cardiofax V

ELECTROCARDIOGRAPH

ECG-9320K

0614-002451I

CONTENTS

General Handling Precautions i
EMC Related Caution iii
Caution iv
Conventions Used in this Manual and Instrument v
◆Warnings, Cautions and Notes v
◆Explanation of the Symbols in this Manual/Instrument v

Section 1 Introduction 1.C1
1-1 General 1.1
1-2 Important Safety Information 1.2
1-3 Panel Descriptions 1.3
1-3-1 Top View 1.3
1-3-2 Operation Panel 1.4
1-3-3 Front Panel 1.6
1-3-4 Rear Panel 1.8
1-3-5 Input Box Set 1.10
1-4 Basic Screen and Menu Window 1.11
1-4-1 Basic Screen 1.11
1-4-2 Menu Window 1.15
1-5 Functions of Each Screen and Window 1.16
1-6 Basic Operation Concept 1.17

Section 2 Installation and Start Up 2.C1
2-1 Selecting a Suitable Location 2.1
2-2 Connecting the Input Box 2.2
2-3 Charging the Built-in Battery 2.5
2-4 Setting the Recording Paper 2.6
2-4-1 Z-fold Recording Paper 2.6
2-4-2 Roll Recording Paper 2.10
2-5 Preparing the IC Memory Card, Flash Disk Card and Floppy Disk 2.11
2-5-1 Precautions when Using IC Memory Card / Flash Disk Card 2.11
2-5-2 How to Insert Battery into IC Memory Card 2.12
2-5-3 Inserting and Removing the IC Memory Card / Flash Disk Card 2.15
2-5-4 Inserting and Removing the Floppy Disk 2.18
2-6 Grounding and Connecting the Power Cord 2.19
2-7 Turning the Power On 2.20
2-7-1 Operating on AC Power 2.20
2-7-2 Operating on Battery Power 2.21

2-8 Calling Up the Menu Window 2.22
2-9 Preparation for the Automatic ECG Filing and Transferring 2.23
2-10 Receiving, Saving and Printing Files 2.24
2-10-1 General 2.24
2-10-2 Preparation to Receive and Record Files 2.24
2-10-3 Handling Received Files 2.25
2-10-4 Running Out of Paper and Other Printing Interruptions when Printing without Saving 2.26
2-11 Changing a Program 2.28
2-12 Initializing a Barcode Reader 2.29

Section 3 Changing Settings Before Measurement (System Setup Window) 3.C1
3-1 Explanation and List of All Setting Items 3.1
3-1-1 General 3.1
3-1-2 Complete List of Settings and Defaults 3.2
3-2 How to Change Settings 3.11
3-3 Printing a List of All Settings 3.13
3-4 Registering or Editing Examinations (Menu Setup Window) 3.14
3-5 Examination Types (Standard 12-lead and Cabrera Lead, Nehb Lead and External Input) and Settings 3.17
3-5-1 Setting Items for Each Examination Type 3.17
3-5-2 Manual Recording (All Examination Types) 3.19
3-5-3 Auto Recording (Standard 12-lead, Cabrera Lead, Nehb Lead Only) 3.21
3-5-4 Rhythm Recording (Standard 12-lead, Cabrera Lead, Nehb Lead Only) 3.25
3-5-5 Post-processing (Standard 12-lead, Cabrera Lead, Nehb Lead Only) 3.26
3-5-6 Report Recording (Standard 12-lead, Cabrera Lead, Nehb Lead Only) 3.27
3-5-7 Rhythm Lead (Standard 12-lead, Cabrera Lead, Nehb Lead Only) 3.31
3-5-8 EXTRA 6 Ch Lead (Standard 12-lead and Cabrera Lead Only) 3.33
3-5-9 Lead Selection (External Signal Only) 3.33
3-5-10 Slow Recording/Hi Cut Filter (All Examination Types) 3.34
3-5-11 Power Up (All Examination Types) 3.35
3-5-12 Requesting Phys. Registration (All Examination Types) 3.38
3-6 Settings for Patient Data Entry 3.39
3-7 Settings for ID Card 3.41
3-8 Settings for Barcode 3.43
3-9 Settings for Communication 3.45
3-10 Settings for Data Compression and Drive 3.46
3-11 Settings for Program and Hospital Name 3.47
3-12 Settings for Sound 3.48

3-13 Settings for Recorder and AC Filter 3.50
3-14 Settings for Language and LCD 3.51
3-15 Settings for Summary Data Creation 3.52
3-16 Settings for Date and Time 3.53
3-17 Settings for Height, Weight and Blood Pressure 3.54
3-18 Saving/Loading the System Settings 3.55
3-18-1 Saving the System Settings in the Memory Card or Floppy Disk 3.55

Section 4 Entering the Patient Information . 4.C1
4-1 General 4.1
4-2 Using the Keyboard and Numeric Keypad 4.3
4-2-1 Procedure 4.3
4-2-2 Keyboard and Numeric Keypad 4.4
4-2-3 Procedures to Enter the Patient Information for Each Item 4.5
4-3 Using the Magnetic Card Reader 4.8
4-4 Using the Barcode Reader 4.8
4-5 Using the Data Filing System 4.9
4-6 Patient Index Database (ID Data File) 4.10

Section 5 Preparing the Patient 5.C1
5-1 Attaching the Electrodes for Standard 12 Lead ECG and Cabrera Lead ECG Recording 5.1
5-2 Attaching the Electrode for Nehb Lead ECG Recording 5.3
5-3 Patient Cable Tip Color Coding 5.4
5-4 Lead Connection 5.5
5-5 Error Indication when the Electrode is Not Attached Firmly .. 5.6

Section 6 Measuring Resting ECG Waveforms 6.C1
6-1 General 6.1
6-1-1 Available Recordings and Operation Tools 6.1
6-1-2 Notes for Accurate Measurement 6.3
6-2 Standard 12 Lead ECG Recording and Cabrera Lead ECG Recording 6.4
6-2-1 General 6.4
6-2-2 Factory Default Settings 6.5
6-2-3 Automatic Recording 6.8
6-2-4 Manual Recording 6.10
6-2-5 Rhythm Recording 6.13
6-3 Nehb Lead ECG Recording 6.14
6-3-1 General 6.14
6-3-2 Factory Default Settings 6.14
6-3-3 Automatic Recording 6.17

6-3-4 Manual Recording 6.19
6-3-5 Rhythm Recording 6.20
6-4 Recording a Summary Report 6.21
6-4-1 General 6.21
6-4-2 Recording Procedure 6.22
6-5 Recording Examples 6.23

Section 7 Recording the External Signal 7.C1
7-1 General 7.1
7-2 Recording Procedure 7.3
7-2-1 Freeze Recording 7.3
7-2-2 Manual Recording 7.4

Section 8 Managing Saved Files 8.C1
8-1 General 8.1
8-2 Calling Up the Data Management Screen 8.4
8-3 Searching for Files 8.5
8-4 Selecting Files 8.7
8-5 Serial Comparison Recording
(Recording the Files Chronologically) 8.7
8-6 Recording Files 8.8
8-6-1 Recording Files 8.8
8-6-2 Recording Files with Changing the Recording Format . 8.8
8-7 Transferring Files 8.11
8-8 Editing Files 8.12
8-8-1 Retrieving Files and Selecting Operations 8.12
8-8-2 Editing Patient Information 8.14
8-8-3 Analyzing Retrieved ECG Waveforms 8.15
8-8-4 Recording the Retrieved Files 8.15
8-8-5 Closing the File Edit Window 8.16
8-9 Deleting Files 8.17
8-10 Copying Files 8.19
8-11 Formatting an IC Memory Card and Floppy Disk 8.21
8-11-1 Formatting the IC Memory Card 8.21
8-11-2 Formatting the Floppy Disk 8.23

Section 9 Troubleshooting and Error Messages 9.C1
9-1 Recording Clear ECG Waveforms 9.1
9-1-1 AC Interference 9.1
9-1-2 Muscle Tremor Interference (EMG) 9.2
9-1-3 Wandering Baseline 9.2
9-1-4 Abnormal Printout 9.3
9-2 Troubleshooting 9.4
9-3 Error Message 9.6

Section 10 Maintenance 10.C1

10-1 Cleaning and Disinfection 10.1
10-1-1 Cleaning Schedule 10.1
10-1-2 Cleaning 10.1
10-1-3 Disinfecting the Electrodes 10.2
10-1-4 Cleaning the Thermal Head 10.2
10-1-5 Cleaning the Floppy Disk Drive Unit 10.3
10-2 Testing the System 10.4
10-3 Periodically Replacement Schedule 10.4

Section 11 Reference 11.C1

11-1 Specifications 11.1
11-2 Standard Accessories 11.4
11-3 Options 11.5
11-3-1 Hardware Options 11.5
11-3-2 Software Options 11.6
11-4 Slave Monitor Interface Board 11.7
11-5 Attaching the Ferrite Core 11.8

GENERAL HANDLING PRECAUTIONS

This device is intended for use only by qualified medical personnel. Use only Nihon Kohden approved products with this device. Use of non approved products or in a non approved manner may affect the performance specifications of the device. This includes, but is not limited to, batteries, recording paper, pens and extension cables and cords for electrodes, input boxes and AC power.

Please read these precautions thoroughly before attempting to operate the instrument.

1. **To safely and effectively use the instrument, its operation must be fully understood.**

2. **When installing or storing the instrument, take the following precautions**:
   (1) Avoid moisture or contact with water, extreme atmospheric pressure, excessive humidity and temperatures, poorly ventilated areas, and dusty saline or sulphuric air.
   (2) Place the instrument on an even, level floor. Avoid vibration and mechanical shock even during moving.
   (3) Avoid placing in an area where chemicals are stored or where there is danger of gas leakage.
   (4) The power line source to be applied to the instrument must correspond in frequency and voltage to specifications, and have sufficient current capacity.
   (5) Choose a room where a proper grounding facility is available.

3. **Before Operation**
   (1) Check that the instrument is in perfect operating order.
   (2) Check that the instrument is grounded properly.
   (3) Check that all cords are connected properly.
   (4) Pay extra attention when the instrument is in combination with other instruments to avoid misdiagnosis or other problems.
   (5) All circuitry used for direct patient connection must be doubly checked.
   (6) Check that battery voltage and battery condition are perfect when using battery-operated models.

4. **During Operation**
   (1) Both the instrument and the patient must receive constant, careful attention.
   (2) Turn power off or remove electrodes and/or transducers when necessary to assure the patient's safety.
   (3) Avoid direct contact between the instrument and the patient.

5. **To Shutdown After Use**
   (1) Turn power off with all controls returned to their original positions.
   (2) Remove the cords gently; do not use force to remove them.
   (3) Clean the instrument together with all accessories to keep them ready for their next use.

6. **The instrument must receive expert, professional attention for maintenance and repairs. When the instrument is not functioning properly, it should be clearly marked to avoid operation while it is out of order.**

7. **The instrument must not be altered or modified in any way.**

8. **Maintenance and Inspection**:
   (1) The instrument and parts must undergo regular maintenance inspection at least every 6 months.
   (2) If stored for extended periods without being used, make sure prior to operation that the instrument is in perfect operating condition.
   (3) Technical information such as circuit diagrams, parts list, descriptions, calibration instructions or other information is available for qualified user technical personnel upon request from your Nihon Kohden distributor.
9. **When the instrument is used with an electrosurgical instrument, pay careful attention to the application and/or location of electrodes and/or transducers to avoid possible burn to the patient.**
10. **When the instrument is used with a defibrillator, make sure that the instrument is protected against defibrillator discharge. If not, remove patient cables and/or transducers from the instrument to avoid possible damage.**

WARRANTY POLICY

Nihon Kohden Corporation (NKC) shall warrant its products against all defects in materials and workmanship for one year from the date of delivery. However, consumable materials such as recording paper, ink, stylus and battery are excluded from the warranty.

NKC or its authorized agents will repair or replace any products which prove to be defective during the warranty period, provided these products are used as prescribed by the operating instructions given in the operator's and service manuals.

No other party is authorized to make any warranty or assume liability for NKC's products. NKC will not recognize any other warranty, either implied or in writing. In addition, service performed by someone other than NKC or its authorized agents or technical modification or change of products without prior consent of NKC may be cause for voiding this warranty.

Defective products or parts must be returned to NKC or its authorized agents, along with an explanation of the failure. Shipping costs must be pre-paid.

This warranty does not apply to products that have been modified, disassembled, reinstalled or repaired without Nihon Kohden approval or which have been subjected to neglect or accident, damage due to accident, fire, lightning, vandalism, water or other casualty, improper installation or application, or on which the original identification marks have been removed.

In the USA and Canada other warranty policies may apply.

EMC RELATED CAUTION

This equipment and/or system complies with the International Standard IEC 601-1-2 for electromagnetic compatibility for medical electrical equipment and/or system. However, an electromagnetic environment that exceeds the limits or levels stipulated in the IEC 601-1-2, can cause harmful interference to the equipment and/or system or cause the equipment and/or system to fail to perform its intended function or degrade its intended performance. Therefore, during the operation of the equipment and/or system, if there is any undesired deviation from its intended operational performance, you must avoid, identify and resolve the adverse electromagnetic effect before continuing to use the equipment and/or system.

The following describes some common interference sources and remedial actions:

1. **The equipment and/or system is not grounded:**
   For AC powered equipment and/or system, use the provided grounding cable to connect the equipotential terminal of the equipment to the grounding system of the facility.

2. **Strong electromagnetic interference from a nearby emitter source such as an authorized radio station or cellular phone:**
   Install the equipment and/or system at another location if it is interfered by an emitter source such as an authorized radio station. Keep the emitter source such as cellular phone away from the equipment and/or system.

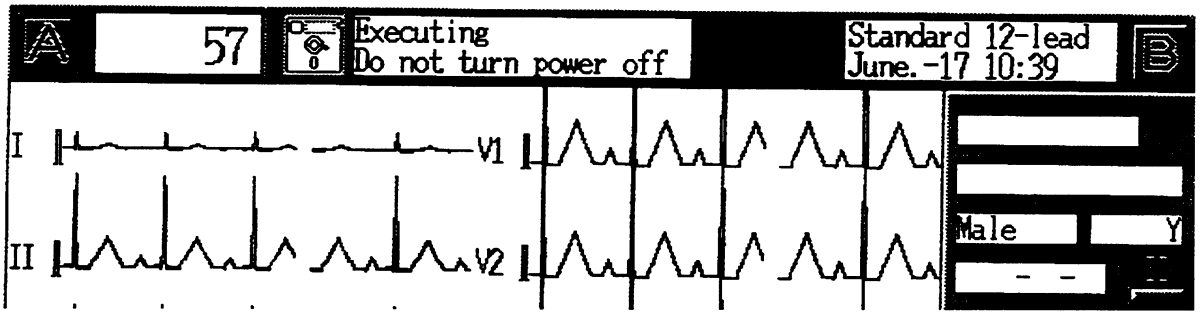
3. **Radio-frequency interference from other equipment through the AC power supply of the equipment and/or system:**
   Identify the cause of this interference and if possible remove this interference source. If this is not possible, use a different power supply.

4. **Effect of direct or indirect electrostatic discharge:**
   Make sure all users and patients in contact with the equipment and/or system are free from direct or indirect electrostatic energy before using it. A humid room can help lessen this problem.

If the above suggested remedial actions do not solve the problem, consult your Nihon Kohden Corporation subsidiary or distributor for additional suggestions.

CAUTION

- **Never turn the power off or remove the memory card or floppy disk while the message "Executing. Do not turn power off." is displayed at the top of the screen. This may cause loss of data. The message is displayed when data is saved to or read from a memory card or floppy disk and during data transfer with an external instrument.**



- **Format the IC memory card only on the ECG-9320 electrocardiograph, otherwise the IC memory card cannot be used with ECG-9320. For formatting the IC memory card, refer to Section 8-11-1.**

- **Set the write protect switch to "WP" (on) when you read the data from the IC memory card on any other equipment which is not specified by Nihon Kohden. If write protect is off and any data is written to the IC memory card by any other equipment, the IC memory card may become unusable with the ECG-9320.**

Conventions Used in This Manual and Instrument

◆Warnings, Cautions and Notes

Warnings, cautions and notes are used in this manual to alert or signal the reader to specific information.

WARNING

A warning alerts the user to the possible injury or death associated with the use or misuse of the instrument.

CAUTION

A caution alerts the user to the possible problems with the instrument associated with its use or misuse such as instrument malfunction, instrument failure, damage to the instrument or damage to other property.

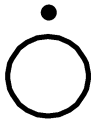
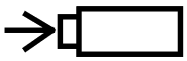
NOTE

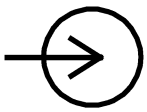
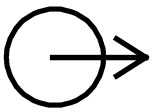
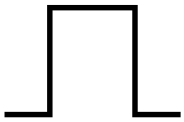
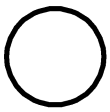
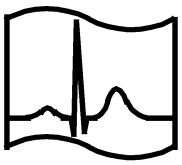
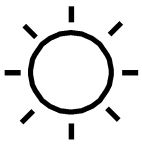
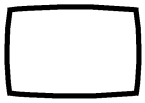
A note provides specific information, in the form of recommendations, prerequirements, alternative methods or supplemental information.

◆Explanation of the Symbols in this Manual/Instrument

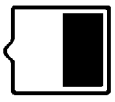
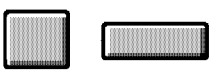
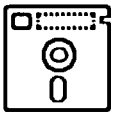
The following symbols found in this manual/instrument bear the respective descriptions as given.

●Main Unit

	"On" only for a part of equipment		Contrast
	"Off" only for a part of equipment		ECG (ECG input terminal)
	Battery charging		Alternating current

 Input terminal	 Output terminal (option)
 Calibration	 Attention, consult operator's manual
 Paper feed	 AC power Off (Disconnection from the mains)
 Automatic control	AC power On (Connection to the mains)
 Recording	 Equipotential terminal
 Brightness	 Video (Video signal output terminal) (option)
 High voltage	 Protective ground terminal

●Screen

 QRS sync display	 Battery check
 Touch-screen key	 File/transfer
	 Paper empty

●**Input Box Set**

Defibrillation-proof
Type CF applied part

●**Others**

The CE mark is a registered trademark of the European Union. The products herewith comply with the requirements of the Medical Device Directive 93/42/EEC.

SECTION 1

INTRODUCTION

1-1 General 1.1
1-2 Important Safety Information 1.2
1-3 Panel Descriptions 1.3
1-3-1 Top View 1.3
1-3-2 Operation Panel 1.4
1-3-3 Front Panel 1.6
1-3-4 Rear Panel 1.8
1-3-5 Input Box Set 1.10
1-4 Basic Screen and Menu Window 1.11
1-4-1 Basic Screen 1.11
1-4-2 Menu Window 1.15
1-5 Functions of Each Screen and Window 1.16
1-6 Basic Operation Concept 1.17

1-1 General

This cardiofax is a real time cardiograph with a 3, 6, or 12-channel recorder. The 10.4 inch LCD touch screen displays the ECG waveforms and various measurement settings and allows efficient and easy operation. You can preset up to 12 examinations and operation tools in the menu. The QP-911E ECG Interpretation software upgrades the cardiograph to an interpretive cardiograph.

NOTE

- **Use Nihon Kohden parts and accessories to assure maximum performance from your instrument.**
- **An optional hardware and software related to the cardiograph are also described in this manual. The word "optional" is omitted in most parts of this manual. Therefore, some hardware and software described in this manual may not apply to your cardiograph. For options, refer to Section 11-3.**

The cardiograph features the following functions:

1. **LCD Screen with Touch-screen Keys**
   The cardiograph provides the touch keys on the screen. You can select the measurement settings and verify operation on the LCD touch-screen. On the 10.4 inch LCD screen, 12 lead ECG waveforms are simultaneously displayed. The various recording information, messages, and marks allow clear ECG recording.

2. **Presettable Examination Menu**
   You can preset up to 12 examinations containing various measurement settings and recording formats according to your medical protocol.

3. **Digitalized ECG Input Box**
   The input box provides isolation circuits to ensure patient safety. This input box is also designed to reduce artifact even if it is placed up to 10 m from the cardiograph.

4. **Digital Communication Interface**
   The cardiograph can automatically file the recorded ECG waveforms and save them in the storage media (Filing function). You can review the ECG waveforms by transferring the ECG files on a personal computer or other Cardiofax by way of the RS-232C port.

5. **Stylus Scratching Sound Synthesizer**
   Operators can evaluate the quality of ECG recording by the sound of the stylus on the paper.

1-2 Important Safety Information

WARNING

1. Surrounding Conditions
   - Never use the cardiograph in the presence of any flammable anesthetic agents or environments in which an electrical arc could ignite an explosion. Failure to follow this warning may result in explosion.
   - Avoid direct sprinkling, spray or moist air from a nebulizer or humidifier.

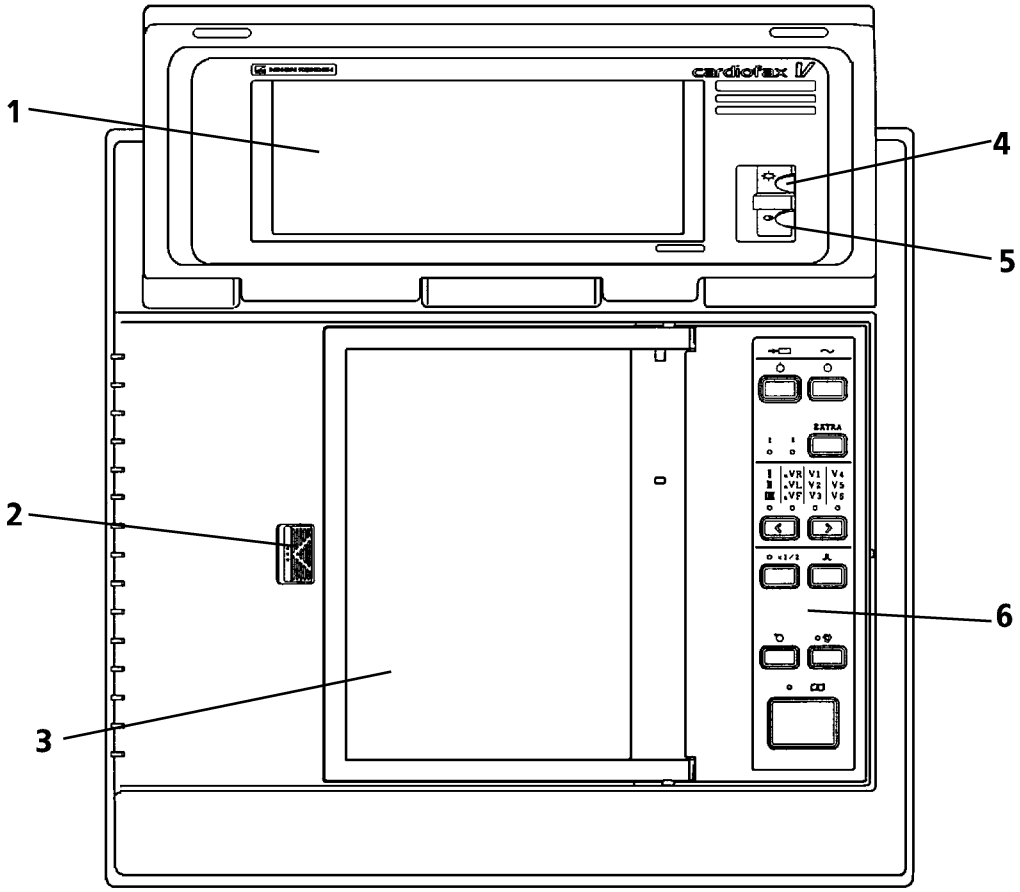
2. Grounding the Cardiograph
   The cardiograph conforms to Class I according of IEC 601-1 (CSA: Risk class 3).
   - Ground the cardiograph to protect the patient and operator from electrical shock.
   - Connect the 3-prong power cord provided with the cardiograph to a 3-contact grounded AC outlet.
   - Periodically check the integrity of the ground at the AC outlet.
   - When several medical instruments are used together, ground all instruments at one-point ground to protect the patient and operator from electrical shock. Failure to follow this warning may result in serious electrical shock or the injury.

3. Using a Defibrillator
   - When the cardiograph is used with a cardiac defibrillator, do not contact the electrodes to the defibrillator paddle. However the ECG input box provides protection against a cardiac defibrillator discharge.
   - All persons must keep clear of the bed and must not touch the patient or any equipment connected to the patient. Failure to follow this warning may serious electrical burn, shock, or other injury during defibrillation.
   - Do not use the CRO output signal for Synchronized cardioversion because there is approx. one second time delay between the original signal and the output signal.

4. Using an Electrosurgery Unit
   When the cardiograph is used with an electrosurgery unit:
   - Firmly attach the ESU's return plate and the ECG electrodes to the patient. Failure to follow this warning may result in serious electrical burn, shock or other injury.
   - Locate ECG electrodes as far as possible from the point of incision to reduce the hazard of burns in the event of a defect in the return plate connection.

