and peripherals such as external antennas - should be used no closer than 30cm (12 inches) to any part of the [ME EQUIPMENT or ME SYSTEM], including the cables specified by the manufacturer.

**CAUTION:**

PROPER LEAD-WIRE CONNECTION — Improper connection will cause inaccuracies in the ECG. Trace each individual lead-wire from the acquisition module label to the color-coded connector, then to the appropriate electrode to ensure that it is matched to the correct label location.

**CAUTION:**

ACCESSORIES (SUPPLIES) - The parts and accessories used must comply with the requirements of the relevant IEC 60601 series safety standards and essential performance standards, and/or the system configuration must meet the requirements of the IEC 60601-1-1 medical electrical system standards.

**CAUTION:**

ACCESSORIES (EQUIPMENT) - The use of accessory equipment that does not comply with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system.

Considerations related to the choice of equipment shall include:

- Use of the accessory in the patient vicinity, and Evidence that the safety certification of the accessory has been performed in accordance with the appropriate IEC 60601-1 and/or IEC 60601-1-1 harmonized national standard.

**CAUTION:**

**BATTERY POWER** — If a device equipped with an optional battery pack will not be used or connected to the power line for a period of over six months, remove the battery.

**CAUTION:**

**BEFORE INSTALLATION** — Compatibility is critical to safe and effective use of this equipment. Please contact your local sales or service representative prior to installation to verify equipment compatibility.

**CAUTION:**

**DISPOSABLES** — Disposable devices are intended for single use only.

They should not be reused as performance may degrade or contamination could occur.

**CAUTION:**

**DISPOSAL** — At the end of its service life, the product described in this manual, as well as its accessories, must be disposed of in compliance with local, state, or federal guidelines regulating the disposal of such products. If you have questions concerning the disposal of the product, please contact ECONET or its distributor.

**CAUTION:**

**EQUIPMENT DAMAGE** — Equipment intended for emergency application must not be exposed to low temperatures during storage and transport to avoid moisture condensation at the application site. Wait until all moisture has vaporized before using the equipment.

**CAUTION:**

**ELECTRIC SHOCK** — To reduce the risk of electric shock, do not remove cover or back of the equipment. Refer servicing to qualified personnel.

**CAUTION:**

**OPERATOR** — Medical technical equipment such as this electrocardiograph system must only be used by persons who have received adequate training in the use of such equipment and who are capable of applying it properly.

**CAUTION:**

**POWER REQUIREMENTS** — Before connecting the equipment to the power line, check that the voltage and frequency ratings of the power line are the same as those indicated on the label of the equipment. If this is not the case, do not connect the system to the power line until you adjust the equipment to match the power source.

In the USA, if the installation of this equipment will use 240V instead of 120V, the source must be center tapped, 240V single-phase circuit.

This equipment is suitable for connection to public mains as defined in CISPR 11.

Equipment connected to the ECG system and to the patient's environment must be powered from a medically isolated power source or must be a medically isolated

equipment. Equipment powered from a non-isolated source can result in chassis leakage currents exceeding safe levels. Chassis leakage current generated by the accessories or equipment connected to a non-isolated outlet may be added to the chassis leakage current of the ECG system.

**CAUTION:**








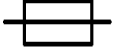



SERVICEABLE PARTS — This equipment contains no user serviceable parts.

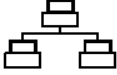






Refer servicing to qualified service personnel.

**CAUTION:**

SUPERVISED USE — This equipment is intended for use under the direct supervision of a licensed health care practitioner.

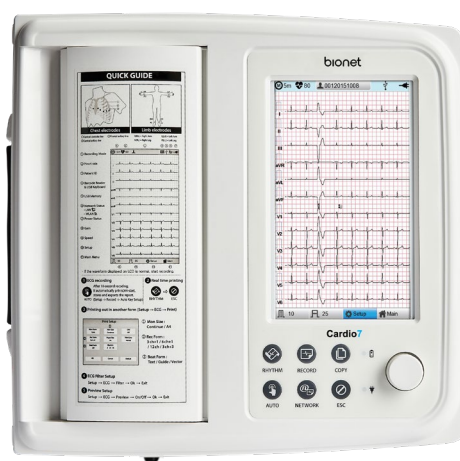
## Safety Symbols

Symbols	Description
	Attention: Consult accompanying documents.
	Consult Instructions for Use: This symbol advises the reader to consult the operating instructions for information needed for the proper use of the equipment.
	Safety Sign: It indicates that you should read the user manual. Read the user manual before starting work or operating the equipment.
	General Prohibition Sign
	Defibrillation Proof-Type CF APPLIED PART
	Type B APPLIED PART
	AC Power
	Fuse
	Conductor provides a connection between equipment and the potential equalization bus bar of the electrical installation
	ECG Patient Cable Connector
	USB Connector

Symbols	Contents
	Local Area Network (LAN) connector
	Power Off
	Power On
	Battery Operation Indicator
	AC Power Connection Indicator
	Manufacturer
	Waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.

# Chapter 1. General Information

## 1) Product Overview



Cardio7 is a 12-channel ECG (Electrocardiogram) recording equipment that measures and records the patient's ECG. It not only provides parameters necessary for diagnosis, patient's ECG record and automatic diagnosis, but also increases chart management efficiency by providing ECG records and printing reports when patient or user information is entered. At the same time, it can transmit the saved data to a network-connected PC for file management. Its user-oriented design enables ECG examination with a single push of a button. It saves, transfers and prints the data that has been acquired by automatic diagnosis. In addition, the battery pack, which can be stored inside as an optional component, ensures high portability and makes it possible to inspect or use the equipment in an emergency.

## 2) Indication for use

The Cardio7 ECG Analysis System is intended to acquire, analyze, display and record electrocardiographic information from adult and pediatric populations.

Basic systems deliver 12 lead ECG's, interpretive analysis, vector loops, and can be upgraded to provide software analysis options such as high-resolution signal averaging of QRS and P wave portions of the electrocardiogram. Transmission and reception of ECG data to and from a central ECG cardiovascular information system is optional.

The Cardio7 is intended to be used under the direct supervision of a licensed healthcare practitioner, by trained operators in a hospital or medical professional's facility.

## 2-1) Indications

The ECG has proven to be among the most useful diagnostic tests in clinical medicine. It is now routine in the evaluation of patients with implanted defibrillators and pacemakers, as well as to detect myocardial injury, ischemia and the presence of prior infarction as well. In addition to its usefulness in ischemic coronary disease, the ECG is of particular use in the diagnosis of disorders of the cardiac rhythm and the evaluation of syncope.

The equipment is commonly used to detect and diagnose pulmonary diseases, such as: Asthma, Cystic fibrosis, Pulmonary fibrosis.

## 2-2) Contraindications

There are no absolute contraindications to performing an ECG other than the patient's refusal. Some patients may be allergic or, more commonly, sensitive to the adhesive used to attach the electrodes. In this case, use hypoallergenic alternatives available from various manufacturers.

## 3) Recording ECGs During Defibrillation

This equipment is protected against the effects of cardiac defibrillator discharge to ensure recovery, as required by test standards. The patient signal input of the acquisition module is defibrillation-proof, therefore, it is not necessary to remove the ECG electrodes prior to defibrillation.

When using stainless steel or silver electrodes a defibrillator discharge current may cause the electrodes to retain a residual charge causing a polarization or DC offset voltage.

This electrode polarization will block the acquisition of the ECG signal. To avoid this condition, use non-polarized electrodes, which will not form a DC offset voltage when subjected to a DC current, such as silver/silver-chloride types if there is a situation where there is a likelihood that a defibrillation procedure will be necessary.

If using polarized electrodes, disconnect the lead-wires from the patient before the shock is delivered. Electrode defibrillation recovery is the ability of the electrode to allow the ECG trace to return after defibrillation. It is recommended to use non-polarized disposable electrodes with a Defibrillation Recovery class as specified in AAMI EC12 4.2.2.4. AAMI EC12 requires that the polarization potential of an electrode pair does not exceed 100mV, 5 seconds after a defibrillation discharge.

## 4) Product Characteristics

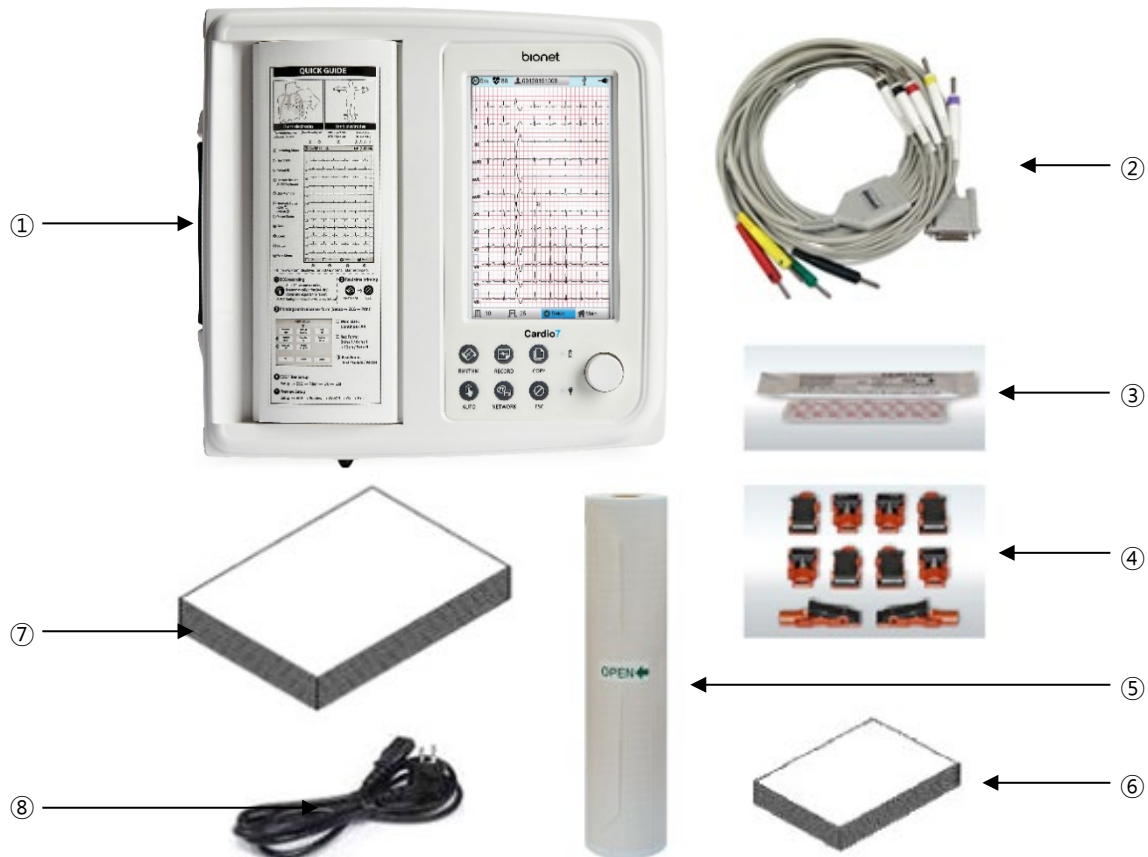
- This equipment configures the 12-channel ECG waveforms in various configurations, such as 3ch+1 rhythm, 3ch+3 rhythms, 6ch+1 rhythm, and 12 channels, and prints them on A4 or Letter size paper.

- The rhythm of 1 channel acquired for a certain period of time (1 minutes, 5 minutes, 10 minutes) is printed on A4 or Letter size paper.
- The 12 channel rhythms are continuously printed simultaneously in real time.
- The heart rate, PR interval, RR interval, QRS interval, QT interval, QTc interval, P-R-T axis, and SV1/RV1/R+S size required for diagnosis are automatically calculated and provided on the report along with the ECG.
- Automatic ECG diagnostic results for pediatrics and adults are provided.
- Once an ECG is saved, you can change its filter settings, gain, print speed, channel configuration and rhythm settings, and print it out, which is helpful for diagnosis.
- Battery can be internally equipped as an optional component, facilitating convenient carry and use.
- Manage chart effectively by addition of patient and operator data on EKG printout.
- You can store up to 200 patient data, and transfer the stored data to another PC over the network, or save them in a USB memory.

## 5) Product Configuration

The Cardio7 system consists of the following components. Open the packaging box and check that all components below are included and make sure that the main body or components are not damaged.

### 5-1) Basic Components and Accessories



- ① Cardio7 body (1 EA) – Dimension 300(W) x 290(D) x 89.5(H) mm
- ② Patient cable (1 EA) – Length 3,700mm
- ③ Disposable electrodes (1 SET)
- ④ ECG clips (1 SET)
- ⑤ ECG paper (1 EA)
- ⑥ Diagnosis Guide Book (1 EA)
- ⑦ User manual (1 EA)
- ⑧ Power cable (1 EA) – Length 2,500mm (Max)

## 5-2) Optional components



① Battery (1 EA)

### CAUTION

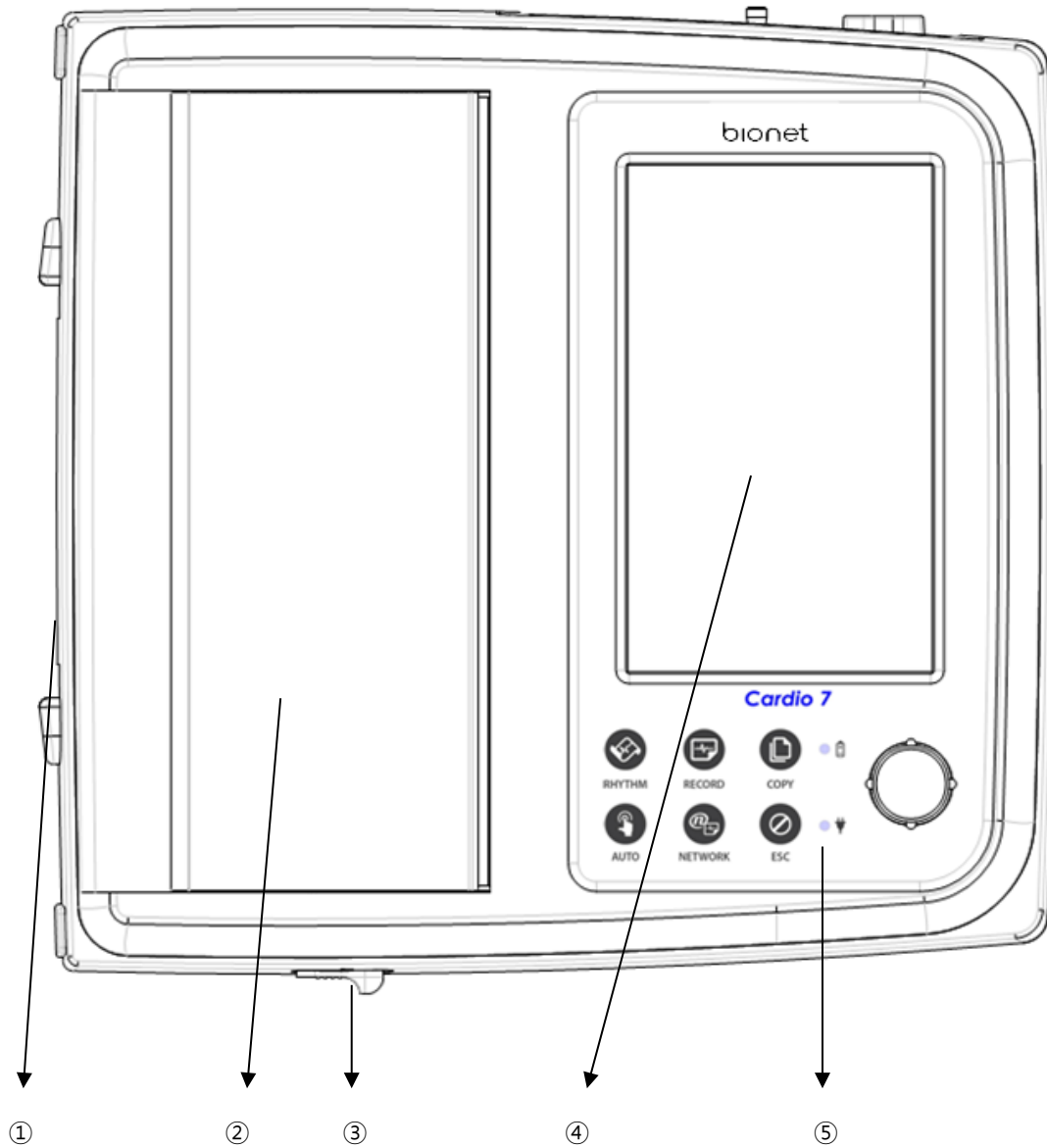
Using non-standard accessories other than the Bionet-provided supplies may cause signal distortion or noise. Be sure to use genuine accessories supplied by Bionet.

### WARNING

Bionet is not liable for any problems caused by you not using the battery provided by Bionet. Make sure to use the genuine battery provided by Bionet.

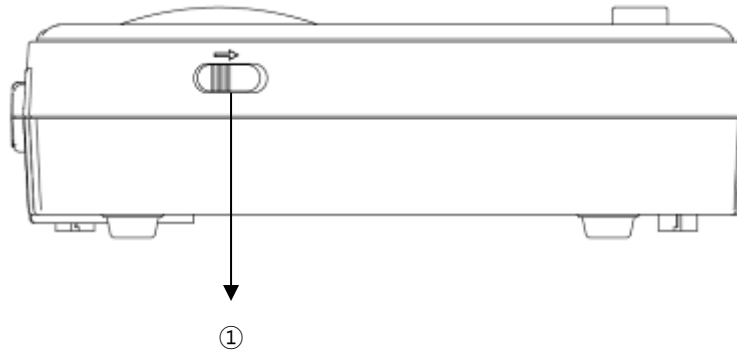
## 5-3) Body Configuration

### ■ Top View



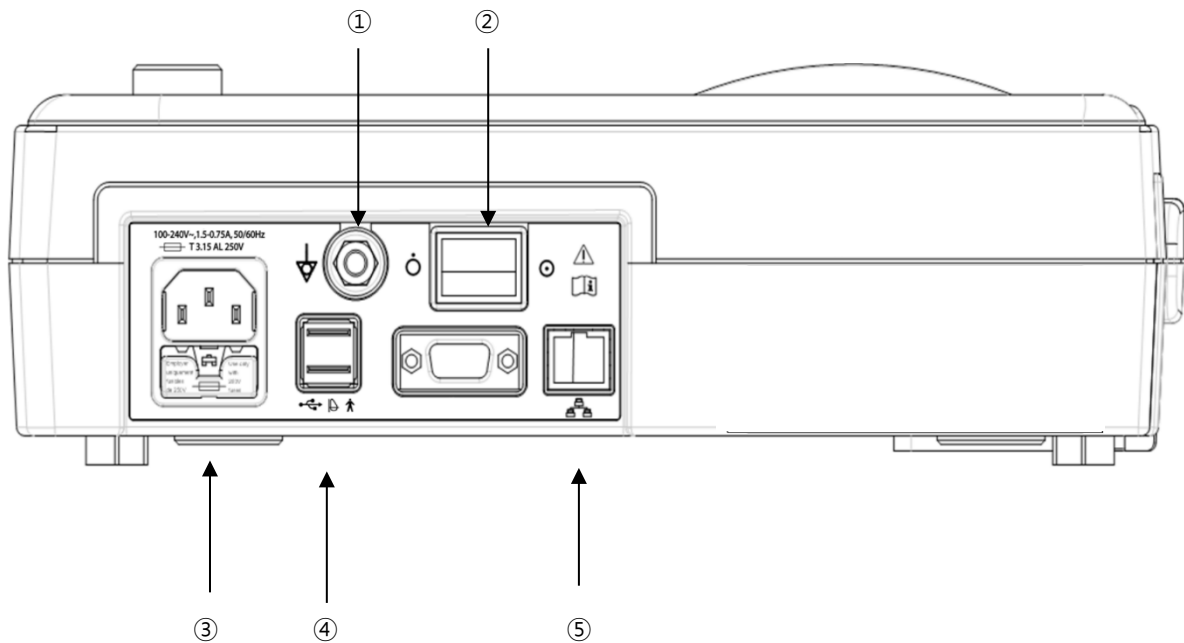
- ① Handle
- ② Printer Cover
- ③ Printer Cover Switch
- ④ LCD
- ⑤ Control Panel

### ■ Front View



① Printer Cover Switch

### ■ Rear View



① Protective Ground Terminal

② Power Switch

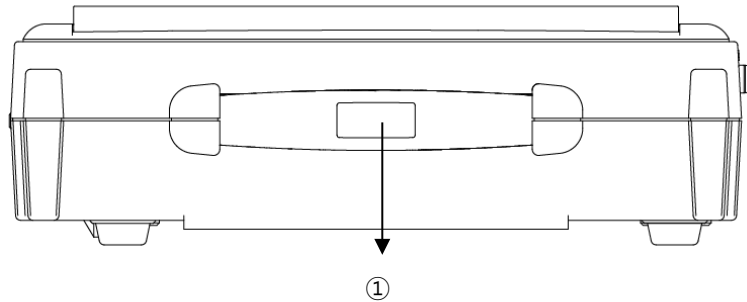
③ AC Power Connection Port (+ Fuse(250V , 3.15AL) x 2)

④ USB Port

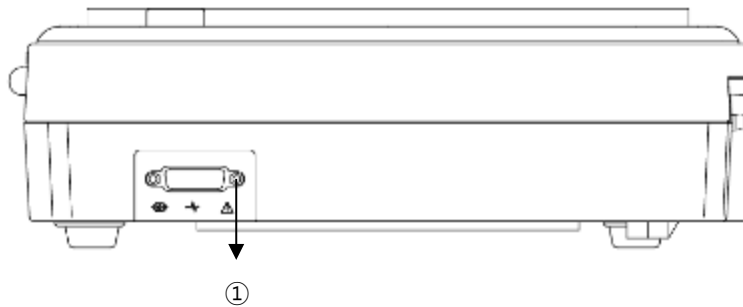
⑤ RJ45 LAN Port

#### NOTE

Appliance inlet of separate power supply unit is used as mains disconnecting device.

**■ Left Side View**

① Handle

**■ Right Side View**

① Patient Cable Connection Port

**WARNING**

There is a risk of electric shock if the Rest stand of the equipment is damaged or cannot be fixed to the equipment body. Do not use the product and immediately ask the manufacturer and the seller for repair.

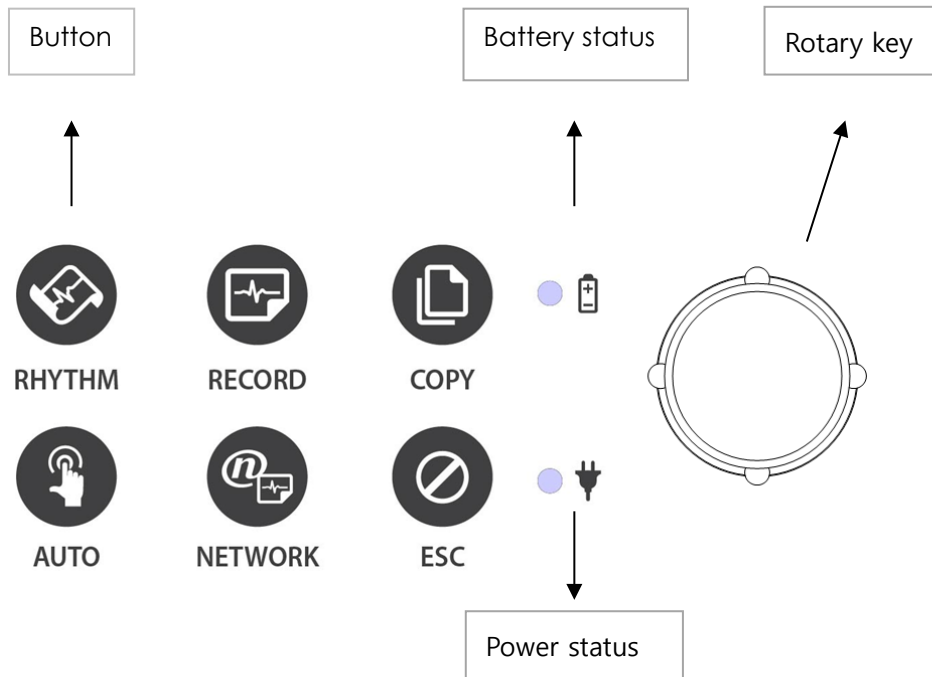
**NOTE**

Do not open the cover of the equipment; it may cause an electric shock. Repair or disassembly of the equipment can only be performed by those who have product repair qualifications recognized by Bionet.

### 5-4) Front Panel



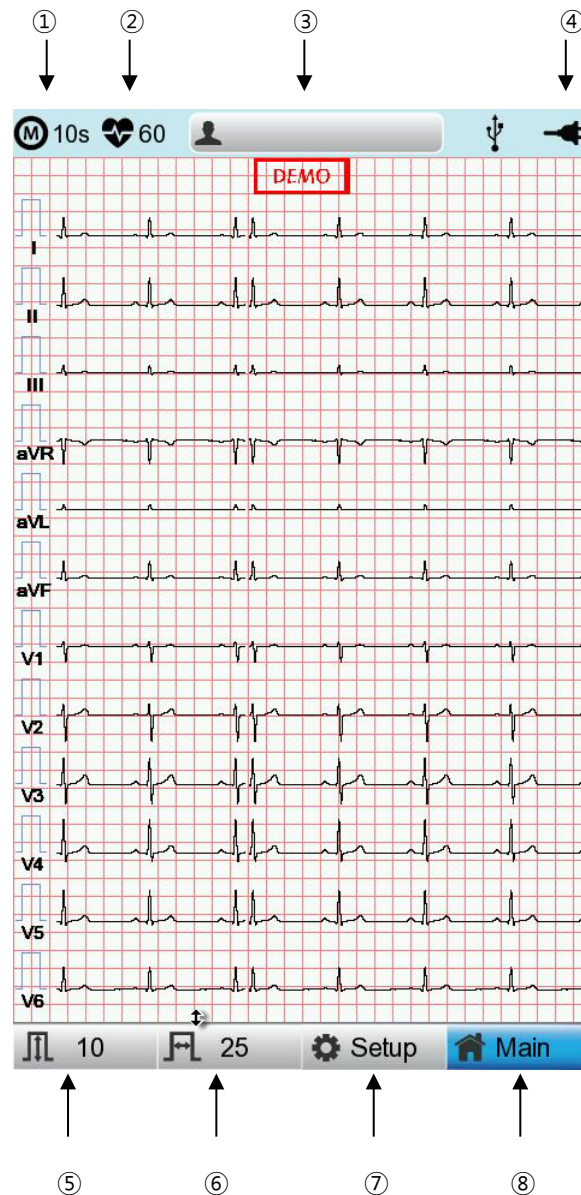
Graphic Display Window



During device boot up, you can see the system software version and the Bionet name.

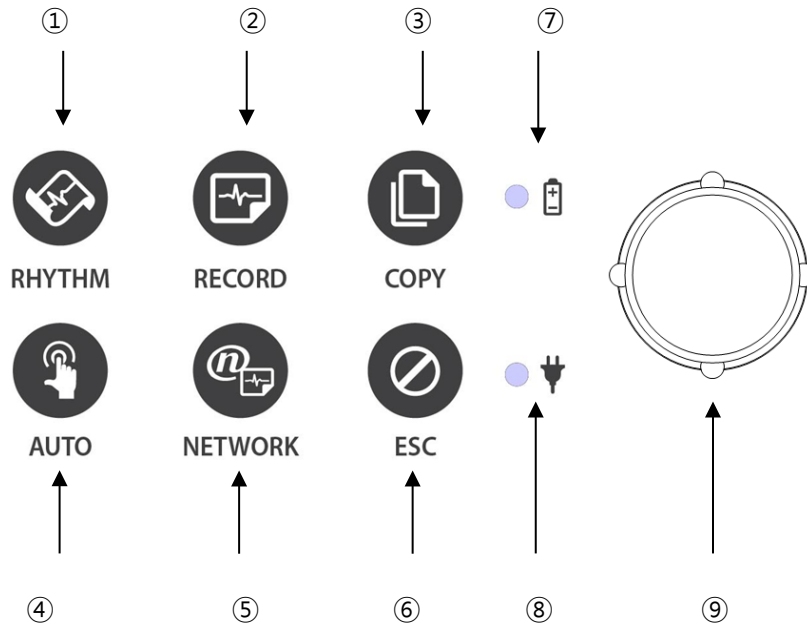
### 5-5) Graphic display LCD

Refer to the following description about the LCD graphic window.









- ① ECG recording mode (10s, 1m, 3m, 5m, 10m)
- ② Heart rate
- ③ Patient ID.
- ④ Battery status or AC power connection status
- ⑤ Current gain: Touch this button to set Gain.
- ⑥ Current print speed: Touch this button to set the print speed.
- ⑦ Setup Menu
- ⑧ Touch this button to move to other menus such as ECG, Spiro, File, or Worklist.

## 5-6) Control Panel





### ■ Button Description


①		A real-time ECG waveform is continuously printed or prepared as a report.
②		10sec. and long-term readings (1min., 3min., 5min., 10min.) are printed as an output form after processing.
③		Process the recorded data with or without revision and print them out.
④		It operates the product in the most frequently used operation from the ECG diagnosis test to data saving.
⑤		It transfers the test data, or saved data to the server PC.

⑥		You can cancel the operation or switch to the previous mode by entering the main menu.
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#### ■ Indicating Lights

⑦		Battery charge indicator with AC connected: During operation, if the battery is fully charged, the LED lights green, otherwise it turns orange.
⑧		AC Code connection indicator: The LED lights green when the equipment is connected to AC power.

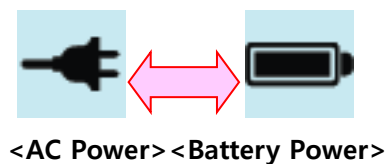
#### ■ Rotary Key

⑨		Use when navigating or selecting menu items (Same functionalities can be achieved by touching menu items on the screen).
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## 4-7) Power

#### ■ AC Power

When the equipment is connected to AC power, the Power LED on the front lights green. When a battery is mounted, it is charged in automatic charging mode.



#### WARNING

Be sure to connect this equipment to a power supply with protective grounding.

## ■ Battery Power

If you turn on the battery-mounted equipment with the AC power supply being cut off, the equipment is powered by the battery and the battery indicator is displayed in the upper right corner of the LCD screen. If the battery power is low, an alarm sounds. Connect AC power quickly to the equipment, otherwise, it automatically turns off after a certain period of time.

- Time required to fully charge the equipment that has been turned off after being completely discharged: Up to 3 hours.
- Continuous use time after full charge:
  - About 6 hours in standby mode without ECG recording
  - You can print up to 200 ECG recordings in 12-channel format at 25mm/s and 10mm/mV settings.
- Battery Type: Lithium-ion battery  
A lithium-ion battery is a rechargeable battery containing lithium-ion cells. Each battery includes an electrical remaining capacity measurement circuit and a safety protection circuit.

### WARNING

- The battery charge display is accurate only when the battery is functioning normally
- Capacity or operating time of old or defective batteries is significantly compromised.





### NOTE

Without an AC power supply, it takes up to 15 seconds for the battery-charging display to reflect the actual capacity of the internal battery.

### NOTE

- Bionet recommends replacing the lithium-ion battery after 24 months of use.
- Battery life depends on the frequency of use.
- Continued use by the battery power reduces the battery life and shortens the time of replacement.
- Be sure to recharge the battery before it is completely discharged.

### ■ Battery Power Status

- : Fully charged.
- : Half charged.
- : Low charged.
- : Almost discharged.

### ■ Replacing the Battery

Replace the battery with the same type.

- Battery Type: Lithium-ion battery (10.8V, 3250mAh)
- A lithium-ion battery is a rechargeable battery containing lithium-ion cells. Each battery includes an electrical remaining capacity measurement circuit and a safety protection circuit.
- When to replace: When the equipment is connected to a power source, the battery is charged automatically. It cannot be charged separately from the equipment. The battery can be recharged about 300 times or more. Replace it if you cannot use it for longer than 20 minutes even after full charge. In case the battery is damaged or leaks, replace it immediately. Do not use a damaged battery on the equipment.

#### CAUTIONS

For the protection of environment, do NOT throw wasted battery away. Please inquire at the biomedical engineering lab of the hospital and dispose according to the appropriate procedure to the authorized place(according to national regulations).

#### WARNING

- Pay attention to the polarity when replacing the battery.
- Bionet strongly recommends using the battery provided with the equipment.
- Using an unauthorized battery may damage the equipment.

### ■ The Effect of Lithium-Ion Technology on the Battery

Find out about lithium-ion battery technology here.

The battery is discharged naturally even when not installed in the equipment. Discharging is caused by the current demanded by the lithium-ion battery integrated circuit. Battery is self-discharged due to the nature of lithium-ion cells, and the self-discharge rate doubles for every 10°C (18°F) rise in temperature.

Battery retention loss is greater at higher temperatures. As the battery ages, it may not be fully charged, as a result, the total charge capacity used for saving and using gradually decreases.

### ■ Conditioning Guidelines

Check battery performance by fully charging and completely discharging it every 6 months.

### ■ Storage Guidelines

Store the battery between 20°C and 25°C (68°F and 77°F) when it is set aside separately. When the battery is installed in the equipment and connected to AC power, the temperature of the battery increases by 15°C to 20°C (59°F to 68°F) at room temperature, which shortens the life of the battery.

When a battery is installed in the equipment with AC power being connected, normally the equipment does not use the battery power. Battery life may be less than 12 months. Store the battery along with the equipment to prevent being lost and stolen and separate the battery from the equipment when moving the equipment.

### ■ Recycling the Battery

Replace the battery when it is no longer charged. The battery can be recycled. Remove the old battery from the monitor and follow your local recycling guidelines.

#### WARNING

- Do not incinerate the battery or store it at high temperatures as it may explode, which may cause you serious injury.
- Do not use the battery that has been impacted, disfigured, or submerged; dispose of it.

## 6) System Installation

### 6-1) Installation Precautions

Note the following when installing the Cardio7

- Use the equipment within the ambient temperature of 10~40°C and humidity of 30~85%.
- Check the connection of the power cord and handle the patient cable with care.
- Do not plug multiple cords into a single electrical outlet.
- Install the equipment body on a flat surface.
- Connect the ground if noise occurs.
- Do not use the electrical cords that generate connection noise.
- All settings stay saved in the internal memory even when the equipment is turned on and off.
- Handle the equipment with care as it is sensitive to impact.
- Install the equipment in a place with proper ambient temperature and humidity, and away from dust and flammable materials.

### 6-2) Connection Power

Connect the power cable to the power supply and the power terminal on the back of the Cardio7 to power on.

### 6-3) Connecting Patient Cable

Connect the Patient Cable to the patient cable connection port on the right side of the equipment.

Connect the limb electrodes to RL (N), LL (F), RA (R), and LA (L) terminals and chest electrodes to V1(C1), V2 (C2), V3 (C3), V4 (C4), V5 (C5) and V6 (C6) terminals of the patient cable.

### 6-4) Paper Installation

- Push the printer cover release switch to the right to open the printer door of the Cardio7. Install EKG paper with the side to be recorded appearing on top. Close the cover to finish the paper installation process.

**WARNING**

Use only the ECG recording paper provided by Bionet for ECG recording. Otherwise, the poor printing quality may affect the doctor's diagnosis. Bionet is not liable for any problems caused by you not using the ECG recording paper provided by Bionet.

**WARNING**

Modifications to this equipment are not allowed.  
Do not disassemble or modify this equipment without the manufacturer's approval.  
Repair or disassembly of the equipment can only be performed by those who have product repair qualifications recognized by Bionet.

### 6-5) Connecting the Network

As only the service technicians can connect this equipment to the network, consult with the IT staff in the hospital in advance.

Follow IEC 80001-1, which is the Risk management of IT networks to which medical devices are connected.

