

CE 0086

CARDIMAX

FX-7402

ELECTROCARDIOGRAPH

Ver.03

OPERATION MANUAL



- Before using this device, read this operation manual.
- Store this manual in a location near the unit for future reference.

 FUKUDA
DENSHI



This device bears a CE label in accordance with the provisions of Medical Device Directive 93/42/EEC.

PERSONS RESPONSIBLE FOR SUPPLYING DEVICES TO THE EC MARKET
UNDER MDD 93/42/EEC.

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Note:

Only qualified physicians or persons under instructions from physicians are allowed to use the FX-7402.

This Operation Manual is for FX-7402 Version 03.

How to Use the Operation Manual

Congratulations on the purchase of your new electrocardiograph from Fukuda Denshi!

This operation manual is intended as a guide for proper operation of the Cardimax FX-7402.

Be sure to read and understand this manual thoroughly before using the Cardimax FX-7402 so you can perform each task smoothly and fully utilize the functions offered by this device.

If you have any questions or views about our product or manual, contact your local Fukuda Denshi sales and service representative.

This manual is organized into 8 chapters, with 3 appendices, glossary, and index.

Chapter 1, "General Information" deals with a general introduction to the Cardimax FX-7402. This chapter contains illustrations of the Cardimax FX-7402 so you can become familiar with the equipment before beginning use.

Chapter 2, "Preparing the Cardimax FX-7402 for Operation" provides you with a step-by-step procedure to set up the Cardimax FX-7402. This chapter also contains the procedure for charging the rechargeable battery.

Chapter 3, "Operating the Cardimax FX-7402: Recording a Standard 12-lead ECG in the Automatic Recording Mode" describes step-by-step the entire operation flow starting from connecting the patient cable to the electrode and attaching the electrodes to the patient, to recording the electrocardiogram using—as an example—the Automatic Recording of the standard 12-lead ECG. This chapter also provides information about the screen and keys on the touch-panel and operation panel.

Chapter 4, "Recording the Electrocardiogram: Standard ECG Mode" contains information on how to record the electrocardiogram using the standard ECG mode.

Chapter 5, "Recording the Electrocardiogram: Advanced Features" contains information on how to record the electrocardiogram using advanced features, including the Review Recording, POST Recording, R-R Trend Test Mode, Arrhythmia ECG Mode, and Arrhythmia Automatic Extension Recording Modes. (The Arrhythmia ECG Mode and Arrhythmia Automatic Extension Recording Mode are available only when the PC-7403 program cartridge is installed.)

Chapter 6, "Managing ECG Data Files" contains information on how to save ECG data on a PC card, read ECG data from the built-in memory or PC card, and send ECG data to a personal computer from the built-in memory or PC card. The chapter also explains how to initialize the PC card and other ECG data management functions.

Chapter 7, "Setting Up the Parameters of the Cardimax FX-7402" contains information on how to set up parameters such as the number of display channels and recording format using the SET UP MODE screens in accordance with your purposes.

Chapter 8, "Maintenance and Troubleshooting" deals with basic maintenance procedures. It also provides information on what to do when you are unable to measure an accurate electrocardiogram, and includes a list of error messages and their recovery actions.

Appendix A, "Specifications" gives you the main specifications for the Cardimax FX-7402.

Appendix B, "Daily Check Lists" summarizes the daily check items and their procedures.

Appendix C, "Periodic Check Lists" summarizes the periodical check items and their procedures.

The Glossary explains the technical terms used in this manual.

The Index is provided to locate specific information quickly.

Conventions

Keys

The step-by-step operation procedures in this manual are shown with screens and text. When you operate the Cardimax FX-7402, you use the Operation Panel keys and function keys on the Touch-panel. In this manual, the keys are indicated in the following manner.

Example of an Operation Panel key: **[START/STOP]**

Press the relevant key on the Operation Panel.

Example of function key on the Touch-panel: **[MANUAL]**

Touch the relevant function key on the Touch-panel.

Optional features

This manual provides information on the operation of the Cardimax FX-7402 and the additional functions it can provide when you plug in the PC-7403 program cartridge. Some of the functions are available only when the program cartridge is installed. The operation of the FX-7402 varies depending on the installed program cartridge. In this manual, the functions inherent to the PC-7403 program cartridge are identified with the following icon to set them apart:



Indicates a function that is available only when you have installed the PC-7403 program cartridge in the Cardimax FX-7402.
The PC-7404 incorporates the function of PC-7403.

Special Notice to User

Malfunction caused by EMC

The Cardimax FX-7402 complies with the safety standards IEC60601-2-25 (1999) and IEC60601-1-2 (2001). However, if there is a strong electromagnetic wave nearby that exceeds prescribed limits, the device could malfunction. If this happens, use the required countermeasures.

Influence of radiated electromagnetic wave:

The use of a cellular phone could affect the operation of the FX-7402. Alert persons in a facility where medical electronic equipment is installed to turn off their cellular phones and small radio equipment.

Influence of bursts and conduction electromagnetic wave:

High-frequency noise from other equipment may infiltrate into the FX-7402 through the AC outlet. Identify the noise source and stop use of the relevant equipment if possible. If this equipment cannot be shut down, provide the countermeasures for this noise route using a noise suppressing device, etc.

Influence of static electricity:

The discharge of static electricity could affect the operation of the FX-7402 in a dry environment (room), particularly in winter. Before using the FX-7402, humidify the room or discharge static electricity from a patient and persons who will record the ECG.

Influence of surge (lightening):

If there is a thunderstorm occurring nearby, it might cause a voltage surge in the FX-7402. If you expect any danger, unplug the power supply cord from the AC outlet and run the FX-7402 on its built-in battery power (optional). Also use an uninterruptible power supply, if available.

Equipment classification

The Cardimax FX-7402 falls under the following equipment classifications:

- 1) Protection against electrical shock
Class I, Internally powered
- 2) Type against electrical shock
Applied part: Type CF
- 3) Protection against liquids entering the device
General equipment standards

- 4) Operating safety in the presence of air-inflammable anesthetic gases or oxygen/nitrous oxide-anesthetic gases
The equipment must be used in an environment free from inflammable anesthetic gases or inflammable cleaning agents.
- 5) Running mode
Continuous running mode

Safety Precautions

- Before using the Cardimax FX-7402, be sure to read this section to ensure safety and correct operation.
- Be sure to follow the precautions given below. These are important matters related to safety.

Safety notifications

The following three safety notices alert the user to the level of hazard and damage that may result from not following the instructions or from misuse of the equipment.

 DANGER	Ignoring these instructions could cause death, serious injury, or major fire.
 WARNING	Ignoring these instructions could cause death, serious injury, or fire.
 CAUTION	Ignoring these instructions could cause injury or damage to the equipment.

Safety icons

The following icons appear with the instructions given in safety notices. They basically categorize what you should do or not do in the following manner:

	Indicates actions that are prohibited.
	Provides instructions for dangers, warnings, and cautions.
	Indicates actions that must be performed.

Precautions on analysis program**CAUTION**

Interpretation and Minnesota codes given by the Cardimax FX-7402 do not instruct the physician as to the kind and degree of cardiac disease. Accordingly, four value judgments are given for electrocardiogram (ECG) waveform and although "abnormal" indicates a large possibility of organic cardiac disease, there are cases where no cardiac disease exists despite an abnormal ECG (that is, an abnormal ECG may be caused by something other than the heart). On the other hand, care should be taken in the event any preclinical coronary arteriosclerosis could be present despite a normal ECG interpretation. Therefore, for a proper diagnosis, the ECG should be integrated with other interpretations. This program is not an arrhythmia monitor. The FX-7402 has no arrhythmia alarms.

Precautions on measurement program**CAUTION**

The equipment may measure the ECG waveform incorrectly due to external noise (such as drift of baseline, electromyogram, AC interference, etc.). Another matter requiring careful consideration is that tiny R waves in V1 and V2 may be overlooked and the S wave could be interpreted as the Q wave.

Precautions on the use of the battery pack**DANGER**

	<ul style="list-style-type: none"> • Be sure to use the specified battery pack (8/HRY-4/3AFD). • Be sure to charge the battery using the Cardimax FX-7402. Charging the battery using other equipment could lead to a hazard.
	<ul style="list-style-type: none"> • Do not disassemble or mutilate the battery. You could burn yourself. • Do not incinerate or heat the battery. You could burn yourself, or the battery could burst or leak toxic substances. • Do not short the battery. You could burn yourself. • Keep away from children. • If the liquid contained in the battery gets into your eyes, do not rub them. Wash your eyes thoroughly with water and see a doctor immediately.

Nonexplosion proof

 DANGER	
	Do not operate the FX-7402 in an environment where there is a risk of explosion. Do not operate the FX-7402 in the presence of flammable anesthetics.

Magnetic resonance imaging

 WARNING	
	Do not operate the FX-7402 during Magnetic Resonance Imaging (MRI) scanning. The conducting current may cause burns. Operating the FX-7402 may affect the MRI image, while the MRI may affect the accuracy of the FX-7402.

High-frequency surgery

 WARNING	
	The patient cable (CP-104T, CP-104L or CP-104J) contains resistors installed in the lead wire plugs to prevent damage to the equipment when used in the presence of high frequency surgery apparatus. These components reduce the risk of not only device damage, but also the risk of burns to the patient.

Defibrillation protection

 WARNING	
	The FX-7402 may remain connected to the patient during defibrillation only if the proper patient cable provided with defibrillator protection is being used. The patient cable (CP-104T, CP-104L or CP-104J) is provided with defibrillation protection. The FX-7402 will not be damaged when these cables are used, even if the defibrillator paddles come into contact with the ECG electrodes.

Connection

DANGER	
	<ul style="list-style-type: none">• This isolation measure is provided to protect the patient. Operation is bypassed if the electrodes on the patient cable come into contact with any other metal object or other electrically conductive objects, including the operator's hands. When such contact occurs, there is a risk of electric shock, regardless of whether or not the objects are grounded.• All ECG wires (patient connections), connectors, and amplifiers are electronically isolated from the rest of the device and from ground. This isolation restricts the current that can pass through a patient to less than 10 microamperes.• If the power supply cords of several different units are connected together in a multiple outlet tap, an increase in chassis leakage current can create a potential hazard.• When a cardiac pacemaker or other electrical stimulator is connected to the patient, it increases the risk of a potential hazard. Pay particular attention to safety measures to record ECG in such conditions. Appropriate measures must be taken to assure that the chassis leakage current is at a safe level.• The FX-7402 is a Type CF equipment. It must not, however, be placed in direct contact with the heart.
	<p>Be sure to connect the power supply cord to a hospital-grade wall AC outlet. If no hospital-grade wall outlet is available, connect the potential equalization cable securely to a proper ground. If no proper grounding is available, operate the FX-7402 on its rechargeable battery.</p>

Preventive maintenance

CAUTION	
	<p>The purpose of preventive maintenance is to ensure the device is always in a safe operating condition and to prevent possible future problems. Preventive maintenance should be performed at least once during each 12-month period. Preventive maintenance consists of a thorough inspection of the device, all connections, and all attached cables for signs of physical damage. Immediate maintenance must be performed if:</p> <ul style="list-style-type: none">• The device was subject to extreme mechanical stress; e.g., after a heavy fall.• Liquid or fluids have spilled on or into the device.• The device does not function, or functions improperly.• Parts of the device cabinet are cracked, broken, or damaged.• The power supply cord or the patient cable and interconnecting cables show signs of deterioration.

Transportation

 **CAUTION**



When transporting the FX-7402, pack it with the specified packing materials.

Disposing of the FX-7402, accessories, and options

 **WARNING**



When you dispose of the FX-7402, accessories, or optional parts, entrust them to specialized industrial waste dealers.

General precautions

CAUTION	
	<ul style="list-style-type: none">Do not use or store the FX-7402 in a place where it may be exposed to a liquid spill. Liquid in the equipment can be a source of danger such as electric shocks to a patient or operator of the FX-7402.Do not subject the FX-7402 to a strong impact or vibration and do not drop. Such damage to the equipment could cause an electric shock or fire. If you unintentionally drop the FX-7402, contact your local Fukuda Denshi sales and service representative.Do not subject the liquid crystal display to a strong impact. The device can be damaged by unwarranted force.
	<ul style="list-style-type: none">Make sure the patient does not come in contact with the FX-7402, other electric appliances, or metal. Such contact increases the leakage current and can become a source of danger to the patient.Do not insert a PC card in the wrong direction or with too much force. This could cause damage to both the FX-7402 and PC card.
	<ul style="list-style-type: none">When you unplug a cord, be sure to hold the plug to remove the cord (do not pull the cord itself). Also, do not plug/unplug the cord with wet hands. This could cause an electric shock, short circuit, or injury.Operate the touch-panel display with a finger. If you operate the touch-panel screen with a tool instead of your finger, this could damage the surface of the touch-panel screen and cause the device to malfunction.Wipe off dirt on the surface of the touch-panel display with a soft cloth moistened using ethanol or with the silicon cloth supplied with the accessories.When not using the FX-7402, keep it covered using the equipment cover supplied with the accessories to prevent liquid spilling into the liquid crystal display. <p>Checks:</p> <ul style="list-style-type: none">Perform the daily checks to assure the safety of the FX-7402.Perform the periodical checks every three to four months to assure the safety of the FX-7402. <p>The periodical checks should be performed by a specialist every 12 months to assure the safety of the FX-7402.</p>

Equipment Symbols

The following symbols are printed on the Cardimax FX-7402.



Attention: Read the Operation Manual.



Type CF equipment



Potential equalization terminal



AC power supply



Serial port



External CRT terminal

Guidance for Electromagnetic Compatibility (EMC)

Details about the electromagnetic compatibility (EMC) of the Cardimax FX-7402 are given below. Before using the FX-7402, be sure to read and understand the following information.

Compliance with electromagnetic emissions

The Cardimax FX-7402 is intended for use in the electromagnetic environment specified in the following table. Before using the FX-7402, check the environmental conditions where it is used.

Emissions test	Compliance	Electromagnetic environment/guidance
RF emissions CISPR 11	Group 1	The Cardimax FX-7402 uses RF energy for its internal functions only. Therefore, its RF emissions are very low and are not likely to cause any interference in electronic equipment installed nearby.
RF emissions CISPR 11	Class B	
Harmonic emissions IEC61000-3-2	Class A	The Cardimax FX-7402 is suitable for use in all types of buildings, including private houses. It can be used by direct connection to the commercial low-voltage power supply in buildings used for domestic purposes.
Voltage fluctuations/flicker emissions IEC61000-3-3	Compliance	

Compliance with electromagnetic immunity 1

The Cardimax FX-7402 is intended for use in the electromagnetic environment specified in the following table. Before using FX-7402, check the environment conditions where it is used.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment/guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6kV: Contact ±8kV: Air	±6kV: Contact ±8kV: Air	The desirable floor materials are wood, concrete, or ceramic tiles. If the floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transition/burst IEC 61000-4-4	±2kV: Power supply lines ±1kV: Input/output lines	±2kV: Power supply lines ±1kV: Input/output lines	The power supply quality should be that of a standard commercial or hospital environment.
Surge IEC 61000-4-5	±1kV: Differential mode ±2kV: Common mode	±1kV: Differential mode ±2kV: Common mode	The power supply quality should be that of a standard commercial or hospital environment.
Voltage drops, dips, and fluctuations of the input power supply line IEC 61000-4-11	<5% U_T (>95% drop in U_T) for 0.5 cycle <40% U_T (>60% drop in U_T) for 5 cycles <70% U_T (>30% drop in U_T) for 25 cycles <5% U_T (>95% drop in U_T) for 5 seconds	<5% U_T (>95% drop in U_T) for 0.5 cycle <40% U_T (>60% drop in U_T) for 5 cycles <70% U_T (>30% drop in U_T) for 25 cycles <5% U_T (>95% drop in U_T) for 5 seconds	The power supply quality should be that of a standard commercial or hospital environment. If the FX-7402 user requires continuous operation even during a power failure, it is recommended to use an uninterruptible power supply or a battery (optional).
Magnetic field of commercial frequency (50/60Hz) IEC 61000-4-8	3 A/m	3 A/m	The power frequency magnetic field should have the same characteristics as that of general locations in a standard commercial or hospital environment.

 **Note:**

U_T puts priority on the AC power supply voltage over the applied test level.

Compliance with electromagnetic immunity 2

The Cardimax FX-7402 is intended for use in the electromagnetic environment specified in the following table. Before using FX-7402, check the environmental conditions where it is used.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment/guidance
Conducted RF IEC 61000-4-6	3 Vrms 150kHz to 80MHz	3 Vrms	Portable and mobile RF communications equipment must not be operated closer to any part of the FX-7402 (including cables) than the recommended separation distance calculated from the formula applicable to the transmitter frequency. Recommended separation distance: $d=1.2\sqrt{P}$ $d=1.2\sqrt{P}$ 80MHz to 800MHz $d=2.3\sqrt{P}$ 800MHz to 2.5GHz Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer, and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters (determined by an electromagnetic site survey*) must be lower than the compliance level in each frequency range**. Interference may occur in the vicinity of equipment marked with the following symbol:
Radiated RF IEC 61000-4-3	3 V/m 80kHz to 2.5GHz	3 V/m	

Notes:

- The higher frequency range is between 80MHz and 800MHz.
- These guidelines may not apply in all situations. Electromagnetic propagation is affected by reflection and absorption from buildings, objects, and people.

*: The field strengths of fixed transmitters, such as base stations for radio (cellular/cordless) phones and land mobile radios, amateur radio, AM/FM radio broadcast and TV broadcast base stations cannot be predicted theoretically with accuracy. To assess the electromagnetic environment produced by fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the site where the FX-7402 is used exceeds the applicable RF compliance level above, the equipment should be monitored to

assure normal operation. If an abnormality is observed, additional measures may be necessary, such as re-orienting or relocating the FX-7402.

- **: Over the frequency range 150kHz to 80MHz, field strengths should be less than 3 V/m.

Recommended separation distance between portable/mobile RF communications equipment and FX-7402

The Cardimax FX-7402 is intended for use in an electromagnetic environment where RF emission interference is controlled. The electromagnetic interference can be prevented during operation by providing a minimum distance between portable/mobile RF communications equipment (transmitters) and the FX-7402 as recommended below (according to the maximum output power of the transmitter).

Rated maximum output power of transmitter (W)	Separation distance according to frequency of transmitter (m)		
	26MHz to 80MHz $d=1.2\sqrt{P}$	80MHz to 800MHz $d=1.2\sqrt{P}$	800MHz to 2.5GHz $d=2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

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

Notes:

- The separation distance is applied for the higher frequency range of 80MHz to 800MHz.
- These guidelines may not apply in all situations. Electromagnetic propagation is affected by reflection and absorption from buildings, objects, and people.

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Chapter 1

General Information

Introduction

Welcome to the new electrocardiograph from Fukuda Denshi. The Cardimax FX-7402 measures a standard 12-lead electrocardiogram (ECG) using advanced microprocessor technology. The FX-7402 is compact and portable. With an optional rechargeable battery, you can take it anywhere to perform a medical examination.

Configurations of Cardimax FX-7402

The configuration of the Cardimax FX-7402 varies depending on the installation of the optional program cartridge PC-7403 program cartridge.

When the PC-7403 program cartridge is installed, you can perform optional functions with the Cardimax FX-7402. The following table summarizes the functions available with or without the PC-7403.

Function	CTR G	
	None	PC-7403
Standard ECG Mode	Yes	Yes
 Analysis Recording	No	Yes
Measurement Recording	Yes	Yes
Manual Recording	Yes	Yes
R-R Trend Test Mode	Yes	Yes
 Arrhythmia ECG Mode	No	Yes
ECG Data File	Yes	Yes

Before using your Cardimax FX-7402, determine its configuration and the supported functions from the above table.

Main Features

Standard 12-lead ECG

Records the standard 12-lead waveform. When the optional program cartridge is installed, you can analyze the ECG waveform.

- ☞ See Chapter 4, "Recording the Electrocardiogram: Standard ECG Mode" (page 69) and Chapter 5, "Recording the Electrocardiogram: Advanced Features" (page 79).

R-R Trend Test Mode

Monitors the selected ECG lead for 1 to 5 minutes or 100 or 200 beats and measures the variation of the R-R interval. The measurement results (Standard Deviation, Coefficient of Variation, Trend Graph, and Histogram) are recorded together with the ECG waveform.

- ☞ See "R-R Trend Test Mode" in Chapter 5, "Recording the Electrocardiogram: Advanced Features" (page 86).

PC-7403

Arrhythmia ECG Mode

Monitors the selected 3-leads of ECG for 1 to 3 minutes and analyzes the arrhythmia. The analysis results are recorded as a report together with the ECG waveform.

- ☞ See "Arrhythmia ECG Mode" in Chapter 5, "Recording the Electrocardiogram: Advanced Features" (page 90).

Various recording formats

The waveform recording channels and report formats can be changed in accordance with the application. The recorder incorporates a high-density thermal printer that provides a clear recording on paper.

- ☞ See "Selecting the Recording Format" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 129).

User-friendly touch-panel liquid crystal display (LCD)

The FX-7402 incorporates a high-resolution LCD to provide a sharp screen display. You can easily verify the ECG waveforms, pulse rate, electrode conditions, and analysis data on this screen. You can also enter alpha characters and numerical values by using the touch-panel display.

- ☞ See "Operation Panel" and "Touch-Panel Display" in Chapter 3, "Operating the Cardimax FX-7402" (pages 51 to 55).

ECG data file management function

The Cardimax FX-7402 allows you to save ECG data in the built-in memory and on a PC card. You can store up to 300 ECG data files in the built-in memory. You can also send ECG data from the FX-7402 to a personal computer if connected.

- ☞ See Chapter 6, "Managing ECG Data Files" (page 96).

Portable electrocardiograph

You can record ECG data in a remote location (where there is no AC wall outlet) by using the optional battery to power the FX-7402.

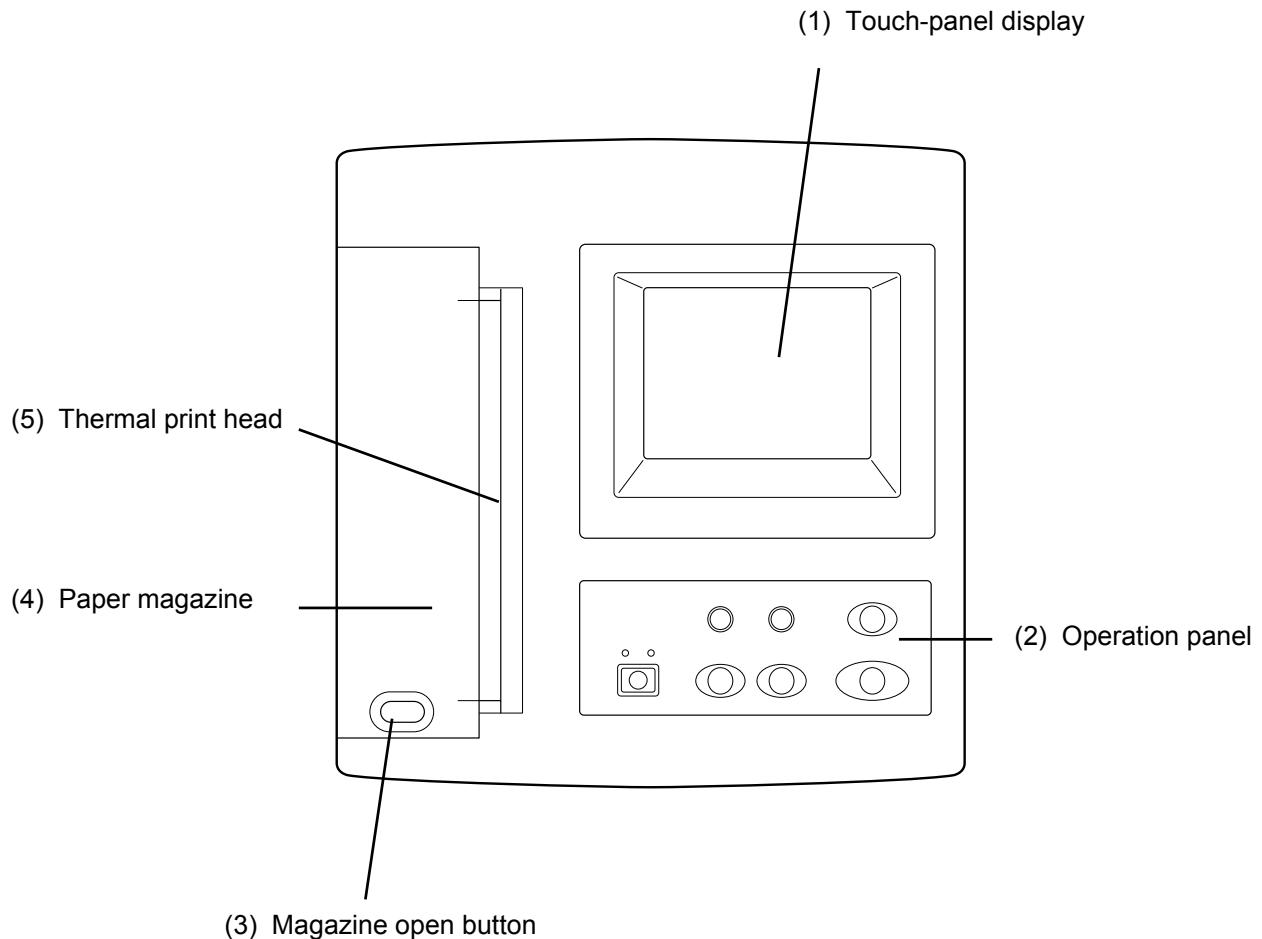
- ☞ See "Using the Battery (Option)" in Chapter 2, "Preparing the Cardimax FX-7402 for Operation" (page 38).

External slave monitor for easy to view waveform display

You can connect an external slave monitor (optional) to the FX-7402 and easily check ECG waveforms in a remote location.

Names and Functions of Parts

Front view



(1) Touch-panel display

Displays ECG waveforms, patient information, and equipment status. Used also to enter patient data or perform various operations by touching the touch-panel keys (soft keys) provided on the screen.

 **CAUTION**

- **Do not place a heavy object on the touch-panel display or subject it to shock.**
Otherwise, it could be damaged.
- **Operate the touch-panel display with a finger.**
If the surface of the touch-panel display is scratched, it could damage the LCD.
- **Wipe off dirt on the surface of the touch-panel display with a soft cloth moistened with ethanol or use the silicon cloth supplied with the accessories.**
- **When not using the FX-7402, keep it covered to prevent liquid spilling into the LCD.**

(2) Operation panel

Provides the controls for the Cardimax FX-7402 operation.

 See "Operation Panel" and "Touch-Panel Display" in Chapter 3, "Operating the Cardimax FX-7402" (pages 51 to 55) for further information about the keys on the operation panel and touch-panel display.

(3) Magazine open button

Press to open the paper magazine cover.

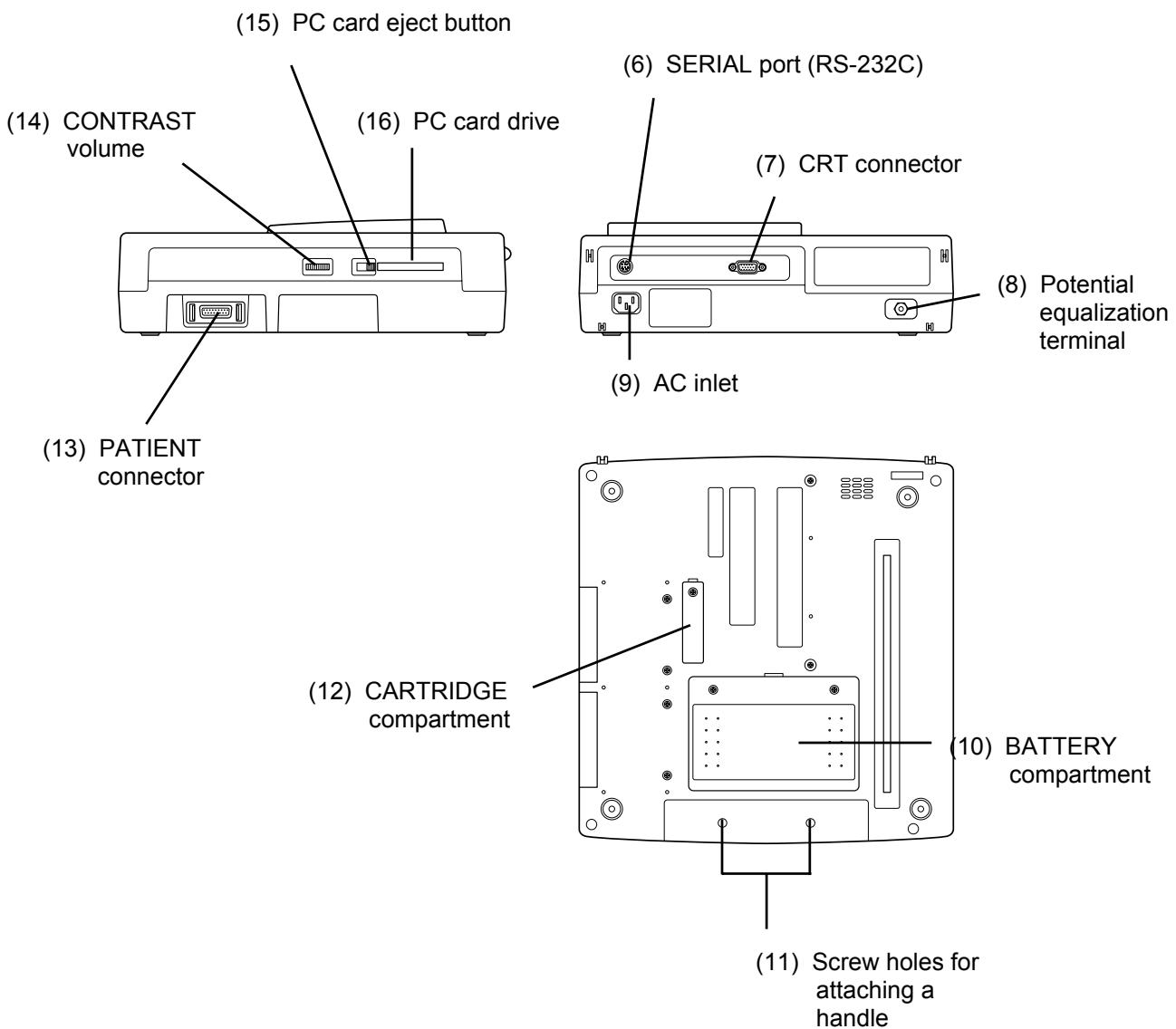
(4) Paper magazine

Load the recording paper here.

(5) Thermal print head

Records (prints) the ECG waveforms and characters, such as the measured values.

Side, rear, and bottom views _____



(6) SERIAL port (RS-232C)

Connect the cross cable (RS-232C) here to connect external equipment such as a personal computer.

(7) CRT connector

Connect an external slave monitor cable here.

 **CAUTION**

If a non-isolated signal is connected to the CRT connector and the source of this signal is linked to a different protective ground terminal, the ECG instrument chassis might be subjected to a ground potential difference which would produce a fault condition. Appropriate measures must be taken to prevent this condition.

(8) Potential equalization terminal

Connect the potential equalization cable (CE-12) to this terminal.

 **CAUTION**

- When using the FX-7402 in conjunction with other instruments, use the specified potential equalization cable (CE-12) to equalize the potential.
- When using the FX-7402 in conjunction with other instruments, pay special attention to the combined leakage current of all instruments. Refer to "Connection" in "Safety Precautions" before using in this manner. Be sure to follow the operating instructions for the other instruments.

(9) AC inlet

Plug in the matching end of the power supply cord here.

(10) BATTERY compartment

Install the optional battery (8/HRY-4/3AFD) in this compartment.

(11) Screw holes for attaching a handle

Used for attaching the optional OA-301 handle.

(12) *CARTRIDGE compartment*

Install the optional program cartridge (PC-7403) in this compartment.

(13) *PATIENT connector*

Plug in the patient cable here.

 **CAUTION**

- Do not use a cable other than the specified patient cable (CP-104J, CP-104L or CP-104T).
- Do not use this connector for any purpose other than ECG input.
- The FX-7402 is designed to comply with the requirements of IEC for Class I, type CF. Protection against a defibrillator is only available when used with the proper patient cable. Be sure to use the proper patient cable (CP-104J, CP-104L or CP-104T) when using with a defibrillator. Refer to "Accessories" in this chapter for the appropriate cable.

(14) *CONTRAST volume*

Use this control to adjust the display contrast.

(15) *PC card eject button*

Press this button to remove a PC card from the drive.

(16) *PC card drive*

Insert an optional PC card, for storing ECG data, into this drive.

 **WARNING**



- To use optional equipment, contact your local Fukuda Denshi sales and service representative.
- To use the Cardimax FX-7402 together with other medical equipment, contact your local Fukuda Denshi sales and service representative. Never disassemble the equipment.

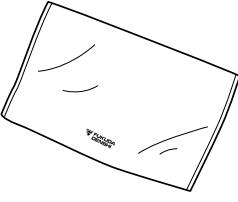
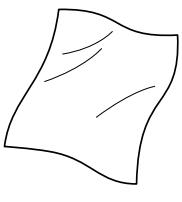
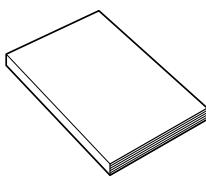
 **CAUTION**

- During operation of the PC card drive, do not remove the card or turn off the power.
- Be sure to use the specified PC card (FMC-4, FMC-20, FMC-40, FMC-85).

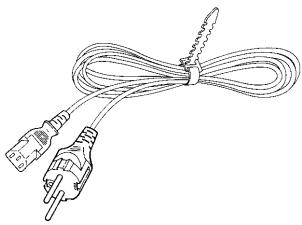
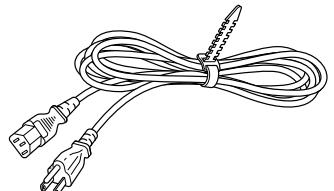
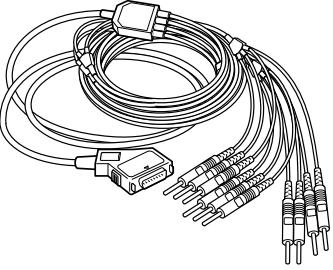
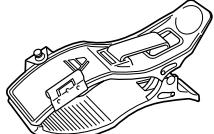
Accessories

The common accessories of the FX-7402 required by all users are included in the same box as the main unit. The special accessories used under a different environment are provided in a separate box. There are three special accessory packages: (1) ASE-02G General Accessories Package, (2) ASE-02A Accessories Package for U.S. and (3) ASE-02E Accessories Package for Europe. Make sure that you have the correct accessory package.

Common Accessories

1 Equipment cover (1 pc) 	2 Silicon Cloth (1 pc) 	3 Operation Manual (this document) 
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ASE-02G General Accessories Package

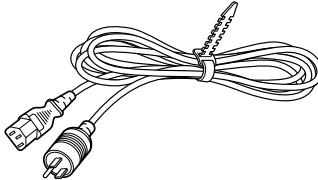
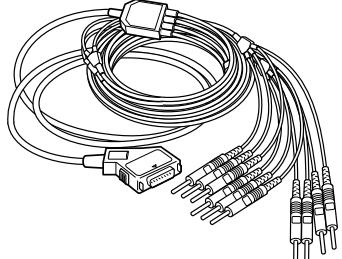
1 Power supply cord CS-18 (1 pc) 	2 Power supply cord CS-20 (1 pc) 	3 Patient cable CP-104J (1 pc) 
4 Limb electrode TE-43 (1 set) 	5 Chest electrode TE-01 (6 pc) 	6 Keratin cream OJ-02 (1 pc) 



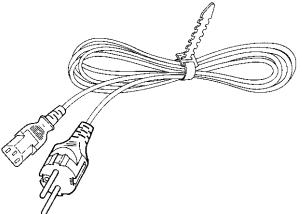
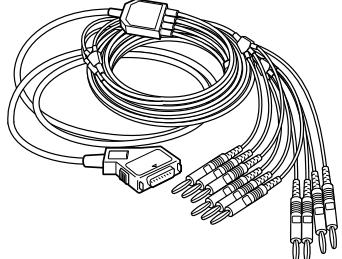
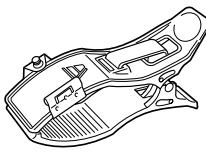
CAUTION

- When you use the ASE-02G general accessories package and the ASE-02A accessories package, the accessories do not comply with European Community (CE) requirements.
- Use the ASE-02E accessories package for Europe to comply with the CE requirements.

ASE-02A Accessories Package for U.S.

1 Power supply cord CS-24 (1 pc) 	2 Patient cable CP-104L (1 pc) 	
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ASE-02E Accessories Package for Europe

1 Power supply cord CS-18 (1 pc) 	2 Patient cable CP-104T (IEC) (1 pc) 	3 Limb electrode TEE-43RG (1 set) 
4 Chest electrode TEE-01RA (6 pc) 	5 Keratin cream OJ-02 (1 pc) 	

Optional Parts and Consumables

The following optional parts and consumables are available for the FX-7402.

Program cartridge PC-7403

The PC-7403 program cartridge provides additional features including Arrhythmia ECG Mode and analysis recording in the Standard ECG Mode.

- ☞ See "Introduction" in Chapter 1, "General Information" for further information about the program cartridge and its functions (page 1).



Program cartridge PC-7404

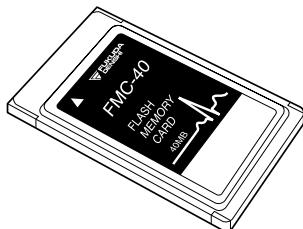
The PC-7404 program cartridge provides additional features including Stress Test Mode and analysis recording in the Standard ECG Mode.



PC card FMC-4 (4MB), FMC-20 (20MB), FMC-40 (40MB), FMC-85 (85MB)

Used as an external storage medium for ECG data.

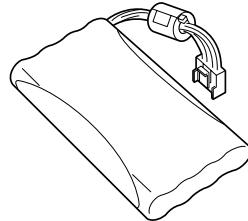
- ☞ See Chapter 6, "Managing ECG Data Files" (page 96).



Battery pack 8/HRY-4/3AFD

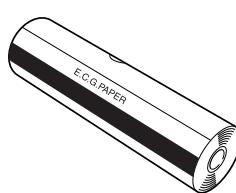
Used as the power supply for the Cardimax FX-7402 in a remote location where there is no AC wall outlet.

- ☞ See "Using the Battery (Option)" in Chapter 2, "Preparing the Cardimax FX-7402" (page 38).

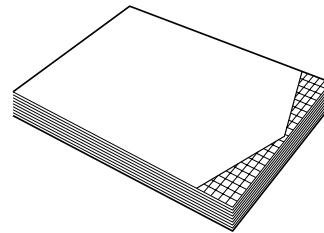
**Recording paper (Roll paper OP-69TE, Z-fold paper OP-621TE)**

Spare recording paper.

- ☞ See "Loading the Recording Paper" in Chapter 2, "Preparing the Cardimax FX-7402" (page 16).



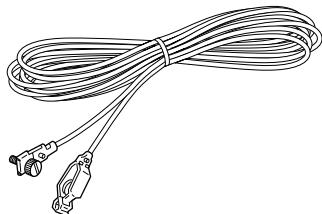
Roll paper



Z-fold paper

Potential equalization cable CE-12

Used as a ground cable.



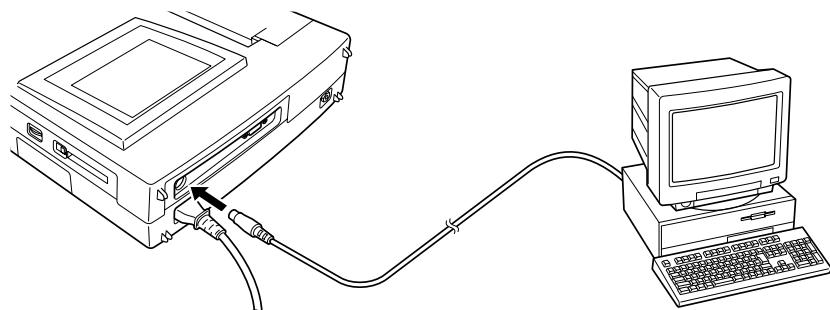
WARNING



- Be sure to connect the optional potential equalization cable (CE-12) when using the Cardimax FX-7402 in a location where no hospital-grade 3-pin wall outlet is available.
- When you use the Cardimax FX-7402 together with other equipment, perform potential equalization using the optional potential equalization cable (CE-12).

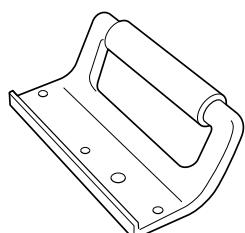
Cross cable CJ-325

This 5-meter communication cable (RS-232C) is used to connect external equipment such as a personal computer.



Handle (OA-301)

Attach this optional handle to the underside of the Cardimax FX-7402 for carrying.



Chapter 2

Preparing the Cardimax FX-7402

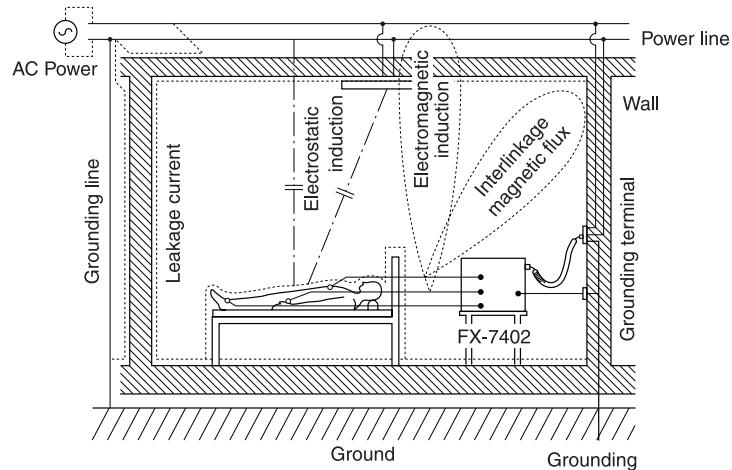
This chapter will help you to choose an installation site, configure, and set-up the Cardimax FX-7402. Follow the instructions provided here to ensure that your electrocardiograph installation process is smooth and trouble-free. Be sure to provide a ground connection using the optional potential equalization cable (CE-12) if the FX-7402 is installed in a place where there are no hospital-grade 3-pin wall outlets.

Site selection

The FX-7402 has been designed so that in addition to using it in hospitals and clinics, it can easily be carried and battery-operated anywhere, for field activities such as a group examination. As you decide where you want to locate the Cardimax FX-7402, take the following matters into consideration to get accurate ECG recordings:

- Keep the Cardimax FX-7402 and the patient's bed away from high-tension wires or high-voltage power lines. If there is an intense radiation source near the Cardimax FX-7402, the ECG will contain noise interference.
- Do not install the Cardimax FX-7402 near X-ray units, ultrasonic equipment, radios, and fluorescent lamps. They could easily become sources of trouble.
- Use the Cardimax FX-7402 in an environment where the room temperature is maintained at 10 to 40 degrees Celsius (50 to 104 degrees Fahrenheit).
- Use the Cardimax FX-7402 in an environment where the relative humidity is from 10 to 95 percent (non-condensing).
- Install the Cardimax FX-7402 in a place where a hospital-grade 3-pin wall outlet is available or a site that provides a secure ground connection.

Route of leakage current, electrostatic induction, and electromagnetic induction

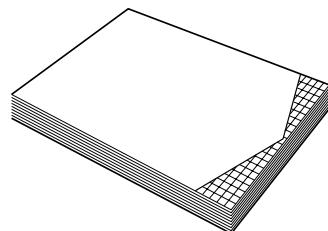


Loading the Recording Paper

Follow the steps below to load paper into the magazine. You can use two types of recording paper: roll paper or Z-fold paper.



Roll recording paper OP-69TE



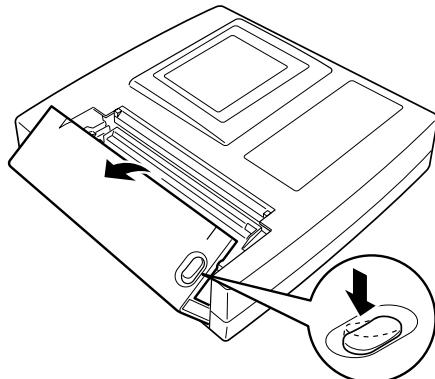
Z-fold paper OP-621TE

Roll recording paper _____

Operation

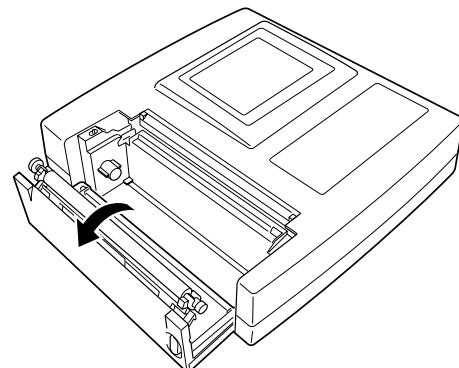
1 Press the magazine open button.

The magazine cover will open slightly.



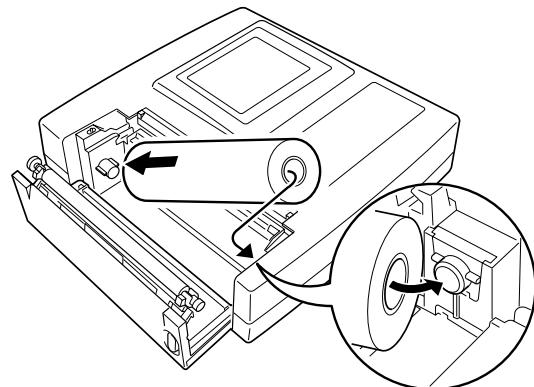
2 Open the magazine cover.

Lift up and completely swing the magazine cover open.



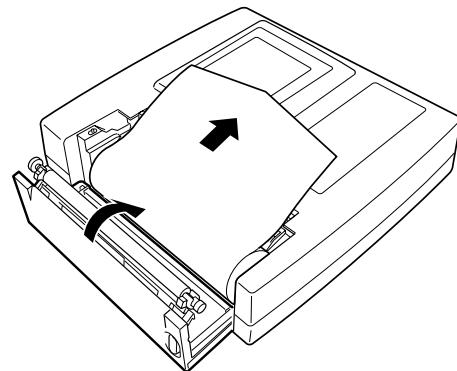
3 Set the recording paper roll.

- (1) Hold the recording paper roll with its free edge facing the operation panel side.
- (2) Align the core of the recording paper roll with the paper holder knob (long) on the far end inside the magazine compartment. Slip and push the core over this knob.
- (3) Align the other side of the core with the paper holder knob (short) on the near end and slip the core over this knob as well.



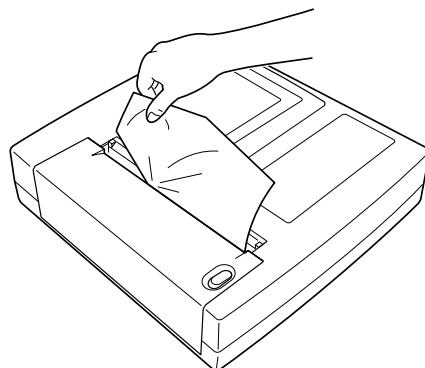
4 Close the magazine cover.

Hold the free edge of the recording paper roll and pull out approximately 30 cm of paper. To close the magazine cover, firmly press the side until it clicks shut.



5 Tear off the extended portion of paper.

Tear off the extended portion of the paper roll on the paper cutter edge.



6 After completing the entire set up procedure in this chapter, turn ON the Cardimax FX-7402 and set the PAPER TYPE in the SET UP MODE (ECG CONTROL screen) to "ROLL."

The PAPER TYPE parameter is set to ROLL at the time of shipment. Therefore, if you have just purchased and are using the Cardimax FX-7402 for the first time, you can skip this step.

 See "Setting the Recording Paper Type" (page 32).

SET UP MODE (ECG CONTROL)		
PAPER TYPE	<input checked="" type="checkbox"/> ROLL	<input type="checkbox"/> Z-FOLD
WIDTH OF BASELINE	<input checked="" type="checkbox"/> Standard	
AC FILTER	<input type="checkbox"/> 50Hz	<input checked="" type="checkbox"/> 60Hz
MUSCLE FILTER	<input type="checkbox"/> 25Hz	<input checked="" type="checkbox"/> 35Hz
DRIFT FILTER	<input type="checkbox"/> 0.25Hz	<input checked="" type="checkbox"/> 0.5Hz
CUT-OFF FREQUENCY	<input type="checkbox"/> 70Hz	<input checked="" type="checkbox"/> 100Hz
KEY CLICK	<input checked="" type="checkbox"/> ON	<input type="checkbox"/> OFF
QRS BEEP	<input checked="" type="checkbox"/> ON	<input type="checkbox"/> OFF
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/>		

Notes:

- Do not expose the recording paper to direct sunlight or leave it in a room with high temperature and humidity. The paper becomes discolored at 70 degrees Celsius (158 degrees Fahrenheit). If this happens, the printed data will be rendered unreadable.
- Do not leave the recording paper under fluorescent lamps for a long time. The light of the lamps will discolor the paper and make the printed data unreadable.
- Do not store the recording paper in polyvinyl chloride film.
- Do not store the recording paper for a long time with printed surfaces pressed against each other. Pressure may transfer printed waveforms from one paper to another.

Z-fold paper

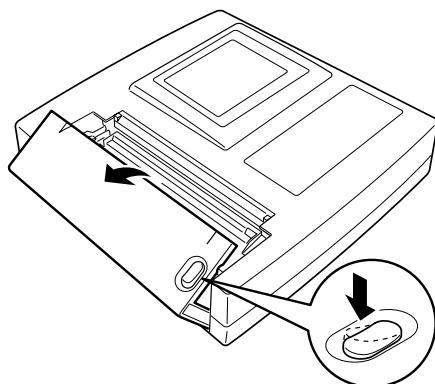
Note:

You cannot load the Z-fold paper directly into the Cardimax FX-7402. Z-fold paper must be placed next to FX-7402 on the desk.

Operation

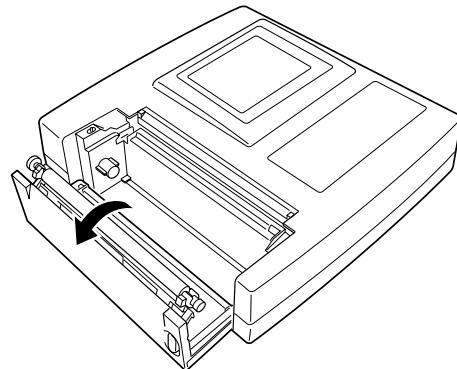
1 Press the paper magazine open button.

The magazine cover will open slightly.

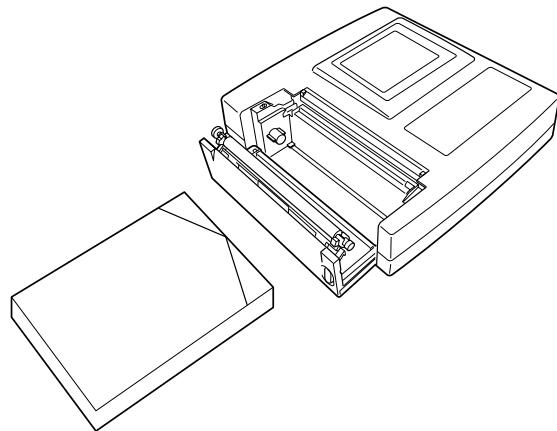


2 Open the magazine cover.

Lift up and completely swing the magazine cover open.

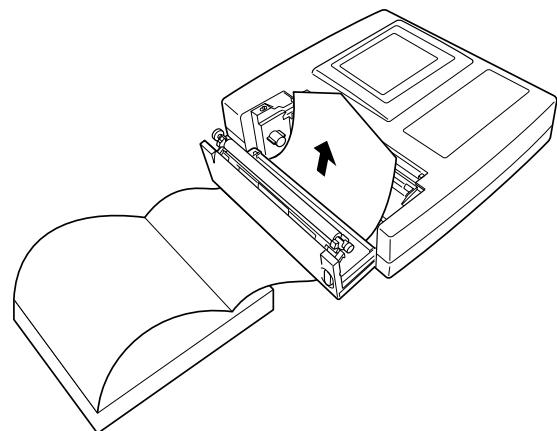


3 Place the Z-fold paper on the left side of the FX-7402.



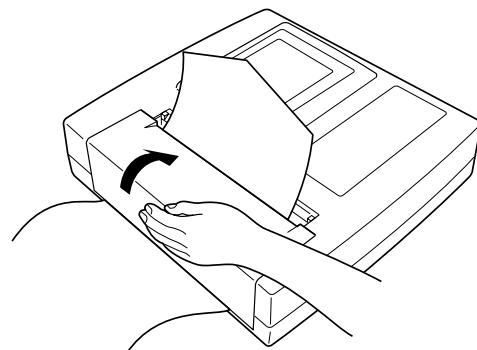
4 Insert the end of the Z-fold paper into the slot at the lower portion of the magazine cover.

Hold the free edge of the Z-fold paper and pull it upwards.



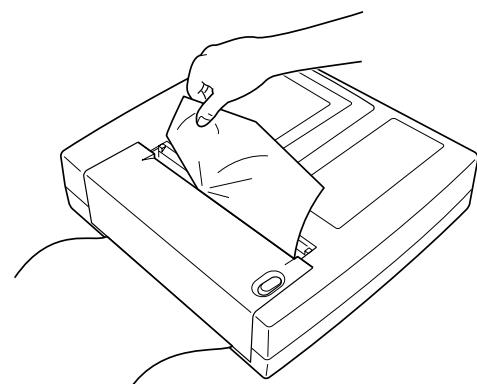
5 Close the magazine cover.

Hold the free edge of the Z-fold paper and pull out approximately 20 cm of paper. Then, firmly press the side of the magazine cover until it clicks shut.



6 Tear off the extended portion of paper.

Tear off the extended portion of the paper on the paper cutter edge.



7 After completing the entire set up procedure in this chapter, turn ON the Cardimax FX-7402 and set the PAPER TYPE in the SET UP MODE (ECG CONTROL screen) to "Z-FOLD."

The PAPER TYPE parameter is set to ROLL at the time of shipment. Therefore, if you have just purchased and are using the Cardimax FX-7402 for the first time, you must set this parameter.

See "Setting the Recording Paper Type" (page 32).

SET UP MODE (ECG CONTROL)		
PAPER TYPE	<input type="radio"/> ROLL	<input checked="" type="radio"/> Z-FOLD
WIDTH OF BASELINE	<input checked="" type="checkbox"/>	Standard
AC FILTER	<input type="radio"/> 50Hz	<input checked="" type="radio"/> 60Hz
MUSCLE FILTER	<input type="radio"/> 25Hz	<input checked="" type="radio"/> 35Hz
DRIFT FILTER	<input type="radio"/> 0.25Hz	<input checked="" type="radio"/> 0.5Hz
CUT-OFF FREQUENCY	<input type="radio"/> 70Hz	<input type="radio"/> 100Hz <input checked="" type="radio"/> 150Hz
KEY CLICK	<input checked="" type="checkbox"/> ON	<input type="checkbox"/> OFF
QRS BEEP	<input checked="" type="checkbox"/> ON	<input type="checkbox"/> OFF
NEXT ↓ PREV ↑ MENU EXIT		

Notes:

- Do not expose the recording paper to direct sunlight or leave it in a room with high temperature and humidity. The paper becomes discolored at 70 degrees Celsius (158 degrees Fahrenheit). If this happens, the printed data will be rendered unreadable.
- Do not leave the recording paper under fluorescent lamps for a long time. The light of the lamps will discolor the paper and make the printed data unreadable.
- Do not store the recording paper in polyvinyl chloride film.
- Do not store the recording paper for a long time with printed surfaces pressed against each other. Pressure may transfer printed waveforms from one paper to another.