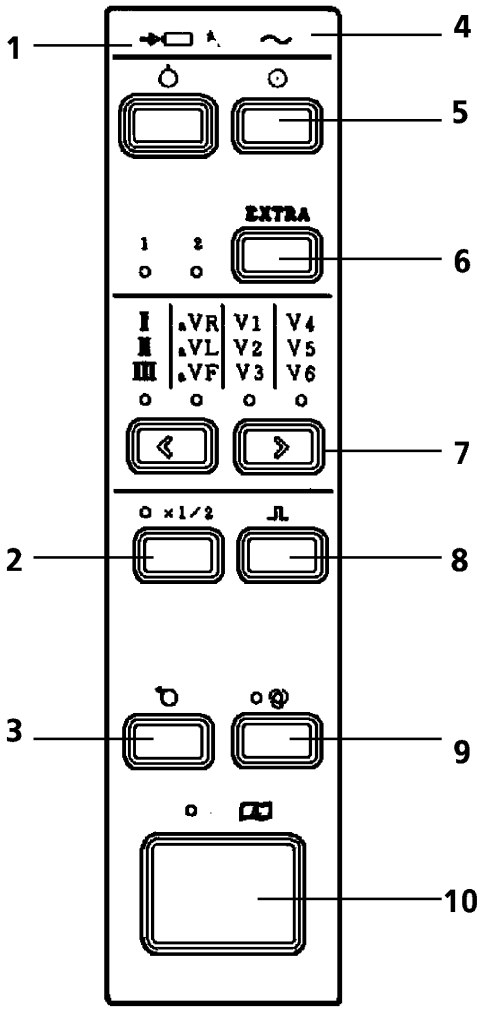
1-3 Panel Descriptions

1-3-1 Top View



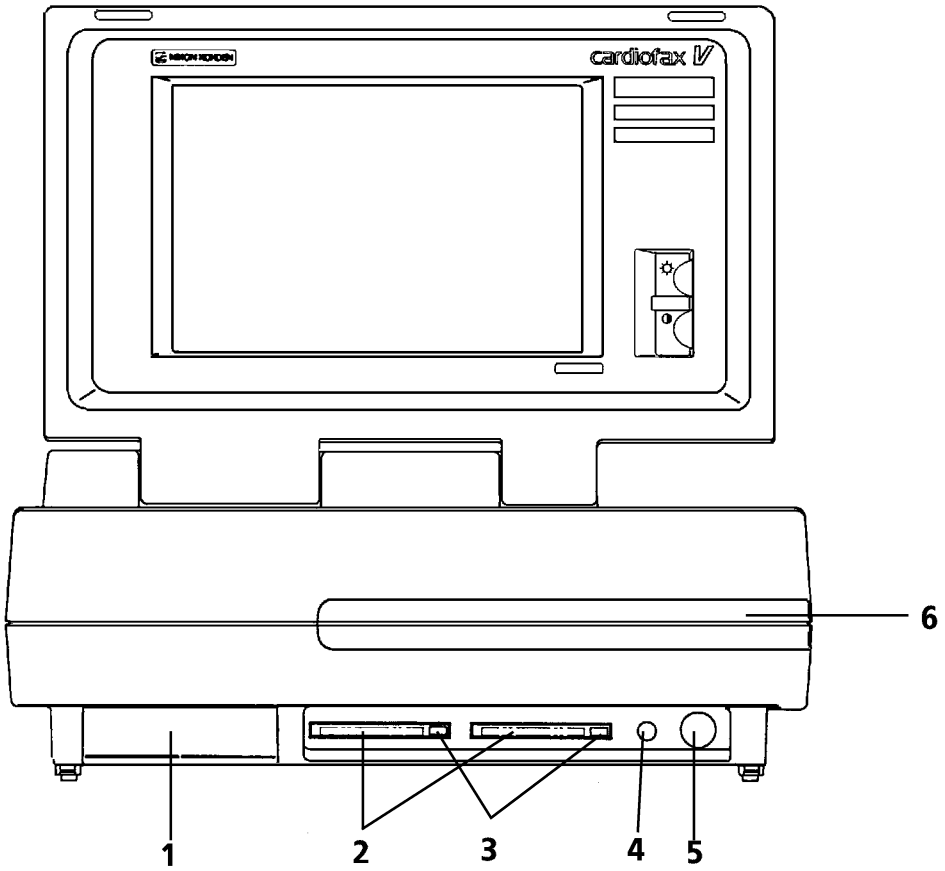
No.	Name	Description
1	LCD touch-screen	Displays ECG waveforms, various information, marks and touch keys.
2	Magazine release lever	Slide this lever to open the magazine when loading the recording paper.
3	Magazine	Contains the recording paper.
4	LCD Brightness control	Controls the brightness of the LCD screen.
5	LCD Contrast control	Controls the contrast of the LCD screen.
6	Operation panel	Refer to next page.

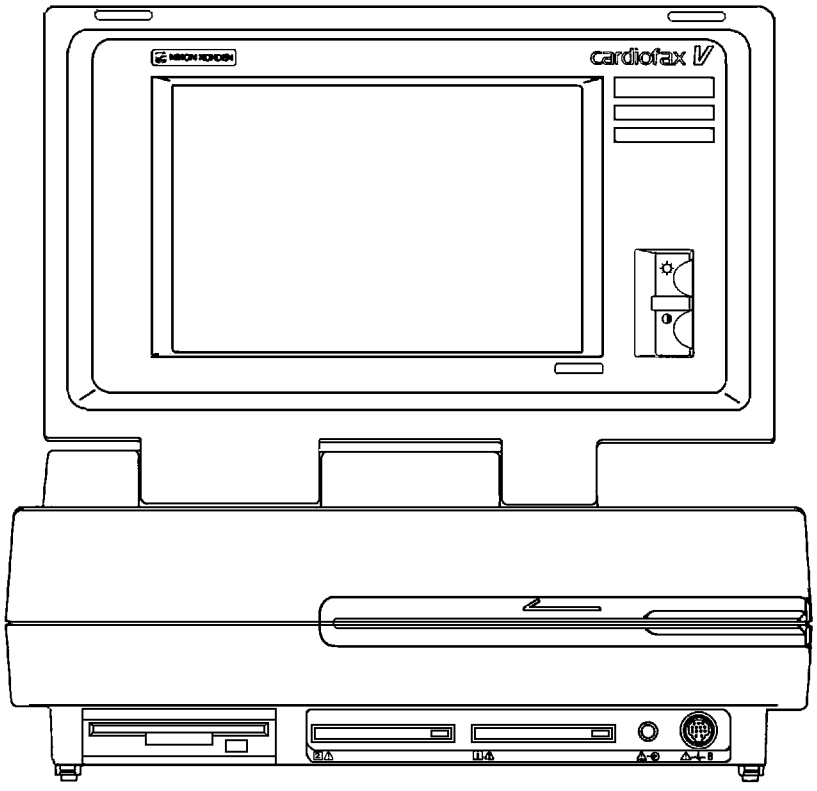
1-3-2 Operation Panel



No.	Name	Description
1	Battery charge lamp	Turn on the Main power switch on the rear panel to charge the battery. During battery charging, the battery charge lamp continuously lights or blinks.
2	Sensitivity ×1/2 switch/lamp	The sensitivity is selected by the Sens key on the LCD screen. This switch reduces the selected sensitivity to half.
3	Paper feed switch	Feeds the paper according to the "Mark on or off" setting in the System Setup. Mark on: Feeds the paper until the next paper mark is detected. Mark off: Feeds the paper while the switch is pressed. **NOTE** **During manual recording, pressing the paper feed switch prints the event mark.**
4	AC power lamp	Lights when the cardiograph is operating on AC power.
5	Power switch	Turns the cardiograph on/off. (⊙): Turns the power on. (◯): Turns the power off.
6	Extra switch /lamp	Selects the extra leads. The lamp lights according to the selected number of channels. Lamp 1 and 2: 6 channel recording Lamp 1 or 2: 3 channel recording (channel 1 to 3 or 4 to 6)
7	Lead selection switch/lamp	Selects the lead group. When manual recording is selected, you can select the lead group recorded on the paper.
8	Calibration switch	Displays and/or records the calibration waveforms. For external input signals, this key is not operative.
9	Auto/Manual selection switch/lamp	Selects automatic recording or manual recording. Lamp on: automatic recording Lamp off: manual recording
10	Start/Stop switch/lamp	Starts or stops recording. When recording starts, the lamp lights.

1-3-3 Front Panel





When the magnetic card reader and floppy disk unit are installed

No.	Name	Description
1	3.5 inch floppy disk drive	The 3.5 inch floppy disk drive is installed here to save or read ECG files.
2	IC memory card slot 1 IC memory card slot 2	For an IC memory card and program card. This slot is also used to read the programs or data file media.
3	Eject button	Press to eject the IC memory card.
4	External signal input socket*	For external analog signals.
5	ECG input box socket B	Connects to the input box.
6	Magnetic card reader slot	Reads the patient information from the ID card.

CAUTION

When connecting an external instrument to the following sockets or slots with an * mark:

- **Ensure that the external instrument complies with the IEC601-1, IEC601-2-25 safety standard for medical equipment. When the instrument does not comply with IEC601-1, IEC601-2-25, such as a personal computer or modem, etc., use a locally available medical use isolation transformer unit between the instrument and the AC outlet.**
- **Attach a ferrite core to the cable for an external instrument. Refer to EMC related caution and Section 11-5.**

CAUTION

The cardiograph should only be connected to an external instrument which complies with the CISPR 11 Second Edition 1990-09, Group 1 and Class B standard.

1-3-4 Rear Panel

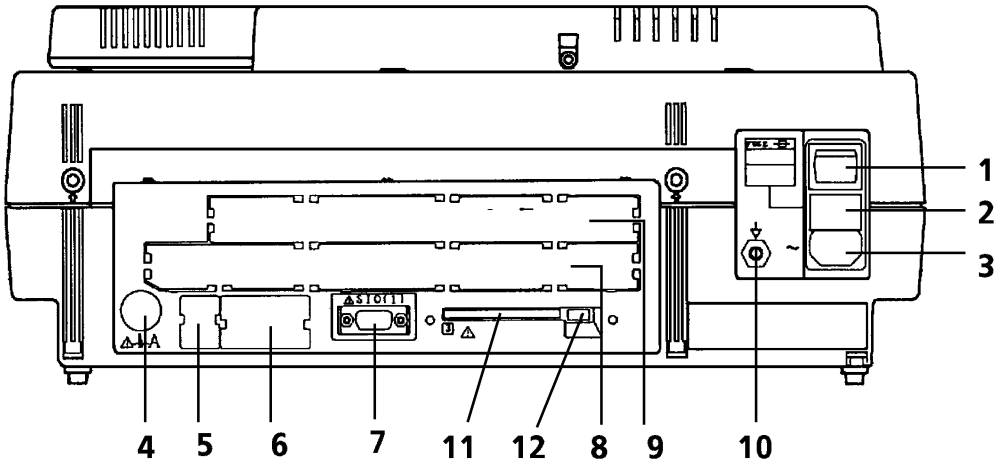
CAUTION

When connecting an external instrument to the following sockets or slots with an * mark:

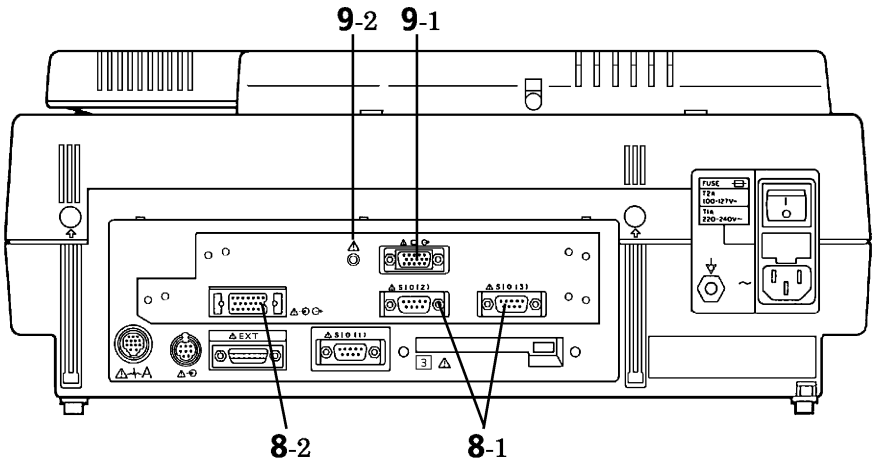
- Ensure that the external instrument complies with the IEC601-1, IEC601-2-25 safety standard for medical equipment. When the instrument does not comply with IEC601-1, IEC601-2-25, such as a personal computer or modem, etc., use a locally available medical use isolation transformer unit between the instrument and the AC outlet.
- Attach a ferrite core to the cable for an external instrument. Refer to EMC related caution and Section 11-5.

CAUTION

The cardiograph should only be connected to an external instrument which complies with the CISPR 11 Second Edition 1990-09, Group 1 and Class B standard.



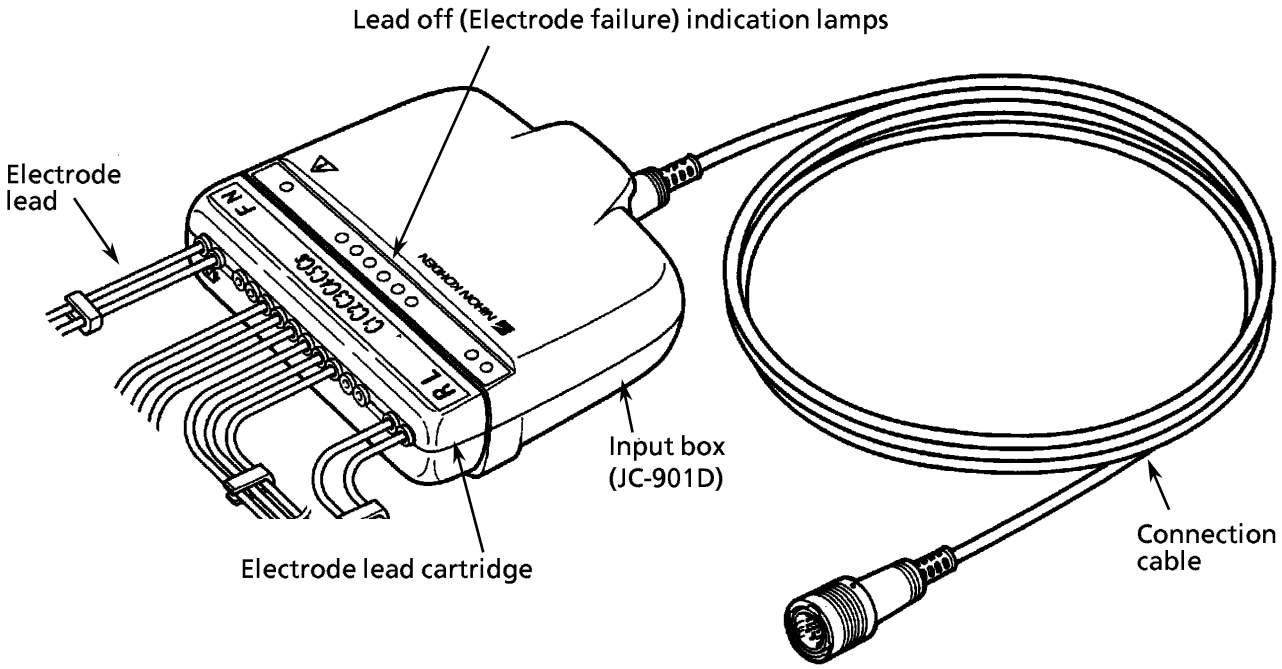
Standard



When the slave monitor interface board and extension I/O board are installed. For pin assignment of each socket, refer to the Service Manual Section 10.

No.	Name	Description
1	Main power switch	Turns the AC power supply on/off.
2	Fuse compartment	Contains the power line protection fuses.
3	AC Source	**CAUTION** • **Fuses cut the power off when an abnormality occurs in the cardiograph. Remove the malfunction before replacing the fuse.** • **Before replacing, turn power off and disconnect the AC power from the cardiograph.** • **Fuse replacement should be done only by a qualified person.** AC power cord socket Connects to the power cord to supply AC power to the cardiograph.
4	Input box socket A	Connects to the input box.
5	Barcode reader socket*	Connects the barcode reader.
6	External input/output socket*	Connector for analog and digital I/O signals.
7	SIO (1) socket 1*	Connects to the personal computer or another Cardiofax for ECG file transfer.
8	Extension I/O board slot*	For an Extension I/O board.
8-1	SIO (2)/SIO (3) SIO socket 2/3*	For an optional external instrument.
8-2	Extension I/O socket*	For 6 channel CRO output signals.
9	Slave monitor interface board slot*	A display board for a slave monitor can be installed.
9-1	Slave monitor socket*	Connects to an slave monitor.
9-2	Color selector	Selects the display color of the slave monitor.
10	Equipotential ground terminal	When the equipotential grounding is required to ensure electrical safety, connect this terminal to the equipotential ground terminal on the wall with the ground lead.
11	IC memory card slot 3	For an IC memory card and program card.
12	Eject button	Press to eject the IC memory card.

1-3-5 Input Box Set



Input Box Set

1-4 Basic Screen and Menu Window

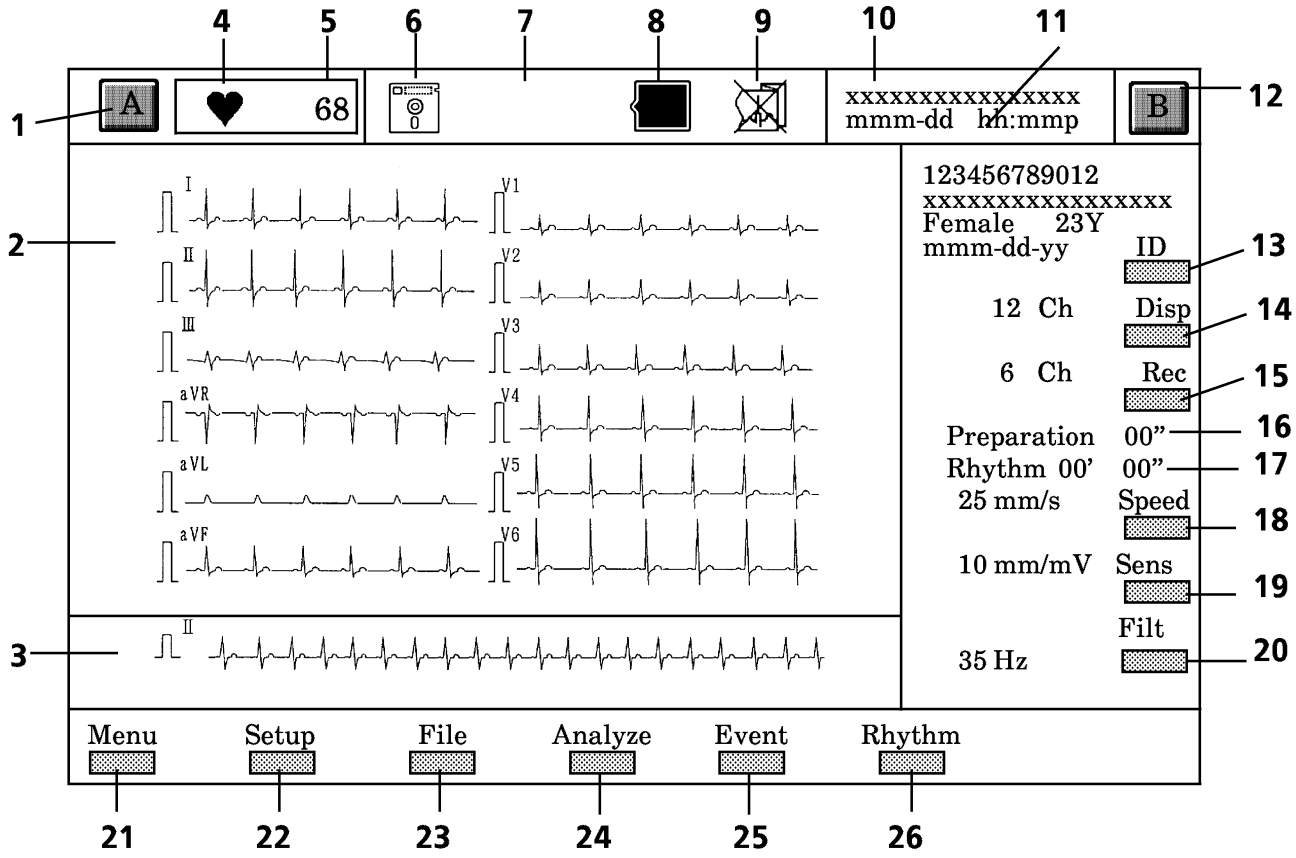
1-4-1 Basic Screen

◆General

When the power is turned on, the examination screen which is assigned to the top of the menu item in the Menu window appears.

The Basic screen displays the ECG waveforms, patient information, messages, marks, selected examination name and touch keys for operation. The screen contents depends on the selected recording menu, settings, or installed software.

◆Explanation of the Keys and Marks Displayed on the Basic Screen



1 Patient A/Patient A selection key
Selects patient A. When patient A is selected, the "A" mark is highlighted.

2 Waveform display area
Displays the acquired ECG waveforms or external input signals. The display time depends on the number of display leads set by the Disp key on the screen or the Extra switch on the operation panel.

12 leads display:	5 seconds ECG waveforms
3-lead, 6-lead, or extra signal display:	10 seconds ECG waveforms and/or external input signals

3 Rhythm lead display area
Displays the selected 20 seconds rhythm lead. When artifact or electrode detachment is detected, the affected waveform is highlighted.

4 QRS mark
Blinks synchronization with the QRS wave.

5 Heart rate
Indicates heart rate. The heart rate is displayed updated every 2 seconds.

6 Filing mark key
The "  " mark is displayed during ECG filing or transferring. To cancel operation, press this key.

7 Electrode condition message
"Electrode Failure" is displayed when the electrode is detached.
"Electrode Noise" is displayed when artifact is detected.

8 Battery operation mark
The "  " mark appears when the cardiograph is operating on battery power. When the battery is almost discharged, this mark blinks.

9 Paper empty mark
The "  " mark blinks when the paper is empty.

10 Menu name
Displays the current examination name.

11 Date and time
Displays the date and time.

12 Patient B/Patient B selection key
Selects patient B. When patient B is selected, the "B" mark is highlighted.

13 ID (Patient information display key)
Displays the Patient Data Input screen. After entering the patient information, ID number, sex, age, date of birth, and name are displayed on the screen.

14 Disp (Display format setting key)
Selects the number of channels displayed on the screen.
Selection list
Rhythm 3ch: 3 rhythm leads selected in the System Setup
Sync. Rec: The same leads that are selected by the Rec key
12ch: 12 leads

15 Rec (Recording format setting key)
Selects the number of channels recorded on the paper.
Selection list: 3ch, 3 with rhythm lead, 6, or 12 channel

16 The following messages are displayed here:

Preparation XX:	After the electrodes have been placed, this message is displayed while artifact or electrode detachment is detected. XX indicates the elapsed time since electrode placement or the last detected.
Ready:	Displayed when ECG recording is available.
Analysis *:	Displayed during ECG analysis. The * mark blinks every second.

XX indicates the elapsed time from the start of manual recording.

17 Displays the elapsed time from the start of Rhythm recording.

18 Speed (Paper speed selection key)
Selects the paper speed in manual recording.
Selection list: 25, 50 mm/s, slow speed (5, 10, 12.5mm/s)

19 Sens (Sensitivity selection key)
Selects the sensitivity
Selection list: 5, 10, 20 mm/mV

20 Filt (High-cut filter selection key)
Selects the high-cut filter to reduce the high frequency component.
Selection list: 25, 35, 75, 100, on 150 Hz
During measurement, you can use one of 5 high-cut frequencies preselected in the System Setup.

21 Menu (Menu key)
Calls up the Menu window.

22 Setup
Calls up the System Setup window of the currently selected examination.

23 File (File key)
Calls up the File window for ECG filing and transferring.

24 Analyze (ECG analysis key) / Report (Report key)

Analyze:	Appears when manual ECG analysis is available. The QP-911E ECG Interpretation software (ECG interpretation result and ECG measurement table recording) or QP-910E (ECG measurement table recording) is required. By pressing the key you can record ECG analysis result or ECG measurement table.
Report:	Appears when Report recording is available. You can print the recording results any number of times until next recording is started.

25 Event (Event mark key)
You can record the event mark on the paper.

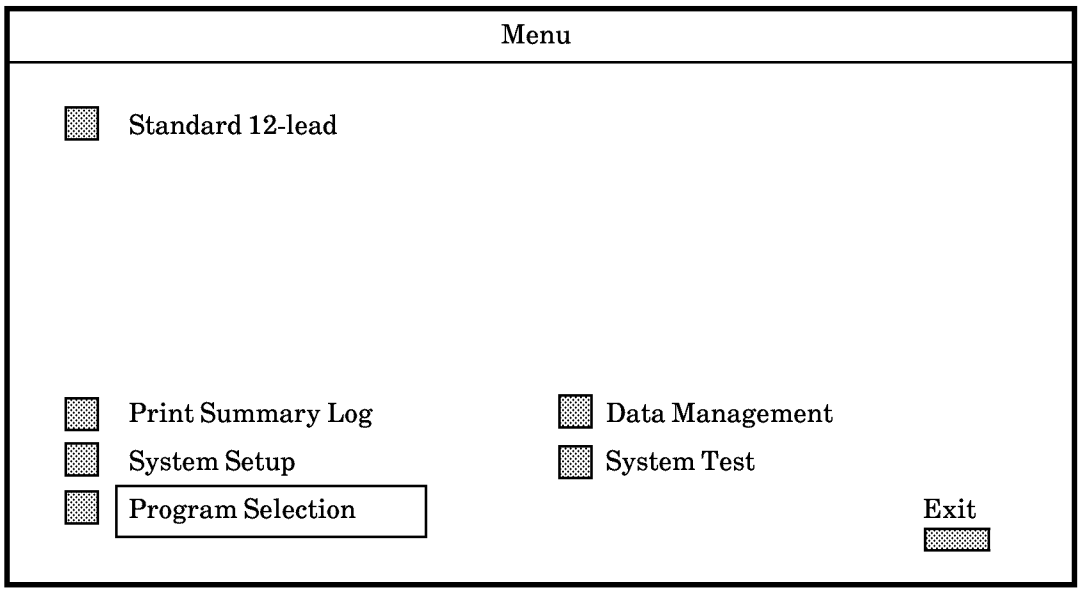
26 Rhythm
Starts to save ECG waveform for Rhythm recording.

◆Explanation of the Error Marks and Message Displayed on the Basic Screen

Marks/messages	Explanation
Paper empty	Blinks when there is no more recording paper. The current recording is stopped.
Electrode failure	The detached electrode name except for N is displayed on the screen. If two or more electrodes, except for N, are detached the "Electrode Failure Limb" message appears on the top of the screen. **NOTE** **If a limb electrode is detached, the cardiograph cannot detect chest electrode detachment.** The rhythm lead waveform is highlighted when electrode detachment or artifact is detected.
Electrode Noise limb or chest (electrode name)	Appears when artifact is detected on the electrode.

1-4-2 Menu Window

The Menu window can contain up to 12 examinations with different measurement settings or recording formats and various operation tools. You can select a preset examination, manage ECG Files, and change the various settings on the Menu window.



To select another examination or operation tool, press the MENU key at the bottom of the screen to call up the Menu window.

Examinations:

1. Standard 12 lead ECG recording
2. Cabrera lead ECG recording
3. Nehb lead ECG recording
4. External recording

Operation tools:

1. Print Summary Log (Recording summary)
2. Data management (Filing and transfer)
   - Displaying files in an IC memory card or floppy disk
   - File search (Searches for an ECG file in an IC memory card or floppy disk)
   - Serial comparison recording (lets you compare different ECG waveforms of the same patient)
   - Report recording (with or without changing the recording format after recording, copy)
   - Transferring (Transfers the file)
   - Editing (Edits the patient information)
   - Deleting (Deletes the file stored in an IC memory card or floppy disk)
3. System Setup (Changing the measurement settings and recording formats etc.)
4. System Test
5. Program Selection

1-5 Functions of Each Screen and Window

Basic screen
- Measuring the resting ECG waveforms
- Automatically filing the ECG waveforms
- Automatically transferring and receiving ECG files
- Measuring external signals

Menu window
- Selecting the examinations or operation tools

Printing the summary report

System Setup window
- Registering the new examination
- Changing the settings for individual examination
- Changing the hardware settings of the cardiograph
- Printing the list of all settings

System Test window
- Checking the cardiograph

Program Selection window
- Selecting the program

Patient Data Input screen
- Entering the patient information

Data Management screen
- Used to manage the ECG files saved in an IC memory card and floppy disk
  - Searching for files
  - Selecting files
  - Recording the files chronologically (Serial comparison recording)
  - Recording files
  - Manually transferring files
  - Editing files
  - Deleting files
  - Copying files
  - Formatting an IC memory card and floppy disk

1-6 Basic Operation Concept

With the control switches on the operation panel and touch keys on the screen, you can do all operations to record ECG waveforms and manage ECG files.