### 6-6) LAN Network

Generally, the LAN networks are configured based on a star topology. You can group Individual devices together via layer-n-switch. Other data traffic is separated by other VLAN networks. Configure the network according to this manual and your network specifications.

LAN connection specifications are described in the following standards.

- Wired Network: IEEE 802.3
- Wireless Network: IEEE 802.11 (a, b, g, n)

If the equipment is used as a layer-2-switch or layer-3-switch, the port settings must be configured on the network switch. Configure the network of Bionet equipment to be compatible with the specifications of your operating organization.

The equipment exchanges data with other medical devices via a LAN network. The network must support the following protocols:

- TCP/IP
- BROADCAST

### **6-7) VLAN Network**

If data is exchanged within a single network, you must establish an independent VLAN network for clinical information systems, such as a network dedicated to medical devices in hospitals. Also, you should build a network system that detects and defends against denial-of-service attacks by establishing a system dedicated to DDos protection.

### **6-8) When using an inappropriate network**

If your network does not meet the requirements, the following may occur:

- Without a firewall and antivirus software:
  - Data is not protected.
  - Data is transferred incomplete or not transferred at all.
  - Data may be sent to the wrong server.
  - Data may be blocked, forged or damaged.
  
- Without an independent network configuration or dedicated system for DDos defense:
  - You may be subject to denial of service attacks (DDos). In this case, the equipment may become slow or may not work properly. In rare cases, you may experience the delayed or repeated booting.

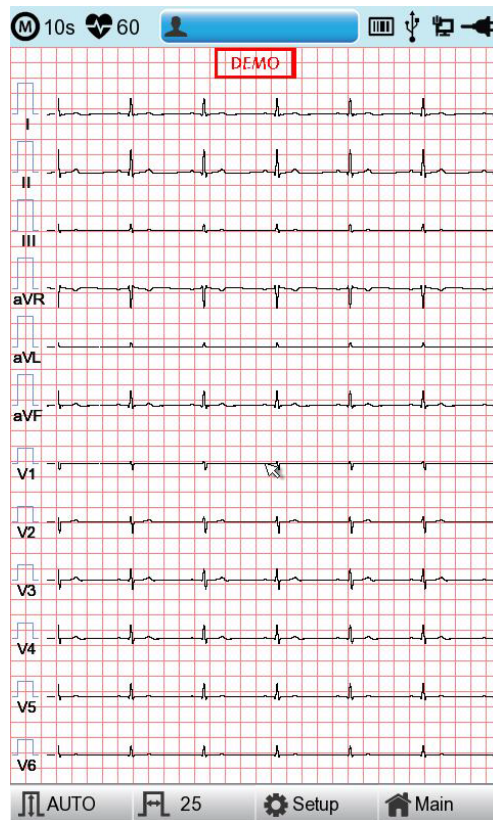
## 7) System Start

When you turn on the equipment, the product name is displayed and the initial menu appears as shown in the picture below.















You can move to the main page of the chosen menu by touching the menu on the screen or rotating the key on the control panel.

The picture below shows the ECG main screen that is loaded when you choose the ECG menu.



The following is a description of the ECG initial screen menu.

Menu	Description
	ECG Recording mode (10s, 1m, 3m, 5m, 10m)
	Heart rate
	Patient information
	Barcode reader or USB Keyboard connection mark
	Replaced by the  icon when a network error occurs during transfer to the PACS server. You can move to the Study Queue screen by touching the  icon.
	USB Memory connection status

	Network status mark (wired :  , wireless :  ). Move to the Network Setup screen by touching the icon.  : The error icon will appear in the event of an IP conflict
	Power status (AC power or battery)
Gain	To set up the size of the ECG waveform
Speed	To set up the speed for printing out the ECG waveform
Setup	Touch this button to set the System
Main	Go to the main screen: Spiro, File, or Worklist





Touch [File] to bring up the ECG data management screen as follows.

No	ID	Name	Age	Date	Study
1	uuj	ryhj	0	20150708	ECG
2	1234		0		ECG
3	234		0		ECG
4	cdee		0	20150512	MVV
5	ddrrg	rdvgy	0	20150512	FVC
6	ed		0	20150512	FVC
7	gjin		0	20150512	ECG
8	ujj		3	20150512	FVC
9	wrtu		0	20150512	FVC
10	1234		0		ECG
11	234		0		ECG
12	cdee		0	20150512	MVV
13	ddrrg	rdvgy	0	20150512	FVC
14	ed		0	20150512	FVC
15	gjin		0	20150512	ECG
16	ujj		3	20150512	FVC
17	wrtu		0	20150512	FVC
18	1234		0		ECG
19	234		0		ECG
20	cdee		0	20150512	MVV
21	ddrrg	rdvgy	0	20150512	FVC
22	ed		0	20150512	FVC
23	gjin		0	20150512	ECG
24	ujj		3	20150512	FVC

File 1/6

Print Delete Setup Main

The following is a description of the File menu.


Menu	Description
File 1/6	File number on the current location/entire file number
	Go to the previous page.
	Go to the next page.
	Patient information
	Search data by entering search criteria.
Print	To print out the chosen data
Delete	Delete the selected files. It appears when server is connected.
Setup	Touch this button to set the System.
Main	Go to the main screen: ECG, Spiro, or Worklist.

Touch [Worklist] to bring up the exam-requested patient management screen as follows.



The following is a description of the Worklist menu.

Menu	Description
Worklist 1/1	Order number in the current location/entire order number
◀	Go to the previous page
▶	Go to the next page
👤	Patient information
🔍	Search data by entering search criteria
Exam	Go to the exam screen
Delete	Delete the selected files. It appears when server is connected
Setup	Touch this button to set the System
Main	Go to the main screen: ECG, Spiro, or File

Touch  (Study Queue icon) to bring up the Study Queue data management screen as follows. Study Queue manages data that has failed to be sent to the server.


Study Queue					
Studies : 3					
No	ID	Name	Date	Study	Status
3	11270410	phudg	2015112...	ECG	Ready
2	11275510	gqafb	2015112...	ECG	Ready
1	11275510	gqafb	2015112...	ECG	Ready

<<
>>
Delete
Retry
Close

The following is a description of the Study Queue management menu.

Menu	Description
Studies	Number of Study file marks
>>	Go to the next page
<<	Go to the previous page.
Delete	Delete the selected data.
Retry	Transfer the selected data.
Close	Close the window.

#### NOTE

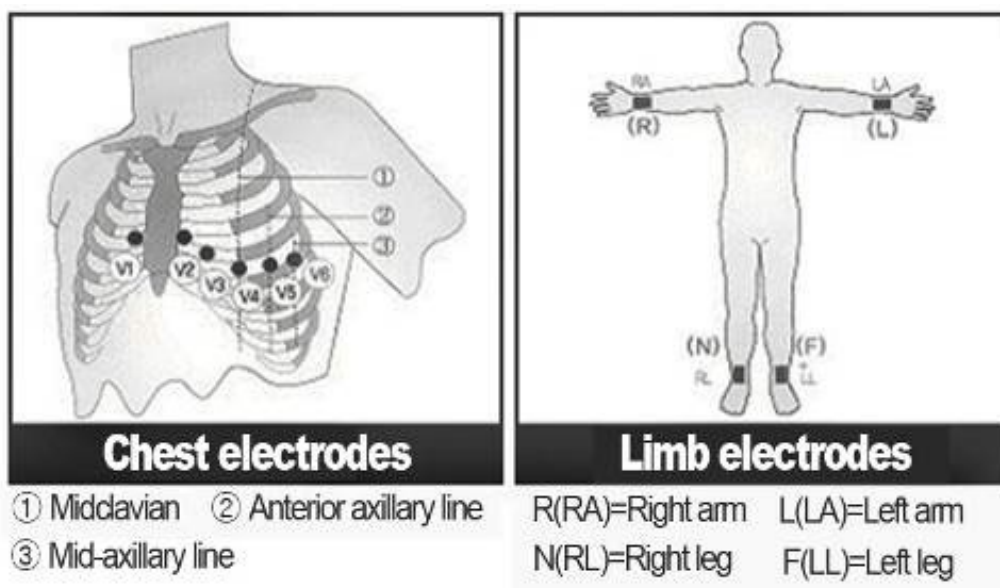
-  The icon appears on the right top corner only if there is an error while sending files.

## Chapter 2. ECG Recording Preparation

### 1) Attaching the Electrodes

When you touch [ I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6], (Lead Fault Information) located in the center of the menu bar at the top of the ECG Main screen, a picture showing where to attach the electrodes is displayed.

To record a standard 12-lead ECG, attach electrodes to the patient's body as shown below.



The positions to attach limb electrodes are as follows:

- RL (N): Right leg
- LL (F): Left leg
- RA (R): Right arm
- LA (L): Left arm

The positions to attach the chest electrodes are as follows:

- V1 (C1): Boundary of fourth intercostal on right side of chest
- V2 (C2): Boundary of fourth intercostal on the left side of chest
- V3 (C3): Mid-location between V2 (C2) and V4 (C4)
- V4 (C4): Mid-location of the front side of fifth intercostal collarbone
- V5 (C5): Front armpit on the horizontal line with V4 (C4)
- V6 (C6): Mid-armpit on the horizontal line with V4 (C4), V5 (C5)

## 2) Connecting Electrodes

### \* Checklist

- Before the exam, check the condition of the equipment and patient, and whether each electrode is well attached.
- Make sure that there are no mechanical hazards.
- Check the status of cables and accessories connected externally.
- Check the status all the measuring devices for the patients.

### 2-1) Connecting Patient Cable

Connect the patient cable to the port on the right side of body and connect limb electrodes to the terminals of RL (N), LL (F), RA (R), and LA (L) of patient cable connected in the Cardio7 and chest electrodes to the terminals V1 (C1), V2 (C2), V3 (C3), V4 (C4), V5 (C5) and V6 (C6).

### 2-2) How to Attach the Electrodes

Have the patient lie down on the bed and release the tension in the skin area where the electrodes will be attached. Clean the area with disinfected alcohol or water before attaching electrodes. In case the patient is hairy on the attaching spots, shave them. If the attachment body part is curved and it is difficult to attach the electrodes, attach them to the positions that are as similar as possible without a curve.

If the noise is severe even if you have used alcohol or water, apply the ECG gel to the attaching spots before attaching the electrodes.

Be sure to wipe off the used ECG Gel, because if it gets dried and hardened, it can generate noise in the ECG signal.

#### WARNING

Be sure to use only the electrodes and patient cable provided by Bionet. Bionet is not liable for any problems caused by your using unauthorized parts.

## 2-3) What to Do with Poor Lead Connection

Turn on the equipment, enter the ECG mode, and check the connection of all leads and the noise level of the waveform. A message appears in case of a lead fault.

**Lead Fault! All Leads.**

### NOTE

- Lead fault message appears only when Lead fault is set to On in ECG General Setup. Otherwise, it will not appear.
- Fault leads and saturation leads in red in yellow.
- Proceed with the ECG exam only when the leads are connected properly.

Take the following measures when the lead connection is poor.




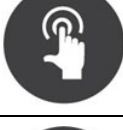


- When the electrodes come off from the skin: Reattach the electrodes following the electrode attachment method.
- When conductivity between the skin and the electrodes is weak: Apply the ECG gel to the electrode-attaching spots and reattach the electrodes.

If the ECG signal is not accurately acquired even after you try all the solutions above, the patient cable may be non-conforming. Contact Bionet's service center.

## 3) Recording ECG

- Enter accurate patient information.
- Connect the ECG cable to the patient in compliance with the ECG measurement preparations.
- Check or change settings such as Filter, Gain, Output Speed, Channel Configuration, Rhythm, etc.
- Refer to What to Do with Poor Lead Connection if the waveform drawn in the LCD screen is abnormal or there is too much noise.
- If the waveform displayed on the LCD screen is normal, press the [RECORD] key to record the ECG.
- Press the [COPY] key either to print it out as modified in your settings.
- Press the [RHYTHM] key to print out the ECG signal waveform in real-time.
- Press the [ESC] key to stop printing or saving the ECG results.

The following is a description of the ECG recording menu.

	A real-time ECG waveform is continuously printed or prepared as a report.
	10sec. and long-term readings (1min., 3min., 5min., 10min.) are saved and are printed as an output form after processing.
	Previously saved data is printed unabridged or as modified in your settings.
	It operates the product in the most frequently used operation from the ECG diagnosis test to data saving.
	It transfers the test data or saved data to the server PC.
	You can cancel the operation or switch to the previous mode by entering the main menu.

## 4) Basic Setup

### 4-1) General Information

When you turn on the equipment, top and bottom menu bars and graphic window appear on the LCD screen.

Top menu bar: Test Mode, Heart Rate, Patient Information, External Device Connection Status, Network Status, Power Status,

Bottom menu bar: Output Gain, Speed, and Setup.

Touch the menu buttons on the LCD screen to change settings.

They can be modified in two ways.

These configuration values can be changed using either the rotary key or touch screen. With the rotary key, the desired menu and changed configuration values can be set easily.

Same functionality can also be achieved with the touch screen by pressing and changing the desired information on the LCD.

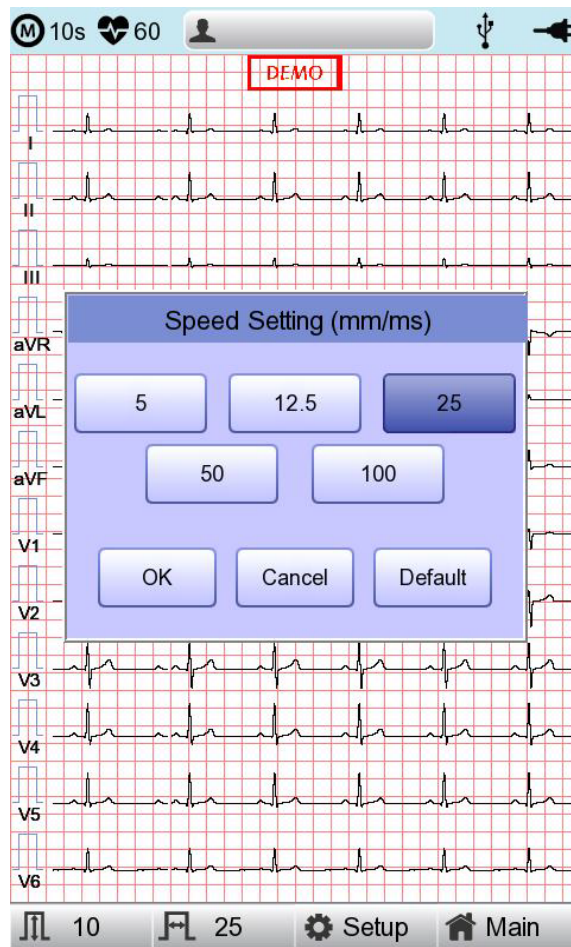
### 4-2) Changing the Configuration Value with The Rotary Key

In this case, please follow these steps: enter Menu Mode, navigate and select Menu and then change values.

- Entering Menu Mode

The rotary key is supposed to rotate clockwise. When the user selects the ECG Main, the initial focus will point to the 'patient' item.

The following is the page you will see when you rotate the key clockwise and click it to enter the speed menu.



- Menu Navigation

Operate by rotating the rotary key. Menu movement will occur in the same direction as the direction of the key's rotation.

- Menu Selection

Initiate by pressing the rotary key. Menu box for setting of the selected menu will be displayed.

- Modifying setting values

Move to desired setting, then modify & select values in the same manner as menu movement shown above. When you select either 5mm/sec, 12.5mm/sec, 25mm/sec, 50mm/sec or 50mm/sec at the 'Speed Setting' POP-UP, the POP-UP window will disappear.

### **4-3) Using the touch screen to modify the information**

When using the touch screen, only two procedures, menu selecting and information modification, are required.

- Selecting Menu

Touch the menu buttons on the screen.

- Setting the Value

Select a menu and touch [OK].

#### 4-4) Patient Information Input

Enter the patient's personal information before starting the ECG test.

The screenshot displays the 'Patient Information' input form. The form is set against a grid background with ECG waveforms. A 'DEMO' label is present at the top. The form fields are as follows:

Field	Value / Unit
ID	[Empty]
Name	[Empty]
Age	[Empty] years
Gender	Female
Height	[Empty] cm
Weight	[Empty] kg
Race	Asian
Smoke	No
Department	[Empty]
Room No.	[Empty]
Study Desc.	[Empty]
Accession No.	[Empty]
Ref. Physician	[Empty]

Buttons: OK, Cancel, New

#### NOTE

- The patient's surname is available after changing the file version to 1.1 in the BMS Server settings.

## Patient ID

Enter a unique number used in the hospital to classify patient medical data. Touch the input field of ID to display the keypad window consisting of alphabets and numbers. Use the keypad window to enter patient ID.

When the user wants to set the data after inputting, the user can press OK button on the keyboard and if the user wants to cancel the setting, pressing ESC button will do it and the keypad window will disappear.



### NOTE

- Do not use ", <, >, ?, /, \*, |, :, #, etc (these invalid characters are set to be inactive) characters for ID.
- Use only plain alphabets and numbers for ID. If you enter an ID in Latin extended characters or Russian, an error may occur when you transfer files with the IDs to a PC or USB memory.

**Patient Name**

Enter the patient name in the same way as entering the ID.

**Age**

Enter an age and select the year of birth for >1 year old; enter age in the form of week or day for 1 < year old. Automatic diagnosis is available from postnatal day 1 for pediatrics.

NOTE
<ul style="list-style-type: none"><li>- Pediatric diagnosis of the ECG is available from the first day of birth.</li><li>- If age is not entered, an adult diagnosis is provided.</li></ul>

**Gender**

Touch the input field of Gender to select Male or Female.

**Height**

Enter the patient height in the same way as entering the age.

If the Height Unit is set to inches in System General Setup, enter the height in ft and inches.

**Weight**

Enter the patient weight in the same way as entering the age.

**Race**

Enter the race of the patient. There are 3 registered races: Asian, White, and Black.

Touch the input field of Race to select the race type.

**Other Information**

Enter Smoke, Department, Room No., Study Description, Accession No., and Referring Physician in the same way as entering ID.

Touch [OK] to save the settings or [Cancel] to cancel the settings. Touch [New] to initialize all the patient information you have entered.

#### 4-5) Using a Barcode Reader




Place the cursor on each item in the patient information screen and scan the barcode. Information is entered automatically.

When you scan the barcode in the ECG main screen, the patient ID is entered automatically.

Basically, you can use any kind of barcode reader.

However, since the default setting of the entry method of each product may be different, check the method supported by Bionet before using them.

- Entry methods supported by Bionet products: International standard and USB
- The products that have been tested by connecting to Bionet equipment are listed below.

No	Manufacturer	Product name	Product image
1	Symbol	LS-2208	
2	ZEBEX	Z-3110	
3	Honeywell	MS5145	

#### NOTE

Each barcode reader has a product-specific initialization code.

Be sure to read the user manual of the product and check the entry method before initializing it.

#### 4-6) Sensitivity Setup

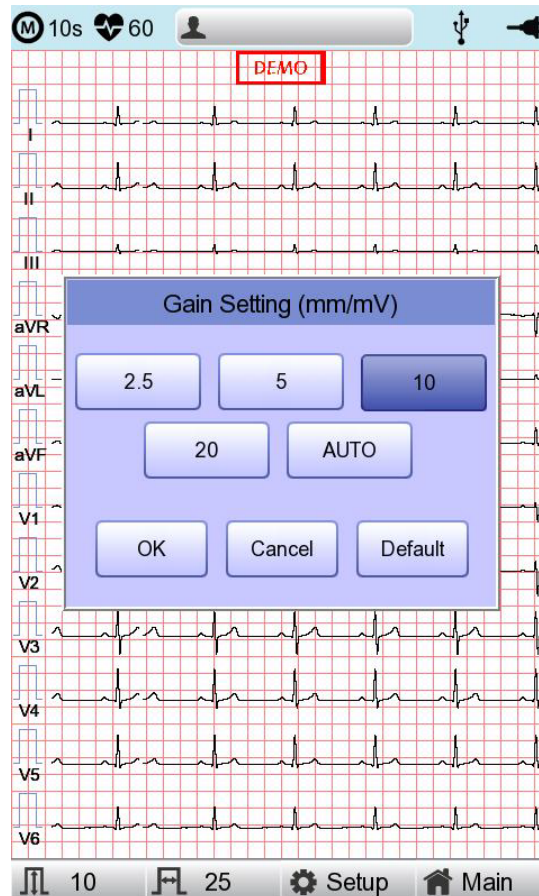
Adjust the Gain if the size of the output signal is too large to overlap neighboring channels, or it is too small to decipher.

Settings: - Set the limb leads (I, II, III, aVR, aVL, aVF) and chest leads (V1, V2, V3, V4, V5, V6) to the same value: 2.5mm/mV, 5mm/mV, 10mm/mV, and 20mm/mV.

- Set the limb leads and chest leads to different values: limb leads 10mm/mV / chest leads 5mm/Mv.

10mm/mV means that a signal of 1mV is drawn at a size of 10mm on screen.

The left side of the graph display will show the channel name and a bar graph, so users can notice recently changed values easily. However, for 20mm/mV, the size of signal is set to be shown for 6 signals only to avoid overlapping signal size displays.

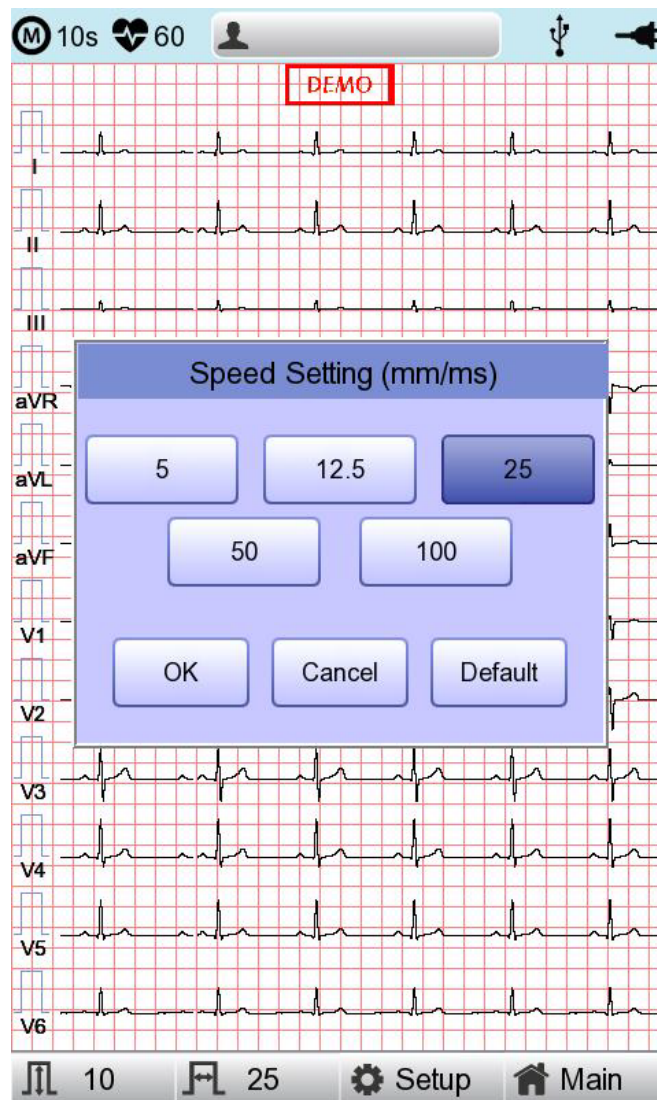


#### NOTE

When you set the recording mode to 3min, 5min, 10min the printing size is fixed at 5.0mm/mV.

#### 4-7) Printing speed Setup

Adjust the width of the output signal for screen output and printout. The available values are 5mm/sec, 12.5 mm/sec, 25mm/sec, 50mm/sec, and 100mm/sec. 25mm/sec means that the ECG signal for 1 second is recorded with a length of 25mm.



#### NOTE

- If you set the Rhythm Size of monitoring to Report, the signal is always printed at 25mm/sec regardless of the Output Speed setting.
- When you set the recording mode to 1min, the signal is always printed at 25mm/sec.
- When you set the recording mode to 3min, 5min, 10min the signal is always printed at 12.5mm/sec.

## 5) LCD Monitor display

The current ECG signal is drawn on the LCD screen in real-time.

Start the test after confirming that the signal is correctly transmitted from all leads.

NOTE
The detection range of heart rate is 30-300 bpm with $\pm 3$ bpm of error range.

## 6) Disclosure

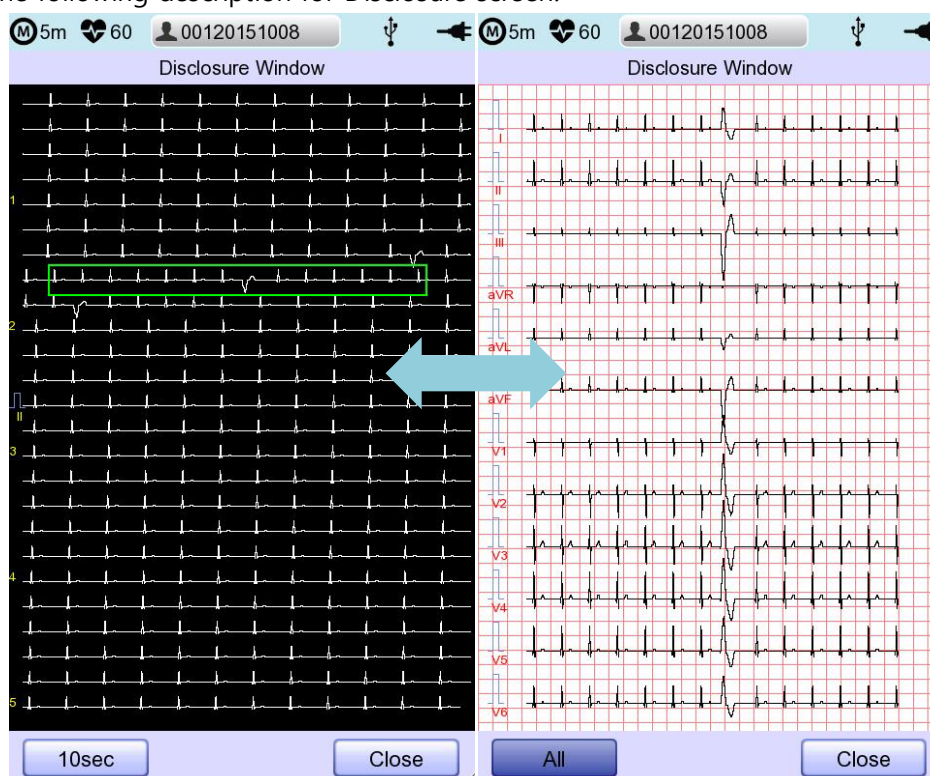
Touch the graph window of the ECG main screen for 3 seconds to switch to Disclosure screen. Disclosure is a function that stores ECG data in the equipment memory and shows it when executed.

In the Disclosure screen: The pre-stored 5 minutes of ECG data are displayed in 1CH. The interval section of the pre-set mode (10 seconds) is marked with a square, allowing you to print diagnosis for the selected area or transmit data of the area.

Touch the graph window and select the screen output section: your touch point becomes the center of the square-marked area. Select the screen output section and press the [Record], [Auto] and [Net] key.

On the control panel to print diagnosis or save and transmit the data.

Refer to the following description for Disclosure screen.



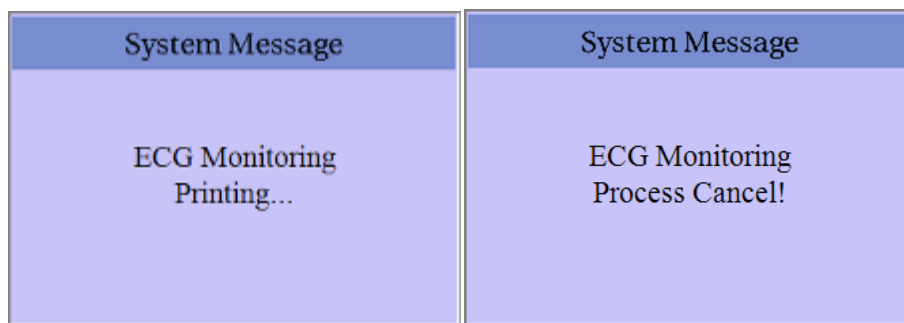
## 7) Real-time Printing (RHYTHM Key)

Press the [RHYTHM] key on the control panel to print the ECG signal in real-time.

You can set the output speed of Rhythm among 5mm/sec, 12.5mm/sec, 25mm/sec, 50mm/sec and 100mm/sec. For Gain, you can set among 2.5mm/mV, 5mm/mV, 10mm/mV, 20mm/mV, and auto.

Set the print form to 3CH, 6CH, or 12CH.

When you press the [RHYTHM] key on the control panel, the message "System" is displayed on the screen and the printing starts according to the set speed.



- 3CH printing: 3 channels are printed simultaneously. (I ~ III / aVR ~ aVF / V1 ~ V3 / V4 ~ V6)  
To change the channel, press the [RHYTHM] key on the control panel again.
- 6CH printing: 6 channels are printed simultaneously. (I ~ aVF / V1 ~ V6) To change the channel, press the [RHYTHM] key on the control panel again.
- 12CH printing: 12 channels are printed simultaneously. (I ~ V6)

Press the [ESC] key on the control panel to stop the printing.

### NOTE

Even if ECG output speed is set as 100 mm/sec, it is not supported when outputting monitoring.

### NOTE

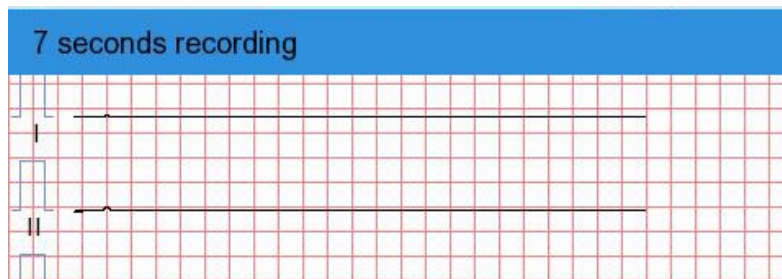
Do not attempt to attach or detach a USB device while the printer is working as it may cause the printer module to rattle.

## 8) Record Mode Printing

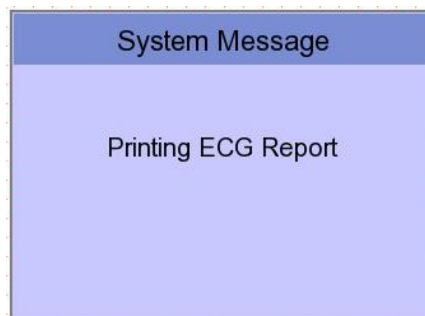
Press the [RECORD] key to diagnose the ECG acquired during the set duration, and print the result.

### 8-1) 10 seconds ECG recording

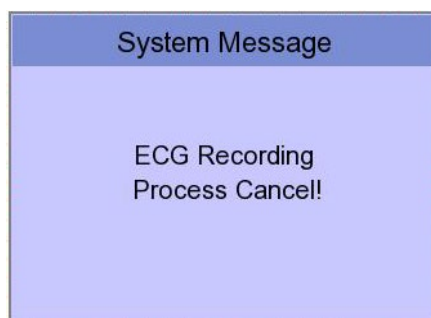
Press the [RECORD] key on the control panel to acquire ECG for 10 seconds. A timer is shown on the top.



Automatic diagnosis is made based on the 10-second resting ECG, and the preview screen appears as follows.



Enter 'ESC' key on the operation panel in order to stop while obtaining or printing out data. In this case, it will display the following message on the screen; cancel ECG recording if saving, otherwise end output while printing out.



## 9) Printing Form

### Record Form

Set the diagnosis print format.

Print Format	Description
3CH+3	10-second resting ECG recording: I, II, and III in the first 2.5 seconds; aVR, aVL, and aVF in the next 2.5 second; V1, V2, and V3 in the next 2.5 seconds; and V4, V5, and V6 in the next 2.5 seconds. The 3-lead rhythm is recorded at the bottom for 10 seconds.
3CH+1	10-second resting ECG recording: I, II, and III in the first 2.5 seconds; aVR, aVL, and aVF in the next 2.5 second; V1, V2, and V3 in the next 2.5 seconds; and V4, V5, and V6 in the next 2.5 seconds. The 1 lead-rhythm is recorded at the bottom for 10 seconds.
6CH+1	10-second resting ECG recording: I, II, III, aVR, aVL, and aVF in the first 5 seconds; V1, V2, V3, V4, V5, and V6 in the next 5 seconds. The 1 lead-rhythm is recorded at the bottom for 10 seconds.
12CH	The 12-lead rhythm is recorded simultaneously for 10 seconds in the order of I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, and V6.
6CH+1 (ST)	8-second ECG recording: I, II, III, aVR, aVL, and aVF in the first 4 seconds; V1, V2, V3, V4, V5, and V6 in the next 4 seconds with ST Map displayed on the right. The 1 lead-rhythm is recorded at the bottom for 10 seconds.

### Rhythm Channel (Rhythm CH1, Rhythm CH2, and Rhythm CH3)

Set the rhythm-representative lead used in the 3CH+3, 3CH+1, 6CH+1, 6CH+1 (ST), 1CH+3 form for diagnosis printout. The 3CH+3 setting uses all 3 selected values, and only the first value is used for the 3CH+1 and 6CH+1 settings.

By default, it is set to II, V1, and V5. As for 3CH+1, 6CH+1, and 6CH+1 (ST), II is used. All II, V1, and V5 are all used for 3CH+3.

### Beat Form

Select between Text, Guide, Vector, and ST Map as additional print form after a diagnosis is printed.

Printing speed is normally fixed at 50mm/sec regardless of the Output Speed setting.

Print Format	Description
Text	A representative beat and each diagnostic parameters are printed.

Guide	The representative beat and each diagnostic parameter are printed, along with a diagnostic guide for arrhythmia.
Vector	The representative beat and each diagnostic parameters are printed, marking QRS Vector with an arrow.
ST Map (Bar)	The representative beat and each diagnostic parameters are printed, drawing ST map in the form of Bar.
ST Map (Dot)	The representative beat and each diagnostic parameters are printed, drawing ST map in the form of Dot.

### Presentation Format

Set the presentation format of 12-lead ECG.

Presentation Format	Description
Standard	12-lead ECG is presented in the standard order: Leads I, II, III, aVR, aVL, aVF, V1,V2,V3,V4,V5 and V6.
Cabrera	12-lead ECG is presented in the Cabrera order: Leads aVL, I, -aVR, II, aVF, III, V1,V2,V3,V4,V5 and V6.

### Rhythm Form

Set the real-time printout form.

Print Format	Description
3CH	3 leads are printed simultaneously. I, II, and III are printed first, and to change the printing lead, press the RHYTHM key on the control panel again. Each time you press the [RHYTHM] key, the sequence changes to I~III → aVR~aVF → V1~V3 → V4~V6 → I~III, and so on.
6CH	6 leads are printed simultaneously. I~ aVF are printed first, and to change the printing lead, press the [RHYTHM] key on the control panel again. Each time you press the [RHYTHM] key, the sequence changes to I~aVF → V1~V6 → I~aVF, and so on.

---

12CH	12 leads are printed simultaneously.
------	--------------------------------------

NOTE
To change the printing lead with the RHYTHM key in 3CH and 6CH settings, the Rhythm Size must be set to Continue.