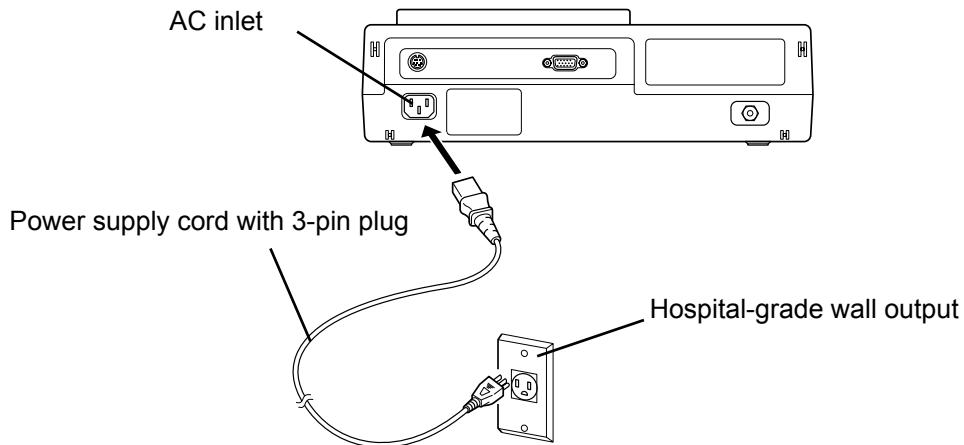
Connecting the Power Supply Cord

Connect the mating end of the power supply cord to the AC inlet on the rear of the Cardimax FX-7402, and plug the opposite end into a hospital-grade wall outlet (3-pin outlet with grounding terminal).

! WARNING



- Be sure to connect the power supply cord to a hospital-grade 3-pin wall outlet.
- If there is no hospital-grade wall outlet available, be sure to connect the optional potential equalization cable (CE-12) to a ground connection. If the ground connection is not performed properly, the patient could be in danger.



✓ Additional information:

The Cardimax FX-7402 can be operated on batteries when no AC wall outlets are available.

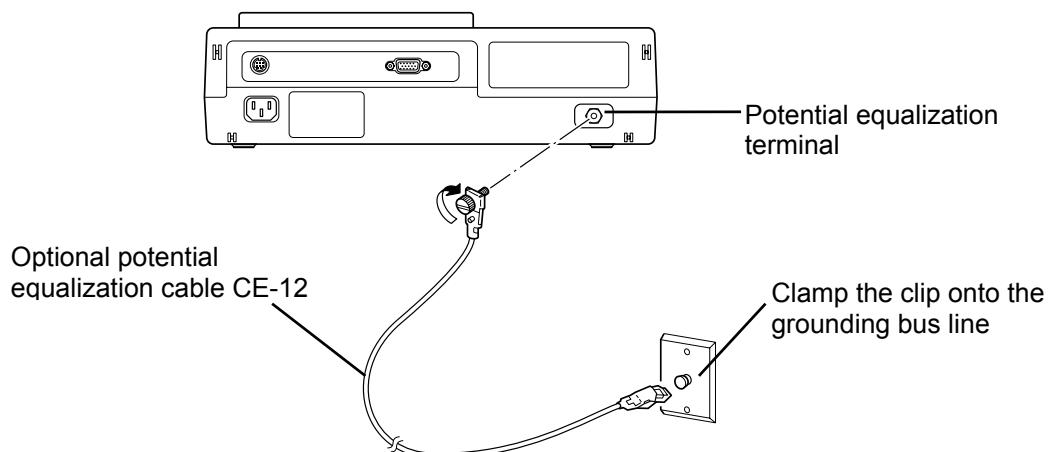
 See "Using the Battery (Option)" in this chapter (page 38).

Connecting the Ground

When a hospital-grade 3-pin wall outlet is unavailable, be sure to connect one end of the optional potential equalization cable (CE-12) to the potential equalization terminal of the Cardimax FX-7402 and the opposite end to ground. (When the power supply cord is connected to a hospital-grade wall outlet, ground is provided automatically and therefore this procedure can be omitted.)

WARNING	
!	<ul style="list-style-type: none"> If there is no hospital-grade wall outlet, be sure to connect the optional potential equalization cable (CE-12) properly to a ground. When the Cardimax FX-7402 is used together with other equipment, connect the Cardimax FX-7402 and the other equipment with the optional potential equalization cable (CE-12). <p>This equalization feature protects the patient from electric shocks even if leakage currents flow from each device.</p>
(circle with a slash)	<p>Precautions on ground connection</p> <ul style="list-style-type: none"> Never make a ground connection to a gas pipe. Such an arrangement could create a highly dangerous situation. Do not make a ground connection to ungrounded objects such as window frames, vinyl water pipes, or grounding terminals of other unrelated equipment. Do not make a ground connection to a water pipe. This arrangement may not provide proper grounding.

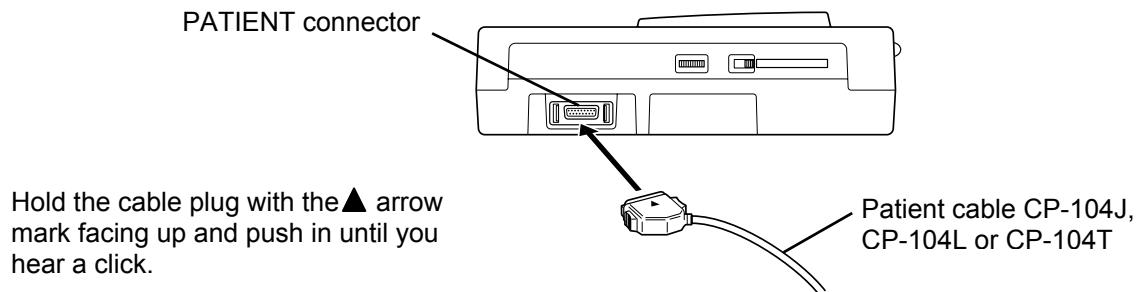
CAUTION	
<p>Precautions on ground connection</p> <ul style="list-style-type: none"> Make sure the optional potential equalization cable (CE-12) is connected properly and there is no breakage in the cable. If there is no suitable object to which a ground connection can be made, bury a metal rod in the ground (earth) and connect the ground to this rod. 	



Connecting the Patient Cable

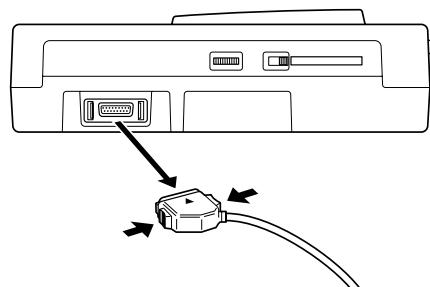
Connect the mating end of the patient cable to the PATIENT connector on the right side of the Cardimax FX-7402. At this time, make sure that the arrow mark on the cable plug is facing up.

 WARNING
<ul style="list-style-type: none"> • Do not use a cable other than the specified patient cable (CP-104J, CP-104L or CP-104T). • Do not use the patient cable for purposes other than ECG input.



Removing the patient cable

Hold and press the buttons on both sides of the cable plug and pull it out from the PATIENT connector.



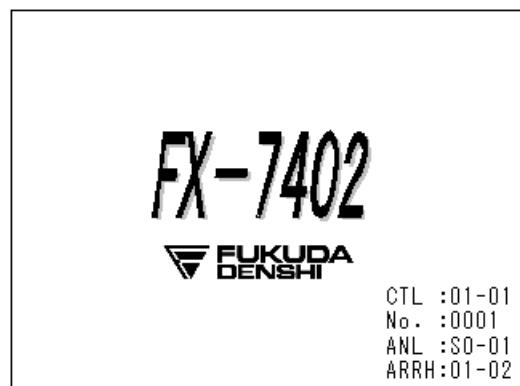
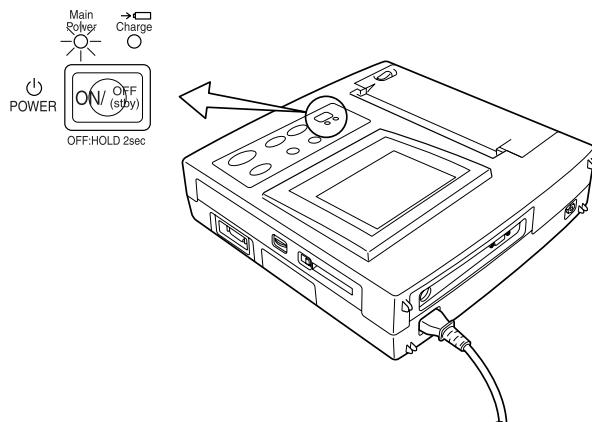
Turning ON Power

To turn ON the Cardimax FX-7402, use the [POWER ON/OFF (stby)] key on the Operation Panel of the Cardimax FX-7402. Before you turn ON the Cardimax FX-7402, make sure that the power supply cord, potential equalization cable, and patient cable are connected properly.

Operation

Turning ON power

Press the [POWER ON/OFF (stby)] key on the Operation Panel of the Cardimax FX-7402. At this time, the Main Power lamp will light. When the initial screen (power-on screen) appears, the Cardimax FX-7402 is ready for operation.



 **Note:**

The initial screen shows the following information:

CTL: Version number of control program

NO: Management number of control program

 PC-7403

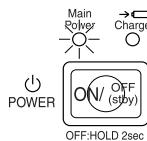
ANL: Version number of analysis program

 PC-7403

ARRH: Version number of arrhythmia ECG analysis program

About the standby status ---

When the power supply cord is connected to the AC connector of the Cardimax FX-7402 and a wall outlet, FX-7402 is put on standby status and the Main Power lamp will light.



Pressing [POWER ON/OFF (stby)] will cancel the standby status and the initial screen will appear.

Turning OFF power ---

Press and hold [POWER ON/OFF (stby)] on the Operation Panel of the Cardimax FX-7402 for more than 2 seconds. At this time, the FX-7402 is put on standby status and the Main Power lamp will remain lit. To turn off power, remove the power supply cord from the wall outlet.

Additional information:

- When you use the battery as a power source, press [POWER ON/OFF (stby)] on the operation panel to turn the Cardimax FX-7402 ON and OFF. If you do not operate the unit for 5 minutes or more, power is turned OFF automatically to prevent unnecessary battery consumption.
- If you press and hold [POWER ON/OFF (stby)] for more than 10 seconds during operation, the power is turned OFF.

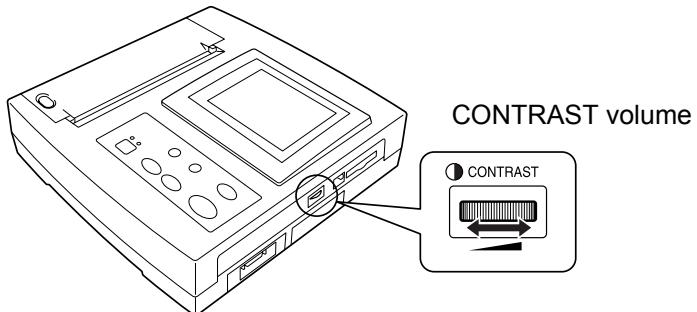
Adjusting the Display Contrast

If the liquid crystal display (LCD) is not clearly visible, adjust the display contrast.

Operation

Use the [CONTRAST] volume on the right side of the Cardimax FX-7402 to adjust the display contrast.

Turn up the [CONTRAST] volume up to make the LCD brighter. Turn down the [CONTRAST] volume to make the LCD dimmer.



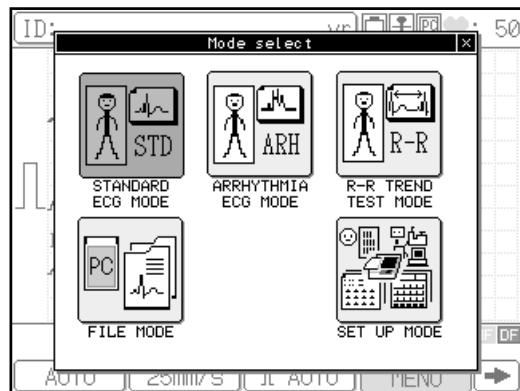
Setting the Date Format and Built-in Clock

Set the date display format and built-in clock to record the accurate date and time.

Operation

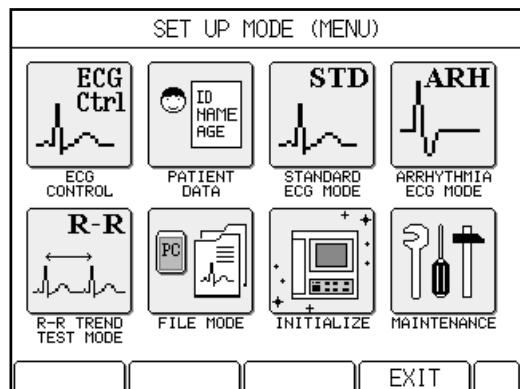
- Turn ON the Cardimax FX-7402. Touch [MENU] on the touch-panel display.

The Mode select screen will appear.



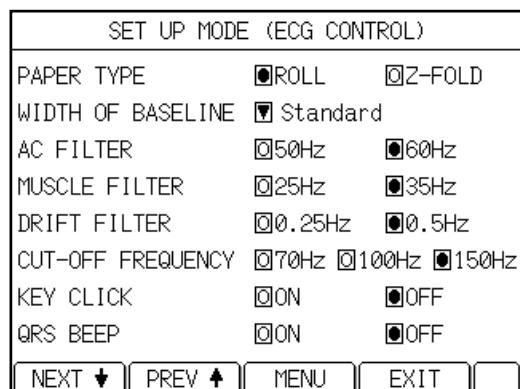
- Touch [SET UP MODE].

The SET UP MODE (MENU) screen will appear.



- Touch [ECG CONTROL].

The SET UP MODE (ECG CONTROL) screen will appear.



4 Touch [Next ↓] to display the next page.

5 Change the [DATE TYPE] parameter if necessary.

The date/time display format at the time of shipment is set to "MM-dd-yy". To change the date/time display format to "dd-MM-yy", touch the radio button of "dd-MM-yy" to turn it on (highlight the button). Otherwise, skip this step.

SET UP MODE (ECG CONTROL)		
CRT DISPLAY	<input checked="" type="checkbox"/> OFF	<input type="checkbox"/> ON
LEAD OFF BUZZER	<input type="checkbox"/> ON	<input checked="" type="checkbox"/> OFF
BUZZER VOLUME		
LANGUAGE	<input checked="" type="checkbox"/> English	
HOSPITAL	[]	
DATE	<input checked="" type="checkbox"/> 01/07/2001	
TIME	<input checked="" type="checkbox"/> 18:07:36	
DATE TYPE	<input checked="" type="checkbox"/> MM-dd-yy <input type="checkbox"/> dd-MM-yy	
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/>		

6 Touch the down arrow key ([▼]) of the [DATE] parameter on the left of the currently set date.

The DATE keypad will appear.

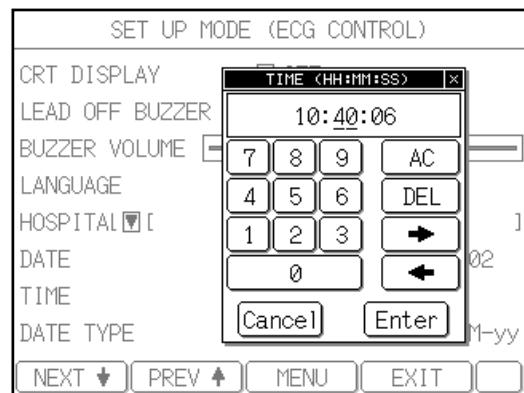
SET UP MODE (ECG CONTROL)		
CRT DISPLAY	<input type="checkbox"/> DATE (MM-DD-YYYY) <input type="text" value="02/21/2002"/>	
LEAD OFF BUZZER	<input type="checkbox"/>	
BUZZER VOLUME		
LANGUAGE		
HOSPITAL	[]	
DATE		
TIME		
DATE TYPE		
<input type="button" value="Cancel"/> <input type="button" value="Enter"/> M-yy		
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/>		

7 Enter the date.

Use the number keys (0 to 9) on the touch-panel display to enter data. Use the left and right arrow keys to move the cursor. If the data you entered are incorrect, touch [AC] to clear all data or [DEL] to clear one digit. After you finish setting the date, touch [Enter] to close the DATE keypad. To cancel the input operation, touch [Cancel].

8 Touch the down arrow key ([▼]) of the [TIME] parameter on the left of the currently set time.

The TIME keypad will appear.



9 Enter the time.

Use the number keys (0 to 9) on the touch-panel display to enter data. Use the left and right arrow keys to move the cursor. If the data you entered are incorrect, touch [AC] to clear all data or [DEL] to clear one digit. After you finish setting the time, touch [Enter] to close the TIME keypad. To cancel the input operation, touch [Cancel].

10 After completing the required settings, touch [EXIT].

The previous screen reappears.

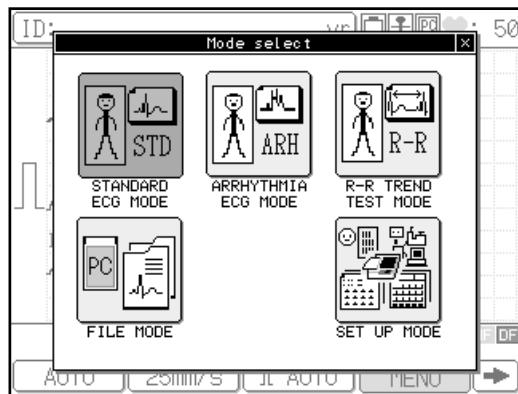
Setting the Recording Paper Type

The recording paper type is set to "ROLL" at the time of shipment. To use Z-fold paper instead of roll paper, change this parameter to "Z-FOLD".

Operation

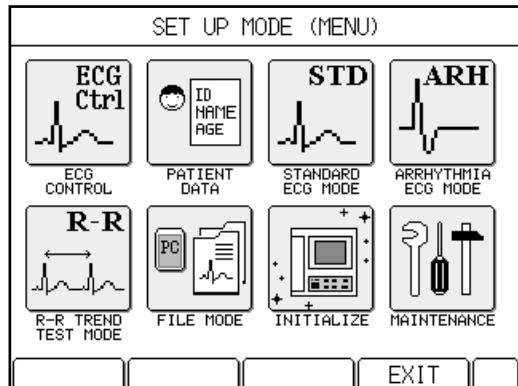
- 1 Turn ON the Cardimax FX-7402. Touch [MENU] on the touch-panel display.

The Mode select screen will appear.



- 2 Touch [SET UP MODE].

The SET UP MODE (MENU) screen will appear.



3 Touch [ECG CONTROL].

The SET UP MODE (ECG CONTROL) screen will appear.

SET UP MODE (ECG CONTROL)			
PAPER TYPE	<input type="radio"/> ROLL	<input checked="" type="radio"/> Z-FOLD	
WIDTH OF BASELINE	<input checked="" type="checkbox"/> Standard		
AC FILTER	<input type="radio"/> 50Hz	<input checked="" type="radio"/> 60Hz	
MUSCLE FILTER	<input type="radio"/> 25Hz	<input checked="" type="radio"/> 35Hz	
DRIFT FILTER	<input type="radio"/> 0.25Hz	<input checked="" type="radio"/> 0.5Hz	
CUT-OFF FREQUENCY	<input type="radio"/> 70Hz	<input type="radio"/> 100Hz	<input checked="" type="radio"/> 150Hz
KEY CLICK	<input type="radio"/> ON	<input checked="" type="radio"/> OFF	
QRS BEEP	<input type="radio"/> ON	<input checked="" type="radio"/> OFF	
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>			

4 Select the desired paper type.

Touch the radio button of the type of paper used with the FX-7402 ([ROLL] or [Z-FOLD]) to turn it on (highlight the button).

SET UP MODE (ECG CONTROL)			
PAPER TYPE	<input type="radio"/> ROLL	<input checked="" type="radio"/> Z-FOLD	
WIDTH OF BASELINE	<input checked="" type="checkbox"/> Standard		
AC FILTER	<input type="radio"/> 50Hz	<input checked="" type="radio"/> 60Hz	
MUSCLE FILTER	<input type="radio"/> 25Hz	<input checked="" type="radio"/> 35Hz	
DRIFT FILTER	<input type="radio"/> 0.25Hz	<input checked="" type="radio"/> 0.5Hz	
CUT-OFF FREQUENCY	<input type="radio"/> 70Hz	<input type="radio"/> 100Hz	<input checked="" type="radio"/> 150Hz
KEY CLICK	<input checked="" type="radio"/> ON	<input type="radio"/> OFF	
QRS BEEP	<input type="radio"/> ON	<input checked="" type="radio"/> OFF	
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>			

5 After completing the required setting, touch [EXIT].

The previous screen reappears.

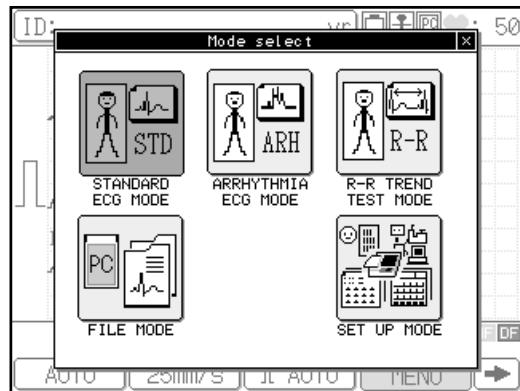
Setting the Hospital Name

Enter your hospital name. The hospital name you enter here will be printed on the reports.

Operation

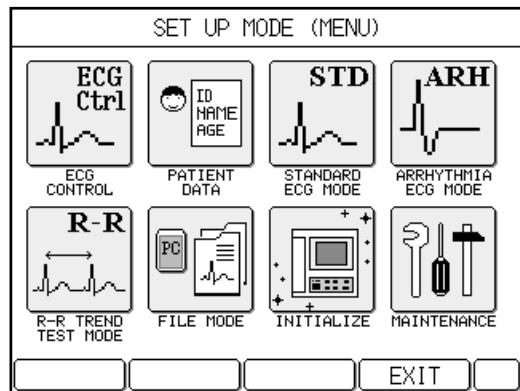
- 1 Turn ON the Cardimax FX-7402. Touch [MENU] on the touch-panel display.

The Mode select screen will appear.



- 2 Touch [SET UP MODE].

The SET UP MODE (MENU) screen will appear.



3 Touch [ECG CONTROL].

The SET UP MODE (ECG CONTROL) screen will appear.

SET UP MODE (ECG CONTROL)			
PAPER TYPE	<input type="checkbox"/> ROLL	<input checked="" type="checkbox"/> 2-FOLD	
WIDTH OF BASELINE	<input checked="" type="checkbox"/> Standard		
AC FILTER	<input type="checkbox"/> 50Hz	<input checked="" type="checkbox"/> 60Hz	
MUSCLE FILTER	<input type="checkbox"/> 25Hz	<input checked="" type="checkbox"/> 35Hz	
DRIFT FILTER	<input type="checkbox"/> 0.25Hz	<input checked="" type="checkbox"/> 0.5Hz	
CUT-OFF FREQUENCY	<input type="checkbox"/> 70Hz	<input type="checkbox"/> 100Hz	<input checked="" type="checkbox"/> 150Hz
KEY CLICK	<input type="checkbox"/> ON	<input checked="" type="checkbox"/> OFF	
QRS BEEP	<input type="checkbox"/> ON	<input checked="" type="checkbox"/> OFF	
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>			

4 Touch [Next ↓] to display the next page.

SET UP MODE (ECG CONTROL)		
CRT DISPLAY	<input checked="" type="checkbox"/> OFF	
LEAD OFF BUZZER	<input type="checkbox"/> ON	<input checked="" type="checkbox"/> OFF
BUZZER VOLUME	<input type="range" value="50"/>	
LANGUAGE	<input checked="" type="checkbox"/> English	
HOSPITAL	<input checked="" type="checkbox"/> []	
DATE	<input checked="" type="text"/> 01/07/2001	
TIME	<input checked="" type="text"/> 18:07:36	
DATE TYPE	<input type="checkbox"/> MM-dd-yy <input checked="" type="checkbox"/> dd-MM-yy	
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>		

5 Touch the down arrow key ([▼]) of the [HOSPITAL] parameter on the left of the currently set name (if any).

The HOSPITAL NAME keyboard will appear. This window has two pages, each showing a different keyboard for letters and numbers/symbols respectively. To change the keyboard page, touch [1/2 ▼] or [2/2 ▼].

SET UP MODE (ECG CONTROL)																																																														
HOSPITAL NAME																																																														
fukuda_																																																														
<table border="1"> <tr> <td>q</td><td>w</td><td>e</td><td>r</td><td>t</td><td>y</td><td>u</td><td>i</td><td>o</td><td>p</td> </tr> <tr> <td>a</td><td>s</td><td>d</td><td>f</td><td>g</td><td>h</td><td>j</td><td>k</td><td>l</td><td>AC</td> </tr> <tr> <td>z</td><td>x</td><td>c</td><td>v</td><td>b</td><td>n</td><td>m</td><td></td><td></td><td>DEL</td> </tr> <tr> <td colspan="10" style="text-align: center;">Space</td> </tr> <tr> <td colspan="5" style="text-align: center;">Cancel</td> <td colspan="5" style="text-align: center;">Enter</td> </tr> <tr> <td colspan="10" style="text-align: right;">1/2 ▼</td> </tr> </table>			q	w	e	r	t	y	u	i	o	p	a	s	d	f	g	h	j	k	l	AC	z	x	c	v	b	n	m			DEL	Space										Cancel					Enter					1/2 ▼									
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<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>																																																														

6 Enter the hospital name.

Use the letter and number keys (0 to 9) displayed on the keyboard window to enter the name. To enter uppercase letters, touch [CAPS] on the letter (lowercase) screen (page 1/2). Use the left and right arrow keys to move the cursor position. If the data you have entered are incorrect, touch [AC] to clear all data or [DEL] to clear a digit. To enter a space, touch the [Space] bar. After you finish setting the name, touch [Enter] to close the HOSPITAL NAME keyboard. To cancel the input operation, touch [Cancel].

7 After completing the required setting, touch [EXIT].

The previous screen reappears.

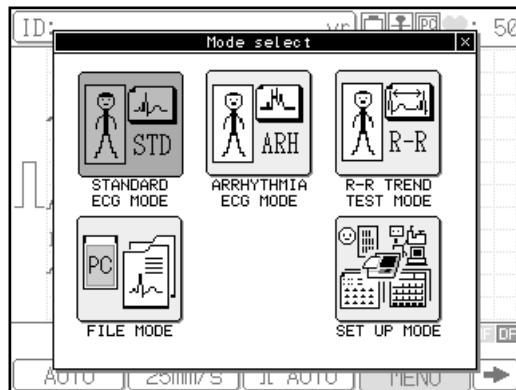
Setting the Language

The Cardimax FX-7402 supports five languages: English, German, French, Spanish, and Italian. The language is set to "English" at the time of shipment. Change the language if necessary.

Operation

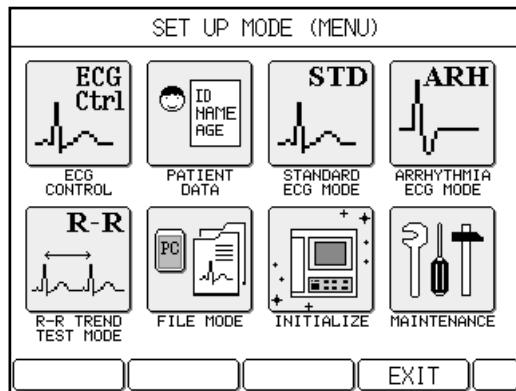
1 Turn ON the Cardimax FX-7402. Touch [MENU] on the touch-panel display.

The Mode select screen will appear.



2 Touch [SET UP MODE].

The SET UP MODE (MENU) screen will appear.



3 Touch [ECG CONTROL].

The SET UP MODE (ECG CONTROL) screen will appear.

SET UP MODE (ECG CONTROL)		
PAPER TYPE	<input checked="" type="checkbox"/> ROLL	<input type="checkbox"/> 2-FOLD
WIDTH OF BASELINE	<input checked="" type="checkbox"/> Standard	
AC FILTER	<input type="checkbox"/> 50Hz <input checked="" type="checkbox"/> 60Hz	
MUSCLE FILTER	<input type="checkbox"/> 25Hz <input checked="" type="checkbox"/> 35Hz	
DRIFT FILTER	<input type="checkbox"/> 0.25Hz <input checked="" type="checkbox"/> 0.5Hz	
CUT-OFF FREQUENCY	<input type="checkbox"/> 70Hz <input type="checkbox"/> 100Hz <input checked="" type="checkbox"/> 150Hz	
KEY CLICK	<input type="checkbox"/> ON <input checked="" type="checkbox"/> OFF	
QRS BEEP	<input type="checkbox"/> ON <input checked="" type="checkbox"/> OFF	
<input type="button" value="NEXT ▼"/> <input type="button" value="PREV ▲"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>		

4 Touch [Next ▼] to display the next page.

SET UP MODE (ECG CONTROL)		
CRT DISPLAY	<input checked="" type="checkbox"/> OFF	
LEAD OFF BUZZER	<input type="checkbox"/> ON	<input checked="" type="checkbox"/> OFF
BUZZER VOLUME	<input type="range" value="50"/>	
LANGUAGE	<input checked="" type="checkbox"/> English	
HOSPITAL	<input checked="" type="checkbox"/> []]	
DATE	<input checked="" type="checkbox"/> 01/07/2001	
TIME	<input checked="" type="checkbox"/> 18:07:36	
DATE TYPE	<input type="checkbox"/> MM-dd-yy <input checked="" type="checkbox"/> dd-MM-yy	
<input type="button" value="NEXT ▼"/> <input type="button" value="PREV ▲"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>		

5 Touch the down arrow key ([▼]) of the [LANGUAGE] parameter on the left of the currently selected language.

The language window will appear.

SET UP MODE(ECG CONTROL)		
CRT DISPLAY	<input checked="" type="checkbox"/> OFF	
LEAD OFF BUZZER	<input type="checkbox"/> ON	<input checked="" type="checkbox"/> OFF
BUZZER VOLUME	<input type="range" value="50"/>	
LANGUAGE	<input checked="" type="checkbox"/> English <input type="checkbox"/> German <input type="checkbox"/> French <input type="checkbox"/> Spanish <input type="checkbox"/> Italian	
HOSPITAL	<input checked="" type="checkbox"/> []]	
DATE	<input checked="" type="checkbox"/> 01/07/2001	
TIME	<input checked="" type="checkbox"/> 18:07:36	
DATE TYPE	<input type="checkbox"/> MM-dd-yy <input checked="" type="checkbox"/> dd-MM-yy	
<input type="button" value="NEXT ▼"/> <input type="button" value="PREV ▲"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>		

6 Touch the desired language.

The selected language will appear in the SET UP MODE (ECG CONTROL) window.

7 After completing the required setting, touch [EXIT].

The previous screen reappears.

Using the Battery (Option)

If you install an optional battery (8/HRY-4/3AFD), you can operate the FX-7402 in a remote place where there is no AC power source.

Battery power is automatically supplied when there is a power failure.

When you use the batteries as a power source, unplug the power supply cord from the wall outlet. Press [POWER ON/OFF (stby)] on the Operation Panel to turn on/off the FX-7402. If you do not operate the unit for 5 minutes or more, the power is turned off automatically to prevent unnecessary battery consumption.

 DANGER	
	<ul style="list-style-type: none">• Be sure to use the dedicated battery pack (8/HRY-4/3AFD).• Be sure to charge the battery using the FX-7402. Using non-specified charging devices to charge the battery pack could be hazardous.
	<ul style="list-style-type: none">• Do not disassemble or mutilate the battery pack. Burns could result.• Do not incinerate or heat the battery pack--the battery pack could burst, leak toxic substances, or give you burns.• Do not short the battery. Burns could result.• Keep away from children.• If the liquid contained in the battery gets into your eyes, do not rub them. Wash eyes thoroughly with water and seek for medical attention immediately.

 **CAUTION**

- If you do not intend to use the FX-7402 for a long period of time, remove the battery from the machine. Even if you do not use the FX-7402, fully charge the battery every three months using the FX-7402. If you failed to recharge the battery, it discharges automatically and may not be used again.
- Do not use the battery in an environment where the room temperature is below 0 degrees Celsius (32 degrees Fahrenheit) or higher than 40 degrees Celsius (104 degrees Fahrenheit).
- Charge the battery in an environment where the room temperature is maintained at 10 to 30 degrees Celsius (50 to 86 degrees Fahrenheit)
- Store the battery in an environment where the room temperature is maintained at 0 to 30 degrees Celsius (32 to 86 degrees Fahrenheit).
- Repeated cycles of brief discharging and recharging of the battery will prevent it from operating at full capacity. Make sure the battery is completely exhausted before recharging it.
- Once the battery is exhausted, recharge it even if it is not going to be used immediately. If you fail to recharge the battery, it discharges automatically and may not be used again.
- The battery life depends on the operating conditions. Normally, replace the battery after 300 charging/discharging cycles. As the battery life nears its end, its capacity is drastically reduced. If this happens, replace the battery with a new one.

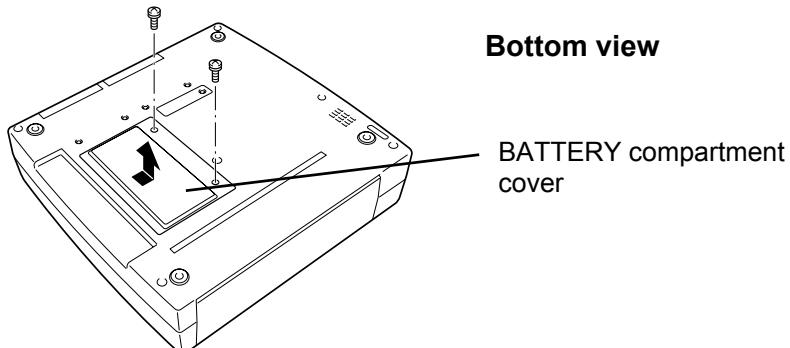
Installing the battery pack

 **Operation****1 Turn OFF the power and unplug the power supply cord.**

Press the [POWER ON/OFF (stby)] on the Operation Panel and unplug the power supply cord.

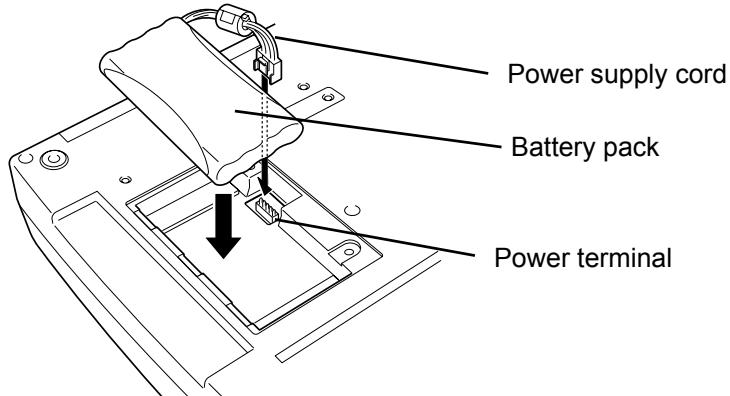
2 Open the BATTERY PACK compartment cover.

Place the FX-7402 on a table with the bottom facing up. Use a Phillips (+) screwdriver to remove the two screws (with washers) on the cover. Put your finger into the indentation and lift the cover carefully in the direction of the arrow, as shown in the figure below.



3 Connect the power supply cable of the rechargeable battery.

Connect the power supply cable of the rechargeable battery to the 5-pin power connector in the battery compartment. Place the battery pack in the compartment.



4 Close the BATTERY compartment cover.

Insert the tabs on the cover in place and close the battery compartment cover. Tighten the two screws (with washers) removed in step 2.

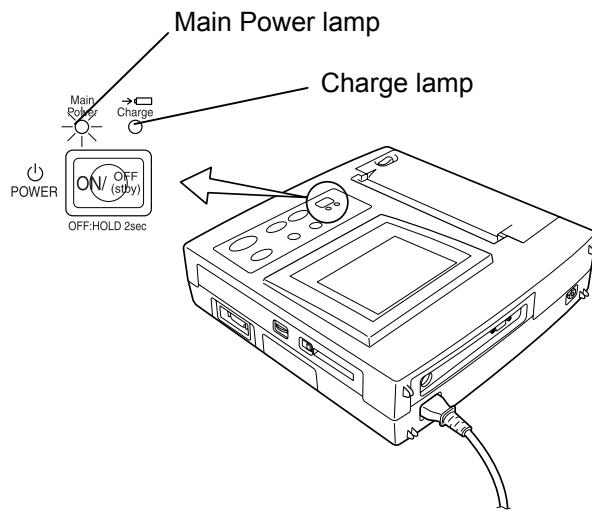
Charging the battery

If the battery is not charged, it automatically starts charging as soon as the FX-7402 is connected to the AC outlet. It takes approximately 3 and one half hours to fully charge the battery. When the battery is fully charged, FX-7402 can perform continuous recording for approximately 60 minutes (for 6-channel recording at 20 degrees Celsius 68 degrees Fahrenheit).

Operation

1 Plug in the power supply cord.

Plug in the power supply cord and leave the FX-7402 on standby status. At this time, the Main Power lamp is lit.



Charging of the battery will start.

While the battery is being charged, the Charge lamp will flash in blue. The flashing becomes slower as the battery is charged.

When the charging is complete, the Charge lamp will turn off.

✓ Additional information:

- The battery does not charge while the FX-7402 is operating. To recharge the battery, turn off the power.
- If any trouble such as abnormal battery temperature, battery voltage, or excessive charge current occurs during charging, the Charge lamp will flash in amber. If the Charge lamp lights in amber when you retry recharging, contact your local Fukuda Denshi sales and service representative.
- The operating time of the battery varies widely depending on the operating environment and conditions.

Installing the Program Cartridge (Option)

When the PC-7403 program cartridge is installed in the FX-7402, the following functions will be supported:

PC-7403

PC-7403:

- Analysis Recording of the Standard ECG Mode
- Arrhythmia ECG Mode



CAUTION

- When plugging in or removing the program cartridge, be sure to turn OFF the Cardimax FX-7402.
- Do not install a cartridge other than the one specified for the Cardimax FX-7402.

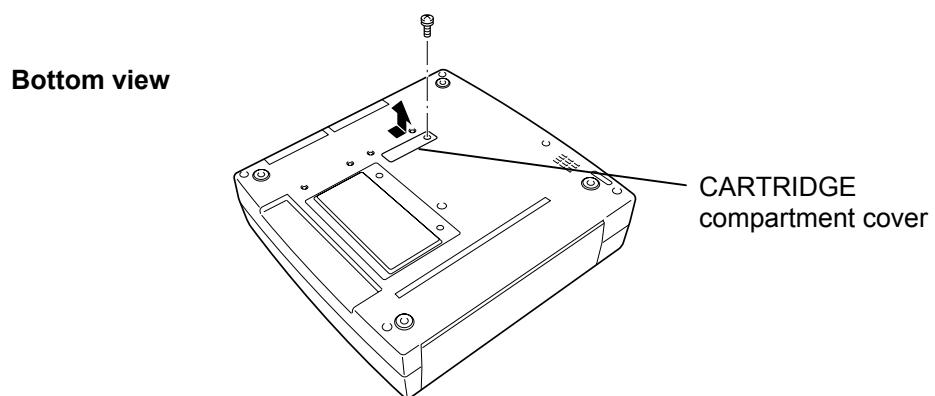
Operation

1 Turn OFF the power and unplug the power supply cord.

Press [POWER ON/OFF (stby)] on the Operation Panel. Unplug the power supply cord.

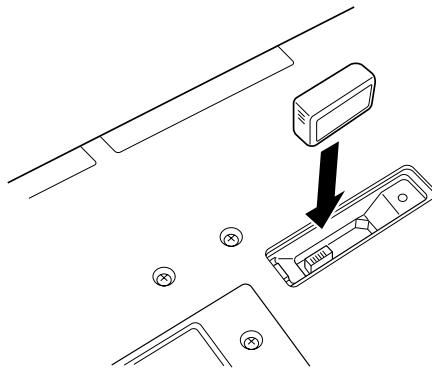
2 Remove the CARTRIDGE compartment cover.

Place the FX-7402 on a table with the bottom facing up. Use a Phillips (+) screwdriver to remove one screw (with washer) on the cartridge cover. Put your finger in the indentation and lift the cover in the direction of the arrow, as shown in the figure below.



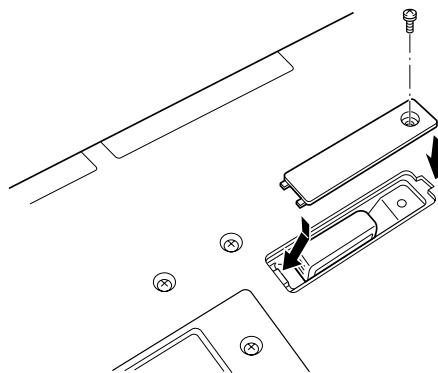
3 Install the program cartridge.

Gently push the program cartridge into the connector until it is seated securely.



4 Reinstall the CARTRIDGE compartment cover removed in step 2.

Insert the tabs on the cover in place and close the CARTRIDGE compartment cover. Tighten the screw (with the washer) removed in step 2.



Connecting the Cardimax FX-7402 to Optional Equipment

You can connect the Cardimax FX-7402 to medical equipment such as treadmills and ergometers that subject a patient to physical stress to monitor the ECG waveforms using the FX-7402. When an optional CRT monitor is connected to the FX-7402, this CRT serves as a slave monitor for displaying the 12-lead ECG waveforms and patient information. You can also connect your PC and use it to manage the patient's information and ECG waveforms read by the FX-7402.

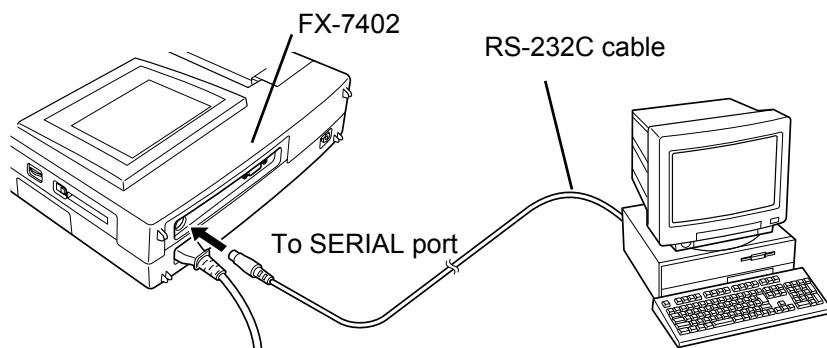
Operation

Personal Computer

To manage ECG data files using your PC, you need to install the ECG Data Filing Software (EFS-100) on the PC.

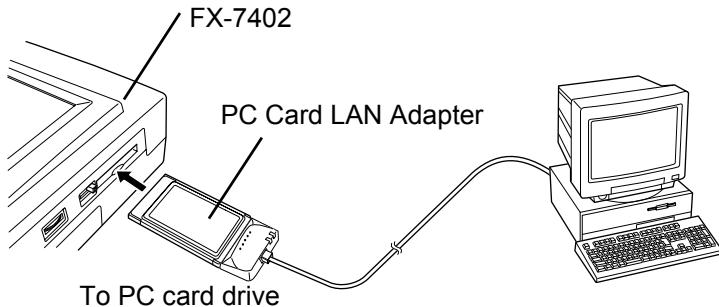
WARNING	
!	<ul style="list-style-type: none"> • Do not use a cable other than the specified RS-232C cable. • Before you connect your PC, unplug the power supply cord from the FX-7402.

Plug the optional CJ-325 cross cable (RS-232C) into the SERIAL port on the rear of the Cardimax FX-7402.



- ☞ See the operating instructions supplied with the ECG Data Filing Software (EFS-100) for further information about the connections between the FX-7402 and a PC, and software installation and operation.
- ☞ See Chapter 6, "Managing ECG Data Files", for further information about the procedure used to send data to a PC (page 96).

Insert PC Card LAN Adapter into the PC card drive on the right side of the Cardimax FX-7402.



- ☞ See the operating instructions supplied with the ECG Data Filing Software (EFS-200) for further information about the connections between the FX-7402 and a PC, and software installation and operation.
- ☞ See Chapter 6, "Managing ECG Data Files", for further information about the procedure used to send data to a PC (page 96).

! CAUTION

- Use only the specified PC Card LAN Adapter. Use of unspecified PC Card LAN Adapter may cause failure.

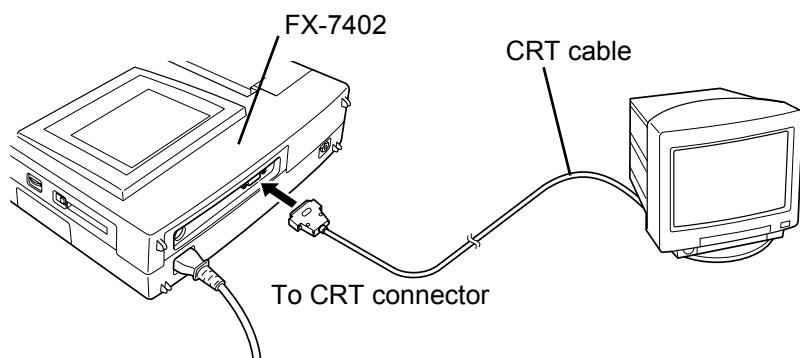
External CRT Monitor

! WARNING



Before you connect the CRT monitor, unplug the power supply cord from the FX-7402.

Plug a commercially available CRT cable (optional) into the CRT connector on the rear of the Cardimax FX-7402.



- ☞ See the operating instructions supplied with the CRT monitor for further information about connections.

 To use an external CRT, set the CRT DISPLAY parameter of the SET UP MODE (ECG CONTROL screen) to "ON". See Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 114).

CAUTION

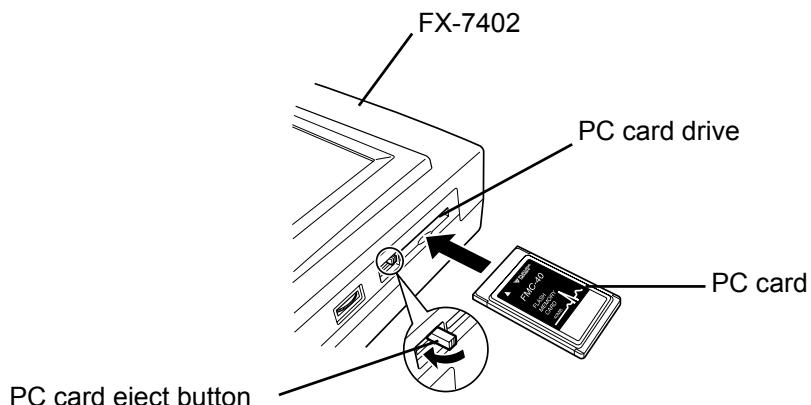
- If a non-isolated signal is connected to the CRT connector and the source of the signal is linked to a different protective ground terminal, the ECG instrument chassis might be exposed to a ground potential difference that would produce a fault condition. Appropriate measures must be taken to prevent this condition.
- Only Class I equipment complying with the relevant IEC Publication may be connected to the CRT monitor. Otherwise, use an isolation transformer to provide power for the CRT monitor. If you have any doubt about this matter, contact your local Fukuda Denshi representative.

Setting a PC Card in the Cardimax FX-7402

You can set a PC card in the Cardimax FX-7402 to store ECG waveforms in a file (on the card).

Operation

- 1 Insert a PC card into the PC card drive on the right side of the FX-7402 in the direction of the arrow printed on the card. Push the card until the PC card eject button pops out. Flip down the eject button.**

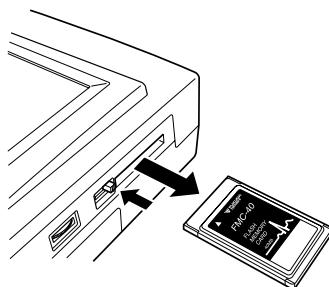


 Please be aware that the PC card cannot be used while using the PC Card LAN Adapter.

Removing the PC card

Operation

- 1 Insert a finger nail in the indentation and flip up the PC card eject button out. Now push the button. The PC card will pop out from the PC card drive. Remove the card from the drive.



☞ See Chapter 6, “Managing ECG Data Files”, for further information about PC card operations (page 96).

CAUTION

- During operation of the PC card drive, do not remove the PC card or turn the power off.
- Be sure to use the specified PC card (FMC-4, FMC-20, FMC-40, FMC-85).

CAUTION

- Do not remove the PC LAN card while the PC Card LAN Adapter is in operation.

Chapter 3

Operating the Cardimax the FX-7402:

Recording a Standard 12-lead ECG in the Automatic Recording Mode

This chapter describes the basic operation of the FX-7402 and the main aspects of ECG recording.

Connecting the Patient Cable to the Electrodes

Make sure the matching end of the patient cable is properly connected to the patient connector on the right side of the FX-7402. Connect the opposite end of the patient cable to the electrodes.

Match the color of each patient cable and corresponding electrode for proper connection. The table below summarizes lead tip codes and corresponding locations for the electrodes.

Patient Cable		Electrode position	Right hand	Left hand	Left leg	Right leg	①	②	③	④	⑤	⑥
CP-104T	Cable/Tip color	Red	Yellow	Green	Black	White/Red	White/Yellow	White/Green	White/Brown	White/Black	White/Purple	
	Symbol	R	L	F	N	C1	C2	C3	C4	C5	C6	
CP-104J	Cable/Tip color	Gray/White	Gray/Black	Gray/Red	Gray/Green	White/Red	White/Yellow	White/Green	White/Blue	White/Orange	White/Violet	
	Symbol	RA	LA	LL	RL	V1	V2	V3	V4	V5	V6	
CP-104L	Cable/Tip color	White / White	Black/Black	Red/Red	Green/Green	Brown/Red	Brown/Yellow	Brown/Green	Brown/Blue	Brown/Orange	Brown/Violet	
	Symbol	RA	LA	LL	RL	V1	V2	V3	V4	V5	V6	

Attaching Electrodes to the Patient

Follow the instructions below to attach electrodes to a patient. Placing the electrodes in their proper locations is one of the most important factors for accurate ECG recording. Much care must be taken to ensure good electrical contact.

Before attaching the electrodes to a patient

Check the condition of the patient

Check the condition of the patient and make sure the person is resting quietly and comfortably. If the patient is tense, relieve tension by talking to the patient. For example, ask them to "Relax your arms and legs and feel completely at ease" or "Breath normally". You cannot record an accurate ECG if the arms and legs of the patient are tense or the patient keeps moving about, because of problems such as electromyogram interference and unstable baseline.

Cleaning the skin

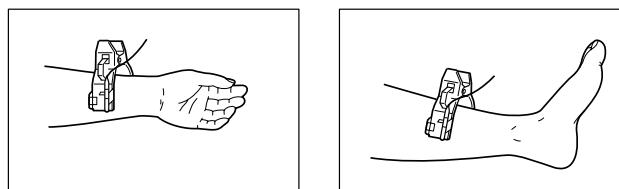
Use an alcohol-moistened cloth and wipe parts of the patient's body where the electrodes are going to be attached, to remove dirt and fatty oil. If foreign substances such as dust remain on the skin or an electrode, the contact resistance will increase and the recording will become unstable.

Applying Keratin cream

Apply Keratin cream for better contact between the skin and electrode. Rub the cream into the patient's skin until the skin becomes slightly reddish. When applying the cream to different parts of the chest to attach electrodes, make sure that the cream on these different parts does not overlap or touch. If adjacent electrode locations on the chest become linked through Keratin cream applied too generously, an accurate ECG will not be recorded.

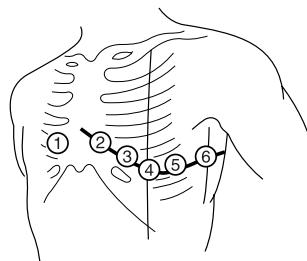
Attaching the limb electrodes (4 locations)

Clamp the arms and legs (several centimeters above the wrist and ankle) firmly with the electrode clips. Make sure the patient does not experience pain or discomfort.



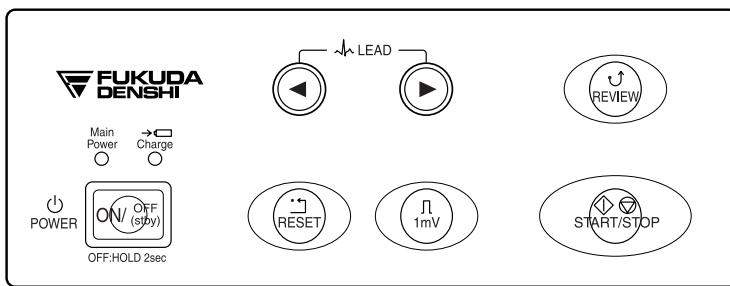
Attaching the chest electrodes (6 locations)

Attach the chest electrodes in the following locations: Make sure the patient does not feel pain or discomfort.



- ①: The fourth intercostal space on the right sternal border.
- ②: The fourth intercostal space on the left sternal border.
- ③: Midway between locations ② and ④.
- ④: The fifth intercostal space on the left mid-clavicular line.
- ⑤: On the left anterior axillary line on the same horizontal level as ④.
- ⑥: On the left mid-axillary line on the same horizontal level as ④ and ⑤.

Operation Panel



The functions of the operation panel keys and lamps are outlined below.

(1) [POWER ON/OFF (stby)] key

Press this key to switch the FX-7402 to power ON from the standby status. Press this key for 2 seconds or more to switch the FX-7402 from power ON to standby status. Also, press this key for 10 seconds or more to forcibly turn OFF the FX-7402 in case there is a system trouble.

When you operate the FX-7402 on the rechargeable battery, use this key to turn the power ON and OFF. If the power supply cord is connected to a wall outlet and the rechargeable battery is installed, the FX-7402 will start charging the battery as soon as the unit is put in the standby status (power is OFF).

(2) [1mV] key

Press this key to display and record the calibrated 1mV waveform.

(3) [RESET] key

Press and hold down this key to reset the ECG waveform. ECG waveform input starts when you release this key.

(4) LEAD [\blacktriangleleft] and [\triangleright] keys

Press these keys to change the leads to be monitored.

(5) [REVIEW] key

Press this key to perform Review Recording. Review Recording starts sampling waveforms from those sampled 10 seconds prior to pressing [REVIEW].

(6) [START/STOP] key

Press this key to start and stop the various recording (sampling) tasks.

(7) Main Power lamp

This lamp lights during the standby and power ON statuses.

(8) Charge lamp

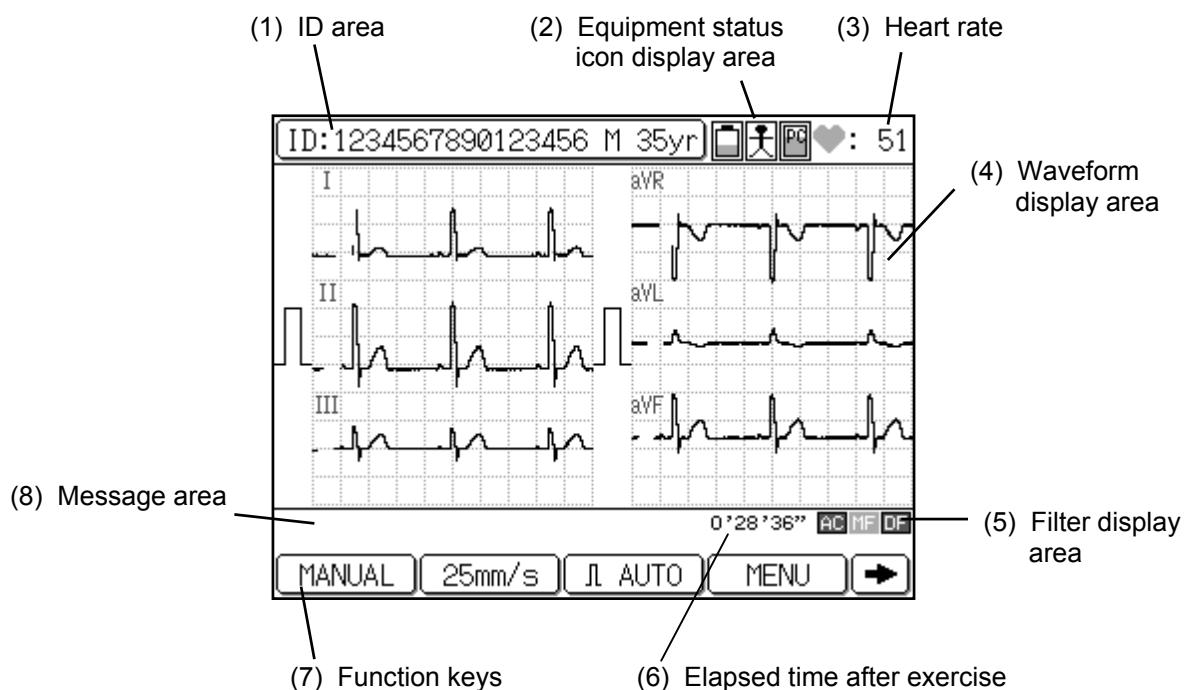
This lamp flashes in blue while the rechargeable battery is being charged. The Charge lamp flashes in amber if any trouble, such as abnormal battery temperature, battery voltage, or charge current occurs during charging. If the Charge lamp lights in amber when you are charging the battery, contact your local Fukuda Denshi sales and service representative.