NOTE

Do not use sharp objects such as pencil or pen to touch the touch screen as this can damage the touch screen.

To select items displayed on the screen:
Press the key beside an item.
The cardiograph displays a check box to request information about an operation that you want to perform.

To enter numbers:
A numeric keypad appears when you select certain menu items.
1. Press the numeric key.
2. Enter the numbers.
3. Press the Enter [↵] key.

To change a number, press the Back space [|←] key to clear the entire number, then do the above steps 1 to 3.

To enter an ID number:
You can enter the ID number with the numeric keypad or keyboard.

To enter alphabetical characters:
The keyboard appears when you select certain menu items. Press the keys to enter supply information, then press the Enter key.

NOTE

- **The cardiograph can turn the back light of the LCD screen off automatically if there is no touch key or switch activity for approximately five minutes by System Setup. To turn on the back light, press the screen or switch on the Operation panel.**
- **In battery power operation, the cardiograph automatically turns the power off if there is no key or switch activity for approximately three minutes and the "Electrode failure" (no electrode is attached to the patient) is displayed on the screen. After turning the power on again, the Basic screen appears.**

SECTION 2

INSTALLATION AND START UP

2-1 Selecting a Suitable Location 2.1
2-2 Connecting the Input Box 2.2
2-3 Charging the Built-in Battery 2.5
2-4 Setting the Recording Paper 2.6
2-4-1 Z-fold Recording Paper 2.6
2-4-2 Roll Recording Paper 2.10
2-5 Preparing the IC Memory Card, Flash Disk Card and Floppy Disk 2.11
2-5-1 Precautions When Using IC Memory Card / Flash Disk Card .. 2.11
2-5-2 How to Insert Battery into IC Memory Card 2.12
2-5-3 Inserting and Removing the IC Memory Card / Flash Disk Card 2.15
2-5-4 Inserting and Removing the Floppy Disk 2.18
2-6 Grounding and Connecting the Power Cord 2.19
2-7 Turning the Power On 2.20
2-7-1 Operating on AC Power 2.20
2-7-2 Operating on Battery Power 2.21
2-8 Calling Up the Menu Window 2.22
2-9 Preparation for the Automatic ECG Filing and Transferring 2.23
2-10 Receiving, Saving and Printing Files 2.24
2-10-1 General 2.24
2-10-2 Preparation to Receive and Record Files 2.24
2-10-3 Handling Received Files 2.25
2-10-4 Running Out of Paper and Other Printing Interruptions when Printing without Saving 2.26
2-11 Changing a Program 2.28
2-12 Initializing a Barcode Reader 2.29

2-1 Selecting a Suitable Location

Put the cardiograph in a suitable location according to the following warnings and cautions.

WARNING

- **Never use this cardiograph under any flammable anesthetic gas condition. Failure to follow this warning may result in explosion.**
- **Before connecting any other equipment to this cardiograph, confirm that the equipment complies with the medical equipment safety standard.**
- **When connecting a personal computer to this cardiograph, use a locally available isolation transformer unit for medical use between the computer and cardiograph.**

CAUTION

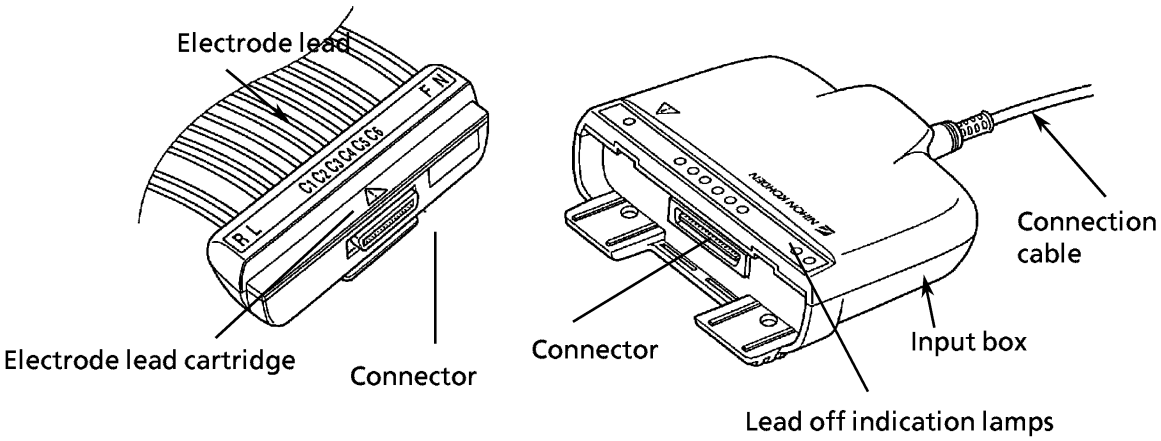
- **The cardiograph should not share the power line with any instrument which consumes a lot of power, such as X-ray instrument, because it may cause artifact.**
- **Avoid a location where the cardiograph is sprinkled with liquids.**
- **Avoid direct sprinkling, spray or moist air from a nebulizer or humidifier.**
- **Avoid exposing the cardiograph to direct sunlight.**
- **Use only KD-901E cart for the ECG-9320 cardiograph. If other cart is used, it may tip over or the cardiograph may fall off.**

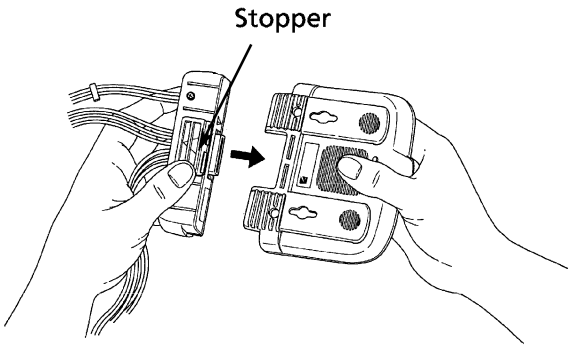
Make sure that there is more than 5 cm of space between the cardiograph and the wall for adequate ventilation so that the operating temperature does not exceed 40 °C. Avoid using the cardiograph near a heater or humidifier.

2-2 Connecting the Input Box

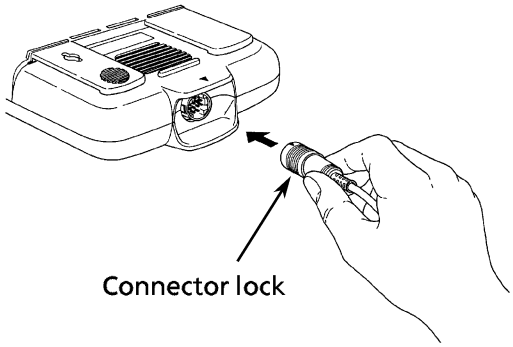
NOTE

- **Do not pull the electrode lead to remove the electrode lead cartridge from the input box.**
- **Do not hold the connector lock when connecting the connection cable to the input box.**
- **Do not press the stopper when connecting the electrode lead cartridge to the Input box.**

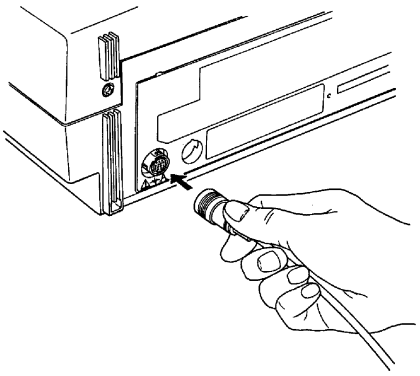




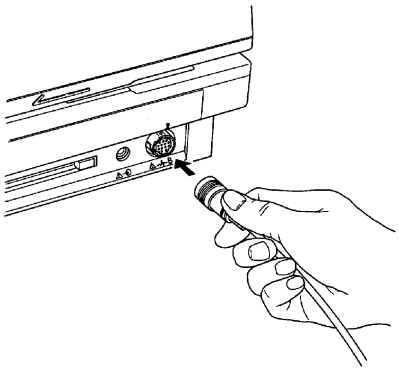
1. Connect the electrode lead cartridge to the input box until connector clicks. The connector is fastened by the connector stopper.



2. Connect the connection cable to the input box cable socket connector aligning the "▼" marks until the connector clicks.



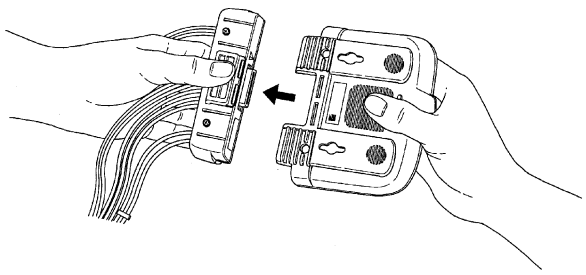
3. Connect the connection cable connector to the patient A socket on the rear panel or the patient B socket on the front panel of the cardiograph aligning the " ● " marks until the connector clicks.



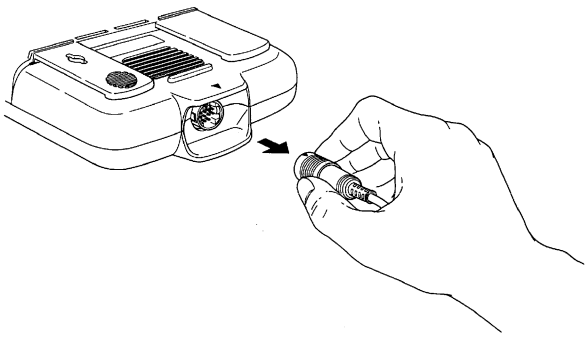
NOTE

When the power is turned on, if the lead off indication lamps do not light, the connection between the input box and cardiograph is faulty. Check the cable connections on the input box and cardiograph.

◆Disconnecting the Connection Cable and Electrode Lead Cartridge

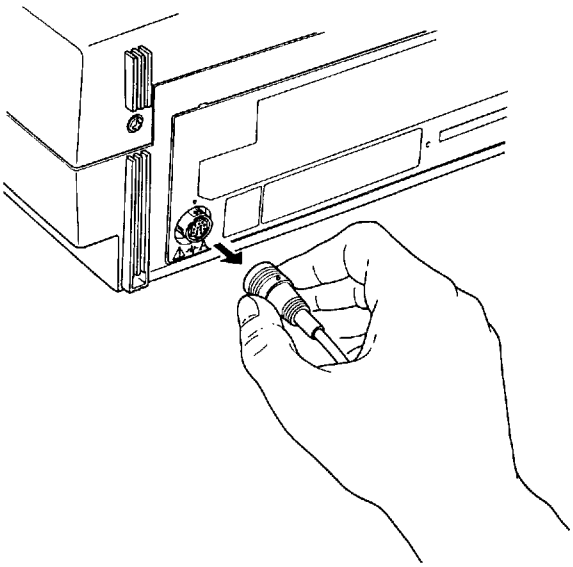


To disconnect the electrode lead cartridge from the input box, press the stopper on the rear of the electrode lead cartridge, then remove the electrode lead cartridge with holding the connector stopper.



To remove the connection cable from the input box, hold and pull the connector lock.

◆Disconnecting the Connection Cable from the Cardiograph



To remove the connection cable from the cardiograph, hold and pull the connector lock.

2-3 Charging the Built-in Battery

NOTE

- **Recharge the built-in rechargeable battery prior to use after shipment or storage. The battery may be discharged during shipment from the factory or during storage.**
- **For optimum battery performance, recharge the battery every 6 months when the cardiograph is not used.**
- **The battery will lose its charge immediately if the storage temperature is 30° C or more. Recharge the battery every 3 months.**
- **Recharge the battery at temperatures between 5 to 30° C. At temperatures over 30° C, the battery will be damaged if recharged.**
- **The cardiograph can operate for 30 minutes with a fully charged battery. If the cardiograph does not operate for at least 15 minutes with a fully battery, replace the battery with a new one.**
- **During operation the battery cannot be charged.**

1. Connect the provided power cord to the AC SOURCE socket on the cardiograph and plug the cord into a 3-prong AC outlet.

2. Turn on the main POWER switch on the rear panel. The AC power lamp lights up to indicate that the cardiograph can operate with AC power. The battery charging lamp lights up or blinks to indicate that the battery is being charged. (Required charging time: approx. 4 hours)

After the battery charging lamp turns off, the lamp starts to blink rapidly. This indicates that a tiny amount of current is being delivered to the battery (trickle charging) to prevent self-discharge of the battery.

Battery Charging Lamp	Battery Condition
Lights	The battery is being charged.
Blinks	The battery is almost fully charged.
Turns off	The battery is fully charged.

2-4 Setting the Recording Paper

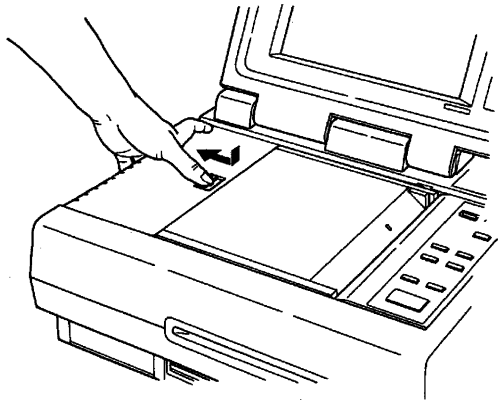
CAUTION

- **Do not touch the thermal head by dirty hand. If accidentally touched, clean the thermal head with the thermal head cleaner pen.**
- **Do not allow ECG electrolyte cream (Cardio cream) or saline solution to come in contact with the thermal head because these may damage the thermal head.**
- **Do not use recording paper which is contaminated with ECG electrolyte cream (Cardio cream) or saline solution to come in contact with the thermal head because these may damage the thermal head.**
- **If ECG electrolyte cream (Cardio cream) or saline solution contacts the thermal head, immediately clean the thermal head with the thermal head cleaner pen.**

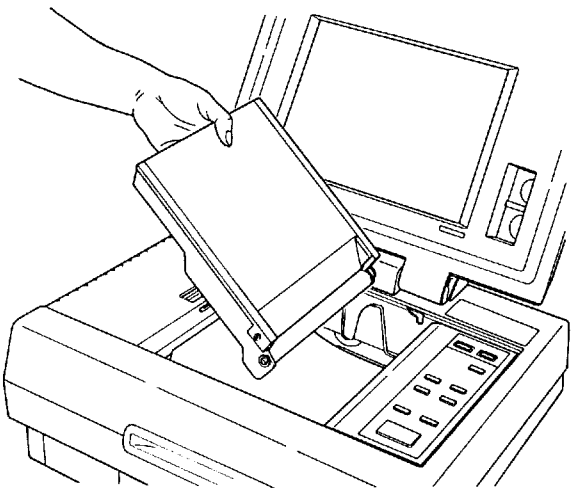
2-4-1 Z-fold Recording Paper

NOTE

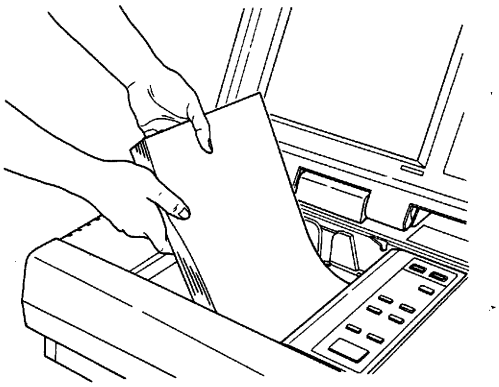
Clean the thermal head with the thermal head cleaner pen before loading a new pack of recording paper.



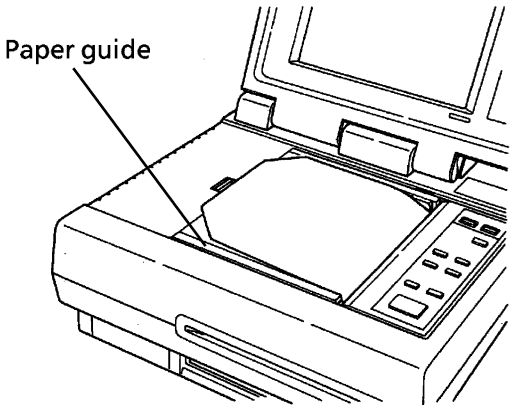
1. Slide the magazine release lever.



2. Take the magazine out.



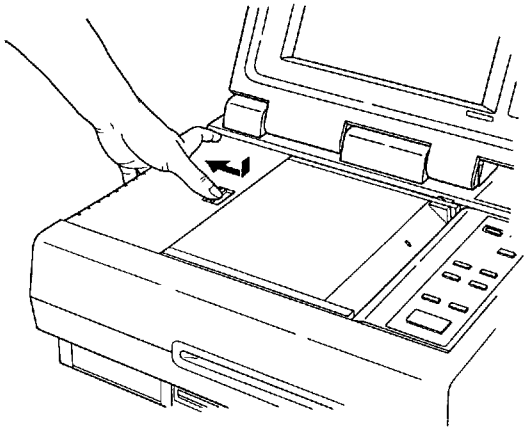
3. Set the recording paper with the printing side up and convex fold right.
   * Carefully set the z-fold paper in the paper compartment so as not to damage the edge of the paper.



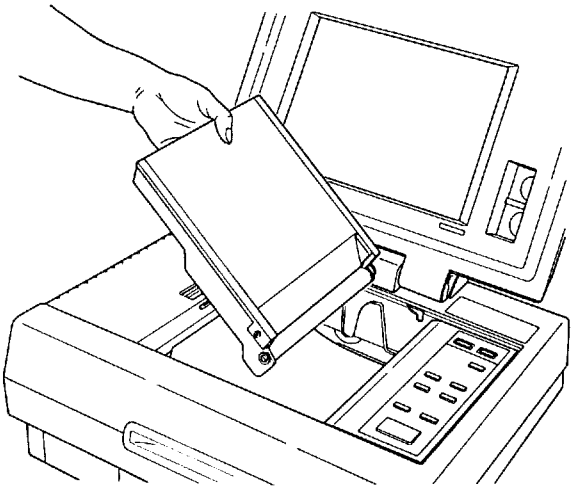
4. Pull the end of the paper out about 20 cm with aligning the lower of the paper to the paper guide.
5. Put the magazine back until it clicks.
6. Press the paper feed key to feed the paper to the first paper mark.

◆When Setting the Z-fold Paper on the Optional KD-901E Cart

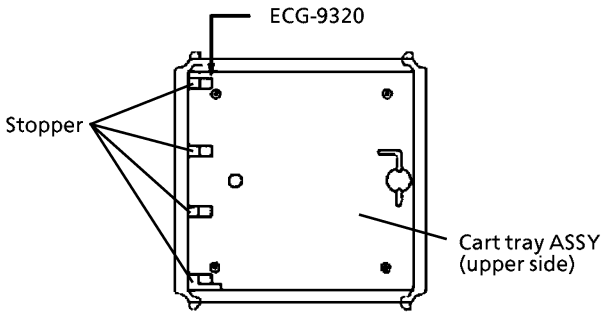
To set the z-fold paper on the cart, the optional Cart Tray ASSY DI-901D is required.



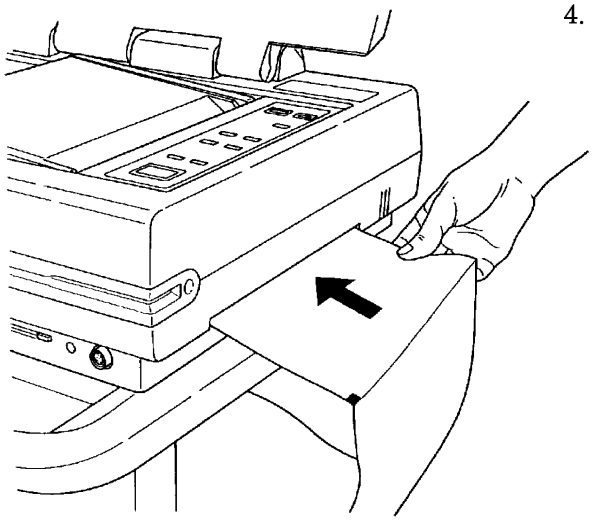
1. Slide the magazine release lever.



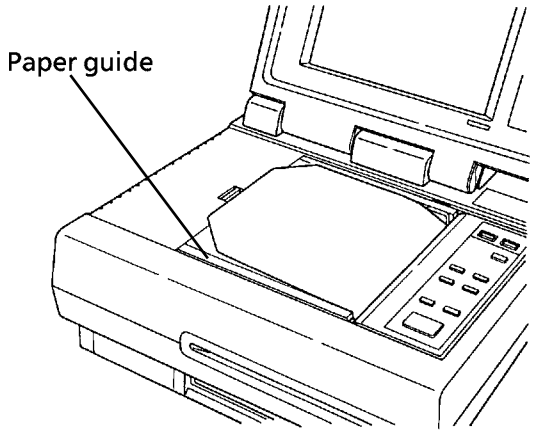
2. Take the magazine out.



3. Set the paper with its carton on the Cart tray ASSY adjusting the position of the stopper of the Cart tray ASSY.

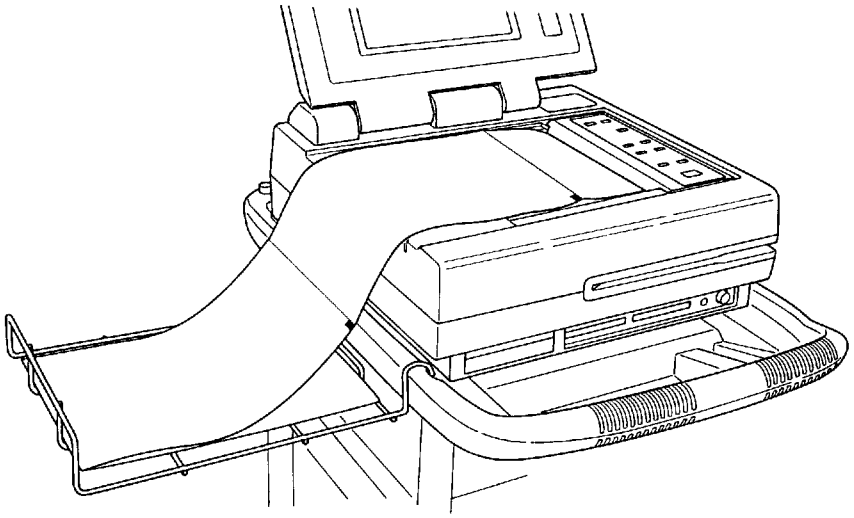


4. Insert the leading end of the paper through the slit (opening) in the right side of the cardiograph.



5. Pull the end of the paper out about 20 cm with aligning the lower of the paper to the paper guide.

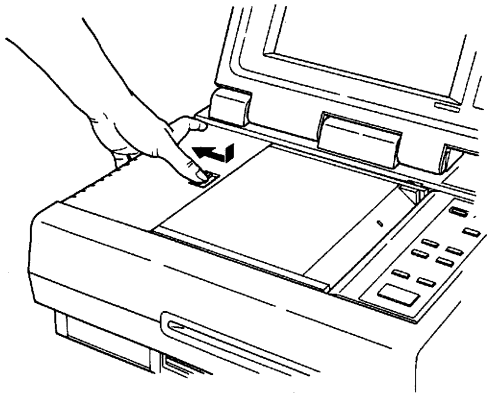
6. Put the magazine back until it clicks.



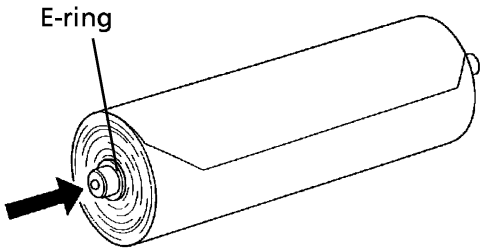
2-4-2 Roll Recording Paper

NOTE

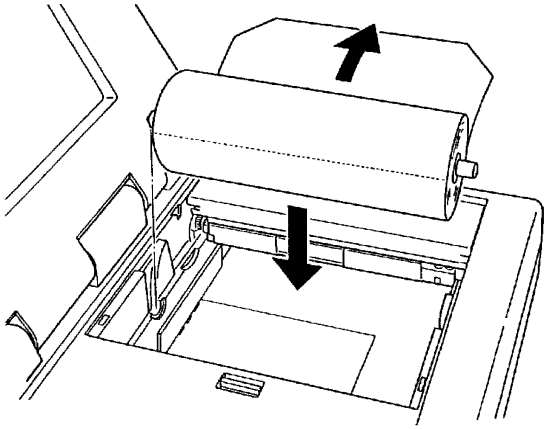
Clean the thermal head with the thermal head cleaner pen before loading a new pack of recording paper.



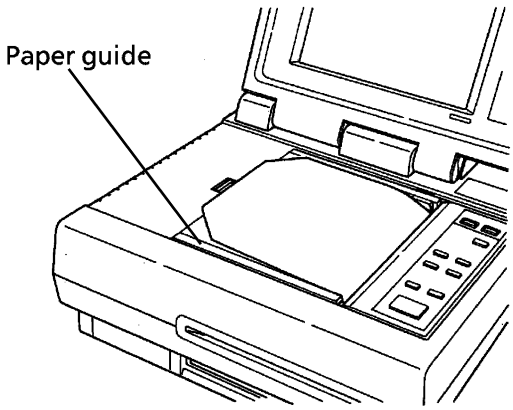
1. Slide the magazine release lever to take the magazine out.



2. Insert the optional paper shaft into the roll paper.



3. Set the recording paper.



4. Pull the end of the paper out about 20 cm with aligning the lower of the paper to the paper guide.
5. Put the magazine back until it clicks.

2-5 Preparing the IC Memory Card, Flash Disk Card and Floppy Disk

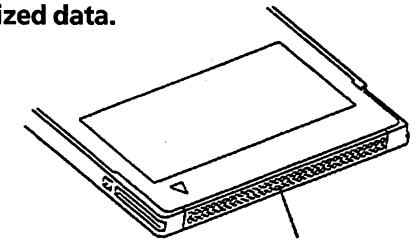
2-5-1 Precautions when Using IC Memory Card / Flash Disk Card

CAUTION

◆ **Use only specified IC memory cards and flash disk cards to assure maximum performance for your cardiograph**

◆ **IC Memory Card / Flash Disk Card Handling**

- **Do not touch a part of the connector. Static electricity may damage the memory or memorized data.**



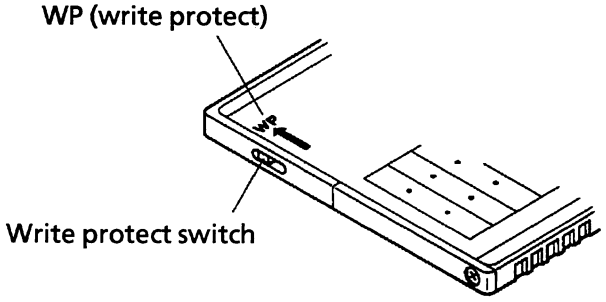
- **Do not put the card in a fire. It will cause an explosion.**
- **Do not bend the card. It may damage the memory.**
- **Do not get the card wet. It may damage the memory.**
- **Do not expose the card to high temperature (more than 65° C) or high humidity (more than 95%). The panels may deform.**

◆ **IC Memory Card / Flash Disk Card Operation**

- **When the card is full, delete the unnecessary file.**
- **To avoid damage to the card or memorized data, do not press the memory card eject button or do not turn OFF the cardiograph while data is written to the card or read from the card.**

◆ **IC Memory Card Write Protect**

- **To prevent the data on the card from erroneous erasing, set the write protect switch to "WP." Then the saved data cannot be erased.**
- **Set the write protect switch to "WP" (on) when you read the data from the IC memory card on any other equipment which is not specified by Nihon Kohden. If write protect is off and any data is written to the IC memory card by any other equipment, the IC memory card may become unusable with the ECG-9320.**



CAUTION, continued

◆ **IC Memory Card Formatting**

Format the IC memory card only on the ECG-9320 electrocardiograph, otherwise the IC memory card cannot be used with ECG-9320. For formatting the IC memory card, refer to Section 8-11-1.