**Rhythm Report (Rhythm Size)**

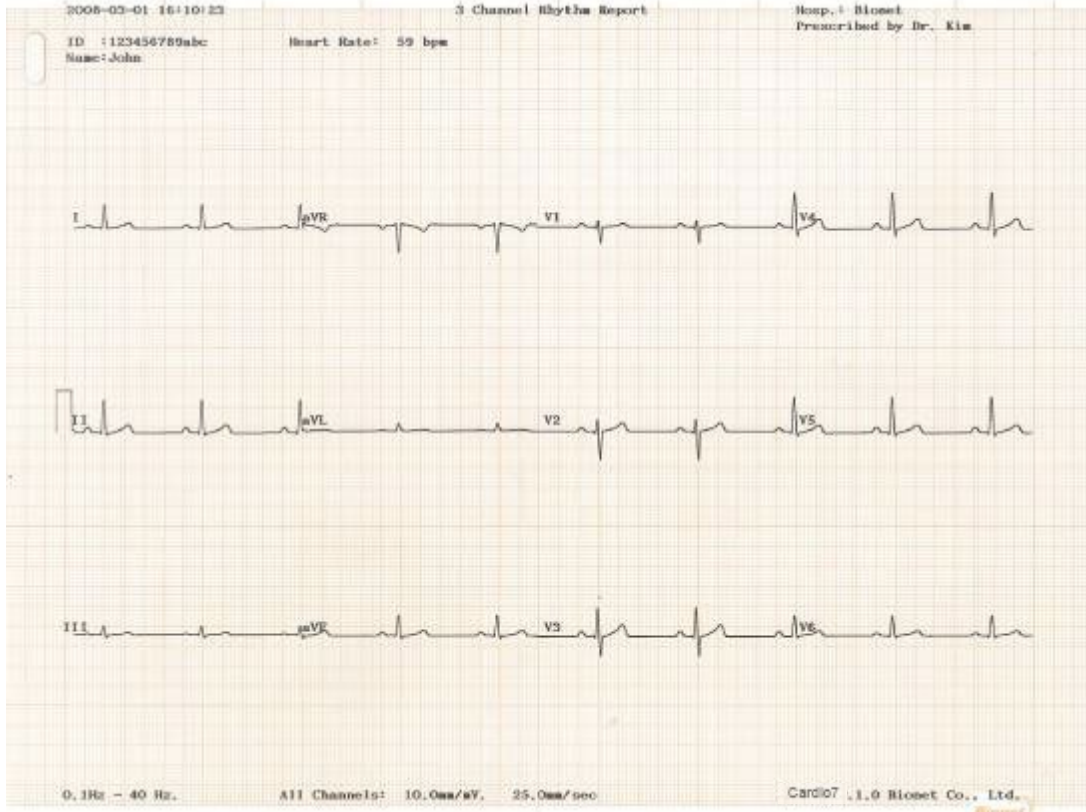
Sets the report size of the real-time print.

- Report: About 10 seconds of data are printed in Report format.
- Continue: The pre-set lead is continuously printed until you press the [ESC] key on the control panel.

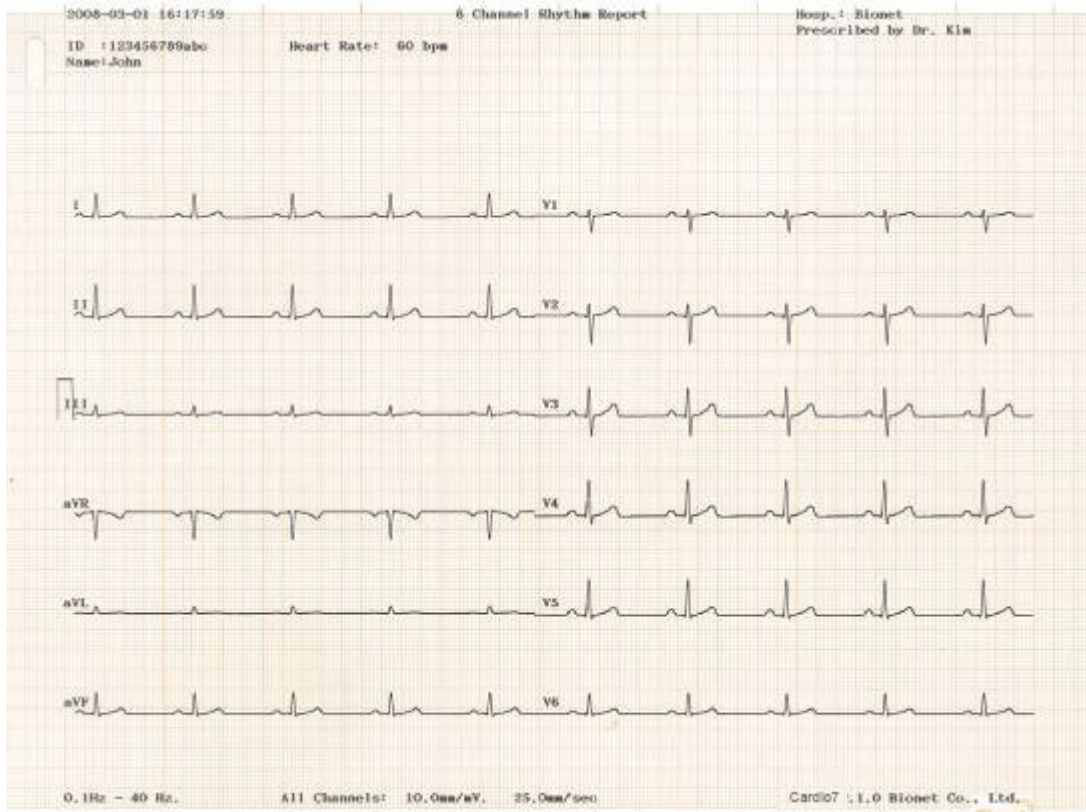
NOTE
When Rhythm Size is set to Report, the printing speed is fixed at 25.0mm/sec.

The followings are examples of print formats:

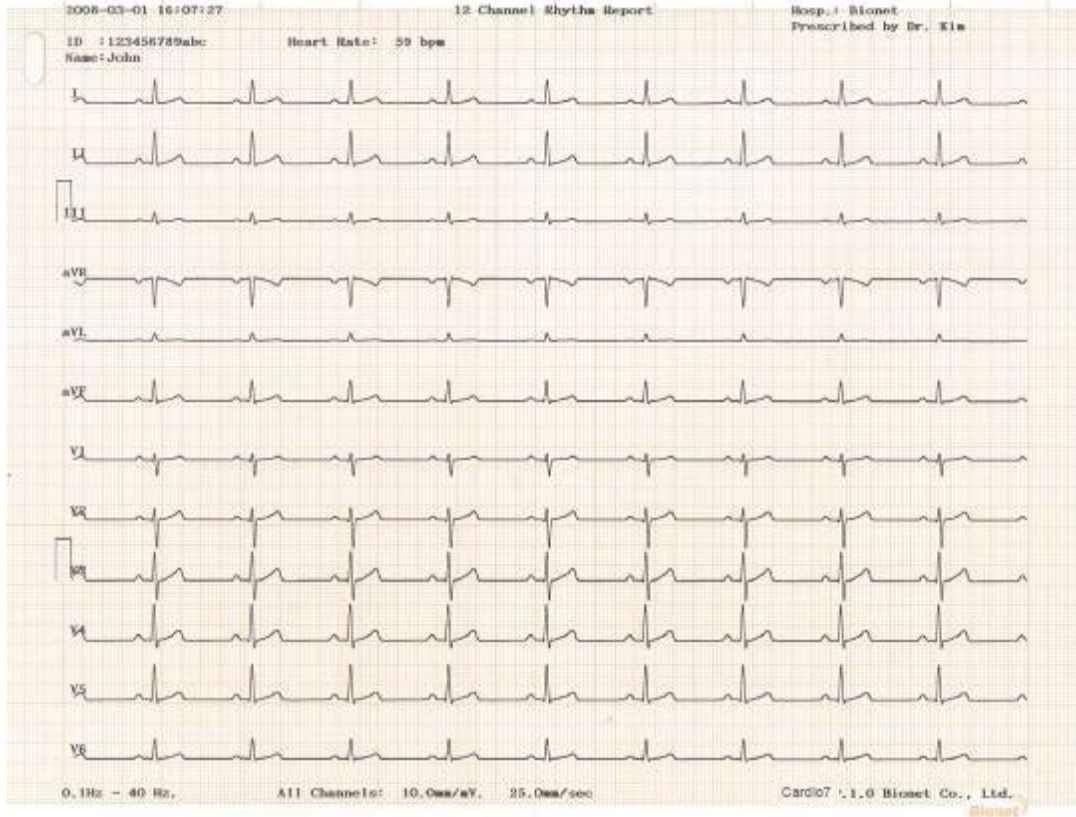
### Rhythm Report Form(3CH)



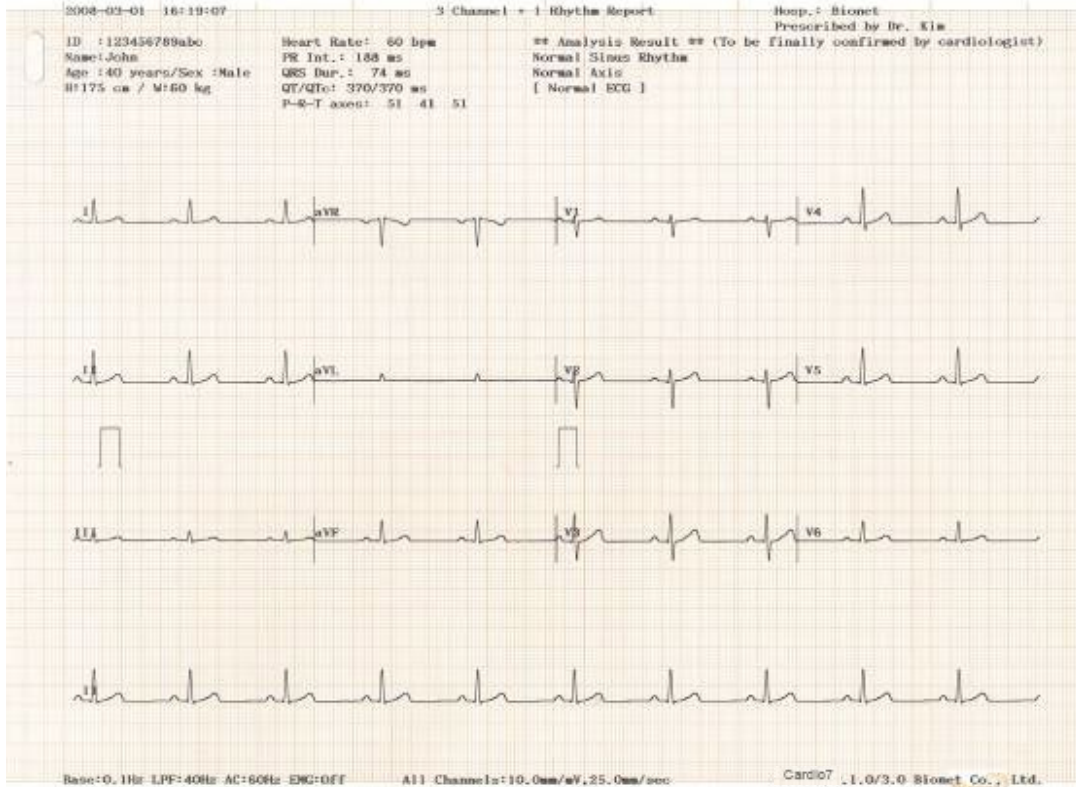
### Rhythm Report Form(6CH)



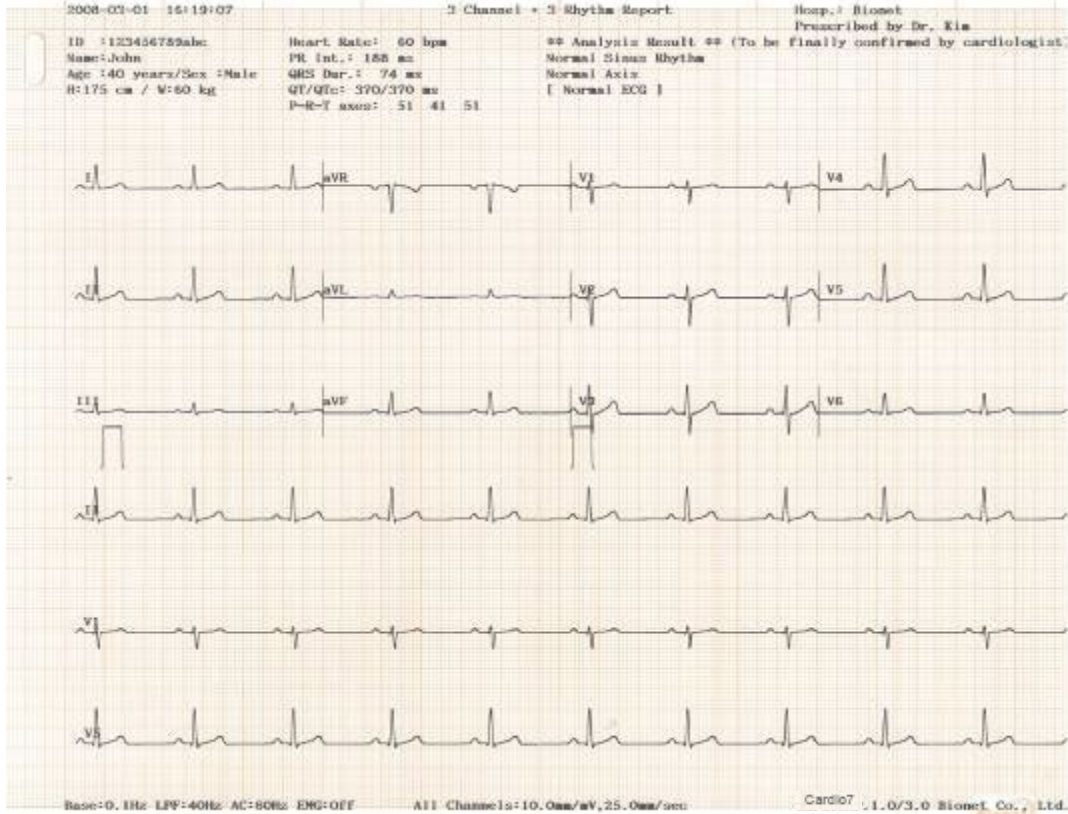
Rhythm Report Form(12CH)



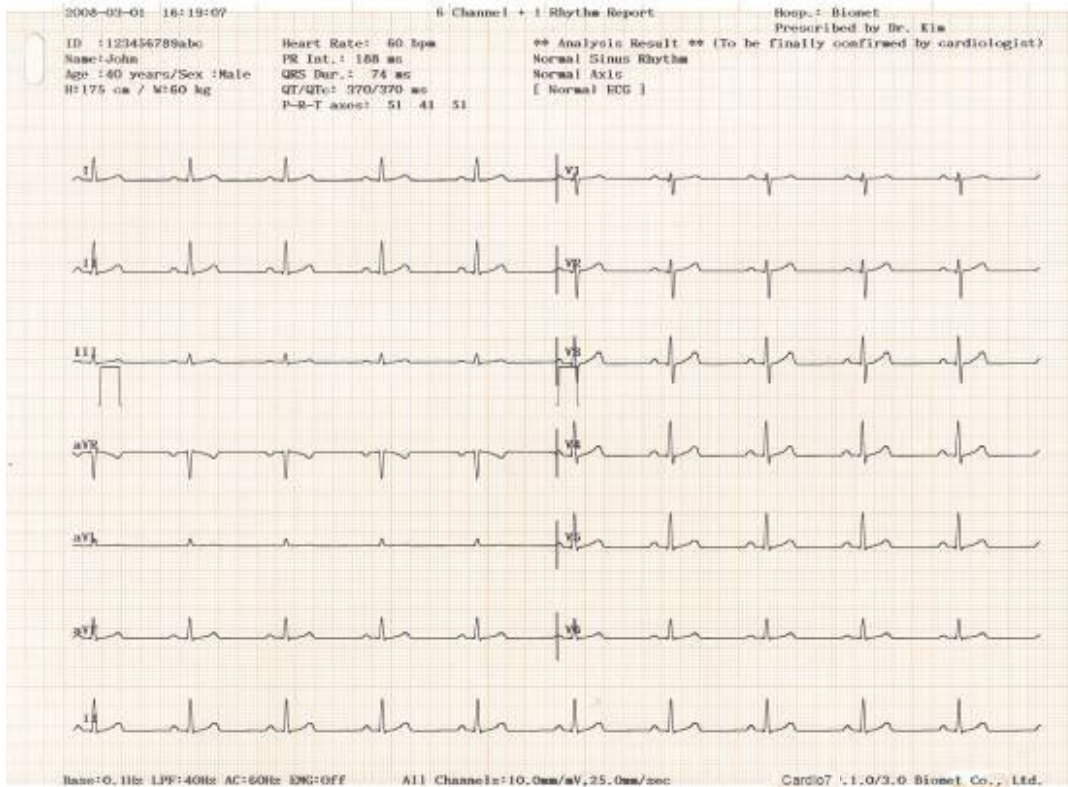
Record Report Form (3CH + 1 RHY)



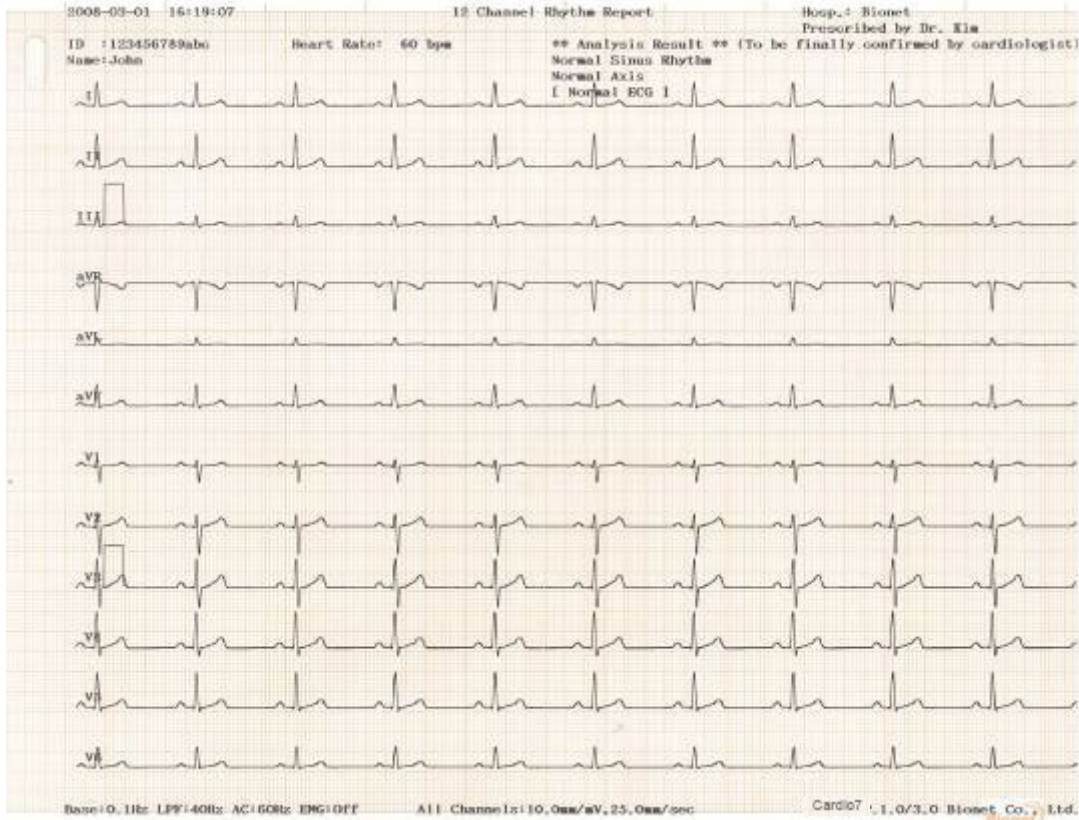
**Record Report Form (3 CH + 3 RHY)**



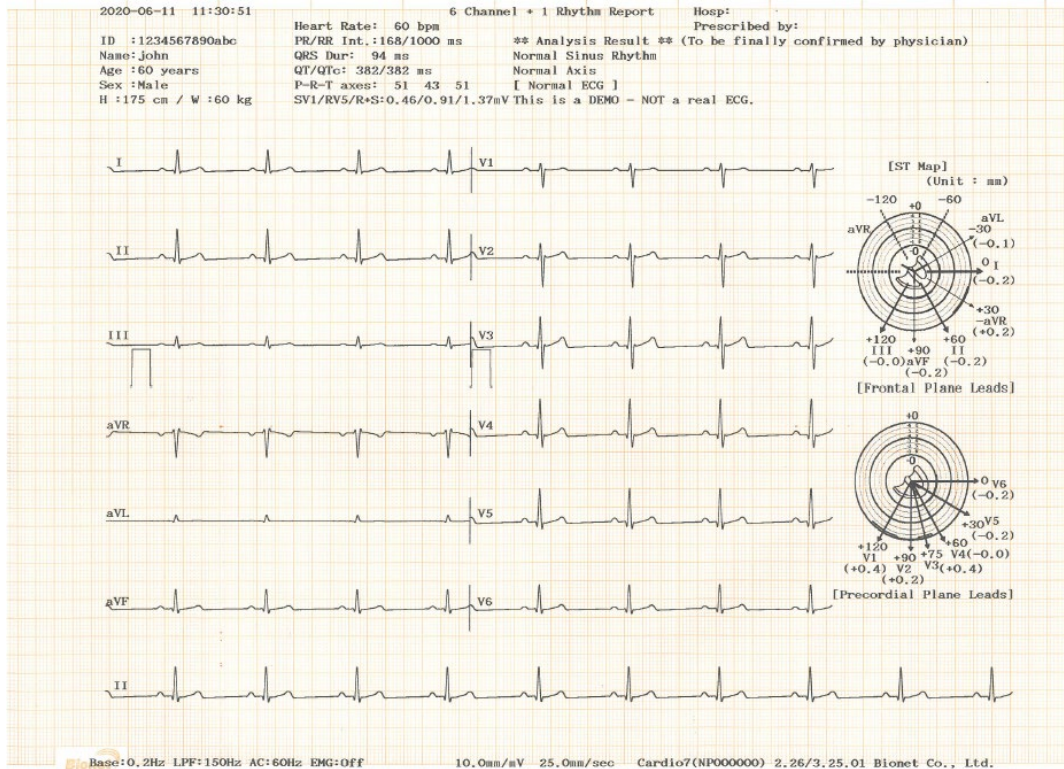
**Record Report Form (6 CH + 1 RHY)**



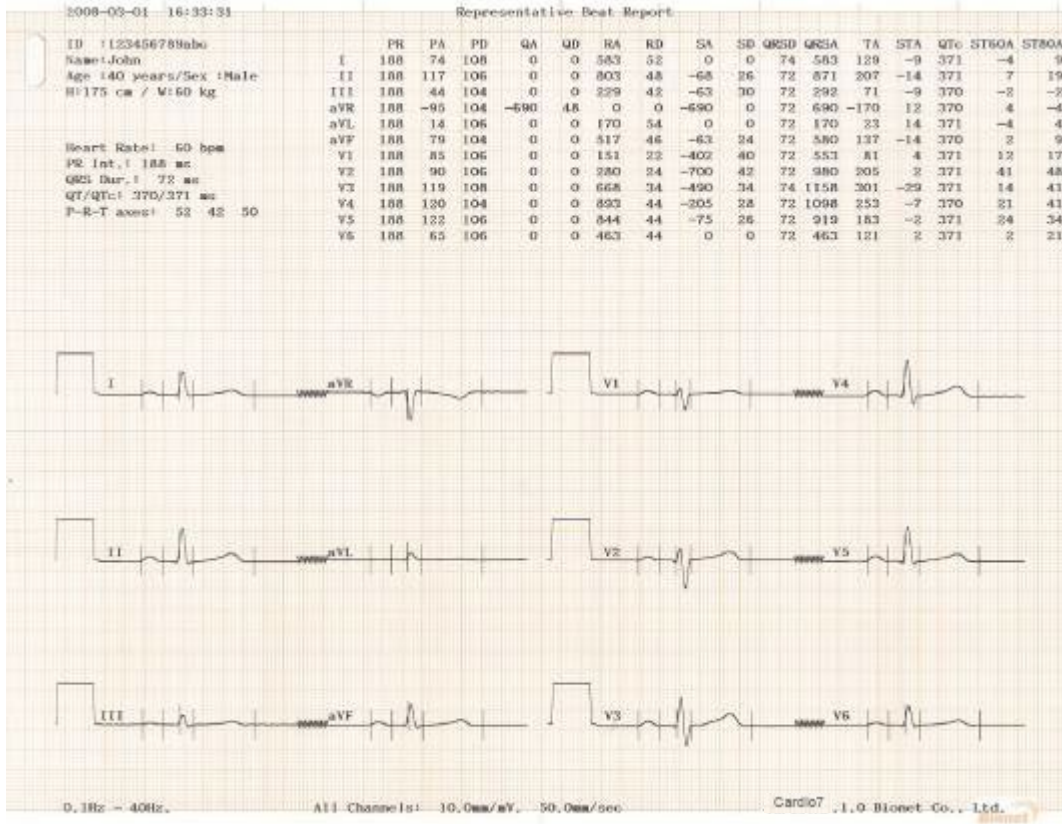
### Record Report Form (12 CH)



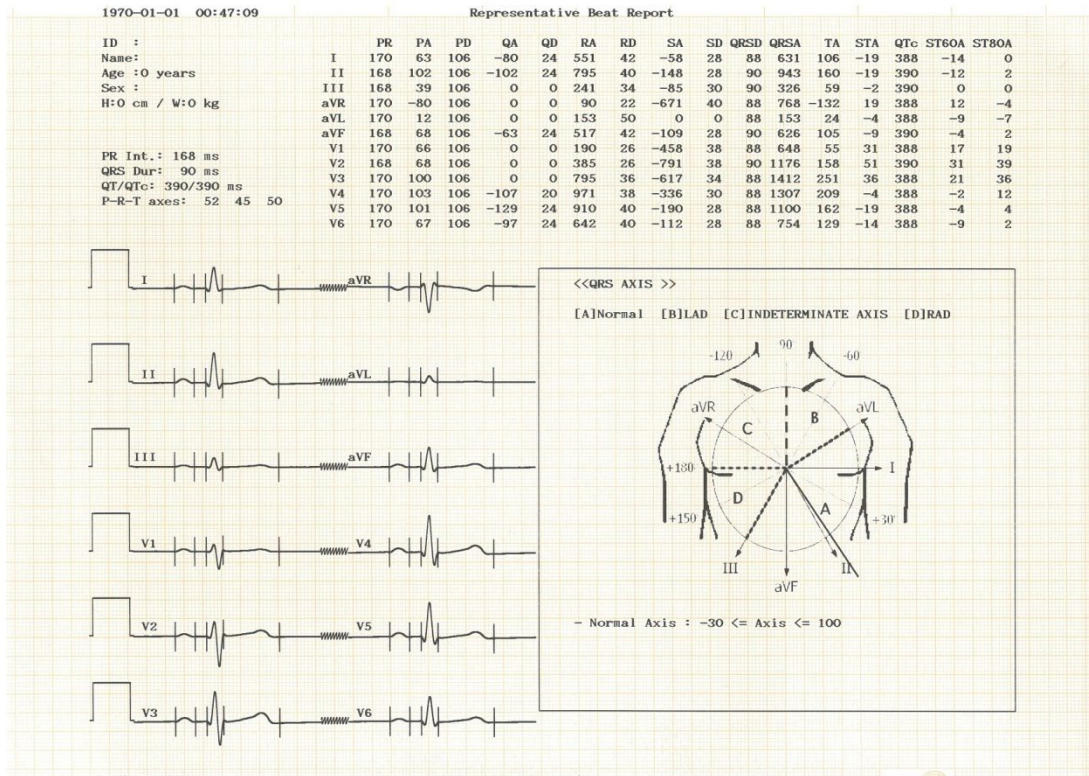
### Record Report Form (6 CH + 1 RHY (ST Map))



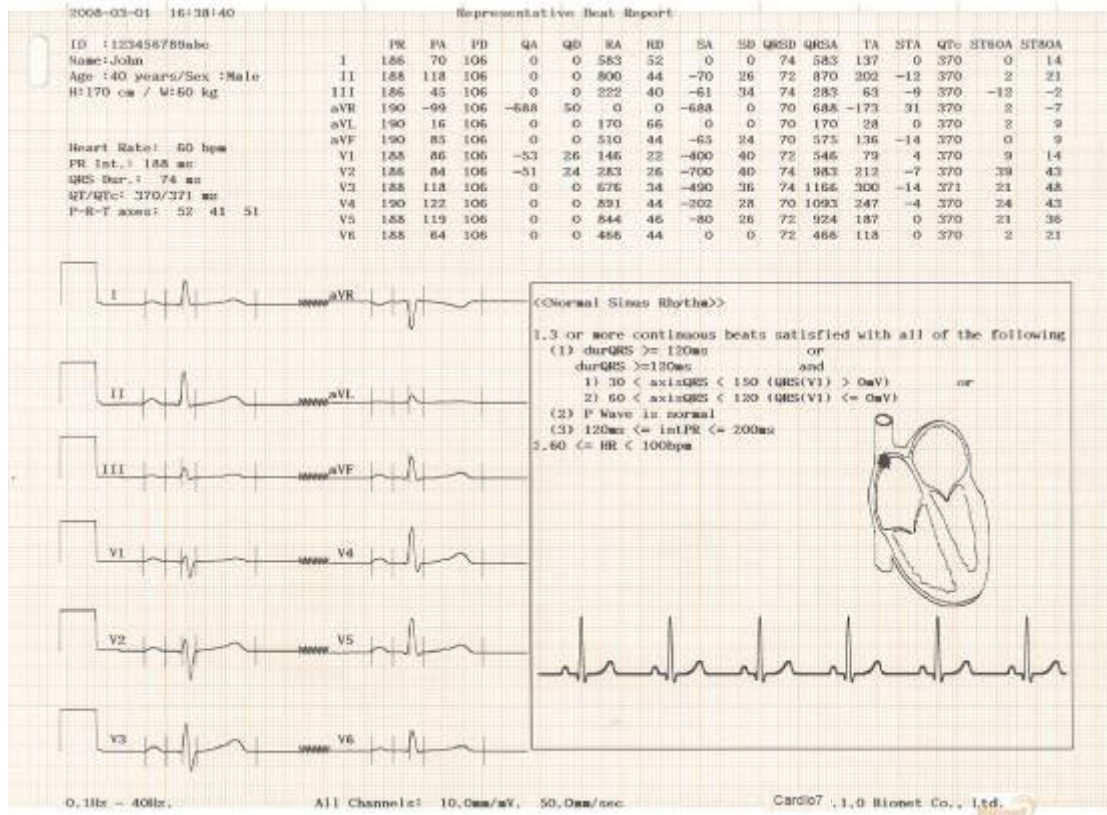
### Record Report Form (BEAT REPORT - TEXT)



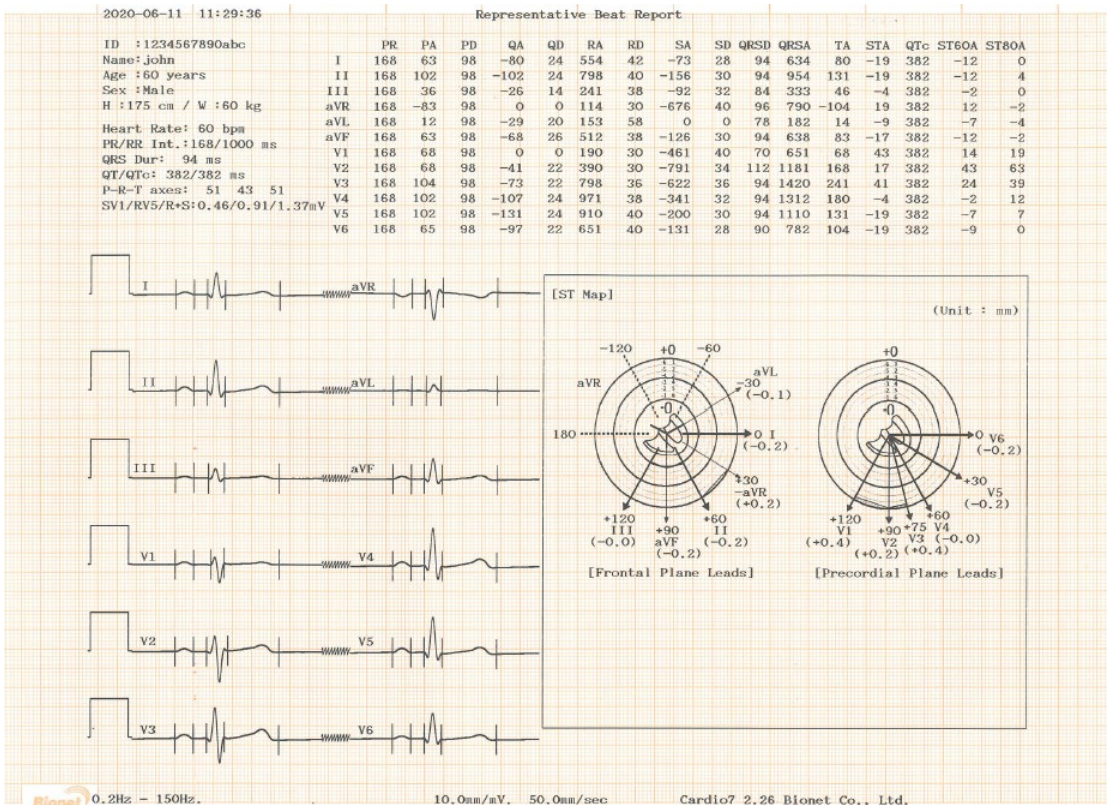
### Record Report Form (BEAT REPORT - VECTOR)



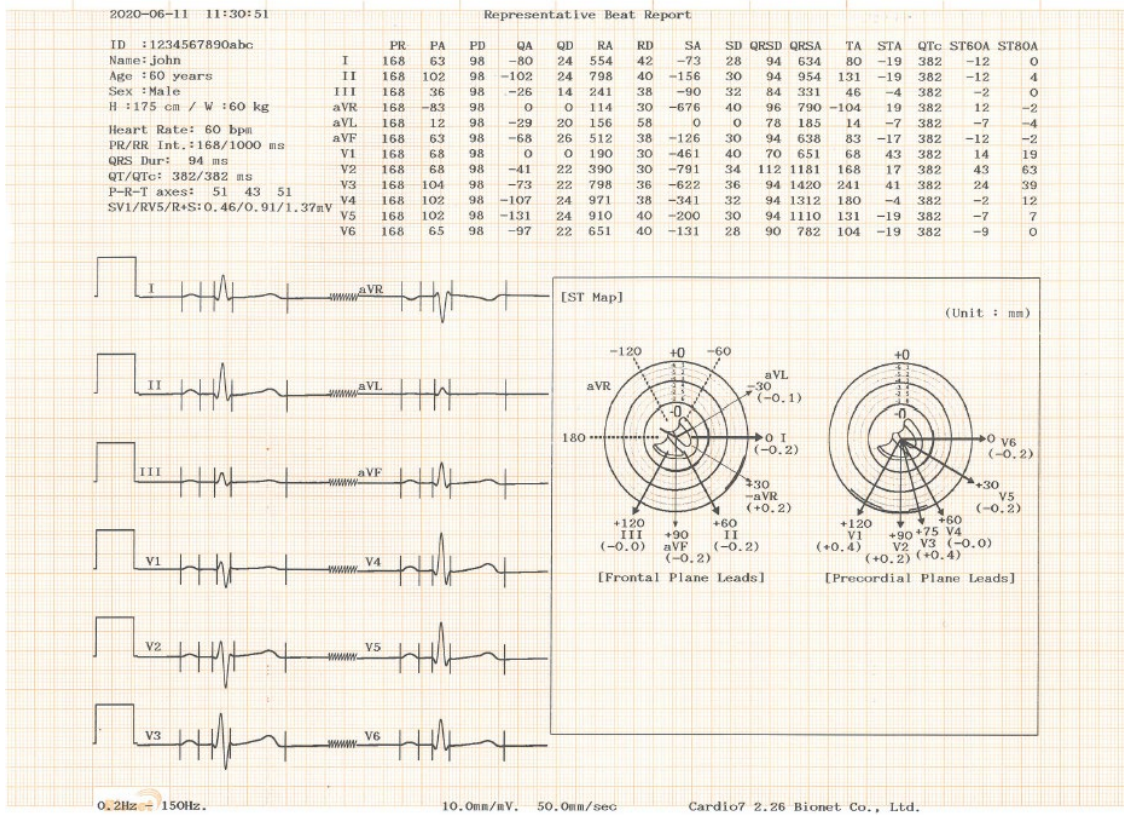
### Record Report Form (BEAT REPORT - GUIDE)



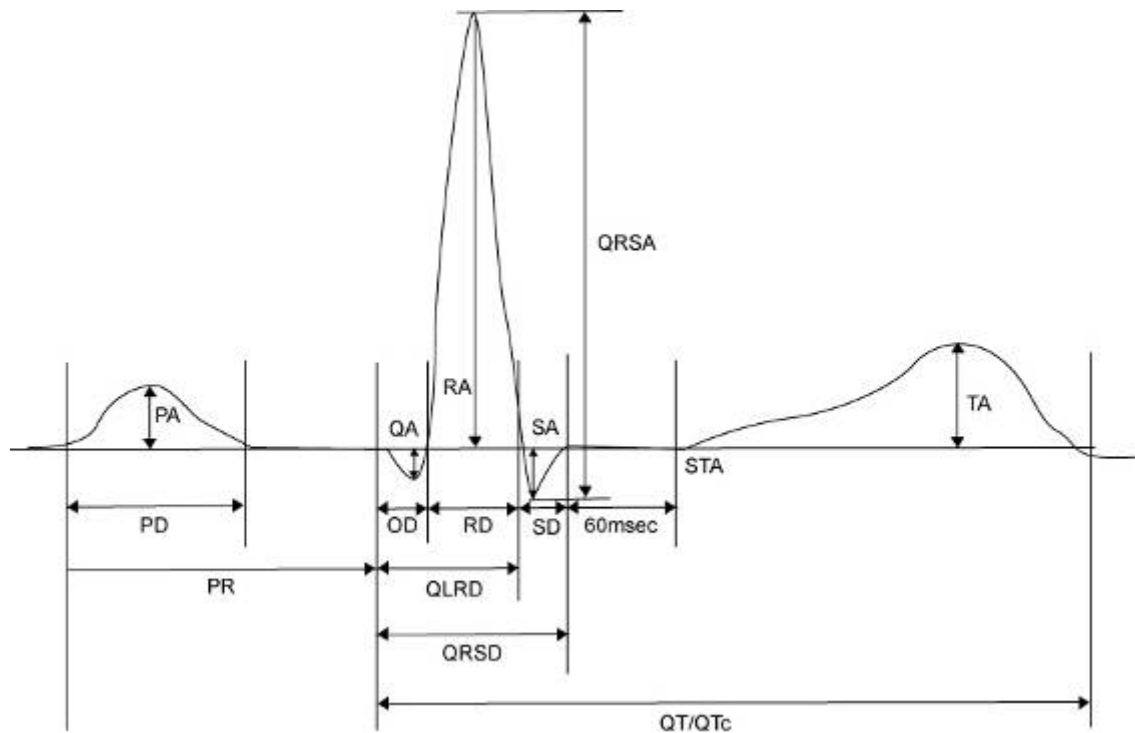
### Record Report Form (BEAT REPORT -ST Map (Dot))



### Record Report Form (BEAT REPORT -ST Map (Bar))



## 9-1) Explanation of BEAT REPORT Variables



- PR: PR Interval
- PA: Amplitude of P Wave (P Amplitude)
- PD: Duration of P Wave (P Duration)
- QA: Amplitude of Q Wave (Q Amplitude)
- QD: Duration of Q Wave (Q Duration)
- RA: Amplitude of R Wave (R Amplitude)
- RD: Duration of R Wave (R Duration)
- SA: Amplitude of S Wave (S Amplitude)
- SD: Duration of S Wave (S Duration)
- QRS D: Duration of QRS Wave (QRS Duration)
- QRSA: Amplitude of QRS Wave (QRS Amplitude)
- TA: Amplitude of T Wave (T Amplitude)
- STA: Amplitude of ST Wave (ST Amplitude)
- QTc: Correct Q-T Interval (collect Q-T Interval)
- ST60A: Amplitude of ST+60ms (ST60ms Amplitude)
- ST80A: Amplitude of ST+80ms (ST80ms Amplitude)

**NOTE**

The unit of parameter intervals (duration, interval) used in the Beat Report is *ms*, and the unit of height (amplitude) is  *$\mu V$* .