Touch-Panel Display

This screen displays patient information, equipment status, heart rate, function keys, various messages, and menus, in addition to the ECG waveform. You can also touch the areas or keys displayed on the screen to display a specific menu or perform a specific function.

Layout of touch-panel display

A typical screen display is shown below. The actual data displayed on the screen varies depending on the function mode and operation.



(1) ID area

The patient's information is displayed here.

ID :Patient ID

MALE/FEMALE :Sex of patient

nn yr :Age of patient (0 to 999)

When you touch this area, a more detailed patient information window will pop up. See "Entering Patient Data" for further details regarding entering patient information (page 57).

(2) Equipment status icon display area

You can check the current status of the electrodes attached to a patient, as well as the battery, recorder, and PC card.

- **Warning icon for detached electrode**



This icon is displayed when an electrode becomes detached from a patient.

- **Battery level icon**

Five different battery level icons are provided to alert you to the remaining battery power. A darker icon means more power. This icon is displayed only when the FX-7402 is operated on batteries (that is, when the power supply cord is not connected to a wall outlet).



Battery level 100 to 76%.



Battery level 75 to 51%.



Battery level 50 to 26%.



Battery level 25 to 1%.



Battery level 0%.

- **PC card icon**

Five different PC card icons are provided to alert you to the PC card available memory space. A darker icon means more memory space. The PC card icon is displayed only when the PC card is specified as a data storage media and the card is set in the PC card drive of the FX-7402.



Full memory available on PC card.



Enough memory (80%) to write data on PC card.



Enough memory (50%) to write data on PC card.



Enough memory (20%) to write data on PC card.



No available memory on PC card.

Note:

The PC card icon is not displayed when a PC card error occurs.

(3) Heart rate

The heart rate of a patient is displayed here together with the heart icon. This icon flashes in synchronization with the patient's heartbeat.

Notes:

- The heart rate is displayed between 20 and 300bpm. When an ECG waveform with a heart rate outside of this range is input, asterisks (****) are displayed.
- The heart rate detection accuracy is ± 2 .

(4) Waveform display area

The FX-7402 displays three formats for ECG waveforms: 3-channel, 6-channel, and 12-channel.

(5) Filter display area

The currently selected filter is indicated here.

(6) Elapsed time after exercise

The time elapsed after exercise (stress test) or time from start of recovery phase is counted and displayed here during the POST recording mode.

(7) Function keys

The keys of functions that can be performed in the currently displayed screen are displayed here. You can touch a key to perform the corresponding function. Touch the left or right arrow key to scroll the function keys. The displayed keys vary depending on the selected test mode and configurations of the FX-7402.

(8) Message area

Messages such as an error message for detached electrodes or out of recording paper pops up here.

Main Menus

The Cardimax FX-7402 has five modes of operation: STANDARD ECG MODE, ARRHYTHMIA ECG MODE (PC-7403), R-R TREND TEST MODE, FILE MODE, and SET UP MODE. You can select the mode from the Mode select window.

Outline of each mode

STANDARD ECG MODE: Displays, records, analyzes (PC-7403 program cartridge), and measures the standard 12-lead ECG.

ARRHYTHMIA ECG MODE: Performs arrhythmia ECG analysis using three selected leads. This mode is displayed only when the PC-7403 program cartridge is installed.

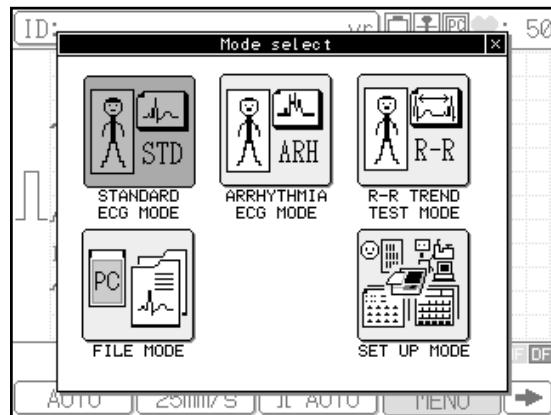
R-R TREND TEST MODE: Performs the R-R trend test using one selected lead.

FILE MODE: Saves or plays back the ECG data using the built-in memory or PC card, or sends ECG data to a PC.

SET UP MODE: Sets each function mode. Also includes the installation mode for adding the optional program and the maintenance mode for user self-diagnostics, such as a recording test.

Selecting a menu

Touch [MENU] to display the Mode select window.



Touch the mode you wish to enter. To cancel the mode selection operation and close the window, touch [X].

Entering Patient Data

You can enter data for each patient in the Standard ECG Mode, Arrhythmia ECG Mode (PC-7403 program cartridge), and R-R Trend Test Mode. The information you enter here will be displayed on the screen and printed on reports, and is used as reference for ECG analysis (PC-7403 program cartridge).

The items to be entered as patient data are summarized in the table below.

Parameter name	Description
ID	Patient number (maximum of 16 digits)
SEX	Male or Female
AGE	Age (maximum of 3 digits)
NAME	Name of a patient (alphanumeric, symbols, space)
RACE	Ethnicity of a patient
HT	Height (cm or inches in 3 digits)
WT	Weight (kg or lbs in 3 digits)
BP	Blood pressure during systolic and diastolic (3 digits each, unit: mmHg)
DRUG	Medication number from the displayed medication list
SYMP	Symptom number from the displayed symptom list
COMT	Comment (alphanumeric, symbols, space)
WARD	Patient's ward number or arbitrary number (maximum of 8 digits)
DEPT	Patient's department number (maximum of 8 digits)

Of the above information, ID, SEX, and AGE data are always displayed in the ID area. The other information, however, can be set so they will not be displayed as patient data.

- ☞ See "Changing the Patient Data Parameters" in Chapter 7, "Setting Up Parameters of the Cardimax the FX-7402" (page 161).

 Note:

PC-7403

Be sure to enter the correct age and sex of the patient. The FX-7402 analyzes ECG based on the age and sex data that are entered. Therefore, if you enter the wrong age and/or sex, the ECG interpretation will be incorrect.

Operation

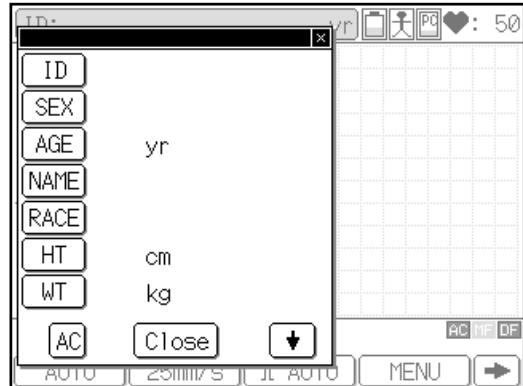
1 Touch the ID area.

The ID input window will pop up.

✓ Additional information:

You can switch the measurement unit to be used for "HT" between "cm" (default) and "inches", and for "WT" between "kg" (default) and "lb" using the SET UP MODE menu.

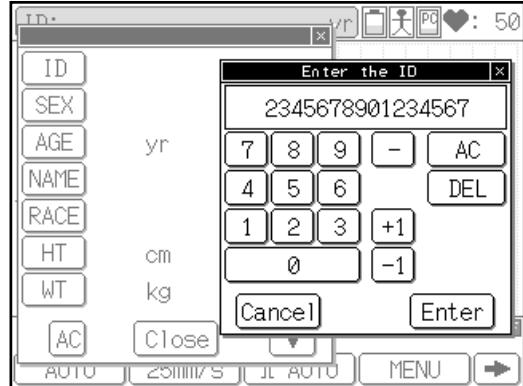
- ☞ See "Changing the Patient Data Parameters" in Chapter 7, "Setting Up Parameters of the Cardimax the FX-7402" (page 161).



2 Enter the patient's ID (maximum 16 digits).

Touch [ID]. The "Enter the ID" keypad will appear. Touch the number keys ([0] to [9]) to enter the ID and touch [Enter]. To enter a hyphen (-), touch [-]. To increment or decrement the ID number, touch [+1] or [-1], respectively.

If you have entered an incorrect number, tap [DEL] to clear the digit you just entered and then reenter data. To clear all the digits you have entered, tap [AC]. To cancel the data input operation, tap [Cancel].



✓ Additional information:

You can enter a fixed number for the upper digits (instead of entering each and every number) or increment the patient's ID number automatically.

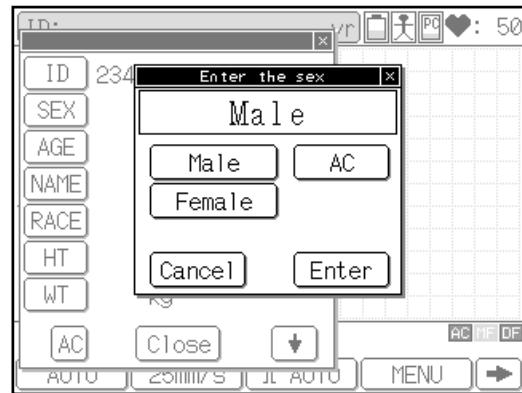
- ☞ See "Changing the Patient Data Parameters" in Chapter 7, "Setting Up Parameters of the Cardimax the FX-7402" (page 161).

3 Enter the patient's sex.

The “Enter the sex” window will appear. (Or, touch [SEX] to display the “Enter the sex” window.) Touch [Male] or [Female] to specify the patient's sex and touch [Enter].

To change the data you selected, touch [AC]. To cancel the data input operation, touch [Cancel].

 **Note:**



When no data have been entered for a patient, the “Enter the sex” window will appear immediately after you enter ID data and exit from the “Enter the ID” window (step 2). In other words, you do not need to touch [SEX] to open the “Enter the sex” window. This will be same for the rest of the patient data input items (that is, as soon as you finish selecting data, the window for entering the next item will automatically pop up). You will need to touch the specific patient data item only when you are editing data that has been previously entered.

4 Enter the patient's age.

a. Direct input method

The “Enter the age” : keypad will appear. (Or, touch [AGE] to display the “Enter the age” keypad.)

When the INPUT BIRTHDAY parameter of the SET UP MODE (PATIENT DATA) screen is set to OFF, touch the number keys ([0] to [9]) to enter the patient's age directly and touch [Enter].

If you have entered an incorrect number, touch [DEL] to clear the digit you just entered and reenter data. To clear all the digits you have entered, touch [AC]. To cancel the data input operation, touch [Cancel].



 See "Changing the Patient Data Parameters" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 161).

b. Birthday input method

The “BIRTHDAY” : keypad will appear.
(Or, touch [AGE] to display the “BIRTHDAY” keypad.)

When the INPUT BIRTHDAY parameter of the SET UP MODE (PATIENT DATA) screen is set to ON, enter the patient's date of birth, which calculates and sets the patient's age. After you set the patient's sex (step 3) or touch [AGE], the “BIRTHDAY” keypad will appear and the cursor is displayed at the month input (when the date display format is set to “mm-dd-yy”). Touch the number keys ([0] to [9]) to enter the patient's month of birth and touch [Enter]. The cursor moves to the date input. Enter the patient's date of birth and touch [Enter]. Enter the patient's year of birth and touch [Enter].

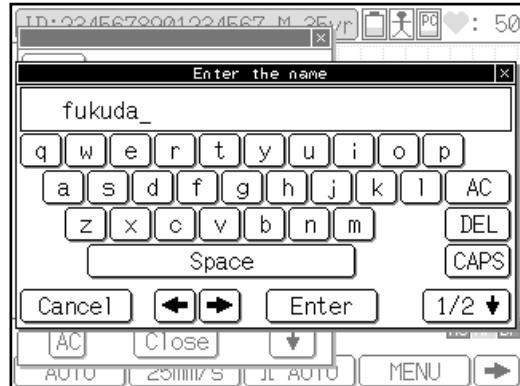


The FX-7402 will calculate and display the age of a patient based on the birthday input.

- ☞ See "Changing the Patient Data Parameters" in Chapter 7, "Setting Up Parameters of the Cardimax the FX-7402" (page 161).

5 Enter the patient's name.

The “Enter the name” : keyboard will appear. (Or, touch [NAME] to display the “Enter the name” keyboard.) This window has two pages, each showing a different keyboard for letters and numbers/symbols respectively. To change the keyboard page, touch [1/2 ↓] or [2/2 ↑]. Touch the letters to enter the patient's name and touch [Enter]. To enter uppercase letters, touch [CAPS] on the letter (lowercase) screen (page 1/2). To move the cursor position, touch [←] or [→]. To enter a space, touch the [Space] bar.



If you have entered an incorrect letter, touch [DEL] to clear the letter you just entered and reenter data. To clear all the letters you have entered, touch [AC]. To cancel the input operation, touch [Cancel].

6 Enter the patient's ethnicity.

The “Enter the race” window will appear. (Or, touch [RACE] to display the “Enter the race” window.) Touch the ethnicity of a patient from the list displayed in the window and touch [Enter].

If you have entered incorrect race, touch [AC] to clear the data and reenter. To cancel the data input operation, touch [Cancel].



7 Enter the patient's height.

The “Enter the height” keypad will appear.

(Or, touch [HT] to display the “Enter the height” keypad.) Touch the number keys ([0] to [9]) to enter the patient's height (cm or inches in 3 digits) and touch [Enter].

If you have entered an incorrect value, touch [DEL] to clear the digit you just entered and reenter data. To clear all the digits you have entered, touch [AC]. To cancel the data input operation, touch [Cancel].



8 Enter the patient's weight.

The “Enter the weight” keypad will appear. (Or, touch [WT] to display the “Enter the weight” keypad.) Touch the number keys ([0] to [9]) to enter the patient's weight (kg or lbs in 3 digits) and touch [Enter].

If you have entered an incorrect value, touch [DEL] to clear the digit you just entered and reenter data. To clear all the digits you have entered, touch [AC]. To cancel the data input operation, touch [Cancel].



9 Touch [↓] to display the next page of patient's information window (if it is not displayed automatically).

10 Enter the patient's blood pressure.

The “Enter the bp” keypad will appear. (Or, touch [BP] to display the “Enter the bp” keypad.) Touch the number keys ([0] to [9]) to enter the systolic and diastolic blood pressure (3 digits each, unit: mmHg) and touch [Enter]. To move the cursor to the right side of a slash (/), touch [Enter] or [\leftarrow] or [\rightarrow].

If you have entered an incorrect value, touch [DEL] to clear the digit you just entered and reenter data. To clear all the digits you have entered, touch [AC].

To cancel the data input operation, touch [Cancel].

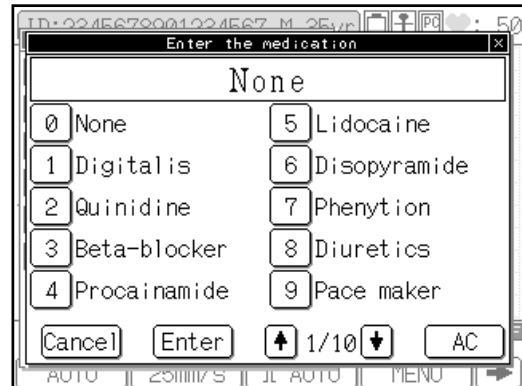


11 Enter the patient's medication.

The “Enter the medication” window will appear. (Or, touch [DRUG] to display the “Enter the medication” window.) Touch the relevant medication number from the list displayed in the window and touch [Enter]. The Enter the medication window has 10 pages. To scroll the page, touch [\downarrow] or [\uparrow].

Numbers 0 to 9 on the first page of this window lists fixed medication data.

Numbers 10 to 99 (pages 2 to 10) are reserved for your use so that you can enter a medication you wish to add. To add a new medication to the list, touch the number. The “Enter the name” keyboard will appear. You can enter the name of medication (up to 12 characters) in the same manner as entering the patient’s name. See step 5 for keyboard operation of letters and numbers/symbols.

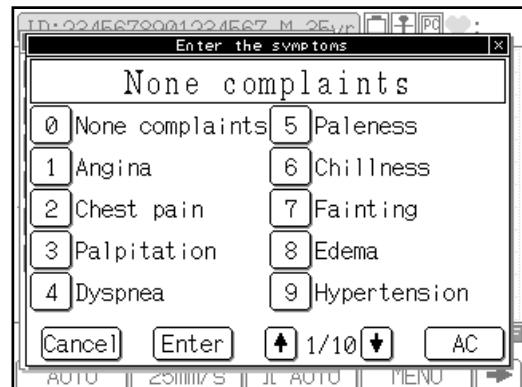


If you have entered an incorrect number, touch [AC] to clear the data and then touch the correct number. To cancel the data input operation, touch [Cancel].

12 Enter the patient's symptoms.

The “Enter the symptoms” window will appear. (Or, touch [SYMP] to display the Enter the symptoms window.) Touch the symptom number from the list displayed in the window and touch [Enter]. The Enter the symptoms window has 10 pages. To scroll the page, touch [\downarrow] or [\uparrow].

Numbers 0 to 9 on the first page of this window lists the fixed symptoms data. Numbers 10 to 99 (pages 2 to 10) are reserved for your use so that you can enter a symptom you wish to add. To



add a new symptom to the list, touch the number. The “Enter the name” keyboard will appear. You can enter the name of the symptom (up to 12 characters) in the same manner as entering the patient’s name. See step 5 for keyboard operation of letters and numbers/symbols.

If you have entered an incorrect number, touch [AC] to clear the data and then touch the correct number. To cancel the data input operation, touch [Cancel].

13 Enter a comment.

The “Enter the comment” keyboard will appear. (Or, touch [COMT] to display the “Enter the comment” keyboard.) Touch the alphabet letters to enter a comment and touch [Enter]. You can enter the comment in the same manner as entering the patient’s name. See step 5 for keyboard operation of letters and numbers/symbols.

If you have entered an incorrect letter, touch [DEL] to clear the letter you just entered and reenter data. To clear all the letters you have entered, touch [AC]. To cancel the data input operation, touch [Cancel].



14 Enter the patient's ward number (8 digits).

The “Enter the ward” keypad will appear. (Or, touch [WARD] to display the “Enter the ward” keypad.) Touch the number keys ([0] to [9]) to enter the patient’s ward number and touch [Enter].

If you have entered an incorrect number, touch [DEL] to clear the digit you just entered and reenter data. To clear all the digits you have entered, touch [AC]. To cancel the data input operation, touch [Cancel].



15 Enter the patient's department number (8 digits).

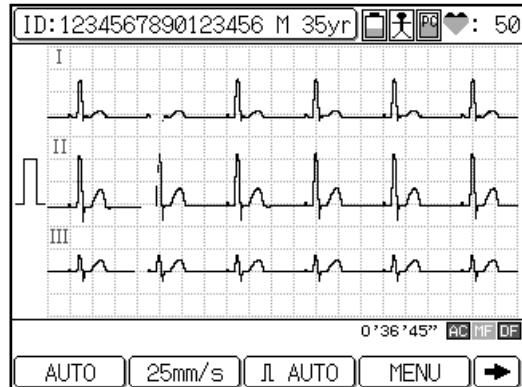
The “Enter the dept” keypad will appear. (Or, touch [DEPT] to display the “Enter the dept” keypad.) Touch the number keys ([0] to [9]) to enter the patient’s department number and touch [Enter].

If you have entered an incorrect number, touch [DEL] to clear the digit you just entered and reenter data. To clear all the digits you have entered, touch [AC]. To cancel the data input operation, touch [Cancel].



16 Touch [Close] to end the patient's information input operation.

The patient information you have just entered is saved in memory and the previous screen reappears. To delete all values you have entered, touch [AC].



Recording the ECG

After you finish the preparations described above, record the ECG. This section provides an overview of the general ECG recording procedure using the Automatic Recording Mode as an example.

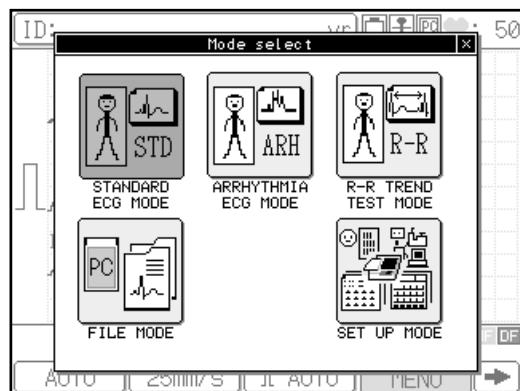
Operation

1 Touch [MENU].

The Mode select window will appear.

 **Note:**

The mode screen varies depending on the configuration. The mode screen shown is displayed when the PC-7403 program cartridge is installed.



2 Touch [STANDARD ECG MODE].

The Standard ECG Mode is selected.

Functions keys available in the Standard ECG Mode screen

[AUTO] or [MANUAL]: Switches between Automatic Recording Mode and Manual Recording Mode.

[25mm/s] or [50mm/s]: Switches the recording speed of the ECG waveforms.

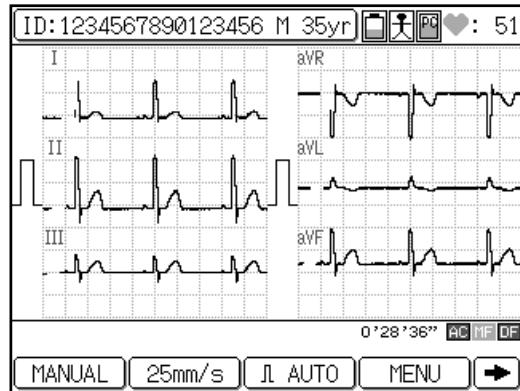
[AUTO] or [**mm]: Switches the display and recording sensitivity of the ECG waveforms. (Where “**” indicates 2.5, 5, 10, and 20mm.)

[MENU]: Displays the Mode select window.

[POST] or [REST]: Switches between POST and REST state.

[FEED]: Feeds the recording paper.

[FILTER]: Displays the Filter set up window and allows you to set AC, MF, or DF filters to ON/OFF.



- [COPY]: Starts writing the automatic recording ECG data, which was stored in the built-in memory immediately before pressing this key.
- [MARK]: Prints a mark on the recording paper during the ECG data printing.
- [→]: Displays the functions keys on the next page.
- [←]: Displays the function keys on the previous page.

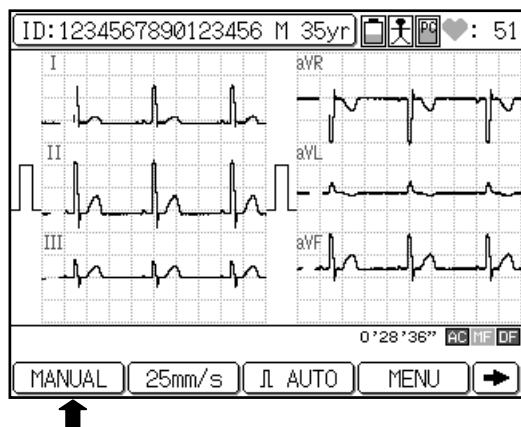
✓ Additional information:

When you turn ON the FX-7402, the Standard ECG Mode is selected.

3 Select the Automatic Recording Mode.

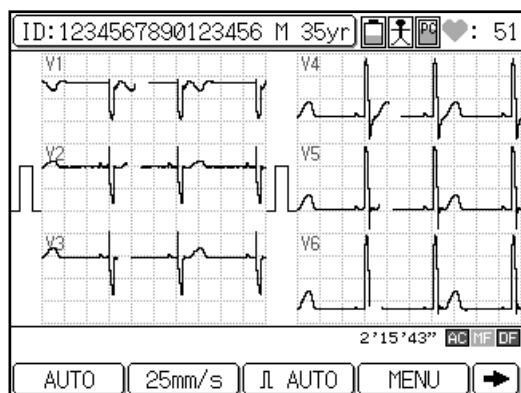
If the [MANUAL] function key is displayed, touch [MANUAL] to select the Automatic Recording Mode. If [AUTO] is displayed, skip this step.

When [AUTO] is displayed, the recording is set to Automatic Recording Mode. If [MANUAL] is displayed, the recording is set to Manual Recording Mode.



4 Check the ECG waveforms.

Check the current waveforms displayed on the screen. To switch the lead, press **LEAD** [◀] or [▶] on the Operation Panel. When 3-channel or 6-channel waveforms are displayed, you can switch the leads to be displayed.



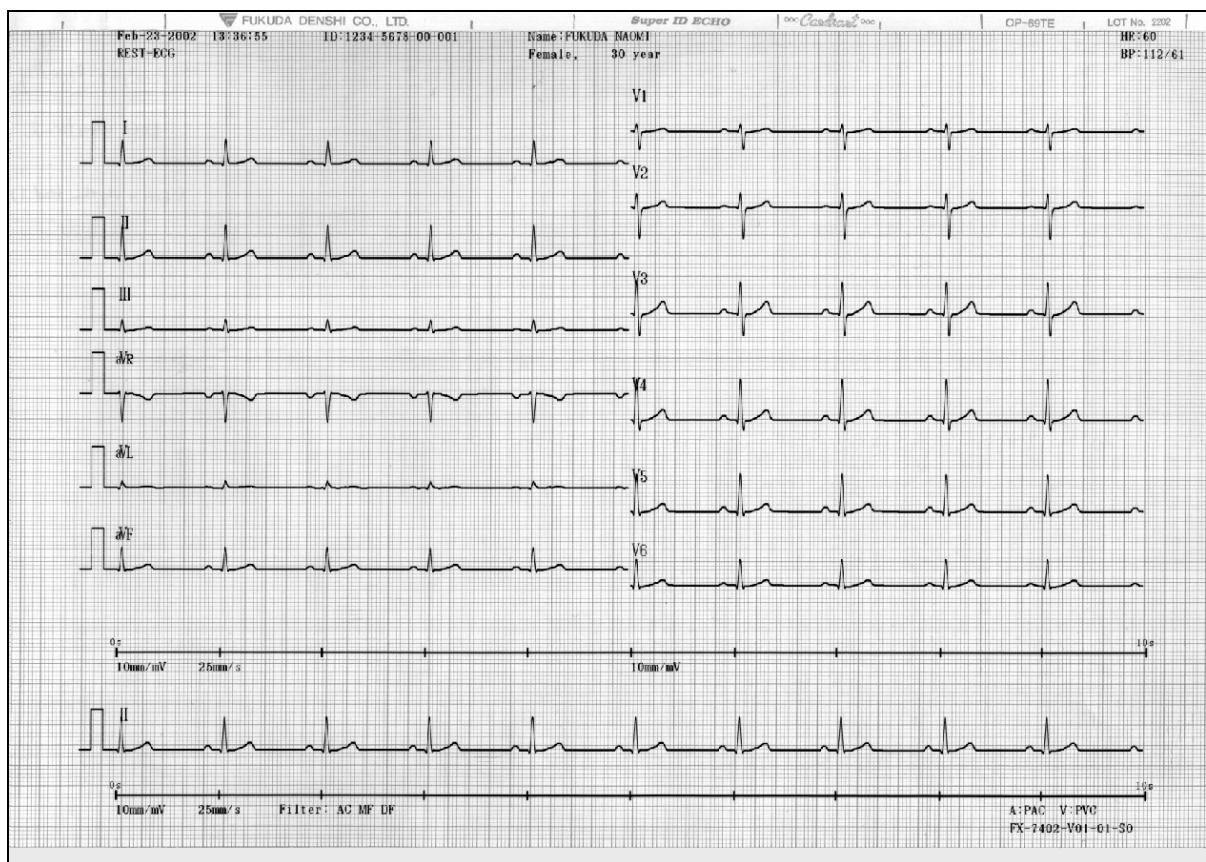
5 Press [START/STOP] or [REVIEW].

Once the displayed waveforms are stable, press **[START/STOP]** or **[REVIEW]** to start printing the ECG.

When the recording is complete, the process stops automatically.

✓ Additional information:

- To cancel the recording, press [**START/STOP**] again.
- If you cannot record an accurate ECG, see "When You Cannot Record an Accurate ECG" in Chapter 8, "Maintenance and Troubleshooting" (page 176).
- The recording data and format can be changed as required.
 - ☞ See "Selecting the Recording Format" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 129).

ECG waveform recording example

Chapter 4

Recording the ECG:

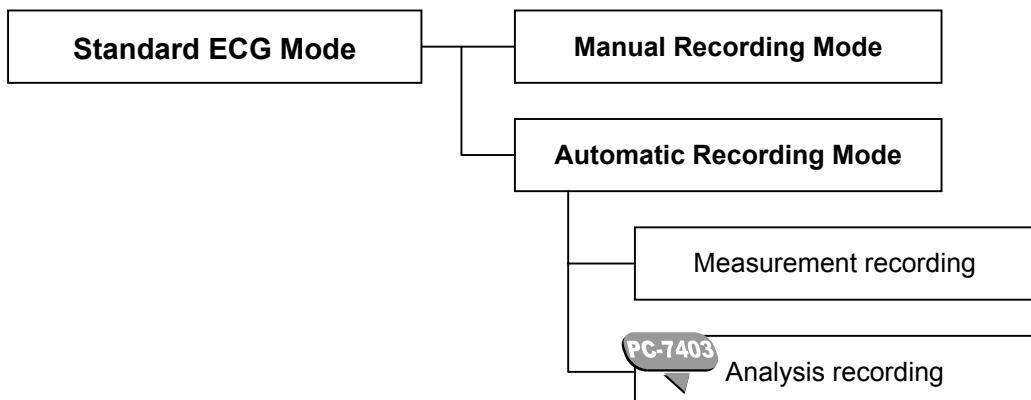
Standard ECG Mode

The Cardimax FX-7402 can be operated using three function modes: Standard ECG Mode, Arrhythmia ECG Mode, and R-R Trend Test Mode. The Arrhythmia ECG Mode, however, is available only when the PC-7403 program cartridge is installed. This chapter discusses how to record ECG in the Standard ECG Mode.

What is the Standard ECG Mode?

The Standard ECG Mode is used to display and record the standard 12-lead ECG. To perform ECG recording, you must select the recording method (operation mode). Two recording methods, i.e. Automatic Recording and Manual Recording are provided as standard functions. Also, if you select Automatic Recording, measurement recording and analysis recording (when the PC-7403 program cartridge is installed) are available.

The chart below shows the structure of the recording methods.



The available operation modes are summarized in the table below.

Configuration	Available operation mode
Without program cartridge	Automatic Recording Mode (measurement recording), Manual Recording Mode
With PC-7403 program cartridge	Automatic Recording Mode (analysis recording), Manual Recording Mode

Automatic Recording Mode (AUTO)

Automatically changes the leads to be recorded, applies the calibrated 1mV waveform, and records the 12-lead ECG.

Measurement recording

Measures each waveform of the 12-lead ECG and prints the measurement results together with the ECG waveform.

PC-7403

Analysis recording

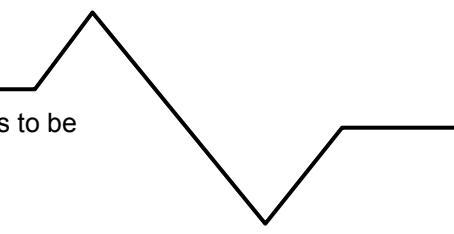
Analyzes each waveform of the 12-lead ECG and prints the interpretation together with the ECG waveform.

Manual Recording Mode (MANUAL)

Requires manual changing of the leads to be recorded, applies the calibrated 1mV waveform, and records the 12-lead ECG.

Automatic Recording Mode

The Automatic Recording Mode allows automatic changing of the leads to be recorded and records the standard 12-lead ECG.

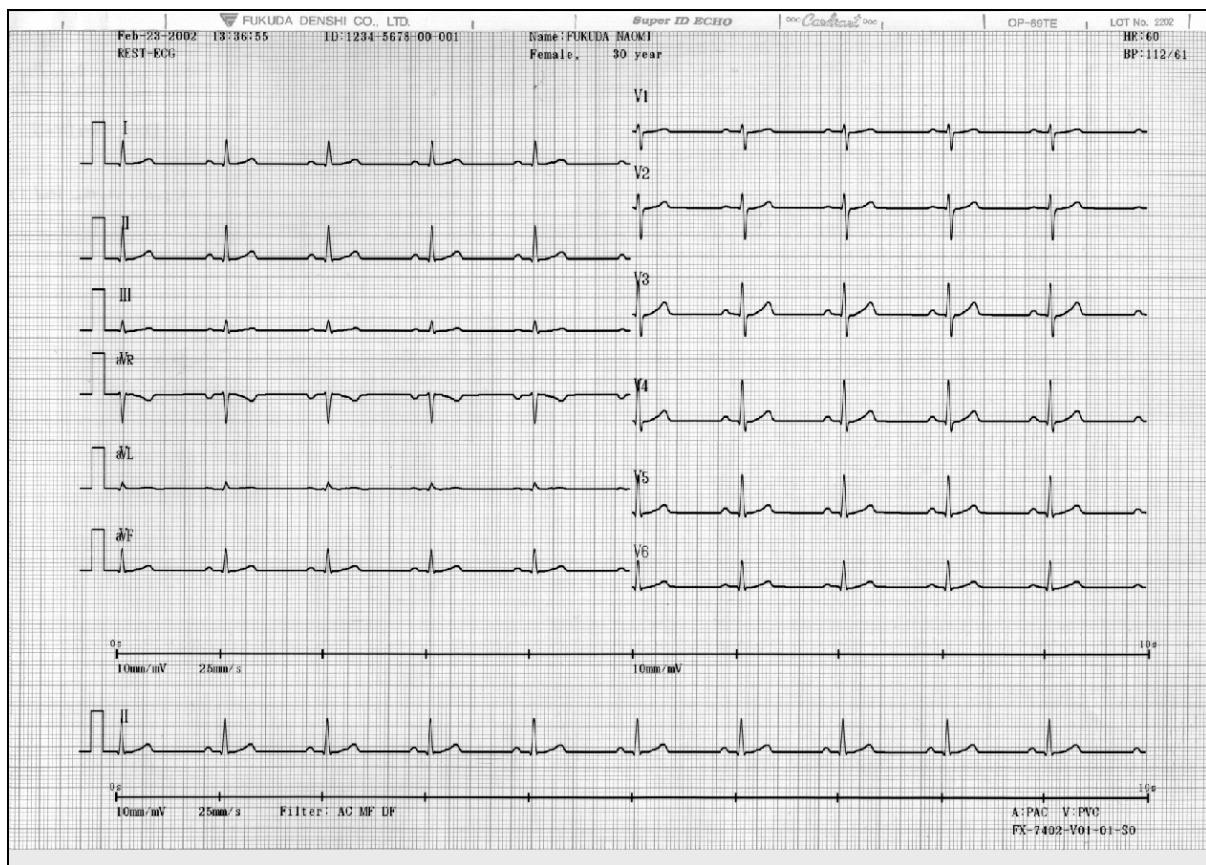


The Automatic Recording Mode includes measurement recording and analysis recording.

The available recording methods are summarized in the table below.

Configuration	Available recording method
Without program cartridge	Measurement recording
PC-7403 With PC-7403 program cartridge	Analysis recording

ECG waveforms



✓ Additional information:

You can change the number of display channels and recording channels as required.

- ☞ See "Selecting the Number of Waveform Display Channels" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 128).
- ☞ See "Selecting the Recording Format" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 129).

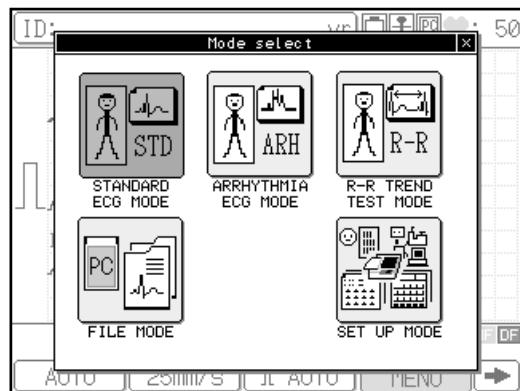
Operation

1 Display the Mode select window.

Touch [MENU] to display the Mode select window.

☞ Note:

The mode screen varies depending on the FX-7402 configuration. The mode screen shown is displayed when the PC-7403 program cartridge is installed.



2 Touch [STANDARD ECG MODE].

The Standard ECG Mode is selected.

Function keys available in the Standard ECG Mode screen

[AUTO] or [MANUAL]: Switches between Automatic Recording Mode and Manual Recording Mode.

[25mm/s] or [50mm/s]: Switches the recording speed of the ECG waveforms.

[AUTO] or [**mm]: Switches the display and recording sensitivity of the ECG waveforms. (Where “**” indicates 2.5, 5, 10, and 20mm.)

[MENU]: Displays the Mode select window.

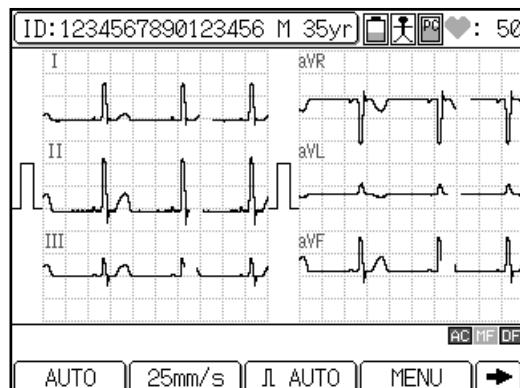
[→]: Displays the function keys on the next page.

[POST] or [REST]: Switches between POST and REST state.

☞ See "POST Recording" in Chapter 5, "Recording the Electrocardiogram: Advanced Features" (page 83).

[FEED]: Feeds the recording paper.

[FILTER]: Displays the Filter set up window and allows you to set the AC, MF, and DF filters ON/OFF.



 See "Setting the filter ON/OFF" in "Additional information" in this chapter (page 74), and "Selecting the Filters" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 163).

[COPY]: Starts reprinting the automatic recording ECG data, which was recorded immediately before pressing this key.

[MARK]: Prints a mark on the recording paper during ECG data printing.

[◀]: Displays the function keys on the previous page.

✓ Additional information:

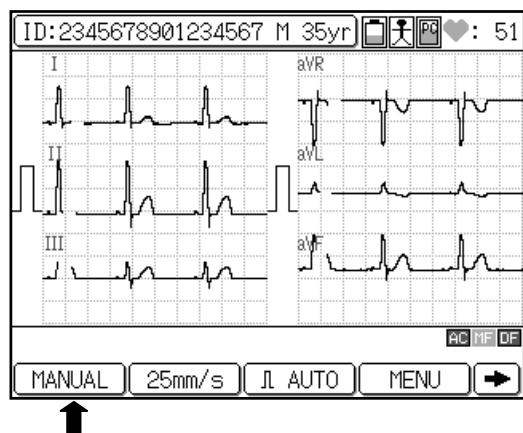
When the FX-7402 is turned ON, the Standard ECG Mode is selected.

3 Select the Automatic Recording Mode.

If the [MANUAL] function key is displayed, tap [MANUAL] to select the Automatic Recording Mode. [AUTO] will be displayed.

✓ Additional information:

The recording mode that was in use when the FX-7402 was turned OFF the last time is selected.

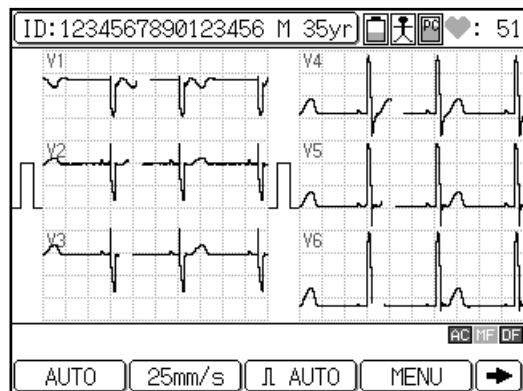


4 Check the ECG waveform.

Check the current waveforms displayed on the screen. To switch the leads, press **LEAD** [**◀**] or [**▶**]. When 3-channel or 6-channel waveforms are displayed, you can switch the leads to be displayed.

Note:

When 12-lead waveforms are displayed, you cannot switch a lead by pressing **LEAD** [**◀**] or [**▶**].



5 Press [START/STOP] or [REVIEW] to start recording.

Once the displayed waveforms are stable, press **[START/STOP]** to start recording the ECG in real time. Or, press **[REVIEW]** to start recording ECG including 10 seconds of ECG that occurred before pressing **[REVIEW]**.

The printout starts and the tracings are printed in accordance with the preset format. When the recording is complete, it will stop automatically.

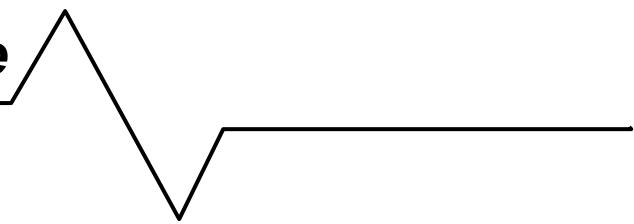
- ☞ See "Review Recording" in Chapter 5, "Recording the Electrocardiogram: Advanced Features" (page 81).
- ☞ See "STANDARD ECG MODE" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 118).

✓ Additional information:

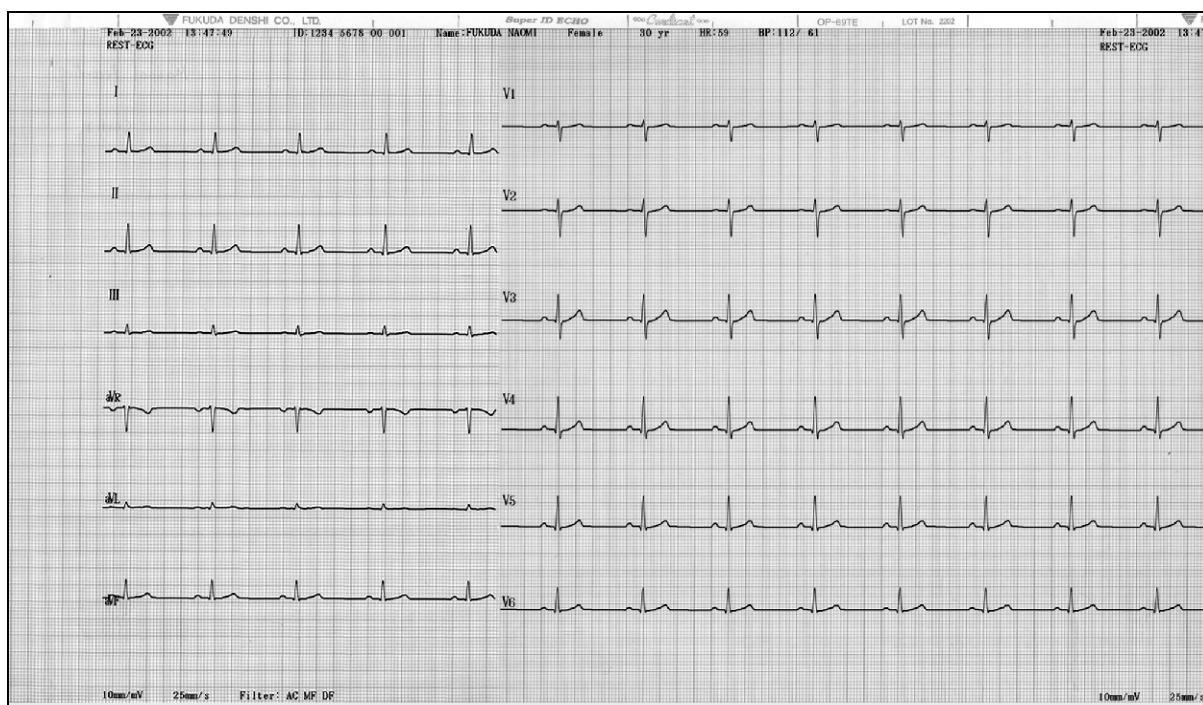
- Automatic real-time recording samples the ECG data and records and measures/analyzes (PC-7403 program cartridge) the waveforms after [START/STOP] is pressed. Real-time recording starts sampling ECG data as soon as the P wave is detected. On the other hand, automatic review recording samples the ECG data and records and measures/analyzes (PC-7403 program cartridge) waveforms from those sampled 10 seconds prior to pressing [REVIEW].
- You can touch the ID area to enter a patient's data. You cannot enter patient data when the FX-7402 is performing a recording, saving data on a PC card, or displaying the function menu.
- **Setting the filter ON/OFF**
To change the AC, MF, and DF filter ON/OFF setting, touch [FILTER]. The Filter set up window will appear. Touch [AC ON/OFF], [MF ON/OFF], or [DF ON/OFF] to change the setting. Touch [Close] to return to the previous screen. The frequency characteristics of each filter are set using the SET UP MODE (ECG CONTROL). When the filter is set to ON, the relevant filter icon ("AC", "MF", "DF") will appear in the current status display area.
- ☞ See "Selecting the Filters" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 163).
- **Changing the sensitivity**
To change the sensitivity, touch the sensitivity key ([AUTO] or [**mm]). Sensitivity settings of 2.5mm/mV, 5mm/mV, 10mm/mV, 20mm/mV, and AUTO (automatic) are available. When you set AUTO, the optimal sensitivity for recording and displaying data is selected automatically from 2.5mm/mV, 5mm/mV or 10mm/mV.
- **Changing the recording speed**
To change the recording speed, touch the speed key ([25mm/s] or [50mm/s]). Speed settings of 25mm/s and 50mm/s are available. The waveforms speed on the display is fixed regardless of this setting.
- To cancel the recording, press [START/STOP] again.
- If you cannot record an accurate ECG, see "When You Cannot Record an Accurate ECG" in Chapter 8, "Maintenance and Troubleshooting" (page 176).

Manual Recording Mode

The Manual Recording Mode enables you to manually change the leads to be recorded, apply the calibrated 1mV waveform, and record the standard 12-lead ECG.



ECG waveforms



✓ Additional information:

You can change the number of display channels as required. The number of channels to be displayed in the Manual Recording Mode complies with the MANUAL RECORD CHANNEL parameter setting of SET UP MODE (STANDARD ECG MODE). For example, if "6CH" is selected for the MANUAL RECORDING CHANNEL parameter, six channels are always displayed regardless of the DISPLAY CHANNEL parameter setting.

-  See "Selecting the Number of Waveform Display Channels" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 128).

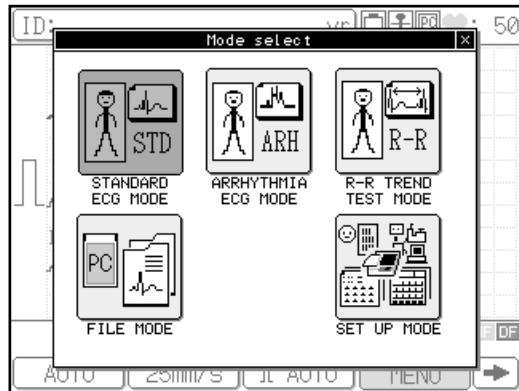
Operation

1 Display the Mode select window.

Touch [MENU] to display the Mode select window.

Note:

The mode screen varies depending on the FX-7402 configuration. The mode screen shown is displayed when the PC-7403 program cartridge is installed.



2 Touch [STANDARD ECG MODE].

The Standard ECG Mode is selected.

Function keys available in the Standard ECG Mode screen

[AUTO] or [MANUAL]: Switches between Automatic Recording Mode and Manual Recording Mode.

[**mm/s]: Switches the recording speed of the ECG waveforms. (Where “**” indicates 5, 10, 12.5, 25, and 50mm/s.)

[AUTO] or [**mm]: Switches the display and recording sensitivity of the ECG waveforms. (Where “**” indicates 2.5, 5, 10, and 20mm/s.)

[MENU]: Displays the Mode select window.

[→]: Displays the function keys on the next page.

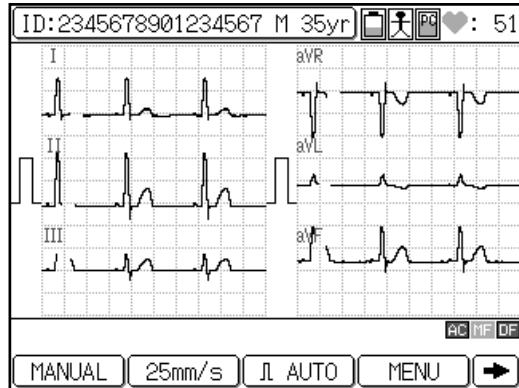
[POST] or [REST]: Switches between POST and REST state.

 See "POST Recording" in Chapter 5, "Recording the Electrocardiogram: Advanced Features" (page 83).

[FEED]: Feeds the recording paper.

[FILTER]: Displays the Filter set up window and enables you to set the AC, MF, and DF filters ON/OFF.

 See "Setting the filter ON/OFF" in "Additional information" in this chapter (page 78), and "Selecting the Filters" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 163).



[MARK]: Prints a mark on the recording paper during ECG data printing.

[◀]: Displays the function keys on the previous page.

✓ Additional information:

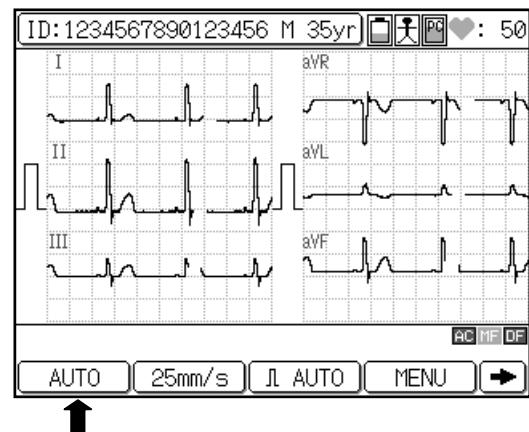
When the FX-7402 is turned ON, the Standard ECG Mode is selected.

3 Select the Manual Recording Mode.

If the [AUTO] function key is displayed, touch [AUTO] to select the Manual Recording Mode. [MANUAL] will be displayed.

✓ Additional information:

The recording mode that was in use when the FX-7402 was turned OFF the last time is selected.

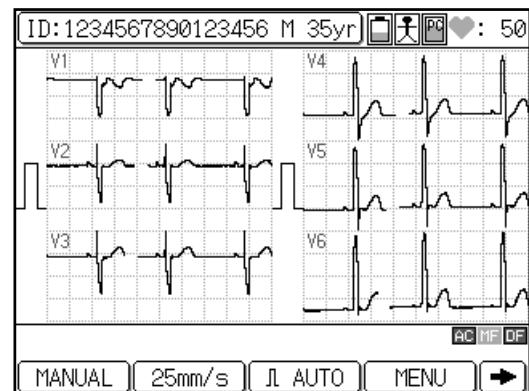


4 Check the ECG waveform.

Check the current waveforms displayed on the screen. To switch the leads, press **LEAD** [◀] or [▶]. When 3-channel or 6-channel waveforms are displayed, you can switch the leads to be displayed.

>Note:

When 12-lead waveforms are displayed, you cannot switch the lead by pressing **LEAD** [◀] or [▶].



5 Press [START/STOP] to start recording.

Once the displayed waveforms are stable, press **[START/STOP]** to start recording the ECG. To switch the leads, press **LEAD** [◀] or [▶].

✓ Additional information:

- You can select the number of recording channels from 3ch, 6ch (default), and 12ch using the "MANUAL RECORD CHANNEL" parameter of the SET UP MODE menu (STANDARD ECG MODE).

See "STANDARD ECG MODE" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 118).

- You can touch the ID area to enter a patient's data. You cannot enter patient data when the FX-7402 is performing a recording, saving data on a PC card, or displaying the function menu.

- **Setting the filter ON/OFF**

To change the AC, MF, and DF filter ON/OFF setting, tap [FILTER]. The Filter set up window will appear. Touch [AC ON/OFF], [MF ON/OFF], or [DF ON/OFF] to change the setting. Touch [Close] to return to the previous screen. The frequency characteristics of each filter are set using SET UP MODE (ECG CONTROL). When a filter is set to ON, the relevant filter icon ("AC", "MF", "DF") will appear in the current status display area.

 See "Selecting the Filters" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 163).

- **Changing the sensitivity**

To change the sensitivity, touch the sensitivity key ([AUTO] or [**mm]). Sensitivity settings of 2.5mm/mV, 5mm/mV, 10mm/mV, 20mm/mV, and AUTO (automatic) are available. When AUTO is set, optimal sensitivity for recording and displaying data is selected automatically from 2.5mm/mV, 5mm/mV or 10mm/mV.

- **Changing the recording speed**

To change the recording speed, touch the speed key ([**mm/s]). Speed settings of 5mm/s, 10mm/s, 12.5mm/s, 25mm/s, and 50mm/s are available. The waveform drawing speed on the LCD is fixed regardless of this setting.

- To output a calibrated waveform, press [**1mV**].
- To cancel the recording, press [**START/STOP**] again.
- If you cannot record an accurate ECG, see "When You Cannot Record an Accurate ECG" in Chapter 8, "Maintenance and Troubleshooting" (page 176).

6 Press [**START/STOP**] again to stop recording.

Chapter 5

Recording the Electrocardiogram:

Advanced Features

The Cardimax FX-7402 can perform various examinations such as arrhythmia analysis and R-R trend test in addition to the standard 12-lead ECG recording. This chapter describes how to use these advanced features supported by the FX-7402.

The Standard ECG Mode supports the following advanced features.

Review recording

Records and measures 10 seconds of ECG that occurred prior to pressing [REVIEW] on the Operation Panel. The recording and measurement is continued.

POST recording

Records ECG after a stress test or after the administration of medication to a patient.

The FX-7402 also provides R-R Trend Test and Arrhythmia ECG Modes in addition to the Standard ECG Mode described in Chapter 4. The Arrhythmia ECG Mode is available only when the PC-7403 program cartridge is installed.

R-R Trend Test Mode

Monitors 1 specified ECG lead for a maximum of 5 minutes, or 100 or 200 pulses and measures the variation of the R-R interval. The results are recorded as an R-R trend test report together with the ECG waveform.

PC-7403

Arrhythmia ECG Mode

Monitors 3 specified ECG leads for 1 to 3 minutes and performs an arrhythmia analysis. The analysis results are recorded as an arrhythmia analysis report together with the ECG waveform.

PC-7403

Arrhythmia automatic extension recording

Automatically performs an arrhythmia analysis when a condition such as arrhythmia is detected during analysis recording.

The advanced features are summarized in the table below.

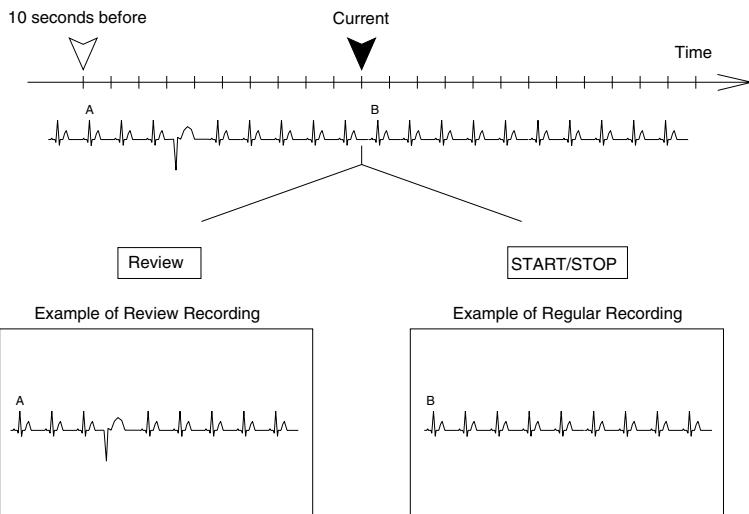
Configuration	Advanced features supported
Without program cartridge	Review recording, POST recording, R-R Trend Test Mode
 With PC-7403 program cartridge	Arrhythmia ECG Mode, Arrhythmia automatic extension recording Review recording, POST recording, R-R Trend Test Mode

Review Recording

The Review Recording feature allows recording and measurement of 10 seconds of ECG that occurred prior to pressing [REVIEW] on the Operation Panel when you are performing a Standard ECG (Automatic Recording), Arrhythmia ECG, or R-R Trend Test Recording. Recording and measurement is continued in the selected mode.