◆ **Lifetime of the IC Memory Card Battery**

When the data storage time exceeds the battery lifetime, data will be lost.

	Surround temperature	
	Less than 40° C	40° C or more
QM-002V	Approx. 5 years	Approx. 5 years
QM-010P	Approx. 5 years	Approx. 2 years

The flash disk card does not use a battery.

2-5-2 How to Insert Battery into IC Memory Card

WARNINGS

Follow the warnings below to avoid serious personal injury.

- **Use only BR2325 memory card battery supplied from NIHON KOHDEN or its authorized distributors.**
- **Do not discard the battery near open flame.**
- **Do not contact the plus (+) and minus (—) terminals of the battery.**
- **Do not open the battery. Failure to follow this warning may damage your skin with internal liquid (material).**
- **Do not use the battery if there is mechanical damage, such as crack, deformation or broken cable.**
- **Do not use organic solvents such as thinner or acetone on the battery because they damage the battery case. To clean the battery, use a dry cloth.**
- **Do not leave the battery in reach of children. If the battery is swallowed, contact your physician immediately.**

CAUTION

- **When replacing the memory card battery with a new one, insert it into the memory card within approx. 10 minutes after removing the previous battery. The built-in sub-battery maintains the data on the memory card for approx. 10 minutes.**
- **Do not touch the + and — sides of the battery. If touched, wipe it with a dry cloth.**
- **Keep the battery away from direct sun light and open flame.**
- **Before disposing of the battery, check with your local solid waste officials for details in your area for recycling options or proper disposal. The battery is recyclable. At the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream.**

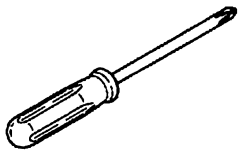
Insert the battery into the memory card before using.

The memory card keeps the stored data intact with the battery operation. When the memory card without the battery is inserted, a message "Check memory card battery." appears on the screen.

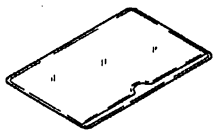
Standard Accessories

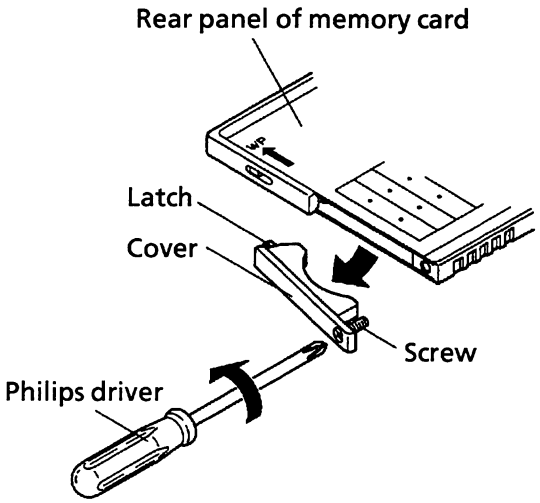
Lithium battery (BR2325)

Philips driver

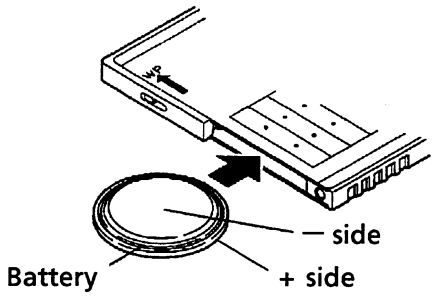


Memory card case

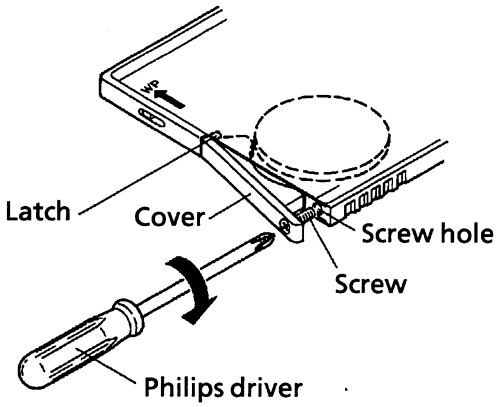




1. Set the rear panel of the memory card up. Fully loosen the screw using the provided Philips driver, then unlatch and remove the cover.

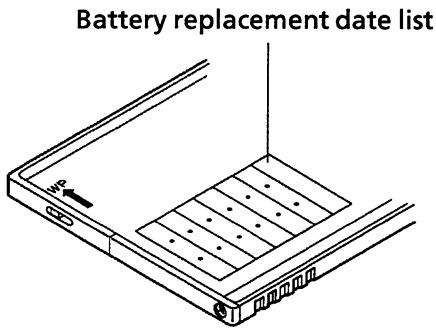


2. Insert the battery (+side down) into the memory card as shown at left.



3. Latch and close the cover pushing the battery in as shown at left.

4. Tighten the screw using the Philips driver.



5. Write the date on the battery replacement date list on the rear panel.

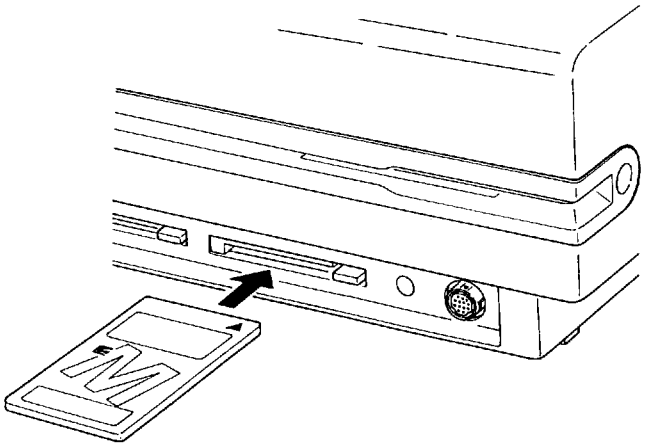
2-5-3 Inserting and Removing the IC Memory Card / Flash Disk Card

◆Inserting the IC Memory Card into Slot 1 or 2

CAUTION

Do not insert the flash disk card into Slot 1 or 2.

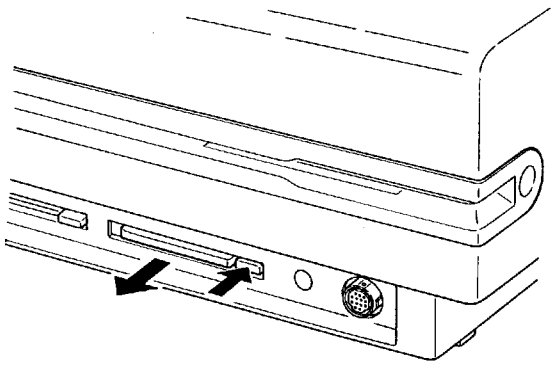
Insert the IC memory card with its label side up into Slot 1 or 2 until the eject button pops out.



◆Removing the IC Memory Card

CAUTION

Do not press the eject button or turn the power off while data is being written to or read from the IC memory card. This may damage the IC memory card and saved data.

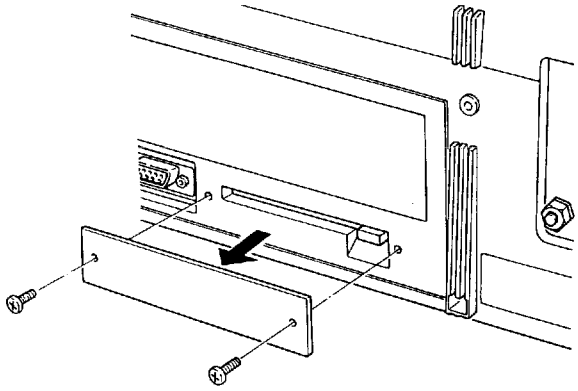


To remove the IC memory card, press the eject button, then pull the card out.

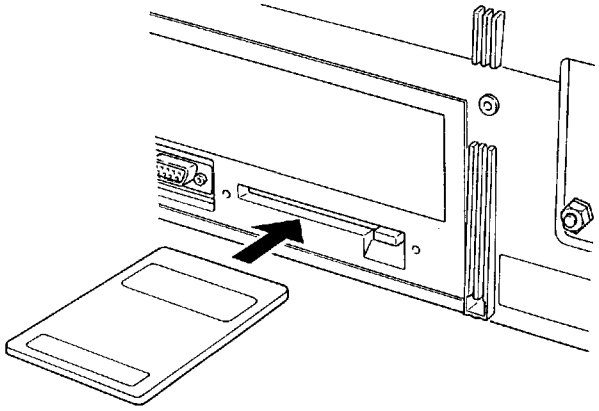
◆Inserting the IC Memory Card or Flash Disk Card into Slot 3

NOTE

Before inserting or removing the flash disk card, turn the cardiograph off.



1. If the IC memory card slot 3 is covered, remove the two screws which attach the IC card slot cover to the bottom casing.



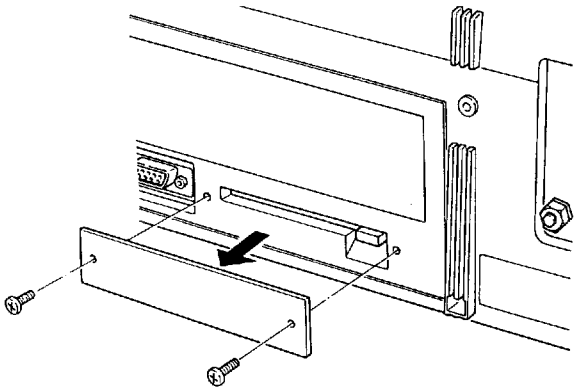
2. Insert the card with its label up into Slot 3 until the eject button pops out.

3. If necessary, reattach the IC card slot cover with the two screws.

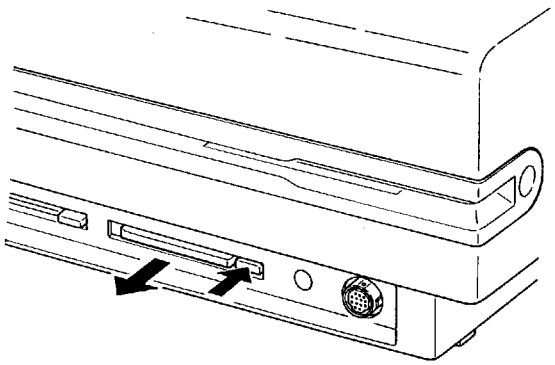
◆Removing the IC Memory Card or Flash Disk Card

CAUTION

Do not press the eject button or turn the power off while data is being written to or read from the card. This may damage the card and saved data.



1. If the IC memory card slot 3 is covered, remove the two screws which attach the IC card slot cover to the bottom casing.



2. Press the eject button, then pull the card out.

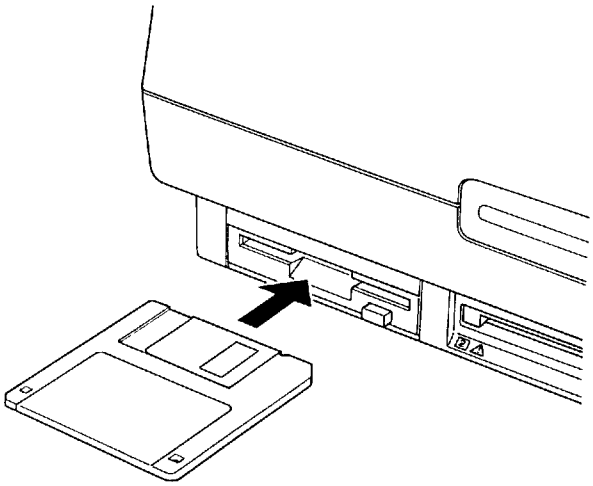
3. If necessary, reattach the IC card slot cover with the two screws.

2-5-4 Inserting and Removing the Floppy Disk

CAUTION

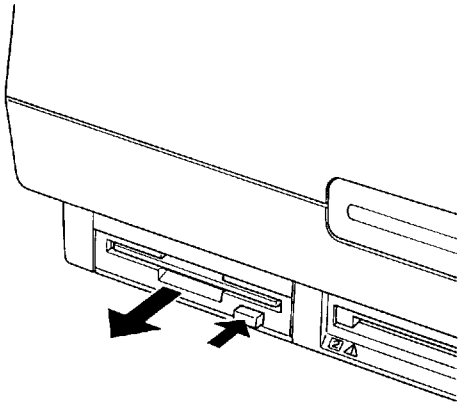
- **Do not turn the power on or off when a floppy disk is inserted in the floppy disk unit. This may damage the floppy disk unit and floppy disk data.**
- **Do not press the eject button while the floppy disk lamp is lit. This may damage the floppy disk unit and floppy disk data.**

◆Inserting the Floppy Disk Into the Floppy Disk Unit



1. Insert a floppy disk with its label up into the floppy disk drive unit.
2. Push the floppy disk in until it clicks.

◆Removing the Floppy Disk



1. Confirm that the floppy disk lamp is not lit.
2. Press the eject button to remove the floppy disk from the floppy disk drive unit.

2-6 Grounding and Connecting the Power Cord

◆Connecting the Power Cord and Grounding the Monitor

3-prong AC Outlet
Connect the provided power cord to the AC SOURCE socket on the rear panel of the instrument and plug the cord into a 3-prong AC outlet.

2-prong AC Outlet
Use the following procedures only when a 3-prong AC outlet is not available and a 2-contact AC outlet is not legally prohibited.

WARNING

Never use a water pipe or gas pipe as a ground because it is not properly grounded and there is a hazard of explosion.

1. Connect the equipotential ground terminal of the instrument to an equipotential ground post on the wall with the ground lead.

2. Connect the power cord to the AC SOURCE socket on the instrument and plug the cord into an AC outlet.

◆Equipotential Grounding

CAUTION

For patient safety, equipotential grounding may be required. Consult with a qualified biomedical engineer.

When equipotential grounding is required to ensure patient safety, connect the equipotential ground terminal on the instrument to the equipotential ground terminal on the wall with the ground lead.

◆Necessity of Equipotential Grounding

When more than one electrical instrument is used, there may be electrical potential difference between the instruments. Potential difference between instruments may cause current to flow to the patient connected to the instruments, resulting in electrical shock (micro shock). Never use any medical equipment without proper grounding.

Always perform equipotential grounding when required. It is often required in the operating room, ICU room, CCU room, cardiac catheterization room and x-ray room. Consult a qualified biomedical engineer to determine if it is required.

2-7 Turning the Power On

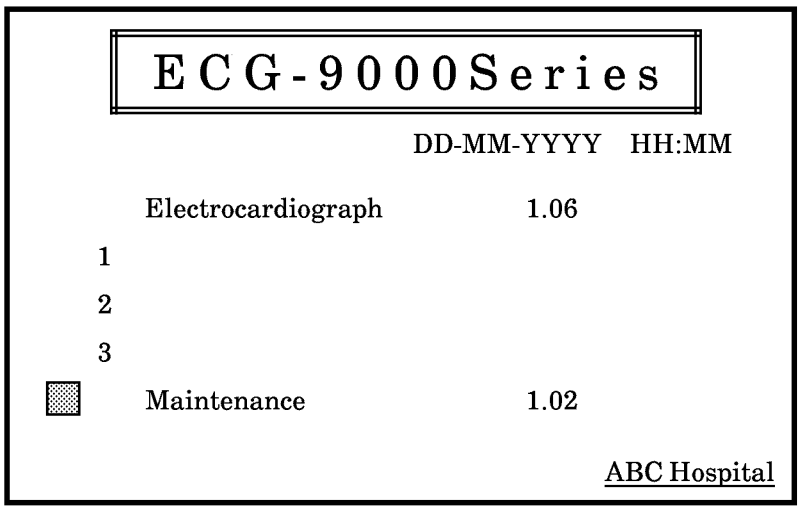
CAUTION

- **If the self-check program detects any cardiograph failure after turning the power on, turn the power off and disconnect the power cord.**
- **Operate the cardiograph on battery power when grounding is not possible.**
- **After turning power off, wait at least 3 seconds to turn the power back on.**
- **Do not turn the power on or off while inserting the floppy disk into the floppy disk drive unit. This may damage the floppy disk data.**

2-7-1 Operating on AC Power

1. Turn the MAIN POWER switch on (|) on the rear panel. The "~" AC lamp on the front panel lights.

2. Press the "(⊙)" ON switch on the operation panel. The self-check program runs, then the Basic screen appears.



Screen during self-check

CAUTION

Do not press the Maintenance key. This key is used to change or upgrade the program. If pressed, the Maintenance window appears; to return to the basic screen, press the Exit key.

NOTE

The cardiograph can turn the backlight of the LCD screen off automatically if there is no touch key or switch activity for approximately five minutes by System Setup. To turn on the back light, press the screen or switch on the operation panel.

2-7-2 Operating on Battery Power

1. Turn the MAIN POWER switch off on the rear panel (○).

2. Press the "(⊙)" ON switch on the operation panel. The self-check program runs, then the Basic screen appears. The "  " mark appears at the top of the screen. The cardiograph can operate for 30 minutes with fully charged battery.

NOTE

- **Operates the cardiograph on AC power when the "  " mark blinks and the alarm sounds. The mark and alarm indicate that the battery voltage is low and the cardiograph will automatically turn the power off within one minute.**
- **In battery power operation, the cardiograph automatically turns the power off if there is no key or switch activity for approximately three minutes and the "Electrode failure" (no electrode is attached patient) is displayed on the screen. After turning the power on again, the basic screen appears.**

Battery operation time

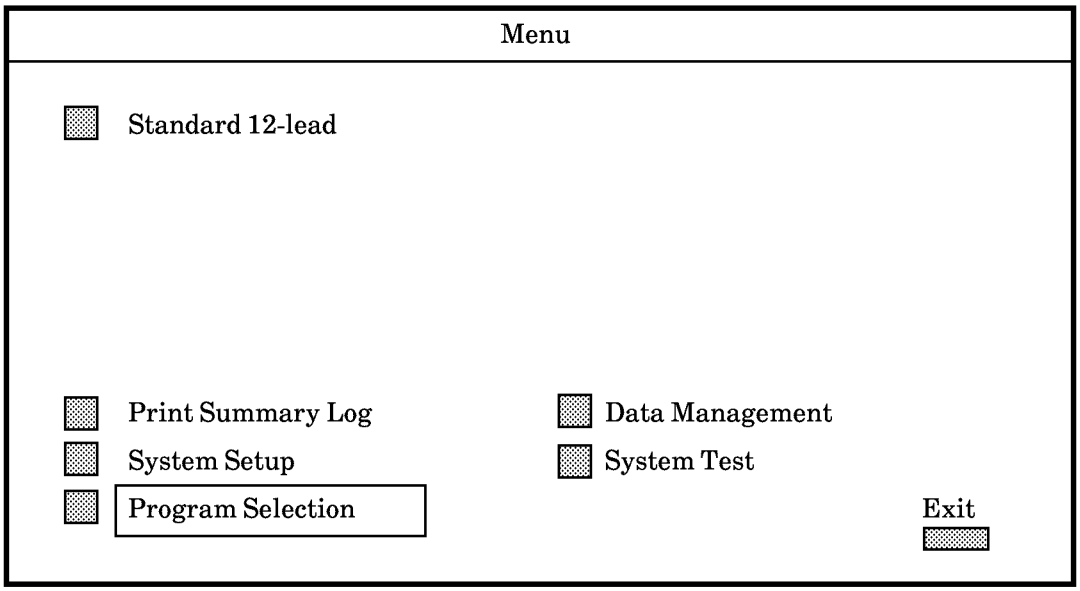
Marks on the screen	Available recording time
	More than 30 minutes
	10 to 20 minutes
	Less than 10 minutes
	Not available; Recharge the battery or operate on AC power.
	Not available; Recharge the battery or operate on AC power.

2-8 Calling Up the Menu Window

When the power is turned on, the cardiograph calls up the examination or operation tool assigned to the top of the menu item in the Menu window.

To select another examination or operation tool, do the following steps. You can select the preset examination or operation tool, or change the various settings.

1. Press the Menu key on the bottom of the screen. The Menu window appears.



2. Press the key beside the examination or operation tool that you want to select.

2-9 Preparation for the Automatic ECG Filing and Transferring

In the resting ECG waveform measurement, the cardiograph temporally saves the acquired ECG waveforms, patient information, and analysis result (measurement table and/or interpretation result when the QP-910E ECG Measurement software or QP-911E ECG Interpretation software) as an ECG file. The cardiograph can automatically save the ECG file in the IC memory card or floppy disk, or transfer the ECG file to another cardiograph or to the Data filing system.

◆To Save the ECG File in an IC Memory Card or Floppy Disk

NOTE

- **If the IC memory card or floppy disk is new, format it prior to use. Refer to Section 8-11 Formatting an IC Memory Card.**
- **To use the floppy disk, the floppy disk drive is required.**

1. Select the drive (IC memory card slot). Refer to Section 3-10 Settings for Data Compression and Drive.

2. Set the Automatic ECG Filing and/or Transferring to ON.
   Refer to Section 3-5-5 Post-processing.

2-10 Receiving, Saving and Printing Files

2-10-1 General

The cardiograph automatically receives any transferred files from another cardiofax or personal computer. After receiving the file, one of the following operations can be performed automatically.

- Saving a file in an IC memory card
- Recording a file
- Saving a file in an IC memory card and recording it

NOTE

- **Between two cardiographs, only file saving is available.**
- **When any of the following operations is selected or performed, a file cannot be received.**
  - **Automatic/Manual Recording**
  - **Analyzing/Measuring ECG**
  - **Rhythm recording**
  - **Freezing waveforms in the External Recording mode**
  - **Opening the System Setup window**
  - **Doing the System Test**
  - **Selecting an item in the Menu window**
  - **Selecting a program in the Program Selection window**
  - **Opening the Data Management screen**

2-10-2 Preparation to Receive and Record Files

NOTE

Operate the cardiograph on AC power to automatically receive the file. If battery operation is selected, the cardiograph automatically turns the power off when there is no key or switch activity for approximately three minutes.

1. Turn the MAIN POWER switch on " (|) " on the rear panel.

2. Press the " ⊙ " ON switch on the operation panel.

3. To save the received files:
   1) Insert an IC memory card into the specified slot.
   2) From the Data Management screen, specify the IC memory card slot.

4. To record the received files, load the recording paper inside the magazine. Refer to Section 2-4.

5. Leave the cardiograph in the above settings. When a file is transferred from another cardiograph or personal computer, the one of the following operation is automatically performed.

   When receiving, a dialog box appears.

The ECG file is being received.

   To cancel receiving the file, press the "  " key. A dialog box appears.

Cancel file receive. OK to cancel ?
YES NO

   Press the YES key to cancel.

2-10-3 Handling Received Files

Files received from a cardiofax or a computer without the Data Filing System:

These files are automatically saved on an IC memory card which is inserted in the assigned slot when they are received. Saved files can be printed and handled from the Data Management screen.

Files received from a computer with the Data Filing System:

The Data Filing System settings determine which of the following ways the received files are handled.

- Automatically saved and printed
  Files are saved on an IC memory card which is inserted in the assigned slot, then printed. Saved files can be handled from the Data Management screen.
- Automatically saved without being printed
  Files are saved on an IC memory card which is inserted in the assigned slot. Saved files can be printed and handled from the Data Management screen.
- Automatically printed without being saved
  In case of running out of paper or other printing interruption, refer to the "Running Out of Paper and Other Printing Interruptions when Printing without Saving" section.

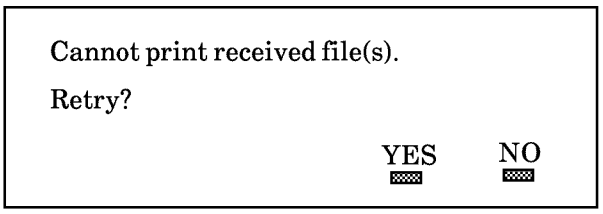
  If an IC memory card is inserted in the selected slot
  Received files are temporarily stored in the IC memory card. After printing, the files are deleted from the IC memory card.

  If no IC memory card is inserted in the selected slot
  Files are received and printed one file at a time. Without an IC memory card, the cardiofax can temporarily store only one file at a time in its internal memory.

2-10-4 Running Out of Paper and Other Printing Interruptions when Printing without Saving

◆No IC Memory Card Inserted

If recording paper runs out during printing, a dialog box appears.



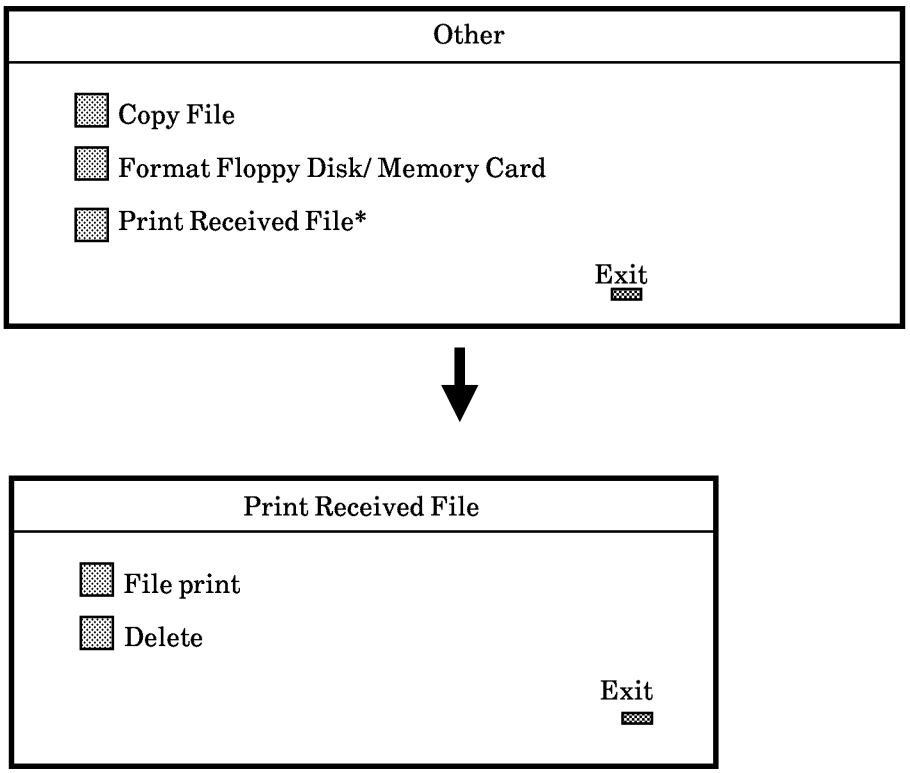
To continue printing, load the recording paper and press the YES key.
To cancel printing, press the NO key.