**NOTE****Dextrocardia**

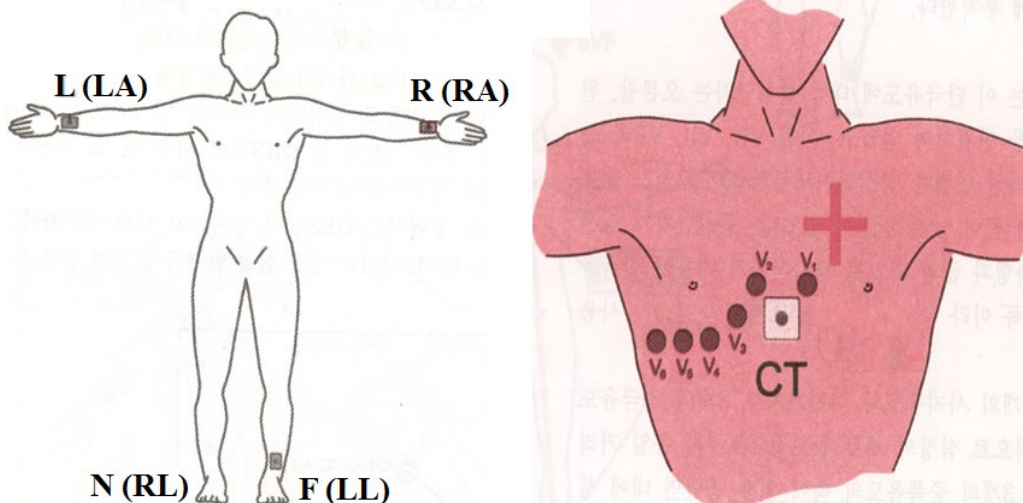
Normally, the heart is located in the left chest. However, there are cases where the heart is located in the right chest, which is called Dextrocardia.

You may suspect Dextrocardia in the following cases:

- If P, QRS and T are all reversed in Lead I
- If aVR and aVL are switched, and lead II and III are switched
- If R wave becomes smaller from V1 to V6 in chest lead

For Dextrocardia patients, change the electrode positions and measure as follows to obtain auto diagnostic results correctly.

- Switch the electrodes on right hand (R) and left hand (L).
- Attach the chest lead from the left in order, which used to be attached from the right.



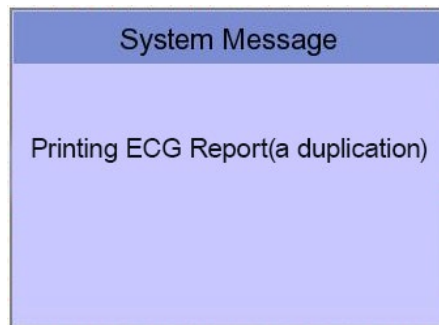
## 10) Printing Diagnostic Copy (COPY key)

You can reprint the saved data with the same settings as before, or print it by changing its settings of Filter, Gain, Output Speed, Channel Configuration, Rhythm, etc.

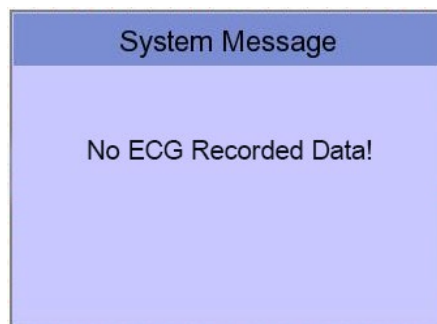
When the diagnosis is issued, press the [COPY] key on the control panel to print a report with the changed settings applied to the saved data.

### NOTE

You cannot use [COPY] key function if you change the diagnosis mode after a diagnosis is issued.



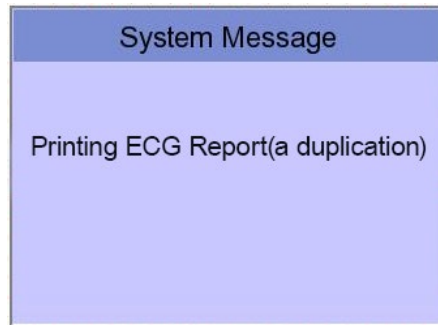
If Copy Mode Printing is called without performing an EKG recording, there would be no EKG data to copy. In this case, the following message box will be displayed:



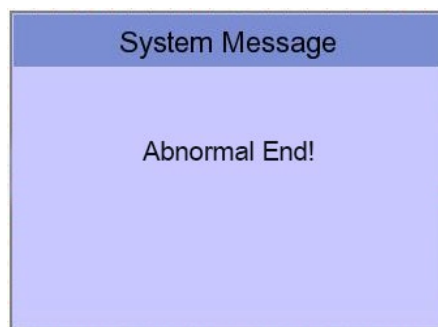
### NOTE

Copy function will become unavailable as data is considered as not existing if Long time function was set after 10-second recording or before 10-second recording.  
Copy function will become unavailable if the predetermined value of Long Time is changed.

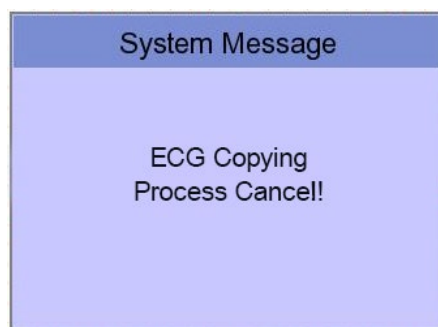
If you change the filters on a previously saved ECG, it will adapt to the new filter. When the new filter is adapted completely, it will start printing after showing the message as below.



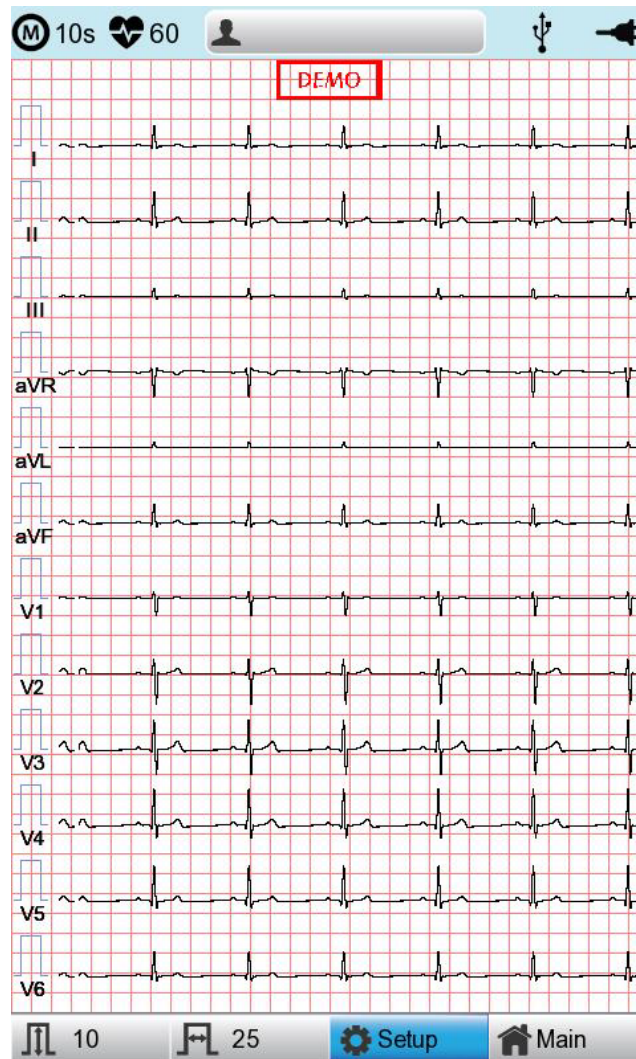
When printing is abnormally completed, the state of the system setting will be displayed after showing the message as shown below for a second.



If you want to stop the process of printing, press the 'ESC' key. Then the process will stop and you will see the ECG Main page after the message shown for a second as below.



## 11) System Setup



Choose the 'Setup' button on the initial ECG main screen to change preferences.

Setup menu consists of Basic Setup, Network Setup, Hospital Setup, ECG Setup, Record Setup and Service Setup and you can change the setting at each window. The main page shows Basic Setup.

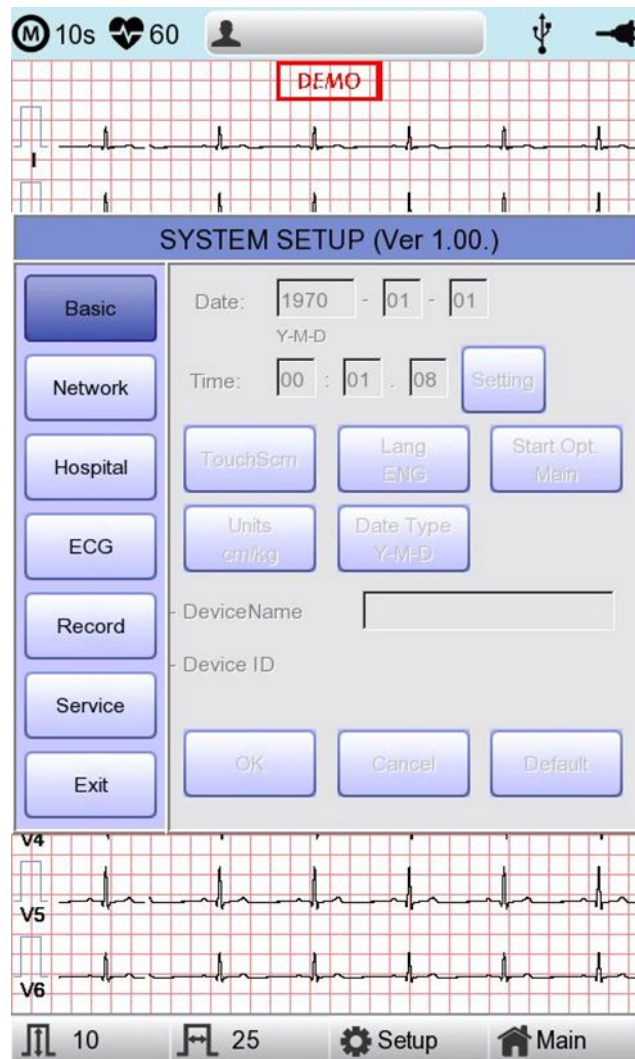
After finishing the settings, press 'OK' to save the new information or press 'Cancel' to cancel it. You can choose 'Exit' or 'ESC' button to exit from the setup menu.

'Default' button is used to default every setting.

## 11-1) Basic Setup

When choosing Basic menu at the left side of the Setup page, you will see the page for Basic Setup.

Basic Setup consists of Date, Time, Touch screen, Start Option, Unit, Date Type and Device Name menus.

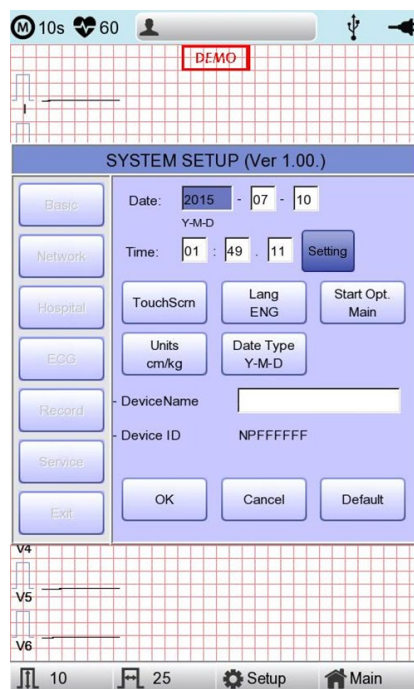


### 11-1-1) Setup date and time

After choosing the Setup menu, press the Basic button then the focus will go to the 'Date' item.

By using the touch screen or rotating the rotary switch, choose the Date (yyyy/mm/dd) or Time (hr/min/sec), then the keypad will show up. You can set up the information by using this keypad.

The Focus will go 'year → month → day → hour → minute → second' consecutively.



If you press the Setting button, you can use the NTP function to get the time from the network and the Time Zone function to set the time of the area where the equipment is installed.

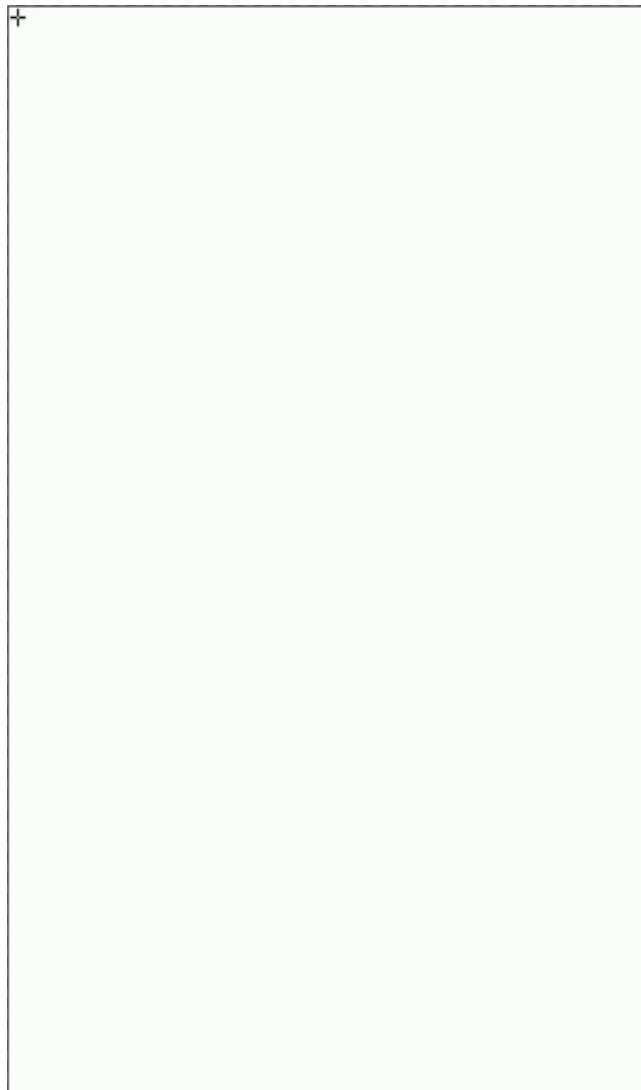
#### NOTE

- When the Time Zone setting is changed, the device is rebooted for stable operation.
- Depending on the network condition where the equipment is installed, it may take a long time for the NTP function to be activated for the first time.
- The NTP function does not work unless an exception is handled by the firewall.
- When using the NTP function, the initial time must be set to the current time. If the difference between the set time and the current time is large, the initial setting may take a long time.

### 11-1-2) Touch Setup

This is a menu to set up the coordinates of the touchpad. When selecting the 'Touch' menu at the Basic Setup page, setup page will disappear and the coordinates for setting calibration will appear as shown below. Follow the instructions shown on the screen, and then the coordinates will be set up.

Please input the information in the right place, otherwise the touchpad may not work properly.

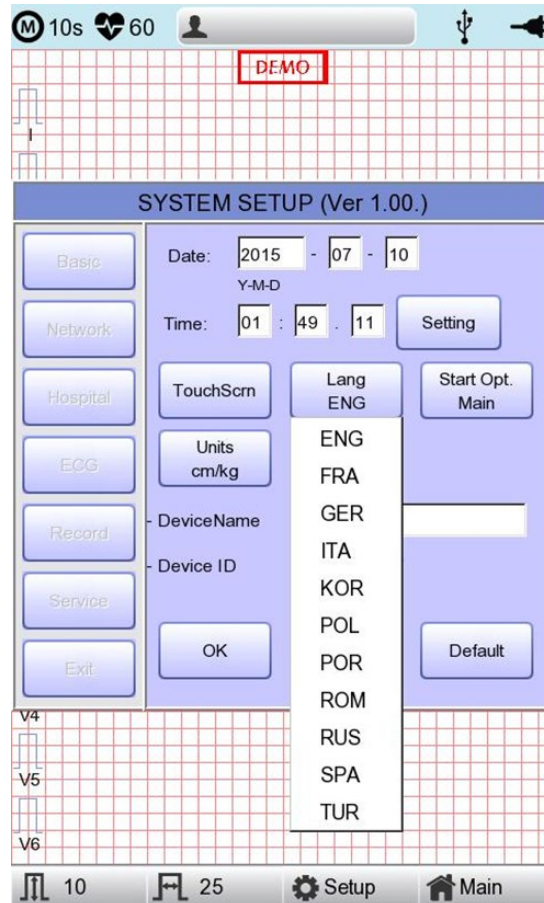
**NOTE**

When the user selects the Touch Setup menu, all windows will disappear and the touch screen setup will start. No keys will be operational until the Touch Setup is complete.

### 11-1-3) Language

when selecting 'Language menu at the Basic Setup page, you can choose the language among English, French, German, Italian, Korean, Polish, Portuguese, Rumanian, Russian, Spanish and Turkish.

Select the language you want to use and click the OK button and then you can use the service in the chosen language.



#### NOTE

Patient information previously entered will be initialized if the language preference is changed.

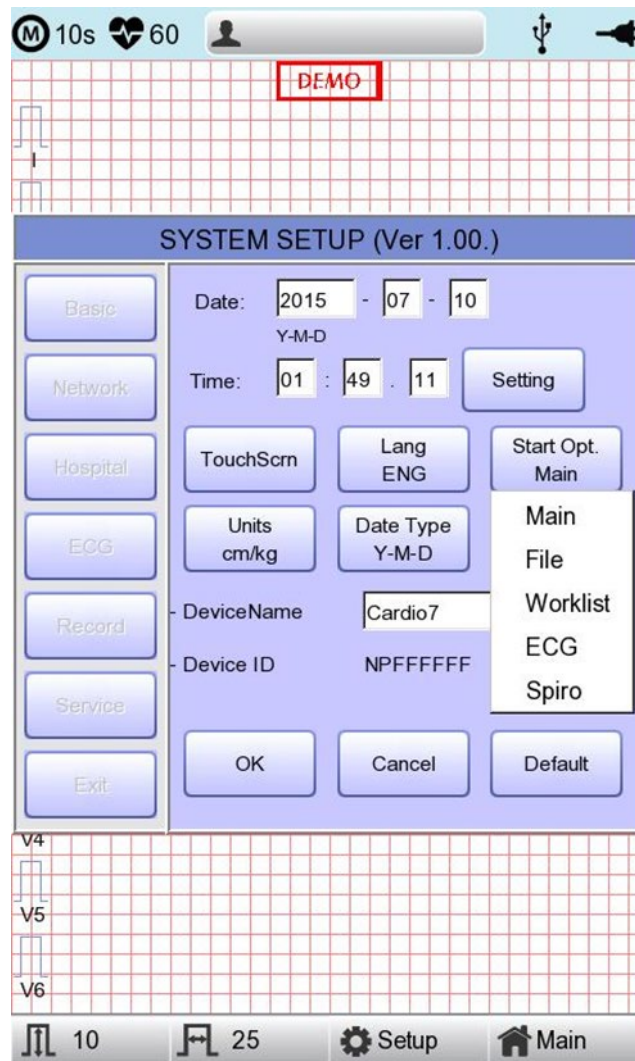
#### NOTE

If language preference is set as "KOR," only the menu on the LCD screen will be shown as Korean, whereas the output will be in English when printing out.

#### 11-1-4) Start Option

Set the initial screen that appears when the equipment is turned on.

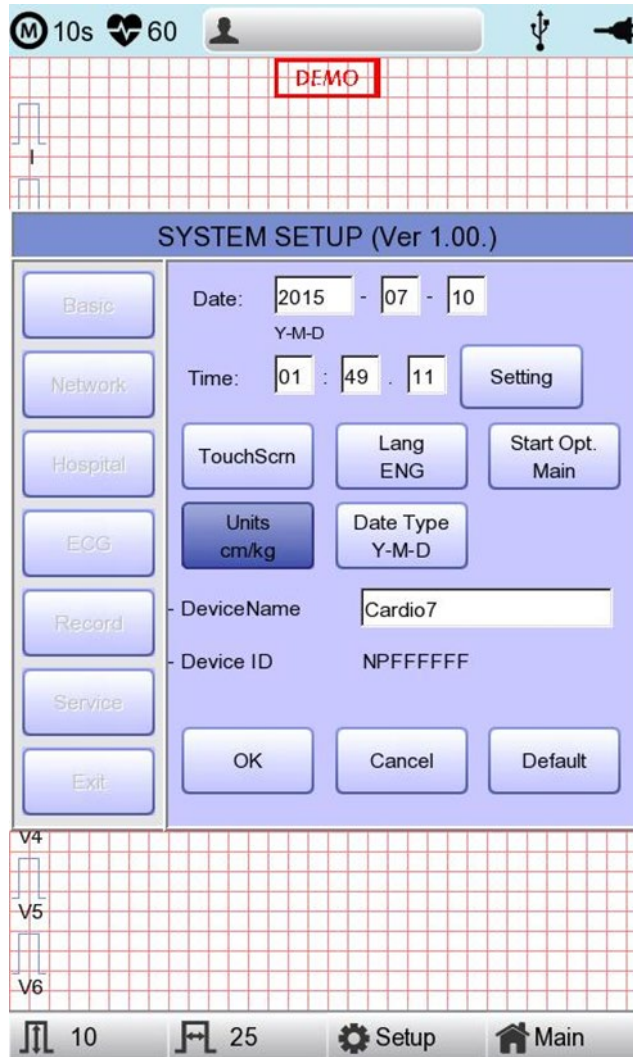
When clicking the 'Start Option' button, a small menu window will appear and you can Select the most frequently used function among MAIN, FILE, WORKLIST, ECG, SPIRO.



### 11-1-5) Units

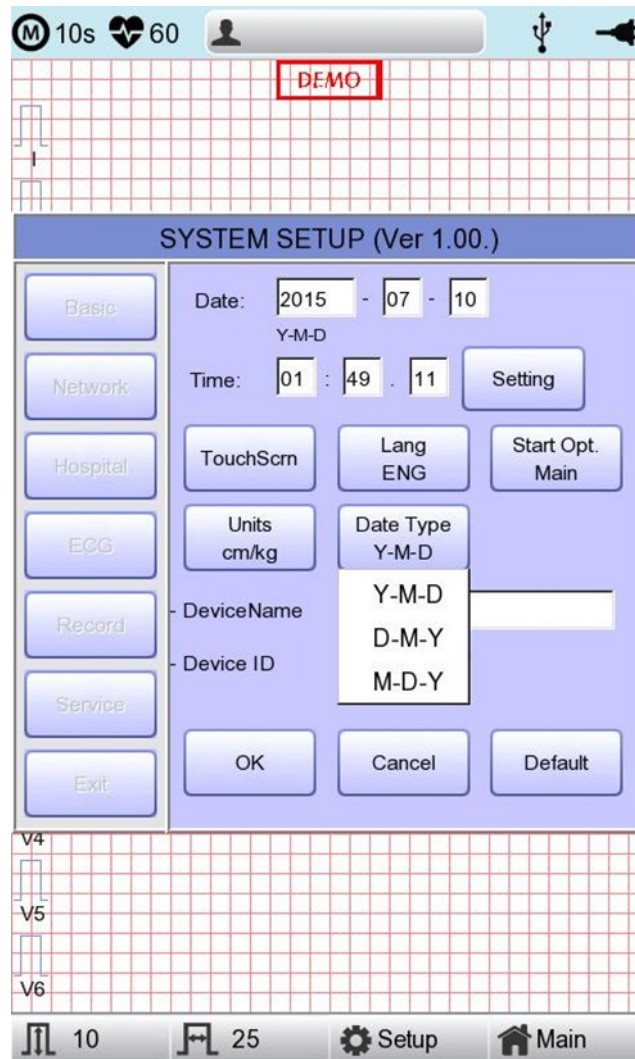
This menu is to select the units for height and weight of the patient. When you click 'Units' button, cm/kg or Inch/Lbs will be shown.

If you select Inch/Lbs unit, the patient's height information will be expressed in \*\*\* Ft(Feet) \*\*\* Inch.



### 11-1-6) Date Type

As seen in the figure below, the date format on the top of the paper can be changed while printing out monitoring and recording results if you choose 'Date Type' from the Basic Setup menu. Choose the date format to be used, and then click the 'OK' button; the date format is converted to the one selected and can be seen on the output.



### 11-1-7) Device Name Setup

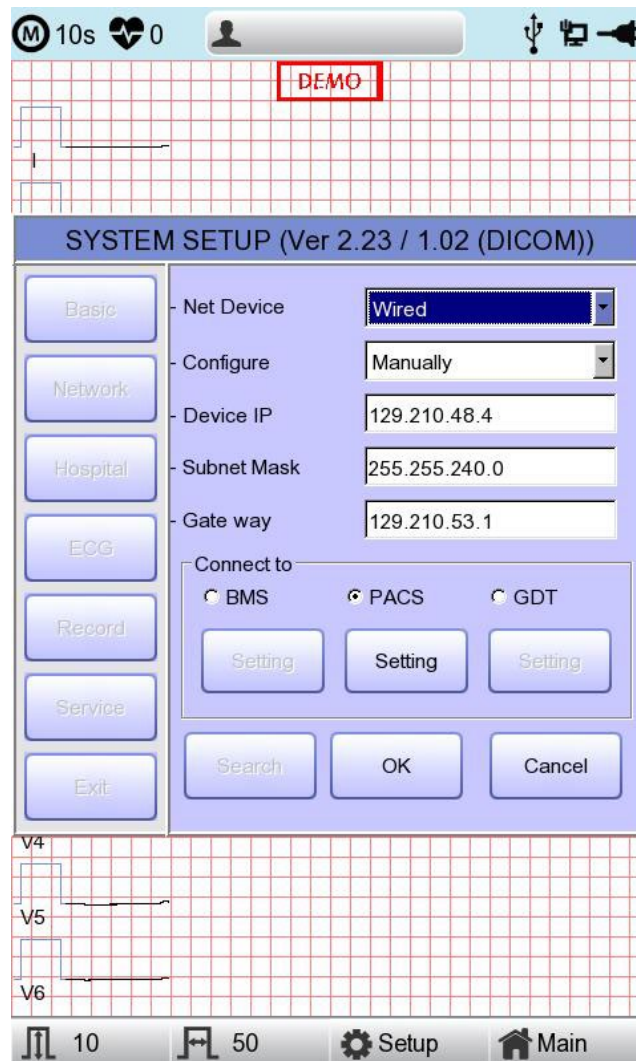
'Device Name' refers to the name of the device. The user can input the name of the device in order to distinguish devices on PC easily.

'Device ID' cannot be revised by the user as it is a unique ID of the device, and is used to identify devices on a PC. 'Device ID' is automatically set for easy identification of devices on the connected PC; therefore, it cannot be revised by user.

### 11-2) Network Setup

When connecting the equipment with LAN to interface with the outside PC, network setup is needed. Network IP is required and DNS is not used.

When selecting the Network menu at the left side of the System Setup page, Network Setup page will show up at the right side.



The mode of network connection can be selected as Wired or Wireless in 'Net Device' setup.

Automatic IP(DHCP) or fixed(Manually) can be selected through 'Configure'.

If the Configure is setup as automatic IP(DHCP), the Device IP, Subnet Mask, Gateway value is received automatically from the DHCP server on your network. If the Configure is set to manually, the user has to enter the Device IP, Subnet Mask, Gateway directly.

When selecting one of the 'Device IP', 'Subnet Mask', 'Gate Way', the keypad will show up. Then, input the information required and press 'OK' button to save or 'ESC' to cancel the information.

When selecting one of the 'Device IP', 'Subnet Mask', 'Gate Way', the keypad will show up. Then, input the information required and press 'OK' button to save or 'ESC' to cancel the information.

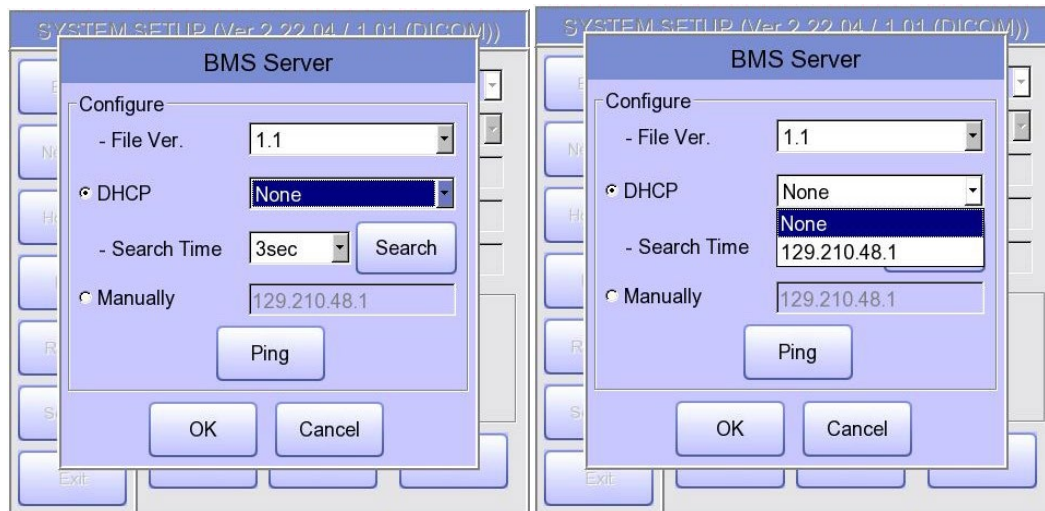
It allows selecting the server which is available to link with the equipment in the 'Connect to' menu.

After selecting the type of interlocking server, select the 'Setting' button; an appropriate setup window to the choice of server will be displayed.

<b>NOTE</b>
To connect to the PACS server, you must enter the Device IP manually. If the IP is set to DHCP, the device IP may change every time the device is turned on. If the changed IP is different from the device IP registered in the PACS server, server connection may not be made.

### 11-2-1) BMS Server Setting

IP setup on BMS Server-installed PC can be performed by choosing either Automatic IP (DHCP) or Fixed IP (Manually) in 'Configure' setup.



The patient's surname is available after changing the file version to 1.1 in the BMS Server settings.

If you change the file version, all existing patient data will be deleted.

If 'DHCP' is chosen, the IP of the BMS Server-installed PC will be shown on the input box.

Choose the IP of the PC you intend to connect as the IP of a BMS Server-installed PC;

If multiple IPs are displayed, choose one belonging to the PC to connect.

At that time, IP will be shown on the input box only if BMS Server is running on the PC.

If no IP of the intended BMS Server to connect is shown on the input box, choose

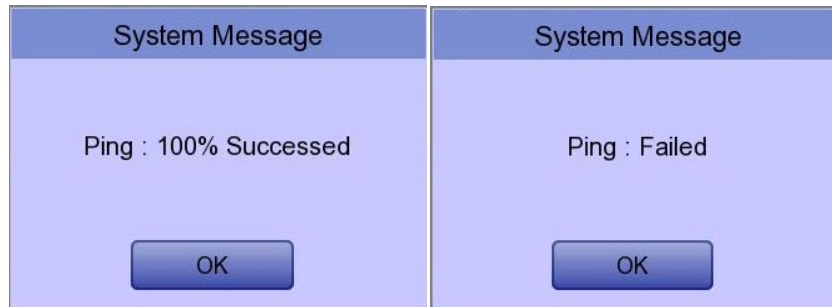
'Search' button to conduct an additional search.

If no IP of the intended BMS Server to connect is shown on the input box, choose 'Manual' mode to perform manual input.

#### NOTE

- If you change the file version, patient data and work list data will be deleted.

Upon completion of BMS Server IP setup, the Ping Test can be conducted to check successful network connection. If choosing 'Ping' button, "Ping : 100% Succeeded" message will be shown for a successful connection, whereas "Ping : Failed" message will be shown for connection failure.