Standard ECG Mode,
Arrhythmia ECG Mode,
R-R Trend Test Mode

Review Recording begins with data that occurred 10 seconds prior to the current time. For example, pressing [START/STOP] as soon as arrhythmia is detected on the screen might not record this condition because it has already passed. In that case, using the Review Recording function ensures the waveform detected on the screen earlier is recorded.



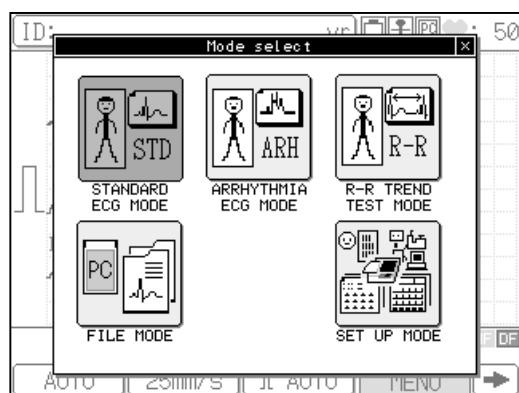
Operation

1 Display the Mode select window.

Touch [MENU] to display the Mode select window.

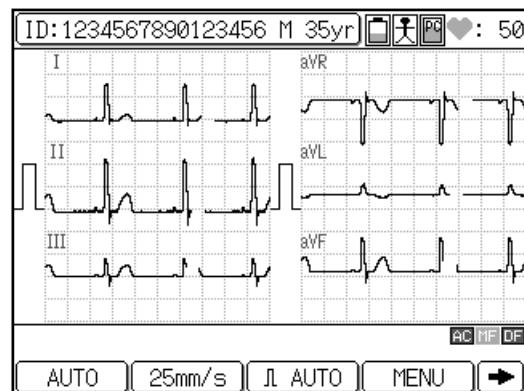
Note:

The mode screen varies depending on the FX-7402 configuration. The mode screen shown is displayed when the PC-7403 program cartridge is installed.



2 Touch [STANDARD ECG MODE], [ARRHYTHMIA ECG MODE], or [R-R TREND TEST MODE].

Select the desired recording mode.

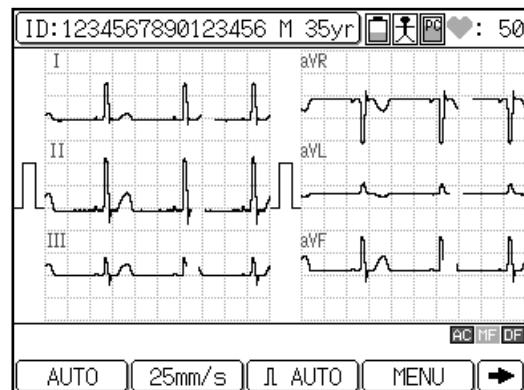


3 Select the Automatic Recording Mode.

If the [MANUAL] function key is displayed, touch [MANUAL] to select the Automatic Recording Mode. [AUTO] will be displayed.

✓ Additional information:

- ☞ See Chapter 4, "Recording the Electrocardiogram: Standard ECG Mode" (page 69), or Chapter 5 (this chapter), "R-R Trend Test Mode" (page 86) or "Arrhythmia ECG Mode" (page 90) for detailed procedure.



4 Press [REVIEW] to start the Review Recording.

The ECG Review Recording starts.

✓ Additional information:

- The rest of the Review Recording operation is the same as the normal recording method of the Standard ECG Mode, Arrhythmia ECG Mode, or R-R Trend Test Mode.
- ☞ See Chapter 4, "Recording the Electrocardiogram: Standard ECG Mode" (page 69).
- To cancel the recording, press [START/STOP].
- When [REVIEW] is pressed, recording will start even if an electrode is detached from a patient.

POST Recording

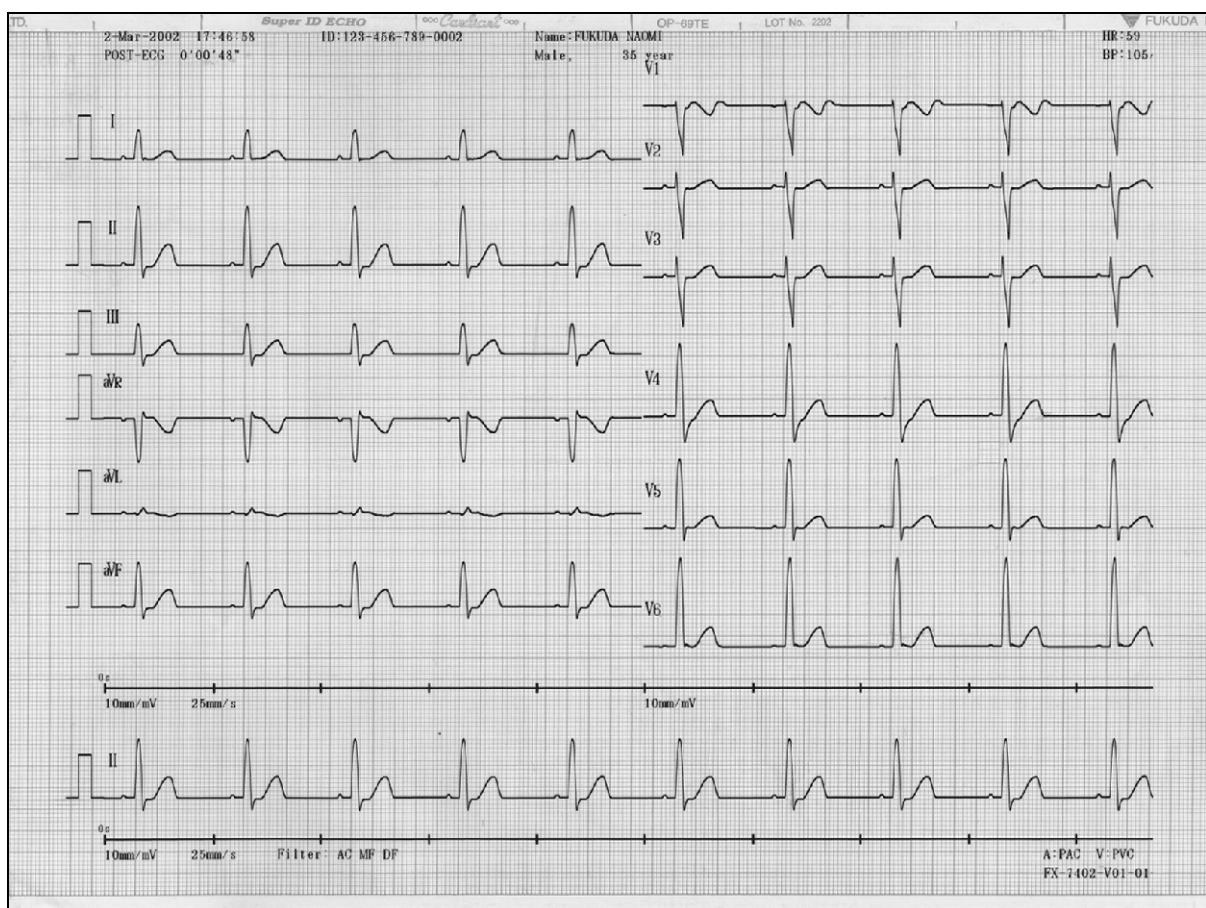
The POST Recording feature allows recording of the ECG after performing a stress test or administering medication to a patient.

Standard ECG Mode

To compare the patient's progress after performing a stress test or administering medication, change the operation status to "POST" and record the ECG. The "POST" status includes the elapsed time.

POST Recording

Elapsed time after performing a stress test or administering medicine to a patient



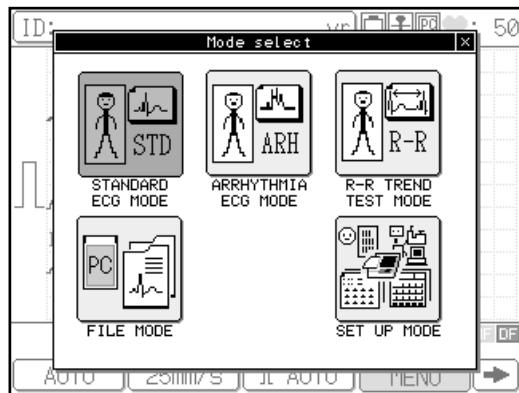
Operation

1 Display the Mode select window.

Touch [MENU] to display the Mode select window.

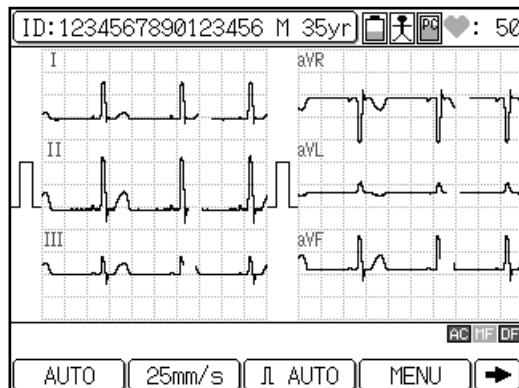
 **Note:**

The mode screen varies depending on the FX-7402 configuration. The mode screen shown is displayed when the PC-7403/PC-7404 program cartridge is installed.



2 Touch [STANDARD ECG MODE].

The Standard ECG Mode is selected.

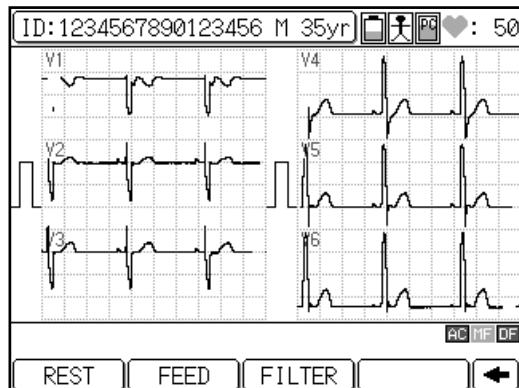


3 Record the ECG before performing the stress test or administering medication to a patient.

Make sure [REST] is selected for the operation status and press [START/STOP] to start recording.

 **Additional information:**

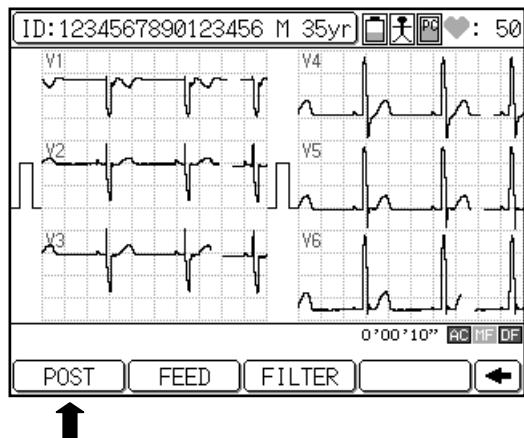
-  See Chapter 4, "Recording the Electrocardiogram: Standard ECG Mode" (page 69) for the detailed procedure.



4 Perform the stress test or administer medication to a patient.

5 Change the operation status to [POST].

Touch [REST] to display [POST]. The elapsed time is counted from this start time.



6 Perform POST Recording.

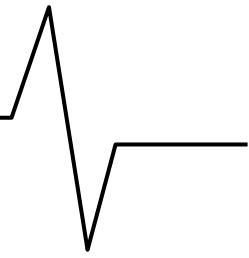
After the designated period has elapsed, press [**START/STOP**] to start recording.

✓ Additional information:

- POST ECG waveforms in the POST state are printed in accordance with the elapsed time (1, 2, 3, 4, or 5 minutes) selected for the POST INTERVAL TIME parameter of the SET UP MODE (STANDARD ECG MODE).
- When the elapsed time is selected, the arrhythmia analysis is not printed automatically, even if AUTO MODE CHANGE of the SET UP MODE (STANDARD ECG MODE) is set to ON.
- POST ECG waveforms in the POST state are printed between automatic recording sessions (during the POST recording intervals) at low speed if the POST COMPRESSED ECG parameter of the SET UP MODE (STANDARD ECG MODE) is set to ON. For example, if you set the POST INTERVAL TIME parameter of SET UP MODE (STANDARD ECG MODE) to 1 minute, ECG recording starts after the completion of the first automatic recording (measurement or analysis recording) and continues until the start of the next automatic recording which takes place 1 minute later.
- To cancel the recording, press [**START/STOP**].

R-R Trend Test Mode

The R-R Trend Test Mode allows monitoring of 1 specified ECG lead for a maximum of 5 minutes, or 100 or 200 pulses and measures the variation of the R-R interval. The measurement results (Standard Deviation, Coefficient of Variation, Trend graph, and Histogram) are recorded as an R-R trend test report together with the ECG waveform.

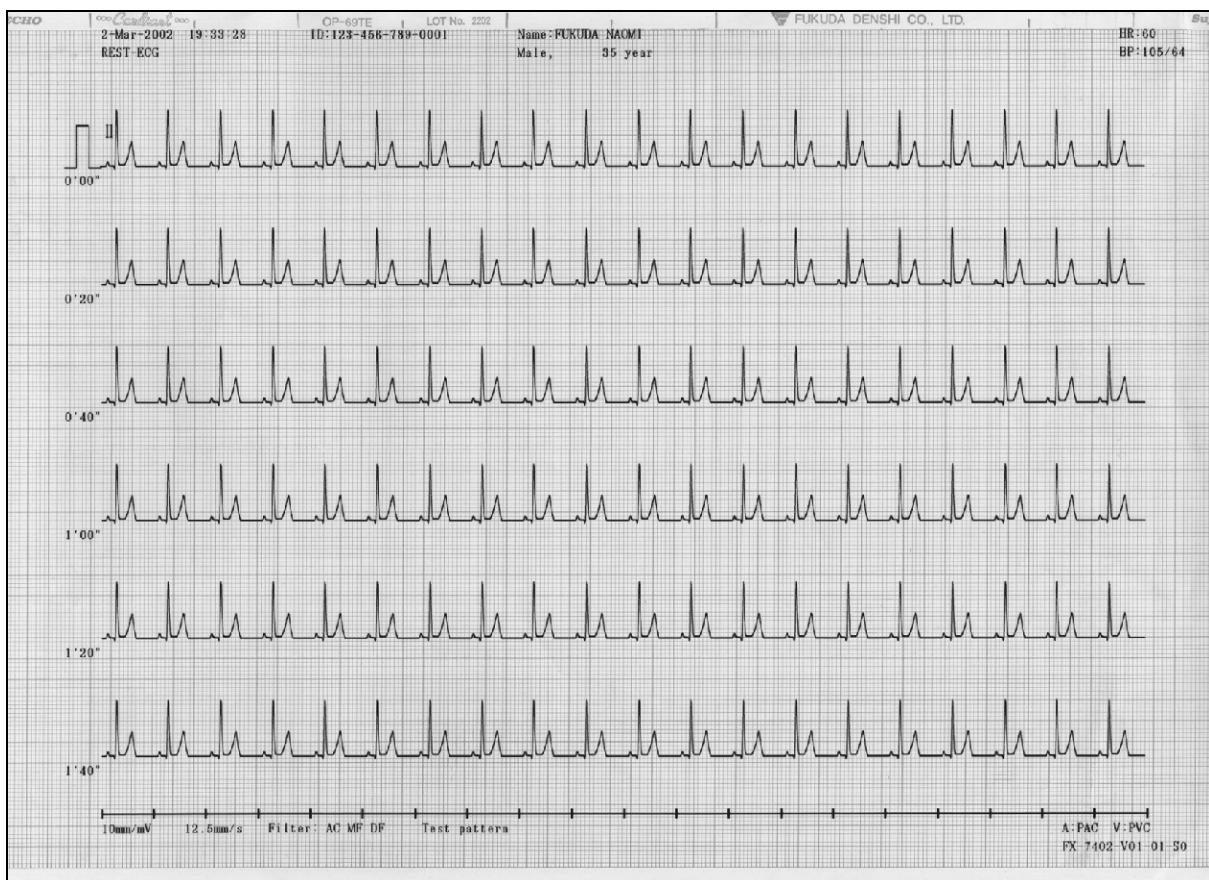


CAUTION



The measurement results should be reviewed and correlated to the printed ECG waveform. The FX-7402 may measure the ECG waveform incorrectly due to external noise (such as a drift of the baseline, electromyogram, AC interference, etc.).

R-R trend test report



Select the desired measurement period from the following by touching [TARGET]: 100BT, 200BT, 1 min, 2 min, 3 min, 4 min, 5 min. The test automatically stops when the selected number of beats, or time has elapsed.

The recording format can be changed as required.

- ☞ See "R-R Trend Test Mode" of "Selecting the Recording Format" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 158).

✓Additional information:

In this mode, one channel that is selected by the R-R TREND LEAD parameter of the SET UP MODE (R-R TREND TEST MODE) is displayed.

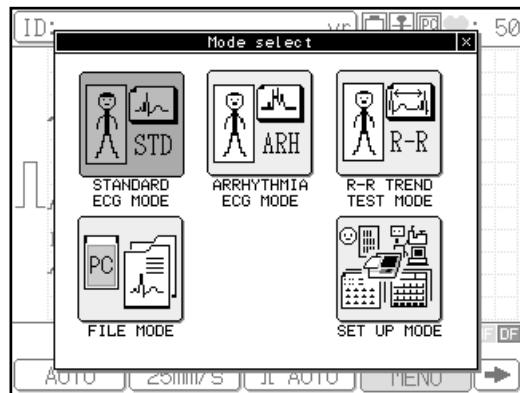
Operation

1 Display the Mode select window.

Touch [MENU] to display the Mode select window.

Note:

The mode screen varies depending on the FX-7402 configuration. The mode screen shown is displayed when the PC-7403 program cartridge is installed.



2 Touch [R-R TREND TEST MODE].

The R-R Trend Test Mode is selected.

Function keys available in the R-R Trend Test Mode screen

[TARGET]: Displays the TARGET SELECT window and allows you to select the measurement period (1min, 2min, 3min, 4min, 5min, 100BT, 200BT).

[COPY]: Starts reprinting the R-R measurement data, which was recorded immediately before pressing this key.

[AUTO] or [**mm]: Switches the display and recording sensitivity of the ECG waveforms. (Where “**” indicates 2.5, 5, 10, and 20mm.)

[MENU]: Displays the Mode select window.

[→]: Displays the function keys on the next page.

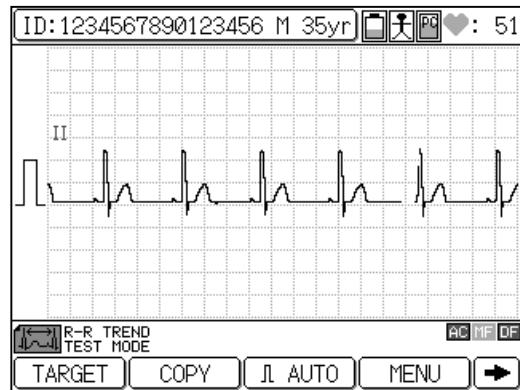
[FEED]: Feeds the recording paper.

[FILTER]: Displays the Filter set up window and allows you to turn the AC, MF, and DF filters ON/OFF.

[←]: Displays the function keys on the previous page.

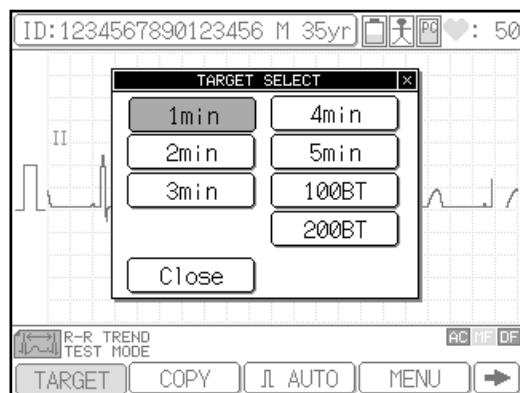
✓ Additional information:

When the FX-7402 is turned ON, the Standard ECG Mode is selected.



3 Select the measurement period.

Touch [TARGET]. The TARGET SELECT window will appear. Select the measurement period from the following: 100BT, 200BT, 1 min, 2 min, 3 min, 4 min, 5 min. Touch [Close] to return to the previous screen.



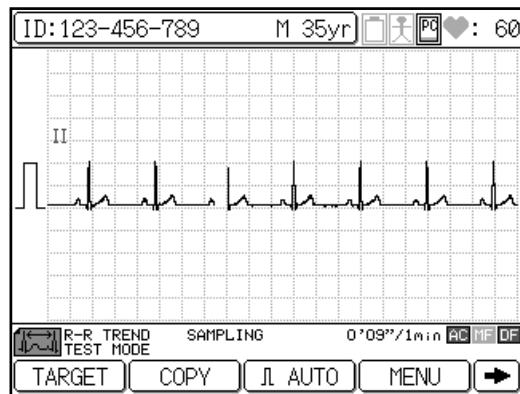
4 Press [START/STOP] or [REVIEW] to start recording.

When [START/STOP] is pressed, the FX-7402 starts sampling the waveforms of a lead selected by the R-R TREND LEAD parameter of the SET UP MODE (R-R TREND TEST MODE).

When [REVIEW] is pressed, the FX-7402 starts sampling waveforms from those sampled 10 seconds prior to pressing [REVIEW].

The lead is recorded for a specified period (or for a specified number of beats). During data sampling, the message "SAMPLING" is displayed together with either the number of sampled R waves and selected number of pulses, or elapsed time and selected measurement period. If either 100BT or 200BT is set in the TARGET SELECT window, the sampling will end automatically when the number of counted R waves reaches the number of beats set in the TARGET SELECT window, or when 5 minutes have elapsed. If 1 to 5 minutes is set in the TARGET SELECT window, the sampling will end automatically when the time set in the TARGET SELECT window has elapsed.

When the test is complete, the R-R trend test report is recorded.



✓ Additional information:

- You can touch the ID area to enter patient's data. You cannot enter patient data when FX-7402 is performing a recording, saving data on a PC card, or displaying the function menu.
- Waveform sampling of the lead is canceled if no QRS is detected within 7 seconds immediately after the test is started. Sampling is also canceled if the number of R-R exceeds 216 per minute when the measurement period (1 to 5 minutes) is set.
- **Setting the filter ON/OFF**
To change the AC, MF, and DF filter ON/OFF, touch [FILTER]. The Filter set up window will appear. Touch [AC ON/OFF], [MF ON/OFF], or [DF ON/OFF] to change the setting. Touch [Close] to return to the previous screen. The frequency characteristics of each filter are set using the SET UP MODE (ECG CONTROL). When a filter is set to ON, the relevant filter icon ("AC", "MF", "DF") will appear in the current status display area.

See "Selecting the Filters" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 163).

- **Changing the sensitivity**

To change the sensitivity, touch the sensitivity key ([AUTO] or [**mm]). Sensitivity settings of 2.5mm/mV, 5mm/mV, 10mm/mV, 20mm/mV, and AUTO (automatic) are available. When you select AUTO, the optimal sensitivity for recording and displaying data is selected automatically from 2.5mm/mV, 5mm/mV or 10mm/mV.

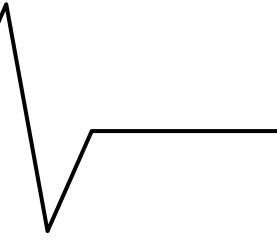
- To output a calibrated waveform, press [**1mV**].
- The recording will start even if an electrode is detached from a patient.
- To cancel the test, press [**START/STOP**].
- You can use the ECG REPORT parameter of the SET UP MODE (R-R TREND MODE) to select the waveform recording speed from either Standard (25mm/s) or Compress (10mm/s).
- If the ANALYSIS REPORT parameter of the SET UP MODE (R-R TREND TEST MODE) is set to ON, you can automatically print the R-R trend graph and R-R histogram.
- If the MEASURED VALUE parameter of the SET UP MODE (R-R TREND TEST MODE) is set to ON, you can automatically print detailed measurement values.

 See "R-R Trend Test Mode" of "Selecting the Recording Format" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 158).

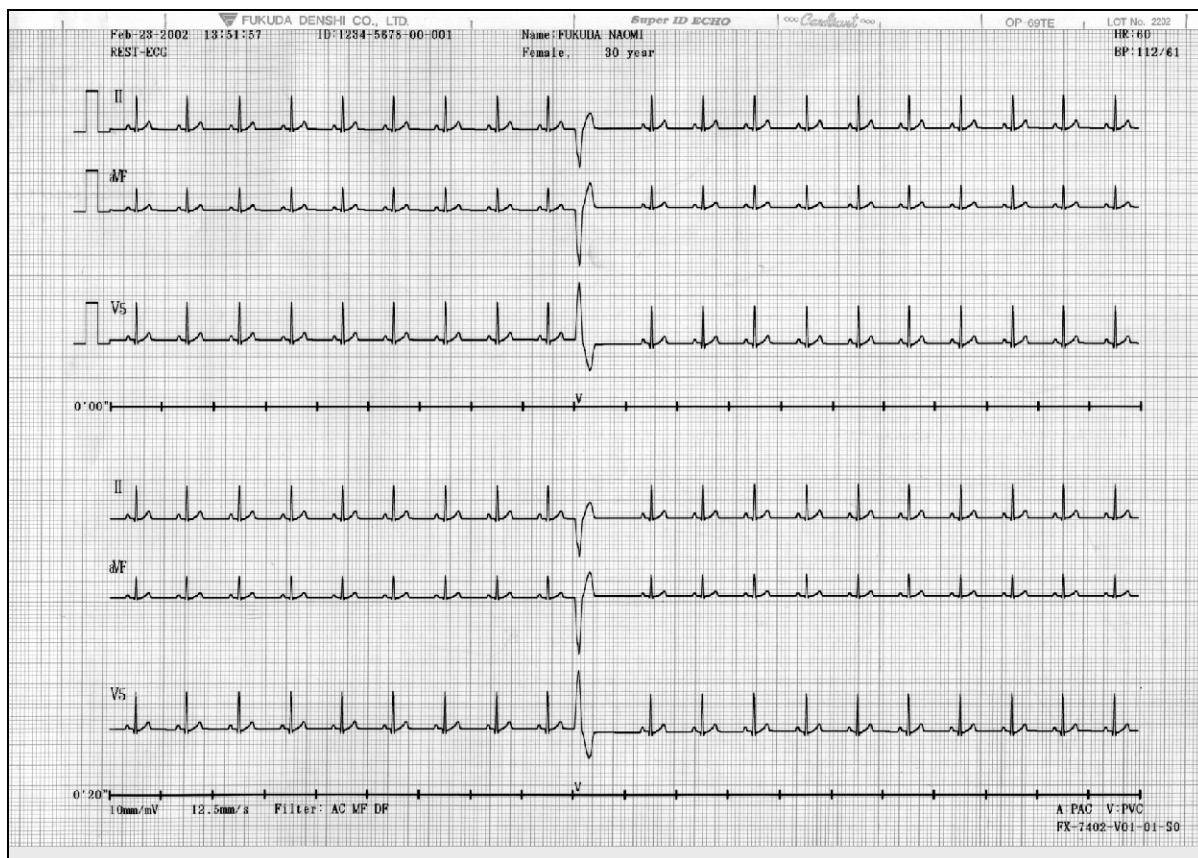
PC-7403

▼ Arrhythmia ECG Mode

The Arrhythmia ECG Mode allows monitoring of 3 specified ECG leads for 1 to 3 minutes and analyzes the arrhythmia condition. The analysis results are recorded as an arrhythmia ECG report together with ECG waveforms.



Arrhythmia ECG report



Select the desired measurement period from the following by touching [TARGET]: 1 min, 2 min, 3 min. The test stops automatically when the selected time has elapsed.

The recording format can be changed as required.

- ☞ See "Arrhythmia ECG Mode" of "Selecting the Recording Format" in Chapter 7, "Setting Up Parameters of the Cardimax the FX-7402" (page 154).

✓ Additional information:

In this mode, three channels selected by the ARRHYTHMIA LEAD 1CH, 2CH, and 3CH parameters of the SET UP MODE (ARRHYTHMIA ECG MODE) are displayed.

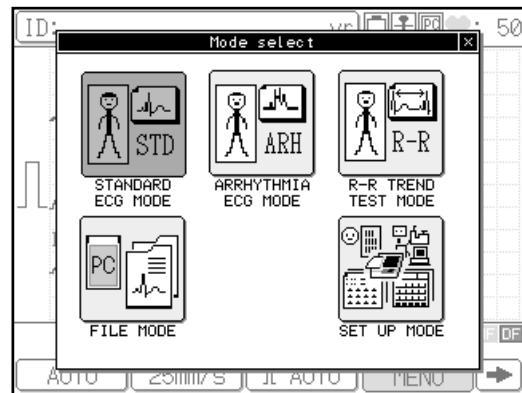
Operation

1 Press the Mode select window.

Touch [MENU] to display the Mode select window.

Note:

The mode screen varies depending on the FX-7402 configuration. The mode screen shown is displayed when the PC-7403 program cartridge is installed.



2 Touch [ARRHYTHMIA ECG MODE].

The Arrhythmia ECG Mode is selected.

Function keys available in the Arrhythmia ECG Mode screen

[TARGET]: Displays the TARGET SELECT window and allows you to select the measurement period (1min, 2min, 3min).

[COPY]: Starts reprinting the arrhythmia ECG measurement data, which was recorded immediately before pressing this key.

[AUTO] or [**mm]: Switches the display and recording sensitivity of the ECG waveforms. (Where “**” indicates 2.5, 5, 10, and 20mm.)

[MENU]: Displays the Mode select window.

[→]: Displays the function keys on the next page.

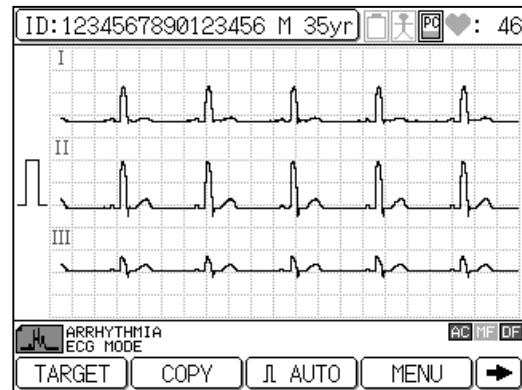
[FEED]: Feeds the recording paper.

[FILTER]: Displays the Filter set up window and allows you to turn the AC, MF, and DF filters ON/OFF.

[←]: Displays the function keys on the previous page.

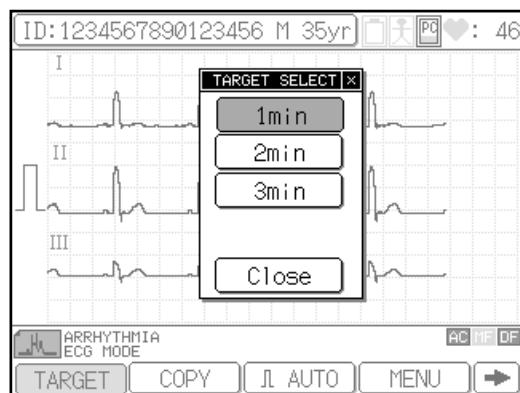
✓ Additional information:

When the FX-7402 is turned ON, the Standard ECG Mode is selected.



3 Select the measurement period.

Touch [TARGET]. The TARGET SELECT window will appear. Select the measurement period from the following: 1 min, 2 min, 3 min. Touch [Close] to return to the previous screen.



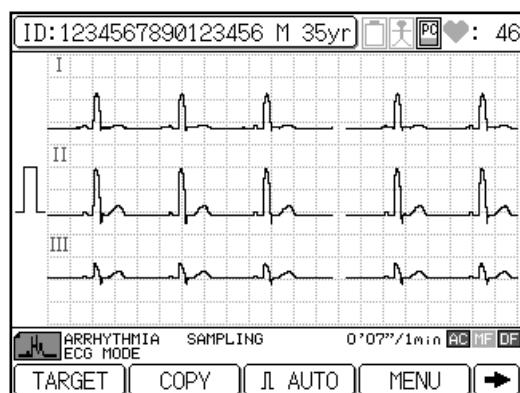
4 Press [START/STOP] or [REVIEW] to start recording.

When [START/STOP] is pressed, the FX-7402 starts sampling the waveforms of the three leads selected by the ARRHYTHMIA LEAD 1CH, 2CH, and 3CH parameters of the SET UP MODE (ARRHYTMIA ECG MODE).

When [REVIEW] is pressed, the FX-7402 starts sampling waveforms from those sampled 10 seconds prior to pressing [REVIEW].

The lead is recorded for a specified period. During data sampling, the message "ARRHYTHMIA SAMPLING" is displayed together with the elapsed time and selected measurement period. If 1 to 3 minutes is set in the TARGET SELECT window, the sampling will automatically end when the time set in the TARGET SELECT window has elapsed.

When the analysis is complete, the arrhythmia ECG report and the measured values are recorded.



✓ Additional information:

- You can touch the ID area to enter patient's data. You cannot enter patient data when the FX-7402 is performing a recording, saving data on a PC card, or displaying the function menu.
- Waveform sampling of the lead is canceled when no QRS is detected within 7 seconds immediately after the test is started.
- Setting the filter ON/OFF**

To change the AC, MF, and DF filter ON/OFF, touch [FILTER]. The Filter set up window will appear. Touch [AC ON/OFF], [MF ON/OFF], or [DF ON/OFF] to change the setting. Touch [Close] to return to the previous screen. The frequency characteristics of each filter are set using the SET UP MODE (ECG CONTROL). When a filter is set to ON, the relevant filter icon ("AC", "MF", "DF") will appear in the current status display area.

See "Selecting the Filters" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 163).

- Changing the sensitivity**

To change the sensitivity, touch the sensitivity key ([AUTO] or [**mm]). Sensitivity

settings of 2.5mm/mV, 5mm/mV, 10mm/mV, 20mm/mV, and AUTO (automatic) are available. When you set AUTO, the optimal sensitivity for recording and displaying data is selected automatically from 2.5mm/mV, 5mm/mV or 10mm/mV.

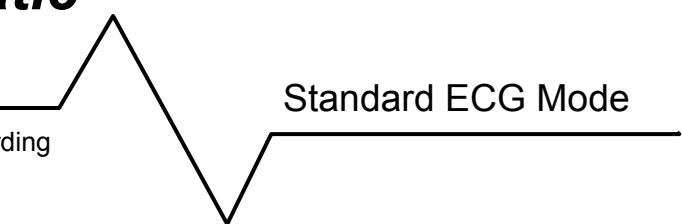
- To output a calibrated waveform, press [**1mV**].
 - The recording will start even if the electrode is detached from a patient.
 - To cancel the test, press [**START/STOP**].
 - If the analysis is disabled, the message "Unanalyzable" will appear and the printing of the Analysis Report is canceled.
 - You can use the ECG REPORT parameter of the SET UP MODE (ARRHYTHMIA ECG MODE) to select the waveform recording speed from either Standard (25mm/s) or Compress (10mm/s).
 - If the ANALYSIS REPORT parameter of the SET UP MODE (ARRHYTHMIA ECG MODE) is set to ON, you can print a report after compiling the analysis observation result and event waveforms.
 - If the MEASURED VALUE parameter of SET UP MODE (ARRHYTHMIA ECG MODE) is set to ON, you can automatically print the detailed measurement values.
-  See "Arrhythmia ECG Mode" of "Selecting the Recording Format" in Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 154).

PC-7403

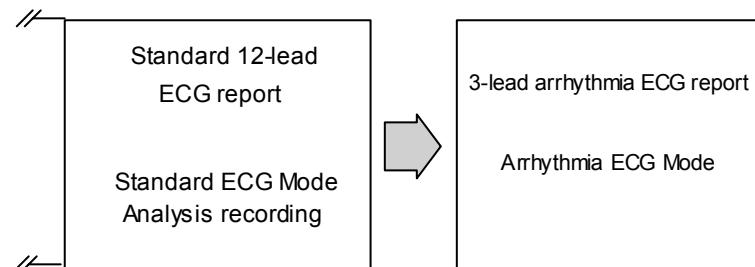
Arrhythmia Automatic Extension Recording

Automatically executes the arrhythmia analysis recording when a specific interpretation such as arrhythmia is detected during the 12-lead analysis recording.

Standard ECG Mode



After performing analysis recording in the Standard ECG Mode, Arrhythmia ECG Mode is executed automatically and the arrhythmia ECG report is printed.



Interpretation criteria for arrhythmia automatic extension recording

ATRIO-VENTRICULAR CONDUCTION DEFECT

412	A-V Block 2 (Wenckebach)	414	2:1 A-V Block
413	A-V Block 2 (Mobitz)	415	Complete A-V Block

ARRHYTHMIA

803	A-V Junctional Rhythm	847	PAC Bigeminy
804	A-V Dissociation	848	PVC Bigeminy
816	Extreme Bradycardia	851	S-A Block or Marked S. Arrhythmia
831	Escape Beat	852	Blocked PAC
841	Supraventricular Premature Beat	862	Runs of PAC
842	Ventricular Premature Beat	864	Runs of PVC
843	PAC Trigeminy	865	Ventricular Rhythm
844	PVC Trigeminy	871	Arterial Fibrillation
845	Frequent PAC	872	Arterial Flutter
846	Frequent PVC	881	Undefined Arrhythmia

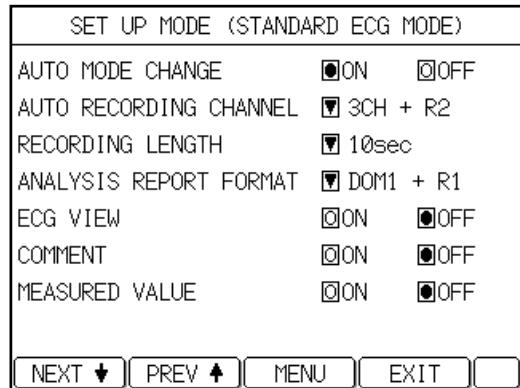
Operation

1 Enable the arrhythmia automatic extension recording.

Display SET UP MODE (STANDARD ECG MODE). Touch the [AUTO MODE CHANGE] parameter and select ON.

✓ Additional information:

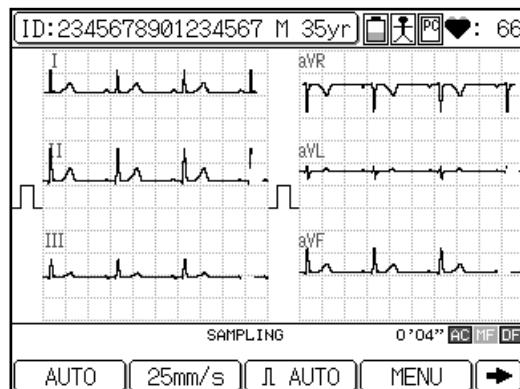
- ☞ See Chapter 7, "Setting Up Parameters of the Cardimax FX-7402" (page 119).



2 Perform Analysis Recording in Standard ECG Mode.

✓ Additional information:

- ☞ See "Automatic Recording Mode" in Chapter 4, "Recording the Electrocardiogram: Standard ECG Mode" (page 71) for further information about the procedure.

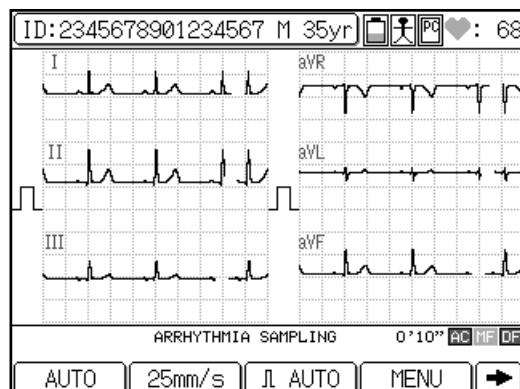


3 Arrhythmia analysis.

When a specific interpretation such as arrhythmia is detected as a result of the analysis, the arrhythmia analysis recording starts automatically. When the analysis is complete, an arrhythmia ECG report is recorded.

✓ Additional information:

- While POST Recording is performed, the arrhythmia analysis is not printed automatically even if AUTO MODE CHANGE of the SET UP MODE (STANDARD ECG MODE) is set to ON.
- When the ECG VIEW parameter of the SET UP MODE (STANDARD ECG MODE) is set to ON, the FX-7402 starts sampling the data used for arrhythmia analysis recording after the ECG analysis is complete. When this parameter is set to OFF, the FX-7402 starts sampling the data after you have confirmed the analysis (ECG VIEW).



Chapter 6

Managing ECG Data Files

This chapter provides information on how to save ECG data on a PC card, read ECG data from the built-in memory or PC card, and send ECG data to a personal computer from the built-in memory or PC card. The chapter also explains how to initialize the PC card and other ECG data management functions.

The Cardimax the FX-7402 has a built-in memory for storing ECG data. The ECG data recorded by analysis and measurement are always saved in the built-in memory. The built-in memory can store up to 300 ECG data files.

Notes:

- The number of ECG data files you can store in the built-in memory depends on the conditions of use. You may not be able to save 300 files.
- When the built-in memory space becomes full, new data are overwritten beginning with the oldest data.
- You cannot delete data in the built-in memory.

Initializing the PC Card

Before saving ECG data on a PC card, be sure to initialize the card on the FX-7402.



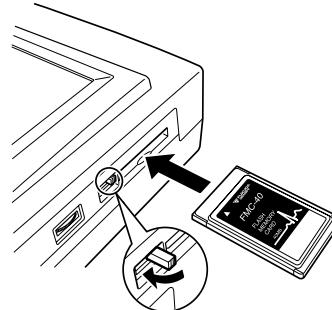
CAUTION

When you initialize a PC card, all data saved in the PC card will be lost. Before initializing, be sure to check if there are data in the PC card.

Operation

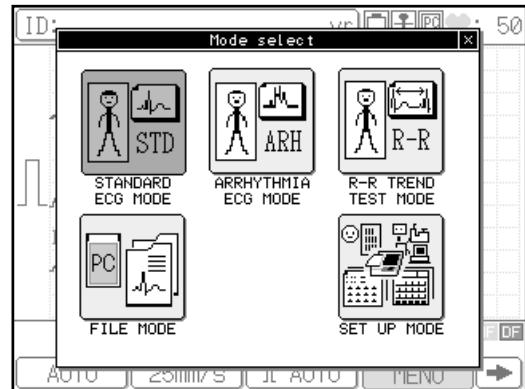
1 Insert the PC card.

Insert the PC card into the PC card drive. Make sure the card is fully inserted in the drive.



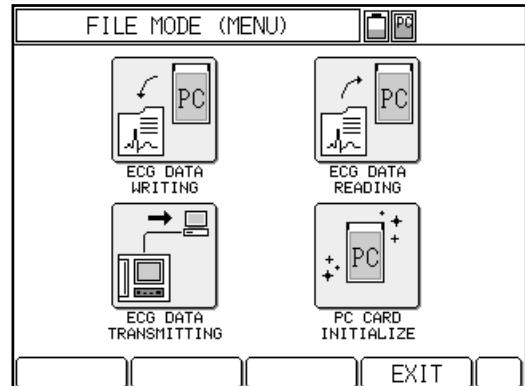
2 Display the Mode select window.

Touch [MENU] to display the Mode select window.



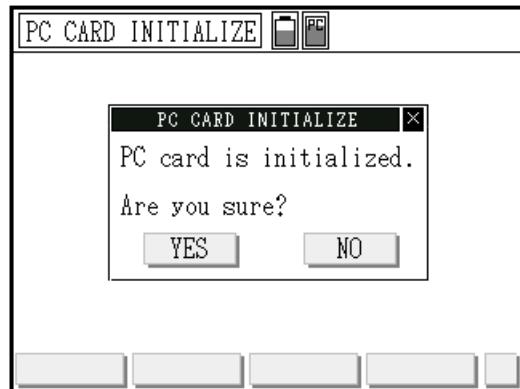
3 Touch [FILE MODE].

The FILE MODE (MENU) appears.



4 Touch [PC CARD INITIALIZE].

A message appears asking you to confirm initialization of the card.



5 Touch [YES] to initialize the PC card.

The message “Initializing PC card...” appears. When the initialization process is finished, the message will disappear.

To cancel initialization, touch [NO] to return to the FILE MODE (MENU) window.

Writing ECG Data to the PC Card

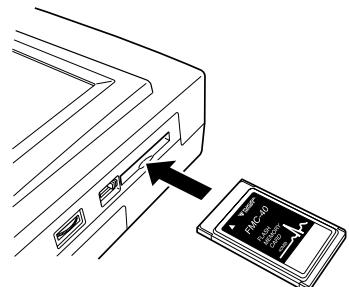
You can write sampled ECG data to a PC card. The type of file to be written complies with the [FILE TYPE] parameter (Wave or Dominant) setting in the SET UP MODE (FILE MODE).

Notes:

- The same ECG data is written only once.
- When you perform the following recordings, the ECG data are saved on a PC card.
 - Analysis recording ECG
 - Measurement recording ECG
 - Arrhythmia analysis ECG
 - R-R trend ECG

1 Insert the PC card.

Insert the PC card into the PC card drive. Make sure the card is fully inserted in the slot.

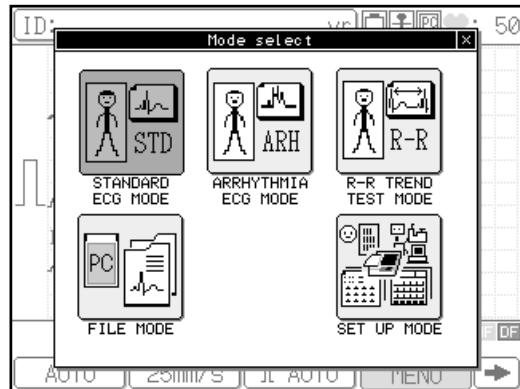


2 Perform ECG sampling.

Press [START/STOP] in the Standard ECG Mode, Arrhythmia ECG Mode (PC-7403), or R-R Trend Test Mode to perform ECG sampling for one cycle.

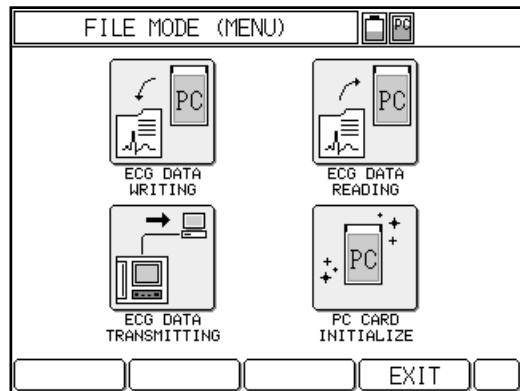
3 Display the Mode select window.

Touch [MENU] to display the Mode select window.



4 Touch [FILE MODE].

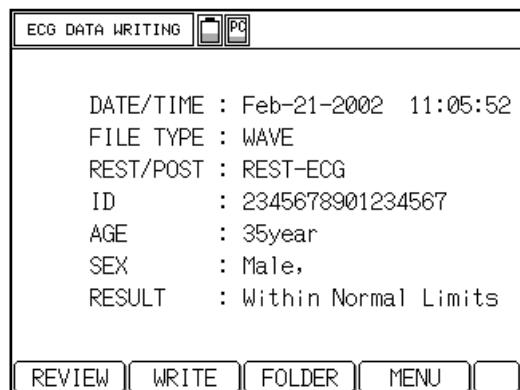
The FILE MODE (MENU) appears.



5 Touch [ECG DATA WRITING].

When sampled data are available, the FILE MODE (DATA WRITING) window appears. If there are no sampled data, the message "NO DATA" appears.

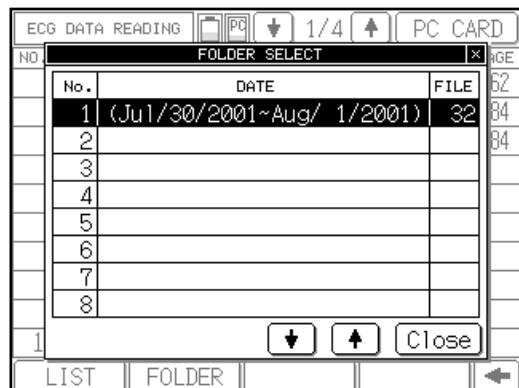
To verify the ECG data before writing to a PC card, touch [REVIEW].



6 If you wish to save data in a specific folder, touch [FOLDER]. Otherwise, skip this step.

If you do not specify a folder, data are saved in an available folder with the smallest number. When you touch [FOLDER], the FOLDER SELECT window will appear.

Touch and highlight the desired folder, then touch [Close]. To scroll the page, touch [↓] or [↑].



7 Touch [WRITE] to write the displayed ECG data to the PC card.

During the write procedure, the message "ECG DATA WRITING" appears.

To cancel writing, touch [MENU] to return to the FILE MODE (MENU) window.

Notes:

- If there is no PC card in the FX-7402, an error message is displayed and a warning beep is emitted when you touch [WRITE].
- You can save up to 300 entries in each folder. When the number of entries exceed this value, data are automatically saved in the next folder.

8 Remove the PC card from the PC card drive.

CAUTION

Do not remove the PC card or turn OFF power while ECG data are being written. This may result in loss of the data saved on the PC card or cause damage to the card.

Additional information:

AUTO FILING

You can set automatic saving of ECG data after the ECG sampling is complete, without having to perform the above operation. Set the [AUTO FILING] parameter of the SET UP MODE (FILE MODE) to ON.

Notes:

- The FX-7402 cannot overwrite and/or rewrite the ECG data on the PC card.
- If you want to increase the capacity of the PC card by deleting specific existing files, see "Deleting ECG data in PC card" (page 106).
- If you wish to remove all saved data on a PC card, see "Initializing the PC Card" (page 96).

Reading ECG Data from the Built-in Memory/PC Card

You can read ECG data from the built-in memory and PC card. You can also delete ECG data from the PC card, or copy ECG data from the built-in memory to the PC card.

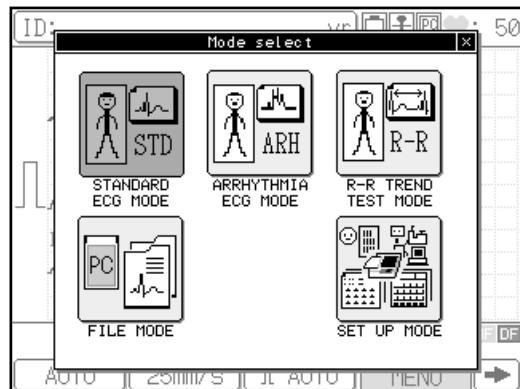
Operation

- To read ECG data from the PC card, insert the PC card. To read the ECG data from the built-in memory, skip this step.**

Insert the PC card into the PC card slot. Make sure the card is fully inserted in the slot.

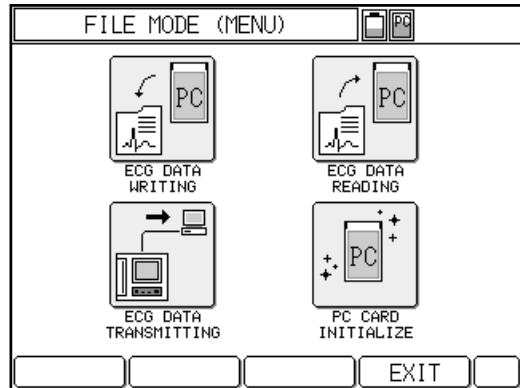
- Display the Mode select window.**

Touch [MENU] to display the Mode select window.



- Touch [FILE MODE].**

The FILE MODE (MENU) appears.



4 Touch [ECG DATA READING].

The FILE MODE (ECG DATA READING) window appears. It displays a list of the ECG data saved in the built-in memory, or PC card. To scroll the page, touch [\downarrow] or [\uparrow].

Notes:

- The list of saved ECG data is read from the built-in memory or a PC card that was last used for displaying the list. If the list was displayed from a PC card the last time and no PC card is set in the FX-7402 this time, the list is displayed from the built-in memory.
- The function keys above are displayed when the ECG data are read from the built-in memory. When the PC card is set, the [DELETE] key is displayed instead of the [COPY] function key.

ECG DATA READING		PC	▼	1 / 5	▲	PC CARD
NO.	ID NO.	DATE/TIME		SEX	AGE	
1	000123456789	03/05/01	16:48	Male	35	
2	000056472813	07/07/01	18:21	Male	42	
3	000346752178	07/07/01	18:35	Female	21	
4	000000023445	11/07/01	09:01	Male	57	
5	998032456781	11/07/01	10:45	Male	64	
6	654789445688	11/07/01	12:36	Female	38	
7	515000005150	14/07/01	08:05	Female	78	
8	000536472819	14/07/01	21:58	Female	81	
9	764839203948	18/07/01	03:32	Male	18	
10	000000000012	18/07/01	13:08	Male	44	

READ SEARCH DELETE MENU →

5 If you wish to switch the media from which data will be read, touch [PC CARD] or [INTERNAL] (built-in memory) at the top of the window. Otherwise, skip this step.

6 If you wish to read data from a specific folder in a PC card, touch [FOLDER]. Otherwise, skip this step.

When you touch [FOLDER], the folder selection screen will appear.

Touch and highlight the desired folder and then touch [Close].

ECG DATA READING		PC	▼	1 / 4	▲	PC CARD
NO.	FOLDER SELECT		FILE	AGE		
No.	DATE	FILE				
1	(Ju1/30/2001~Aug/ 1/2001)	32	62			
2			84			
3			84			
4						
5						
6						
7						
8						
1						

↓ ↑ Close

LIST FOLDER ←

7 Select the data to be read.

Touch the data number of the data to be read. You can select two or more data. The selected data number is highlighted. If you select wrong data by mistake, touch the highlighted number again to cancel the selection of this data.

To verify files stored in the built-in memory or PC card, touch [LIST] to print a list of the files. When a folder in a PC card is selected in step 6, a list of the files stored in the selected folder is printed.

8 Read and print the selected ECG data.

Touch [READ] or press [START/STOP] to read the selected ECG data. The selected ECG data is read in an ascending order according to data number and is printed automatically.

When data for one patient is read, the highlighted number of the data being read is turned off.

To cancel printing, press [START/STOP] while the read ECG data are being printed.

Notes:

- You can touch the [↓] or [↑] keys to display the previous page and next page, if these pages are available.
- If the magazine is open or recording paper runs out while the read ECG data are being printed, printing is canceled automatically.
- If you attempt to switch the media to PC card when a card is not inserted, an error message appears and a warning beep is emitted.

9 Remove the PC card from the PC card slot (if you have inserted one).

CAUTION

Do not remove the PC card or turn OFF the power while the ECG data are being read. This may result in loss of the data saved on the PC card or cause damage to the card.

Searching ECG data

You can search the ECG data to be read by ID number, date, or folder (when data are read from a folder in a PC card).

Operation

1 Perform steps 1 to 4 of “Reading ECG Data from the Built-in Memory/PC Card” (pages 101 to 102).

2 Touch [SEARCH] on the FILE MODE (DATA READING) window.

The SEARCH CONDITIONS window appears.

ECG DATA READING		<input type="button" value="PC"/>	<input type="button" value="▼"/>	1/2	<input type="button" value="▲"/>	INTERNAL
NO.	ID No.	DATE/TIME			SEX AGE	
1	SEARCH CONDITIONS					x
2	ID		/	/	~	/
3	DATE		/	/	~	/
4	<input type="button" value="Close"/> <input type="button" value="Search"/>					
5						
6						
7						
8						
9	111222333444	FEB/28/2002	13:58:40	F	62	
10	112233445566	FEB/28/2002	13:46:23	M	25	
<input type="button" value="READ"/>		<input type="button" value="SEARCH"/>	<input type="button" value="COPY"/>	<input type="button" value="MENU"/>		<input type="button" value="➡"/>

3 Touch the search target.

To search by ID number, touch [ID]. To search by test date, touch [DATE]. To search by folder in a PC card, touch [FOLDER].