◆With IC Memory Card Inserted

When there is an IC memory card in the slot, the file is temporarily saved on an IC memory card. The file is automatically printed, and after printing is complete, the file is automatically deleted from the IC memory card.

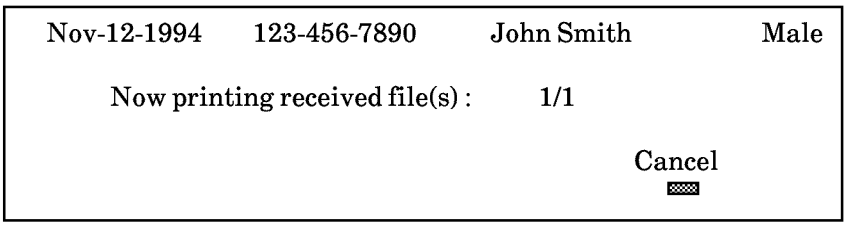
If recording paper runs out and/or printing is cancelled, the data is temporarily saved on the IC memory card.

To continue printing, display the Other window of the Data Management screen, and press the Print Received File key.
* The Print Received File key only appears when the file is received.



1. Load the recording paper.

2. Press the File print key to start printing. The following dialog box appears.



To cancel printing, press the Cancel key in the dialog box.

To delete the temporarily saved files from the IC memory card, press the Delete key in the Print Received File window. Deleting procedures are the same as described in Section 8-9.

2-11 Changing a Program

The cardiograph provides three IC memory card slots to load a program. To change the program, call up the Menu window.

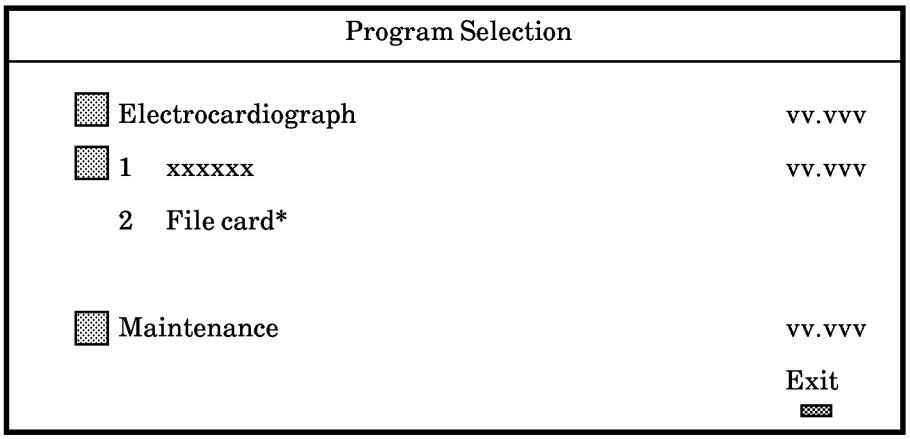
◆To Change the Program

CAUTION

Do not press the Maintenance key. This key is used to change or upgrade the program. If pressed, the Maintenance window appears; to return to the basic screen, press the Exit key in the window.

1. Insert the program card into the IC memory card slot.

2. From the Menu window, press the Program Selection key. The Program Selection window appears.



* cannot select

The program card name and version of the program cards currently inserted into the slots are displayed on the screen. If you change a program name in the System Setup, the changed name is displayed.
To close the screen without selecting a program, press the Exit key on the screen.

3. Press the key beside the program card name to load the program that you want.

2-12 Initializing a Barcode Reader

Prior to use the barcode reader, initialize it by reading the following barcodes (1) to (7). When reading the barcode 1, there are four pip tones. When reading the barcodes (2) to (7), there are two pip tones.

(1)  Z9

(2)  A0

(3)  L0

(4)  M1

(5)  K5

(6)  O5

(7)  Z9

After initializing the barcode reader, check it by using the Barcode Reader window of the System Test.

1. From the Basic screen, press the Menu key to open the Menu window.
2. Press the System Test key.
3. Press the Barcode Reader key.
4. Read the following code.

5. Compare the ASCII coded data of the barcode displayed on the screen and actual value of the barcode.

SECTION 3

CHANGING SETTINGS BEFORE MEASUREMENT (SYSTEM SETUP WINDOW)

3-1 Explanation and List of All Setting Items 3.1
3-1-1 General 3.1
3-1-2 Complete List of Settings and Defaults 3.2
3-2 How to Change Settings 3.11
3-3 Printing a List of All Settings 3.13
3-4 Registering or Editing Examinations (Menu Setup Window) 3.14
3-5 Examination Types (Standard 12-lead and Cabrera Lead, Nehb Lead and External Input) and Settings 3.17
3-5-1 Setting Items for Each Examination Type 3.17
3-5-2 Manual Recording (All Examination Types) 3.19
3-5-3 Auto Recording (Standard 12-lead, Cabrera Lead, Nehb Lead Only) 3.21
3-5-4 Rhythm Recording (Standard 12-lead, Cabrera Lead, Nehb Lead Only) 3.25
3-5-5 Post-processing (Standard 12-lead, Cabrera Lead, Nehb Lead Only) 3.26
3-5-6 Report Recording (Standard 12-lead, Cabrera Lead, Nehb Lead Only) 3.27
3-5-7 Rhythm Lead (Standard 12-lead, Cabrera Lead, Nehb Lead Only) 3.31
3-5-8 EXTRA 6 Ch Lead (Standard 12-lead and Cabrera Lead Only) 3.33
3-5-9 Lead Selection (External Signal Only) 3.33
3-5-10 Slow Recording/Hi Cut Filter (All Examination Types) 3.34
3-5-11 Power Up (All Examination Types) 3.35
3-5-12 Requesting Phys. Registration (All Examination Types) 3.38
3-6 Settings for Patient Data Entry 3.39
3-7 Settings for ID Card 3.41
3-8 Settings for Barcode 3.43
3-9 Settings for Communication 3.45
3-10 Settings for Data Compression and Drive 3.46
3-11 Settings for Program and Hospital Name 3.47
3-12 Settings for Sound 3.48
3-13 Settings for Recorder and AC Filter 3.50
3-14 Settings for Language and LCD 3.51
3-15 Settings for Summary Data Creation 3.52
3-16 Settings for Date and Time 3.53

3-17 Settings for Height, Weight and Blood Pressure 3.54
3-18 Saving/Loading the System Settings 3.55
3-18-1 Saving the System Settings in the Memory Card or Floppy Disk 3.55

3-1 Explanation and List of All Setting Items

3-1-1 General

In the System Setup window, you can change settings for individual examinations (Section 3-5) as well as items which apply to all examinations (Sections 3-6 to 3-18). Setting changes are maintained even when the power is turned off. Settings on the System Setup window cannot be changed during operation.

You can register up to 12 examinations with names of your choice (Section 3-4). By presetting examinations which are specifically required by physicians or departments, you can quickly select a desired examination from the Menu window with a single keystroke.

Following is an outline of all setting items. For a detailed list, refer to the next page.

1. Examination menu settings
   - A. Standard 12-lead and Cabrera lead ECG recording settings
     - A-1. Manual recording
     - A-2. Auto recording
     - A-3. Rhythm recording
     - A-4. Post-processing
     - A-5. Report recording
     - A-6. Rhythm lead
     - A-7. Extra 6 Ch lead
     - A-8. Slow recording and Hi cut filter
     - A-9. Power up
     - A-10. Requesting physician's name registration
   - B. Nehb lead ECG recording settings
     - B-1. Manual recording
     - B-2. Auto recording
     - B-3. Rhythm recording
     - B-4. Post-processing
     - B-5. Report recording
     - B-6. Rhythm lead
     - B-7. Slow recording and Hi cut filter
     - B-8. Power up
     - B-9. Requesting physician's name registration

   C. External signal recording settings
      C-1. Manual recording
      C-2. Lead setting
      C-3. Slow recording and Hi cut filter
      C-4. Power up
      C-5. Requesting physician's name registration
2. Patient data items
3. ID card settings
4. Barcode settings
5. Communication settings
6. Data compression and drive settings
7. Program and hospital names registration
8. Sound settings
9. Recorder and AC filter settings
10. Language and LCD settings
11. Summary log generation
12. Date and time settings
13. Unit for height and weight settings

3-1-2 Complete List of Settings and Defaults

Following is a detailed list of the settings in the outline above. Underlining indicates the factory setting. For details about each item, refer to the individual Sections 3-5.

1. Menu Setup

Item	Settings
Input/Lead Mode Selection	Standard 12-lead, Cabrera lead, Nehb lead, External input
Menu Name	Up to 17 letters

A. Standard 12 Lead and Cabrera Lead Settings

NOTE

Items with *1: Available when the QP-911E ECG Interpretation software is used.
Items with *2: Available when the QP-911E ECG Interpretation software or QP-910E ECG Measurement software is used.

A-1. Manual Recording

Item	Settings
Auto Position	ON, OFF
Analysis Result Format*2	Result (Half-page), Result + Average (Full-page), Result + Average + Rhythm (Full-page), OFF
Measurement Table*2	Measurement Table, Avg. + Rhythm and Measurement Table, Avg. + Measurement Table + M.XYZ, OFF
Automatic Calibration	Before each sequence, After each sequence, OFF

A-2. Auto Recording

Item	Settings
ECG Data Pre-acquisition	ON, OFF
Waveform Recording Format	3 Ch Rhythm + Average, 3 Ch (12-lead), 3 Ch (12-lead) + Rhythm, 6 Ch (12-lead), 6 Ch (12-lead, All data), 12 Ch (12-lead), OFF
Auto Gain	ON, OFF
Analysis Result Format*2	Result + Waveforms (Full-page), Result (Half-page), Result + Average (Full-page), Result + Average + Rhythm (Full-page), OFF
Interpretation Findings*1	Findings + Reason, Findings Only, OFF
Measurement Table*2	Measurement Table, Avg. + Rhythm and Measurement Table, Avg. + Measurement Table + M.XYZ, OFF
Additional 3-lead Rhythm	ON, OFF
Serial Comparison*2	With ST Measurement, Without ST Measurement, OFF

A-3. Rhythm Recording

Item	Settings
Rhythm Recording Format	Single-lead 1 min, Single-lead 3 min, 3-lead 20 s, 3-lead 1 min
Rhythm Recording Time	1 min, 3 min

A-4. Post-processing

Item	Settings
10-second Leads	Save, Transmit, Save + Transmit, OFF
Post-processing Conditions*1	All Data, All Except ** Normal ECG **
Rhythm Leads	Save, Transmit, Save + Transmit, OFF

A-5. Report Recording

Item	Settings
Auto Recording	ON, OFF
Format	Change, Duplicate
Number of Copies	1 to 9 copies

Format Settings (Available when Format is set to Change)

Waveform Recording Format	3 Ch Rhythm + Average, 3 Ch (12-lead), 3 Ch (12-lead) + Rhythm, 6 Ch (12-lead), 6 Ch (12-lead, All data), 12 Ch (12-lead), OFF
Auto Gain	ON, OFF
Analysis Result Format*2	Result + Waveforms (Full-page), Result (Half-page), Result + Average (Full-page), Result + Average + Rhythm (Full-page), OFF
Interpretation Findings*1	Findings + Reason, Findings Only, OFF
Measurement Table*2	Measurement Table, Avg. + Rhythm and Measurement Table, Avg. + Measurement Table + M.XYZ, OFF
Additional 3-lead Rhythm	ON, OFF
Serial Comparison*2	With ST Measurement, Without ST Measurement, OFF

A-6. Rhythm Lead

Item	Settings
1 Ch Lead	Ⅰ, Ⅱ, Ⅲ, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6
3 Ch Lead	Ⅰ, Ⅱ, Ⅲ, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6

A-7. EXTRA 6 Ch Lead

Item	Settings
EXTRA 6 Ch Lead	Ⅰ, Ⅱ, Ⅲ, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6

A-8. Slow Recording/Hi Cut Filter

Item	Settings
Slow Paper Speed	5 mm/s, 10 mm/s, 12.5 mm/s
High Cut Filter	25 Hz, 35 Hz, 7 5Hz, 100 Hz, 150 Hz, Default

Initial setting: 150 Hz

A-9. Power Up

Item	Settings
Waveform Display Format	12 Ch, 3 Ch Rhythm, Same as Printout
Rhythm Waveform Display	ON, OFF
Auto or Manual Recording	Auto, Manual
Recording Channels	3 Ch, 3 Ch + Rhythm, 6 Ch, 12 Ch
Baseline Drift Suppression	ON, OFF
Paper Speed	25 mm/s, 50 mm/s
Age Unit	Years, Months, Weeks, Days
External Output	Same as Printout, EXTRA lead

A-10. Requesting Phys. Registration

Item	Settings
Requesting Phys. Registration	Up to 14 names can be registered.

B. Nehb Lead ECG Settings

B-1. Manual Recording

Item	Settings
Auto Position	ON, OFF
Automatic Calibration	Before each sequence, After each sequence, OFF

B-2. Auto Recording

Item	Settings
ECG Data Pre-acquisition	ON, OFF
Waveform Recording Format	3 Ch 1page, 3 Ch 2pages, 6 Ch
Auto Gain	ON, OFF

B-3. Rhythm Recording

Item	Settings
Rhythm Record Format	Single-lead 1 min, Single-lead 3 min, 3-lead 20 s, 3-lead 1 min
Rhythm Recording Time	1 min, 3 min

B-4. Post-processing

Item	Settings
10-second Leads	Save, Transmit, Save+Transmit, OFF
Rhythm Leads	Save, Transmit, Save+Transmit, OFF

B-5. Report Recording

Item	Settings
Auto Recording	ON, OFF
Format	Change, Duplicate
Number of Copies	1 to 9 copies
Waveform Recording Format	3 Ch 1page, 3 Ch 2pages, 6 Ch
Auto Gain	ON, OFF

B-6. Rhythm Lead

Item	Settings
1 Ch Lead	Ⅰ, Ⅱ, Ⅲ, ND, NA, NI
3 Ch Lead	Ⅰ, Ⅱ, Ⅲ, ND, NA, NI

B-7. Slow Recording/Hi Cut Filter

Item	Settings
Slow Paper Speed	5 mm/s, 10 mm/s, 12.5 mm/s
High Cut Filter	25 Hz, 35 Hz, 75 Hz, 100 Hz, 150 Hz, Default

Initial setting: 150 Hz

B-8. Power Up

Item	Settings
Waveform Display Format	Same as Printout, 6 Ch
Rhythm Waveform Display	ON, OFF
Auto or Manual Recording	Auto, Manual
Recording Channels	3 Ch, 6 Ch
Baseline Drift Suppression	ON, OFF
Paper Speed	25 mm/s, 50 mm/s
Age Unit	Years, Months, Weeks, Days

B-9. Requesting Phys. Registration

Item	Settings
Requesting Phys. Registration	Up to 14 names can be registered.

C. External Input Settings

C-1. Manual Recording

Item	Settings
Auto Position	ON, OFF
Automatic Calibration	Before each sequence, After each sequence, OFF

C-2. Lead Selection

Item	Settings
ECG Lead	Ⅰ, Ⅱ, Ⅲ, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6

C-3. Slow Recording/Hi Cut Filter

Item	Settings
Slow Paper Speed	5 mm/s, 10 mm/s, 12.5 mm/s
High Cut Filter	25 Hz, 35 Hz, 75 Hz, 100 Hz, 150 Hz, Default

Initial setting: 150 Hz

C-4. Power Up

Item	Settings
Baseline Drift Suppression	ON, OFF
Paper Speed	25 mm/s, 50 mm/s
Age Unit	Years, Months, Weeks, Days

C-5. Requesting Phys. Registration

Item	Settings
Requesting Phys. Registration	Up to 14 names can be registered.

2. Patient Data Items

Item	Settings
ID Number	ON, OFF, ID-Sex Code
Name	ON, OFF
Sex	ON, OFF
Age	Birth Date, Age, OFF
Height	ON, OFF
Weight	ON, OFF
Blood Pressure	ON, OFF
Medication	ON, OFF, Medicine Name Registration (Up to 5 kinds can be registered.)
Race	ON, OFF
Room Number	ON, OFF
Department	ON, OFF, Department Name Registration (Up to 14 names can be registered.)
Req. Phys. Name	ON, OFF
Technician Name	ON, OFF, Technician Name Registration (Up to 14 names can be registered.)
Data Auto Erase	ON, OFF
Download	ON, OFF
Master File	ON, OFF

3. ID Card Settings

Item		Settings
Track Selection		Track A, Track B
Data Bits	Track A	5 bits, 7 bits, 8 bits (7F), 8 bits (01)
	Track B	5 bits, 8 bits (7F)
Data Length	Track A	79 (Enter 2 digits)
	Track B	40 (Enter 2 digits)
ID Address		(Enter 2 digits)
Name Address		(Enter 2 digits)
Sex Address		(Enter 2 digits)
Comment Address		(Enter 2 digits)
Male Code		M or up to 8 letters
Female Code		F or up to 8 letters
Year Address		(Enter 2 digits)
Month Address		(Enter 2 digits)
Day Address		(Enter 2 digits)

4. Barcode Settings

ID Address	1-12 (Enter 2 digits)
Name Address	- (Enter 2 digits)
Sex Address	13-13 (Enter 2 digits)
Comment Address	- (Enter 2 digits)
Male Code	1 or up to 8 letters
Female Code	2 or up to 8 letters
Year Address	14-17 (Enter 2 digits)
Month Address	18-19 (Enter 2 digits)
Day Address	20-21 (Enter 2 digits)

5. Communication Settings

Item	Settings
Location Number	Enter a number of up to 4 letters.
Password	Enter up to 10 letters.
Modem Initialize Command	Enter up to 64 letters. AT&M5\J0$D1S0=0\Q3S2=255&D2&C1
Baud Rate	1200, 2400, 4800, 9600 Baud
Direct/Modem Connection	Direct, Modem
Telephone Number	20 digits, a number, + or − key can be used.

6. Data Compression and Drive Settings

Item	Settings
Data Compression Type	Type 1, Type 2
Data Selection	Floppy Disk, Memory Card 1, Memory Card 2, Memory Card 3

7. Program Name and Hospital Name Registration

Item	Settings
Program Name	Enter up to 40 letters.
Hospital Name	Enter up to 40 letters.

8. Sound Settings

Item		Settings
QRS Sync/Pen Sound Selection		QRS Sync Sound, Pen Sound, OFF
QRS Sync Sound Settings	Pitch	Low (0) - High (7) [5]
	Volume	Min (0) - Max (7) [0]
Pen Sound Volume	Volume	Min (0) - Max (7) [0]
Alarm Sound	Pitch	Low (0) - High (7) [4]
	Volume	Min (0) - Max (7) [3]
Chime Sound	Pitch	Low (0) - High (7) [3]
	Volume	Min (0) - Max (7) [3]

9. Recorder and AC Filter Settings

Item	Settings
Recording Paper Type	With Cue Mark, Without Cue Mark
Grid Recording	ON, OFF
AC Filter	50 Hz, 60 Hz, OFF
Baseline Thickness	Thin, Normal, Thick
Overlap	Moderate, Slight, None
Barcode Recording	ON, OFF

10. Language and Display Settings

Item	Settings
Language	English, Local Language
LCD	Normal, Reverse
External Display	Normal, Reverse
Back Light Auto Off	ON, OFF

11. Summary Log Generation

Item	Settings
Create Summary Log	ON, OFF

12. Date and Time Settings

Item	Settings
Date Display Format	YYYY-MMMM-DD, MMMM-DD-YYYY, DD-MMMM-YYYY
Time Display Format	12 Hour, 24 Hour
Date and Time	

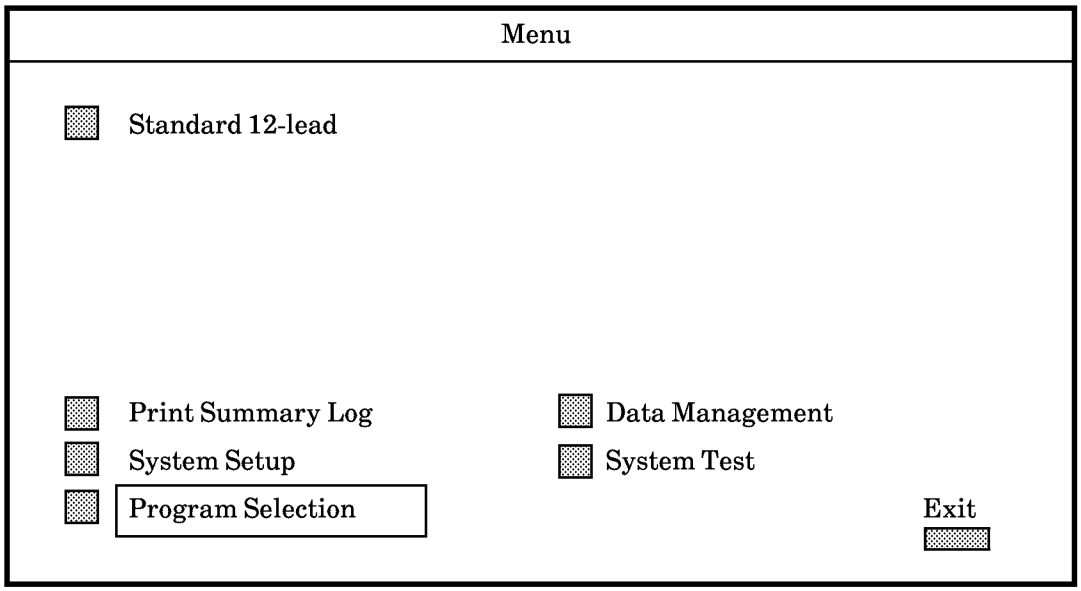
13. Units for Height, Weight and BP.

Item	Settings
Unit for height and weight	cm, kg, inch, pound
Unit for blood pressure	mmHg, kPa

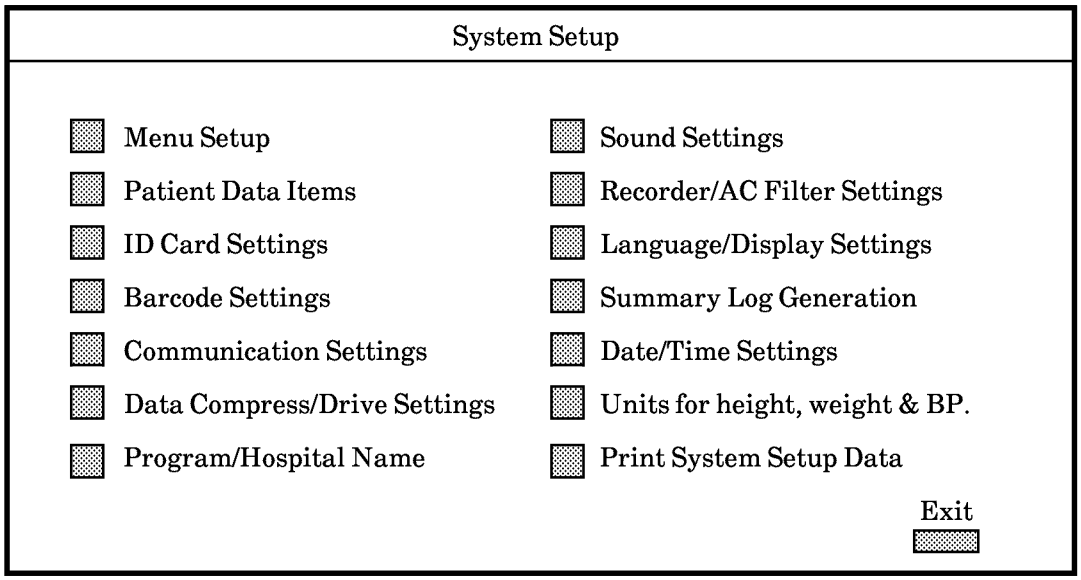
3-2 How to Change Settings

This section describes general procedures for changing settings. For details about individual setting items, see the appropriate sections 3-4 to 3-18. To check the system settings you can print them all out. See Section 3-3.

1. Press the Menu key from the basic screen to open the Menu window.



2. Press the System Setup key to open the System Setup window.



To select an examination, such as standard 12 lead ECG recording, select Menu Setup.

3. Press the key beside an item to open the window or Menu window for that item.

4. You can change settings in one of the following ways.
   - Press the key for the desired item on the window or Menu window.
     Options and keys for changing settings are displayed.
   - To enter numbers, use the numeric keypad. For correction, press the ⌫ key and enter a correct number. Sign keys ([+], [−], etc.) are displayed if necessary.
   - To enter letters, use the keyboard display. Press letter keys.
     Pressing the ALT key displays local language strings.

   When settings are done, the options and keys disappear.

5. To set the settings for another item, repeat steps 3 and 4.

6. After changing all desired settings for the item, confirm the settings and press the OK key. The settings are saved and the Menu window appears.

NOTE

If you do not press the OK key, the setting changes are not saved and are lost when the Menu or Exit key is pressed or the power is turned off.

To reset, press the Cancel key.
The setting changes are canceled and the Menu window appears.

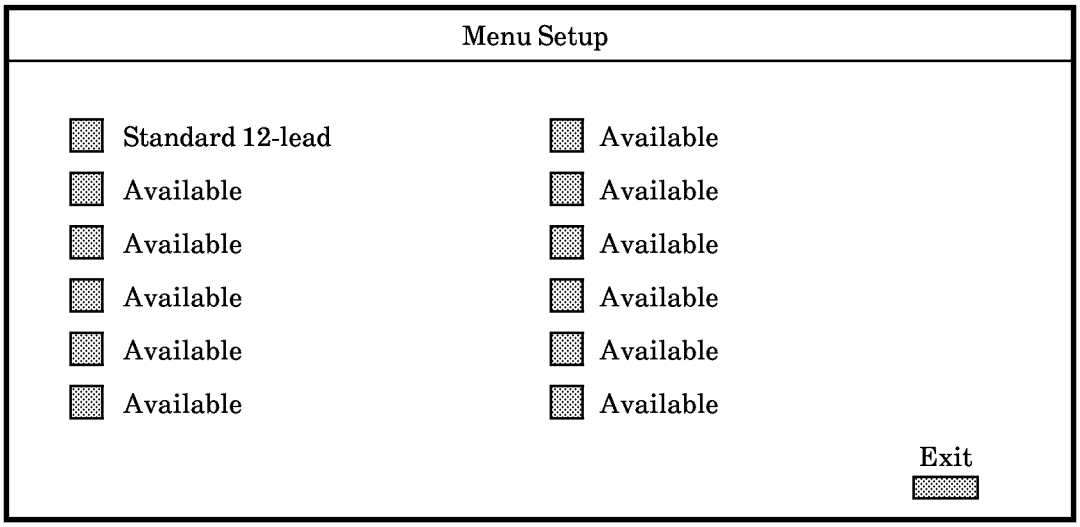
7. Press the Exit key in the System Setup window to close the System Setup window and call up the Basic screen.