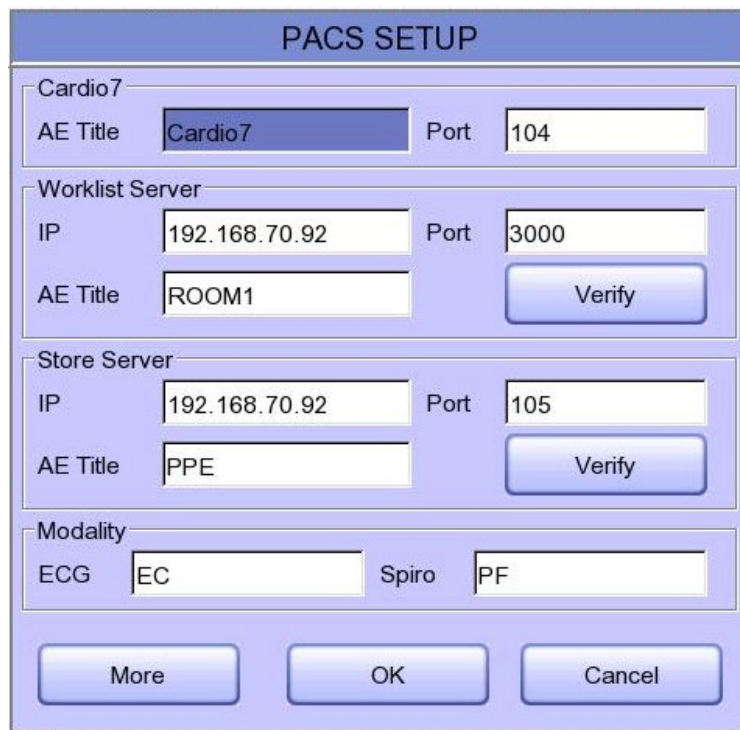
**NOTE**

- Wired usage is recommended for a BMS Server-installed PC network.
- When setting BMS Server, directly enter the IP of the BMS Server-installed PC by selecting "Manually" if searching with DHCP has failed.

### 11-2-2) PACS Server Setting

When selecting the PACS Server, the additional information should be set through the Settings Menu.

The screen for related settings such as the AE Title, IP and Port of Cardio7, Worklist Server and Store Server will appear.



The image shows a 'PACS SETUP' dialog box with the following sections:

- Cardio7**: AE Title: Cardio7, Port: 104
- Worklist Server**: IP: 192.168.70.92, Port: 3000, AE Title: ROOM1, and a Verify button.
- Store Server**: IP: 192.168.70.92, Port: 105, AE Title: PPE, and a Verify button.
- Modality**: ECG: EC, Spiro: PF

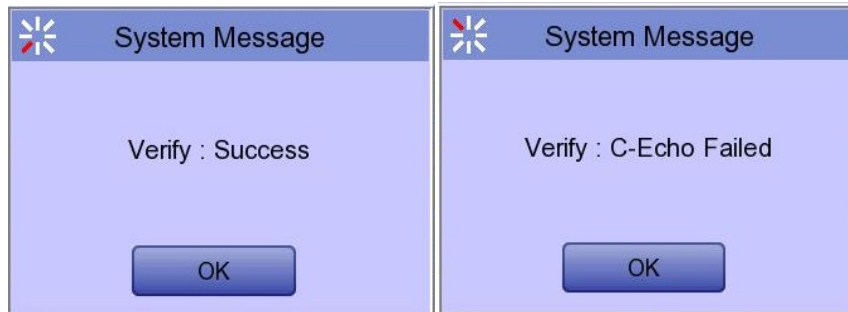
At the bottom are buttons for 'More', 'OK', and 'Cancel'.

When the input window of each item is selected, the keyboard window will appear; Enter the applicable contents.

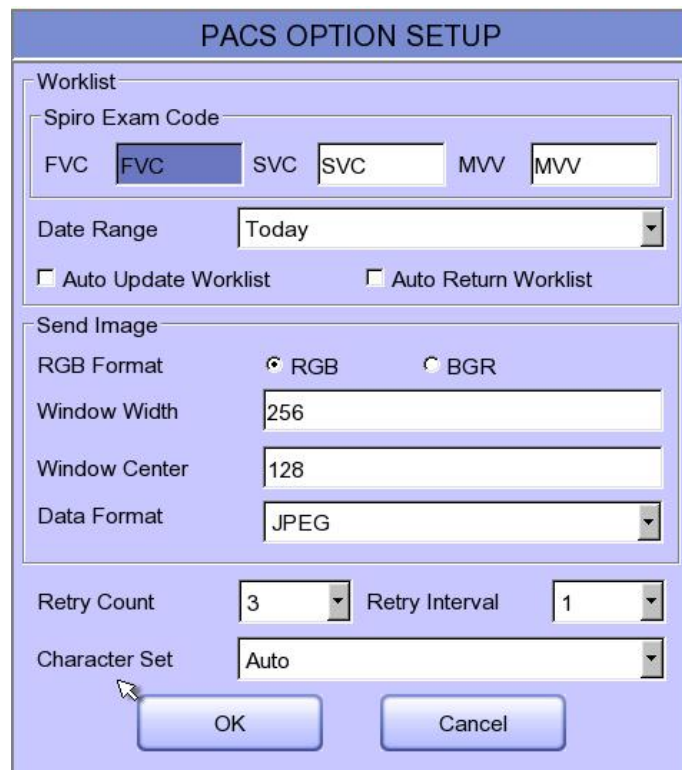
When entry is completed, click the "Verify" button so that the connection between the Worklist Server and the Store Server can be confirmed.



When successful, the "Verify : Success" message will appear; when it has failed, "Verify : C-Echo Failed" will appear.



Set the PACS option by pressing the More button when connection to the server is confirmed.

A screenshot of the 'PACS OPTION SETUP' dialog box. The dialog has a blue title bar. It is divided into several sections: 'Worklist' with 'Spiro Exam Code' (FVC, SVC, MVV), 'Date Range' (Today), and checkboxes for 'Auto Update Worklist' and 'Auto Return Worklist'; 'Send Image' with radio buttons for 'RGB' and 'BGR', and text boxes for 'Window Width' (256), 'Window Center' (128), and 'Data Format' (JPEG); 'Retry Count' (3) and 'Retry Interval' (1); and 'Character Set' (Auto). At the bottom are 'OK' and 'Cancel' buttons.

### Spiro Exam Code

Enter the Exam Code of FVC, SVC and MVV for the Spiro test.

## Data Range

The range of dates when the worklist is brought can be set at the Worklist Server.

You can choose appropriate one from the options such as "Today," "Yesterday ~ Tomorrow", "One Week" and "A Week ago".

For today (today-today), both the start and end dates are set to today, and for today (today-blank), only the start date is set to today to get the worklist.

The screenshot shows the 'PACS OPTION SETUP' dialog box. The 'Date Range' dropdown menu is open, displaying the following options: 'Today', 'Yesterday ~ Tomorrow', 'One Week', and 'A Week ago'. The 'Auto Update Worklist' checkbox is currently unchecked. Other visible settings include: Spiro Exam Code (FVC, SVC, MVV), Window Width (256), Window Center (128), Data Format (JPEG), Retry Count (3), Retry Interval (1), and Character Set (Korean(EUC)).

## Auto Update Worklist

If you tick the Auto Update Worklist, the Worklist update will be run automatically whenever you enter the Worklist screen.

## Auto Return Worklist

If you tick Auto Return Worklist, data will be transferred to the PACS Server and the Worklist screen will re-appear automatically by using the Exam button after selecting the patient to measure, or by using the NETWORK key or AUTO key after selecting the patient to measure.

## RGB Format

Select the RGB Format when converting the image to be transferred to the PACS Server.

The basic setting shall be "RGB"; if the Grid Color of the transferred file appears as green, it will be converted to the red color when the "BGR" is set.

### Window Width / Window Center

Set the Window Width and the Window Center for the file to be transferred to the PACS Server. If the image of the transferred file appears blurred, check the Window Width and Center values which the PACS Server supports, and enter them.

### Data Format

Set the data format for the file to be transferred to the PACS Server.

You can select either "JPEG," "PDF" or "RAW" after checking the format supported by the PACS Server.

The screenshot shows the 'PACS OPTION SETUP' dialog box. It is divided into several sections:

- Worklist:** Spiro Exam Code (FVC, SVC, MVV), Date Range (Today), and checkboxes for Auto Update Worklist and Auto Return Worklist.
- Send Image:** RGB Format (RGB selected), Window Width (256), Window Center (128), and Data Format (JPEG selected).
- Retry Count:** 3
- Character Set:** Auto

Buttons for 'OK' and 'Cancel' are located at the bottom of the dialog.

### Retry Count

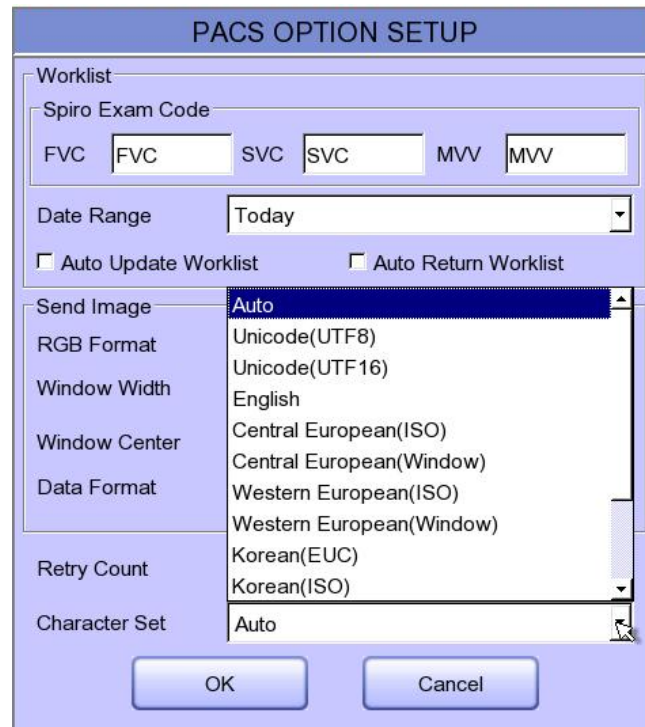
Select the number of Retransmission attempts when a communication error occurs during transfer of data to the PACS Server.

### Retry Interval

Select the interval for Retransmission attempts when a communication error occurs during the transfer of data to the PACS Server.

### Character Set

By selecting the Character Set, multiple selections of language are available; it should be selected according to the character set in order to present contents such as patient information by language when transferring a DICOM file to the PACS Server.



Upon the completion of each setting, press the 'OK' button to save the changes or push the 'Cancel' button or the 'ESC' button of the Operating Panel to cancel them.

### 11-2-3) GDT Setting

When selecting GDT, it should be set additional information through the Setting menu.

It shows the menu screen for related settings such as Work type, GDT Directory, Component name, File name, and Image type.

**GDT SETUP**

**Work Type**  
 Server       Client

**Directory**  
 Directory Path :  
  
 User ID :   
 Password :   
 Date :

**Component**

**Import [EMR,HIS]**  
 Name :   
 Short Name :

**Export [Cardio7]**  
 Name :   
 Short Name :

**File Name**  
 Type :   
 File Name :

**Image**  
 JPEG       PDF       DICOM

OK      Cancel

#### Work Type

Set the GDT operation of the equipment.

- Server: Cardio7 receives requests and commands.
- Client: Cardio7 sends requests and commands.

#### Directory

Enter the type format in which the shared folder information and date information to be used by the GDT protocol.

**Component**

For use GDT protocol, enter the EMR name and abbreviation and the name of Cardio7 and abbreviation.

**Short Name**

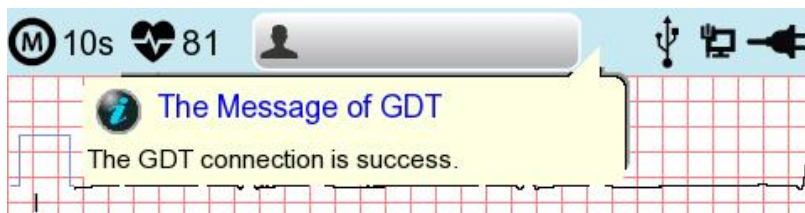
Select the name form of the file to be shared by the GDT protocol.

**Image**

Select the image format of the data file to share with the GDT protocol.

Touch the input field of each item and enter values using the keypad window.

If you finish entering the inputs correctly, a connection success message is displayed at the top of the screen.

**11-2-4) WEB Setting**

When selecting Web transmission, additional information must be set through the Setting menu. The screen for related settings such as DNS Server, URL, ID, PW, Path appears.

A screenshot of a "Web Server" settings screen. The screen has a blue header with the title "Web Server". Below the header, there are five input fields: "- DNS Server" (containing "8.8.8.8"), "- URL", "- ID", "- P.W", and "- Path". To the right of the "- ID" and "- P.W" fields is a "Verify" button. At the bottom of the screen are "OK" and "Cancel" buttons.

**DNS Server**

The IP of the server that supports the domain name system.

**URL**

Web address to access.

**ID**

User ID to be used in the web to be accessed.

**PW**

User password to use on the web to be accessed.

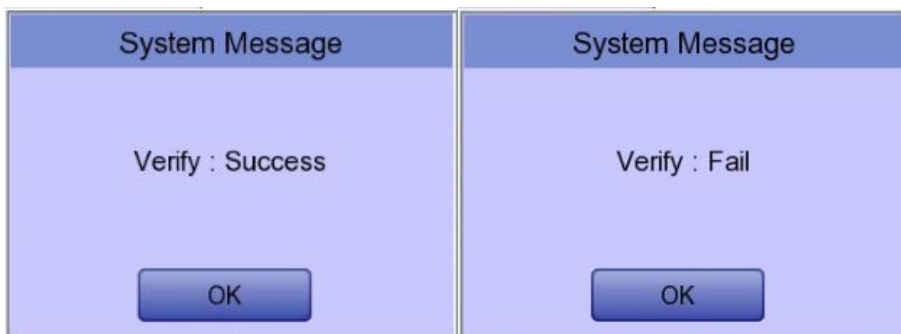
**Path**

Path within the server to which to send the file

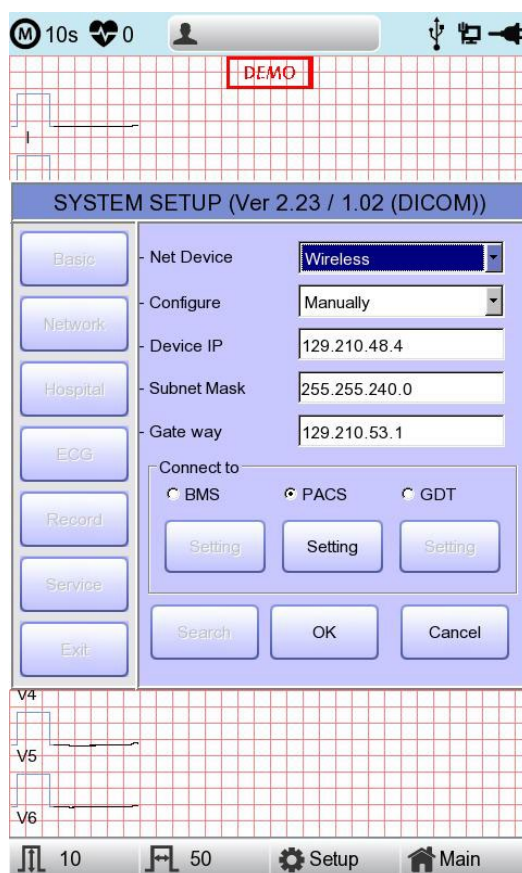
If you select the input window of each item, a keyboard window appears, and you can enter the content.


After entering, you can check the connection between Worklist Server and Store Server by pressing the "Verify" button.

The message "Verify: Success" is displayed on success, and the message "Verify: Fail" on failure.



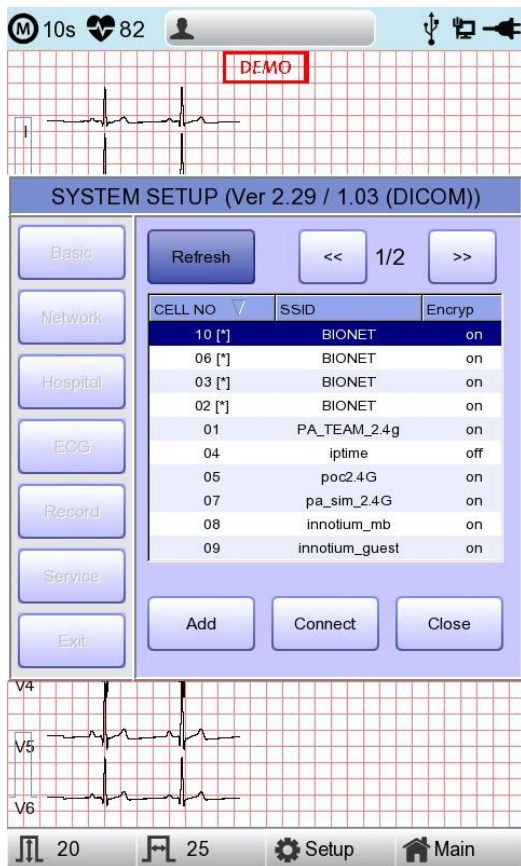
### 11-2-5) Wireless Network Setting



- 1) Connect the USB Wi-Fi dongle to the USB port of Cardio7, and check whether or not the wireless icon (  ) appears in the Status bar on the top of the screen.
- 2) Navigate to System Setup -> Network, and Set the Device as "Wireless".  
When selection is done properly, the "Survey" button on the bottom will be activated.
- 3) Select the "Search" button to search for the AP.  
The AP is to be searched automatically when the "Search" button is pressed;  
the searched AP will appear in the list upon the completion of the search.

#### Specifications of Wireless Network USB Adapter Support

Company Name	Product Name
ipTIME	N100mini
	N150UA
	N150U
TP-LINK	TL-WN725N



- **Refresh** : AP re-searching
- **<<** : Page up
- **>>** : Page down
- **Connect** : Attempting to connect
- **Close** : Closing the window
- **Add** : Hidden Wi-Fi connection

- 4) Select the AP to be connected by using the rotary key or touching. Click the "Connect" button. At that time, the security key input window will appear if the "Encrypt" field is "On".

**Add Network**

- Network Name :  
BIONET

- Security :  
WPA/WPA2-Personal

- Password :

OK Cancel

If you want to connect to Hidden Wi-Fi, click the Add button and manually enter the network name before proceeding.



The screenshot shows a dialog box titled "Add Network". It has a light blue background and a darker blue title bar. The dialog contains the following elements from top to bottom:

- A label "- Network Name :" followed by a white text input field.
- A label "- Security :" followed by a blue button with the text "WPA/WPA2-Enterprise".
- A label "- Identity :" followed by a white text input field.
- A label "- Password :" followed by a white text input field.
- At the bottom, there are two buttons: "OK" and "Cancel".

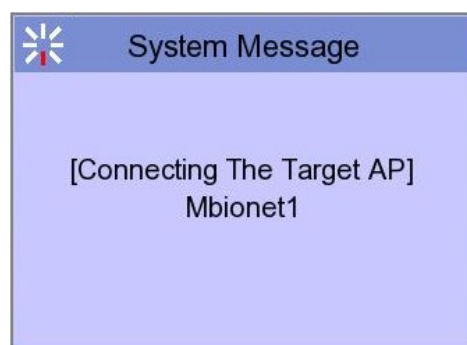
#### NOTE

Search for an AP and set up a security key to use a wireless network.

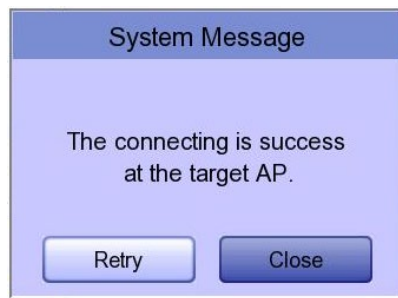
If the AP to connect to does not require authentication, you are automatically connected with no need to enter the security key.


Automatically connected APs without security keys do not guarantee communication security

- 5) After clicking the Key Value input line by using the rotary key or touching, enter the security key.
- 6) Upon the completion of input, click the "OK" button; Connection will be attempted and the message describing the connection status will appear.



- 7) When the message reporting a proper connection appears, click the "Close" button.



When connection is successful, the wireless icon on the status bar at the bottom of the screen will be changed into .

- 8) If connection fails, connection can be re-attempted by pressing the "Retry" button. If connection keeps failing, check the AP and the USB-TO-WLAN status.



- 9) When connection with the AP is successful, set the Device IP, Subnet Mask, Gateway, etc. by selecting manually or Configuring with DHCP. Refer to the Network Setup part of the User Manual for more details.

**NOTE**

Bionet recommends using English alphabet to name the wireless network (SSID) of the AP. Inputs in Korean or other languages can be shown broken or as strange characters.

**NOTE**

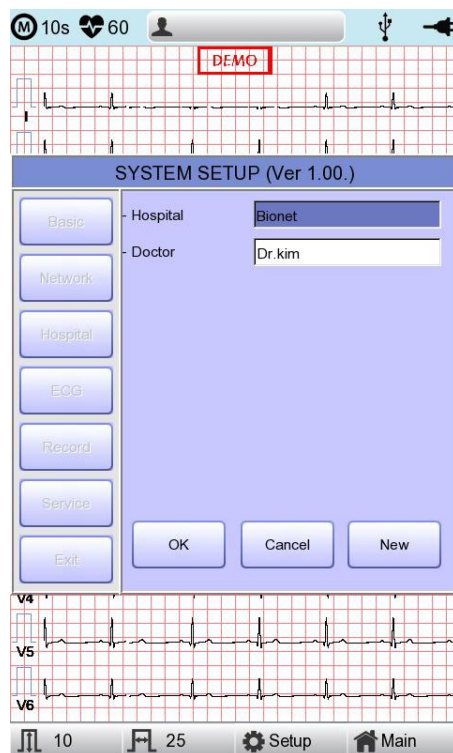
- When using a general AP, it is recommended to connect up to 8 devices to the same network.
- Due to the nature of wireless connection, connection may not be stable depending on the environment.

### 11-3) Hospital Setup

When selecting the 'Hospital' menu at the left side of the Setup page, Hospital Setup page will show up at the right side.

You can input the names of the hospital and doctor.

When clicking the area to input the information, the keypad will show up. Then you can input the information required and press OK button to save or ESC to cancel the information.



### 11-4) ECG Setup

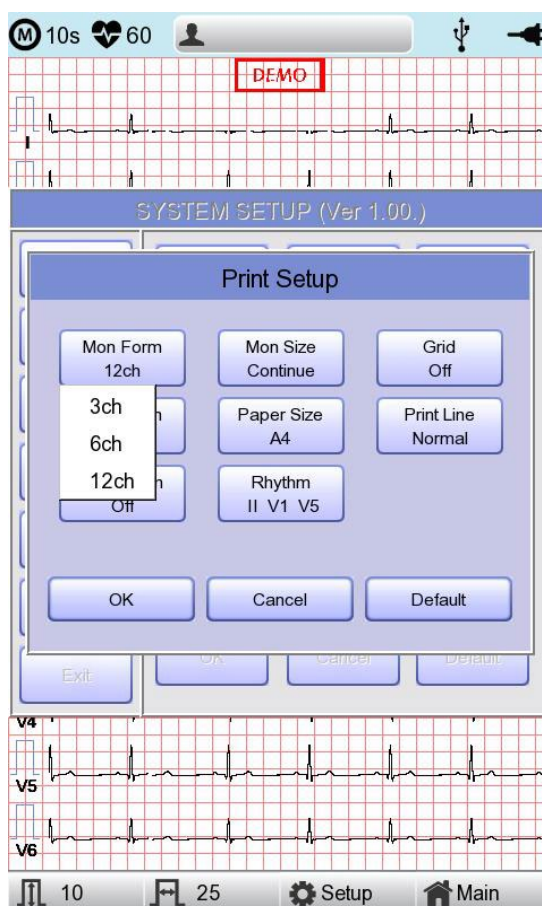
When selecting the 'ECG' menu at the left side of the Setup page, ECG Setup page will show up at the right side.



### 11-4-1) Printing channel setting [Print Setup]

#### [Monitoring Form]

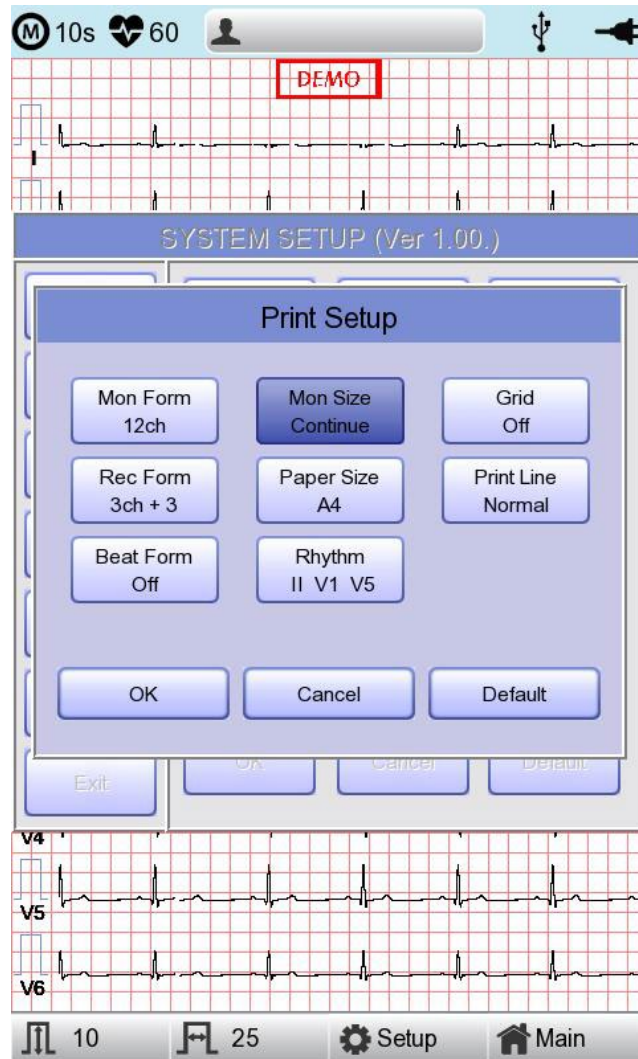
Set up real time-printout form. Click 'Mon Form,' and then a POP-UP window for channel list will be displayed. Default is set as '12CH'.



- 3CH printing: To print 3 channels at the same time (I ~ III / aVR ~ aVF / V1 ~ V3 / V4 ~ V6) If you want to change the channel, press 'RHYTHM' on the control panel.
- 6CH printing: To print 6channels at the same time (I ~ aVF / V1 ~ V6) If you want to change the channel, press 'RHYTHM' on the control panel.
- 12CH printing: To print 12channels at the same time (I ~ V6)

#### NOTE

To change the printing lead with the RHYTHM key in 3CH and 6CH settings, the Rhythm Size must be set to Continue.

**[Monitoring Size]**

Sets the report size of the real-time print.

- Report: About 10 seconds of data are printed in Report format.
- Continue: The pre-set lead is continuously printed until you press the [ESC] key on the control panel.

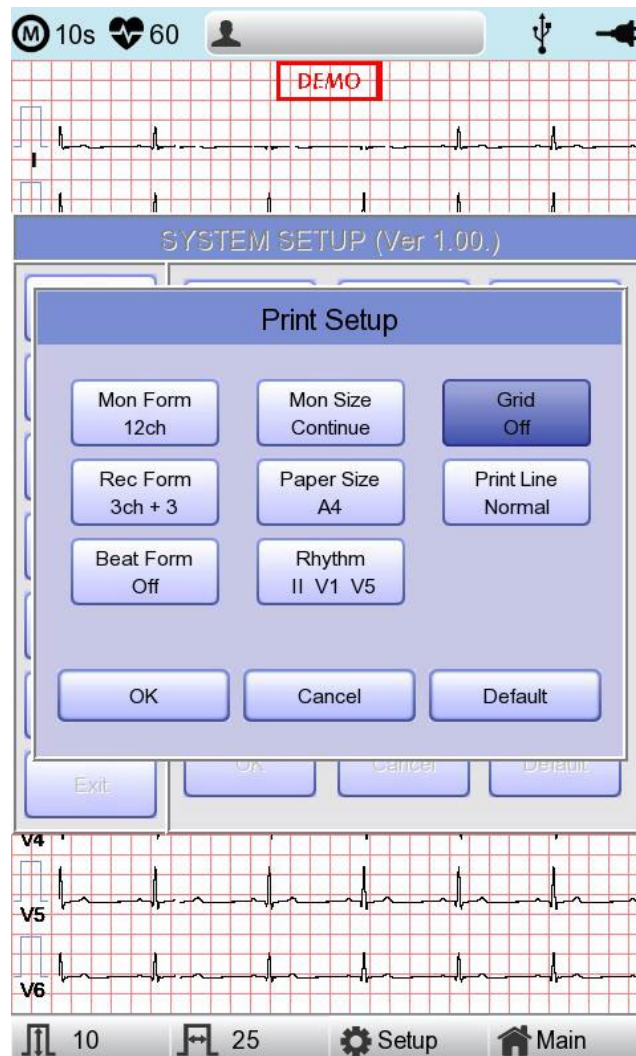
**NOTE**

When Rhythm Size is set to Report, the printing speed is fixed at 25.0mm/sec

**[Grid]**

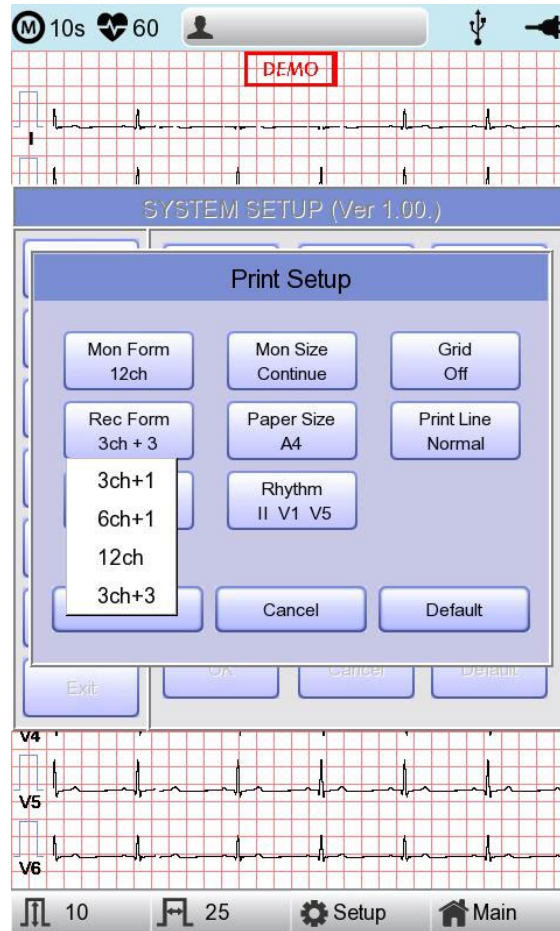
If general fax paper is used for printout, it needs to be marked with a grid. A 5mm X 5mm grid must be in a solid line with the point mark on the 1mm X 1mm location. If using standard ECG recording paper instead of general fax paper(thermal paper), undo the grid marking setup as the recording paper will already have it.

The grid marking setup can be done using output format selection mode. Press rotary key or touch the intended field to select among the Grid selection items, and then the setup will be modified as ON or OFF. If ON, the grid marks will be printed out; if OFF, it will not be printed out.



**[Recording Form]**

You can set up the recording form.



If you choose the 'Rec Form' menu, a small POP-UP menu will appear below; once you choose either 3CH+1, 6CH+1, 12CH or 3CH+3, the POP-UP menu will disappear. The default is '3CH+3'.

- '3CH+1': 10-second ECG will be recorded as I, II and III for the first 2.5 seconds, aVR, aVL and aVF for the next 2.5 seconds, V1, V2, V3 for the next 2.5 seconds and V4, V5, V6 for the next 2.5 seconds. 1 channel of rhythm will be recorded for 10 seconds at the bottom.
- '6CH+1': 10-second ECG will be recorded as I, II, III, aVR, aVL and aVF for the first 5 seconds and V1, V2, V3, V4, V5 and V6 for the next 5 seconds. 1 channel of rhythm will be recorded for 10 seconds at the bottom.
- '12CH': 12-channel rhythm will be recorded as I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5

and V6 at the same time for 10 seconds.

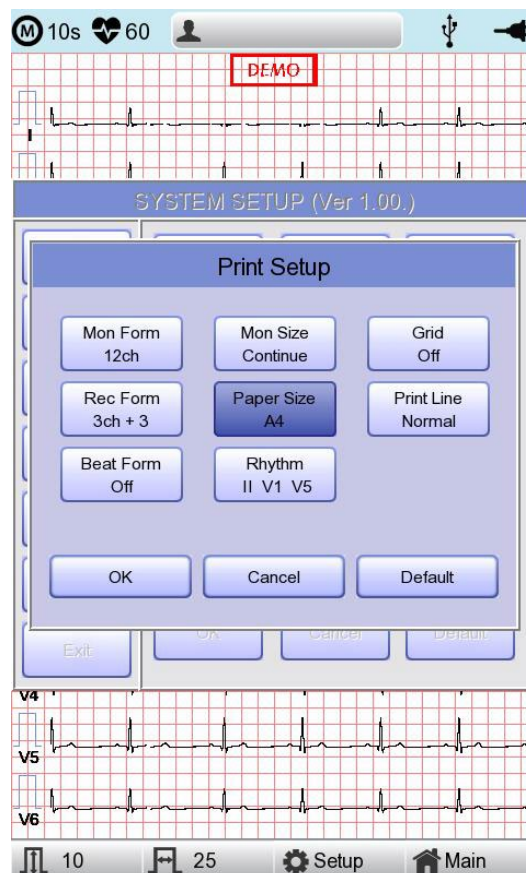
- '3CH+3': 10-second ECG will be recorded as I, II and III for the first 2.5 seconds, aVR, aVL and aVF for the next 2.5 seconds, V1, V2, V3 for the next 2.5 seconds and V4, V5, V6 for the next 2.5 seconds. 3 channels of rhythm will be recorded for 10 seconds at the bottom.

The set value will be displayed on the screen, and when you choose '3CH+1', 3 Channels + 1 Rhythm Report will be shown at the top of the printing form, '6CH+1' for 6 Channels + 1 Rhythm Report, '12CH' for 12 Channels Rhythm Report, '3CH+3' for 3 Channels + 3 Rhythm Report will be shown.

### [Paper Size]

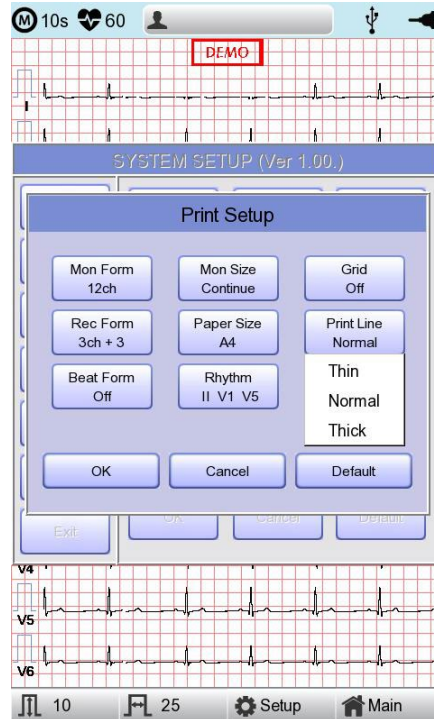
You can set up the paper size. When you click the 'Paper Size' menu, 'A4' will be selected and when clicking it again, 'Letter' will be selected. Default is set as 'A4'.

- 'A4': to output at 297mm for A4 Size printout.
- 'Letter': to output at 279 mm for Letter Size printout.