Search by ID

When you touch [ID], the ENTER THE ID window appears.

Touch the number keys ([0] to [9]) to enter the ID to be searched.

Touch [Enter] to set the input value and close the ENTER THE ID window.

 **Note:**

To clear all input values, touch [AC]. To clear an input value preceding the cursor position, touch [DEL]. To increment or decrement the entered value, touch [+1] or [-1]. To cancel the ID input and close the Enter the ID window, touch [Cancel].

The screenshot shows a software interface for managing ECG data. At the top, there's a menu bar with 'ECG DATA READING', 'PC CARD', and other options. Below the menu, there are fields for 'NO.' (1-3), 'ID No.', 'DATE/TIME', and 'SEX AGE'. A large button labeled 'SEARCH' is positioned next to the ID number field. A modal dialog box is open in the center, titled 'ENTER THE ID'. It contains a numeric keypad with digits 1-9, 0, and +/-, along with buttons for 'AC' (Auto-Center) and 'DEL' (Delete). There are also 'Close', 'Cancel', and 'Enter' buttons at the bottom of the dialog. The background shows a grid of ECG strips.

Search by date

When you touch [DATE], the DATE window appears.

Touch the number keys ([0] to [9]) to enter the starting and ending test dates for a search. If you omit the starting date, the data preceding the ending date will be searched; and if you omit the ending date, the data after the starting date will be searched. If you omit both dates, all data will be searched.

Touch [Enter] to set the search date and close the Enter the date window.

The screenshot shows a software application window titled "ECG DATA READING". The main area has fields for "NO." (1, 2, 3) and "ID No.". Below these are buttons for "SEARCH", "DATE/TIME", "SEX", and "AGE". A "PC CARD" icon is at the top right. A modal dialog box is open in the center. It contains fields for "SEARCH" (with dropdown arrows), "DATE <MM-DD-YYYY>" (with "START:02/20/2002" and "END:03/01/2002" values), and three large buttons labeled "ID", "DATE", and "FOLDER". To the right of the date fields is a numeric keypad with buttons for "7", "8", "9", "AC", "4", "5", "6", "DEL", "1", "2", "3", "0", "→", and "←". At the bottom of the dialog are "Close", "Cancel", and "Enter" buttons.

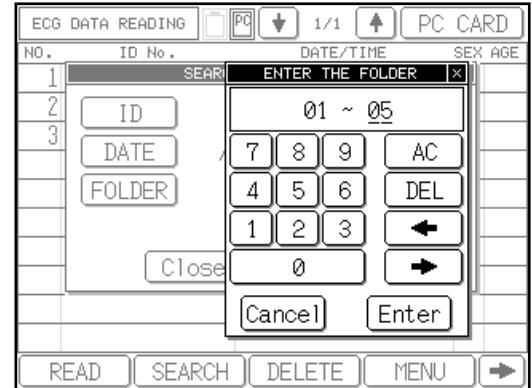
Notes:

- To clear all input values, touch [AC]. To clear an input value preceding the cursor position, touch [DEL]. To move the cursor, touch [\leftarrow] or [\rightarrow]. To cancel the date input and close the DATE window, touch [Cancel].
- The date display format (mm-dd-yy or dd-mm-yy) complies with the [DATE TYPE] parameter setting of the SET UP MODE (ECG CONTROL).
- If you enter an invalid date, this date is ignored and a warning beep is emitted.

Search by folder

When you touch [FOLDER], the ENTER THE FOLDER window appears.

Touch the number keys ([0] to [9]) to enter the starting and ending folder numbers for a search. If you omit the starting folder number, all the folders preceding the ending folder number will be searched; and if you omit the ending folder number, all the folders after the starting folder number will be searched. If you omit both folder numbers, all folders will be searched.



Touch [Enter] to set the folder number and close the 'Enter the folder' window.

Note:

To clear all input values, touch [AC]. To clear an input value preceding the cursor position, touch [DEL]. To move the cursor, touch [\leftarrow] or [\rightarrow]. To cancel the folder number input and close the 'Enter the folder' window, touch [Cancel].

Touch [Enter] to set the input value and close the ENTER THE FOLDER window.

Touch the ECG data matching the search conditions will be displayed.

Copying ECG data from built-in memory to PC card

You can copy the ECG data of a selected data number from the built-in memory to a PC card.

Note:

You cannot copy data from a PC card to the built-in memory.

Operation

- 1 Perform steps 1 to 4 of “Reading ECG Data from the Built-in Memory/PC Card” (pages 101 to 102).**
- 2 If [PC] is displayed at the top of the window, touch [PC] to switch the media to [INTERNAL] (built-in memory). Otherwise, skip this step.**
- 3 Select the data to be read.**

Touch the data number of the data to be read. You can select two or more data. The selected data number is highlighted. If you select wrong data by mistake, touch the highlighted number again to cancel the selection of this data.

 **Note:**

You can search for the ECG data to be read by ID number or date. See “Searching ECG data” (page 103).

- 4 Touch [COPY] on the FILE MODE (DATA READING) window.**

The selected ECG data (highlighted) is copied from the built-in memory to a PC card in an ascending order according to data number.

Deleting ECG data in PC card _____

You can delete the ECG data of a selected data number in a PC card.

 **Note:**

You cannot delete data in the built-in memory.

Operation

- 1 Perform steps 1 to 4 of “Reading ECG Data from the Built-in Memory/PC Card” (pages 101 to 102).**

- 2 If [INTERNAL] is displayed at the top of the window, touch [INTERNAL] to switch the media to [PC] (PC card). Otherwise, skip this step.**

- 3 Select the data to be deleted.**

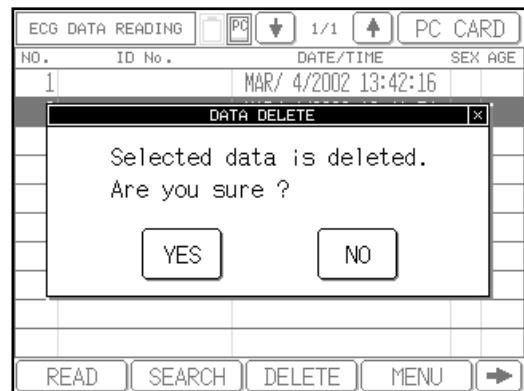
Touch the data number of the data to be deleted. You can select two or more data. The selected data number is highlighted. If you select wrong data by mistake, touch the highlighted number again to cancel the selection of this data.

 **Note:**

You can search for the ECG data to be deleted by ID number, date, or folder. See "Searching ECG data" (page 103).

- 4 Touch [DELETE] on the FILE MODE (DATA READING) window.**

The Data delete window appears.



- 5 Touch [YES] to delete the selected data.**

The selected ECG data (highlighted) in a PC card is deleted in an ascending order according to data number.

To cancel the deletion, touch [NO] and return to the ECG data list window. During the delete operation, the message "ECG DATA DELETING..." is displayed.

 **CAUTION**

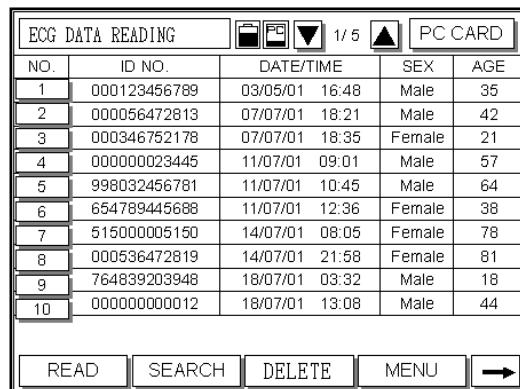
Be careful when you delete data. Deleted ECG data cannot be restored.

Printing a list of ECG data

You can print out a list of the ECG data saved in the built-in memory or PC card.

Operation

- 1 Perform steps 1 to 4 of “Reading ECG Data from the Built-in Memory/PC Card” (pages 101 to 102).**



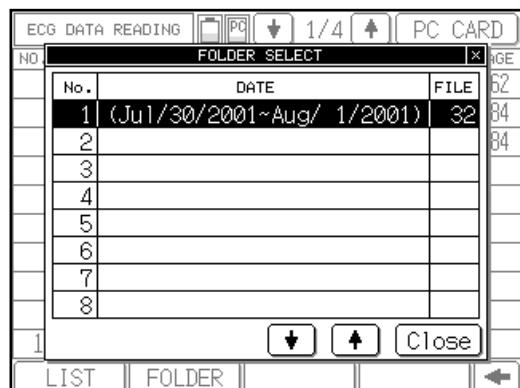
ECG DATA READING		PC	▼	1 / 5	▲	PC CARD
NO.	ID NO.	DATE/TIME		SEX	AGE	
1	000123456789	03/05/01	16:48	Male	35	
2	000056472813	07/07/01	18:21	Male	42	
3	000346752178	07/07/01	18:35	Female	21	
4	000000023445	11/07/01	09:01	Male	57	
5	998032456781	11/07/01	10:45	Male	64	
6	654789445688	11/07/01	12:36	Female	38	
7	515000005150	14/07/01	08:05	Female	78	
8	000656472819	14/07/01	21:58	Female	81	
9	764839203948	18/07/01	03:32	Male	18	
10	000000000012	18/07/01	13:08	Male	44	

READ SEARCH DELETE MENU →

- 2 If you wish to switch the media from which data will be read, touch [PC] (PC card) or [INTERNAL] (built-in memory) at the top of the window. Otherwise, skip this step.**
- 3 If you wish to print data from a specific folder in a PC card, touch [FOLDER]. Otherwise, skip this step.**

When you touch [FOLDER], the folder selection screen will appear.

Touch and highlight the desired folder and then touch [Close].



ECG DATA READING			PC	▼	1 / 4	▲	PC CARD
FOLDER SELECT			x	AGE			
NO.	DATE	FILE					
1	(Jul/30/2001~Aug/ 1/2001)	32		62			
2				84			
3				84			
4							
5							
6							
7							
8							

1 ▼ ▲ Close

LIST FOLDER ←

- 4 Touch [LIST] or press [START/STOP] to start printing the ECG data list.**

To stop printing while the list is being printed, touch [STOP] or press [START/STOP].

5 Touch [MENU] to stop printing operation and return to the FILE MODE (MENU) window.

 **Note:**

If the magazine is open or recording paper runs out while printing the ECG data list, printing is canceled automatically.

Sending ECG Data to a Personal Computer

You can send sampled ECG data to a personal computer from the built-in memory or a PC card. You can also send the data automatically.

To automatically send the data, serial port or PC Card LAN Adapter can be used. When using the serial port, select SERIAL for TRANSMITTING MODE in the FILE MODE menu. When using the PC Card LAN Adapter, select LAN for TRANSMITTING MODE in the FILE MODE menu.

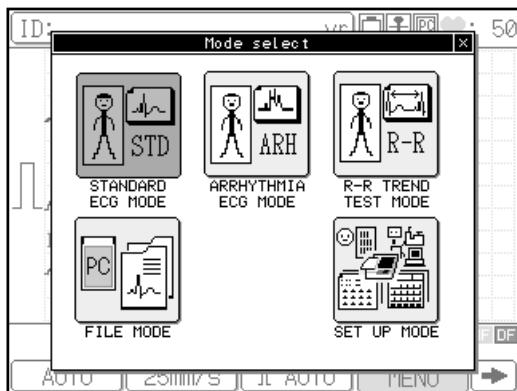
Operation

1 Perform ECG sampling.

Press [START/STOP] in the Standard ECG Mode, Arrhythmia ECG Mode (PC-7403 program cartridge), or R-R Trend Test Mode to perform ECG sampling for one cycle.

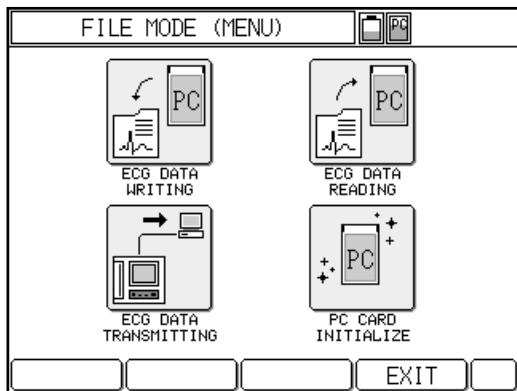
2 Display the Mode select window.

Touch [MENU] to display the Mode select window.



3 Touch [FILE MODE].

The FILE MODE (MENU) appears.



4 Touch [ECG DATA TRANSMITTING].

If sampled data are available, the FILE MODE (DATA TRANSMITTING) window appears. If data are not available, the message "NO DATA" will appear in the FILE MODE (DATA TRANSMITTING) window.

To verify the ECG data before sending it to a PC, touch [REVIEW] (PC-7403 program cartridge).

ECG DATA TRANSMITT		1 / 5	INTERNAL	
NO.	ID NO.	DATE/TIME	SEX	AGE
1	000123456789	03/05/01 16:48	Male	35
2	000056472813	07/07/01 18:21	Male	42
3	000346752178	07/07/01 18:35	Female	21
4	000000023445	11/07/01 09:01	Male	57
5	998032456781	11/07/01 10:45	Male	64
6	654789445688	11/07/01 12:36	Female	38
7	515000005150	14/07/01 08:05	Female	78
8	000536472819	14/07/01 21:58	Female	81
9	764839203948	18/07/01 03:32	Male	18
10	000000000012	18/07/01 13:08	Male	44

READ SEARCH REVIEW MENU →



The function keys above are displayed before the ECG data are sent. While the ECG data are being transmitted to a PC, only the [STOP] function key is displayed.

5 Touch [SEND] to send the displayed ECG data to a PC.

While the ECG data are being sent, the message "ECG DATA SENDING..." appears.

To cancel the data transmission, touch [STOP] to return to the previous window. An error beep is emitted and the message "ECG DATA TRANSMISSION CANCELED" will appear.



The same ECG data can be sent as many times as required.

6 Touch [MENU] to stop ECG data transmission and return to the FILE MODE (MENU) window.



AUTO SEND

You can set automatic sending of ECG data to a PC after the ECG sampling is complete, without having to perform the above operation. Set the [AUTO SENDING] parameter of the SET UP MODE (FILE MODE) to ON.

Sending ECG data from the built-in memory/PC card

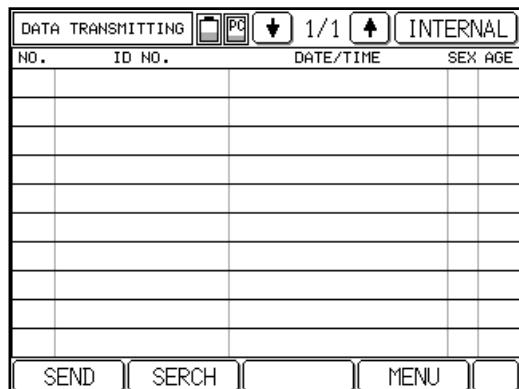
You can also send the ECG data in the built-in memory or PC card to a personal computer from the ECG data list window.

Operation

1 Perform steps 2 to 4 of “Sending ECG Data to a Personal Computer” (pages 110 to 111).

2 Touch [MEDIA].

A list of the ECG data saved in the built-in memory or PC card appears.



Notes:

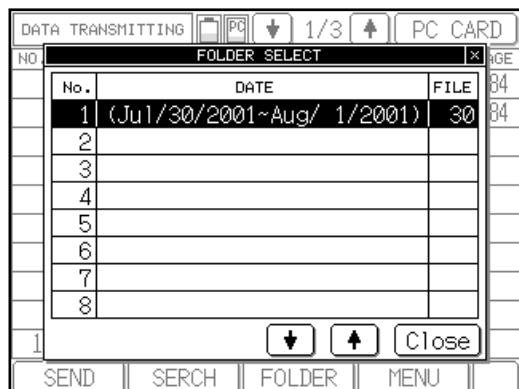
- The list of saved ECG data is read from the built-in memory or PC card that was last used for displaying the list. If the list was displayed from a PC card the last time and no PC card is set in the FX-7402 this time, the list is displayed from the built-in memory.
 - The function keys above are displayed before the ECG data are sent. While the ECG data are being sent to a PC, only the [STOP] function key is displayed.

3 If you wish to switch the media from which to send data, touch [PC] (PC card) or [INTERNAL] (built-in memory) at the top of the window. Otherwise, skip this step.

4 If you wish to send data from a specific folder in a PC card, touch [FOLDER]. Otherwise, skip this step.

When you touch [FOLDER], the folder selection screen will appear.

Touch and highlight the desired folder, then touch [Close].



5 Select the data to be sent.

Touch the data number of the data to be sent. You can select two or more data. The selected data number is highlighted. If you select a wrong data by mistake, touch the highlighted number again to cancel the selection of data.

6 Send the selected ECG data.

Touch [SEND] to send the selected ECG data. The selected ECG data are sent in an ascending order according to data number.

To cancel the data transmission, touch [STOP] to return to the previous window. An error beep is emitted and the message “ECG DATA TRANSMISSION CANCELED” will appear.

Notes:

- You can touch the left and right keys to display the previous page and next page, if these pages are available.
- You can touch [SEARCH] to display the Search conditions window to search for the ECG data that you wish to send. See “Searching ECG data” (page 103) for further information on how to search data.
- If you attempt to switch the media to the PC card when a card is not installed in the FX-7402, an error message is displayed and a warning beep is emitted.

7 Touch [MENU] to stop ECG data transmission and return to the FILE MODE (MENU) window.

8 Remove the PC card from the PC card drive if you have inserted one.

CAUTION

Do not remove the PC card or turn OFF power while ECG data are being read. This may result in loss of the data saved on the PC card or cause damage to the card.

Chapter 7

Setting Up Parameters of the Cardimax FX-7402

You can use the SET UP MODE menus to change the FX-7402 parameters such as the recording format and filters in order to meet the requirements of your ECG recording.

Overview of Parameters

The parameters you can change using the SET UP MODE are summarized in the table below.

The parameters of the ARRHYTHMIA ECG MODE menu are available only when the PC-7403 program cartridge is installed.

ECG CONTROL

Parameter	Setting	Description
PAPER TYPE	ROLL*,Z-FOLD	Set the type of recording paper to be used. Change this parameter to Z-FOLD to use fan-fold paper instead of a recording paper roll.
WIDTH OF BASE LINE	Thin, Standard*, Thick	Set the thickness of the waveform base line to be used for display and reports.
AC FILTER	50Hz, 60Hz*	Specify the cut-off frequency of the AC filter. See "Selecting the Filters" in this chapter (page 163).
MUSCLE FILTER	25Hz, 35Hz*	Specify the cut-off frequency of the muscle filter. See "Selecting the Filters" in this chapter (page 163).
DRIFT FILTER	0.25Hz, 0.5Hz*	Specify the cut-off frequency of the drift filter. See "Selecting the Filters" in this chapter (page 163).
CUT-OFF FREQUENCY	70Hz, 100Hz, 150Hz*	Specify the cut-off frequency of the high-frequency filter.
KEY CLICK	ON, OFF*	Set this parameter ON to have the unit sound a tone every time you touch the keys on the screen or press the keys on the Operation Panel. Otherwise, set to OFF.

QRS BEEP	ON, OFF*	Set this parameter ON to have the unit sound beeps synchronized with heartbeat detection. Otherwise, set to OFF.
CRT DISPLAY	ON, OFF*	Set this parameter ON to display the waveform on an external CRT (if installed). Otherwise, set to OFF.
LEAD OFF BUZZER	ON, OFF*	Set this parameter ON to have the unit sound beeps when any one of the electrodes gets detached from the patient. Otherwise, set to OFF.
BUZZER VOLUME		Touch the volume bar to set the desired buzzer volume. The leftmost position on the bar is the lowest volume setting and the rightmost position is the highest volume setting. You can touch any position on the bar to set the level. The tones of the FX-7402 such as keypad and error tones are emitted in accordance with the level selected here.
LANGUAGE	English*, German, French, Spanish, Italian	Set the language to be used for display and recording.
HOSPITAL		Set the name of your hospital or clinic to be printed on the reports.  See "Setting the Hospital Name" in Chapter 2, "Preparing the Cardimax FX-7402" (page 34).
DATE	Jan/01/2002	Set the current date.
TIME	00:00:00	Set the current time.
DATE TYPE	MM-dd-yy*, dd-MM-yy	Select the date format for indicating the date.  See "Setting the Date Format and Built-in Clock" in Chapter 2, "Preparing the Cardimax FX-7402" (page 29).

: The settings marked with an asterisk () are the default settings.

PATIENT DATA

Parameter	Setting	Description
AUTO ID NO. INC	ON, OFF*	Set this parameter ON to assign patient IDs automatically. Each time an Automatic Recording during the REST status is completed successfully, the ID number is automatically incremented by 1. To assign each patient's ID manually, set this parameter OFF.
FIXED ID NUMBER	[999999999999999], OFF*	Use this parameter to fix the upper digits of the patient's ID to a specified number.
INPUT BIRTH DAY	ON, OFF*	Set this parameter ON to enable automatic setting of the patient's age by simply entering the patient's date of birth. This way, the patient's age does not have to be entered.
NAME	ON*, OFF	Set this parameter ON to include the patient's name in the patient data. Otherwise, set to OFF.
RACE	ON*, OFF	Set this parameter ON to include the patient's ethnicity in the patient data. Otherwise, set to OFF.
HEIGHT	cm*, inch, OFF	Set this parameter ON to include the patient's height in the patient data. Otherwise, set to OFF.
WEIGHT	kg*, lb, OFF	Set this parameter ON to include the patient's weight in the patient data. Otherwise, set to OFF.
BLOOD PRESSURE	ON*, OFF	Set this parameter ON to include the patient's blood pressure information in the patient data. Otherwise, set to OFF.
DRUG	ON*, OFF	Set this parameter ON to include the patient's medication information in the patient data. Otherwise, set to OFF.
SYMPTOMS	ON*, OFF	Set this parameter ON to include the patient's symptoms in the patient data. Otherwise, set to OFF.
COMMENT	ON*, OFF	Set this parameter ON to include a comment in the patient data. Otherwise, set to OFF.
WARD	ON*, OFF	Set this parameter ON to include the patient's ward information in the patient data. Otherwise, set to OFF.

DEPARTMENT	ON*, OFF	Set this parameter ON to include the patient's department information in the patient data. Otherwise, set to OFF.
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: The settings marked with an asterisk () are the default settings.

STANDARD ECG MODE

Parameter	Setting	Description
DISPLAY CHANNEL	3CH*, 6CH, 12CH	Specify the number of channels of ECG waveforms to be displayed simultaneously on the same screen. You can select from: 3 channels, 6 channels, and 12 channels. This data can be specified for Automatic Recording. See "Selecting the Number of Waveform Display Channels" in this chapter (page 128).
MANUAL RECORD CHANNEL	3CH, 6CH*, 12CH	Specify the number of channels of ECG waveforms to be recorded simultaneously during Manual Recording.
LEAD CHANGE LINE	ON, OFF*	Set this parameter ON to print the lead change line upon changing leads during Automatic Recording.
AUTO SENSITIVITY	AUTO*, 1+AUTO	Set this parameter to AUTO to display and print the ECG waveforms by selecting the optimal sensitivity automatically. Or, set this parameter to 1+AUTO to display and print ECG waveforms using a sensitivity of 10mm/mV and then print ECG waveforms using the automatically selected optimal sensitivity.
RHYTHM LEAD 1	I to V6 (II*)	Specify the lead to be used as the rhythm lead (1st channel) when the RECORDING CHANNEL parameter is set to "3+R1" (3CH + one rhythm lead), "3+R2" (3CH + two rhythm lead), or "6+R1" (6CH + one rhythm lead). This parameter should be set when executing Automatic Recording.
RHYTHM LEAD 2	I to V6 (V5*)	Specify the lead to be used as the rhythm lead (2nd channel) when the RECORDING CHANNEL parameter is set to "3+R2" (3CH + two rhythm lead). This parameter should be set when executing Automatic Recording.
POST INTERVAL TIME	OFF*, 1 min., 2 min., 3 min., 4 min., 5 min.	Set the elapsed time in minutes to automatically perform Automatic Recording in the POST state. Otherwise, set to OFF.
POST COMPRESSED ECG	ON*, OFF	Set this parameter ON to print out POST ECG waveforms between automatic recording sessions in the POST state at low speed.

		Otherwise set to OFF.
 AUTO MODE CHANGE	ON*, OFF	Set this parameter ON to print out the arrhythmia analysis automatically if an arrhythmia-related observation comment is available in the ECG analysis data after completing ECG analysis. Otherwise, set to OFF.
AUTO RECORDING CHANNEL	3*, 3+R1, 3+R2, 6, 6+R1, 12, NONE	Specify the number of ECG waveforms channels to be printed simultaneously during Automatic Recording Mode. You can select from: 3 channels, 3 channels + rhythm lead 1st channel set by the RHYTHM LEAD 1 parameter, 3 channels + rhythm lead 1st and 2nd channels set by the RHYTHM LEAD 1 and 2 parameter, 6 channels, 6 channels + rhythm lead 1st channel set by the RHYTHM LEAD 1 parameter, 12 channels. This data can be specified for Automatic Recording. See "Selecting the Recording Format" in this chapter (page 129).
RECORDING LENGTH	8 to 24 sec. (10 sec.*)	Set the recording period from 8 to 24 seconds for roll paper. Set either 10 seconds (1 page) or 20 seconds (2 pages) for Z-fold paper.
REPORT FORMAT	NONE, DOM1+R1*, DOM2+R1, DOM2+R2, DOM3, FULL3+R1, FULL3+R2, FULL6, FULL6+R1	Specify the format of the analysis report or measurement report to be output during Analysis Recording (PC-7403) or Measurement Recording respectively. When this parameter is set to NONE, the analysis report or measurement report is not recorded.   See "Analysis report" and "Measurement report" of "Selecting the Recording Format" in this chapter respectively (pages 135 and 145).
 ECG VIEW	ON, OFF*	Set this parameter ON to confirm the analysis (including interpretation results) on the screen before printing the analysis data during Analysis Recording.
 COMMENT	ON, OFF*	Set this parameter ON to print out the analysis comment after the analysis report during Analysis Recording.

MEASURED VALUE	ON, OFF*	<p>Set this parameter ON to print out detailed measurement values after printing the analysis/analysis comment report (PC-7403) or measurement report during Automatic Recording.</p> <p> See the relevant "Detailed measurement values" section of "Selecting the Recording Format" in this chapter (pages 140 and 151).</p>
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: The settings marked with an asterisk () are the default settings.

✓ Additional information:

The DISPLAY CHANNEL and RECORDING CHANNEL parameters are invalid for the Arrhythmia ECG Mode or R-R Trend Test Mode. The number of channels to be displayed complies with the MANUAL RECORD CHANNEL parameter setting when manual recording of the Standard ECG Mode is executed.

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ARRHYTHMIA ECG MODE

Parameter	Setting	Description
ARRHYTHMIA LEAD 1CH	I to V6 (II*)	Specify the lead (1st channel) to be used for arrhythmia analysis.
ARRHYTHMIA LEAD 2CH	I to V6 (aVF*)	Specify the lead (2nd channel) to be used for arrhythmia analysis.
ARRHYTHMIA LEAD 3CH	I to V6 (V5*)	Specify the lead (3rdt channel) to be used for arrhythmia analysis.
ECG REPORT	NONE, Standard*, Compress	Set this parameter to select the waveform recording speed from either Standard (25mm/s) or Compress (10mm/s). When this parameter is set to NONE, the ECG report is not recorded.
ANALYSIS REPORT	ON*, OFF	Set this parameter ON to automatically print out a report after compiling the analysis observation result and event waveforms. Otherwise, set to OFF.
MEASURED VALUE	ON, OFF*	Set this parameter ON to print the measured values after the arrhythmia ECG report during the Arrhythmia ECG Mode execution.

: The settings marked with an asterisk () are the default settings.

R-R TREND TEST MODE

Parameter	Setting	Description
R-R TREND LEAD	I to V6 (II*)	Specify the lead to be used for R-R trend test.
ECG REPORT	NONE, Standard*, Compress	Set this parameter to select the waveform recording speed from either Standard (25mm/s) or Compress (10mm/s). When this parameter is set to NONE, the ECG report is not recorded.
ANALYSIS REPORT	ON*, OFF	Set this parameter ON to automatically print out a report after compiling the R-R trend graph and histogram. Otherwise, set to OFF.
MEASURED VALUE	ON, OFF*	Set this parameter ON to print out the measured values after printing the R-R trend test report during the R-R Trend Test. Otherwise, set to OFF.

: The settings marked with an asterisk () are the default settings.

FILE MODE

Parameter	Setting	Description
AUTO FILING	ON, OFF*	Set this parameter ON to save the results automatically on a PC card after sampling is complete. Otherwise, set to OFF.
FILE TYPE	Dominant, Wave*	Select the type of data when storing the automatic recording data in the PC card or EFS-200.
R-R FILE TYPE	Result*, Wave + Result	Select the type of data when storing the R-R trend test record in the PC card or EFS-200.
SENDING TYPE	Result*, Dominant + Result, Wave + Result	Select the type of data when sending the analysis or measurement result to a EFS-100.
R-R SENDING TYPE	Result*, Wave + Result	Select the type of data when sending the R-R trend test result to a EFS-100.
BAUD RATE	4800, 9600*, 19200	Select the baud rate to be used for sending data to a PC.
AUTO SENDING	ON, OFF*	Set this parameter ON to send the results automatically to a PC after sampling is complete. Otherwise, set to OFF.
TRANSMITTING MODE	LAN*, SERIAL	Select a communication port through which to send ECG data to a personal computer.
ECG IP Address		Specify the IP address of the ECG.
Host IP Address		Specify the IP address of the host.
FTP User Name		Specify the user name to log in to the FTP host.
FTP Password		Specify the password to be used to log in to the FTP host.
Path		log in to the FTP host and specify the relative path of the destination of data transmission.
Data Format	FUKUDA*, SCP-ECG	Specify the format of the data to be transmitted.

: The settings marked with an asterisk () are the default settings.

General Flow of the Parameter Setup Procedure

The SET UP MODE screens consist of 8 menus: ECG CONTROL, PATIENT DATA, STANDARD ECG MODE, ARRHYTHMIA ECG MODE, R-R TREND TEST MODE, FILE MODE, INITIALIZE, and MAINTENANCE. For further information about the operation of a specific parameter such as the recording format, see the following sections in this chapter.

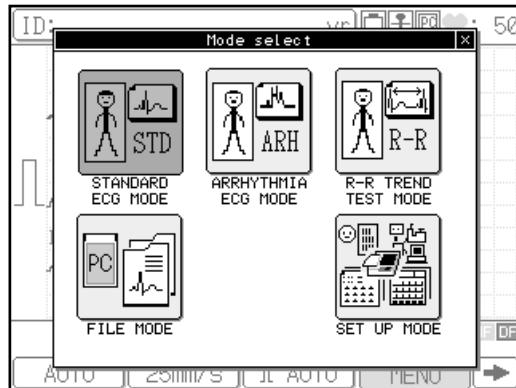
The ECG CONTROL, PATIENT DATA, STANDARD ECG MODE, R-R TREND TEST MODE, and FILE MODE screens contain parameters that are valid for all function modes. The ARRHYTHMIA ECG MODE parameters can be used only when the PC-7403 program cartridge is installed. The INITIALIZE menu is used to initialize the settings and restore the unit to its default settings.

-  See “Performing the Self-diagnostics Test” in Chapter 8, “Maintenance and Troubleshooting”, for further information about the MAINTENANCE menu (page 166).

Operation

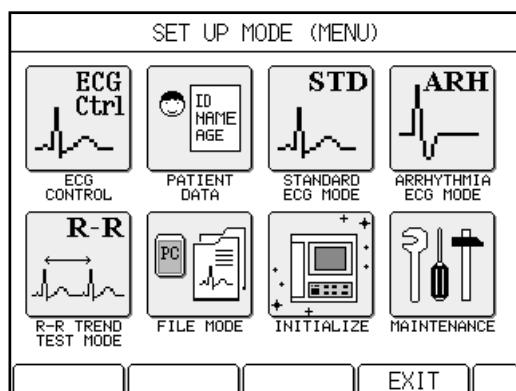
1 Display the Mode select window.

Touch [MENU] to display the Mode select window.



2 Touch [SET UP MODE].

The SET UP MODE (MENU) will appear.



3 Select the desired SET UP MODE menu.

Note the ARRHYTHMIA ECG MODE menu is displayed only when the PC-7403 program cartridge is installed.

4 Select the parameter to be changed.

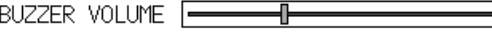
When the SET UP MODE screen displays a parameter to be changed, touch and select that parameter. To display the next page, touch [NEXT ↓].

SET UP MODE (ECG CONTROL)			
PAPER TYPE	<input checked="" type="radio"/> ROLL	<input type="radio"/> 2-FOLD	
WIDTH OF BASELINE	<input checked="" type="checkbox"/>	Standard	
AC FILTER	<input type="radio"/> 50Hz	<input checked="" type="radio"/> 60Hz	
MUSCLE FILTER	<input type="radio"/> 25Hz	<input checked="" type="radio"/> 35Hz	
DRIFT FILTER	<input type="radio"/> 0.25Hz	<input checked="" type="radio"/> 0.5Hz	
CUT-OFF FREQUENCY	<input type="radio"/> 70Hz	<input checked="" type="radio"/> 100Hz	<input checked="" type="radio"/> 150Hz
KEY CLICK	<input type="radio"/> ON	<input checked="" type="radio"/> OFF	
QRS BEEP	<input type="radio"/> ON	<input checked="" type="radio"/> OFF	
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>			

5 Select the setting.

Touch the radio button of the setting that you want to select (●). To change the setting of an item with a down arrow (▼) next to it, touch the down arrow. A window that provides choices for this setting (or three consecutive touch keyboard pages for character input such as a hospital name) will appear. Touch the desired setting in this window and touch [Enter] to select the new setting.

-  See “Selecting the radio button”, “Changing the setting of an item with the down arrow (▼) button”, “Entering letters”, and “Entering numeric values” for further information about the input procedures (pages 126 to 127).

SET UP MODE (ECG CONTROL)		
CRT DISPLAY	<input checked="" type="checkbox"/>	OFF
LEAD OFF BUZZER	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
BUZZER VOLUME		
LANGUAGE	<input checked="" type="checkbox"/> English	
HOSPITAL	<input checked="" type="checkbox"/> []	
DATE	<input checked="" type="checkbox"/> 01/07/2001	
TIME	<input checked="" type="checkbox"/> 18:07:36	
DATE TYPE	<input checked="" type="radio"/> MM-dd-yy <input type="radio"/> dd-MM-yy	
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>		

6 Touch [EXIT] to end the setting operation.

Display another SET UP MODE screen if necessary and set the required parameter. After you finish all the required settings, touch [EXIT] to end the setting operation and return to the test mode screen.

To return to the SET UP MODE (MENU) screen, touch [MENU].

Selecting the radio button

You can turn on the radio button for selecting the desired value or item from two or more choices.

Example:

[●] : Selected

[○] : Not selected

SET UP MODE (PATIENT DATA)		
AUTO ID No. INC	<input checked="" type="radio"/> ON	<input type="radio"/> OFF
FIXED ID NUMBER	<input checked="" type="checkbox"/>	[]
INPUT BIRTHDAY	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
NAME	<input checked="" type="radio"/> ON	<input type="radio"/> OFF
RACE	<input checked="" type="radio"/> ON	<input type="radio"/> OFF
HEIGHT	<input checked="" type="radio"/> cm	<input type="radio"/> inch <input type="radio"/> OFF
WEIGHT	<input checked="" type="radio"/> kg	<input type="radio"/> lb <input type="radio"/> OFF
BLOOD PRESSURE	<input checked="" type="radio"/> ON	<input type="radio"/> OFF
<input type="button" value="NEXT ▼"/> <input type="button" value="PREV ▲"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button"/>		

Changing the setting of an item with the down arrow (▼) button

When there is a down arrow (▼) to the left of the current setting, touch this arrow. A window that provides choices for this setting will appear. Touch the desired setting in this window.

Example:

SET UP MODE (ECG CONTROL)		
CRT DISPLAY	<input checked="" type="checkbox"/>	OFF
LEAD OFF BUZZER	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
BUZZER VOLUME	<input type="range" value="50"/>	
LANGUAGE	<input checked="" type="checkbox"/>	English []
HOSPITAL	<input checked="" type="checkbox"/>	[]
DATE	<input checked="" type="text"/> 01/07/2001	
TIME	<input checked="" type="text"/> 18:07:36	
DATE TYPE	<input type="radio"/> MM-dd-yy	<input checked="" type="radio"/> dd-MM-yy
<input type="button" value="NEXT ▼"/> <input type="button" value="PREV ▲"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button"/>		

SET UP MODE(ECG CONTROL)		
CRT DISPLAY	<input checked="" type="checkbox"/>	OFF
LEAD OFF BUZZER	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
BUZZER VOLUME	<input type="range" value="50"/>	<input type="text"/>
LANGUAGE	<input checked="" type="checkbox"/>	English
	<input type="checkbox"/>	German
	<input type="checkbox"/>	French
	<input type="checkbox"/>	Spanish
	<input type="checkbox"/>	Italian
DATE	<input checked="" type="text"/>	
TIME	<input checked="" type="text"/>	
DATE TYPE	<input type="radio"/> MM-dd-yy	<input checked="" type="radio"/> dd-MM-yy
<input type="button" value="NEXT ▼"/> <input type="button" value="PREV ▲"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button"/>		

Entering letters

When there is a down arrow (▼) preceding the current setting, touch this arrow. If the setting requires an input of letters such as a hospital name, the alphanumeric keyboard window will pop up. Two keyboard pages are available: letters and symbols/number. Touch [1/2 ↓] or [2/2 ↑] to switch the keyboards and key in the letters. To enter uppercase letters, touch [Caps] on the letter (lowercase) screen. To enter a space,

touch the [Space] bar. If you enter a wrong letter, touch [DEL] to delete a letter; or touch [AC] to delete all letters. You can touch [\leftarrow] or [\rightarrow] to move the cursor position. After you enter the data, touch [Enter]. The previous screen reappears.

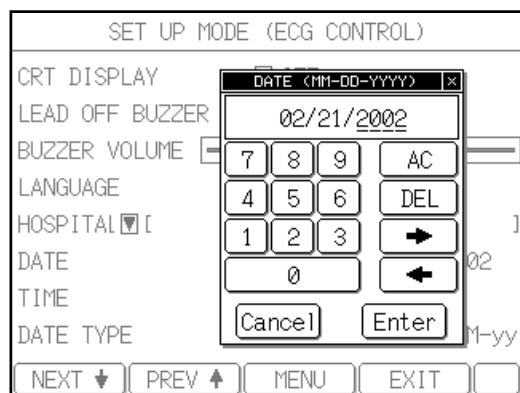
Example:



Entering numeric values

When there is a down arrow (\blacktriangledown) preceding the current setting, touch this arrow. If the setting requires an input of numeric values such as the date, the keypad window will pop up. Touch the number keys to enter the desired value. If you enter a wrong number, touch [DEL] to delete a digit; or touch [AC] to delete all digits. You can touch [\leftarrow] or [\rightarrow] to move the cursor position. After you enter the data, touch [Enter]. The previous screen reappears.

Example:



Selecting the Number of Waveform Display Channels

Use the following procedure to set the ECG waveform display format.

Select the number of ECG waveform channels to be displayed simultaneously on the screen. Set the "DISPLAY CHANNEL" parameter on the SET UP MODE (STANDARD ECG MODE) screen.

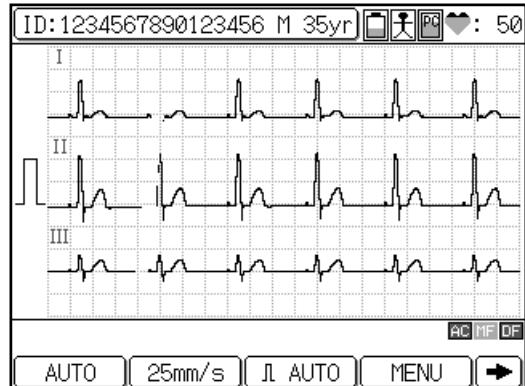
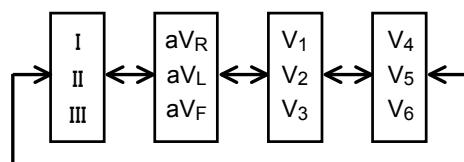
SET UP MODE (STANDARD ECG MODE)	
DISPLAY CHANNEL	<input checked="" type="checkbox"/> 3CH
MANUAL RECORD CHANNEL	<input checked="" type="checkbox"/> 3CH
LEAD CHANGE LINE	<input type="radio"/> ON <input checked="" type="radio"/> OFF
AUTO SENSITIVITY	<input checked="" type="radio"/> AUTO <input type="radio"/> 1+AUTO
RHYTHM LEAD1	<input checked="" type="checkbox"/> II
RHYTHM LEAD2	<input checked="" type="checkbox"/> V5
POST INTERVAL TIME	<input checked="" type="checkbox"/> OFF
POST COMPRESSED ECG	<input type="radio"/> ON <input checked="" type="radio"/> OFF
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>	

✓ Additional information:

The number of channels to be displayed complies with the MANUAL RECORD CHANNEL parameter setting when Manual Recording of the Standard ECG Mode is executed.

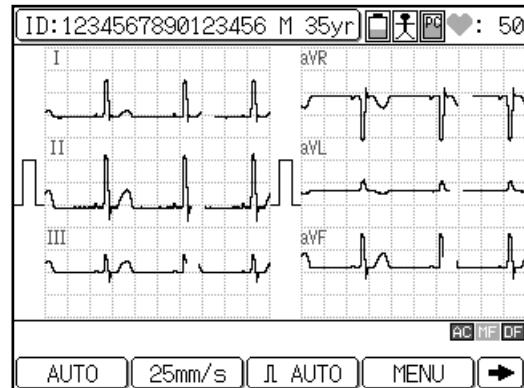
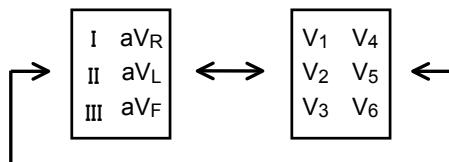
3CH

Displays the lead groups for 3 channels on a screen. Each time you press **LEAD** [**◀** or **▶**], the lead group will be changed in the following order:

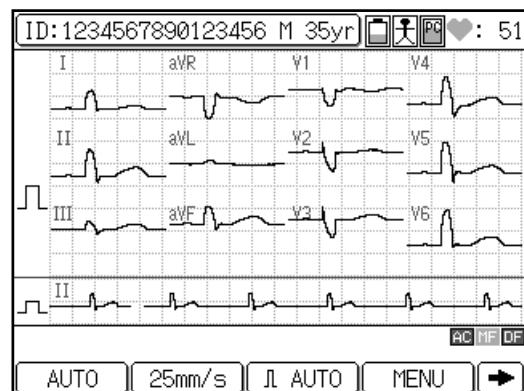


6CH

Displays the lead groups for 6 channels on a screen. Each time you press **LEAD** [**◀**] or [**▶**], the lead group will be changed in the following order:

**12CH**

Displays the lead groups for 12 channels on a screen. When 12CH is selected, the latest 1 beat for every second is displayed.



Selecting the Recording Format

Use the following procedure to select the print format to be applied for each test mode.

Standard ECG Mode - Measurement Recording

Measurement Recording outputs 3 types of printout formats: ECG waveforms, measurement report, and detailed measurement values. These can be enabled or disabled for the printing of the ECG waveform and detailed measurement values. Also, the print formats for all 3 reports can be selected.

ECG waveforms	Measurement report	Detailed measurement values
---------------	--------------------	-----------------------------

The following SET UP MODE screens are used to select the parameters related to the recording format of Measurement Recording:

SET UP MODE (STANDARD ECG MODE) screen (page 1/2)

SET UP MODE (STANDARD ECG MODE)		
DISPLAY CHANNEL	<input checked="" type="checkbox"/> 3CH	<input type="checkbox"/> 3CH
MANUAL RECORD CHANNEL	<input checked="" type="checkbox"/> 3CH	<input type="checkbox"/> 3CH
LEAD CHANGE LINE	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
AUTO SENSITIVITY	<input checked="" type="radio"/> AUTO	<input type="radio"/> 1+AUTO
RHYTHM LEAD1	<input checked="" type="checkbox"/> II	<input type="checkbox"/> III
RHYTHM LEAD2	<input checked="" type="checkbox"/> V5	<input type="checkbox"/> V6
POST INTERVAL TIME	<input checked="" type="checkbox"/> OFF	<input type="checkbox"/> ON
POST COMPRESSED ECG	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>		

SET UP MODE (STANDARD ECG MODE) screen (page 2/2)

SET UP MODE (STANDARD ECG MODE)		
AUTO MODE CHANGE	<input checked="" type="radio"/> ON	<input type="radio"/> OFF
AUTO RECORDING CHANNEL	<input checked="" type="checkbox"/> 3CH + R2	<input type="checkbox"/> 3CH + R1
RECORDING LENGTH	<input checked="" type="checkbox"/> 10sec	<input type="checkbox"/> 20sec
ANALYSIS REPORT FORMAT	<input checked="" type="checkbox"/> DOM1 + R1	<input type="checkbox"/> DOM1 + R2
ECG VIEW	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
COMMENT	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
MEASURED VALUE	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>		

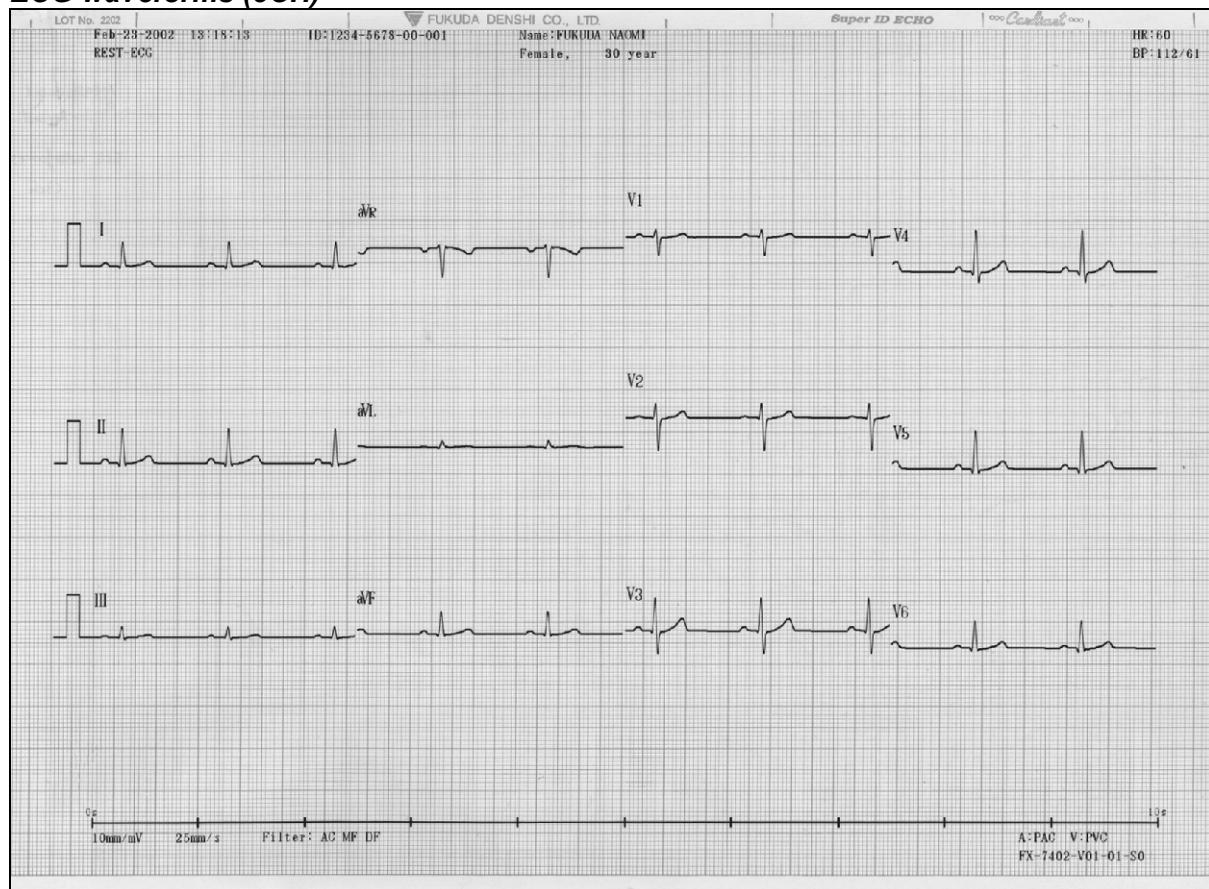
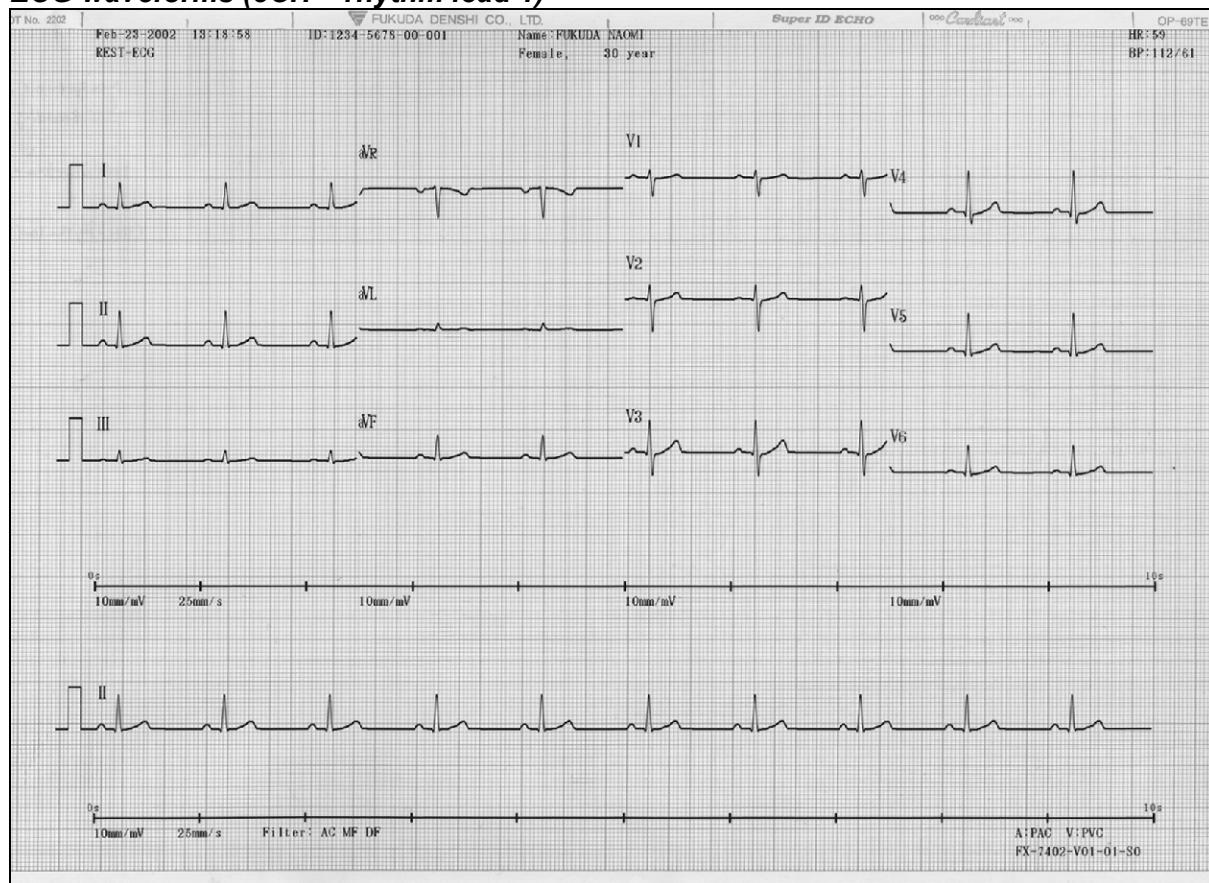
ECG waveforms

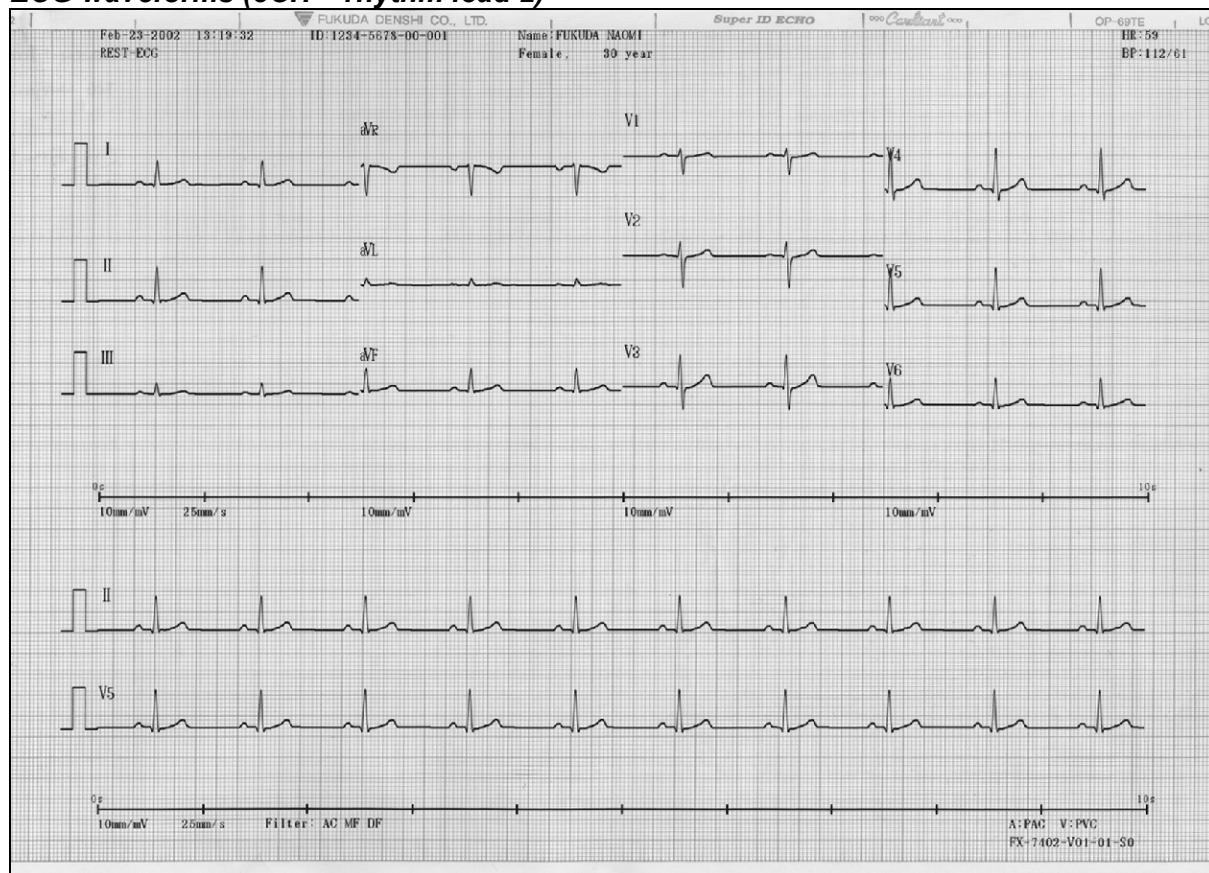
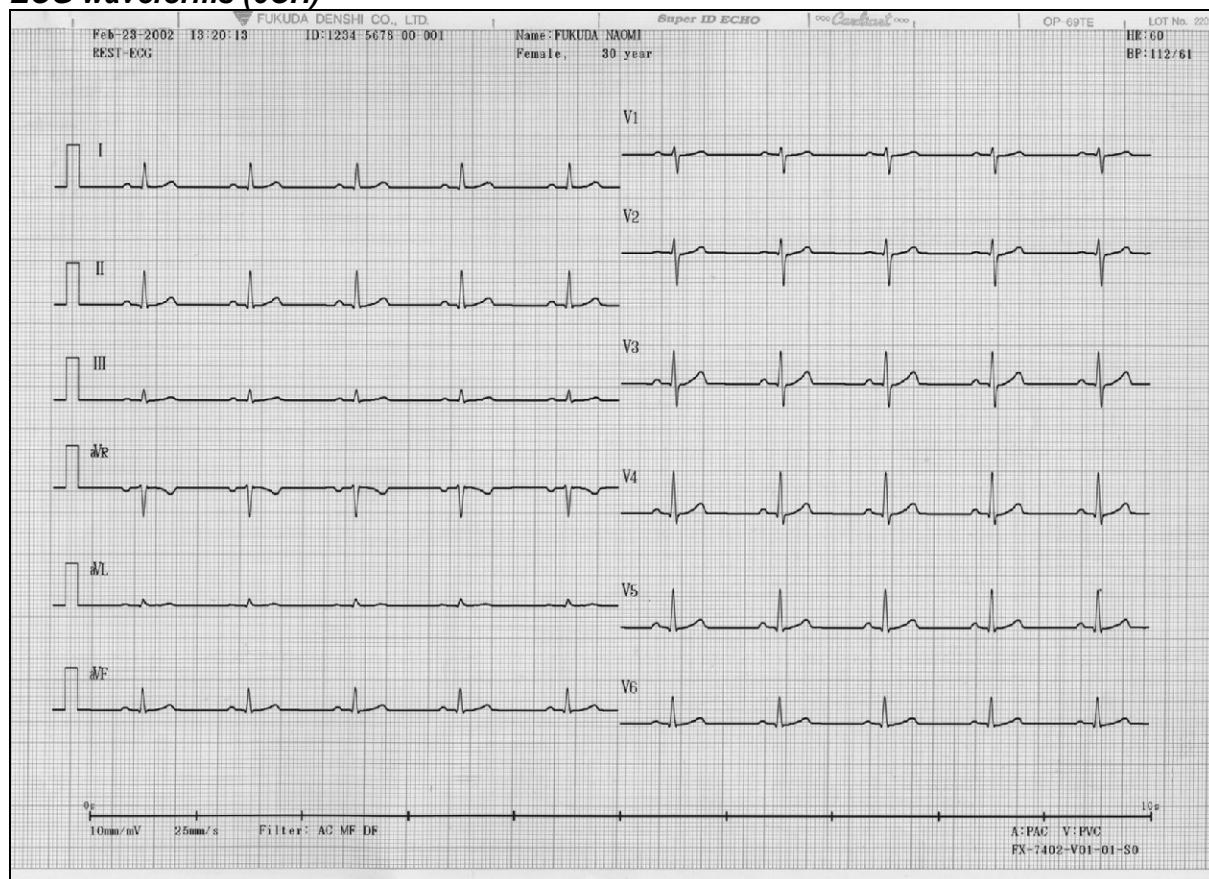
You can select the following parameters for Measurement Recording:

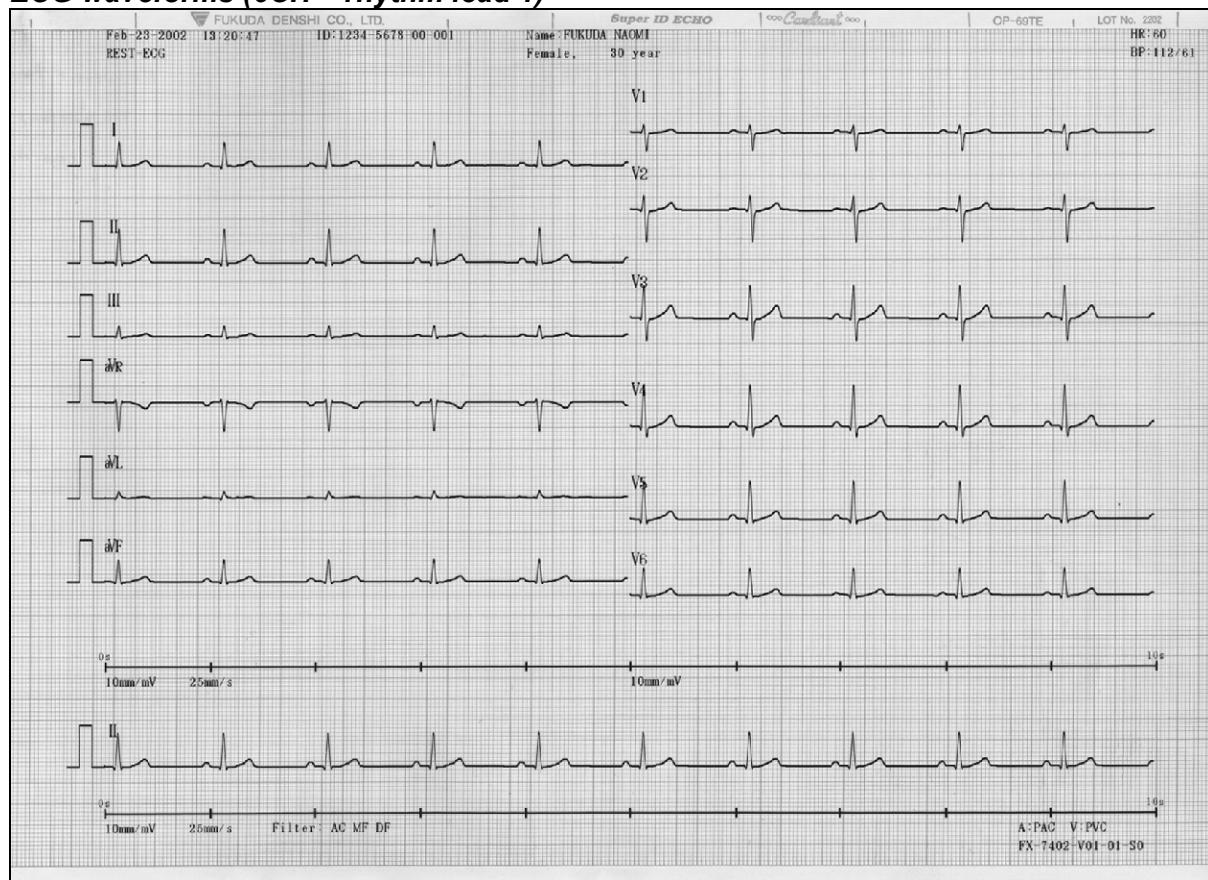
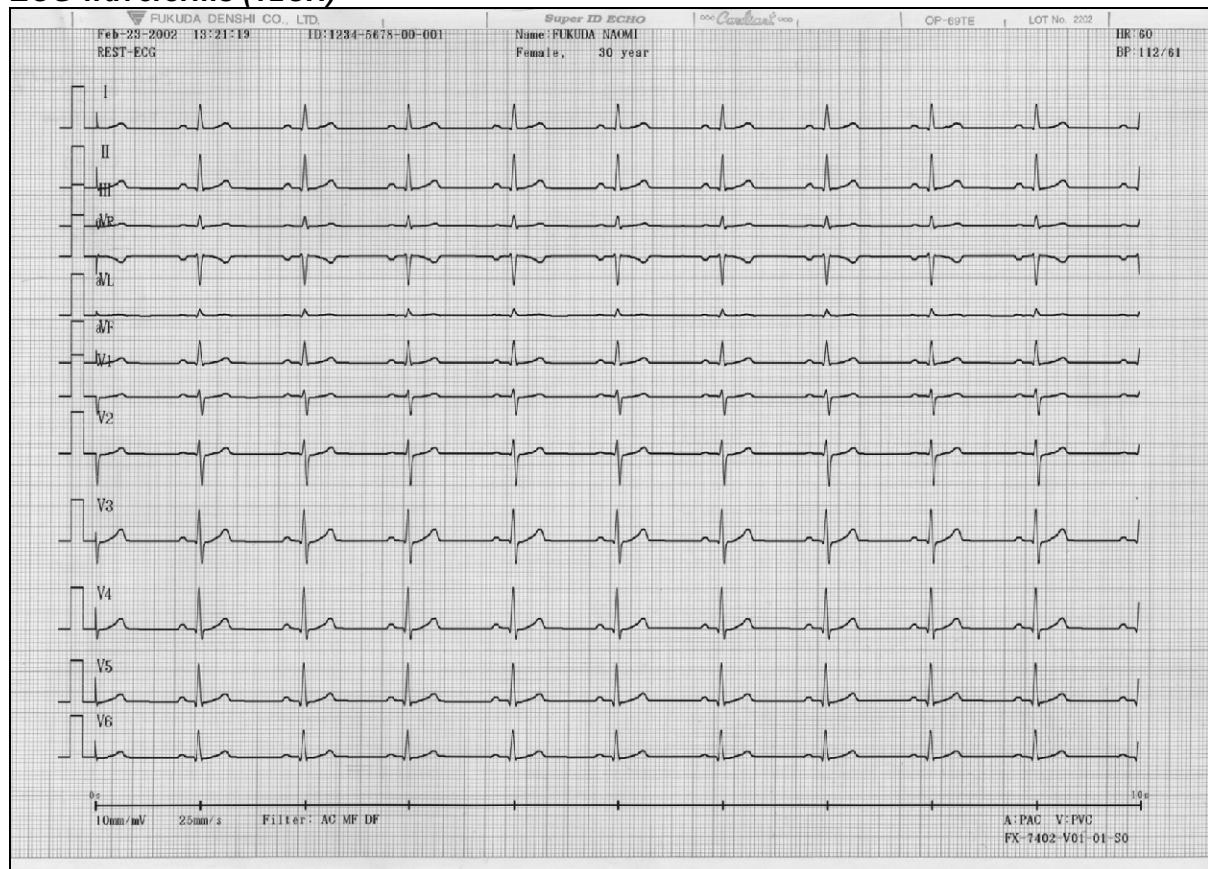
- AUTO RECORDING CHANNEL: Select the number of channels of ECG waveform to be recorded simultaneously. 3CH, 3+R1 (3CH + rhythm lead 1st channel), 3+R2 (3CH + rhythm lead 1st and 2nd channels), 6CH, 6+R1 (6CH + rhythm lead 1st channel), or 12CH.
- RHYTHM LEAD 1/2: Select the lead to be used as the rhythm lead when the AUTO RECORDING CHANNEL parameter is set to "3+R1", "3+R2", or "6+R1".
- RECORDING LENGTH: Set the length of the recording from 8 to 24 seconds for roll paper. Set it to either 10 seconds (1 page) or 20 seconds (2 pages) for Z-fold paper.

 **Note:**

The ECG waveforms will be printed continuously even if the 10- or 20-second waveforms are divided into some blocks by the Recording Channels configuration.

ECG waveforms (3CH)**ECG waveforms (3CH + rhythm lead 1)**

ECG waveforms (3CH + rhythm lead 2)**ECG waveforms (6CH)**

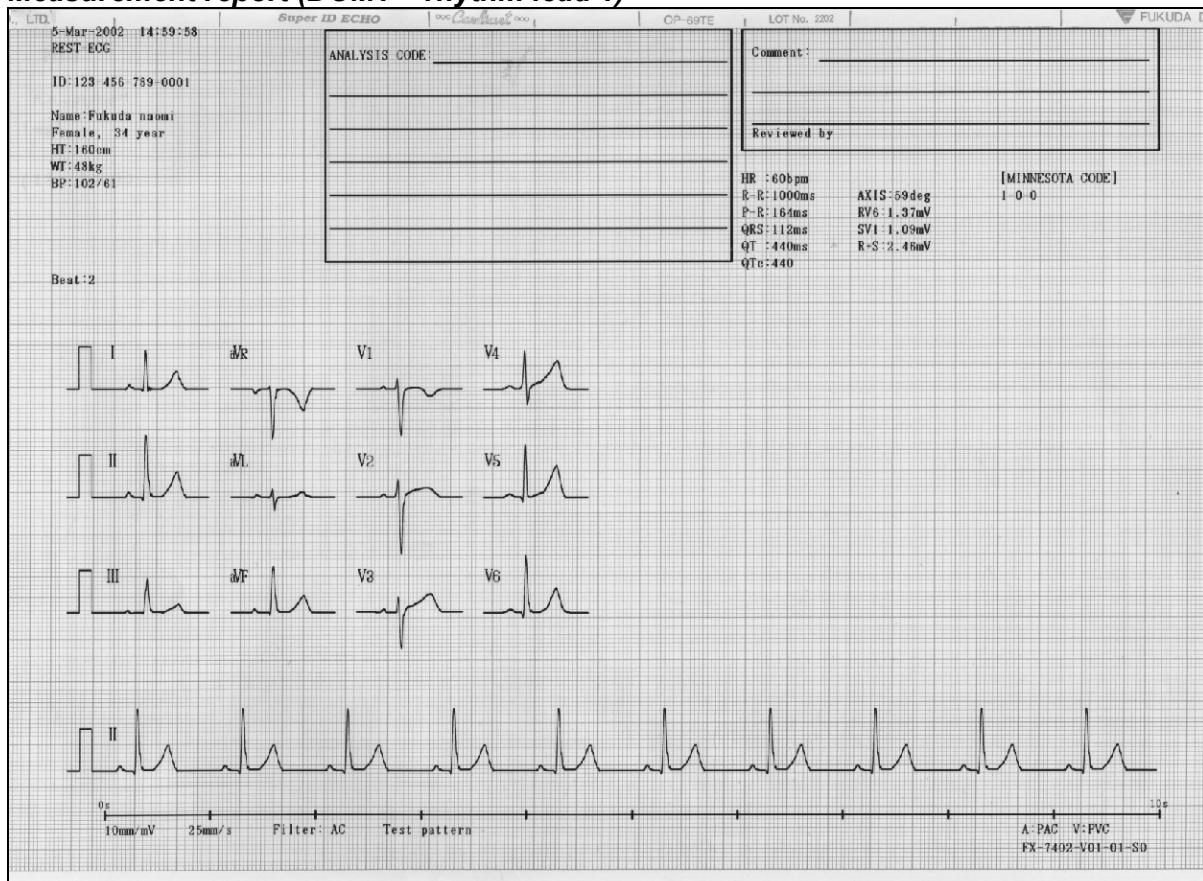
ECG waveforms (6CH + rhythm lead 1)**ECG waveforms (12CH)**

Measurement report

These are basic measurement values and measurement waveforms. You can select the following parameters:

REPORT FORMAT: Select the format of the measurement report to be printed. (DOM1+R1, DOM2+R1, DOM2+R2, DOM3, FULL3+R1, FULL3+R2, FULL6, FULL6+R1) When this parameter is set to NONE, the measurement report is not recorded.

Measurement report (DOM1 + rhythm lead 1)



Measurement report (DOM2 + rhythm lead 1)

Super ID ECHO | Cardiac | OP-69TE | LOT No. 2202 | FUKUDA DENSHI CO., LTD.

5-Mar-2002 14:59:53
REST-ECG

ID:123-456-789-0001

Name: Fukuda naomi
Female, 34 year
HT:160cm
WT:48kg
BP:102/61

ANALYSIS CODE: _____

Comment: _____

Reviewed by _____

HR : 60bpm R-R:1000ms P-R:164ms QRS:112ms QT:440ms QTc:440 [MINNESOTA CODE] I-0-0

R: 1.37mV SV1:1.09mV R+S:2.46mV

Beat: 2

I II III aVR aVL aVF

V1 V2 V3 V4 V5 V6

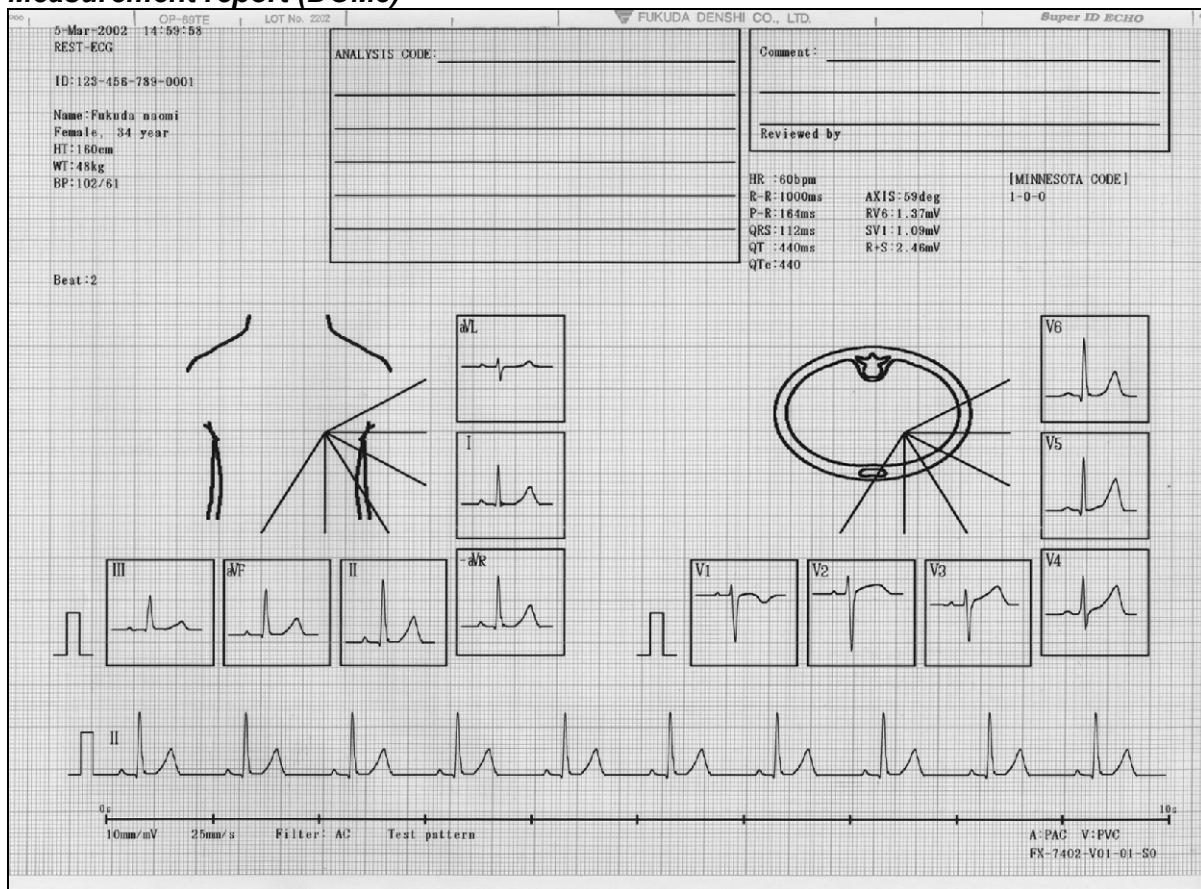
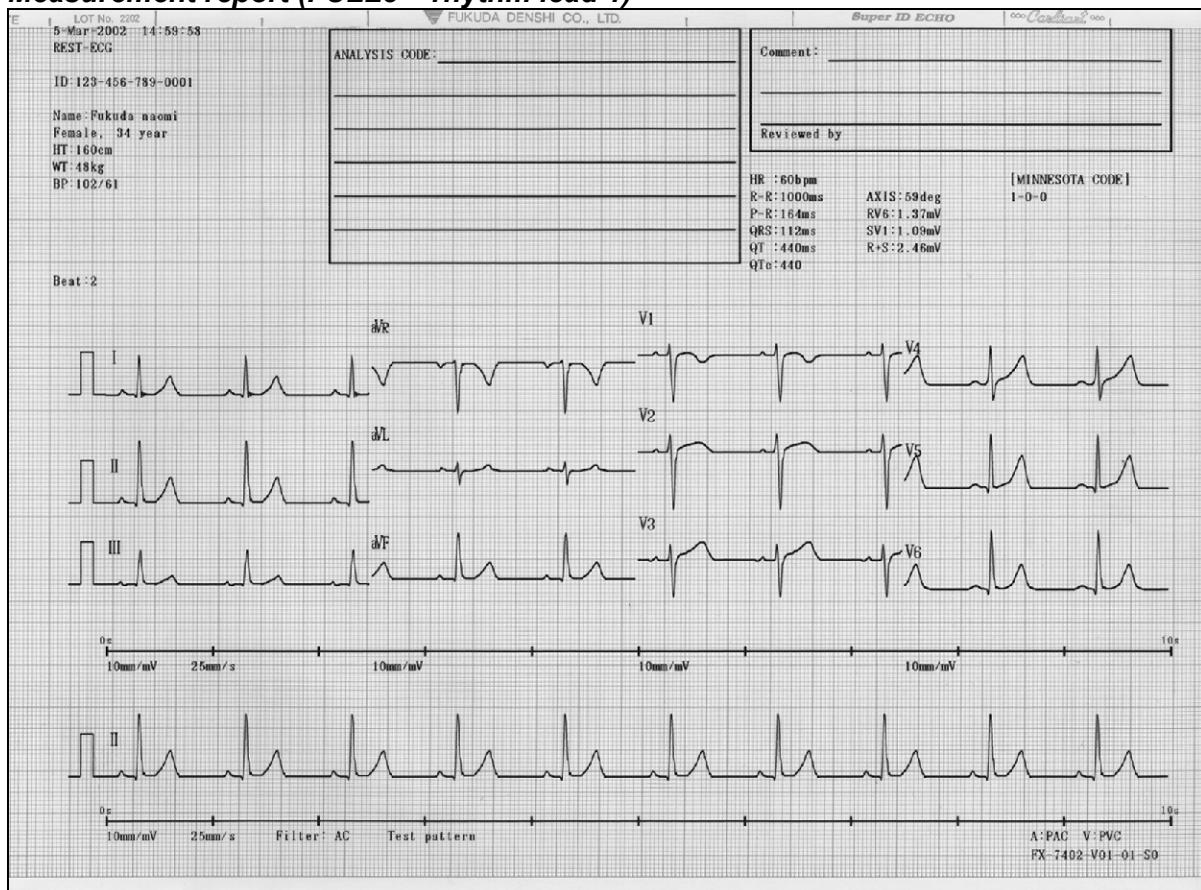
Test pattern

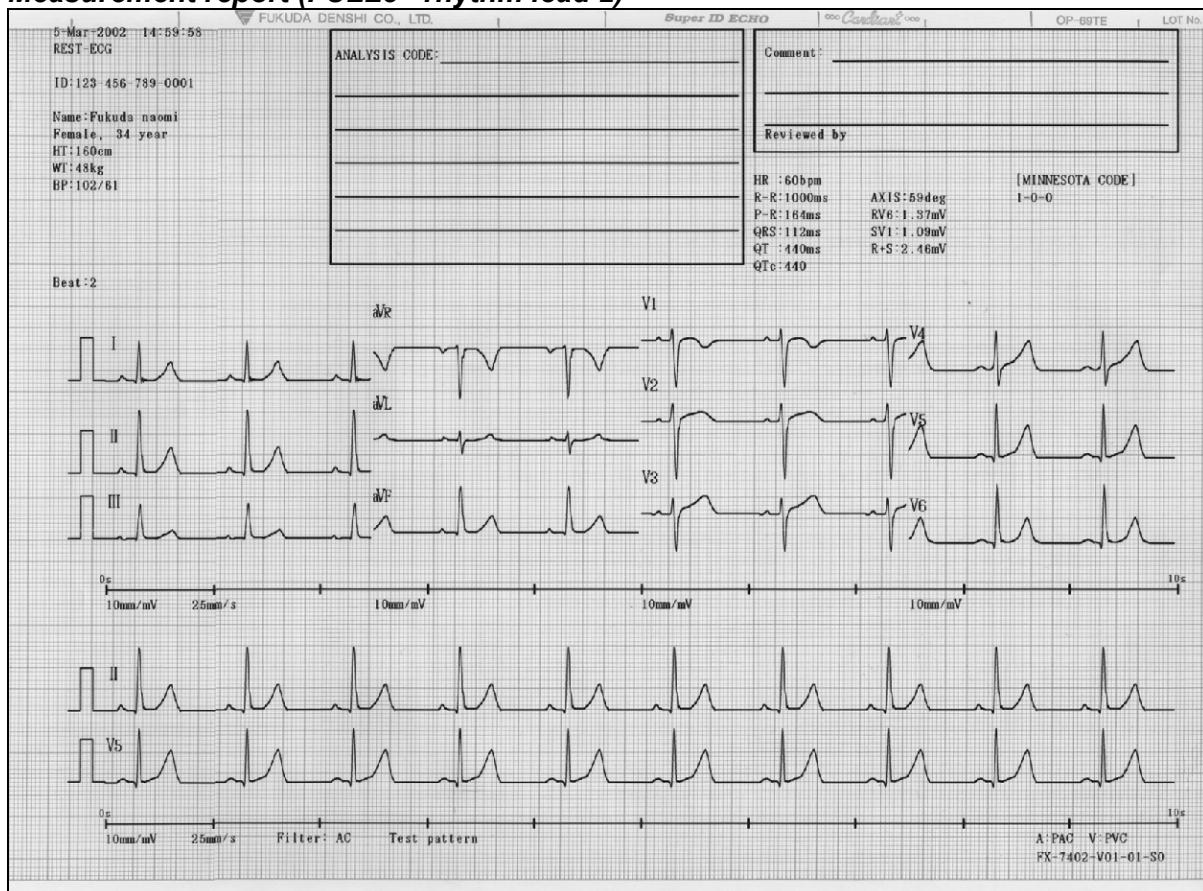
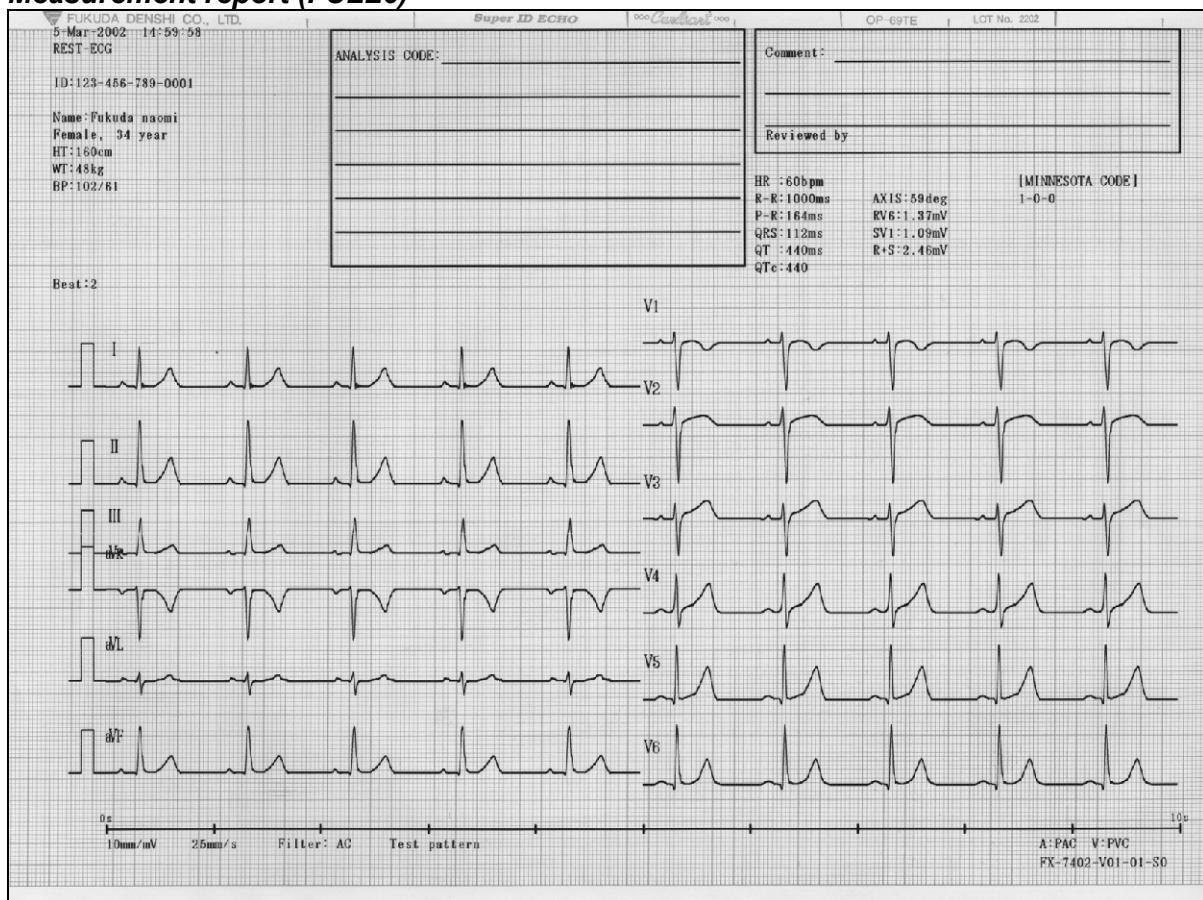
0s 10mm/mV 25mm/s Filter: AC A:PAC V:PVC FX-7402-V01-S0 10s

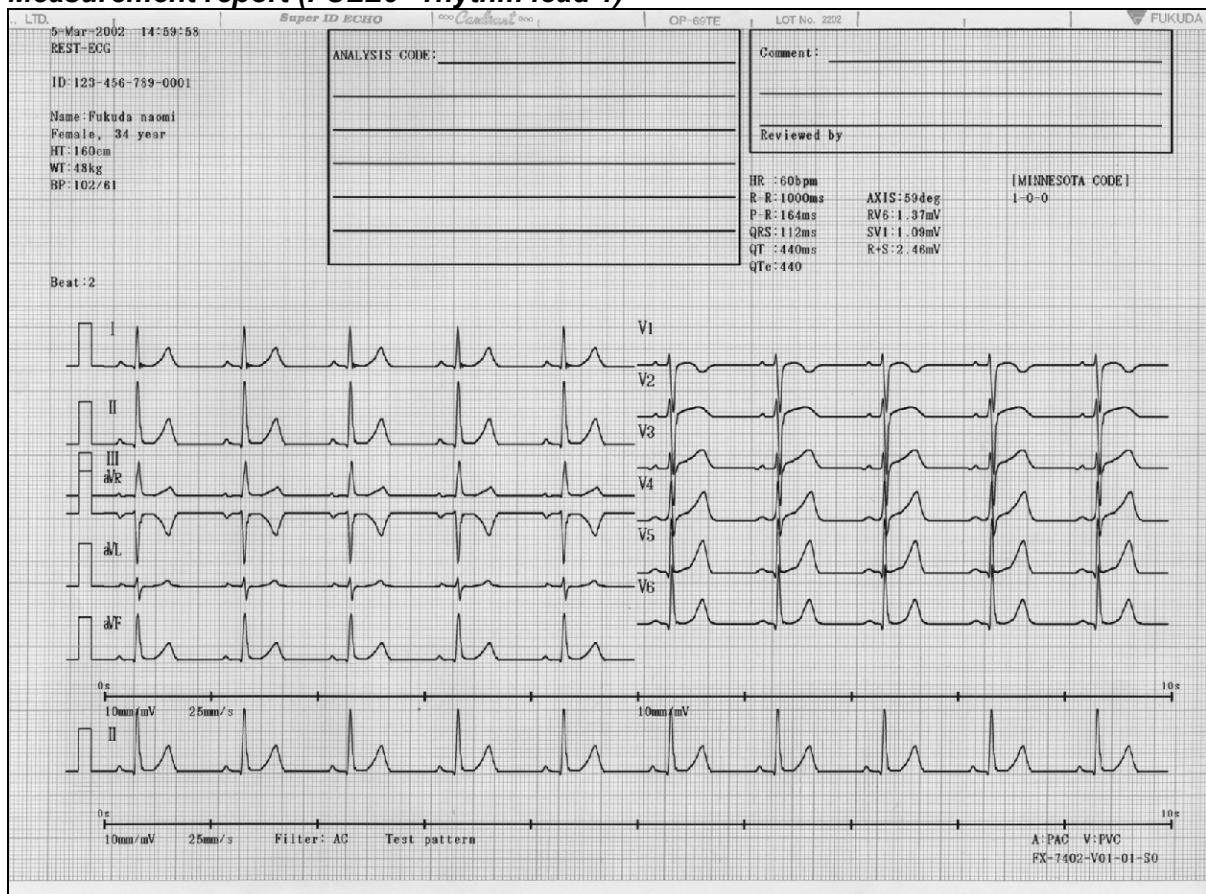
Measurement report (DOM2 + rhythm lead 2)

Measurement Report (D-ECHO - Rhythm lead 2)

D ECHO	OP-69TE	LOT No. 2202	FUKUDA DENSHI CO., LTD.
8-Mar-2002 14:59:58			
REST ECG			
ID:123-456-789-0001	ANALYSIS CODE:	Comment: _____	
Name: Fukuda naomi			
Female, 34 year			
HT:160cm			
WT:48kg			
BP:102/61			
Reviewed by _____			
[MINNESOTA CODE] 1-0-0			
HR: 60bpm R-R: 1000ms P-R: 164ms QRS: 112ms QT: 440ms QTc: 440			
AXIS: 59deg RV6: 1.37mV SV1: 1.09mV R-S: 2.46mV			
Beat: 2			
<p>0m 10mm/mV 25mm/s Filter: AC Test pattern</p> <p>A:PAC V:PVC FX-7402-V01-01-S0</p>			

Measurement report (DOM3)**Measurement report (FULL3 + rhythm lead 1)**

Measurement report (FULL3+ rhythm lead 2)**Measurement report (FULL6)**

Measurement report (FULL6+ rhythm lead 1)

Detailed measurement values

These are detailed measurement values related to dominant waveforms used for Measurement Recording.

MEASURED VALUE: Set this parameter ON to print the detailed measurement values. Otherwise, set to OFF.

Detailed measurement values



Standard ECG Mode - Analysis Recording

The analysis recording prints the following 4 types of data: ECG waveforms, analysis report, analysis comment, and detailed measurement values. The printing of the ECG waveform, analysis comment, and detailed measurement values can be enabled or disabled. The print format for all 4 reports can be selected.

ECG waveforms	Analysis report	Analysis comment	Detailed measurement values
---------------	-----------------	------------------	-----------------------------

The following SET UP MODE screens are used to set the parameters related to the recording format of analysis recording:

SET UP MODE (STANDARD ECG MODE) screen (page 1/2)

SET UP MODE (STANDARD ECG MODE)		
DISPLAY CHANNEL	<input checked="" type="checkbox"/> 3CH	<input type="checkbox"/> 3CH
MANUAL RECORD CHANNEL	<input checked="" type="checkbox"/> 3CH	<input type="checkbox"/> 3CH
LEAD CHANGE LINE	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
AUTO SENSITIVITY	<input checked="" type="radio"/> AUTO	<input type="radio"/> 1+AUTO
RHYTHM LEAD1	<input checked="" type="checkbox"/> II	<input type="checkbox"/> III
RHYTHM LEAD2	<input checked="" type="checkbox"/> V5	<input type="checkbox"/> V6
POST INTERVAL TIME	<input checked="" type="checkbox"/> OFF	<input type="checkbox"/> ON
POST COMPRESSED ECG	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>		

SET UP MODE (STANDARD ECG MODE) screen (page 2/2)

SET UP MODE (STANDARD ECG MODE)		
AUTO MODE CHANGE	<input checked="" type="radio"/> ON	<input type="radio"/> OFF
AUTO RECORDING CHANNEL	<input checked="" type="checkbox"/> 3CH + R2	<input type="checkbox"/> 3CH + R1
RECORDING LENGTH	<input checked="" type="checkbox"/> 10sec	<input type="checkbox"/> 20sec
ANALYSIS REPORT FORMAT	<input checked="" type="checkbox"/> DOM1 + R1	<input type="checkbox"/> DOM1 + R2
ECG VIEW	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
COMMENT	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
MEASURED VALUE	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>		

ECG waveforms

You can select the following parameters for the ECG waveforms to be used for Analysis Recording:

AUTO RECORDING CHANNEL: Select the number of channels of the ECG waveform to be recorded simultaneously. 3CH, 3+R1 (3CH + rhythm lead 1st channel), 3+R2 (3CH + rhythm lead 1st and 2nd channels), 6CH, 6+R1 (6CH + rhythm lead 1st channel), or 12CH.

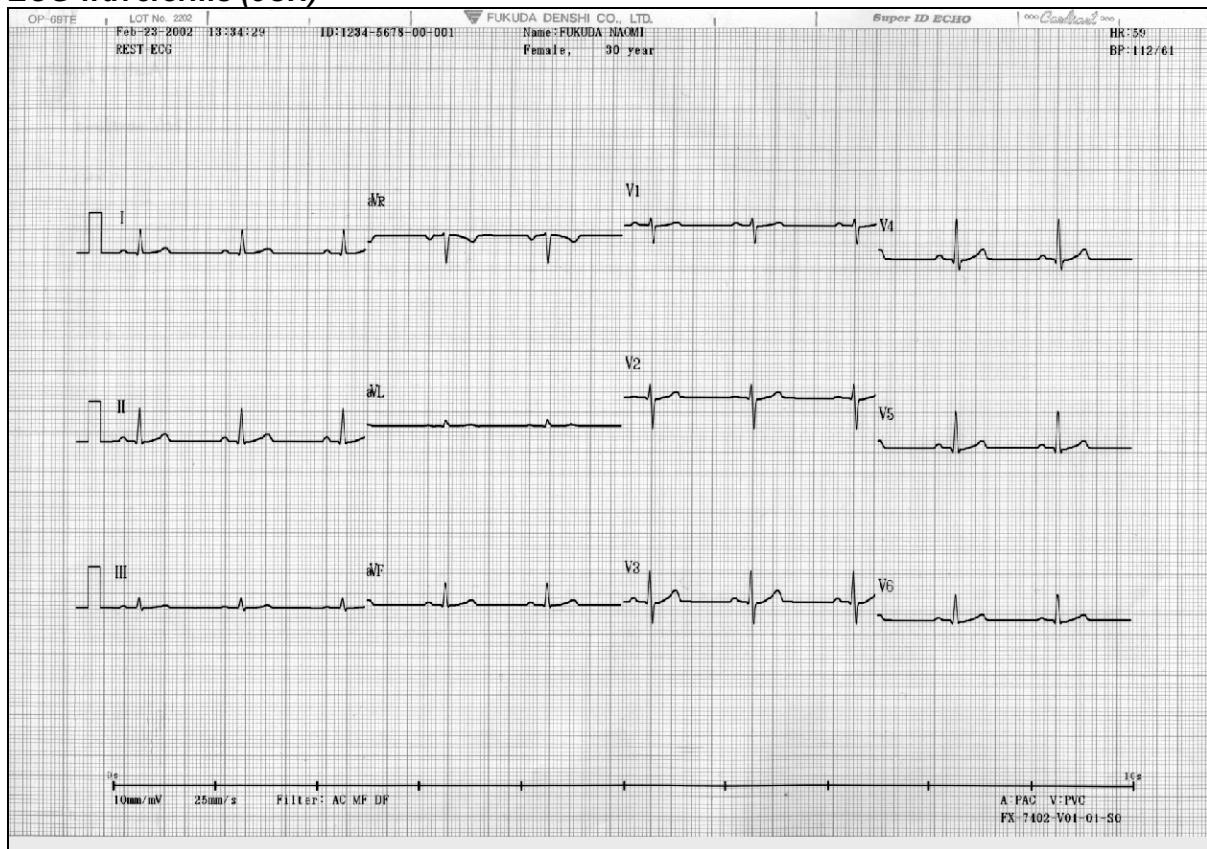
RHYTHM LEAD 1/2: Select the lead to be used as the rhythm lead when the RECORDING CHANNEL parameter is set to "3+R1", "3+R2", or "6+R1".

RECORDING LENGTH: Set the length of the recording from 8 to 24 seconds for roll paper. Set it to either 10 seconds (1 page) or 20 seconds (2 pages) for Z-fold paper.

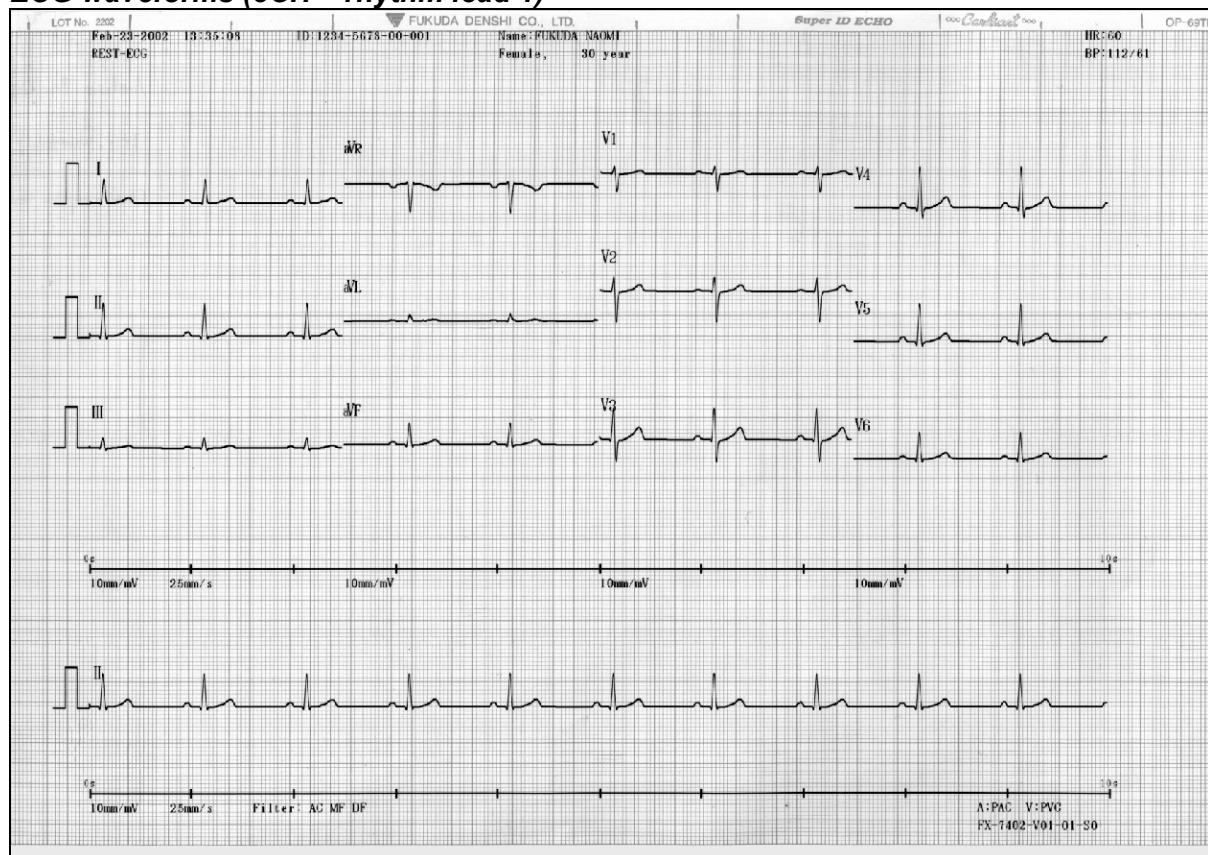
 Note:

The ECG waveforms will be printed continuously even if the 10- or 20-second waveforms are divided into some blocks by the Recording Channels configuration.

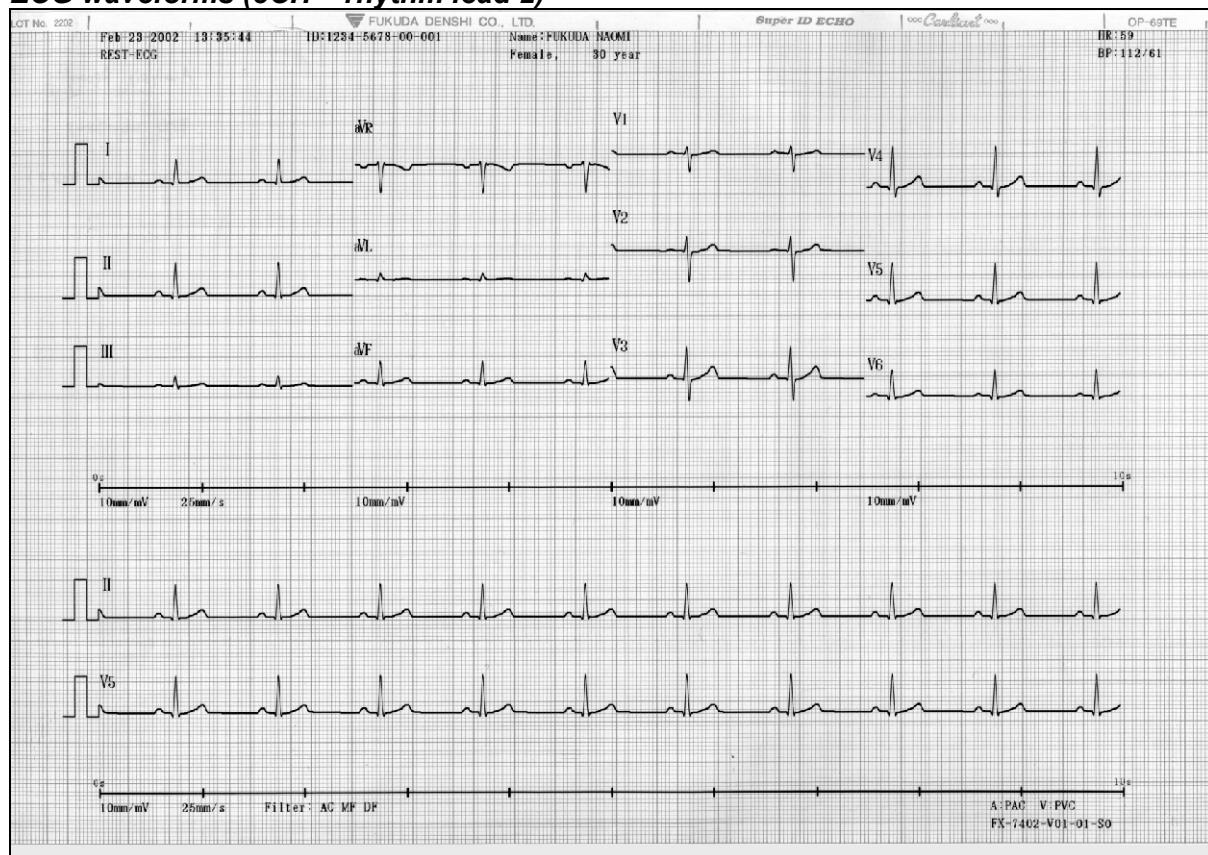
ECG waveforms (3CH)

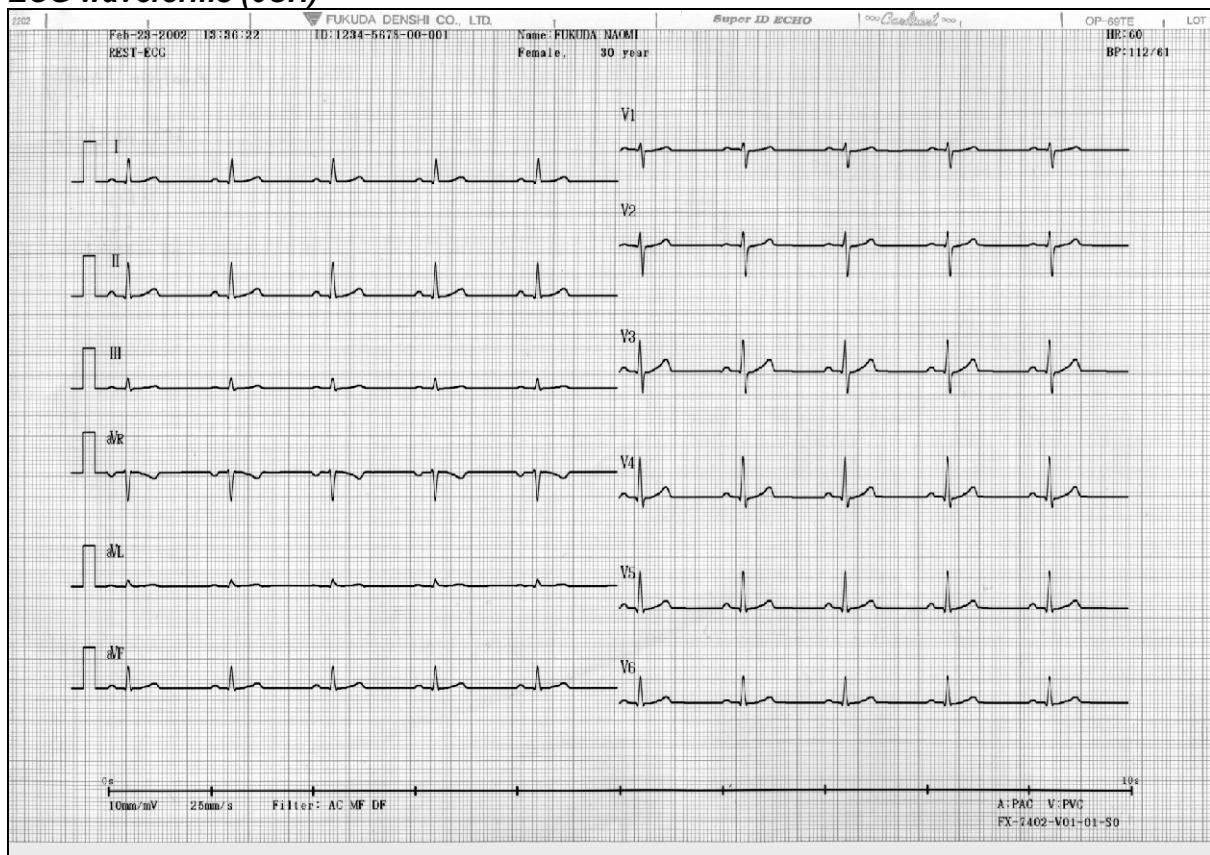


ECG waveforms (3CH + rhythm lead 1)



ECG waveforms (3CH + rhythm lead 2)

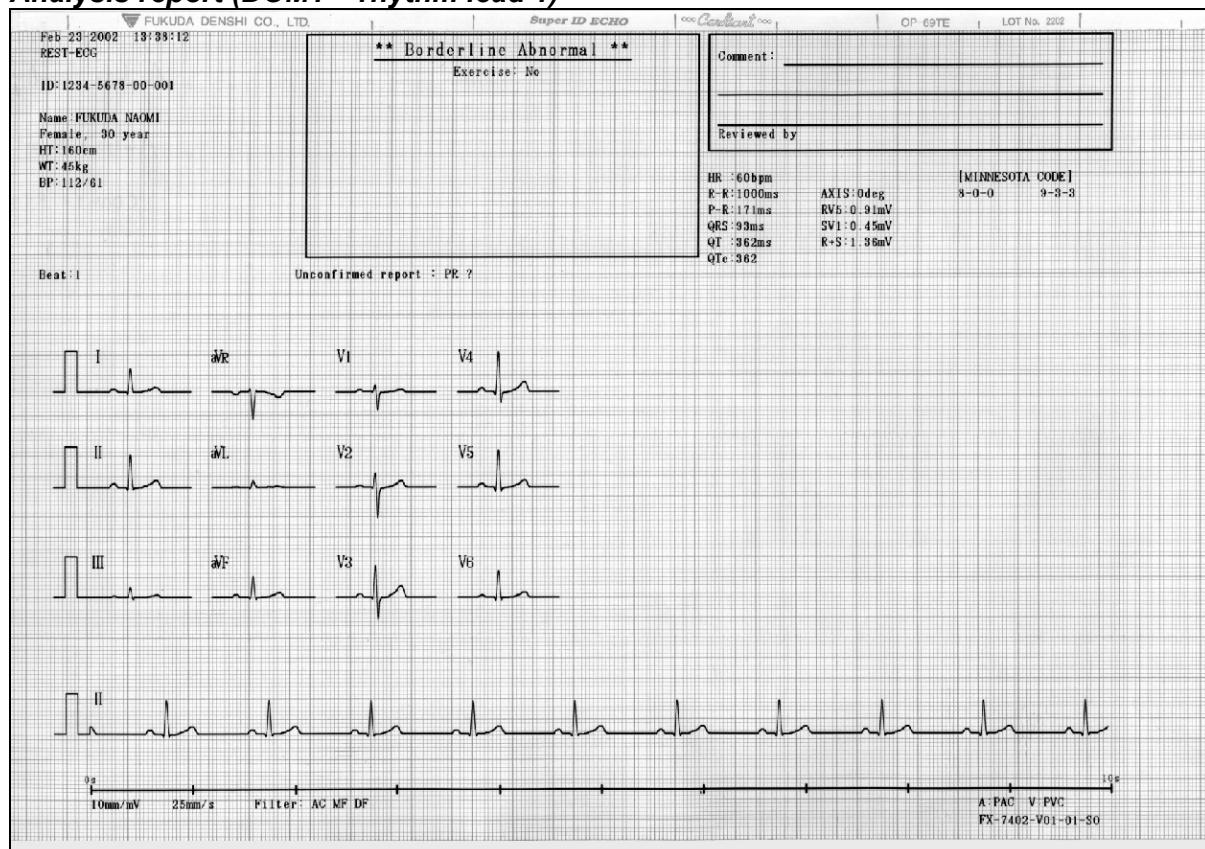
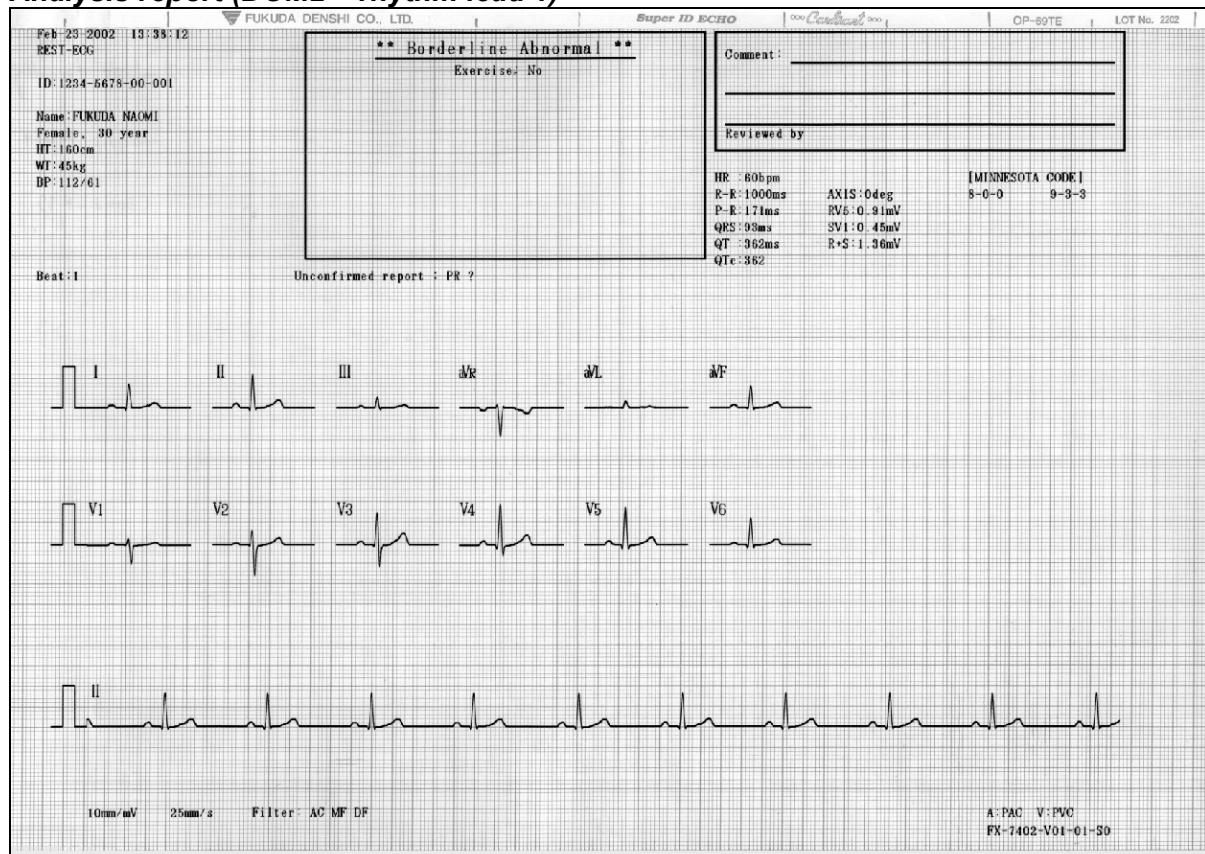