3-3 Printing a List of All Settings

Selecting Print System Setup Data on the System Setup window records all items and settings of the System Setup. After the recording is completed, the System Setup window appears. To stop recording, press the Cancel key.

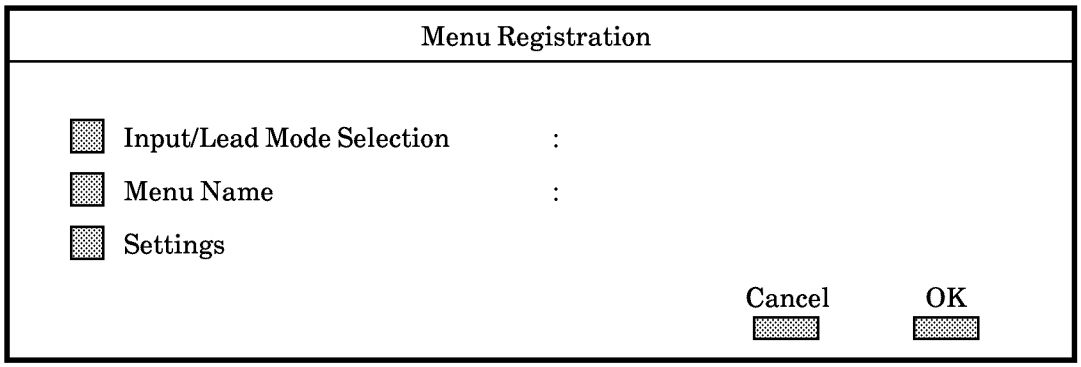
3-4 Registering or Editing Examinations (Menu Setup Window)

When you select Menu Setup in the System Setup window, the following examination menu list screen is displayed. Registered examinations are displayed on the menu and you may register new examinations at an [Available] menu item or edit existing examinations. The registered examinations on the Menu Setup window are displayed on the menu and can be selected during operation.

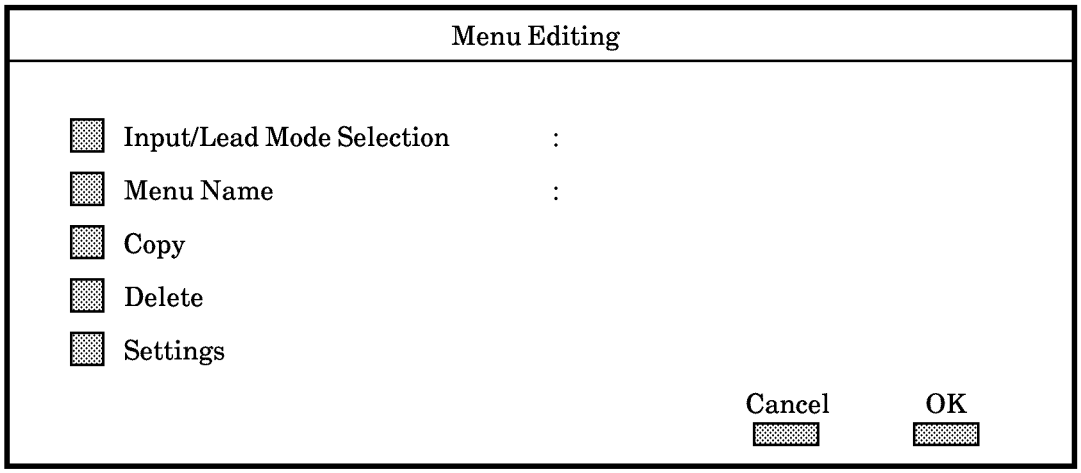


Press the key for the menu item in the Menu Setup window where you wish to change settings or register a new examination. One of the following two windows appears depending on whether the selected item in the Menu Setup window already has or does not have a registered examination.

When the selected item does not have a registered examination:



When the selected item already has a registered examination:



Input/Lead Mode Selection
Specify the examination type (Standard 12-lead, Cabrera lead, Nehb lead or External input). See Section 3-5 for an explanation of each examination type. This selection changes the items in **Settings** below.

Menu Name
Selecting this item lets you edit the name of the menu item. The keyboard is displayed and you can specify an examination name using up to 17 letters.

Copy
Selecting this item allows you to copy the settings from the currently selected examination to another examination. Everything is copied. A Menu window is displayed where you press the key to select the menu item to copy to.

Delete
Selecting this item allows you to delete all settings of the currently selected examination. You are asked to confirm deletion. Pressing the YES key deletes the contents and the NO key cancels the deletion.

Settings

This item allows you to change various settings. The settings you can change differ depending on the **Input/Lead Mode Selection**. The setting method for each examination type is different. Refer to Section 3-5.

NOTE

If you do not press the OK key, the setting changes are not saved and are lost when the Menu or Exit key is pressed or the power is turned off.

3-5 Examination Types (Standard 12-lead and Cabrera Lead, Nehb Lead and External Input) and Settings

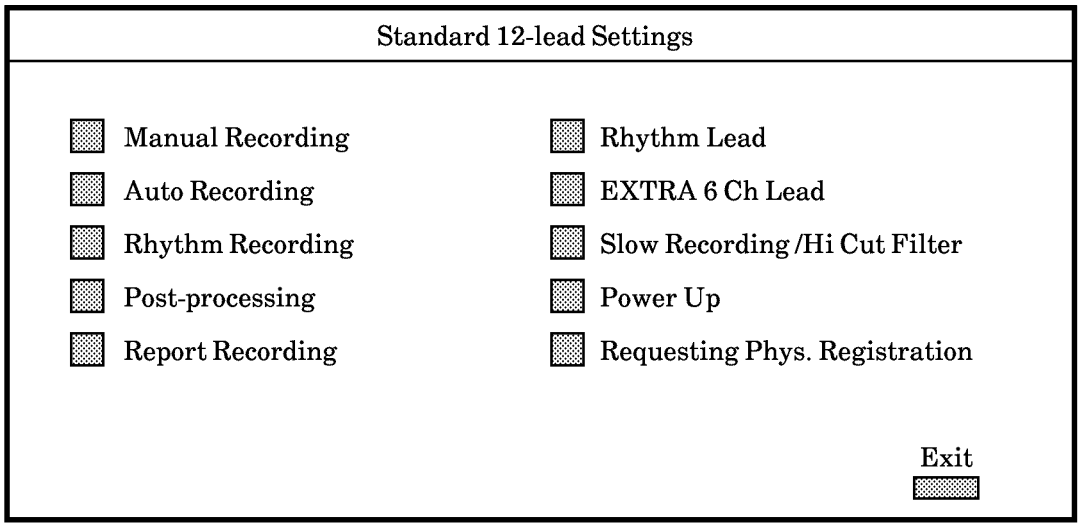
3-5-1 Setting Items for Each Examination Type

Different examination types have different setting items, as shown below. For available setting items, refer to Section 3-1-2. Standard 12 lead and Cabrera lead recording have the same items and only their sequences are different. Pressing the Standard 12 Lead, Cabrera Lead, Nehb Lead or External Signal key displays one of the following screens.

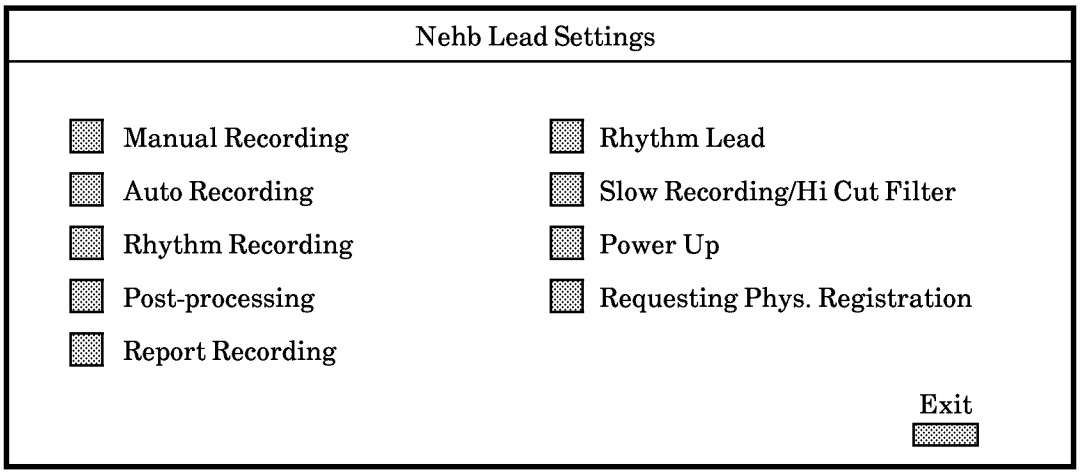
To display the setting screen for an item on one of the following screens, press the touch key for the item. Each item is explained in Sections 3-5-1 through 3-5-12.

Standard 12 Lead and Cabrera Lead screen

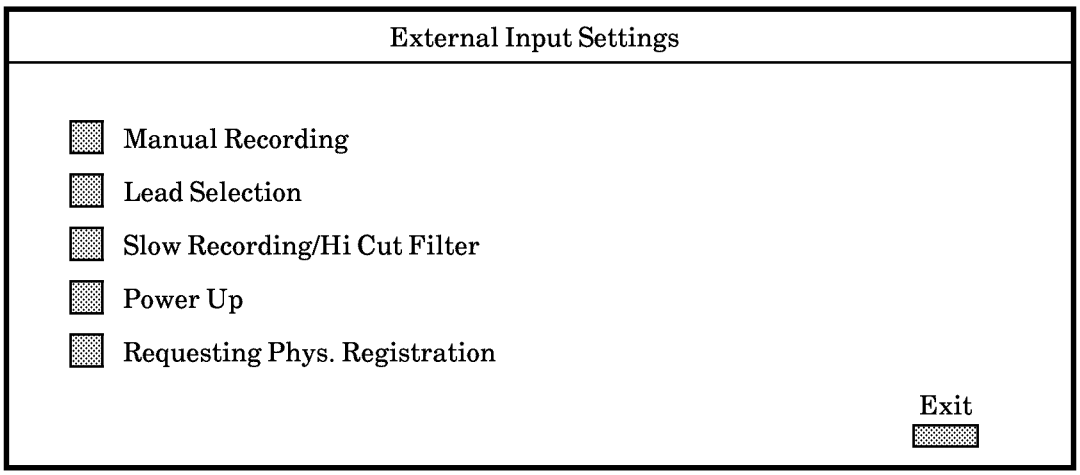
When the Standard 12-lead setting is selected:



Nehb Lead screen



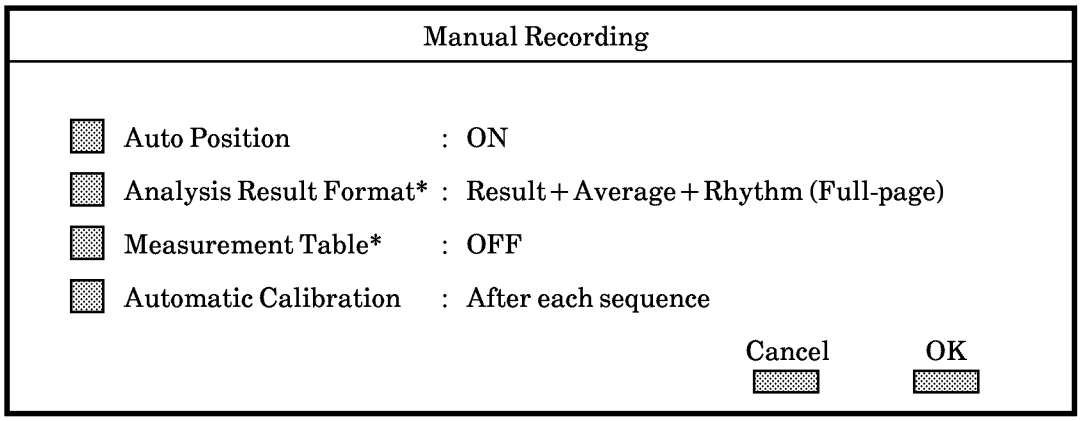
External Input screen



3-5-2 Manual Recording (All Examination Types)

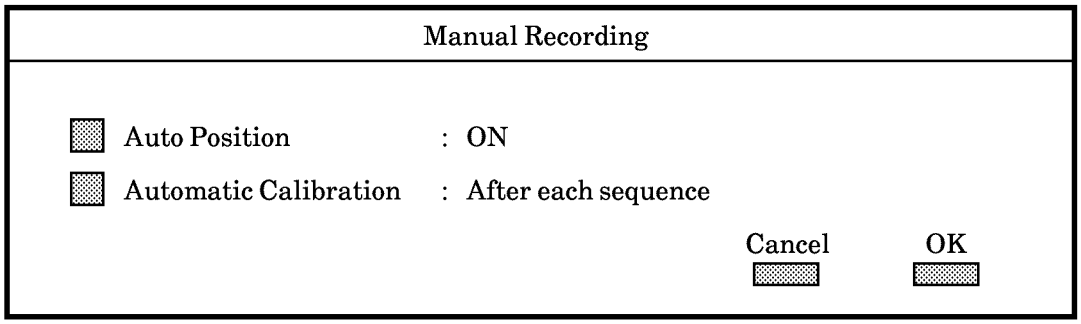
Here you are setting for manual recording.
The underlined settings are preset before shipment from the factory.

Standard 12-lead and Cabrera lead



* These items are displayed only when QP-910E or 911E is used.

Nehb lead



Auto Position (ON, OFF)
This function automatically changes the position of the ECG waveforms on recording paper.

Number of recording channels	Trace width
3	56 mm each
3 with Rhythm lead	40 mm each (Rhythm lead: 45 mm)
6	28 mm each
12*	14 mm each

* 12 channel recording is not available in Nehb lead ECG recording.

Analysis Result Format (Result (Half-page), Result + Average (Full-page), Result + Average + Rhythm (Full-page), OFF)
This item selects how to treat an analysis result.

Result (Half-page):	An analysis result is recorded in half a page.
Result + Average (Full page):	Analysis result and average waveform are recorded.
Result + Average + Rhythm (Full page):	Analysis result and average waveform are recorded together with one channel of rhythm lead.
OFF:	An analysis result is not recorded.

Measurement Table (Measurement Table, Avg. + Rhythm and Measurement Table, Avg. + Measurement Table + M.XYZ, OFF)
This item selects whether a detailed measurement value is recorded or not.
Average waveform + rhythm is recorded at the speed of 50 mm/s and the measurement point is also recorded.

Measurement Table:	Only a measurement table is recorded.
Avg. + Rhythm and Measurement Table:	Rhythm lead (with P, QRS wave pattern) and heartbeat (with measurement points) corresponding with the recorded value are recorded.
Avg. + Measurement Table + M.XYZ:	2 kinds of average are recorded at the speed of 25 mm/s, sensitivity 10 mm/mV, and 50 mm/s, sensitivity 20 mm/mV. Also measurement table, modified XYZ waveform and vector are recorded. Modified X = 1.06 × V6 Modified Y = 1.25 × aVF = 0.625 × (Ⅱ × 2 − Ⅰ) Modified Z = 0.043 × V6 − 0.532 × V2
OFF:	A measurement table is not recorded.

Automatic Calibration (Before each sequence, After each sequence, OFF)
This item selects whether or not to automatically record calibration when the lead is switched during manual recording.

3-5-3 Auto Recording (Standard 12-lead, Cabrera Lead, Nehb Lead Only)

Here you are setting the recording format for Auto Recording.
The underlined settings are preset before shipment from the factory.

Standard 12-lead and Cabrera lead

Auto Recording		
ECG Data Pre-acquisition	:	OFF
Waveform Recording Format	:	6 Ch (12-lead)
Auto Gain	:	ON
Analysis Result Format*	:	Result + Average + Rhythm (Full-page)
Interpretation Findings**	:	Findings + Reason
Measurement Table*	:	OFF
Additional 3-lead Rhythm	:	OFF
Serial Comparison*	:	OFF
		Cancel OK

* These items are displayed only when QP-910E or 911E is used.
** This item is displayed only when QP-911E is used.

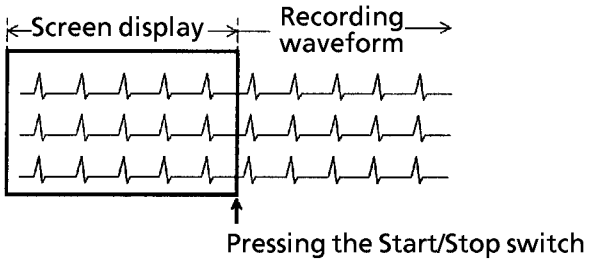
Nehb lead

Auto Recording		
ECG Data Pre-acquisition	:	OFF
Waveform Recording Format	:	6 Ch
Auto Gain	:	ON
		Cancel OK

ECG Data Pre-acquisition (ON, OFF)

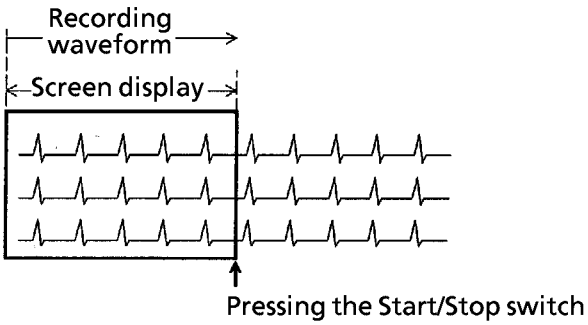
● Real time recording (the "ECG Data Pre-acquisition" is set to "OFF"):

When you press the Start/Stop switch, the cardiograph starts to record real time ECG waveforms in the preset format. The ECG lead group is periodically switched according to the preset lead selection.



● Delayed recording (the "ECG Data Pre-acquisition" is set to "ON"):

The cardiograph always stores the ECG waveforms before recording them, so you can check the waveforms before recording the ECG waveforms. The cardiograph starts to record the delayed waveforms which were stored 10 seconds before pressing the Start/Stop switch. The ECG waveforms are recorded in the preset format. The ECG lead group is periodically switched according to the preset lead selection.



Waveform Recording Format - Standard 12-lead and Cabrera lead

(3 Ch Rhythm + Average, 3 Ch (12-lead) + Rhythm, 6 Ch (12-lead), 6 Ch (12-lead, All data), 12 Ch 12-lead, OFF)

This item selects an ECG waveform recording format.

3 Ch Rhythm + Average:	3 channels of rhythm and 1 channel of average waveform(s) is recorded.
3 Ch (12-lead):	The 12 leads are recorded in 4 sequences of 3 channels each. Each sequence takes 2.5 seconds.
3 Ch (12-lead) + Rhythm:	The 12 leads are recorded in 4 sequences of 3 channels each. Each sequence takes 2.5 seconds. 1 channel of rhythm lead is also recorded.
6 Ch (12-lead):	The 12 leads are recorded in 2 sequences of 6 channels each. Each sequence takes 5 seconds.
6 Ch (12-lead, All data):	The 12 leads are recorded in 2 sequences of 6 channels each. Each sequence takes 10 seconds and includes all data.

12 Ch (12-lead):	The 12 leads in 12 channels are recorded simultaneously for 10 seconds.
OFF:	ECG waveforms are not recorded. Other items to be selected later are recorded. File saving and transferring are performed even when nothing is recorded.

Waveform Recording Format - Nehb lead (3 Ch 1 page, 3 Ch 2 pages, 6 Ch)
This item selects an ECG waveform recording format.

3 Ch 1 page:	Each 3 channels in 2 sequences are recorded in 1 page. Each lead takes 5 seconds for recording. Lead intervals are temporally sequential.
3 Ch 2 pages:	Each 3 channels in 2 sequences are recorded in 2 pages. Each lead takes 10 seconds for recording. All recordings are performed in the same phase.
6 Ch:	All 6 channels are recorded in 1 page.

Auto Gain (ON, OFF)
This item selects whether Auto Gain works or not. See Section 3-5-2 Manual Recording "Auto Position" for the relation between the number of recording channels and trace width.

Analysis Result Format (Result + Waveforms (Full-page), Result (Half-page), Result + Average (Full-page), Result + Average + Rhythm (Full-page), OFF)
This item selects an analysis result format.

Result + Waveforms (Full-page):	An analysis result is recorded at the top of the format set at Waveform Recording Format.
Result (Half-page):	An analysis result is recorded in half a page.
Result + Average (Full page):	Analysis result and average waveform are recorded.
Result + Average + Rhythm (Full page):	Analysis result and average waveforms are recorded together with one channel of rhythm lead.
OFF:	An analysis result is not recorded.

Interpretation Findings (Findings + Reason, Findings Only, OFF)
This setting selects an output format for analysis interpretation.

Findings + Reason:	The reasoning is output together with an analysis interpretation.
Findings Only:	An analysis interpretation is output without the reasoning.
OFF:	An analysis interpretation is not output.

Measurement Table (Measurement Table, Avg. + Rhythm and Measurement Table, Avg. + Measurement Table + M.XYZ, OFF)
This item selects whether a measurement table is recorded or not. Average + Rhythm is recorded at the speed of 50 mm/s and the measurement point is also recorded.

Measurement Table:	Only a measurement table is recorded.
Avg. + Rhythm and Measurement Table:	Rhythm lead, average waveforms (with a measurement point) and a measurement table are recorded.
Avg. + Measurement Table + M.XYZ:	2 kinds of average are recorded at the speed of 25 mm/s, sensitivity 10 mm/mV, and 50 mm/s, sensitivity 20 mm/mV. Also measurement table, modified XYZ waveform and vector are recorded. Modified X = 1.06 × V6 Modified Y = 1.25 × aVF = 0.625 × (Ⅱ ×2− Ⅰ) Modified Z = 0.043 × V6 − 0.532 × V2
OFF:	A measurement table is not recorded.

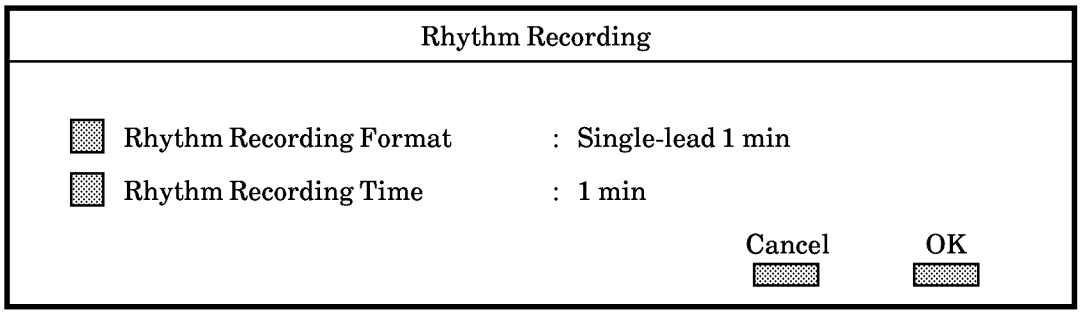
Additional 3-lead Rhythm (ON, OFF)
This item selects whether Rhythm 3 Ch is recorded or not.

Serial Comparison (With ST Measurement, Without ST Measurement, OFF)
This item selects whether Serial Comparison is recorded or not. Recording serial comparison requires an optional memory card or a file on a floppy disk. Serial recording automatically searches for then records up to 4 latest data of the same patient in all files in the selected drive by the ID number. Serial Comparison can be recorded with or without ST measurement data.

3-5-4 Rhythm Recording (Standard 12-lead, Cabrera Lead, Nehb Lead Only)

Here you are setting the recording format and period for rhythm lead recording. The underlined settings are preset before shipment from the factory.

To select the rhythm lead(s), see Section 3-5-7.



Rhythm Recording Format (Single-lead 1 min, Single-lead 3 min, 3-lead 20 s, 3-lead 1 min)

Single-lead 1 min: The specified rhythm lead is recorded in one page for one minute. One trace takes 10 seconds. The recording speed is 25 mm/s.

Single-lead 3 min: The specified rhythm lead is recorded in one page for 3 minutes. One trace takes 30 seconds. The recording speed is one third of 25 mm/s.

3-lead 20 s: The 3 specified rhythm leads are recorded in one page for 20 seconds. One trace takes 10 seconds. The recording speed is 25 mm/s.

3-lead 1 min: The 3 specified rhythm leads are recorded in one page for one minute. One trace takes 30 seconds. The recording speed is 25 mm/s.

1 page = 295 mm

Rhythm Recording Time (1 min, 3 min)

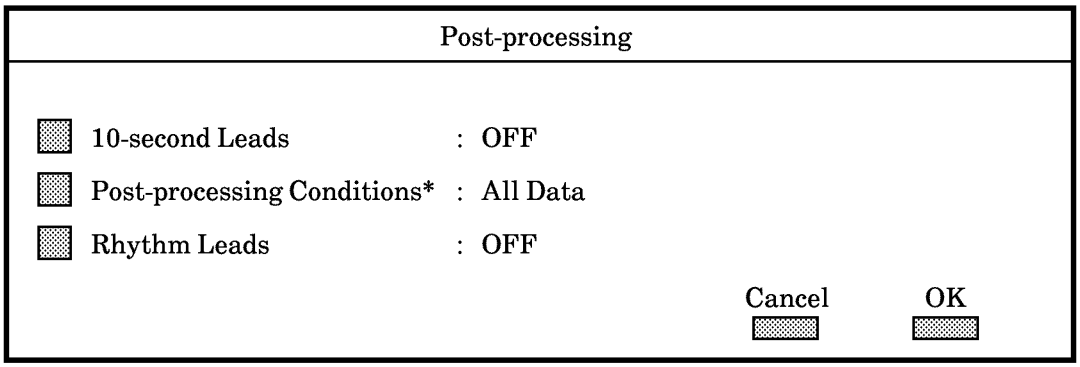
Here you set 1 minute or 3 minutes recording period for one period of rhythm lead recording.

To continue the rhythm recording, press the Rhythm key during an examination.

3-5-5 Post-processing (Standard 12-lead, Cabrera Lead, Nehb Lead Only)

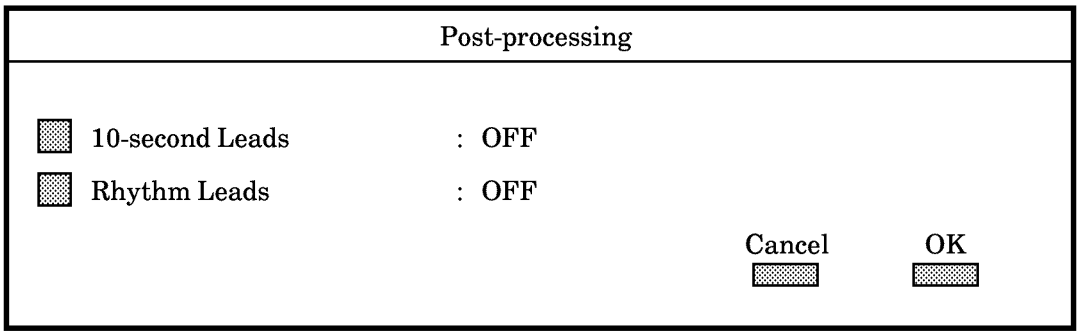
Here you are setting the operations after ECG recording. The underlined settings are preset before shipment from the factory.