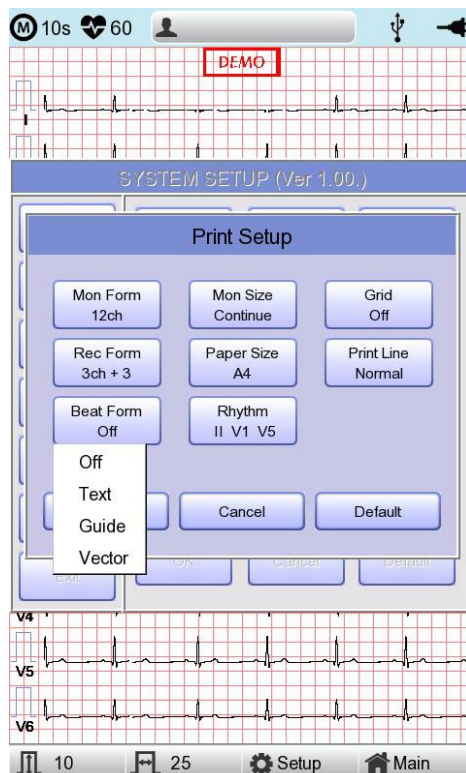


**[Print Line]**

You can set the line thickness of the printouts. Three setting options are available; "Thin", "Normal" and "Thick".

**[Beat Form]**

You can set up the additional beat report printing.



When you select the 'Beat Form' menu, a small POP-UP menu will appear at the bottom and it will disappear when choosing OFF, Text, Vector or Guide.

Default is set as 'OFF'.

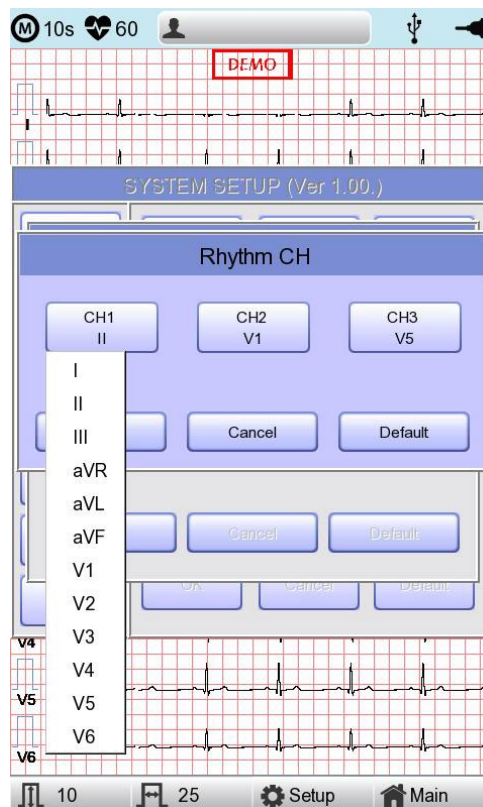
Beat report will be attached to the printing form of channels of '3CH +1', '6CH +1', '12CH' and '3CH +3'. It will record every important result by marking the representative waveform of each form.

### [Rhythm]

You can set up the rhythm leads for printing out the diagnosis of 3CH+1, 6CH+1, 3CH+3 and Long Time(1,3,5,10 Minute). You can choose 3 rhythm leads and when '3CH+3' is chosen, you can use all of the 3 leads, while when '3CH+1', '6CH+1' or 'Long Time' is chosen, you can use the first value only.

Default is set as 'II, V1, V5', so when 3CH+1, 6CH+1 or Long Time is chosen, you can use the lead 'II' and 3CH+3 for lead 'II, V1, V5'.

If you choose 'Rhythm' menu, 'Rhythm Channel' window will be displayed as shown below.

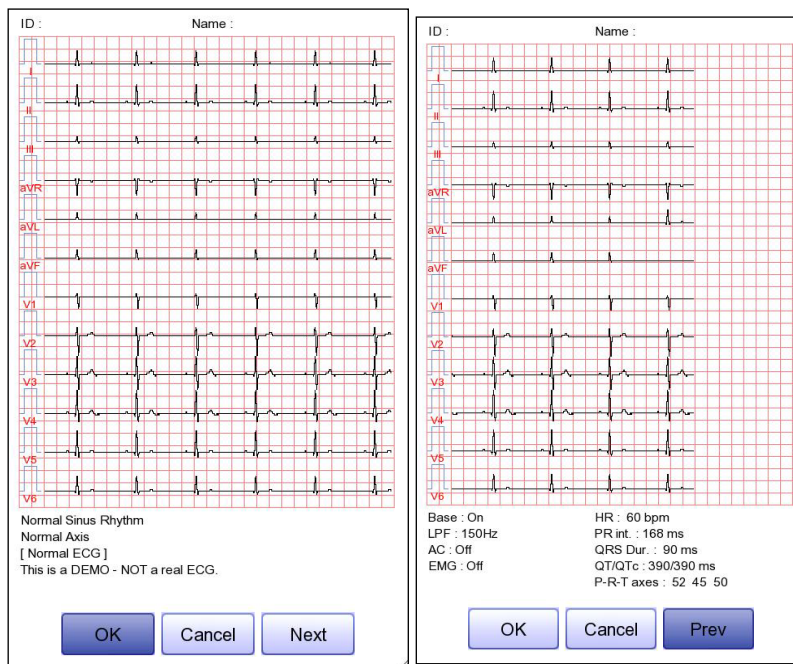
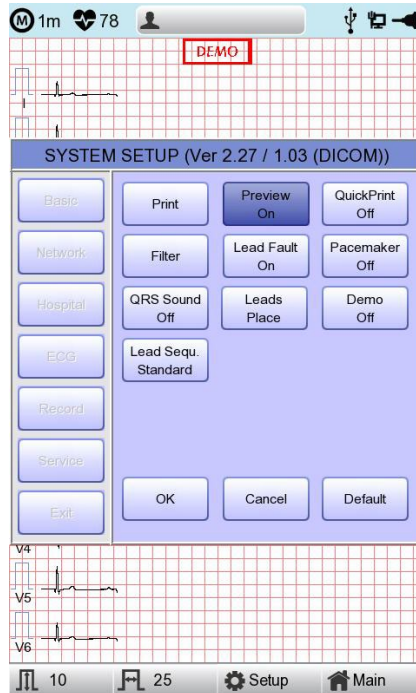


At that time, select either the 'CH1', 'CH2' or 'CH3' menu; and then choose one from Lead I ~ V6 in the select menu.

### 11-4-2) Preview

After performing measurements by using keys such as RECORD, AUTO and NET, the device can automatically show the outcome to the user. This function can be turned On or Off in this window.

When the preview setting is set to "On", the "Preview" screen will appear following data collection with RECORD, AUTO and NET keys. While "Preview" screen is showing, the user can perform print, save or transmit the data after clicking [OK], or no action after selecting [Cancel]

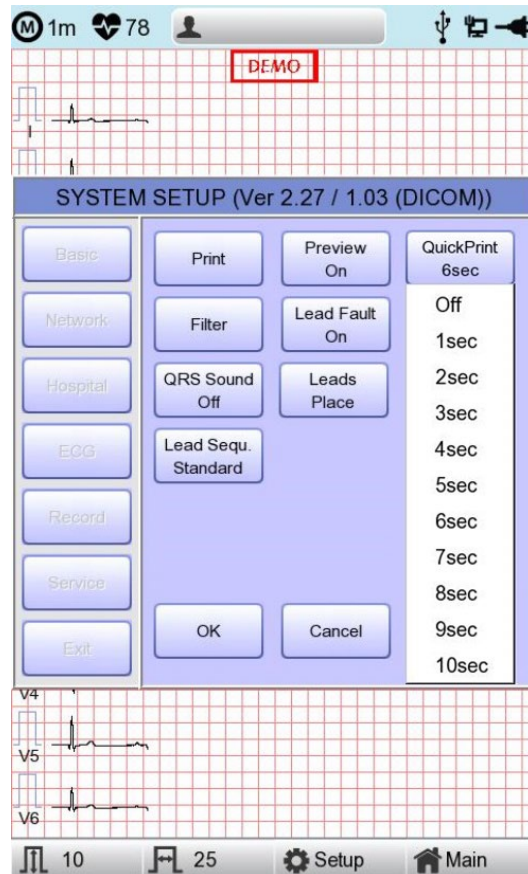


- The first page: ECG 0 - 6 seconds signal data, ID, Name, and Diagnosis
- The next page: ECG 6 - 10 seconds signal data, ID, Name, Filter setup, Rhythm parameter values

<b>NOTE</b>
The preview screen will be shown with output speed set to 25mm/sec. The preview screen is available for 10-second recording only.

### 11-4-3) Quick Print

Set the Quick Print options. Since the data pre-saved for a set amount of time (0-10 seconds) is used, it takes less time to acquire data, reducing time to providing data.



#### NOTE

- With the Quick Print option set, touch the ON button when the signal stabilizes. Since the data pre-saved for a set amount of time is used, diagnosis and printing may be affected unless the saved data is stabilized.
- Quick Print option is available only for 10-second recording. It cannot be used for long-term (1 minute, 3 minutes, 5 minutes, 10 minutes) recordings.

#### 11-4-4) Filter Setup

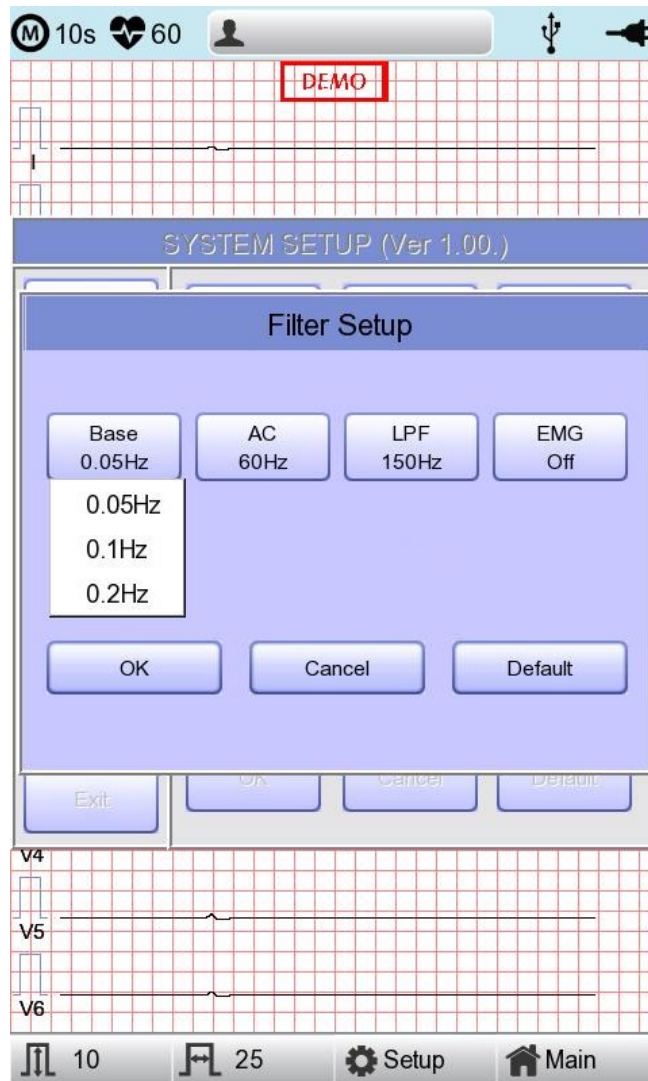
The signal output generated by the device may contain extra unwanted signals in addition to the EKG wave such as AC noise, baseline drift caused by respiration, noise generated by an electrical field nearby, etc. Applying filters could help to reduce or remove those unwanted signals from the output of the device.

To change filter information, enter the Filter Setup Menu either by moving the selection block over and select it using the rotary key or by touching the menu on the touch screen.



Upon selection, the Filter Setup menu, shown below, will appear. Use either the rotary key or touch screen to navigate and select menu items to edit. After editing, OK must be selected in order to apply the changed value.

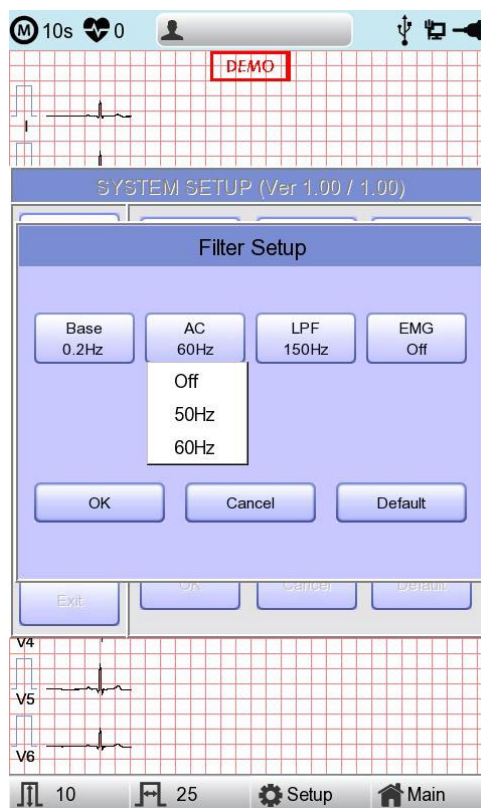
Baseline drift is caused by the patient's breathing. It can be seen as ECG signals being overlapped on a large parabola. The Baseline filter provides 0.05Hz, 0.1Hz and 0.2Hz, and its set values will appear as Base:0.05Hz, Base:0.1Hz and Base:0.2Hz at the bottom of the Output Form.



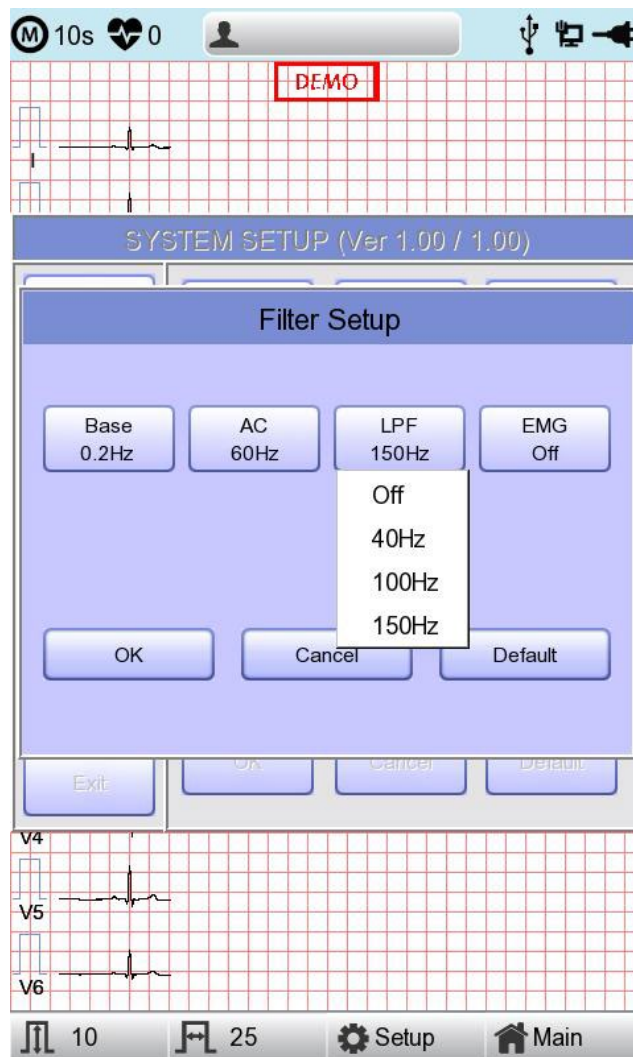
There are three types of an AC power noise filter; 60Hz, 50Hz and OFF. When set to OFF, the filter will not be applied. If the filter is set to 50Hz or 60Hz, then the AC filter will remove 50Hz or 60Hz power noise correspondingly. In the U.S., the AC filter should be set to 60Hz. Check the properties of your power source before setting AC filter properties.

Under battery power, there would be no AC noise being generated. In this case, please set the AC filter setting to OFF so that output signal would not be distorted.

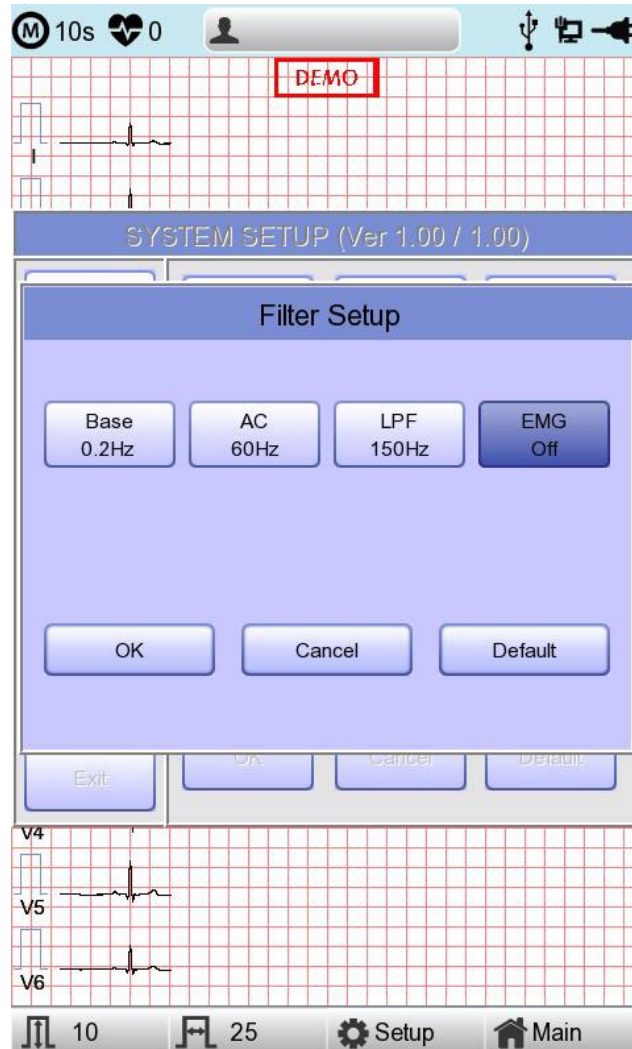
The status of the AC filter can be checked on the bottom part of the printout - indicating AC 60Hz, AC 50Hz or AC OFF



If the recorded EKG signal contains a lot of noise, Low Pass Filter (LPF) may help to clear it. For Low Pass Filter, 40Hz, 100Hz, 150Hz and OFF option is offered. Here, 40Hz option means the filter will remove any unwanted signal with frequencies above 40Hz. Low Pass Filter values will appear on the bottom of the printout form; if LPF setting is OFF then as LPF: Off; if the LPF setting is 40Hz then as LPF: 40Hz; if LPF setting is 100Hz then as LPF: 100Hz; if LPF setting is 150Hz, then as LPF: 150Hz.



Select 'ON' when applying 'EMG' filter; otherwise, select 'OFF.' Setup values will be shown on the bottom of the printout form as 'EMG: On' or 'EMG: Off' when applying the filter.



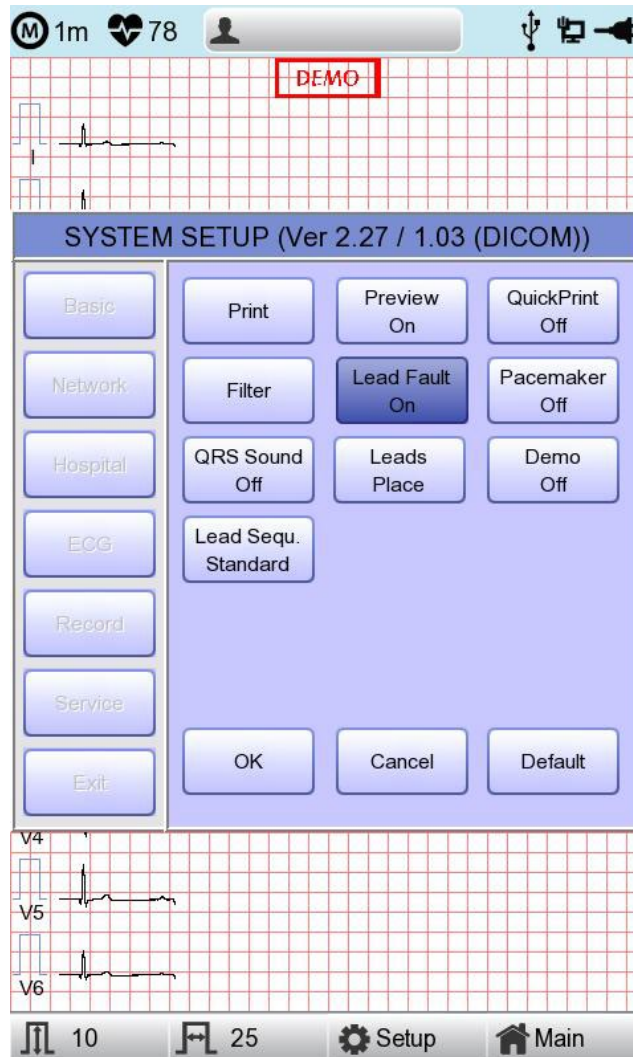
#### NOTE

Applying filters may distort the original signal. Therefore, the proper use when the recording signal is in bad condition can reduce ECG signal distortion.

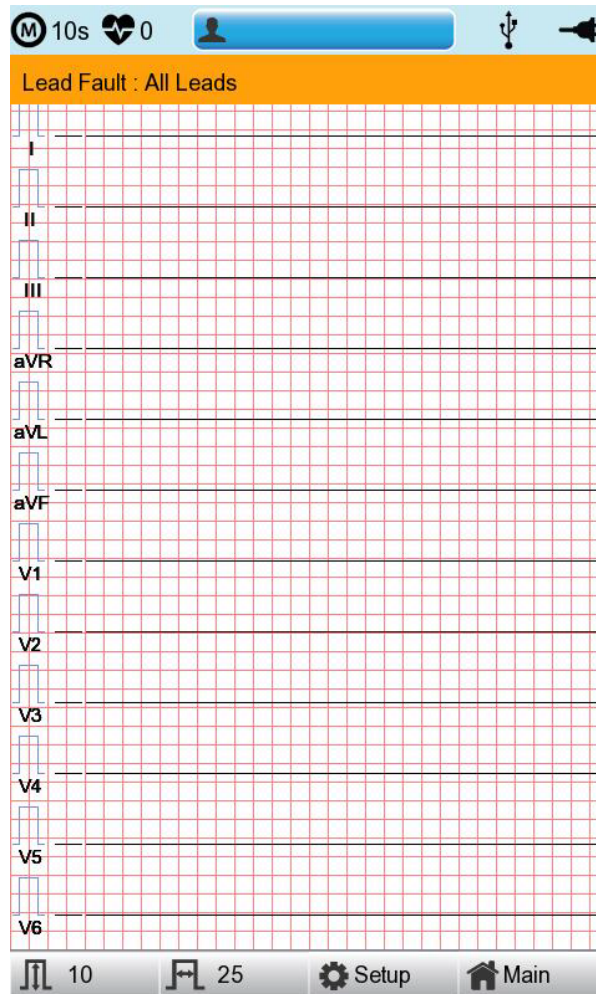
Referentially, it is recommended to apply the Baseline Drift filter and AC filter all times and that the Near Field filter is used properly. It is also recommended that the LPF be set to 150 Hz for diagnostic outputs.

## Lead fault Signal Display Setting

When the connection between the patient and leads is improper, lead fault can occur. In that case, you can choose whether to have the lead fault message on the ECG Main page or not. Selecting 'Lead Fault' menu will switch between ON and OFF in the menu, with ON turning on the message display and OFF switching off the message display.



The following message for Lead Fault will be shown with affected channels:



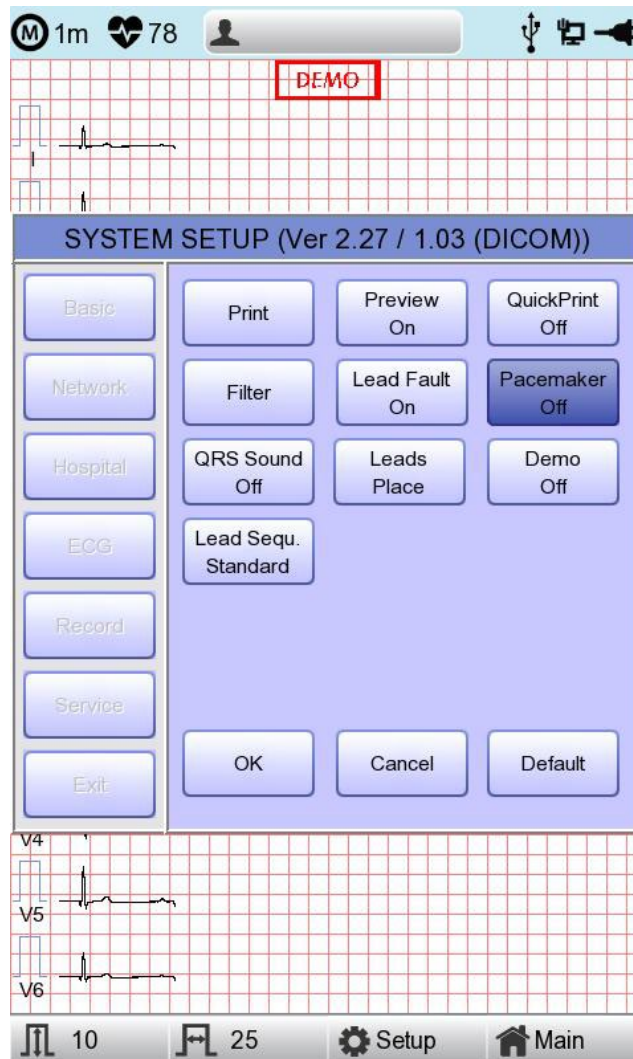
#### NOTE

- If 'RA' Lead becomes Fault, the wave types of all Leads will not be indicated.
- If 'LA' Lead becomes Fault, the wave types of I and V1-V6 Leads will not be indicated.
- If 'RL' Lead becomes Fault, Lead Fault message might not be shown and the wave types of all Leads might be indicated.
- If 'LL' Lead becomes Fault, the wave type of II and V1-V6 Leads will not be indicated.
- If a Lead Fault occurs during monitoring or recording, a buzzer alarm will sound and the message box will pop up.
- No pacemaker signal may be detected. Additionally, if a Lead Fault occurs, please re-measure the EKG as it could have affected the measurement by the device.

### 11-4-6) Pacemaker signal printing

In case of using the pacemaker signals, you can choose whether to print out the location of the pacemaker when monitoring or recording.

You can select ON or OFF by clicking the 'Pacemaker' item. When it is on, the location of the pacemaker will be printed out, while when it is off, it will not be printed out.



#### NOTE

- It is recommended to set the pacemaker off for normal use and only when the patient uses a pacemaker, set it on.
- When having a Lead Fault, the Pacemaker signals may not be detected.

### 11-4-7) QRS Sound Setup

In this menu, users can set the device to ring an alarm sound when a QRS beat has generated while it is in waiting mode. Users can either set the alarm ON or OFF by selecting the menu with ON turning on and OFF turning off the alarm sound.

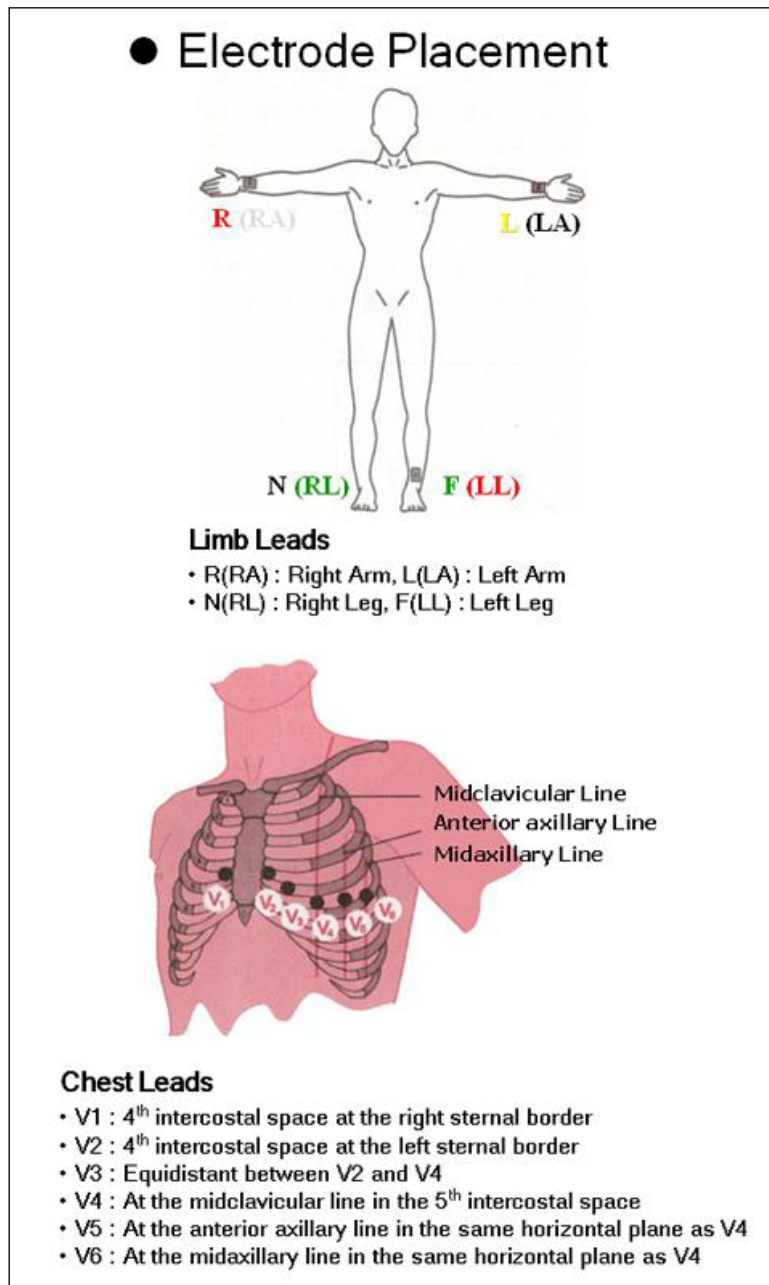


#### NOTE

No sound will ring while printing even when the QRS sound is set to ON.

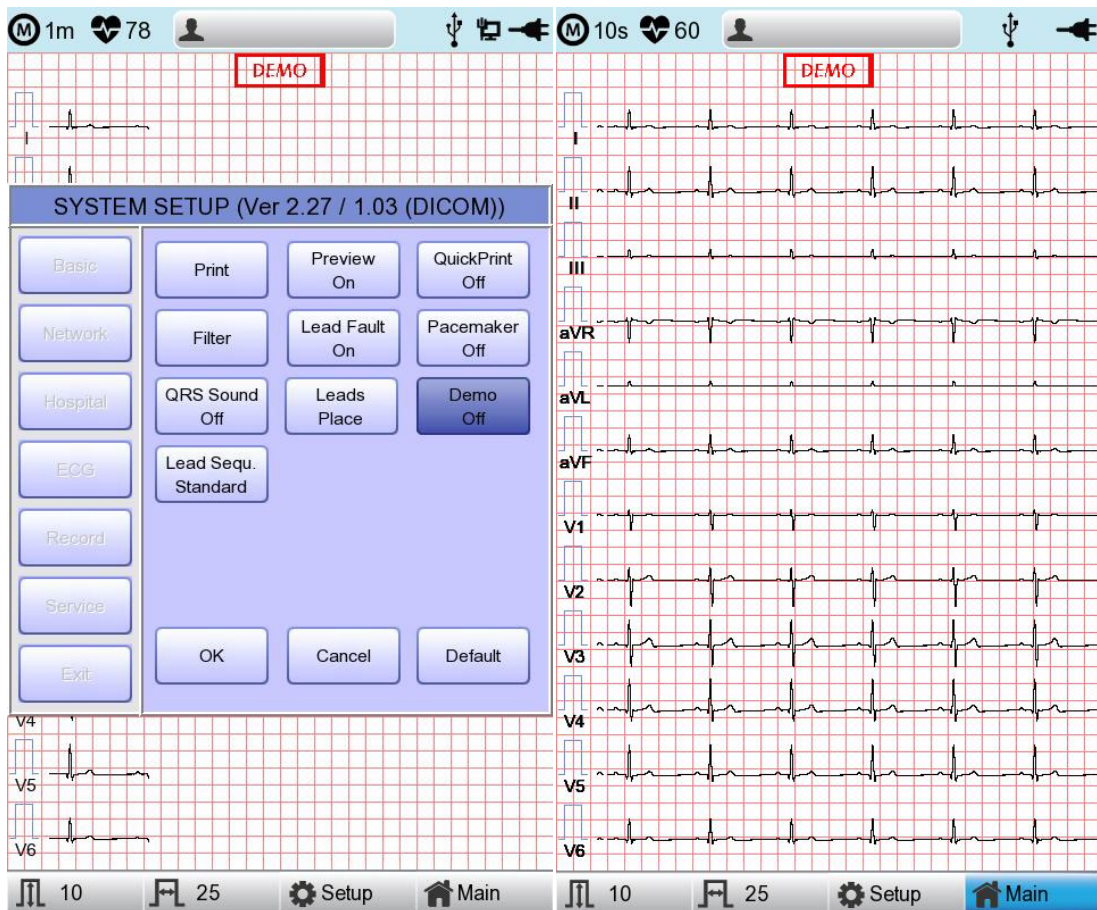
### 11-4-8) Method of Leads Place

'Leads Place' menu shows how to connect electrodes on the graphic display. Focusing on and selecting 'Leads Place' menu will bring the screen shown below. At that time, enter the screen-touch, rotary or 'ESC' key; and then the 'how to connect electrodes' screen will disappear while going back to the 'ECG Setup' setup window.



### 11-4-9) Demo Mode Setting

This menu puts Cardio7 in demo mode. When it is set to ON, 60bpm Sinus Normal Rhythm signal will be displayed on the device and DEMO sign will appear on the upper part of the LCD screen. Users can test rhythm, diagnostic, copy printing functions as well as PC communication and other miscellaneous functions in Cardio7.



### 11-4-10) Lead Sequence Setting

In this menu, users can set the display formats for the lead sequence. Users can either set the Standard or the Cabrera by selecting the menu.

- Standard : The limb leads are indicated: I, II, III, aVR, aVL, aVF
- Cabrera : The limb leads are indicated: aVL, I, -aVR, II, aVF, III



## 11-5) Record Setup

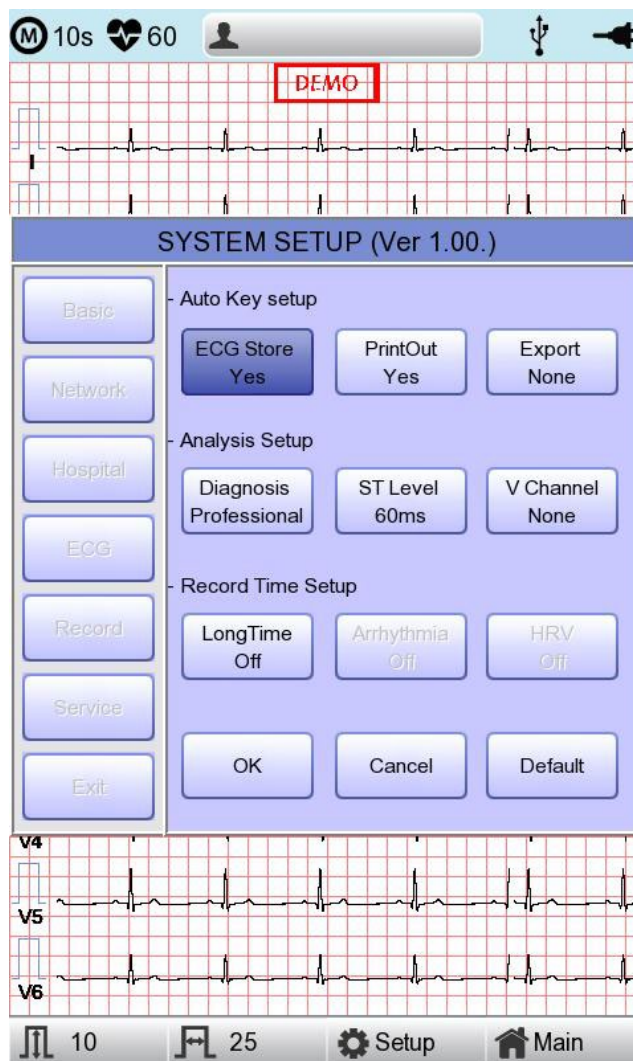
When selecting the 'Record' menu at the left side of the Setup page, the record setup page will show up at the right side.