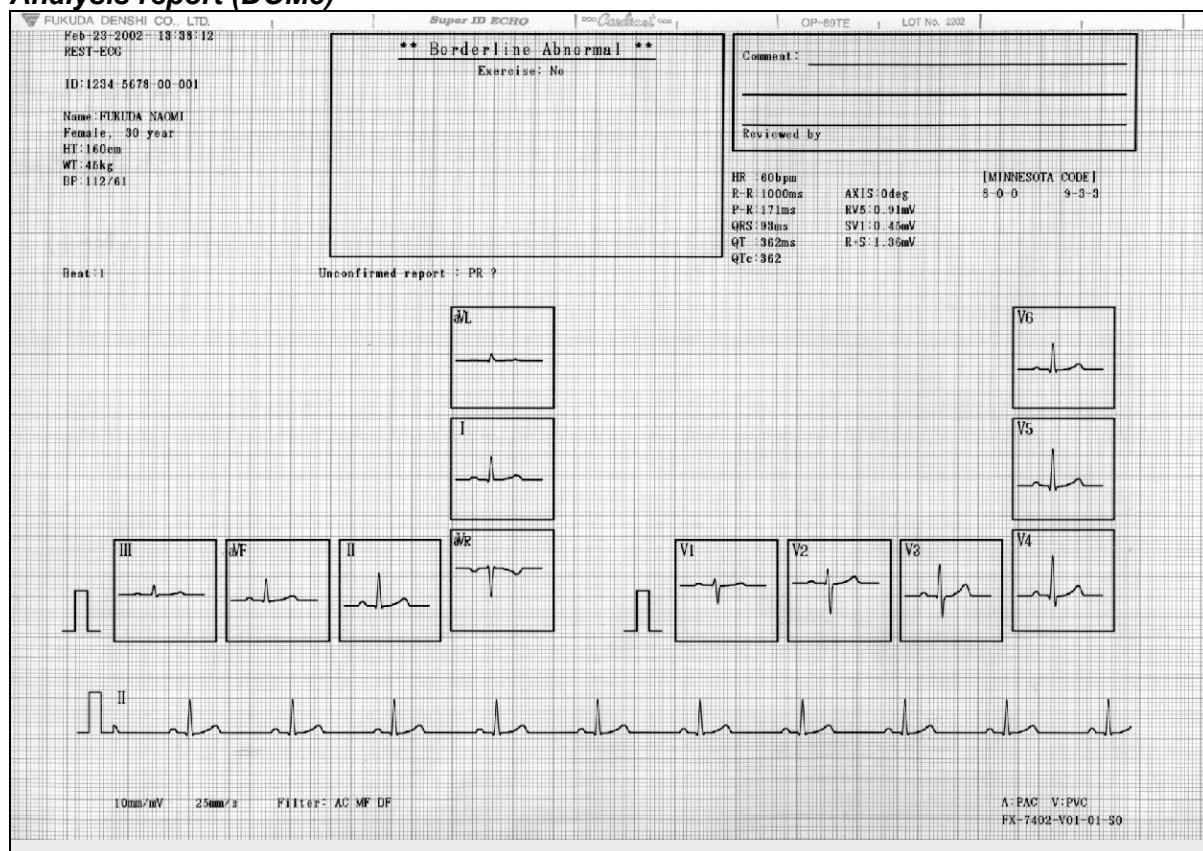
ECG waveforms (6CH)**ECG waveforms (6CH + rhythm lead 1)**

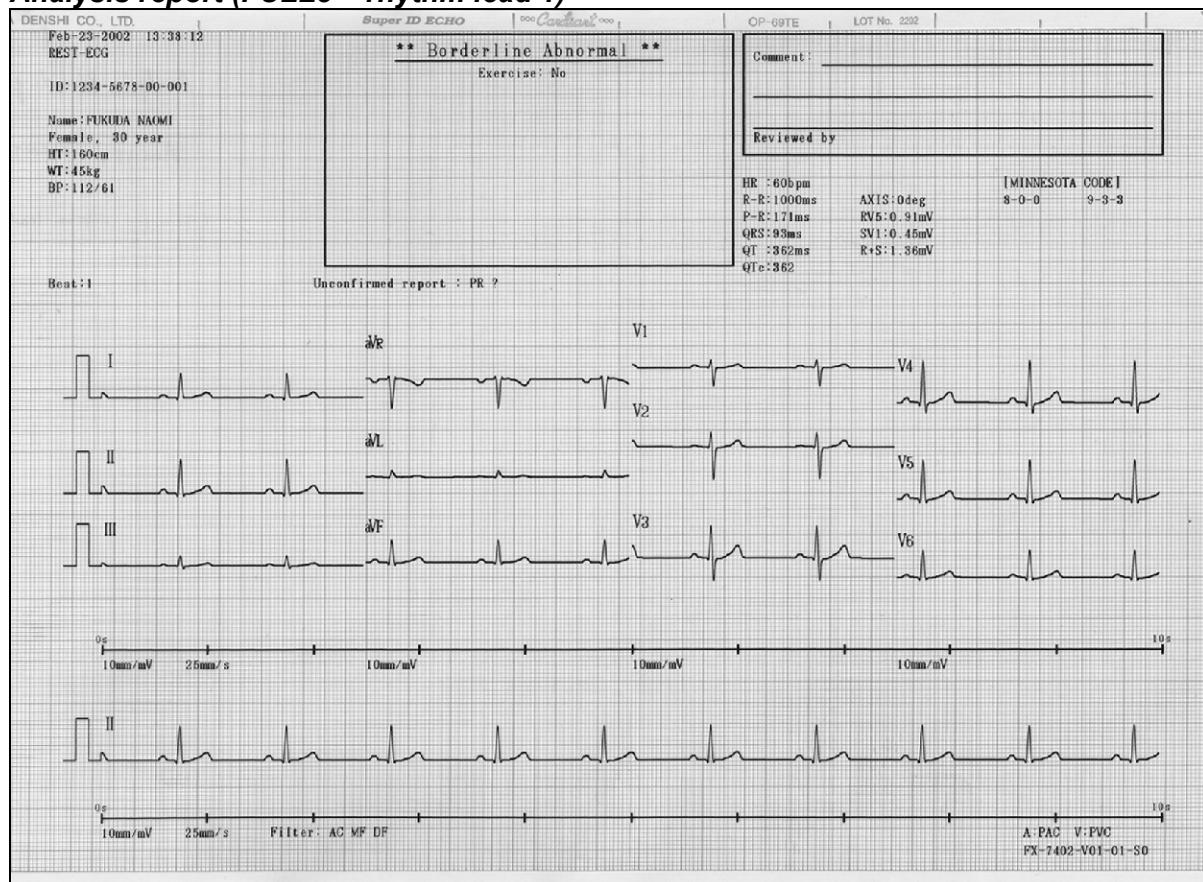
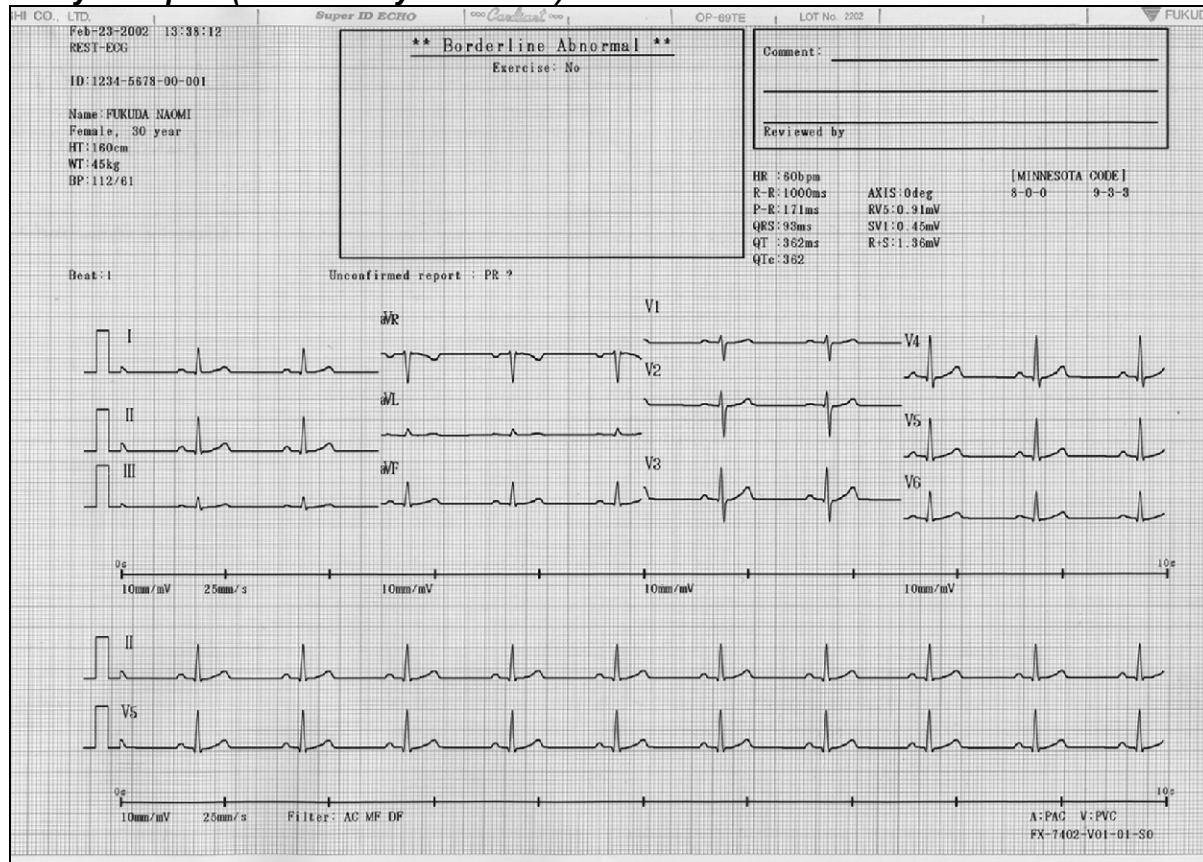
ECG waveforms (12CH)**Analysis report**

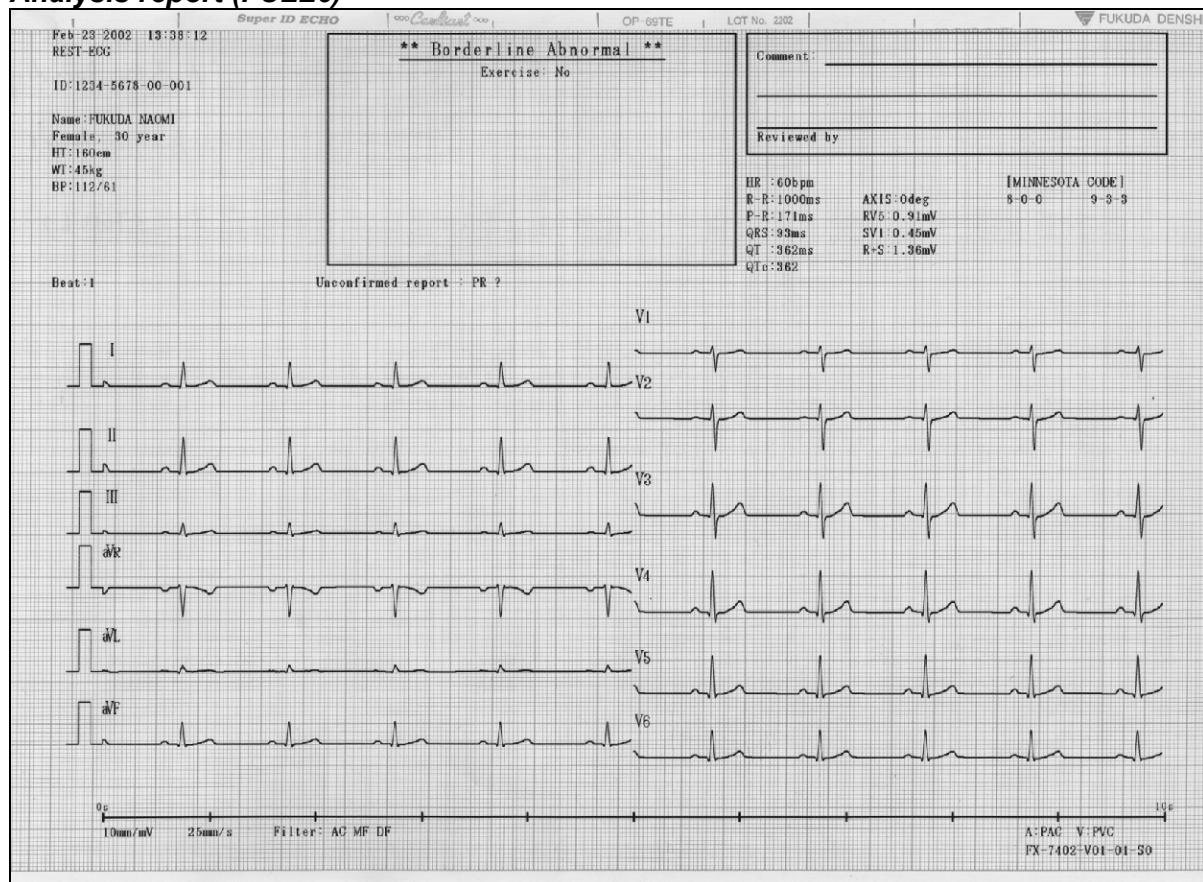
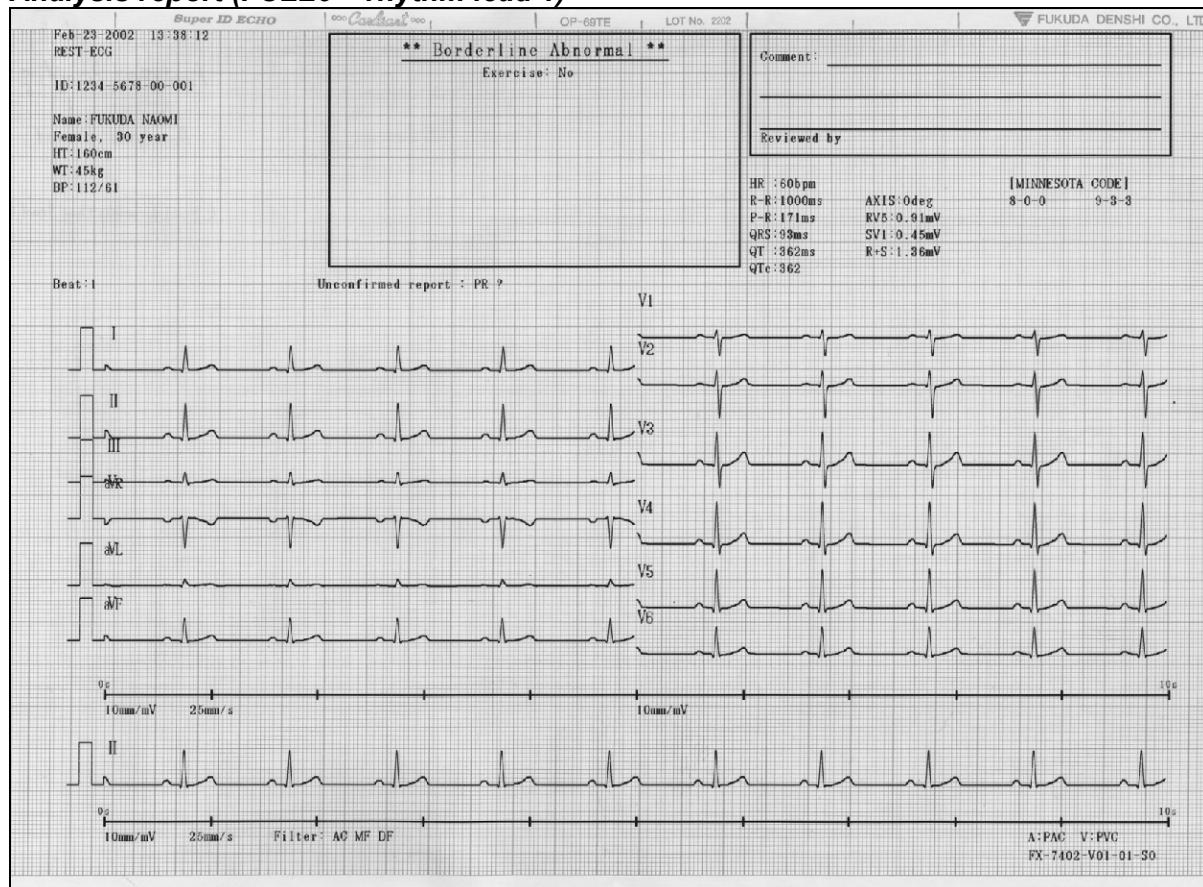
These are basic measurement values, interpretation, and analysis waveforms. The following parameters can be selected:

REPORT FORMAT: Select the format of the analysis report to be printed. (OFF, DOM1+R1, DOM2+R1, DOM2+R2, DOM3, FULL3+R1, FULL3+R2, FULL6, FULL6+R1) When this parameter is set to NONE, the analysis report is not recorded.

Analysis report (DOM1 + rhythm lead 1)**Analysis report (DOM2 + rhythm lead 1)**

Analysis report (DOM2 + rhythm lead 2)**Analysis report (DOM3)**

Analysis report (FULL3 + rhythm lead 1)**Analysis report (FULL3 + rhythm lead 2)**

Analysis report (FULL6)**Analysis report (FULL6 + rhythm lead 1)**

Analysis comment

This is a comment for the interpretation, waveforms, and measured values.

COMMENT: Set this parameter ON to print the comment. Otherwise, set to OFF.

Analysis comment

Super ID ECHO	000 CaseNo 000	OP-69TE	LOT No. 2202	FUKUDA DENSHI CO., LTD.
2-Mar-2002 18:03:14	ID:123-456-789-0003	Name:FUKUDA NAOMI		HR:69
REST-ECG		Male,	85 year	BP:105/64
<p>----- Final Comment ----- Virtually within normal limits</p> <p>----- Interpretation Comment -----</p> <p>----- Wave Measurement Comment ----- If MUSCLE filter is used, note that QRS amplitude will be reduced.</p> <p>----- Criteria Comment ----- J TYPE ST<=-0.10mV</p>				
FX-7402-V01-01-S0				

Detailed measurement values

These are detailed measurement values related to dominant waveforms used for Analysis Recording.

MEASURED VALUE: Set this parameter ON to print the detailed measurement values. Otherwise, set to OFF.

Detailed measurement values

Super ID ECHO	Cardimax	OP-69TE	LOT No. 202	FUKUDA DENSHI CO., LTD.																					
Feb-23-2002 13:38:12																									
REST-EOG																									
ID:1234-5678-0001																									
Name:FUKUDA NAOMI Female, 30 year HT:160cm WT:45kg BP:112/61																									
HR:80bpm R-R:1000ms P-R:171ms QRS:93ms QT:362ms QTc:362	RW5:0.9mV RV1:0.45mV SV1:0.45mV RV5+SV1:1.36mV TV1:0.07mV																								
WAVE MEASUREMENT	(mV)	I	II	III	aVR	aVL	aVF	V1	V2	V3	V4	V5	V6												
		0.06	0.09	0.03	-0.07	0.00	0.06	0.06	0.04	0.09	0.09	0.09	0.05												
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00												
		-0.05	-0.06	0.00	0.00	0.00	-0.03	0.00	0.00	-0.04	-0.08	-0.11	-0.08												
		0.57	0.81	0.25	0.05	0.19	0.52	0.17	0.36	0.77	0.39	0.91	0.64												
		0.00	-0.05	0.04	-0.70	0.00	-0.05	-0.45	-0.74	0.54	-0.25	-0.10	-0.07												
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00												
		0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01												
		0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.03	0.02	0.00	0.00												
		0.11	0.17	0.06	-0.14	0.03	0.11	0.07	0.16	0.28	0.24	0.17	0.13												
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00												
		T1a	T2a																						
		0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00												
		(ms)																							
		QT	366	370	348	368	338	368	344	360	372	372	374	370											
		QTe	366	370	348	368	338	368	344	360	372	372	374	370											
		Pd	92	96	78	94	0	90	86	86	92	92	92	86											
		Pd	0	0	0	0	0	0	0	0	0	0	0	0											
		Q_d	22	22	0	0	0	20	0	0	22	24	24	24											
		R_d	62	48	48	22	76	48	34	36	38	42	46	46											
		S_d	0	26	30	50	0	24	50	54	50	44	26	24											
		R'd	0	0	0	0	0	0	0	0	0	0	0	0											
		P_R	170	170	172	170	130	168	184	174	166	168	168	162											
		QRS	86	96	82	94	76	92	34	98	110	108	96	94											
		FVT	16	16	26	16	28	12	22	24	14	16	16	16											
		FLG	0	0	0	0	0	0	0	0	0	0	0	0											
		ARRHYTHMIA MEASUREMENT																							
No.	R-R	P-R	QRS	P	F	ARI	AR2	PK1	PK2	AX1	AX2	#	No.	R-R	P-R	QRS	P	F	ARI	AR2	PK1	PK2	AX1	AX2	#
1	0	172	98	1	2	242	300	180	210	0	0		2	1000	174	98	1	1	241	239	179	209	0	0	
3	1000	172	100	1	1	240	302	180	209	0	0		4	1000	172	98	1	1	238	300	177	209	0	0	
5	1000	174	98	1	1	240	301	178	208	0	0		6	1000	172	100	1	1	244	302	180	208	0	0	
7	1000	172	100	1	1	244	300	180	208	0	0		8	1000	174	100	1	1	241	302	179	210	0	0	
9	1000	170	100	1	1	239	239	178	209	0	0		10	1000	170	100	1	1	241	239	179	210	0	0	

Additional information:

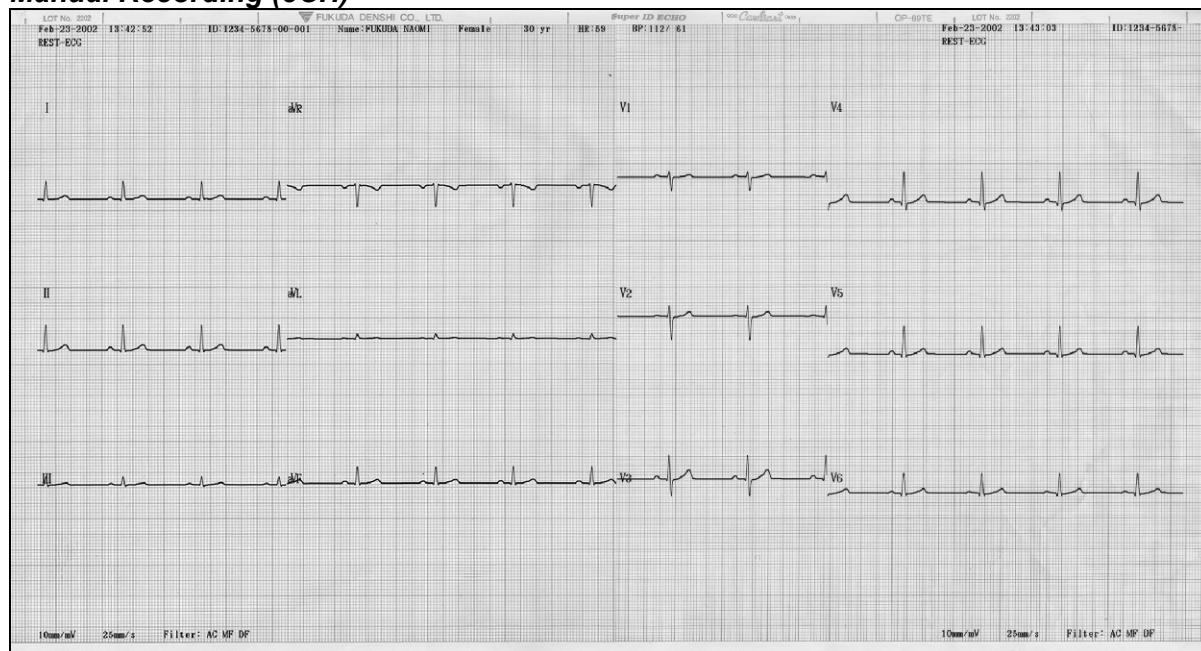
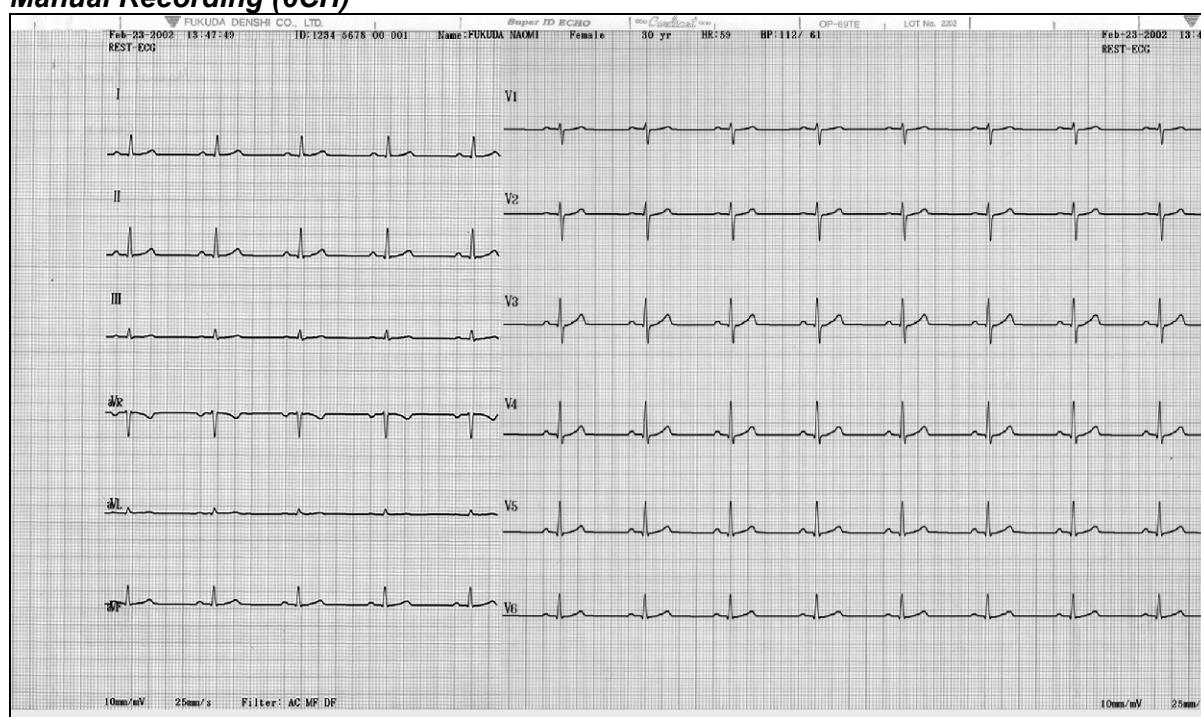
Before printing the report, confirm the analysis information.

If the ECG VIEW parameter (SET UP MODE (STANDARD ECG MODE) (page 2/2)) is set to ON, a part of the analysis information can be displayed. The information can be checked first, then printed.

Standard ECG Mode - Manual Recording ---

Manual Recording prints the ECG waveform that is the same as the waveform on the screen.

You can change the lead and sensitivity, reset the input waveform, and record a calibrated 1mV waveform during Manual Recording, as required. See "Manual Recording Mode" in Chapter 4, "Recording the Electrocardiogram: Standard ECG Mode" (page 75).

Manual Recording (3CH)**Manual Recording (6CH)**

Manual Recording (12CH)

PC-7403

Arrhythmia ECG Mode

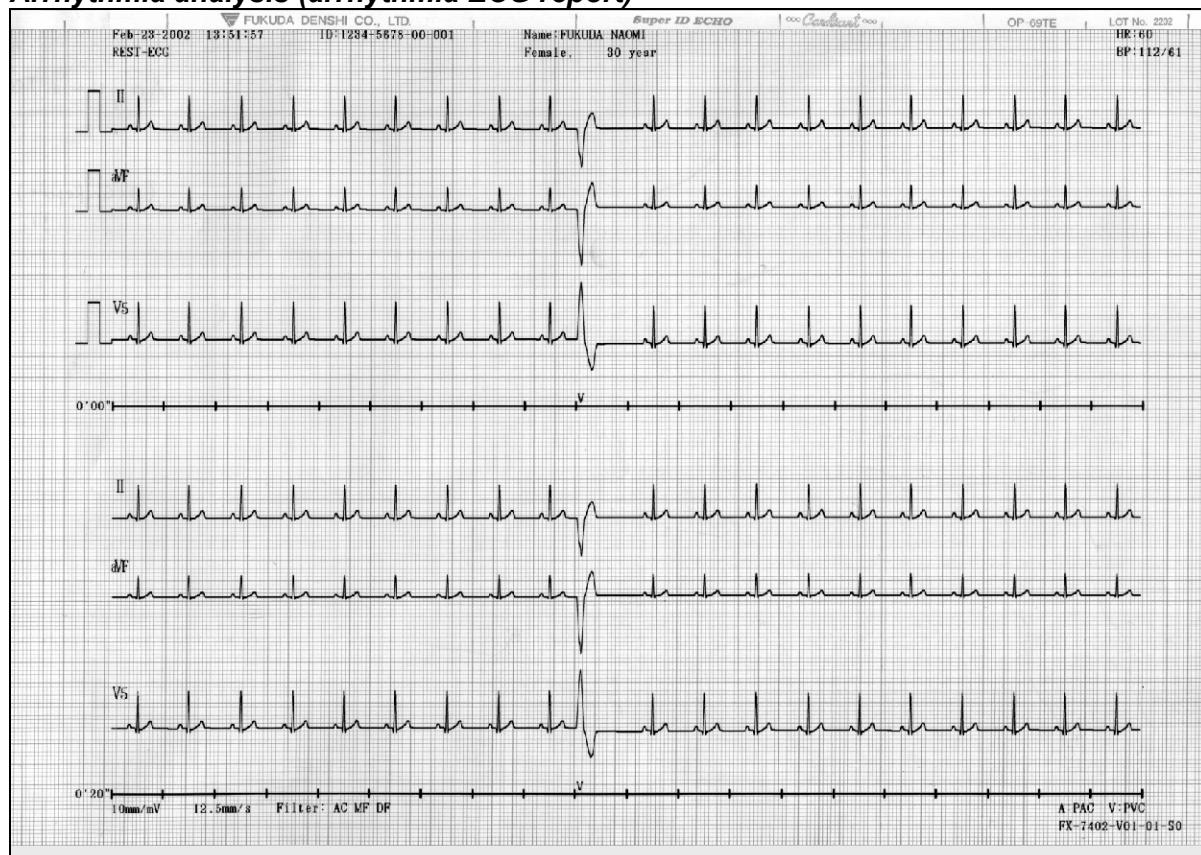
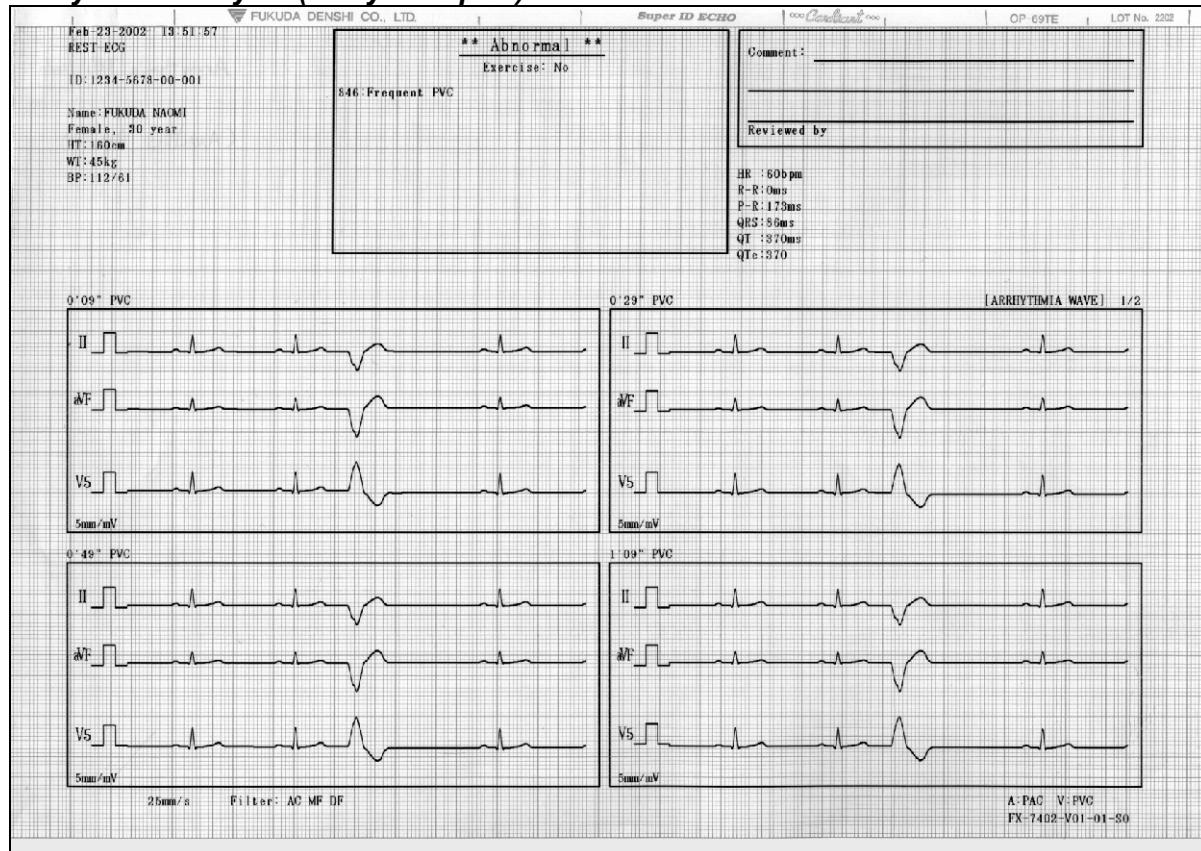
The arrhythmia analysis prints the arrhythmia ECG report and measured values.
Select the report format for the arrhythmia ECG report and measured values.

The SET UP MODE (ARRHYTHMIA ECG MODE) screen is used to select the parameter related to the recording format of the Arrhythmia ECG Mode.

SET UP MODE (ARRHYTHMIA ECG MODE) screen

SET UP MODE (ARRHYTHMIA ECG MODE)	
ARRHYTHMIA LEAD 1CH	<input checked="" type="checkbox"/> II
ARRHYTHMIA LEAD 2CH	<input checked="" type="checkbox"/> aVF
ARRHYTHMIA LEAD 3CH	<input checked="" type="checkbox"/> V5
ECG REPORT	<input checked="" type="checkbox"/> Standard
ANALYSIS REPORT	<input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
MEASURED VALUE	<input checked="" type="checkbox"/> ON <input type="checkbox"/> OFF
NEXT ↓ PREV ↑ MENU EXIT	

- ECG REPORT:** Select the waveform recording speed from either Standard (25mm/s) or Compress (10mm/s). When this parameter is set to NONE, the ECG report is not recorded.
- ANALYSIS REPORT:** Set this parameter ON to automatically print out a report after compiling the analysis observation result and event waveforms. Otherwise, set to OFF.
- MEASURED VALUE:** Set this parameter ON to print the measured values. Otherwise, set to OFF.

Arrhythmia analysis (arrhythmia ECG report)**Arrhythmia analysis (analysis report)**

Arrhythmia analysis (measured values)

R-R Trend Test Mode

The R-R trend test will print the test report together with ECG waveforms, and measured values. Select the report format for these reports.

The SET UP MODE (R-R TREND TEST MODE) screen is used to select the parameters related to the recording format of the R-R Trend Test Mode.

SET UP MODE (R-R TREND TEST MODE) screen

SET UP MODE (R-R TREND TEST MODE)	
R-R TREND LEAD	<input checked="" type="checkbox"/> II
ECG REPORT	<input checked="" type="checkbox"/> Standard
ANALYSIS REPORT	<input checked="" type="radio"/> ON <input type="radio"/> OFF
MEASURED VALUE	<input checked="" type="radio"/> ON <input type="radio"/> OFF
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>	

ECG REPORT:

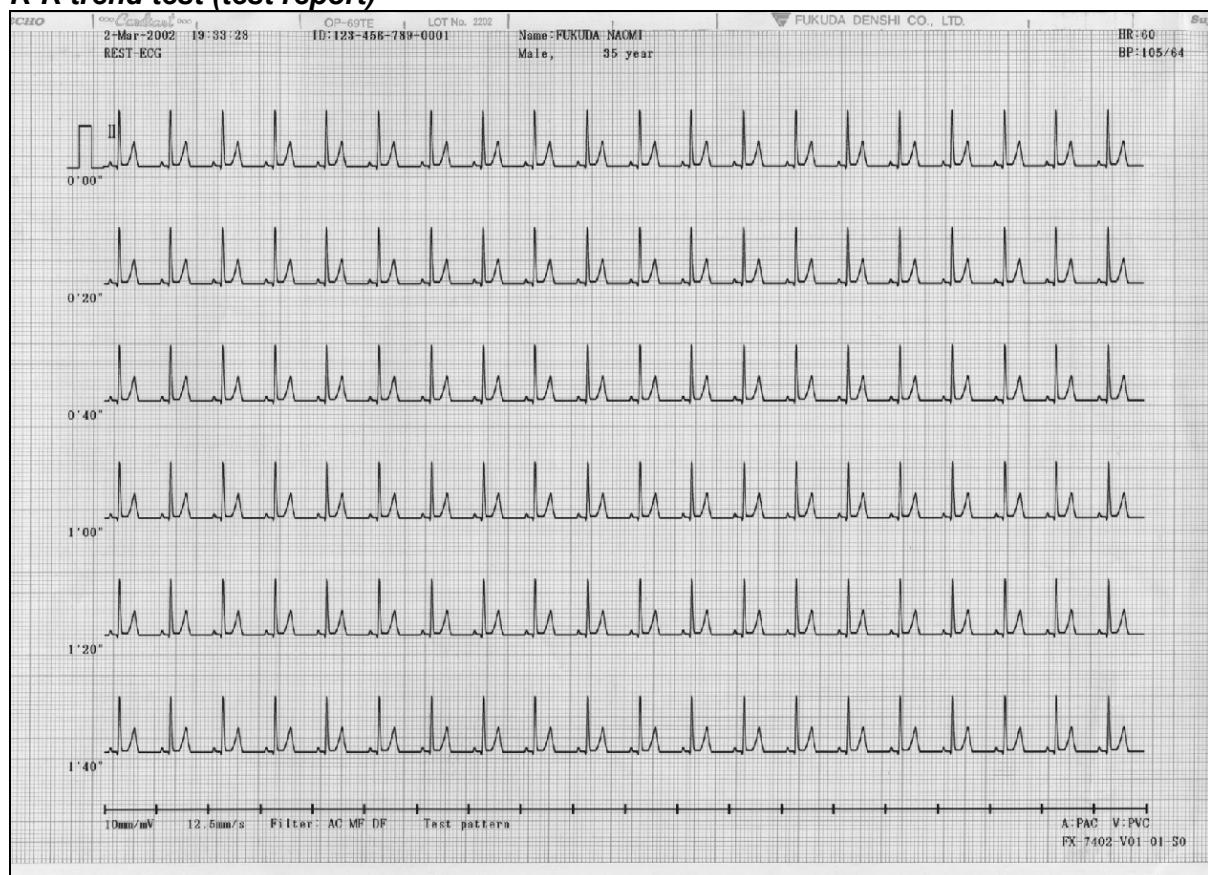
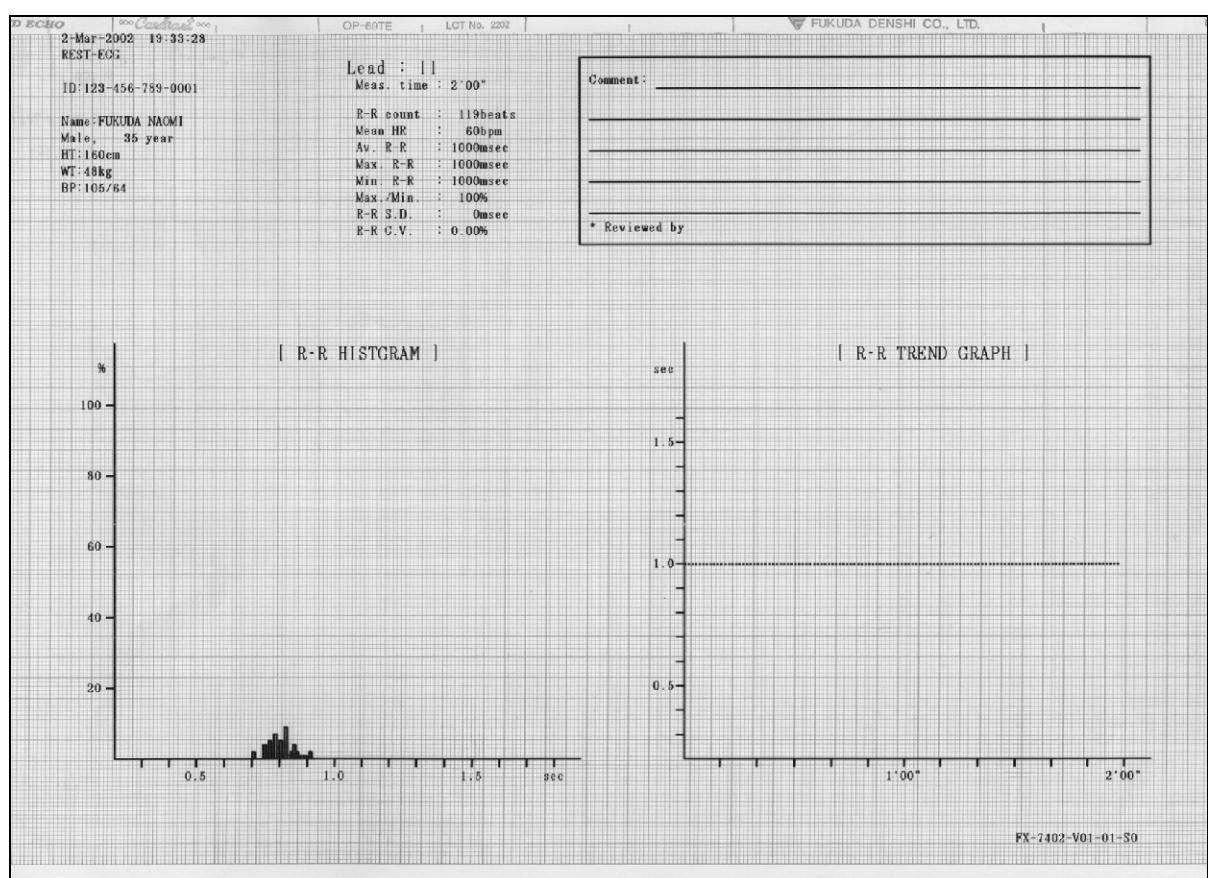
Select the waveform recording speed from either Standard (25mm/s), or Compress (10mm/s). When this parameter is set to NONE, the ECG report is not recorded.

ANALYSIS REPORT:

Set this parameter ON to automatically print a report after compiling the R-R trend graph and R-R histogram. Otherwise, set to OFF.

MEASURED VALUE:

Set this parameter ON to print the measured values. Otherwise, set to OFF.

R-R trend test (test report)**R-R trend test (analysis report)**

R-R trend test (measured values)

D ECHO	2-Mar-2002 19:33:28	OP-69TE	LOT No. 2202	FUKUDA DENSHI CO., LTD.	
REST-ECG		Lead : []			
ID:123-456-789-0001		Meas. time : 2'00"	Comment : _____ _____ _____		
Name:FUKUDA NAOMI Male, 35 year HT:160cm WT:48kg BPF:105/64		R-R count : 119beats Mean HR : 60bpm Av. R-R : 1000msec Max. R-R : 1000msec Min. R-R : 1000msec Max. / Min. : 100% R-R S.D. : 0msec R-R C.V. : 0.00%			
				* Reviewed by _____	
[R-R MEASUREMENT]					
No.	R-R(ms)	No.	R-R(ms)	No.	
1	1000	31	1000	61	1000
2	1000	32	1000	62	1000
3	1000	33	1000	63	1000
4	1000	34	1000	64	1000
5	1000	35	1000	65	1000
6	1000	36	1000	66	1000
7	1000	37	1000	67	1000
8	1000	38	1000	68	1000
9	1000	39	1000	69	1000
10	1000	40	1000	70	1000
11	1000	41	1000	71	1000
12	1000	42	1000	72	1000
13	1000	43	1000	73	1000
14	1000	44	1000	74	1000
15	1000	45	1000	75	1000
16	1000	46	1000	76	1000
17	1000	47	1000	77	1000
18	1000	48	1000	78	1000
19	1000	49	1000	79	1000
20	1000	50	1000	80	1000
21	1000	51	1000	81	1000
22	1000	52	1000	82	1000
23	1000	53	1000	83	1000
24	1000	54	1000	84	1000
25	1000	55	1000	85	1000
26	1000	56	1000	86	1000
27	1000	57	1000	87	1000
28	1000	58	1000	88	1000
29	1000	59	1000	89	1000
30	1000	60	1000	90	1000

FX-7402-V01-01-S0

Changing the Patient Data Parameters

Add or delete items to be entered as patient data.

To change the patient data parameters, use the SET UP MODE (PATIENT DATA) screen (page 1 and page 2).

SET UP MODE (PATIENT DATA) screen (1/2)

SET UP MODE (PATIENT DATA)		
AUTO ID No. INC	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
FIXED ID NUMBER	<input checked="" type="checkbox"/> []	
INPUT BIRTHDAY	<input type="radio"/> ON	<input checked="" type="radio"/> OFF
NAME	<input checked="" type="radio"/> ON	<input type="radio"/> OFF
RACE	<input checked="" type="radio"/> ON	<input type="radio"/> OFF
HEIGHT	<input type="radio"/> cm	<input type="radio"/> inch <input checked="" type="radio"/> OFF
WEIGHT	<input type="radio"/> kg	<input type="radio"/> lb <input checked="" type="radio"/> OFF
BLOOD PRESSURE	<input checked="" type="radio"/> ON	<input type="radio"/> OFF
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>		

SET UP MODE (PATIENT DATA) screen (2/2)

SET UP MODE (PATIENT DATA)		
DRUG	<input checked="" type="radio"/> ON	<input type="radio"/> OFF
SYMPTOMS	<input checked="" type="radio"/> ON	<input type="radio"/> OFF
COMMENT	<input checked="" type="radio"/> ON	<input type="radio"/> OFF
WARD	<input checked="" type="radio"/> ON	<input type="radio"/> OFF
DEPARTMENT	<input checked="" type="radio"/> ON	<input type="radio"/> OFF
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=""/>		

Select the following parameters:

- AUTO ID NO. INC:** Set this parameter ON to automatically assign the patient IDs. Each time Measurement Recording (without a program cartridge) or Analysis Recording (PC-7403) during the REST status is finished, the ID number is incremented by 1. To assign each patient's ID manually, set this parameter OFF.
- FIXED ID NUMBER:** Specify the number you want to use as fixed number for the upper digits of the patient ID.
- INPUT BIRTHDAY:** Set this parameter ON to enable automatic setting of the patient's age by simply entering the patient's date of birth. You don't have to enter the patient's age.

NAME:	Set this parameter ON to include the patient's name in the patient data. Otherwise, set to OFF.
RACE:	Set this parameter to include the patient's ethnicity in the patient data. Otherwise, set to OFF.
HEIGHT:	Set this parameter to cm or inch to include the patient's height in the patient data. Otherwise, set to OFF.
WEIGHT:	Set this parameter to kg or lbs to include the patient's weight in the patient data. Otherwise, set to OFF.
BLOOD PRESSURE:	Set this parameter ON to include the patient's blood pressure information in the patient data. Otherwise, set to OFF.
DRUG:	Set this parameter ON to include the patient's medication information in the patient data. Otherwise, set to OFF.
COMMENT:	Set this parameter ON to include a comment in the patient data. Otherwise, set to OFF.
SYMPTOMS:	Set this parameter ON to include the patient's symptoms in the patient data. Otherwise, set to OFF.
WARD:	Set this parameter ON to include the patient's ward information in the patient data. Otherwise, set to OFF.
DEPARTMENT:	Set this parameter ON to include the patient's department information in the patient data. Otherwise, set to OFF.

Selecting the Filters

Set the cut-off frequency of the AC filter, muscle filter, drift filter, and high-cut filter.

Once the filter parameters are set, they can be turned ON and OFF by simply tapping [FILTER] during sampling.

SET UP MODE (ECG CONTROL) screen (1/2)

SET UP MODE (ECG CONTROL)			
PAPER TYPE	<input checked="" type="radio"/> ROLL	<input type="radio"/> Z-FOLD	
WIDTH OF BASELINE	<input checked="" type="checkbox"/> Standard		
AC FILTER	<input type="radio"/> 50Hz	<input checked="" type="radio"/> 60Hz	
MUSCLE FILTER	<input type="radio"/> 25Hz	<input checked="" type="radio"/> 35Hz	
DRIFT FILTER	<input type="radio"/> 0.25Hz	<input checked="" type="radio"/> 0.5Hz	
CUT-OFF FREQUENCY	<input type="radio"/> 70Hz	<input type="radio"/> 100Hz	<input checked="" type="radio"/> 150Hz
KEY CLICK	<input type="radio"/> ON	<input checked="" type="radio"/> OFF	
QRS BEEP	<input type="radio"/> ON	<input checked="" type="radio"/> OFF	
<input type="button" value="NEXT ↓"/> <input type="button" value="PREV ↑"/> <input type="button" value="MENU"/> <input type="button" value="EXIT"/> <input type="button" value=" "/>			

Select the following parameters:

- | | |
|--------------------|---|
| AC FILTER: | Select the cut-off frequency of the AC filter (50/60Hz). |
| MUSCLE FILTER: | Select the cut-off frequency of the muscle filter (25/35Hz). |
| DRIFT FILTER: | Select the cut-off frequency of the drift filter (0.25/0.5Hz). |
| CUT-OFF FREQUENCY: | Select the cut-off frequency of the high-cut filter (70/100/150Hz). |

Note:

Be careful about setting the cut-off frequency of the muscle filter. When it is set (25Hz or 35Hz), the amplitude of the QRS complex will be reduced.

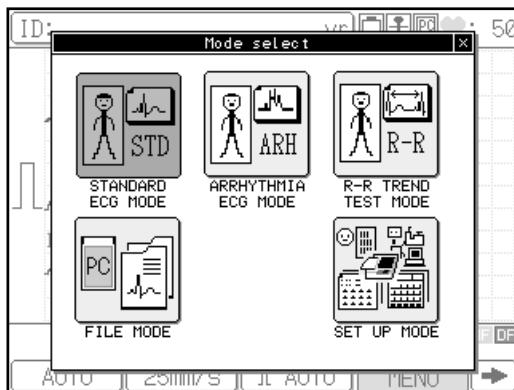
Initializing Parameters

You can reset the parameters to their default settings (excluding date and time setting).

Operation

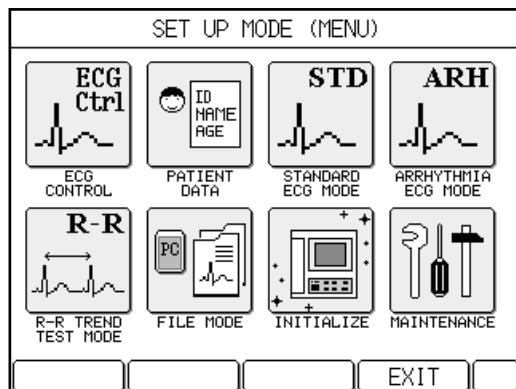
1 Display the Mode select window.

Touch [MENU] to display the Mode select window.



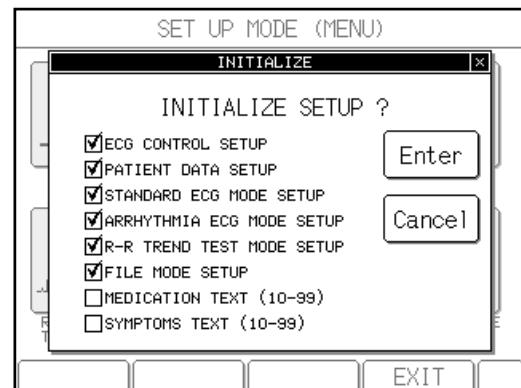
2 Touch [SET UP MODE].

The SET UP MODE (MENU) will appear.



3 Touch [INITIALIZE].

The INITIALIZE window will appear with a confirmation message.



4 Touch [Enter].

The parameters are reset to their default settings. To cancel the initialization operation, touch [Cancel].

Chapter 8

Maintenance and Troubleshooting

Performing the Self-diagnostics Test

The FX-7402 provides the following six types of user menus for daily machine check ups.

- TEST PATTERN Menu for selecting the built-in ECG test pattern waveform used for operation checks and demonstration.
- RECORDING TEST Menu for performing the overall recording test.
- KEY TEST Menu for performing the key operation test.
- LCD TEST Menu for checking missing dots of the LCD and halftones.
- CRT TEST Menu for checking whether an optional CRT connected to FX-7402 will display images properly.
- BUZZER TEST Menu for checking the sounds and volume of the speaker.

Starting the test menu

Use the following procedure to start the MAINTENACE menu.

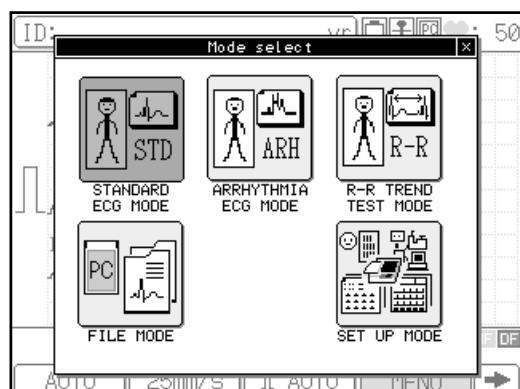
Operation

1 Display the Mode select window.

Touch [MENU] to open the Mode select window.

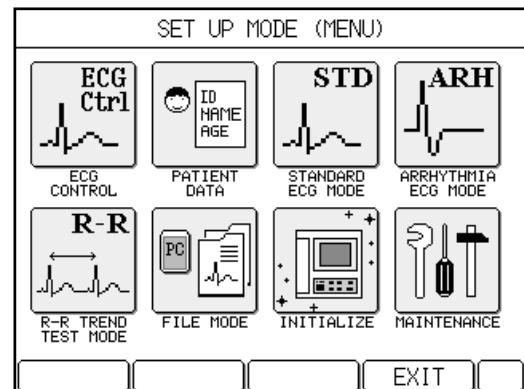
Note:

The mode screen will be different depending on the configuration. The mode screen shown is displayed when the PC-7403 program cartridge is installed.



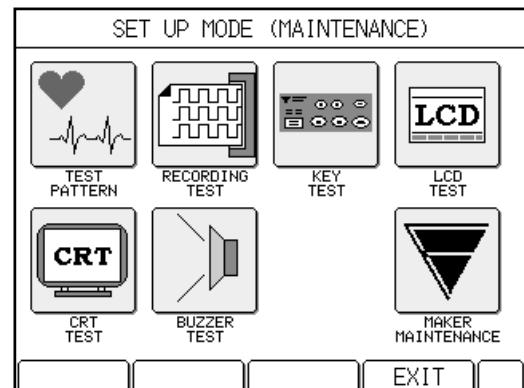
2 Touch [SET UP MODE].

The SET UP MODE (MENU) window will appear.



3 Touch [MAINTENANCE].

The SET UP MODE (MAINTENANCE) window will appear.



4 See the corresponding section for the detailed operation of each test.

Note:

You cannot access the MAKER MAINTENANCE menu. The manufacturer uses it for checks and adjustment of this machine during the manufacturing process and product inspection.

Selecting the ECG test pattern waveform

Use the following procedure to run the TEST PATTERN menu.

You can select from the following three types of test pattern waveforms.