Standard 12-lead and Cabrera lead



* This item is displayed only when QP-911E is used.

Nehb lead



10-second Leads (Save, Transmit, Save + Transmit, OFF)
This item selects how to process the ECG data after auto recording.

Save:	Auto-recorded data is saved.
Transmit:	Auto-recorded data is transferred.
Save + Transmit:	Auto-recorded data is saved and transferred.
OFF:	Auto-recorded data is not saved or transferred.

Post-processing Conditions - Standard 12-lead and Cabrera lead
(All Data, All Except **Normal ECG**)
This item selects the ECG data for saving and/or transferring after recording, based on the judgment of analysis interpretation output.

All Data:	All-data are processed regardless of judgment.
All Except ** Normal ECG **:	Auto-processing is not performed in the case of ** Normal ECG ** on analysis interpretation.

Rhythm Leads (Save, Transmit, Save + Transmit, OFF)
This item selects how to process the ECG data after Rhythm Recording. The file saving and/or transferring is performed when the one page recording is completed.

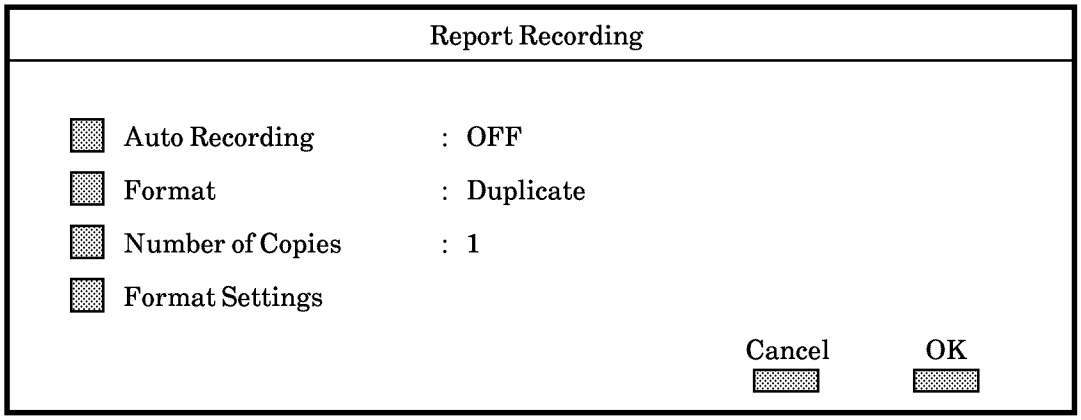
Save:	Rhythm-recorded data is saved.
Transmit:	Rhythm-recorded data is transferred.
Save + Transmit:	Rhythm-recorded data is saved and transferred.
OFF:	Rhythm-recorded data is not saved or transferred.

3-5-6 Report Recording (Standard 12-lead, Cabrera Lead, Nehb Lead Only)

Here you are setting the format for report recording. You can change the contents and settings for report recording. A report can contain ECG waveforms, analysis results, interpretation findings and measurement table.

The underlined settings are preset before shipment from the factory.

◆Standard 12-lead and Cabrera Lead



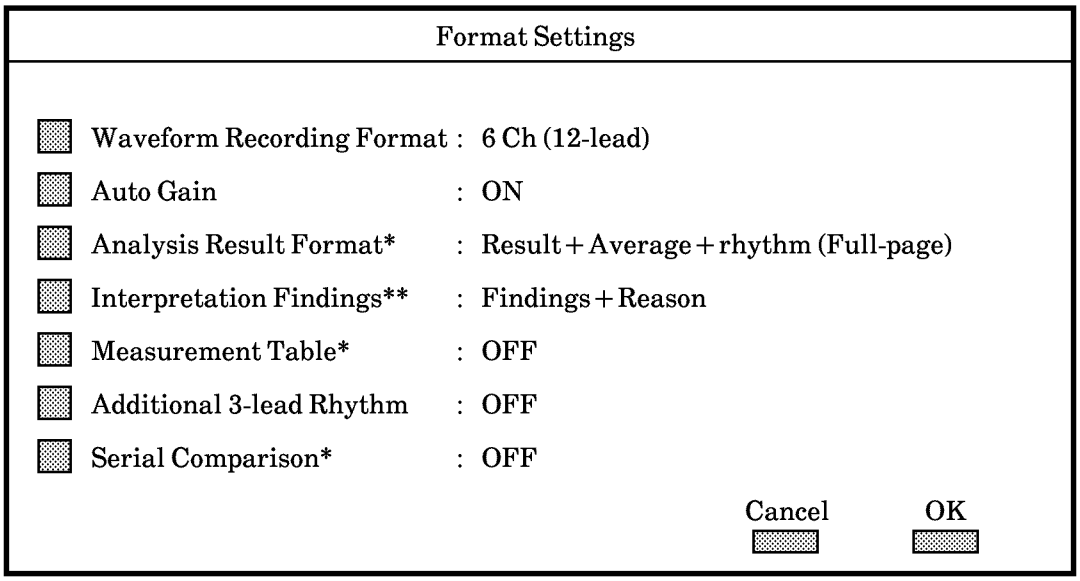
Auto Recording (ON, <u>OFF</u>)
This item selects whether or not a report is automatically output after auto-recording. If set to OFF, you can record a report manually.

Format (Change, <u>Duplicate</u>)
This item selects whether or not to use a different format for report recording and auto recording.
Selecting Change opens the Format Settings window (shown on the following page).

Number of Copies (<u>1</u> to 9 copies)
This item selects the number of copies to be recorded at one session of Report Recording.

Format Settings

The following window opens when Change is selected for Format.



* These items are displayed only when QP-910E or QP-911E is used.

** This item is displayed only when QP-911E is used.

Waveform Recording Format (3 Ch Rhythm + Average, 3 Ch (12-lead), 3 Ch (12-lead) + Rhythm, 6 Ch (12-lead), 6 Ch (12-lead, All data), 12 Ch (12-lead), OFF)
This item selects the format for recording ECG waveforms.

3 Ch Rhythm + Average:	3 channels of rhythm and 1 channel of average waveform(s) is recorded.
3 Ch (12-lead):	The 12 leads are recorded in 4 sequences of 3 channels each. Each sequence takes 2.5 seconds.
3 Ch (12-lead) + Rhythm:	The 12 leads are recorded in 4 sequences of 3 channels each. Each sequence takes 2.5 seconds. 1 channel of rhythm lead is also recorded.
6 Ch (12-lead):	The 12 leads are recorded in 2 sequences of 6 channels each. Each sequence takes 5 seconds.
6 Ch (12-lead, All data):	The 12 leads are recorded in 2 sequences of 6 channels each. Each sequence takes 10 seconds and includes all data.
12 Ch (12-lead):	The 12 leads in 12 channels are recorded simultaneously for 10 seconds.
OFF:	ECG waveforms are not recorded. Other items to be selected later are recorded. File saving and transferring are performed even when nothing is recorded.

Auto Gain (ON, OFF)
This item selects whether Auto Gain works or not. See Section 3-5-2 Manual Recording "Auto Position" for the relation between the number of recording channels and trace width.

Analysis Result Format (Result + Waveforms (Full-page), Result (Half-page), Result + Average (Full-page), Result + Average + Rhythm (Full-page), OFF)
This item selects an analysis result format.

Result + Waveforms (Full-page):	An analysis result is recorded at the top of the format set at Waveform Recording Format.
Result (Half-page):	An analysis result is recorded in half a page.
Result + Average (Full page):	Analysis result and average waveform are recorded.
Result + Average + Rhythm (Full page):	Analysis result and heartbeat (average waveform) are recorded together with one channel of rhythm lead.
OFF:	An analysis result is not recorded.

Interpretation Findings (Findings + Reason, Findings only, OFF)
This setting selects an output format for analysis interpretation.

Findings + Reason:	The reasoning is output together with an analysis interpretation.
Findings only:	An analysis interpretation is output without the reasoning.
OFF:	No analysis interpretation is output.

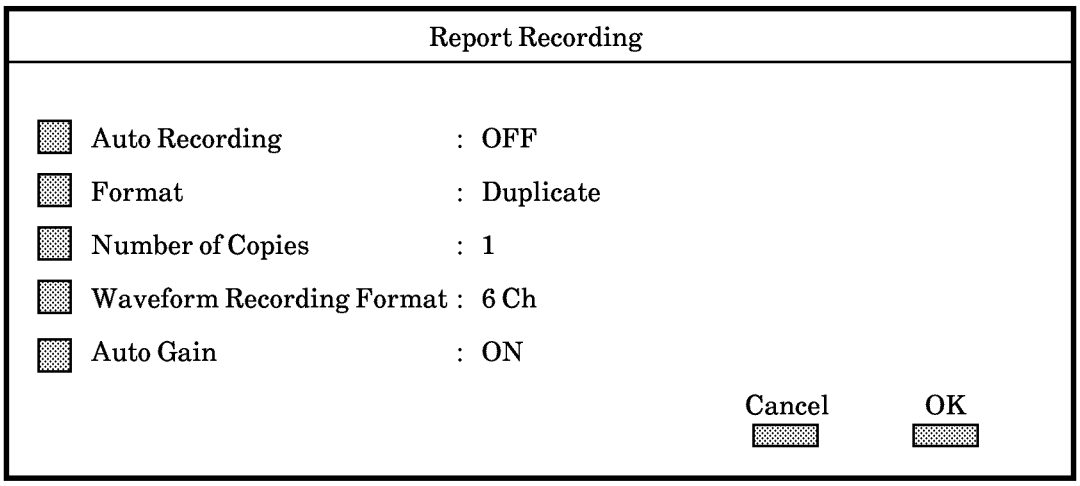
Measurement Table (Measurement Table, Avg. + Rhythm and Measurement Table, Avg. + Measurement Table + M.XYZ, OFF)
This item selects whether a measurement table is recorded or not.

Measurement Table:	Only a measurement table is recorded.
Avg. + Rhythm and Measurement Table:	Rhythm lead (with P, QRS wave pattern) and heartbeat (with measurement points) corresponding with the recorded value are recorded. Average + Rhythm is recorded at the speed of 50 mm/s and the measurement point is also recorded.
Avg. + Measurement Table + M.XYZ:	2 kinds of average are recorded at the speed of 25 mm/s, sensitivity 10 mm/mV, and 50 mm/s, sensitivity 20 mm/mV. Also measurement table, modified XYZ waveform and vector are recorded. Modified X = 1.06 × V6 Modified Y = 1.25 × aVF = 0.625 × (Ⅱ ×2− Ⅰ) Modified Z = 0.043 × V6 − 0.532 × V2
OFF:	A measurement table is not recorded.

Additional 3-lead Rhythm (ON, OFF)
This item selects whether Rhythm 3 Ch is recorded or not.

Serial Comparison (With ST Measurement, Without ST Measurement, OFF)
This item selects whether Serial Comparison is recorded or not. Recording serial comparison requires an optional memory card or a file on a floppy disk. Serial recording automatically searches for then records up to 4 latest data of the same patient in all files in the selected drive by ID number. Serial Comparison can be recorded with or without ST measurement data.

◆**Nehb Lead**



Auto Recording (ON, OFF)
This item selects whether or not a report is automatically output after auto-recording. If set to OFF, you can record a report manually.

Format (Change, Duplicate)
This item selects whether or not to use a different format for report recording and auto recording.
Selecting Change opens the Format Settings window (shown on the following page).

Number of Copies (1 to 9 copies)
This item selects the number of copies to be recorded at one session of Report Recording.

Waveform Recording Format (3 Ch 1 page, 3 Ch 2 pages, 6 Ch)
This item selects an ECG waveform recording format.

3 Ch 1 page:	Each 3 channels in 2 sequences are recorded in 1 page. Each lead takes 5 seconds for recording. Lead intervals are temporally sequential.
3 Ch 2 pages:	Each 3 channels in 2 sequences are recorded in 2 pages. Each lead takes 10 seconds for recording. All recordings are performed in the same phase.
6 Ch:	All 6 channels are recorded in 1 page.

Auto Gain (ON, OFF)
This item selects whether Auto Gain works or not. See Section 3-5-2 Manual Recording "Auto Position" for the relation between the number of recording channels and trace width.

3-5-7 Rhythm Lead (Standard 12-lead, Cabrera Lead, Nehb Lead Only)

Here you are setting the Rhythm Lead(s). The following items apply to the Rhythm Lead that you see here.

◆For Standard 12-lead ECG and Cabrera Lead ECG Recording

Rhythm 1 ch

Item	Settings	
Analysis Result Format*	Result + Average + Rhythm (Full-page)	§3-5-2 Manual Recording
Analysis Result Format*	Result + Average + Rhythm (Full-page)	§3-5-3 Auto Recording
Rhythm Recording Format	Single-lead 1 min or Single-lead 3 min	§3-5-4 Rhythm Recording
Waveform Recording Format	3 Ch (12-lead) Rhythm	§3-5-6 Report Recording
Rhythm Waveform Display	YES	§3-5-11 Power Up

*Only when either QP-911E or QP-910E is used.

Rhythm 3 ch

Item	Settings	
Additional 3-lead Rhythm	ON	§3-5-3 Auto Recording
Rhythm Recording Format	3-lead 20 s or 3-lead 1 min	§3-5-4 Rhythm Recording
Waveform Recording Format	3 Ch Rhythm + Average	§3-5-6 Report Recording
Rhythm Waveform Display	YES	§3-5-11 Power Up

◆For Nehb Lead ECG Recording

Rhythm 1 ch

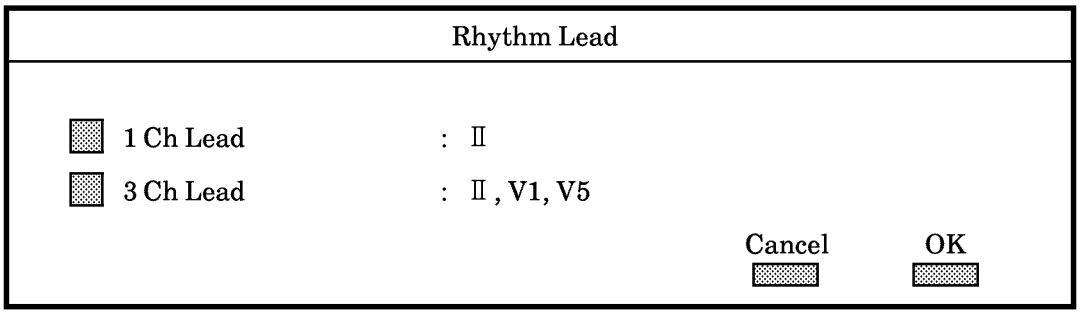
Item	Settings	
Rhythm Recording Format	Single-lead 1 min or Single-lead 3 min	§3-5-4 Rhythm Recording
Rhythm Waveform Display	YES	§3-5-11 Power Up

Rhythm 3 ch

Item	Settings	
Rhythm Recording Format	3-lead 20 s or 3-lead 1 min	§3-5-4 Rhythm Recording

The underlined settings are preset before shipment from the factory.

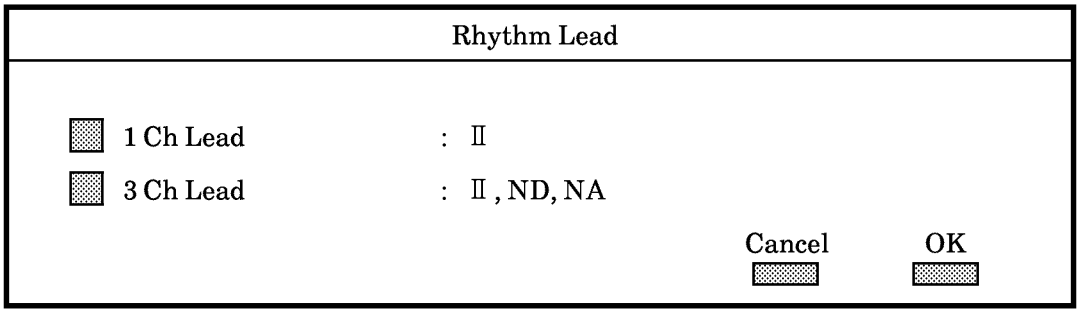
◆Standard 12-lead ECG and Cabrera Lead ECG Recording



1 Ch Lead (Ⅰ, Ⅱ, Ⅲ, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6)
This item selects single lead rhythm recording.

3 Ch Lead (Ⅰ, Ⅱ, Ⅲ, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6)
Selecting this item opens a window for selecting 1 Ch, 2 Ch or 3 Ch. After selecting one of them, set the lead for the channel.

◆Nehb Lead ECG Recording

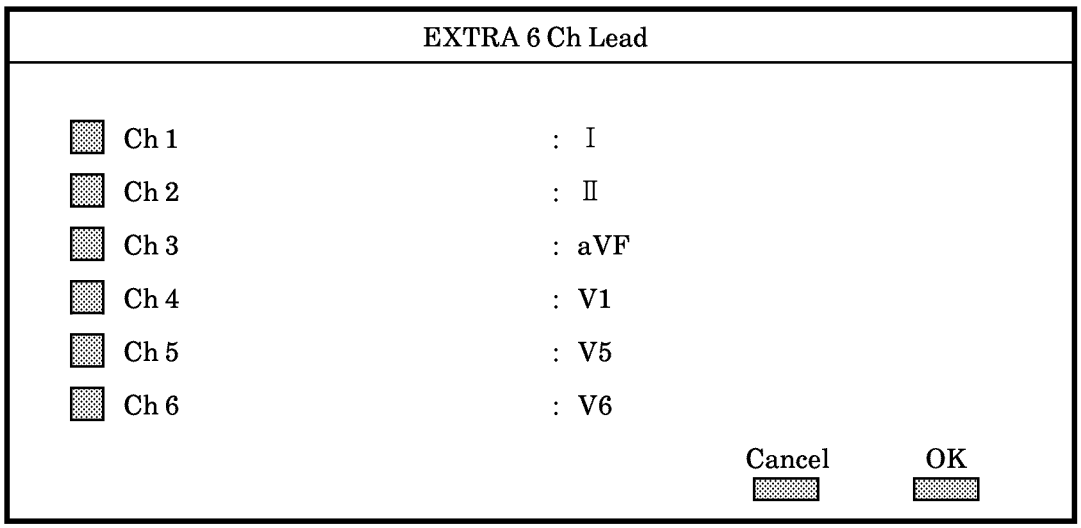


1 Ch Lead (Ⅰ, Ⅱ, Ⅲ, ND, NA, NI)
This item selects Rhythm 1 Ch Lead.

3 Ch Lead (Ⅰ, Ⅱ, Ⅲ, ND, NA, NI)
Selecting this item opens a window for selecting 1 Ch, 2 Ch or 3 Ch. After selecting one of them, set the lead for the channel.

3-5-8 EXTRA 6 Ch Lead (Standard 12-lead and Cabrera Lead Only)

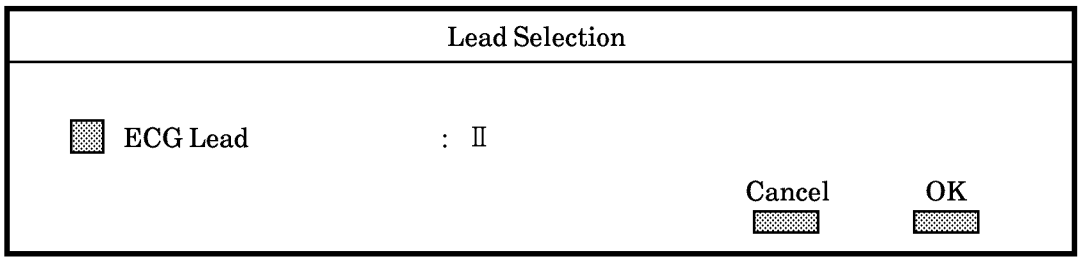
Here you are setting the leads used in the EXTRA recording. Extra leads are the combination of any of the standard 12 leads that you select for 6 channels.
The underlined settings are preset before shipment from the factory.



Ch 1 - Ch 6 lead (Ⅰ, Ⅱ, Ⅲ, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6)
Selecting the channel opens the window for the lead(s) for that channel.

3-5-9 Lead Selection (External Signal Only)

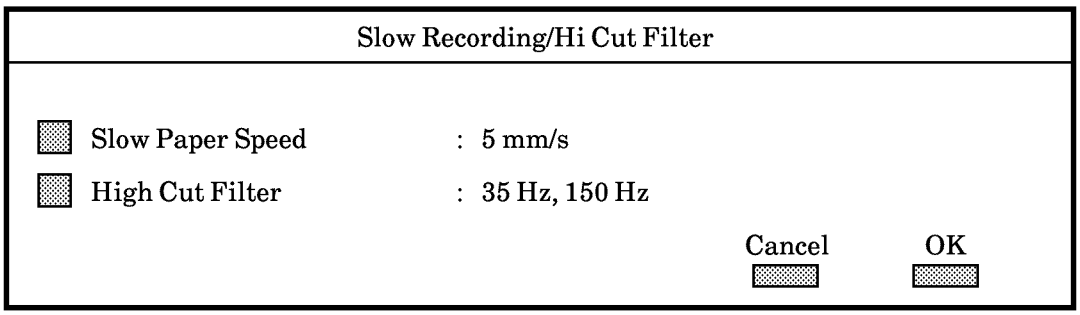
Here you are setting the lead from standard 12 leads for the external signal recording.
The underlined settings are preset before shipment from the factory.



ECG Lead (Ⅰ, Ⅱ, Ⅲ, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6)

3-5-10 Slow Recording/Hi Cut Filter (All Examination Types)

Here you are setting the slow paper speed and high cut filter frequency.
The underlined settings are preset before shipment from the factory.



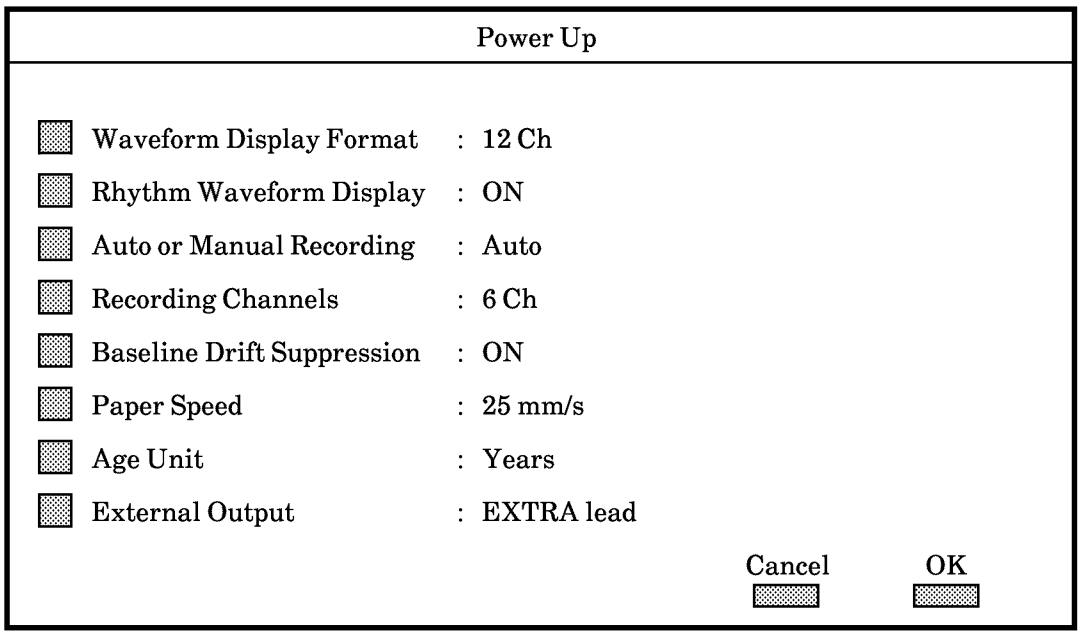
Slow Paper Speed (5 mm/s, 10 mm/s, 12.5 mm/s)
This item selects the slow paper speed.

High Cut Filter (25 Hz, 35 Hz, 75 Hz, 100 Hz, 150 Hz, Default)
You can set up to five high cut filter frequencies for Filter key on the Basic screen.
Default: Selects the high-cut filter when the power is turned on.

3-5-11 Power Up (All Examination Types)

Here you are setting the initial conditions for each examination. All of the following items except Rhythm Wave from Display and External Output can be changed with a touch key or a panel switch after starting an examination.
The underlined settings are preset before shipment from the factory.

◆Standard 12-lead and Cabrera Lead ECG Recording



Waveform Display Format (12 Ch, 3 Ch Rhythm, Same as Printout)
This item selects the format for waveform display on the screen.

Rhythm Waveform Display (ON, OFF)
This item selects whether or not a rhythm waveform is displayed at the bottom of the waveform display screen. The displayed lead is the lead selected in 1 Ch Rhythm on the Rhythm Lead item (Section 3-5-7).

Auto or Manual Recording (Auto, Manual)
This item selects either auto or manual recording.

Recording Channels (3 Ch, 3 Ch + Rhythm, 6 Ch, 12 Ch)
This item selects the number of channels.

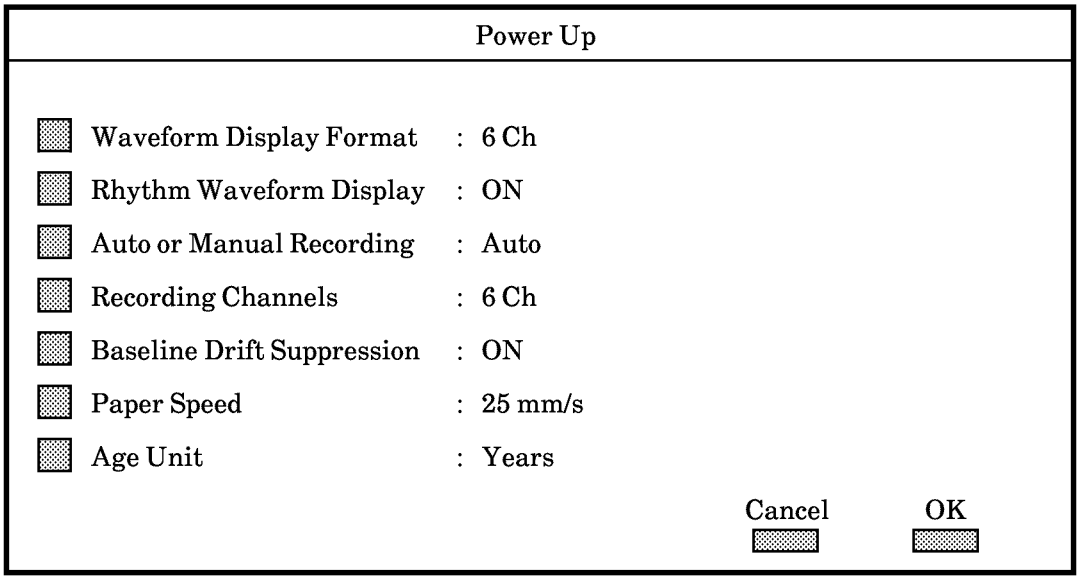
Baseline Drift Suppression (ON, OFF)
This item selects whether baseline drift suppression turns on or off. Baseline drift suppression prevents the baseline from drifting by locking it into one position at the start of recording.