Record Setup menu consists of the 'AUTO' key on the control panel setup item and auto diagnosis setup item.

### 11-5-1) 'AUTO' key setting

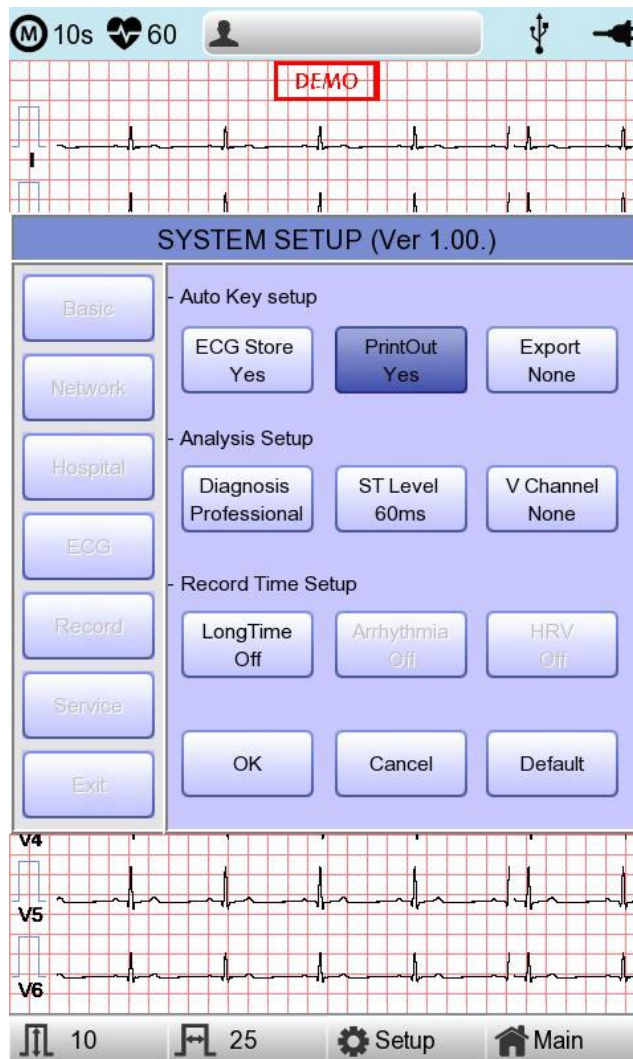
When the 'Store' menu has the focus, click it to set up 'Yes' or 'No'.

When 'Yes' is selected, you can operate the ECG test by pressing the 'AUTO' key on the control panel and the ECG data will be automatically saved, but when 'No' is selected, the ECG data will not be saved. (Default: Yes)



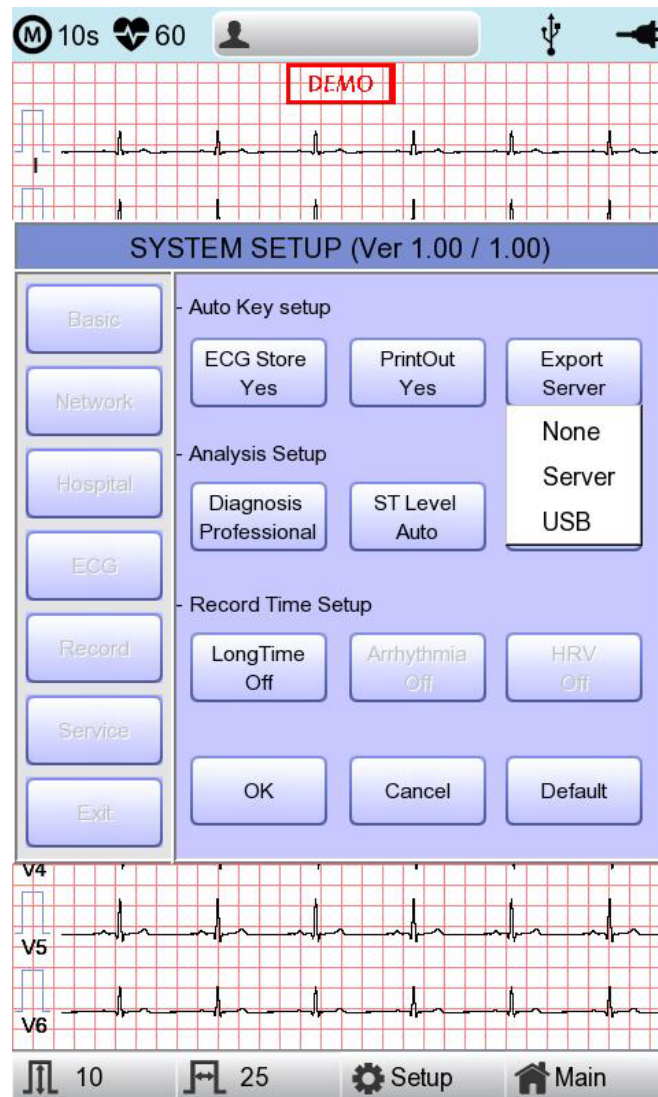
When the 'Print Out' menu has the focus, click it to set up 'Yes' or 'No'.

When 'Yes' is selected, you can operate the ECG test by pressing the 'AUTO' key on the control panel and the ECG data will be automatically print out, but when 'No' is selected, the ECG data will not be printed out. Default is set as 'Yes'.




When selecting the 'Export' menu, a small menu window as below will appear and it will disappear when selecting one of None, Server, USB.

If it is 'None,' ECG data will not be externally transferred; if it is 'USB,' ECG data will be automatically saved to the external USB memory. In addition, if it is set up as 'Server,' data will be automatically transferred to PC Server IP among Network options. (Default : None)



#### NOTE

When you remove the external device after sending to USB Memory, you should

click icon  that is correct to each device

On top of the main screen and remove the device.

Otherwise data can be damaged.

## 11-5-2) Analysis Setup

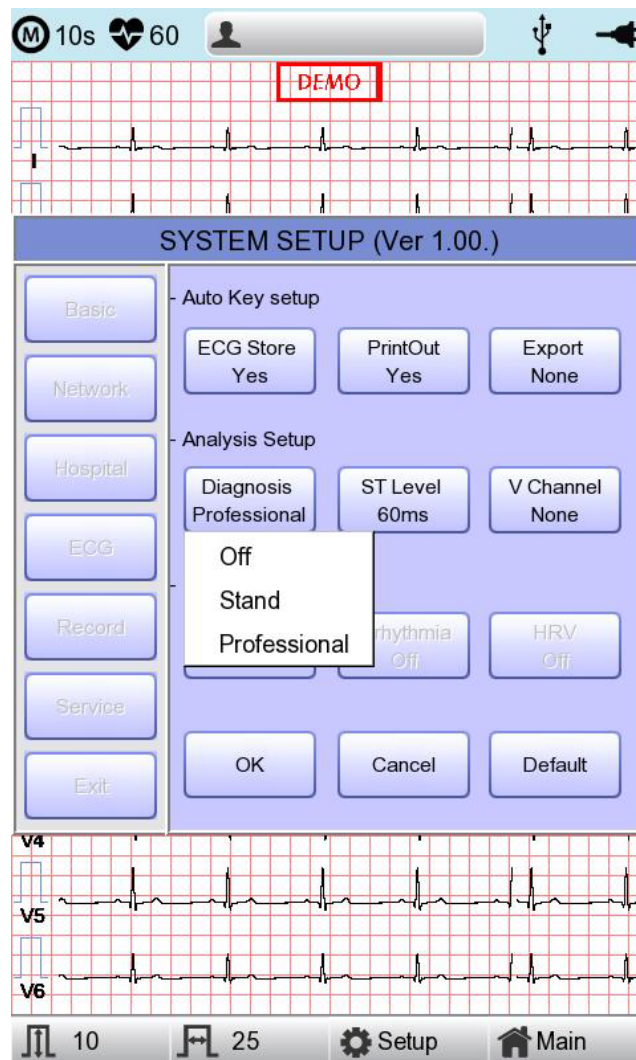
### Diagnosis setting

Set the Automatic Diagnosis level of the 10-second recording.

off : the content of diagnosis will not be printed out

Standard level: Provides only serious diagnoses with the diagnostic criteria value is raised.

Professional level: Various diagnoses are provided according to the standard diagnosis criteria.



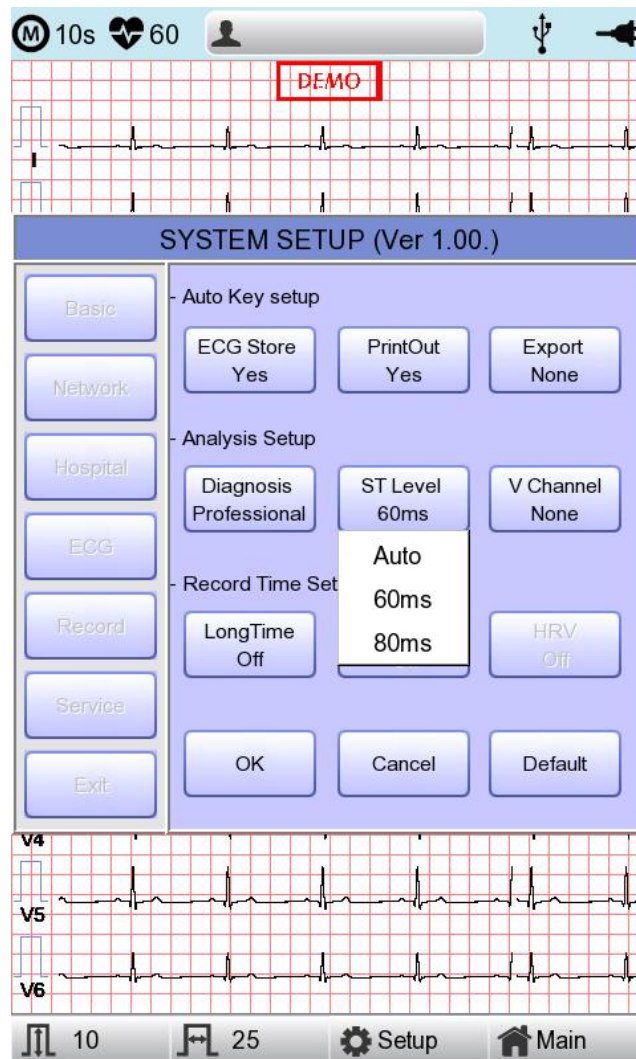
### ST Level setting

Set the ST Segment diagnosis during automatic diagnosis on 10-second recording.

AUTO: The J Point related to ST Level is automatically set.

60msec: J Point is set to 60msec point.

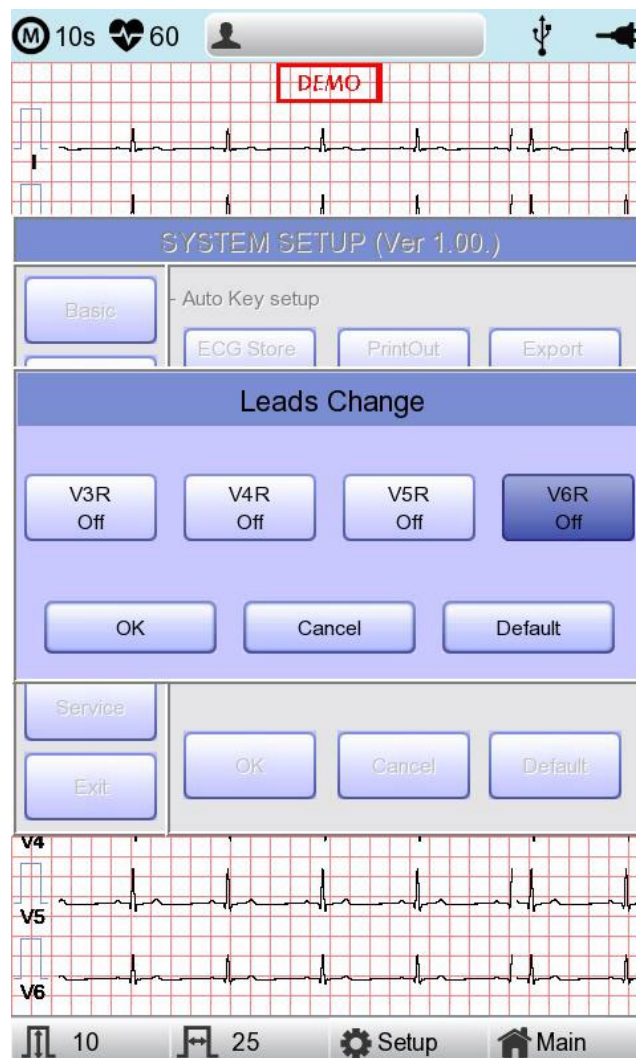
80msec: The J Point is set to the 80msec point.



### V Channel setting

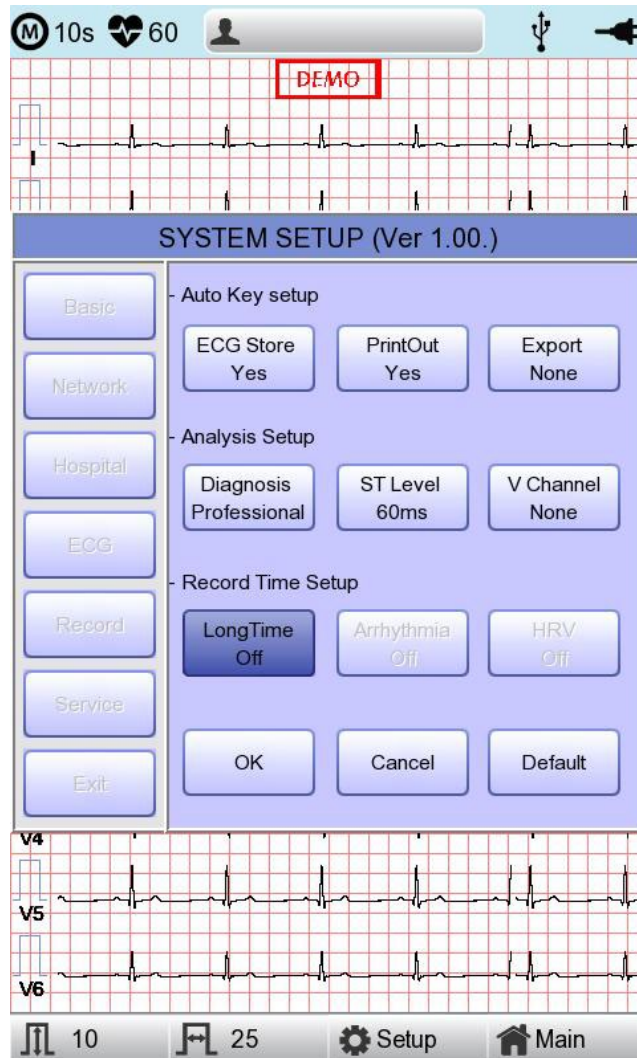
'V Change' menu is used to set up the V3 ~ V6 on the printing paper when diagnosing children in which the location of V3 ~ V6 electrodes need to be changed from left to right.

Basically, the 'V Change' is set as 'None' and when you click this menu, a 'Leads Change' POP-UP window will show up as below. Each time you select the V3R, V4R, V5R or V6R, it will be on or off. When one is selected, the letter R will be seen at the end of the chosen channel (V3 → V3R), otherwise it will not.



### 11-5-3) Long Time setting

Duration of Arrhythmia and HRV recording can be set up. It can be selected as 1, 3, 5 or 10 min.

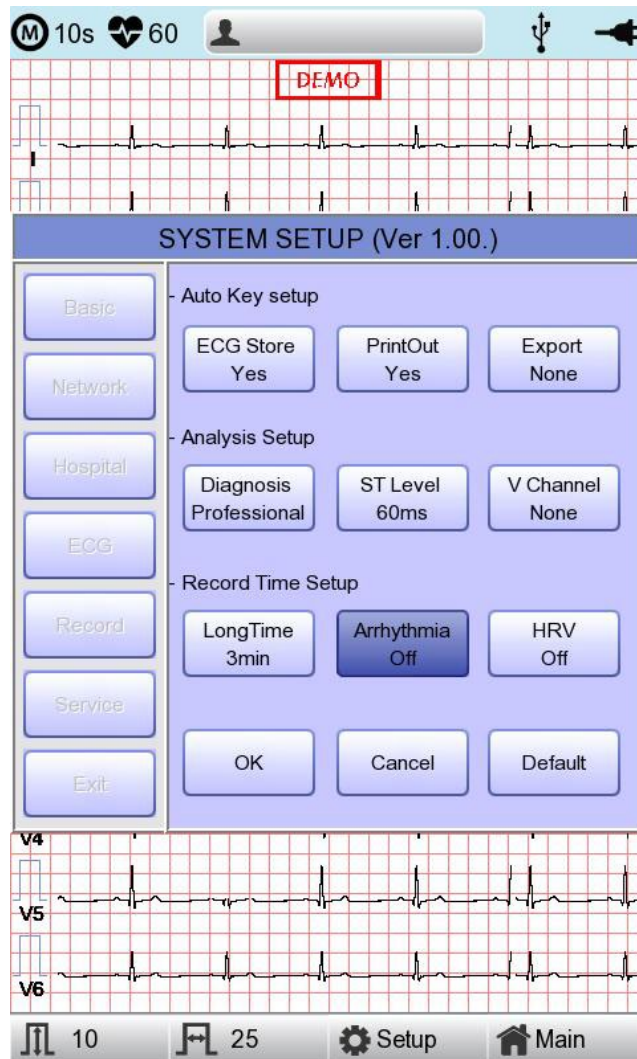


#### NOTE

- For Arrhythmia and HRV, only 3, 5 or 10 min are available.
- Upon output of Arrhythmia and HRV, ECG with pre-setup duration will be printed out by one choice of Lead-a line at 20-second interval.
- Output will be indicated in increments of 5 mm/mV for gain and in increments of 12.5 mm/sec for speed.

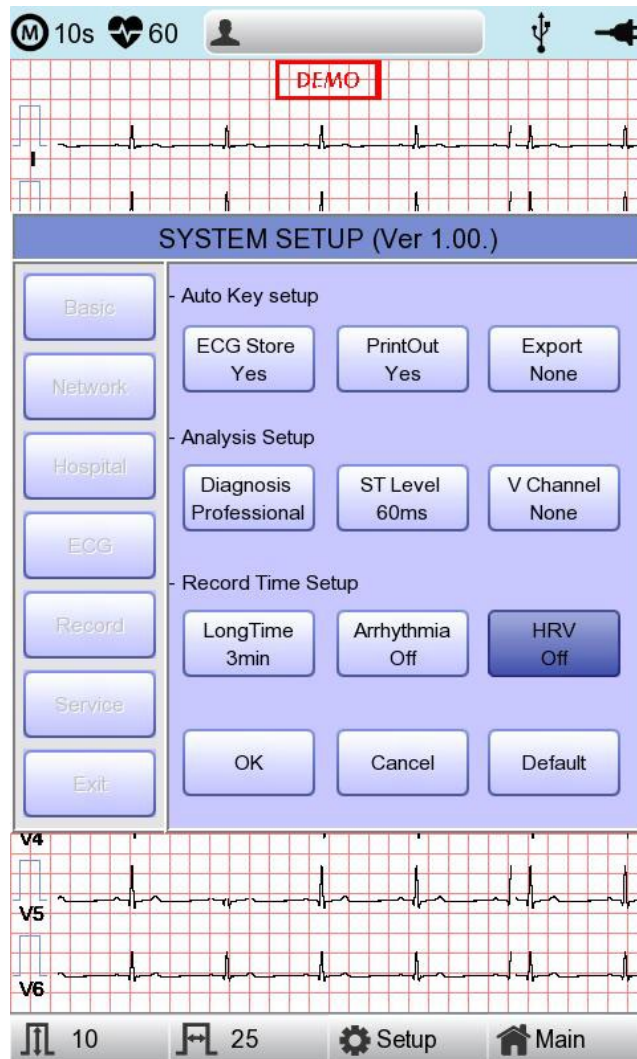
#### 11-5-4) Arrhythmia Setting

When performing Long Time recording, arrhythmia printout options can be configured. If 'Arrhythmia' option is selected as ON, printout will be performed; if OFF, it will not be performed.



### 11-5-5) HRV Setting

When performing Long Time recording, HRV printout options can be configured. If 'HRV' option is selected as ON, printout will be performed; if OFF, it will not be performed.



**WARNING**

Do not touch patient cables or equipment when using a ventricular defibrillator.

**WARNING**

When connecting electrodes or patient cables, do not allow connectors to touch conductive parts or ground. In particular, when attaching the electrodes to the patient's body, make sure that they do not come into contact with conductive parts or the ground.

**WARNING**

Do not use the supplied ECG patient cables to measure respiration. They should be used for ECG measurement only.

**CAUTION**

Do not use the supplied ECG patient cables to measure respiration. They should be used for ECG measurement only.

**CAUTION**

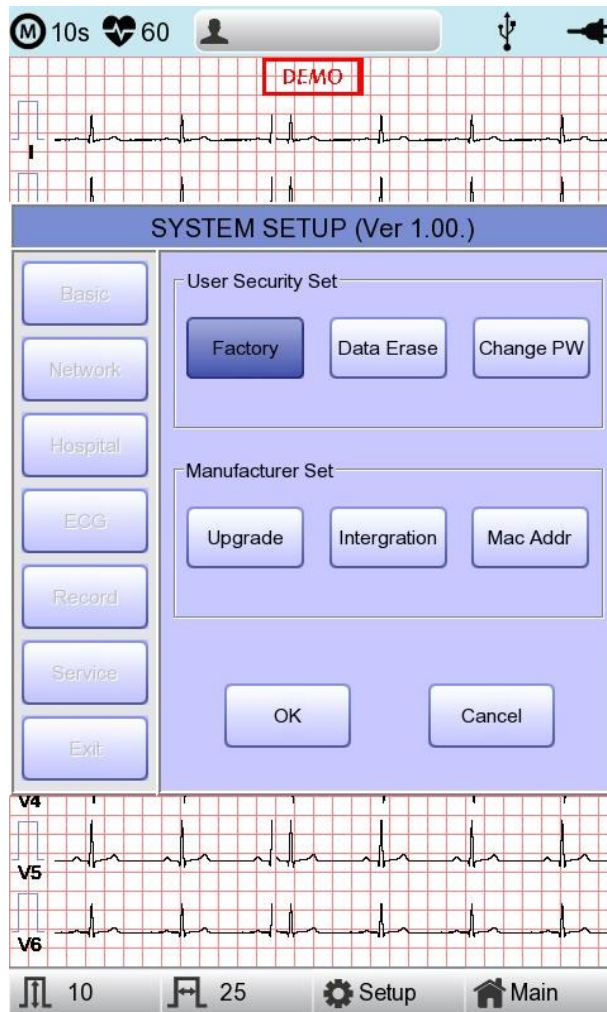
Cardio7 should be used in the presence of a health care professional when used for patients who have undergone Cardiac Assist Device surgery.

## 11-6) Service Setup

If 'Service' menu on the left of the Setup screen is selected, the other Setup screen related to 'User Security Set' and 'Manufacture Set' will appear.

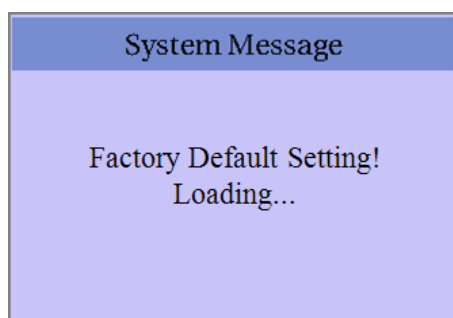
At 'User Security Set' setup, it is possible to change Factory Setting and User Password.

At 'Manufacture Set' setup, it is possible to change Upgrade and Device Options:  
please contact the Bionet Service center.



**11-6-1) Factory (Reset Settings)**

In order to reset to factory conditions, press the 'Factory' button and enter the Password. Reset will proceed, with the message below appearing on the LCD screen for 1 second.



The initialized values are as follows.

Contents	Setting Value
Gain	10mm/mV
Speed	25mm/s
Start Option	Main
Unit	Height : cm, Weight : kg
Date Type	YYYY-MM-DD
Patient Info (File)	Delete
Device Name	Cardio7
Net Device	Wired
Configure	Manually
Device IP	192.168.30.224
Subnet Mask	255.255.255.0
Gate way	192.168.30.1
BMS Server	0.0.0.0
Hospital	blank
Doctor	blank
Preview	On
Quick Print	Off
Lead Fault	On

Pacemaker	Off
QRS sound	Off
Demo	Off
Mon Form	12ch
Mon Size	Continue
Grid	Off
Rec Form	3ch + 3
Paper Size	A4
Print Line	Normal
Beat Form	Off
Rhythm	II, V1, V5
Base Filter	On
AC Filter	For ENG and KOR language, '60Hz' For other languages, '50Hz'
Low Pass Filter	150Hz
EMG Filter	Off
ECG Store	Yes
Print Out	Yes
Export	None
Diagnosis	Professional
ST Level	Auto
V Channel	None
Long Time	Off
Arrhythmia	Off
HRV	Off
Target	PC
Method	Manual
Format	EKG
Delete	Yes

---

JPEG Size	1024 x 768
Pressure	760mmHg
Humidity	70%
Temp	25°C
Syringe	3000cc
Patient information	initialized

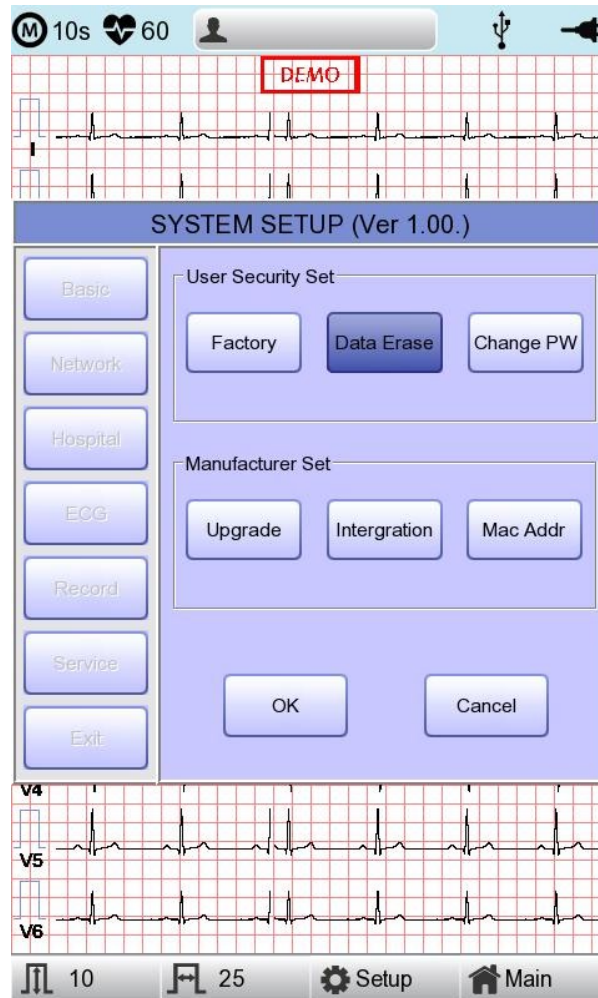
<b>NOTE</b>
-------------

Even though the system is reset, the 'User password' is not initialized.
--

### 11-6-2) Data Erase

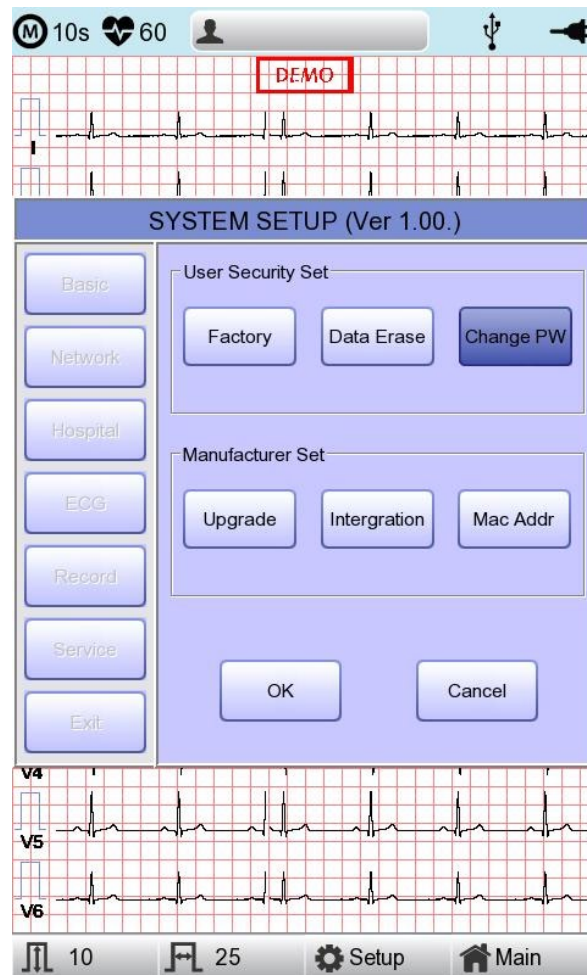
All data in Files and Worklist will be deleted.

For the data erasure function, a password must be entered



### 11-6-3) Change PW

User Password can be configured. User Password is the number entered for Factory and Data Erase. The password should be a 4-digit number.



#### NOTE

Contact the Bionet service center when you forget your password.

## Chapter 3. File management

### 1) Display and function

The screenshot shows a file management interface with a table of data. The table has columns for No, ID, Name, Age, Date, and Study. The interface includes a top toolbar with navigation and search icons, and a bottom toolbar with Print, Delete, Setup, and Main buttons. Numbered callouts 1-10 point to specific elements: 1 points to the 'File 1/6' text; 2 points to the left arrow; 3 points to the right arrow; 4 points to the user icon; 5 points to the search icon; 6 points to the USB icon; 7 points to the Print button; 8 points to the Delete button; 9 points to the Setup button; and 10 points to the Main button.

No	ID	Name	Age	Date	Study
1	uuj	ryhj	0	20150708	ECG
2	1234		0		ECG
3	234		0		ECG
4	cdee		0	20150512	MVV
5	ddrrg	rdvgy	0	20150512	FVC
6	ed		0	20150512	FVC
7	gjin		0	20150512	ECG
8	ujj		3	20150512	FVC
9	wrtu		0	20150512	FVC
10	1234		0		ECG
11	234		0		ECG
12	cdee		0	20150512	MVV
13	ddrrg	rdvgy	0	20150512	FVC
14	ed		0	20150512	FVC
15	gjin		0	20150512	ECG
16	ujj		3	20150512	FVC
17	wrtu		0	20150512	FVC
18	1234		0		ECG
19	234		0		ECG
20	cdee		0	20150512	MVV
21	ddrrg	rdvgy	0	20150512	FVC
22	ed		0	20150512	FVC
23	gjin		0	20150512	ECG
24	ujj		3	20150512	FVC

#### ① Page information

- For example, [1/20] means that you see the first page among total 20 pages. 1 Page contains 24 lines of Data.

If Rotary is selected, the focus will be moved to Data list.

- ② Button to skip to the previous page
- ③ Button to skip to the next page
- ④ Button to check the patient's information of the chosen data saved
- ⑤ Button to search the data you want
- ⑥ State of battery or AC power connection
- ⑦ Button to print out the chosen saved data
- ⑧ Button to delete the data
- ⑨ Button to set up the environment of 'File Management'
- ⑩ Button to move to other main screen from 'File Management'

At the initial file management page, the first data of the list has the focus. The focus will automatically move to the menu bar at the bottom of the screen, when you click the data by touching the screen or rotating the rotary key on the control panel.

If there is no data in the page, the focus can be found on [Print] button.

When there is no patient information you want to select, please press [<] or [>] button or the 'Search' menu to move to other pages.

- Menu direction (Rotary Key's right spin)

Print → Delete → Setup → Main → Page information → [<] → [>] → Info → Search → Print

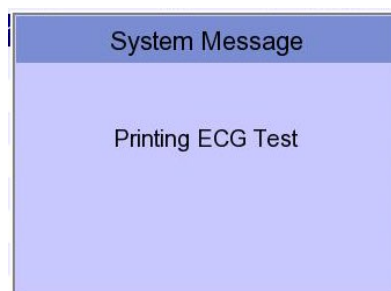
- Menu direction (Rotary Key's left spin)

Print → Search → Info → [>] → [<] → Page information → Main → Setup → Delete → Print

## 2) Data printing

When selecting a saved data at the ECG file management page by using rotary key or touch screen, the focus will appear at the data list.

Press the 'Print' button to print out the data. Then you will see a message as shown below.



**NOTE**

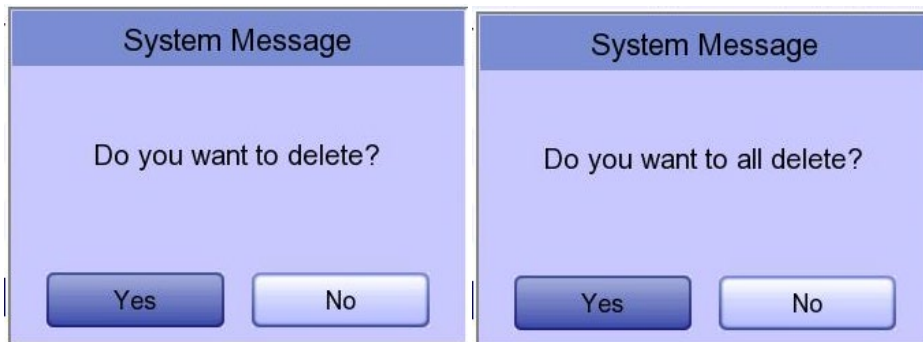
You should avoid attaching and detaching a USB device while printing out, as it could cause the printer module to rattle.

### 3) Data deleting

When pressing the 'Delete' button, a small pop-up menu will show up. You can choose to press the 'select' or 'all' button.

When you press the 'Select' button, one data will be deleted, but if you press the 'All' button, all data in the list will be deleted.

In order to help the user not to make a mistake when deleting the data, a message shown as below will appear to reaffirm whether you really want to delete the data.



#### Caution

Please think carefully before selecting the 'All' button, as it will permanently delete all of the ECG data.

## 4) System Setup

When clicking the 'Setup' button at the ECG data file management page, you will see a 'System Setup' window as shown below.

'PAT Info.' menu is to set up whether the patient information is retained or not, when you move the main screen of the ECG. When you click the menu, 'Retain' will be set up and when clicking the menu again, 'Delete' will be set up. Default is set as 'Delete'.

- 'Delete': To set up the patient information is deleted, when you move to main screen of the ECG.
- 'Retain': To set up the patient information is retained, when you move to main screen of the ECG This may result in more than one record for the same patient.

### NOTE

The steps for Network, Hospital and Service Setting are identical with the steps for ECG Main setting.