NONE: Makes a test pattern waveform invalid.

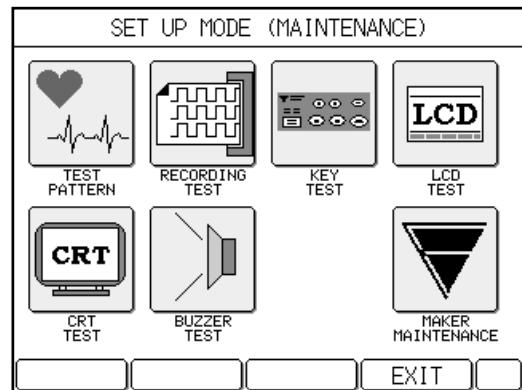
NORMAL: Normal pattern waveform

PVC WAVE: Arrhythmia pattern waveform PVC

Operation

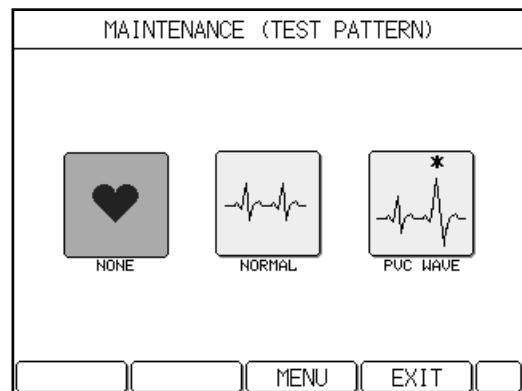
1 Open the SET UP MODE (MAINTENANCE) window.

Perform steps 1 to 3 of "Starting the test menu" (pages 166 to 167) to open the SET UP MODE (MAINTENANCE) window.



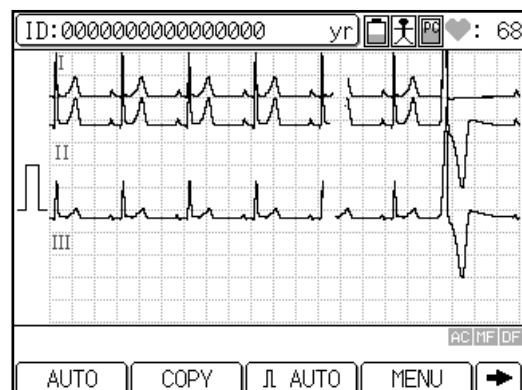
2 Touch [TEST PATTERN].

The MAINTENANCE (TEST PATTERN) window will appear.



3 Touch the desired test pattern waveform.

The ECG standard mode screen will appear and the selected test pattern waveform appears on the ECG standard mode screen. The selected test pattern is highlighted.



4 Touch [MENU].

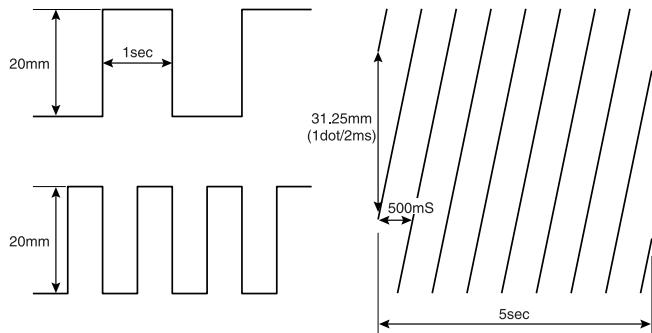
The test pattern setting takes effect and the SET UP MODE (MAINTENANCE) window reappears.

Notes:

- "NORMAL" or "PVC WAVE" will appear respectively during the recording if you select NORMAL or PVC WAVE.
- The electrode off information is ignored if you select NORMAL or PVC WAVE.
- NONE is always selected at the time of power-on and initialization. The test pattern information is not saved.

Performing the recording test

The RECORDING TEST records the following waveforms using a sequence of five different paper speeds: 5mm/second, 10mm/second, 12.5mm/second, 25mm/second, and 50mm/second.



Use the following procedure to run the RECORDING TEST menu.

Operation

1 Open the SET UP MODE (MAINTENANCE) window.

Perform steps 1 to 3 of "Starting the test menu" (pages 166 to 167) to open the SET UP MODE (MAINTENANCE) window.

2 Touch [RECORDING TEST].

The MAINTENANCE (RECORDING TEST) window will appear.



3 Press [START/STOP] key.

When all recording tests are complete (the recording test in 50mm/second is finished), the MAINTENANCE (RECORDING TEST) window reappears.

Notes:

- You can end the recording test by pressing [START/STOP]. The MAINTENANCE (RECORDING TEST) window reappears.
- If you touch [MENU] when recording is terminated, the SET UP MODE (MAINTENANCE) window reappears.
- If you touch [EXIT] when recording is terminated, the ECG test screen will reappear.

Performing the key test

Use the following procedure to run the KEY TEST menu.

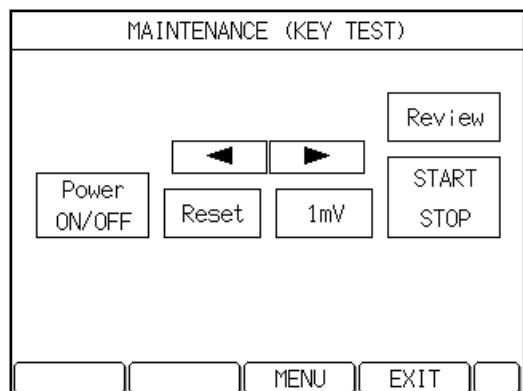
Operation

1 Open the SET UP MODE (MAINTENANCE) window.

Perform steps 1 to 3 of "Starting the test menu" (pages 166 to 167) to open the SET UP MODE (MAINTENANCE) window.

2 Touch [KEY TEST].

The MAINTENANCE (KEY TEST) window will appear.



3 Press a key on the operation panel and make sure the corresponding key is highlighted on the screen.

For example, press [START/STOP]. The [START STOP] indication on the screen will be highlighted.

 **Note:**

If you press [POWER ON/OFF], the [Power ON/OFF] indication on the screen will not be highlighted.

4 After you finish the test, tap [MENU].

The SET UP MODE (MAINTENANCE) window will reappear.

 **Note:**

If you touch [EXIT], the ECG test screen will reappear.

Performing the LCD test

Use the following procedure to run the LCD TEST menu.

 **Operation****1 Open the SET UP MODE (MAINTENANCE) window.**

Perform steps 1 to 3 of "Starting the test menu" (pages 166 to 167) to open the SET UP MODE (MAINTENANCE) window.

2 Touch [LCD TEST].

The LCD test will start, using a predefined format.

When the LCD test is complete, the SET UP MODE (MAINTENANCE) window reappears.

Performing the CRT test

Connect an optional CRT to the FX-7402 and use the following procedure to run the CRT TEST menu.

Operation

1 Open the SET UP MODE (MAINTENANCE) window.

Perform steps 1 to 3 of "Starting the test menu" (pages 166 to 167) to open the SET UP MODE (MAINTENANCE) window.

2 Touch [CRT TEST].

The CRT test will start, using a predefined format.

When the CRT test is complete, the SET UP MODE (MAINTENANCE) window reappears.

Performing the buzzer test

Use the following procedure to run the BUZZER TEST menu.

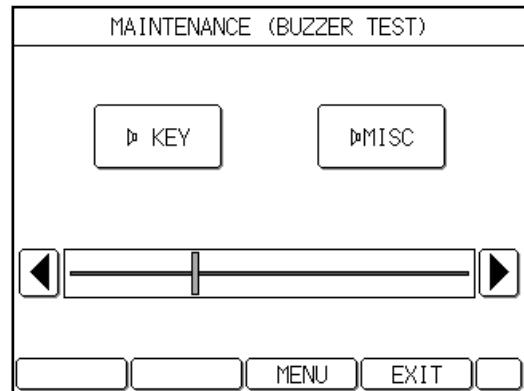
Operation

1 Open the SET UP MODE (MAINTENANCE) window.

Perform steps 1 to 3 of "Starting the test menu" (pages 166 to 167) to open the SET UP MODE (MAINTENANCE) window.

2 Touch [BUZZER TEST].

The MAINTENANCE (BUZZER TEST) window will appear.



3 Touch either [KEY] (for key tones) or [MISC] (for other alarm tones).

The buzzer will sound for approximately 0.5 seconds.

4 Turn the speaker volume up, or down if necessary. Otherwise, skip this step.

Touch [\blacktriangleright] or [\blacktriangleleft] to turn the volume up or down. Or, touch the volume bar directly to select the desired volume. The leftmost position on the bar is the lowest volume setting and the rightmost position is the highest volume setting. You can touch any position on the bar to select the level of volume.

5 After you finish the test, tap [MENU].

The SET UP MODE (MAINTENANCE) window will reappear.

Note:

If you touch [EXIT], the ECG test screen reappears.

Cardimax FX-7402 Maintenance

Maintenance instructions

Follow the procedures described in this chapter for maintenance of the FX-7402. For maintenance safety, functions, performance, and reliability, you must implement "Daily Checks" prior to operation, as well as "Periodic Checks". Note that Fukuda Denshi assumes no responsibility for an accident resulting from the lack of maintenance.

 CAUTION	
	<ul style="list-style-type: none">• Do not open the cabinet of the FX-7402.• Make sure that liquids such as alcohol do not spill into the interior of the FX-7402.

Daily checks

Perform the daily checks in accordance with Appendix B, "Daily Check Lists" (page 183). If any item in the daily check list fails to satisfy the required criteria, the overall judgment must also be "failed." Take corrective actions for failed items. Use the FX-7402 only after all items qualify as required.

Periodic checks

Periodic checks of medical electronic equipment are indispensable for prevention of faults and accidents and for the maintenance of safety and performance. For more information, contact your local Fukuda Denshi service representative.

If any item in Appendix C, "Periodic Check Lists" (page 184) fails, the overall judgment is also "failed." Take corrective actions for failed items. Use the FX-7402 only after all items qualify as required.

Cleaning and disinfecting

 CAUTION	
	Do not heat sterilize with water, steam, or air.

Electrodes (clips, cups, plates):

Use the following procedures for the electrodes.

Cleaning:

Use a cloth moistened with a household cleaning agent and wipe the entire electrode. Next, wipe with a clean cloth that is moistened with ordinary tap water and let electrodes dry.

Disinfecting:

Use a high level disinfecting solution, such as Cidex™. Follow the manufacturers disinfecting instructions.

 WARNING	
	Reusable electrodes may transport bacteria from one patient to another resulting in a risk of infection. Always disinfect reusable electrodes after each use.

Main unit and patient cables:

Use the following procedures for the external cabinet and patient cable.

Cleaning:

Use a cloth moistened with water that contains an ordinary household cleaning agent. Next, wipe with a clean cloth that is moistened with ordinary tap water and let the cabinet and cable dry.

Disinfecting:

Thoroughly spray the outside cabinet or patient cable with a high level disinfecting solution, such as Cidex™. Follow the manufacturers disinfecting instructions.

 CAUTION	
	Under no circumstances should the Patient Cable be immersed in any cleaning fluid. Do not spray any connector parts on main unit and patient cable. Do not use ether or benzene as it may damage the cabinet.

When You cannot Record an Accurate ECG

If accurate ECG samples cannot be obtained, check the following items and retry the operation:

1. Are the examination conditions appropriate?

- Make sure the FX-7402 is not used near devices that cause noise, such as X-ray units, ultrasonic equipment, cellular phone, or other electrical appliances. When there are such appliances nearby, turn off the power of those devices or move to another examination area where there will be no interference from those devices. If the patient's bed is made of metal, connect the ground for the bed.
- Make sure the temperature in the examination area is maintained at 20 to 25 degrees Celsius (68 to 77 degrees Fahrenheit).
- Make sure the examination area has low humidity conditions.

2. Is the power supply cord connected properly? (When using AC power supply)

- Make sure the plug is not loose.
- Make sure no other cables are touching the power supply cord.

3. Is the patient cable connected properly?

- Make sure the connector is not loose.
- Make sure the cable is kept away from the power supply cord.
- Make sure the lead tips of the patient cable are connected to the corresponding electrodes.

4. Are the electrode conditions satisfactory?

- Make sure fatty oil on the patient's skin (in contact with electrodes) is wiped off properly and Keratin cream has been applied.
- Make sure the electrodes are clean. If electrodes are dirty, wash them with alcohol or soapy water. If this does not remove dirt, lightly sandpaper the electrodes.
- Make sure the electrode attachment is not loose. If loose, tighten it properly. At this time, however, make sure the patient does not feel any pain.
- Make sure old and new electrodes or different types of electrodes are not used together.

5. Is the patient's condition satisfactory?

- Make sure the patient is comfortable. If the patient is tense, reassure him or her that the ECG examination is simple and harmless.

- Make sure the patient does not move or speak during the examination.
- Make sure the bed is not too small.
- Make sure the patient's arms or legs do not come in contact with metal parts of the bed.

6. Is enough paper in the machine?

- Make sure there is enough recording paper for the test.

When an Error Message is Displayed

If an error message appears during operation, take the required action.

Error messages related to the rechargeable battery

LOW BATTERY!

Cause:

The rechargeable battery is unable to provide the power needed for operation.

Action to be taken:

Charge the battery. See "Using the Battery" (page 38).

NO BATTERY!

Cause:

An attempt was made to charge the optional rechargeable battery pack, even though it is not installed.

Action to be taken:

Install the battery pack and then charge the battery. See "Using the Battery" (page 38).

Error messages related to the magazine and recording paper

MAGAZINE UP

Cause:

The magazine is open.

Action to be taken:

Make sure that the magazine cover is closed properly. See "Loading the Recording Paper" (pages 16 to 22).

NO PAPER

Cause:

The unit has run out of recording paper.

Action to be taken:

Load new recording paper. See "Loading the Recording Paper" (pages 16 to 22).

CHECK PAPER

Cause:

The paper cue mark cannot be detected, even though Z-fold paper is specified.

Action to be taken:

Display the SET UP MODE (ECG CONTROL) screen to check the PAPER TYPE parameter setting. To use a recording paper roll, set this parameter to ROLL and to use Z-fold paper, set it to Z-FOLD. See "Setting the Recording Paper Type" (page 32).

Error message related to ECG waveforms

QRS DETECT ERROR

Cause:

The recorded waveform cannot be analyzed during the Analysis Recording and Measurement Recording.

Action to be taken:

Check the condition of the electrodes and patient, then retry the operation.

Cause:

The measured waveform cannot be analyzed during the R-R Trend Test Recording.

Action to be taken:

Check the condition of the electrodes and patient, then change the test lead if necessary and retry the operation.

 See "When You Cannot Record an Accurate ECG" (page 176).

Error messages related to ECG data file

NO PC CARD

Cause:

The PC card is not inserted properly into the PC card drive.

Action to be taken:

Insert the PC card fully into the drive.

THIS CARD ISN'T SUPPORTED.**Cause:**

Either the PC card is not formatted or it has an incompatible format.

Action to be taken:

Check the PC card. If necessary, format the PC card once more. See "Initializing the PC Card" (page 96).

NO DATA**Cause:**

ECG data to be written to the PC card is not found.

Action to be taken:

Perform the ECG analysis recording or test, then write data. See "Writing ECG Data to the PC Card" (page 98).

Cause:

ECG data is not found on the PC card.

Action to be taken:

Insert a PC card in which contains ECG data.

NO CAPACITY**Cause:**

The data cannot be saved because there is not enough free space on the PC card.

Action to be taken:

Delete data which are no longer required to create more free space or use a PC card that has enough free space.

WRITE ERROR**Cause:**

An error occurred while data was being written to a PC card or during formatting of the card.

Action to be taken:

It is assumed the PC card or PC card drive has trouble. Contact your local Fukuda Denshi sales and service representative.

CAN'T READ THIS DATA**Cause:**

Attempt was made to read data which cannot be read by the FX-7402.

Action to be taken:

Use data which can be read by the FX-7402.

READ ERROR

Cause:

An error occurred while data was being read from a PC card.

Action to be taken:

It is assumed the PC card or PC card drive has trouble. Contact your local Fukuda Denshi sales and service representative.

DELETE ERROR

Cause:

An error occurred while data saved on a PC card was being deleted.

Action to be taken:

It is assumed the PC card or PC card drive has trouble. Contact your local Fukuda Denshi sales and service representative.

Error messages related to equipment control

SYSTEM ERROR

Cause:

An error occurred in the FX-7402.

Action to be taken:

Note the displayed error code (2-digit number preceded by a \$ sign) and turn OFF the FX-7402 immediately. Contact your local Fukuda Denshi sales and service representative and explain the error code.

RECORDER OVER HEAT

Cause:

Thermal recording head overheated.

Action to be taken:

Turn OFF the FX-7402 immediately. This is assumed to be a machine failure. Contact your local Fukuda Denshi sales and service representative and ask for repairs.

ECG AMP ERROR!

Cause:

ECG amplifier control failure.

Action to be taken:

Turn OFF the FX-7402 immediately. This is assumed to be a machine failure. Contact your local Fukuda Denshi sales and service representative and ask for repairs.

Appendix A. Specifications

Electrocardiograph

Leads:	Standard 12 leads
Sensitivity:	1/4, 1/2, 1, 2cm/mV, or automatic
Polarization voltage:	$\pm 550\text{mV}$ or greater
Frequency response:	0.05 to 150Hz
Time constant:	3.2 sec.
Common mode rejection:	2mmp-p or lower (103dB or more)
Input impedance:	50M ohms or greater
Input circuit current:	5×10^{-8} A or lower
Internal noise:	20 μ Vp-p or lower
Calibrated voltage:	1mV $\pm 2\%$ or lower
Sampling rate:	8000/Sec/CH
Filters	
AC filter:	-20dB or less at 50/60Hz
Muscle filter:	-3dB (-6dB/oct) at 25/35Hz
Drift filter:	-3dB or less at 0.25/0.5Hz
Recording system:	Thermal array head
Recording speed:	5, 10, 12.5, 25, 50mm/sec.
Recording resolution	
Deflection axis:	8 dots/mm
Time axis:	500 μ sec.
Recording channels:	3CH, 3CH+rhythm lead1, 3CH+rhythm lead2, 6CH, 6CH+rhythm lead1, 12CH
Recording paper	
Roll recording paper:	OP-69TE (210mm x 30M)
Z-fold paper:	OP-621TE (210mm x 100M)

Display

Type:	Liquid crystal display (LCD) with backlighting
Resolution:	320 dot (horizontal) x 240 dot (vertical)
Patient data:	ID number, age, sex, height, weight, etc.

Measurement operation

Basic measurement value: Heart rate, R-R time, P-R time, QRS time, QT time, QTc, electrical axis, SV1, RV5(6)

Analysis operation (When the PC-7403 program cartridge is installed)

Interpretation and code:	Approx. 110 types
Minnesota code:	Approx. 130 types
Grade judgment:	4 types
Exercise judgment:	3 types (REST status only)

General

Safety standard:	IEC60601-1 (Class I, type CF; Internally powered equipment, type CF)
Power supply	
AC power supply:	100 to 240V AC ($\pm 10\%$), 50/60Hz, Power consumption: 120VA 230V AC, 50/60Hz, Power consumption: 80VA
DC power supply:	Ni-MH battery (8/HRY-4/3AFD), Power consumption: 65W
Dimensions:	335mm (W) x 346mm (D) x 100mm (H) (13.18" x 13.6" x 3.9")
Weight:	Approx. 6kg (13.22 lbs.)

Operating environment

Temperature:	+10 to +40 degrees Celsius (50 to 104 degrees Fahrenheit)
Humidity:	25 to 95% (no condensation)
Atmospheric pressure:	70 to 106kPa (700 to 1060mbar)

Storage environment

Temperature:	-10 to +55 degrees Celsius (14 to 131 degrees Fahrenheit)
Humidity:	10 to 95% (no condensation)
Atmospheric pressure:	70 to 106kPa (700 to 1060mbar)

Appendix B. Daily Check List

Type of check	Check item	Procedure	Criterion
Visual check	Appearance	1. Exterior flaws, cracks, deformation, rust	Visually check for exterior flaws, cracks, deformation, and rust.
		2. Peeling off and dirt on nameplate and panel	Visually check for peeling off of nameplate and panel for dirt.
		3. Keys	Visually check for damage to keys.
	Accessories	1. Power supply cord, patient cable	Visually check for flaws and damages.
		2. Limb electrode, chest electrode	Visually check for dirt, rust, flaws, and damage.
		3. Recording paper	Check whether the recording paper is loaded properly.
		4. Operation Manual	Check whether the Operation Manual is being kept in its specified place.
Mechanical check	Main unit	1. Keys	The keys must operate smoothly.
		2. Recorder	The operation of the recorder must be smooth and no abnormal noise should be heard.
	Accessories	1. Power supply cord, patient cable	The power supply cord and patient cable must be connected firmly to the Cardimax FX-7402.
		2. Limb electrode, chest electrode	The limb electrodes and chest electrodes must be connected to the patient cables properly.
	Performance	1. Power supply	When the power is turned ON, the initial screen (power-on screen) must be displayed.
		2. Display	The LCD must display the waveforms on the waveform display screen.
		3. Recording	The waveforms must be printed.
		4. Recording speed: 25mm/s	The error of ten seconds must be within $\pm 3\%$ (24.25 to 25.75cm or 9.5" to 10.1").

Appendix C. Periodic Check List

Type of check	Check item	Procedure	Criterion
Visual check	Appearance	1. Exterior flaws, cracks, deformation, rust	Visually check for exterior flaws, cracks, deformation, and rust.
		2. Peeling off and dirt on nameplate and panel	Visually check for peeling off of the nameplate and panel and dirt.
		3. Keys	Visually check for damage to keys.
	Accessories	1. Power supply cord, patient cable	Visually check for flaws and damages.
		2. Limb electrode, chest electrode	Visually check for dirt, rust, flaws, and damage.
		3. Recording paper	Check whether the recording paper is loaded properly.
		4. Operation Manual	Check whether the Operation Manual is being kept in its specified place.
Mechanical check	Main unit	1. Keys	Make sure the keys operate smoothly.
		2. Recorder	Make sure the operation of the recorder is smooth and no abnormal noise can be heard.
	Accessories	1. Power supply cord, patient cable	Make sure the power supply cord and patient cable are connected firmly to the Cardimax FX-7402.
		2. Limb electrode, chest electrode	Make sure the limb electrodes and chest electrodes are connected properly to the patient cables.

Type of check	Check item	Procedure	Criterion
Self-diagnostics test	Performance	1. Recording speed	Execute the RECORDING TEST (MAINTENANCE menu) to make sure the paper feed condition is normal.
		2. Print condition	Execute the RECORDING TEST (MAINTENANCE menu) to make sure the printing condition is normal.
		3. Keys	Execute the KEY TEST (MAINTENANCE menu) to make sure the key operations are normal.
		4. Display	Execute the LCD TEST (MAINTENANCE menu) to check dots on the screen.
		5. Buzzer	Execute the BUZZER TEST (MAINTENANCE menu) to make sure a buzzer sound is emitted for 1 second upon pressing keys.
		6. CRT	Performs the CRT TEST (MAINTENANCE menu) to check the operation of an optional CRT connected to FX-7402.
	Others	1. Power supply	Make sure the FX-7402 can be turned ON and OFF during use of both AC power and rechargeable battery.
		2. Power supply cord	Check for continuity using a tester.
			The power supply cord must be conducting.

Appendix D. LAN communication function

1. Setting the Network Connection

This chapter provides an explanation of the procedure for configuration parameters for transmitting ECG data.

The network-based filing function provided by the FX-7402 uses the FTP protocol. Since the FX-7402 operates as an FTP client, a personal computer (PC) is required that is provided with an FTP server function when connected to the network. In this chapter, an explanation is provided using Windows 2000 Professional or Windows XP Professional as the OS of the PC.

The procedure may differ in the case of using a different PC provided with an FTP server function. Refer to Chapter 7 for information on the communication settings of the FX-7402.

Initial Network Setup

This section provides an explanation of the reference procedure for connecting the FX-7402 to a network using a PC at the facility where the FX-7402 is installed.

Notes:

- The setup procedure described below provides an example of setting up operation based on the default values of the FX-7402.

TCP/IP Setup (Windows 2000)

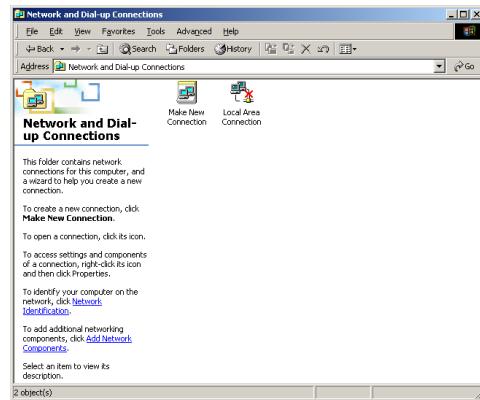
1 Open the Control Panel.

Click the [Start] button located in the lower left corner of the screen, and then open the Control Panel from the [Setup] menu.



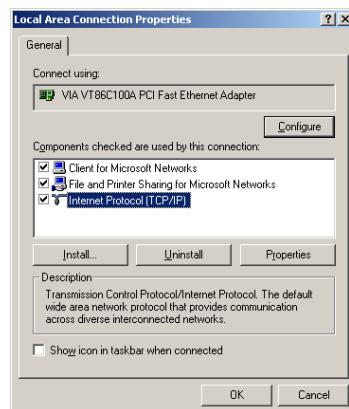
2 Display the [Local Area Connection Status] window.

Double-click on the [Network and Dialup Connections] icon of the control panel to display the [Network and Dialup Connections] window. Then double-click on [Local Area Connections] to display the [Local Area Connection Status Window].



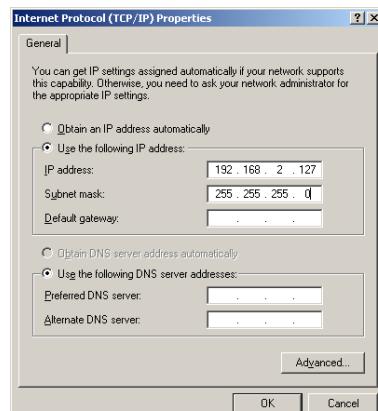
3 Display [Internet Protocol (TCP/IP) Properties].

Click on [Properties (P)] of the [Local Area Connection Status] window to display the [Local Area Connection Properties] window, and then click on [Properties (R)] after having selected the [Internet Protocol (TCP/IP)] list.



4 Set the IP Address.

Select the [Use the following IP address] radio button, enter [192.168.2.127] for the IP address and [255.255.255.0] for the subnet mask, and then click the [OK] button. Similarly, click the [OK] button of the [Local Area Connection Properties] window as well as the [Close (C)] button of the [Local Area Connection Status] window to close each window.





TCP/IP Setup (Windows XP)

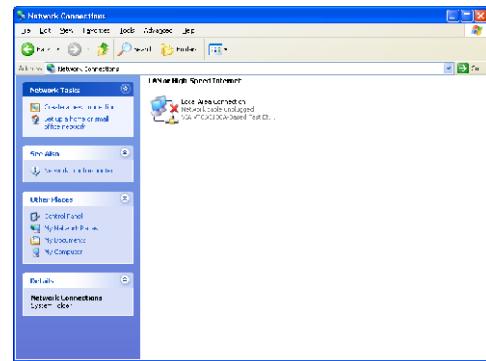
1 Open the Control Panel.

Click the [Start] button located in the lower left corner of the screen, and then open the Control Panel from the [Setup] menu.



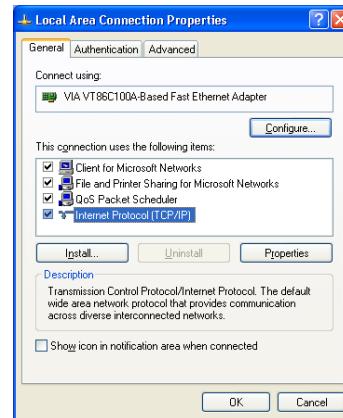
2 Display the [Local Area Connection Status] window.

Double-click on the [Network Connections] icon of the control panel to display the [Network Connections] window. Then double-click on the [Local Area Connections] list to display the [Local Area Connection Status Window].



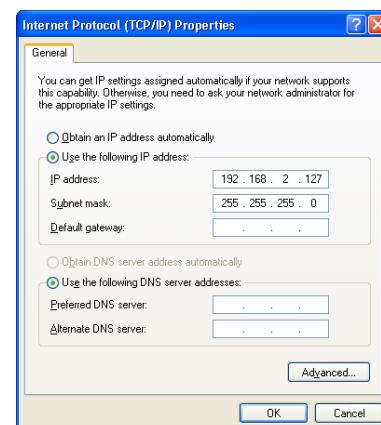
3 Display [Internet Protocol (TCP/IP) Properties].

Click on [Properties (P)] of the [Local Area Connection Status] window to display the [Local Area Connection Properties] window, and then click on [Properties (R)] after having selected the [Internet Protocol (TCP/IP)] list.



4 Set the IP Address.

Select the [Use the following IP address] radio button, enter [192.168.2.127] for the IP address and [255.255.255.0] for the subnet mask, and then click the [OK] button. Similarly, click the [OK] button of the [Local Area Connection Properties] window as well as the [Close (C)] button of the [Local Area Connection Status] window to close each window.



Network Connection Setup

This section provides an explanation of the procedure for setting up the FTP server connection using Internet Service Manager (IIS). Please refer to the other procedure if you do not use IIS.

Notes:

- The following procedure is to be performed by a user that has an administrator privilege.

Installing the FTP Server (Windows 2000)

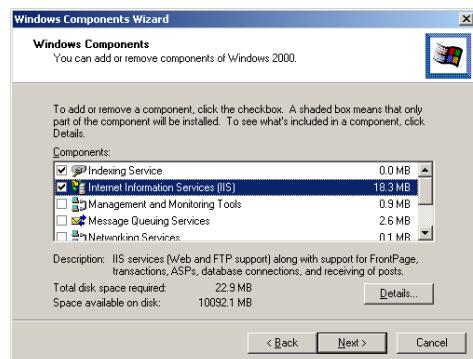
1 Open the Control Panel.

Click the [Start] button located in the lower left corner of the screen, and then open the Control Panel from the [Setup] menu.



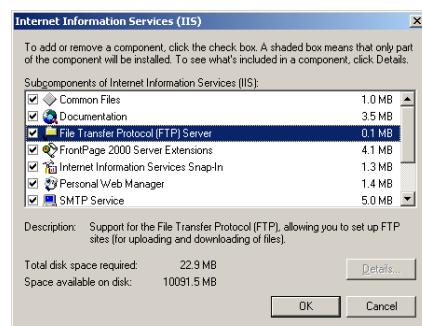
2 Display the [Windows Component Wizard].

Double-click on the [Add/Remove Programs] icon of the control panel to display the [Add/Remove Programs] window. Then click on the [Add/Remove Windows Components] icon to the left of that window to display the [Windows Component Wizard].



3 Select the FTP server.

Click on the [Details] button after having selected Internet Information Service (IIS) to display the [Internet Information Service (IIS)] window of the Internet Information Service (IIS), check the check box of the File Transfer Protocol (FTP) server, and then click the [OK] button to close the window.



4 Complete installation.

Click the [Next] button after returning to the Windows Component Wizard to install the selected component. A window confirming completion of installation will be displayed after a short while. Click the [Finish] button to complete installation of the FTP server.

Setting Up the FTP Server (Windows 2000)

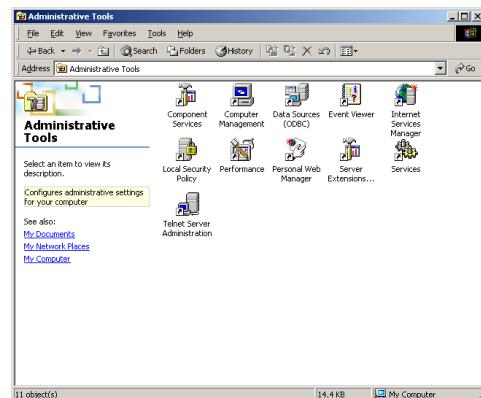
1 Open the Control Panel.

Click the [Start] button located in the lower left corner of the screen, and then open the Control Panel from the [Setup] menu.



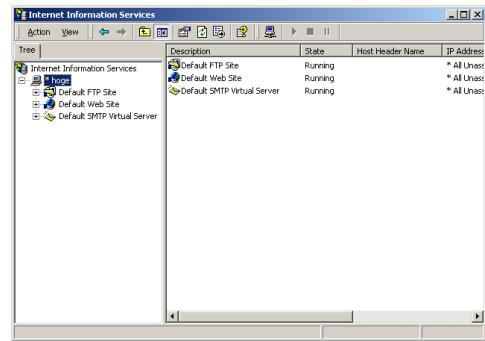
2 Display the [Administrative Tools] window.

Double-click on the [Administrative Tools] icon of the control panel to display the [Administrative Tools] window.



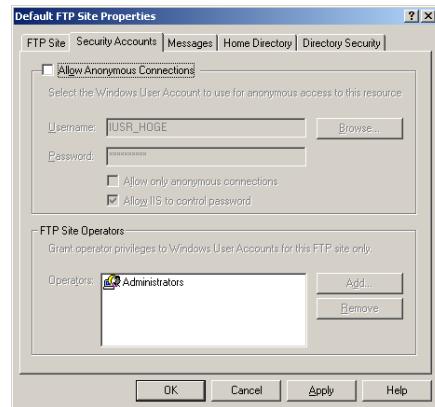
3 Display [Internet Information Service].

Double-click on the [Internet Service Manager] icon of the [Administrative Tools] window to display the [Internet Information Service] window. Then expand the icon of the computer displayed to the left to display the [Default FTP Site].



4 Set the security account.

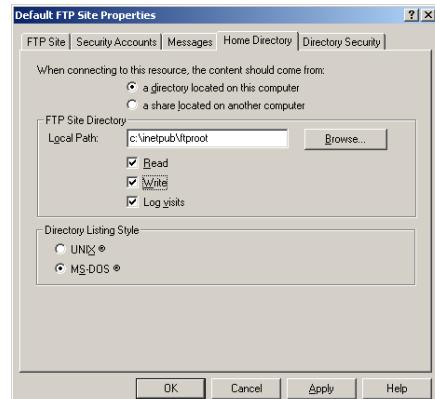
Right-click on [Default FTP Site] and select [Properties] to display the [Default FTP Site Properties] window, and then select the [Security Accounts] tab. Remove the [Allow Anonymous Connections] check box.



5 Set the home directory.

Select the [Home Directory] tab of the [Default FTP Site Properties] window. Check the [Write (W)] check box for setting the [FTP Site Directory]. The folder where data transmitted from the FX-7402 is stored is indicated as a local path. Set this as necessary (it may also be left at the default setting).

Click the [OK] button to complete setup of the FTP server.



Installing the FTP Server (Windows XP)

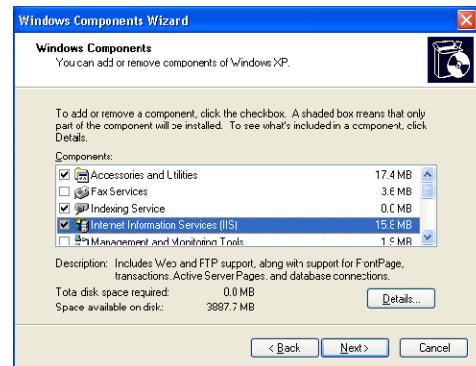
1 Open the Control Panel.

Click the [Start] button located in the lower left corner of the screen, and then open the Control Panel from the [Setup] menu.



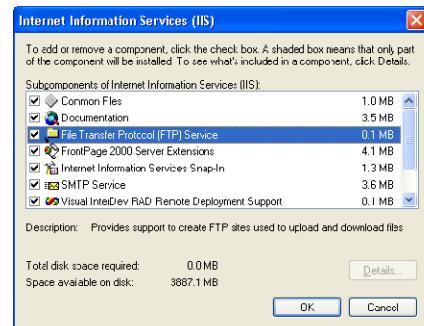
2 Display the [Windows Component Wizard].

Double-click on the [Add/Remove Programs] icon of the control panel to display the [Add/Remove Programs] window. Then click on the [Add/Remove Windows Components] icon to the left of that window to display the [Windows Component Wizard].



3 Select the FTP server.

Click on the [Details] button after having selected Internet Information Service (IIS) to display the [Internet Information Service (IIS)] window of the Internet Information Service (IIS), check the check box of the File Transfer Protocol (FTP) server, and then click the [OK] button to close the window.



4 Complete installation.

Click the [Next] button after returning to the Windows Component Wizard to install the selected component. A window confirming completion of installation will be displayed after a short while. Click the [Finish] button to complete installation of the FTP server.

Setting Up the FTP Server (Windows XP)

1 Open the Control Panel.

Click the [Start] button located in the lower left corner of the screen, and then open the Control Panel from the [Setup] menu.



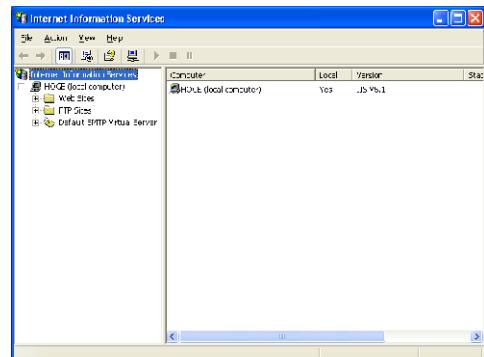
2 Display the [Administrative Tools] window.

Double-click on the [Administrative Tools] icon of the control panel to display the [Administrative Tools] window.



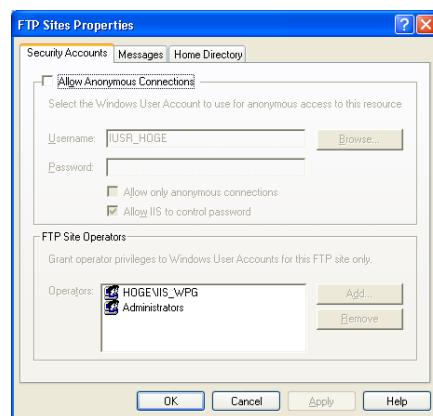
3 Display [Internet Information Service].

Double-click on the [Internet Service Manager] icon of the [Administrative Tools] window to display the [Internet Information Service] window. Then expand the icon of the computer displayed to the left to display the [Default FTP Site].



4 Set the security account.

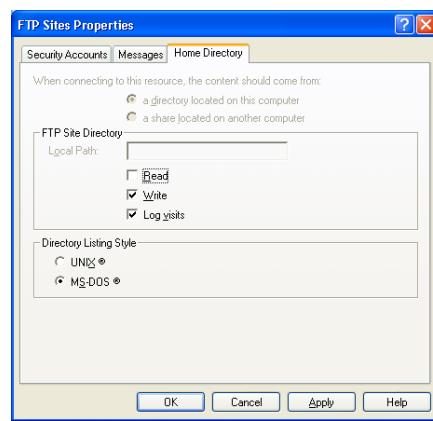
Right-click on [Default FTP Site] and select Properties to display the [FTP Site Properties] window, and then select the [Security Account] tab. Remove the [Allow Anonymous Connections] check box.



5 Set the home directory.

Select the [Home Directory] tab of the [FTP Site Properties] window. Check the [Write (W)] check box for setting the [FTP Site Directory]. The folder where data transmitted from the FX-7402 is stored is indicated as a local path. Set this as necessary (it may also be left at the default setting).

Click the [OK] button to complete setup of the FTP server.



2. ECG Data

The following provides an explanation of the ECG data sent as a reply from the FX-7402 to the PC.

Data can be output in either Fukuda Original format or SCP-ECG (Standard Communications Protocol for Computer-Assisted Electrocardiography) format. Use Set Up mode to select the format.

Data in Fukuda Original format can only be viewed on a PC with EFS-200 installed. The SCP-ECG format is compliant with the IEC 62D/443/NP protocol (proposed on August 17, 2001).

An explanation of the SCP-ECG format output by the FX-7402 is given below.

List of SCP-ECG Data Structures

Data Structures of 12-Lead Electrocardiograms

Record Header	Checksum CCITT over the entire record	
Record Header	Size of the entire ECG record (in bytes)	
Section 0	Pointers to data areas in the record	
Section 1	Header Information Patient data / ECG acquisition data	
Section 3	ECG Lead definition	
Section 6	Encoded rhythm data	
Section 7	Global measurements	
Section 8	Textual diagnosis from the "INTERPRETIVE" device	PC-7403
Section 10	Lead measurement results	

Data Structures of Arrhythmia ECG Mode

PC-7403

Record Header	Checksum CCITT over the entire record
Record Header	Size of the entire ECG record (in bytes)
Section 0	Pointers to data areas in the record
Section 1	Header Information Patient data / ECG acquisition data
Section 3	ECG Lead definition
Section 6	Encoded rhythm data
Section 7	Global measurements
Section 8	Textual diagnosis from the "INTERPRETIVE" device
Section 10	Lead measurement results

Data Structures of R-R Trend Test Mode

Record Header	Checksum CCITT over the entire record
Record Header	Size of the entire ECG record (in bytes)
Section 0	Pointers to data areas in the record
Section 1	Header Information Patient data / ECG acquisition data
Section 3	ECG Lead definition
Section 6	Encoded rhythm data
Section 128	Lead measurement results (only for R-R Trend Test Mode)

Section Configurations

This section provides an explanation of the data of each section set with the FX-7402. Explanations are omitted for those sections for which data has already been set by SCP-ECG.

Section 0

This section contains data that has already been set by SCP-ECG.

Section 1

This section contains data that already been set by SCP-ECG. Since tag information is set in section 1, an explanation is only provided for tag data set with the FX-7402.

List of Tags Used

Tag No.	Description	
0	Name	Since the FX-7402 does not distinguish between first name and last name, name information is set here.
2	Patient ID	
4	Age	
5	Date-of-birth	
6	Height	
7	Weight	
8	Sex	
9	Race	
10	Drugs	
11	Systolic blood pressure	
12	Diastolic blood pressure	
14	Machine ID Acquiring Device	
15	Machine ID Analyzing Device	PC-7403

Tag No.	Description	
16	Acquiring Institution Description	
17	Analyzing Institution Description	PC-7403
18	Acquiring Department Description	
19	Analyzing Department Description	PC-7403
20	Referring Physician	
21	Latest Confirming Physician	
22	Technician Description	
25	Date of Acquisition	
26	Time of Acquisition	
27	Baseline Filter	
28	Low-pass Filter	
29	Filter Bit Map	
30	Free Text Field	
200	Affiliation	FX-7402 original data
201	Avg. blood pressure	FX-7402 original data
202	Medication information 2	FX-7402 original data
203	Subjective symptoms	FX-7402 original data
204	BMI	FX-7402 original data
205	Presentation	FX-7402 original data
206	Respiration rate	FX-7402 original data
207	Load category	FX-7402 original data
208	Load information	FX-7402 original data
209	Terminal no.	FX-7402 original data
210	Physician name	FX-7402 original data
211	Name of correcting person	FX-7402 original data
212	Correction date	FX-7402 original data
213	Correction time	FX-7402 original data
214	Order no.	FX-7402 original data
254	Comments	FX-7402 original data
255	None (demographic section terminator)	

The following provides an explanation of FX-7402 original data.

TAG	LENGTH	VALUE (Parameter data)																								
200	96	Additional affiliation data (Text Character) <table border="1" data-bbox="742 265 1291 467"> <tr> <td>Byte</td><td>Contents</td></tr> <tr> <td>1-32</td><td>Affiliation 2</td></tr> <tr> <td>33-64</td><td>Affiliation 3</td></tr> <tr> <td>65-96</td><td>Affiliation 4</td></tr> </table>	Byte	Contents	1-32	Affiliation 2	33-64	Affiliation 3	65-96	Affiliation 4																
Byte	Contents																									
1-32	Affiliation 2																									
33-64	Affiliation 3																									
65-96	Affiliation 4																									
201	2	Avg. blood pressure (binary)- units: mmHg																								
202	Arbitrary	Medication information (Text Character)																								
203	Arbitrary	Subjective symptoms (Text Character)																								
204	4	BMI (binary) <table border="1" data-bbox="742 660 1244 862"> <tr> <td>Byte</td><td>Contents</td></tr> <tr> <td>1-2</td><td>BMI</td></tr> <tr> <td>3</td><td>Location of decimal point</td></tr> <tr> <td>4</td><td>Reserved</td></tr> </table>	Byte	Contents	1-2	BMI	3	Location of decimal point	4	Reserved																
Byte	Contents																									
1-2	BMI																									
3	Location of decimal point																									
4	Reserved																									
205	2	Presentation (binary)																								
206	2	Respiration rate (binary)																								
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212	6	Correction date (binary) <table border="1" data-bbox="742 2093 1244 2138"> <tr> <td>Byte</td><td>Contents</td></tr> </table>	Byte	Contents																						
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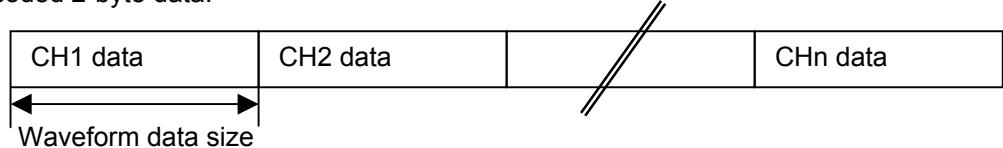
TAG	LENGTH	VALUE (Parameter data)		
		1-2	Correction year	
		3-4	Correction month	
		5-6	Correction date	
213	6	Correction time (binary)		
		Byte	Contents	
		1-2	Correction hours	
		3-4	Correction minutes	
		5-6	Correction seconds	
214	256	Order no. (Text Characters)		
		Byte	Contents	
		1-128	Order no. 1	
		129-256	Order no. 2	
254	Arbitrary	Comments (Text Characters)		

Section 3

This section contains data that has already been set by SCP-ECG.

Section 6

This section contains data that has already been set by SCP-ECG. Furthermore, waveform data is set in the manner shown below. Waveform data is indicated with coded 2-byte data.



Section 7

This section contains data that has already been set by SCP-ECG.

Section 8

This section contains data that has already been set by SCP-ECG.

Section 10

This section contains data that has already been set by SCP-ECG. In addition, 56 bytes of data are also set as information specified by the manufacturer. The contents of information specified by the manufacturer are as shown below. Furthermore, all data is in the form of coded 2-byte data, and the initial value is 0.

LENGTH	VALUE (Parameter data)
2	R-R time (binary)
2	P-R time (binary)
2	QRS time (binary)
2	ST1 time (binary) * This differs from the ST1 time of SCP-ECG.
2	ST2 time (binary) * This differs from the ST2 time of SCP-ECG.
2	ST3time (binary) * This differs from the ST3 time of SCP-ECG.
2	QRS peak-to-peak (binary)
2	FVT time (binary)
2	VAT1 time (binary)
2	VAT2 time (binary)
2	Noise value (binary)
2	QTc time (binary)
2	U wave amplitude (binary)
2	Notch (binary)
2	Noise level (binary)
2	Defective recording information (binary)
2	Trigger point (binary)
2	P wave beginning point (binary)
2	P wave ending point (binary)
2	QRS wave beginning point (binary)
2	QRS wave ending point (binary)
2	T wave beginning point (binary)
2	T wave ending point (binary)
2	Next R-R (binary)
2	Pre-compensation value (binary)
2	Post-compensation value (binary)
2	ST measurement interval (binary)
2	Reserved (binary)

Section 128

This is an original section that has not already been set by SCP-ECG, and is set for only the R-R Trend Test Mode. Contents relating to measured values of the R-R Trend Test Mode are set in section 128.

The following provides an explanation of the data of section 128.

LENGTH	VALUE (Parameter data)
600	Typical measured value
608	R-R histogram data
150	Heart beat flag 1
Arbitrary	R wave position
Arbitrary	R-R time
Arbitrary	Heart beat flag 2
Arbitrary	Heart beat flag V
Arbitrary	Heart beat flag A

The following provides an explanation of individual data.

Typical Measured Value Data

LENGTH	VALUE (Parameter data)
2	Sampling interval (binary) Sampling interval is set in μ sec units with coded 2-byte data.
2	Test time (binary) Test time is set in second units with coded 2-byte data.
2	No. of test R waves (binary) The number of R waves detected during the testing time is set with coded 2-byte data.
2	Average heart rate (binary) Average heart rate is set with coded 2-byte data.
2	Average R-R time (binary) Average R-R time is set with coded 2-byte data.
2	Maximum R-R time (binary) Maximum R-R time is set with coded 2-byte data.
2	Minimum R-R time (binary) Minimum R-R time is set with coded 2-byte data.
2	Maximum/minimum R-R time (binary) The ratio of maximum R-R time to minimum R-R time is set with coded 2-byte data.
2	Standard deviation (binary) The standard deviation of R-R interval is set with coded 2-byte data.
2	Coefficient of variation (binary) The coefficient of variation of R-R interval is set with coded 2-byte data.
2	Test conditions (binary) The test conditions of the R-R Trend Test Mode are set. -1: Undefined 0: 1 min. 1: 2 min. 2: 3 min. 3: 4 min. 4: 5 min. 5: 100 beats 6: 200 beats 7: 40 sec. 8: 6 min. 9: 7 min. 10: 8 min. 11: 9 min. 12: 10 min.
2	Respiration rate (binary) Respiration rate is set with coded 2-byte data.
2	Presentation (binary) The presentation is set. -1: Undefined 1: Lying 2: Sitting 3: Standing
2	Analysis sampling unit (binary) The analysis sampling unit during R-R measurement is set in μ sec units with coded 2-byte data.
2	Analysis version no. (binary) The analysis version used during R-R measurement is set.
30	Reserved

R-R Histogram Data

LENGTH	VALUE (Parameter data)	
4	Data for R-R interval of less than 30 seconds (binary)	
	Byte	Contents
	1-2	No. of data records
	3-4	Ratio (units: %)
4	Data for R-R interval of 0.30 to less than 0.31 seconds (binary)	
	Byte	Contents
	1-2	No. of data records
	3-4	Ratio (units: %)
4	Data for R-R interval of 0.31 to less than 0.32 seconds (binary)	
	Byte	Contents
	1-2	No. of data records
	3-4	Ratio (units: %)
Data is similarly set in 0.01 second intervals.		
4	Data for R-R interval of 1.79 to less than 1.80 seconds (binary)	
	Byte	Contents
	1-2	No. of data records
	3-4	Ratio (units: %)
4	Data for R-R interval of 1.80 seconds or longer (binary)	
	Byte	Contents
	1-2	No. of data records
	3-4	Ratio (units: %)

Heart Beat Flag

Heart beats are set as being normal or abnormal for up to 1200 detected beats from the start of testing. When a heart beat has been judged to be abnormal, a "1" is set for the corresponding BIT. An example of the manner in which data is set is as shown below.

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
1st beat	2nd beat	3rd beat	4th beat	5th beat	6th beat	7th beat	8th beat
1st byte		2nd byte				150th byte	
Beats 1-8		Beats 9-16				Beats 1193-1200	

R Wave Position

The position of the detected R wave is set. Information on R wave position is set in several sets of detected R waves.

LENGTH	VALUE (Parameter data)
2	Parameter length (binary) The size of the data set for R wave position information is set with coded 2-byte data.
4 x No. of R waves	R wave position (binary) R wave position from the start of testing is set in msec units in the order of detection with non-coded 4-byte data.

R-R Time

The R-R time is set based on the detected R waves. Information on R-R time is set for several sets of detected R-R times.

LENGTH	VALUE (Parameter data)
2	Parameter length (binary) The size of data set for R-R time information is set with coded 2-byte data.
2 x No. of R-R Times	R-R time (binary) R-R time is set in msec units in the order of detection with non-coded 2-byte data.

Heart Beat Flag 2

Data is set for whether a detected heart beat is normal or abnormal. Differing from the previously described Heart Beat Flag, information is set for the entire duration of testing. The size of heart beat flag 2 is set for the first 2 bytes of Heart Beat Flag 2. The data configuration of heart beat flag 2 is the same as that of the Heart Beat Flag.

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
1st beat	2nd beat	3rd beat	4th beat	5th beat	6th beat	7th beat	8th beat
1st byte		2nd byte				Nth byte	
Beats 1-8		Beats 9-16				Beats n-7 to n	

Heart Beat Flag V

Data is set for whether a detected heart beat is PVC. The size of Heart Beat Flag V is set for the first 2 bytes of heart beat flag V. When a detected heart beat has been judged to be PVC, a "1" is set for the corresponding BIT. The data configuration of Heart Beat Flag V is the same as that of Heart Beat Flag 2.

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
1st beat	2nd beat	3rd beat	4th beat	5th beat	6th beat	7th beat	8th beat
1st byte		2nd byte		Nth byte			
Beats 1-8		Beats 9-16				Beats n-7 to n	

Heart Beat Flag A

Data is set for whether a detected heart beat is PAC. When a detected heart beat has been judged to be PAC, a "1" is set for the corresponding bit. The data configuration of Heart Beat Flag A is the same as that of Heart Beat Flag 2.

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
1st beat	2nd beat	3rd beat	4th beat	5th beat	6th beat	7th beat	8th beat
1st byte		2nd byte		Nth byte			
Beats 1-8		Beats 9-16				Beats n-7 to n	

Glossary

Backup battery:

A NiMH battery used for retaining clock data. For replacement, contact your local Fukuda Denshi service representative.

Coefficient of variation (CV):

The R-R Trend Test Mode measures the R-R interval of the sampled ECG waveform and calculates the coefficient of variation using the following formula:

$$\text{Coefficient of variation (CV)} = \frac{\text{Standard deviation}}{\text{Average RR}} \times 100\%$$

Dominant waveform:

Removes beats suspected to be a premature beat, beats with baseline disturbance, and noise used for measuring each waveform (P wave, R wave, etc.) among the ECG waveforms sampled for 12-lead analysis, picks the best beat as a typical waveform. This is called a dominant waveform.

The Dominant waveform is used to calculate the following parameters in Analysis and Measurement Recording:

P-R, QRS, QTc, AXIS, RV5(6), SV1, and R+S.

For a complete discussion of waveform parameters, see the supplied "Program Guide Book" (PI-13).

Electrical axis:

The FX-7402 calculates the electrical axis of the QRS complex using the following formula:

$$\text{Electrical axis (}^\circ\text{)} = \text{Tan}^{-1}\left(\frac{\sqrt{3} (\text{II} + \text{III})}{2 \times \text{I} + \text{II} - \text{III}}\right)$$

Filter:

Noise such as AC interference (50/60Hz), electromyogram (25Hz or more), and drift (0.5Hz or less) may become mixed with the ECG signal. The filters can eliminate such noise. The FX-7402 performs digital processing using a microcomputer. Note, however, when the muscle filter is used, the amplitude of the QRS complex could be reduced.

Heart rate indication:

The FX-7402 displays the heart rate on the screen. The lead specified for the RHYTHM LEAD 1 parameter (SET UP MODE (STANDARD ECG MODE)) is used and the average of 4 beats is calculated. This value is displayed as the heart rate.

Histogram:

Displayed on the R-R trend test result report. The measured R-R interval is indicated on the horizontal axis and its frequency is indicated as a percentage on the vertical axis.

A histogram picks up only the normal beats from all the R-R intervals measured, and represents these normal beats in a graph.

Minnesota code:

The Minnesota code was developed by the University of Minnesota in the U.S., and is designed so the 12-lead ECG can be classified objectively by a common standard. For details about the Minnesota code, see the supplied "Program Guide Book" (PI-18).

Standard deviation (SD):

The R-R Trend Test Mode measures the R-R interval of the sampled ECG waveform and calculates the standard deviation using the following formula:

$$\text{Standard deviation (SD)} = \sqrt{\frac{\sum_{n=1}^N (\text{RR}_n - \text{Average RR})^2}{N}}$$

Transitional zone:

Normally, the R wave gradually becomes larger from the V1 lead to V6 lead, and the S wave gradually becomes shallow. The lead portion where the R wave and S wave are nearly equal is called the transitional zone.

Trend graph:

Displayed on the R-R trend test result report. The elapsed time is indicated on the horizontal axis and the measured R-R interval is indicated on the vertical axis.

A trend graph represents all R-R intervals measured in a graphic format.

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