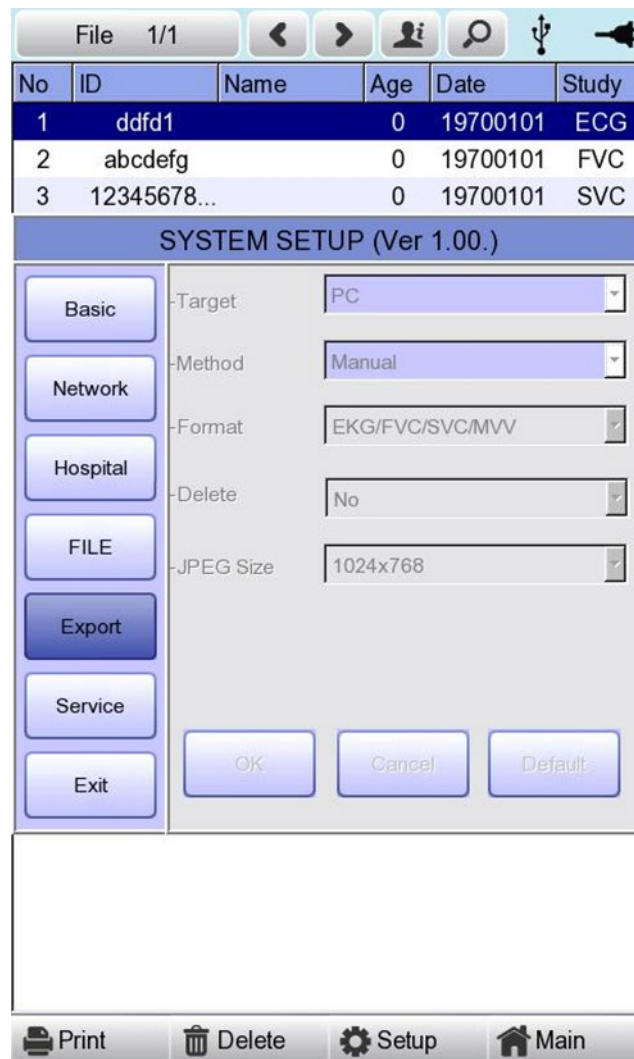
When clicking the 'FILE' button, you will see 'FILE' window as shown below.



You can activate the automatic deletion function by clicking the 'Auto Del.' menu in the 'FILE' menu window.

When the automatic deletion function is activated, when a new file is saved beyond the maximum storage capacity, the oldest file is deleted and then saved.

When clicking the 'Export' button, you will see 'Export' window as shown below.



When clicking the 'Target' button, a POP-UP window will show up and it will disappear when selecting one of BMS Server or USB.

- BMS Server/PACS Server :To save the data in the BMS Server or PACS Server.
- USB: To save the data in the external USB Memory

When clicking the 'Method' button, a small line window will show up and it will disappear when selecting Manual, Select, All or All New.

- Manual: menu window allows user to select either 'Selected, All, All New, Cancel' or 'Selected, Cancel' whenever transferring data
- Select : To transfer the selected data
- All : To transfer all data
- All New: To transfer the newly saved data

When clicking the 'Format' button, a line window will show up and it will disappear when selecting EKG/FVC/SVC/MVV, MFER(ECG), XML(ECG), JPEG, PDF. 'Format' menu is used to select the user's options when transferring the data.

- EKG/FVC/SVC/MVV: To save the data by type of '\*\*\*.ekg'/'\*\*\*.fvc'/'\*\*\*.svc'/'\*\*\*.mvv'
- MFER: To save the data by type of '\*\*\*.mwf'
- XML: To save the data by type of '\*\*\*.xml'
- JPEG: To save the data by type of '\*\*\*.jpg'
- PDF: To save the data by type of '\*\*\*.pdf'
- DICOM :To save the data by type of'\*\*\*.dcm'

When clicking the 'Delete' button, a line window will show up and it will disappear when selecting Yes or No. 'Delete' menu is used to select the user's options after the data has transferred.

- Yes: To delete the data after it has transferred
- No: To not delete the data after it has transferred

NOTE
- If 'Format' menu has only 'EKG/FVC/SVC/MVV' options, it is possible to select 'All' or 'All New' in 'Method' menu; for other formats, 'Selected' is the only option.

## 5) Switching menu

When selecting the 'Main' button at the main page of 'File management', a line window will show up. You can choose ECG, Spiro or Worklist to go to the chosen page.

The patient's information of selected data does not transmit when skipping to 'Worklist Management' screen. But it depends on the setting value of 'PAT Info.' menu when skipping to 'ECG' main screen.

- ECG : Skip to ECG main screen
- Worklist :Skip to 'Worklist Management' screen
- Spiro : Skip to spirometry measurement screen

## 6) Patient information

When selecting a saved data at the ECG file management page by using a rotary key or a touch screen, the focus will appear at the data list.

Press the 'Info' button. Then you will see a 'Patient Information' window as shown below. Information other than patient name cannot be changed.

No.	ID	Name	Age	Date	Study
24	06262202	nhgkg	2	20180628	ECG

Patient Information	
* ID	06262208
Name	fufhr
F. Name	
* Age M-D-Y	6 - 26 - 2018 Date of birth
* Gender	Female
* Height	cm
Weight	kg
* Race	White
Smoke	No
Department	
Room No	
Study Desc.	ECG
Accession No.	262208
Ref. Physician	JOHN DOE

## 7) Data search

When clicking the 'Search' button at the ECG data file management page, you will see a 'Patient Search' window as shown below. If you rotate the rotary key, the 'search condition' button will have focus. Press the 'Find' button after inputting the information about ID, Name, Date or Age.

When the search takes a long time, a message will show up to let you know the progress. After searching, you will see a data search result page.

No	ID	Name	Age	Date	Study
1	11270410	phudg	0	20151127	ECG
2	11275510	gqafb	0	20151127	ECG
3	11275510	gqafb	0	20151127	ECG
4	7890	dvvv	32	20151127	FVC

**Patient Search**

Search Condition: ID

- ID:

- Name:

- Day:  -  -  ~

Y-M-D

-  -

- Age:  ~

20	193	193	0	20150720	ECG
21	194	194	0	20150720	ECG
22	189	189	0	20150720	ECG
23	190	190	0	20150720	ECG
24	191	191	0	20150720	ECG

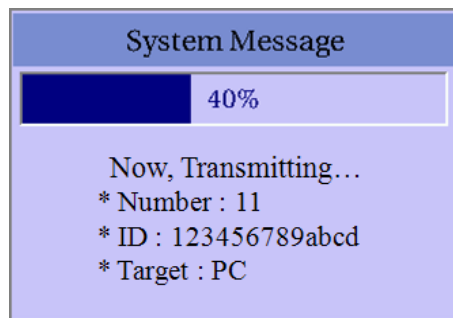
## 8) Data transfer

You can transfer the saved data to the external device at the ECG data file management page by using the 'NETWORK' key on the control panel.

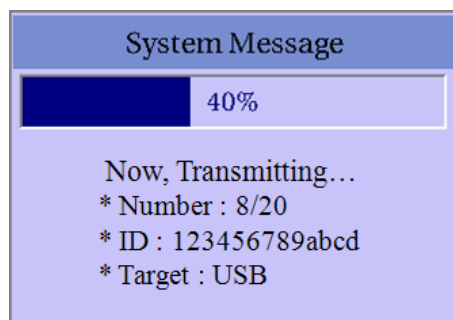
When pressing the 'NETWORK' key, a message will show up, asking which menu you want to select.



If you transfer a selected data, a message with progress speed or other information will be shown as below.



If you transfer all of the data, a message with progress speed or other information will be shown as below. In this case, the total number of files and the file being transferred currently will be displayed.



**NOTE**

When transmitting multiple sets of data to PC after saving, a network error could occur which may cause transmission halt and subsequent loss of data. Therefore, we recommend users to practice following procedures to minimize such loss.

1. In EKG Main, press [NET] button to transmit data to PC immediately after measuring..
2. When transmitting multiple sets of measurements, rather than sending all data at once, we recommend users to transmit individual records after each measurement.

**NOTE**

If the system boots up without having LAN cable connected, the network function may not work properly. In this case, enter [System] -> [Network] -> [OK] then press 'NETWORK' button to attempt running the network function again. Please refer Network Setup part of the manual to get more information regarding IP configuration setup.

## 9) Data import

You can import the saved data from the external device at the ECG data file management page by using the 'RECORD' key on the control panel.

When pressing the 'RECORD' key, 'Import File List' screen will be shown as below.

No	ID	Name	Age	Date	Study
1	ddfd1		0	19700101	ECG
2	abcdefg		0	19700101	FVC
3	12345678...		0	19700101	SVC
4	dog		0	19700101	MVV
5	abcdefg		0	20000101	MVV

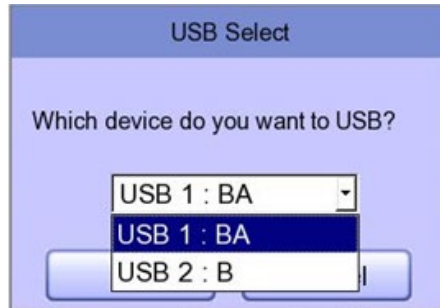
  

FILE LIST MANAGEMENT	
No	Name
1	1234567890_19700101002436.SVC
2	111_20140101002029.MVV
3	7hh_20150101053631.MVV
4	abcdefg_19700101000101.FVC
5	abcdefg_20000101001909.MVV
6	abcdefg_20150101011837.MVV
7	ddfd1_19700101000750.ekg
8	1_19700101000045.MVV

Select All Close

Print Delete Setup Main

If 2 different USB memory devices are connected, a system message window prompting you to select one of them will appear.



If the external device is not connected to Cardio7, the error message will be shown as below.

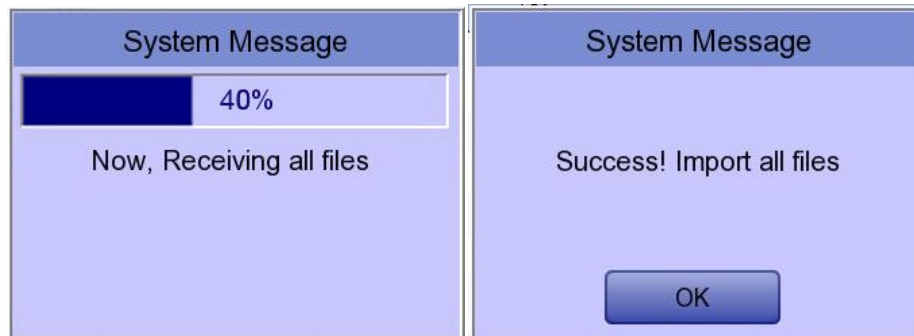


If you select the 'Selected' menu in the 'Import File List' screen, after receiving the selected data from the external device a system message will be shown as below.



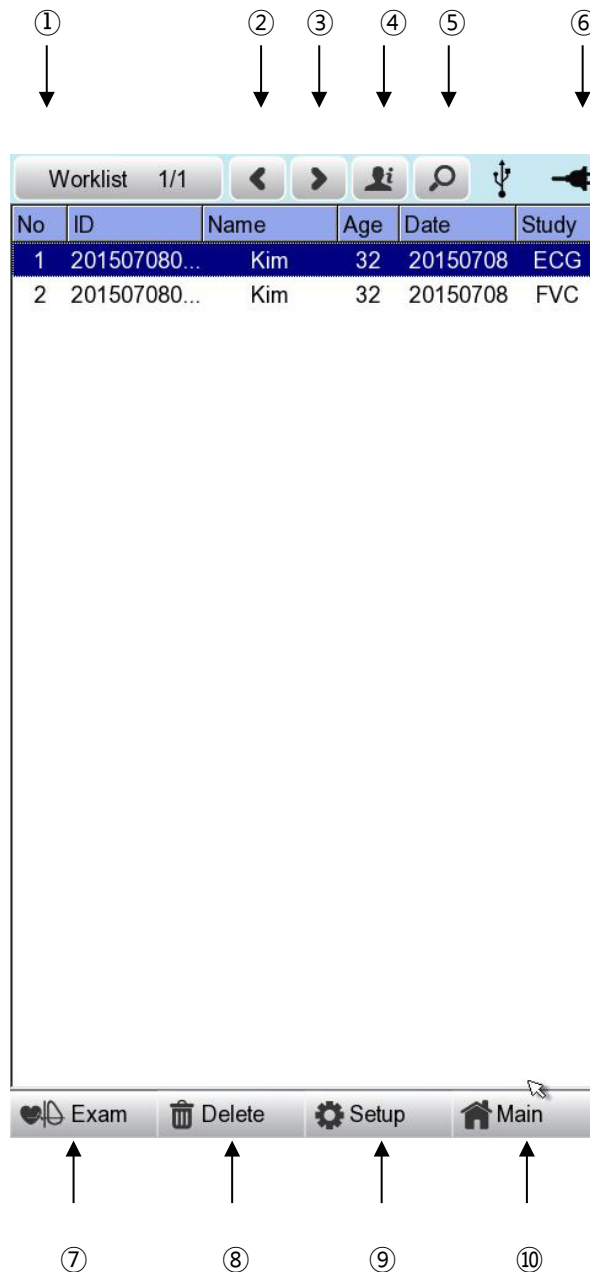
If you select the 'All' menu in the 'Import File List' screen, a system message with progress speed will be shown as below.

After receiving all data from the external device, a system message will be shown as below.



## Chapter 4.ECG worklist management

### 1) Display and function



- ① Current page/total number of file pages

For example, [1/20] means that you see the first page among total 20 pages. 1 Page contains 24 Data.

If Rotary is selected, the focus will be moved to Data list.

- ② Go to the previous page.
- ③ Go to the next page.
- ④ Patient information
- ⑤ Worklist Search
- ⑥ Battery status or AC power connection status
- ⑦ Connection status of the external device.
- ⑧ Deleting a User button  
(After interlocking with the PACS Server, press the 'Update' button)
- ⑨ Setup Menu
- ⑩ Touch this button to move to other menus such as ECG, Spiro, or File

At the initial file management page, the first data of the list has the focus. The focus will automatically move to the menu bar at the bottom of the screen, when you click the data by touching the screen or rotating the rotary key on the control panel.

If there is no data in the page, the focus can be found on [Exam] button.

When there is no patient information you want to select, please press [<] or [>] button or the 'Search' menu to move to other pages.

- Menu direction (Rotary Key's right spin)

Exam → Delete → Setup → Main → Page information → [<] → [>] → Info → Search → Exam

-Menu direction (Rotary Key's left spin)

Exam → Search → Info → [>] → [<] → Page information → Main → Setup → Delete → Exam

We recommend using less than 200 work lists.

## 2) ECG Test

Select 'Exam' button to go ECG main screen in order to start ECG measurement with patient information in the test-requested data list.

There is no need to input additional information, as all of the patient information is already saved upon ECG test.

**CAUTION**

Each functional key action of ECG Main Menu is as follows:

- RECORD : not saving measured data but performing output only.
- NET : not saving measured data but transferring it to a PC.
- AUTO : running according to Auto Key setup of system.

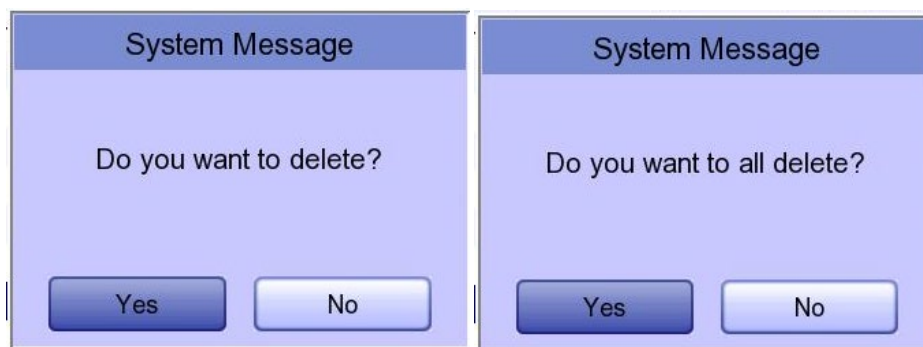
To save measured data for the Test requested, configure **ECG Store on Auto Key setup as Yes**, and then start measurement by pressing the Auto button.

### 3) Data deleting

When pressing the 'Delete' button, a small pop-up menu will show up. You can choose to press the 'select' or 'all' button.

When you press the 'Select' button, one data will be deleted, but if you press the 'All' button, every data in the list will be deleted.

To help the user not to make a mistake when deleting the data, a message shown as below will appear to reaffirm whether you really want to delete the data.

**CAUTION**

Please think carefully before selecting the 'All' button, as it will permanently delete all of the ECG data.

#### 4) System Setup

When clicking the 'Setup' button at the ECG data worklist management page, you will see the 'worklist System Setup' window as shown below.

No	ID	Name	Age	Date	Study
<b>SYSTEM SETUP (Ver 1.00.)</b>					
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;"> <p>Basic</p> <p>Network</p> <p>Hospital</p> <p>Service</p> <p>Exit</p> </div> <div style="width: 80%;"> <p>Date: 2015 - 07 - 10 Y-M-D</p> <p>Time: 03 : 09 : 24</p> <p>TouchScrn    Lang ENG    Start Opt Main</p> <p>Units cm/kg    Date Type Y-M-D</p> <p>DeviceName: Cardio7</p> <p>Device ID: NPFFFFFF</p> <p>OK    Cancel    Default</p> </div> </div>					

#### NOTE

The steps for Network, Hospital and Service Setting are identical with the steps for ECG Main setting.

## 5) Switching menu

When selecting the Main button at the main page of the ECG file management, a line window will show up. You can choose ECG or FILE to go to the chosen page.

The patient's information of selected data does not transmit, when moving to other main screen.

- ECG: skip to ECG main screen
- FILE: skip to 'File Management' screen
- Spiro: skip to spirometry measurement screen

## 6) Patient information

When selecting saved data at the ECG file management page by using rotary key or touch screen, the focus will appear at the data list.

Press the 'Info' button to see the 'Patient Information' page. After checking all of the information, press the OK button and then the 'Patient Information' page will disappear.

The screenshot shows a 'Patient Information' dialog box with the following fields and values:

Field	Value
ID	06262208
Name	fufhr
F. Name	
Age	6 - 26 - 2018
Gender	Female
Height	
Weight	
Race	White
Smoke	No
Department	
Room No	
Study Desc.	ECG
Accession No.	262208
Ref. Physician	JOHN DOE

The form also includes an 'OK' button at the bottom. The background shows a 'Worklist' table with columns: No., ID, Name, Age, Date, Study.

## 7) Data search

When clicking the 'Search' button at the ECG data order management page, you will see a 'Patient Search' window as shown below. If you rotate the rotary key, the 'search condition' button will have focus.

Press the 'Find' button after inputting the information about ID, Name, Date or Age.

When the search takes a long time, a message will show up to let you know the progress. After searching, you will see a data search result page.

No	ID	Name	Age	Date	Study
1	4567	dfgh	23	20151123	FVC
2	4567	dfgh	23	20151123	SVC
3	4567	dfgh	23	20151123	MVV
4	1234	fghj	45	20151123	FVC

**Patient Search**

Search Condition ID

- ID

- Name

- Day  -  -  ~

Y-M-D

-  -

- Age  ~

Exam
 Delete
 Setup
 Main

## Chapter 5. System Management

### 1) Maintenance and Cleaning

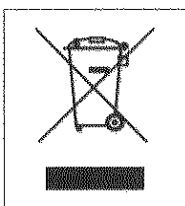
Keep Cardio7 equipment and handles clean. Avoid damaging or contaminating the equipment using the methods recommended below.

If you use the substances - including not allowed substances - that can damage on the product, warranty is not applied even during the warranty period.

NOTE
Clean the equipment and examine the body and electrodes thoroughly. Do not use old or damaged equipment.

At least once a month, wipe the body and measuring electrodes with a soft cloth moistened with alcohol to keep them clean. Do not use lacquer, thinner, ethylene, or oxide. Keep cables and limb and chest electrodes free of dust and dirt, and wipe them with a cloth dampened in lukewarm water (40°C/104°F) after use. Wipe them with clinical grade alcohol at least once a week. Do not immerse equipment or ECG wires in liquids or detergents. Keep the equipment and cables away from liquids.

### Existing Device Disposal



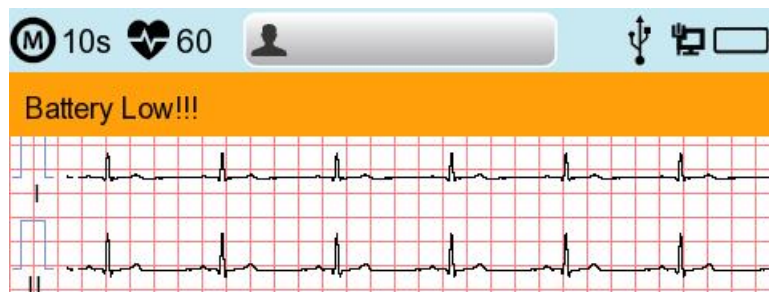
1. Products bearing this symbol (X-marked wheeled bins) are subject to European Directive 2002/96/EC.
2. All electrical and electronic products must be disposed of separately from municipal waste at the collection facility designated by government or local authorities.
3. Proper disposal of old devices helps prevent potential adverse consequences against environmental and human health.
4. For more information on the disposal of existing devices, contact City Hall, Waste Disposal Service Center, or the store where you purchased the product.

## 2) Regular Examination

As with any other medical equipment, have your Cardio7 regularly safety inspected once a year. Refer to the service manual provided by Bionet for inspection items.

## 3) Trouble Shooting

- **Printing was not successful:**  
The cover may not be closed properly. Please close the cover and print again.
- **When using the battery power, there was a beep for more than 3 times and a message came as shown below:**



The battery is low. Please connect to the AC power to use.

- **If there is a lot of noise in the output signal**  
: Check if AC power filter is set. If the noise is persistent even though the AC power filter is set, connect the ground wire to the ground electrode of the system.  
Do not connect the grounding to that of AC power source, but to the metal connected to the surrounding patient's bed or building.
- **When The external USB keyboard is not working properly:**  
Connect the external USB keyboard to the USB port before you turn on the power of Cardio7. If you connect the external USB keyboard to the USB port after you turn on the power of Cardio7, you should turn off the power of Cardio7 and turn on again.

If it is still not working, please contact our customer service center.

- **System messages**

The following system messages may occur while you are operating this system. You may be required to perform some action. If you perform the recommended actions and the condition still remains, contact authorized service personnel.

No.	System message	Cause	Solution
1	Please check date and time	Internal coin battery is discharged.	Please contact CS(Customer Support) team of Bionet to replace old coin type battery with new one
2	Address is not valid	When wrong network address(IP, SM, GW) is entered	Check the right network address before input
3	Invalid value. [Use: 0~9, A~F]	When wrong character is entered at time of inputting Mac address	Please input valid character such as 0~9, A to F in number and alphabet respectively
4	There is no patient ID. Please enter patient ID.	When you implement AUTO or NET button without patient ID	Please enter patient ID in patient information window to implement
5	Wrong password. Please re-enter your password.	When wrong password is entered	Check and input right password
6	Enter password length error. Please re-enter your password	When wrong number of characters is entered as password	Please check and input valid and correct password
7	The internal memory is full. Please erase other files or transfer to external storage.	When over 200 files are stored at internal memory	Erase files in File menu
8	Not enough free disk space	USB memory device has insufficient space to receive files.	Remove unnecessary files from USB memory (Minimum 500KB space is needed to export 1 file)

9	Please check the USB memory.	When USB memory stick is not inserted, or is out of order	Please check and insert USB memory stick in right position. Note that USB memory file format supports FAT, FAT32 only (this can be checked on PC)
10	There is no Access Point. Please check the AP	There is no wireless access point detected.	Check AP and retry
11	Fail, connecting. Do you want to retry?	When wireless AP connection is failed	- Press Retry button - Retry after checking AP
12	Ping : Failed	When there is connecting failure between network and PC with BMS Server	-Check System setup and network - Check PC network setup -Check LAN cable or wireless environment
13	Verify : C-Echo Failed	When there is failure between PACS Server PC and network	- Check system setup and network - Check PC network setup -Check LAN cable or wireless environment -Please check PACS programs are working
14	IP address conflict.	The device's IP address is already in use on the network	Please contact 'Network Team' to check IP address, and set right IP in turn of System setup and Network
15	Connection Error. Check Lan cable, network setting and relevant program.	When there is failure of network connection	Please check LAN cable connection, network setting, server PC's networking and related S/W programs
16	File Trans Fail!!	When file transmission to server PC or USB memory fails	Check server PC's networking conditions, and USB memory, and retry
17	Check Worklist Server IP	When server IP of PACS worklist is not input	Input server IP of PACS worklist in turn of System setup, Network and PACS setting

18	Check Device AE Title	When AE Title of device is not input	Input AE title of device in turn of System setup, Network and PACS setting
19	Check Device Port	When port of device is not input	Input port of device in turn of System setup, Network and PACS setting
20	Check Worklist Server Port	When server port of PACS Worklist server is not input	Input server port of PACS Worklist server in turn of System setup, Network and PACS setting
21	Check Store AE Title	AE title of PACS store server is not input	Input AE title of PACS store server in turn of System setup, Network and PACS setting
22	Fail to send Image	When file transmission to PACS store server has failed	Retry after checking network conditions
23	Fail to connect Store Server	When there is connection failure between PACS store server and device	Check network condition with PACS store server
24	Transmission failed file is existing. Are you sure to delete?	When the transmission failed file to PACS store server needs to be deleted	Delete the failed file after transmitting the file to PACS store server
25	Recharge Battery!	When the battery level is Low	Please connect power cable or charge battery
26	Printer: Time out.	Printer stops working due to technical problem of device	Check the printer
27	Printer: Busy continue	When the wrong printer data were input	Check the printer
28	Printer: Temperature high	When the Printer gets heated due to long and continuous use of printer	Please stop the use of printer for at least one minute and try again
29	Printer: Paper empty	When the printing paper is completely out	Please put new roll of printing paper for use

30	Printer: Printer not ready	When there is no 'ready' answer from printer module	Check the printer
31	Printer: Unknown data	When the wrong protocol was put into the printer	Check the printer
32	Abnormal End!	When the printer was abnormally forced to stop during printing	Re-start printing
33	Lead Fault!	When the lead is off from the patient body	Please reattach the electrode on patient body
		When the conductivity between patient body and electrode is weak	Apply some water to reusable electrodes, and reattach them
34	No ECG Recorded Data!	When the user tries to execute copy printing without any recording data	Try make copy after recording data by "RECORD", "AUTO", and "NET" button

## 4) Manufacturer Declaration

### Electromagnetic Compatibility Information

Phenomenon	Basic EMC standard or test method	Test level/requirement
Mains terminal disturbance voltage	CISPR 11	Group1, Class A
Radiated disturbance	CISPR 11	Group1, Class A
Harmonic Current Emission	IEC 61000-3-2	Class A
Voltage change, Voltage fluctuations and Flicker Emission	IEC 61000-3-3	Pst: 1 Plt: 0.65 Tmax:0.5 dmax: 4% dc: 3.3%
Electrostatic Discharge Immunity	IEC 61000-4-2	± 8 kV/Contact  ± 2, ± 4, ± 8, ± 15 kV/Air
Radiated RF Electromagnetic Field Immunity	IEC 61000-4-3	3 V/m 80 MHz - 2.7 GHz 80% AM at 1 kHz
Immunity to Proximity Fields from RF wireless Communications Equipment	IEC 61000-4-3	Table 9 in IEC 60601-1-2: 2014
Electrical Fast Transient/Burst Immunity	IEC 61000-4-4	± 2 kV, 100 kHz repetition frequency  ± 1 kV, 100 kHz repetition frequency
Surge Immunity	IEC 61000-4-5	Line to Line ± 0.5 kV, ± 1 kV  Line to Ground ± 0.5 kV, ± 1 kV, ± 2 kV

Immunity to Conducted Disturbances Induced by RF fields	IEC 61000-4-6	3 V 0.15 MHz - 80 MHz  6 V in ISM bands Between 0.15 MHz and 80 MHz  80% AM at 1 kHz
Power Frequency Magnetic Field Immunity	IEC 61000-4-8	30 A/m 50 Hz and 60 Hz
Voltage dips	IEC 61000-4-11	0 % $U_i$ ; 0.5 cycle At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°
		0 % $U_i$ ; 1 cycle and 70 % $U_i$ ; 25/30 cycles Single phase: at 0°
Voltage interruptions	IEC 61000-4-11	0 % $U_i$ ; 250/300 cycle

### Electromagnetic compatibility\_ Guidance and manufacturer's declaration

Guidance and manufacturer's declaration – electromagnetic emissions		
The Cardio7 is intended for use in the electromagnetic environment specified below. The customer or the user of the Cardio7 should assure that it is used in such an environment.		
Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The Cardio7 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The Cardio7 is suitable for use in all establishments other than domestic, and may be
Harmonic emissions	Class A	used in domestic establishments and those

IEC 61000-3-2		directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes, provided the following warning is heeded:
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	<p><b>Warning:</b> This equipment/system is intended for use by healthcare professionals only.</p> <p>This equipment/ system may cause radio interference or may disrupt the operation of nearby equipment. It may be necessary to take mitigation measures, such as re-orienting or relocating the Cardio7 or shielding the location.</p>

### Guidance and manufacturer's declaration – electromagnetic immunity


The Cardio7 is intended for use in the electromagnetic environment specified below.

The customer or the user of the Cardio7 should assure that it is used in such an environment.

IMMUNITY test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/output lines	± 2 kV for power supply lines ± 1 kV for input/output lines	The quality of supplied power should be suitable for general business site or hospital environment.

Surge IEC 61000-4-5	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	The quality of supplied power should be suitable for general business site or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5%UT (>95%dip in UT) for 0,5 cycle 40 %UT (60 %dip in UT) for 5, 6 cycles 70 %UT (30 %dip in UT) for 25,30 cycles <5%UT (>95%dip in UT) for 5 s	<5%UT (>95%dip in UT) for 0,5 cycle 40 %UT (60 %dip in UT) for 5, 6 cycles 70 %UT (30 %dip in UT) for 25,30 cycles <5%UT (>95%dip in UT) for 5 s	Mains power quality should be that of a typical residential or hospital environment. If the user of the Cardio7 requires continued operation during power mains interruptions, it is recommended that the Cardio7 be powered from an uninterruptible power supply or a battery be used with the system power source.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/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 voltage of the power before using test level			

<b>Guidance and manufacturer's declaration – electromagnetic immunity</b>			
The Cardio7 is intended for use in the electromagnetic environment specified below. The customer or the user of the Cardio7 should assure that it is used in such an environment.			
<b>IMMUNITY test</b>	<b>IEC 60601 test level</b>	<b>Compliance level</b>	<b>Electromagnetic environment - guidance</b>
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80MHz	3 Vrms	<p>Portable and mobile RF communications equipment should be used no closer to any part of the Cardio7, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.</p> <p><b>Recommended separation distance</b></p> $d = \left[ \frac{3,5}{V_1} \right] \sqrt{P}$ $d = \left[ \frac{3,5}{E_1} \right] \sqrt{P}$ <p style="text-align: right;">80 MHz to 800 MHz</p> $d = \left[ \frac{7}{E_1} \right] \sqrt{P}$ <p style="text-align: right;">800 MHz to 2,5 GHz</p> <p>Where <math>P</math> is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and <math>d</math> is the recommended separation distance in meters (m).</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, <sup>a</sup> should be less than the compliance level in each frequency range. <sup>b</sup></p>
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2,5 GHz	3 V/m	

			<p>Interference may occur in the vicinity of equipment marked with the following symbol:</p> 
<p>NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.</p>			
<p>NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</p>			
<p><sup>a</sup> 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 cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Cardio7 is used exceeds the applicable RF compliance level above, the Cardio7 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the Cardio7.</p> <p><sup>b</sup> Over the frequency range 150 kHz to 80 MHz, field strength should be less than 3 V/m</p>			

<b>Recommended separation distances between portable and mobile RF communications equipment and the Cardio7</b>			
<p>The Cardio7 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Cardio7 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Cardio7 as recommended below, according to the maximum output power of the communications equipment.</p>			
<b>Rated maximum output power of transmitter</b>  <b>[W]</b>	<b>Separation distance according to frequency of transmitter</b> <b>[m]</b>		
	150 kHz to 80 MHz	80 MHz to 800 MHz	800 MHz to 2,5 GHz

	$d = \left[\frac{3,5}{V_1}\right]\sqrt{P}$	$d = \left[\frac{3,5}{E_1}\right]\sqrt{P}$	$d = \left[\frac{7}{E_1}\right]\sqrt{P}$
	V1=3 Vrms	E <sub>1</sub> = 3 V/m	E1=3 V/m
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.17	1.17	2.33
10	3.69	3.69	7.38
100	11.67	11.67	23.33

For transmitters rated at a maximum output power not listed above, the recommended separation distance  $d$  in meters (m) can be estimated 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 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

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

## Chapter 6. Specification

<b>ECG Leads</b>	Simultaneous 12 Leads Resting ECG
<b>Recording Channel</b>	3CH+1RHY, 3CH+3RHY, 6CH+1RHY, 12CH, 6CH+ST map 1CH Long Time(1min, 3min, 5min,10min) and Special Beat Report (Text, Guide, Vector, ST map)
<b>Gain</b>	2.5, 5, 10, 20, Auto (I~aVF: 10, V1~V6: 5) mm/mV
<b>Printing Speed</b>	5, 12.5, 25, 50, 100 mm/sec
<b>Sampling Rate</b>	Analysis Sampling Rate - 500 Digital Sampling Rate - 8,000

<b>Filters</b>	AC (50/60 Hz, -20dB or better), Muscle (25~35Hz, -3dB or better), Baseline drift (0.05Hz, 0.1Hz, 0.2Hz, -3dB or better), Low pass filter(off, 40Hz, 100Hz, 150Hz)
<b>Display</b>	800 x 480 pixel resolution, 7" Color TFT wide display 12 channels preview, ID, HR, Gain, Speed, Power status
<b>User Interface</b>	Touch screen, Rotary push-knob
<b>Printer Resolution</b>	Thermal print head, Roll Paper Report paper - width : A4/Letter 215mm(8.5") - length : A4 297 mm (11.7") Letter 279mm(11")  Resolution: 8dot/mm(0.125mm pitch)
<b>Patient data</b>	ID, name, age, gender, height, weight, race, smoke, department, room number, study desc., accession no., referring physician
<b>Basic Measurement</b>	Heart rate(30~300bpm, $\pm 3$ bpm), PR/RR int., QRS dur., QT/QTc int., P-R-T axis, SV1/RV5/R+S amp.
<b>ECG Data Storage</b>	Internal Storage for 200 ECGs : Built- in memory
<b>Electrical</b>	Internal noise: 20uV(p-p)max Input impedance: $\geq 50M\Omega$ Input voltage range: $\pm 5$ mV CMRR: $> 105$ dB DC offset voltage: $\geq \pm 400$ mV Patient leakage current: $< 10$ uA Frequency response: 0.05 ~ 200 with in $-3$ dB Isolated, defibrillation and ESU protected
<b>Signal Quality Control</b>	Pacemaker pulse detection Lead fault detection, Signal Saturation Detection
<b>Line Power</b>	Input: 100-240Vac, 1.5-0.75A, 50-60Hz, Output: 15Vdc, 4.2A

<b>Battery type</b>		Replaceable and Rechargeable, Lithium ion, 10.8V, 3250mA
<b>Battery Capacity</b>		6 hours of normal use or print 200 ECG pages(12 channel format at 25mm/s and 10mm/mV) The battery will charge to its full capacity within 3 hours with the power off.
<b>Communication</b>		LAN, WIFI(option), USB flash driver, USB barcode scanner
<b>Safety Conformity</b>		Class I, Type CF defibrillation-proof applied part.
<b>Environmental</b>	<b>Operation</b>	Ambient Temperature: 10~40°C Relative Humidity: 30~85%RH Atmospheric Pressure: 70~106KPa
	<b>Storage</b>	Ambient Temperature: -20~60°C Relative Humidity: 10~95%RH Atmospheric Pressure: 50~106KPa
<b>Dimensions</b>		300(W) x 290(D) x 89.5(H) mm , Approx. 3.5 kg
<b>Standard Accessory</b>		Patient Cable (1 EA), Disposable electrodes (1 SET), ECG clips (1 SET), ECG Paper (1 EA), Power Cord (1 EA), Operation manual (1EA), ECG diagnosis guide (1EA)
<b>Options</b>		Rechargeable battery(1 EA),