Paper Speed (25 mm/s, 50 mm/s)
This item selects the paper feeding speed of either 25 mm/s or 50 mm/s.

Age Unit (Years, Months, Weeks, Days)
This item selects an age unit.

External Output (Same as Printout, EXTRA lead)
This item selects whether external output signals are set for the same lead as recording or for continuous EXTRA lead.

◆Nehb Lead ECG Recording



Waveform Display Format (Same as Printout, 6 Ch)
This item selects the format for waveform display on the screen.

Rhythm Waveform Display (ON, OFF)
This item selects whether or not a rhythm waveform is displayed at the bottom of the waveform display screen. The displayed lead is the lead selected in 1 Ch Rhythm on the Rhythm Lead item (Section 3-5-7).

Auto or Manual Recording (Auto, Manual)
This item selects either auto or manual recording.

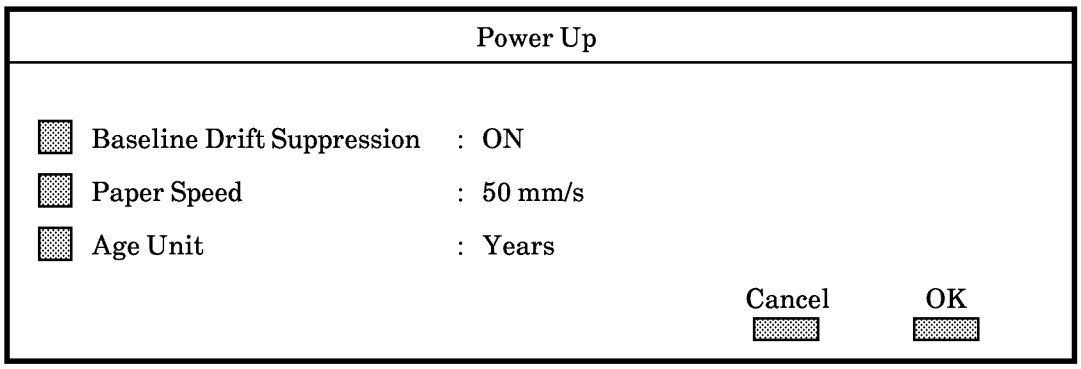
Recording Channels (3 Ch, 6 Ch)
This item selects the number of channels.

Baseline Drift Suppression (ON, OFF)
This item selects whether baseline drift suppression turns on or off. Baseline drift suppression prevents the baseline from drifting by locking it into one position at the start of recording.

Paper Speed (25 mm/s, 50 mm/s)
This item selects the paper feeding speed of either 25 mm/s or 50 mm/s.

Age Unit (Years, Months, Weeks, Days)
This item selects an age unit.

◆External Input



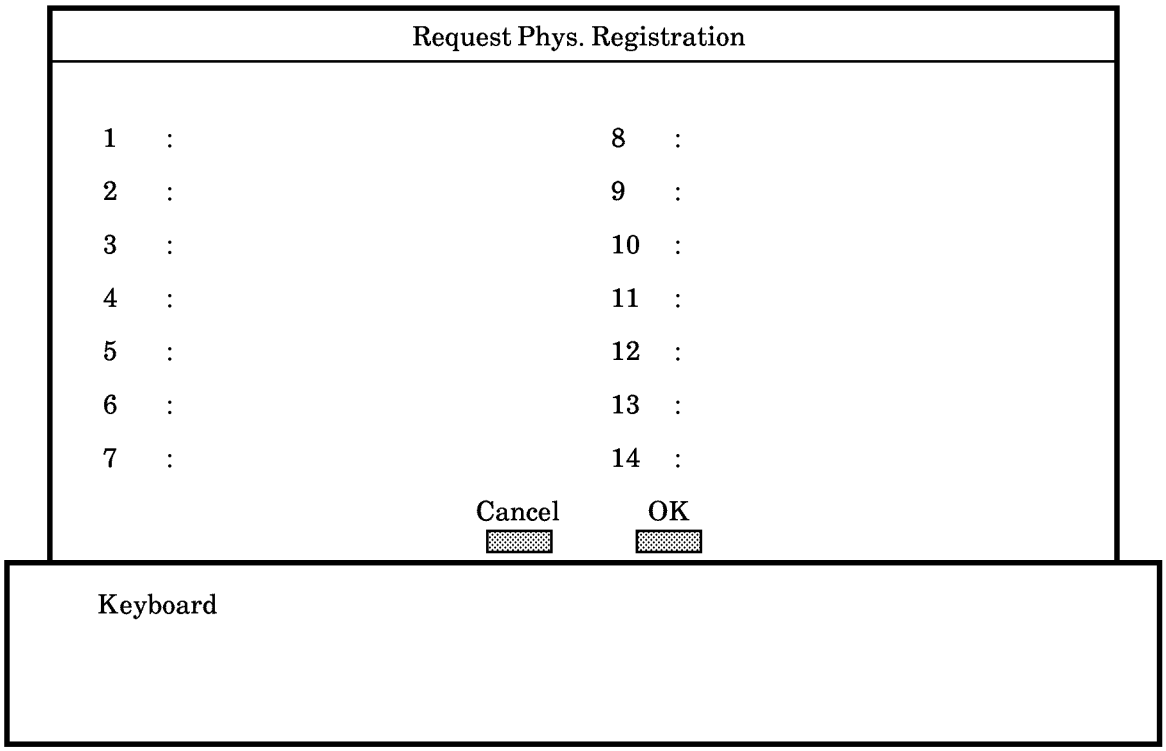
Baseline Drift Suppression (ON, OFF)
This item selects whether baseline drift suppression turns on or off. Baseline drift suppression prevents the baseline from drifting by locking it into one position at the start of recording.

Paper Speed (25 mm/s, 50 mm/s)
This item selects the paper feeding speed of either 25 mm/s or 50 mm/s.

Age Unit (Years, Months, Weeks, Days)
This item selects an age unit.

3-5-12 Requesting Phys. Registration (All Examination Types)

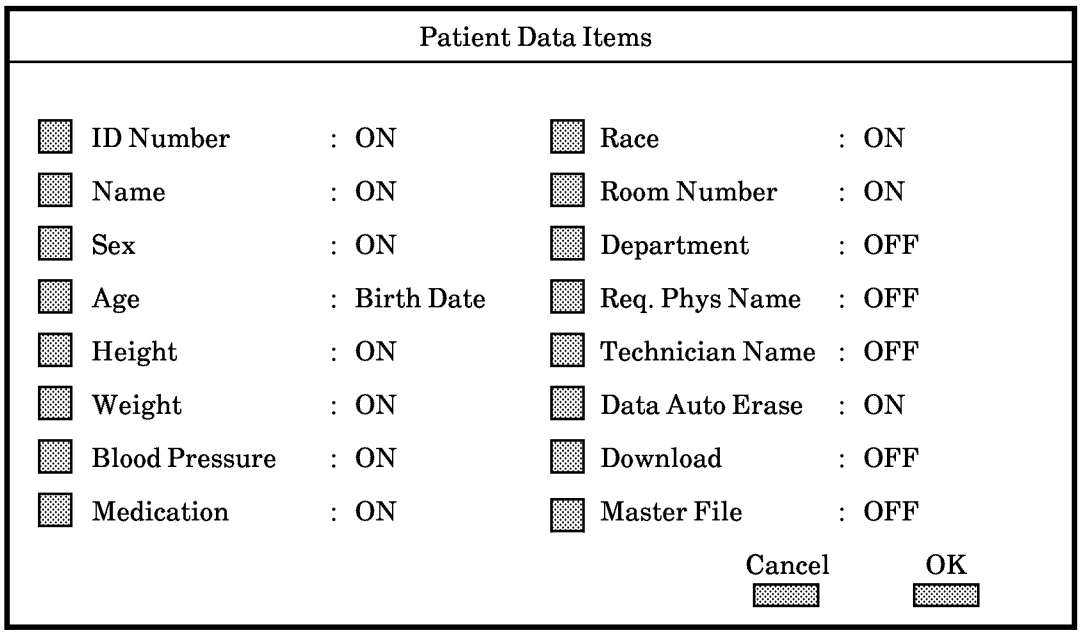
You can register up to 14 names of physicians who use this examination.
Selecting this item displays the following window with the keyboard. Select a number then register physicians' names using the alphabetical keys.



3-6 Settings for Patient Data Entry

These settings determine what items are displayed when you call up the Patient Data Input screen and also how patient data can be entered. You can add or delete items from the Patient Data Input screen. Specify ON for necessary items and OFF for unnecessary items.

The underlined settings are preset before shipment from the factory.



ID Number (ON, OFF, ID-Sex Code)
This item selects whether entering a Patient ID Number is entered or not.
The ID-Sex Code is for the country that has a national ID system where the ID code also indicates the sex. (eg. Denmark)

Name, Sex, Height, Weight, Blood Pressure, Medication, Race, Room Number, Department, Req. Phys Name, Technician Name (ON, OFF)
You can select whether each item is displayed on the Patient Data Entry screen.
Also the names of medications, medical departments and technicians' names can be registered. For requesting physicians' names, refer to Section 3-5-12.
You cannot select ON without registering a name.

◆Registering Medicine Name / Department Name / Technician Name

1. Press the key for the item that you want to select.

2. Press the key for registration. The registration window is displayed at the top of the screen and alphabetical keys are displayed at the bottom of the screen.

   For medication name registration, keys 1 to 9 are unchangeable. You can enter up to 20 letters for each key from 10 to 14.
   For the department name and technician name registration, you can enter up to 20 letters for each key from 1 to 14.

3. When you register all names, press the Set key.
   To cancel setting, press the Cancel key.

Age (Birth Date, Age, OFF)
This item selects whether age is displayed and how to enter it. You can enter age either by birth date or age in years.

Data Auto Erase (ON, OFF)
This item selects whether or not data for the other items such as age and sex is automatically deleted when a new ID No. is entered.

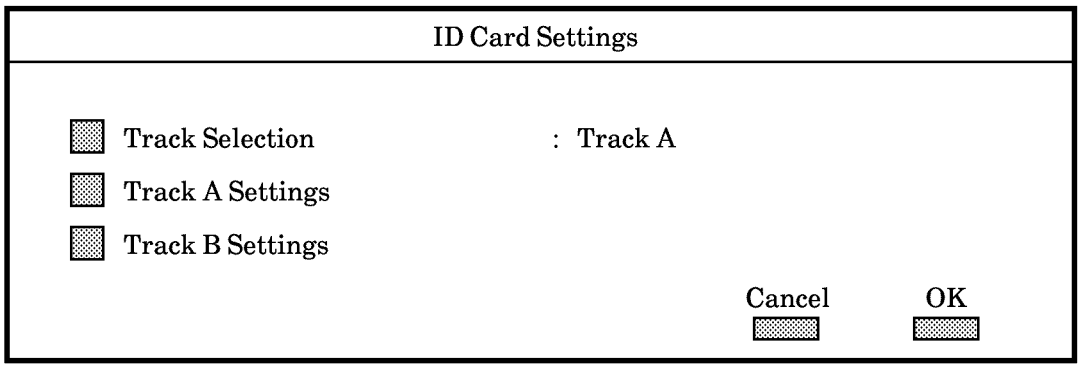
Download (ON, OFF)
This item selects whether or not to automatically enter the ID number, patient name, date of birth and sex saved in an external device such as a data filing system.

Master File (ON, OFF)
This item selects whether or not to use the patient information saved in a patient index file (flash disk card). Refer to Section 4-6 "Patient Index Database (ID Data File)".

3-7 Settings for ID Card

Here you are setting the conditions for using an optional Magnetic card reader (ID card reader). This system can incorporate an optional card reader for reading ID cards that are specified by ANSIx4.13, ISO2894, and ANSIx4.16, ISO3554. This reader, however, can read only one track out of three tracks. Therefore, the card reader should be adjusted to read the track where patient's data is recorded when it is incorporated into the system.

The relationships between ID card tracks, Magnetic card reader to be incorporated into the system and system settings are as follows. The underlined settings are preset before shipment from the factory.



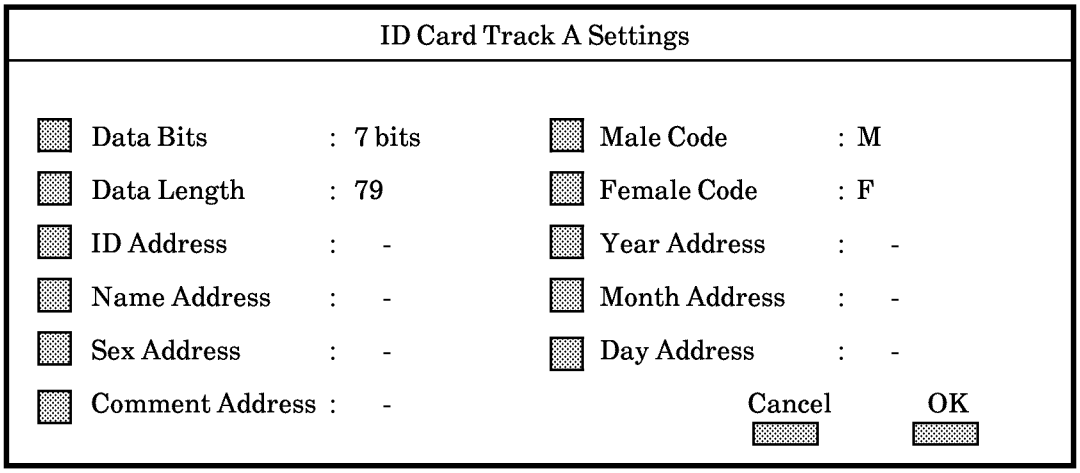
Track Selection

This item selects the track to be used.

Track A: For reading Track 1 with QI-911E and Track 2 with QI-912E and QI-911D.

Track B: For reading Track 2 with QI-911E and Track 3 with QI-912E.

Track A Settings, Track B Settings
This item selects the contents of Tracks A and B. Press the touch key for the selected track to display the following screen.



Items are common for Track A and Track B but settings may differ.

Data Bits (Track A: 5 bits, 7 bits, 8 bits (7F), 8 bits (01), Track B: 5 bits, 8 bits (7F))
This item selects a data bit length. Eight bits has one option to specify the starting code.

Data Length (Enter using a number of two digits. The initial values for Track A is 79 and Track B 40.)
This item selects data lengths.

ID Address
This item selects the location of an ID number in an address range. When no range is specified, the system considers there is no ID number data.

Name Address
This item selects the location of a name in an address range.
When no range is specified, the system considers there is no name data.

Sex Address
This item selects the location of sex in an address range.
When no range is specified, the system considers there is no sex data.

Comment Address
This item selects the location of a comment.

Male Code (M)
This item selects a male identification code. You can set up to 8 letters for Male Code.

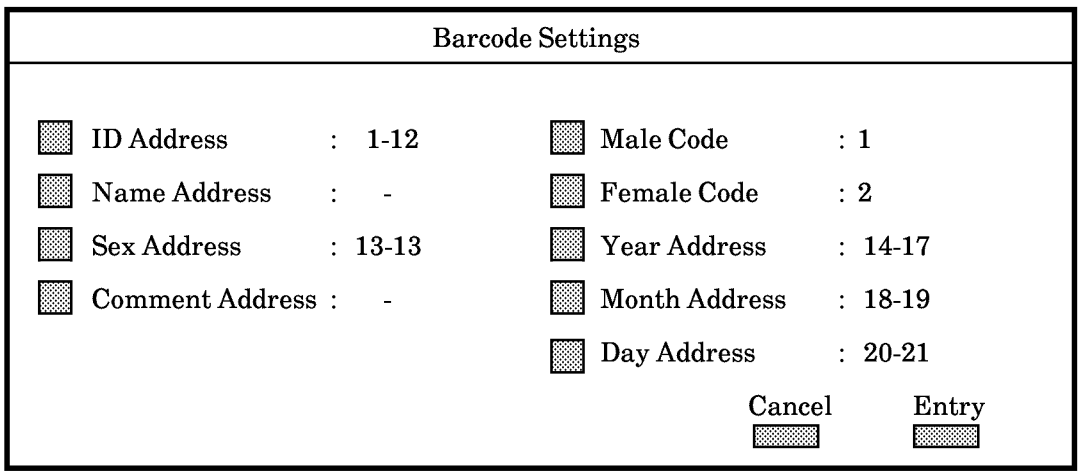
Female Code (F)
This item selects a female identification code. You can set up to 8 letters for Female Code.

Year/Month/Day Address
These items select a birth date address by setting year, month and date.
When no date is entered, the system considers that there is no birth date data.

3-8 Settings for Barcode

Here you are setting the conditions for using an optional Barcode reader. This system can incorporate an optional Barcode reader for reading barcodes that are specified by WPC (UPC, EAN/JAN), CODE-39, NW-7, Industrial 2 of 5, Interleaved 2 of 5, CODE-93, CODE-128, HSI Plessey.

The following items select the contents of where patient's data is recorded. The barcode settings shown below are the preset settings before shipment from the factory.



ID Address (1-12)
This item selects the location of an ID number in an address range. When no range is specified, the system considers there is no ID number data.

Name Address
This item selects the location of a name in an address range.
When no range is specified, the system considers there is no name data.

Sex Address (13-13)
This item selects the location of sex in an address range.
When no range is specified, the system considers there is no sex data.

Comment Address
This item selects the location of a comment.

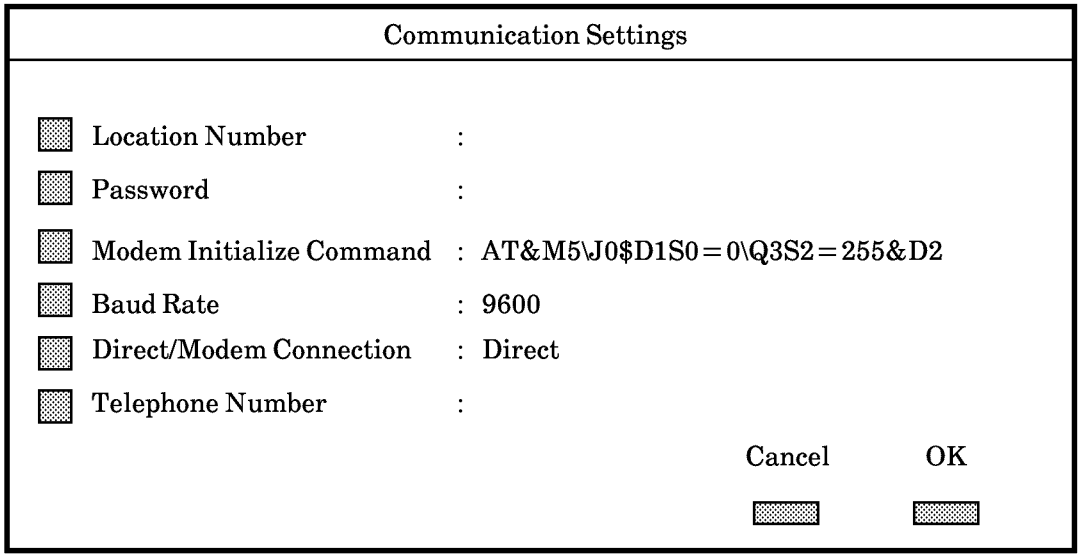
Male Code (1)
This item selects a male identification code. You can set up to 8 letters for Male Code.

Female Code (2)
This item selects a female identification code. You can set up to 8 letters for Female Code.

Year/Month/Day Address (14-17 / 18-19 / 20-21)
These items select a birth date address by setting year, month and date.
When no date is entered, the system considers that there is no birth date data.

3-9 Settings for Communication

Here you are setting the conditions for communications. The underlined settings are preset before shipment from the factory.



Location Number (4 letters)
The numeric keypad appears. Enter 4 letters as a Location number when it is required by the system to communicate with.

Password (Up to 10 letters)
The keyboard appears. Enter a password using up to ten letters when it is required by the system to communicate with.

Modem Initialize Command (Up to 64 letters)
The keyboard appears. Enter a Modem Initialize Command using up to 64 letters. When the modem in use fails in normal connection, change the existing command. See the manual that came with the modem for details.

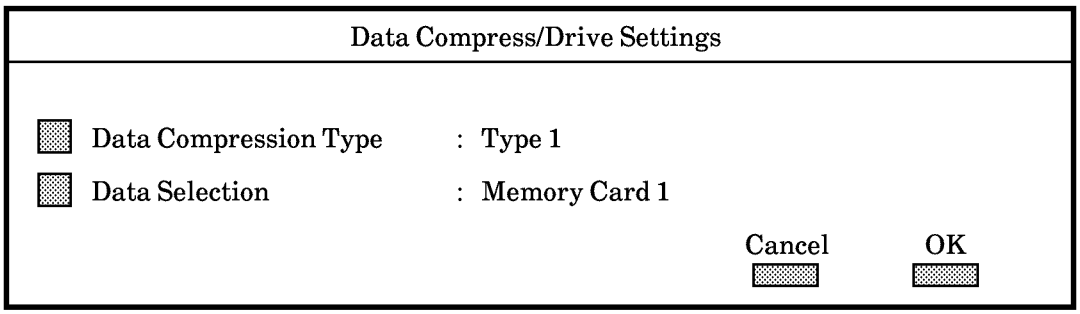
Baud Rate (1200, 2400, 4800, 9600 baud)
This item selects a baud rate. Match it with the baud rate of the system to communicate with.

Direct/Modem Connection (Direct, Modem)
Select direct communication or a modem.

Telephone Number (Up to 20 digits)
Enter the phone number to communicate with. Enter up to 20 digits using the numeric and [+] and [−] keys displayed. (+: for pause)

3-10 Settings for Data Compression and Drive

Here you are selecting the type and the filing device for Standard 12-lead, Cabrera lead and Nehb lead ECG files. The underlined settings are preset before shipment from the factory.



Data Compression Type (Type 1, Type 2)
This item selects the file type for Standard 12-lead and Cabrera-lead files. For Nehb lead ECG files, the Data Compression Type 1 is only available.

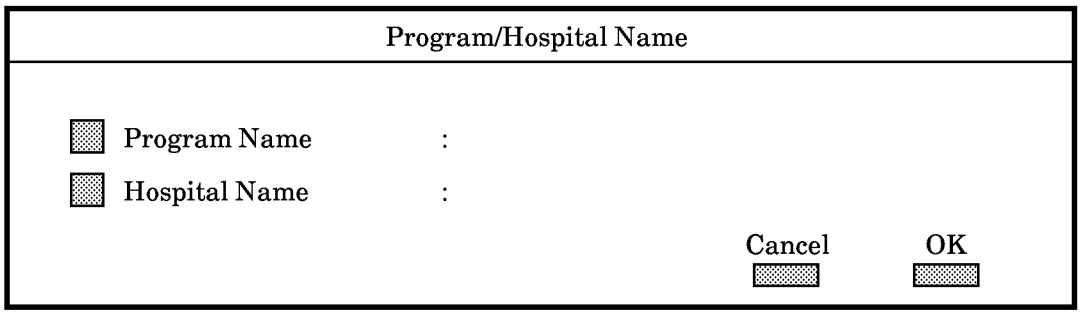
Type 1: Coded file
The record of ECG waveforms and analysis results are rewritten with special codes and the data amount is compressed to about a third of the original volume. Because the file is created by translating into special codes, restoration of original waveforms is easy.
A 1.44MB formatted floppy disk can contain about 30 files each of which contains recorded ECG data for 10 seconds.

Type 2: Compressed file
The record of ECG waveforms and analysis results are compressed into files of about a tenth of the original volume. A 1.44MB formatted floppy disk can contain about 100 files each of which contains recorded ECG data for 10 seconds.

Data Selection (Floppy Disk, Memory Card 1, Memory Card 2, Memory Card 3)
This item selects a filing device. The setting of "Floppy Disk" is displayed only when an optional floppy disk drive is installed. Memory Card 1, 2 and 3 shows the slots of a memory card. Slot 1 and 2 are on the front side and slot 3 is on the back side. Both the floppy disk drive and memory card slot 3 are optional.

3-11 Settings for Program and Hospital Name

Here you are entering a program identification name and hospital name. Selecting an item displays the registration window at the top of the screen and keyboard at the bottom of the screen.

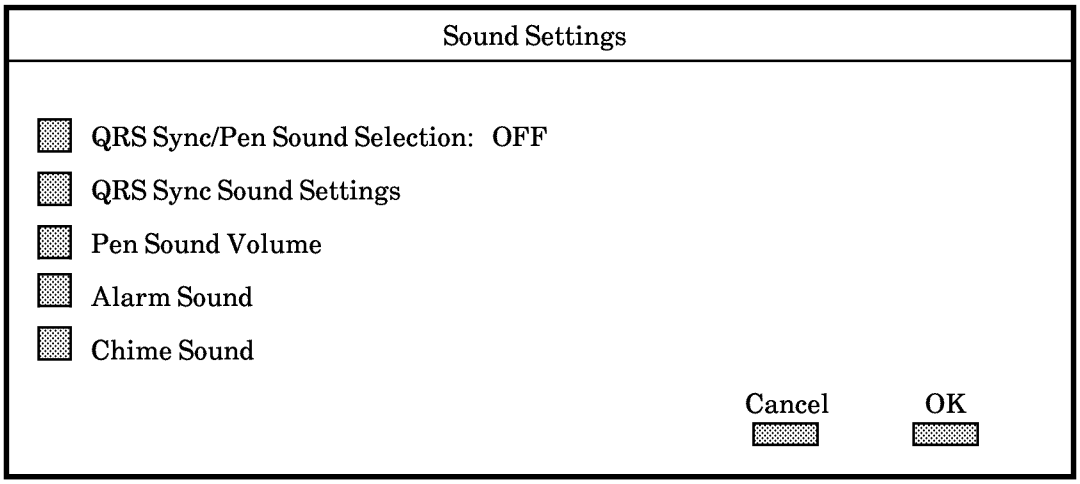


Program Name (Up to 40 letters)
You can enter any name for a program using up to 40 letters. When no name is entered, the default name "Electrocardiograph" is displayed. These program names appear when you call up the Program Select screen.

Hospital Name (Up to 40 letters)
You can register the hospital name to print it on the recording paper. When the power is turned on, the registered hospital name is displayed at the lower part of the screen.

3-12 Settings for Sound

Here you are setting the volume and pitch for the various sounds.



QRS Sync/Pen Sound Selection
Press to specify how to output the sound for ECG.

QRS Sync/Pen Sound Selection (QRS Sync Sound, Pen Sound, OFF)
QRS Sync Sound: Turns the QRS synchronized sound ON.
Pen Sound: Makes scratching sound like a stylus on a paper.
OFF: No sound is made for ECG.

QRS Sync Sound Settings
Sets the pitch and volume of QRS Synchronized sound.

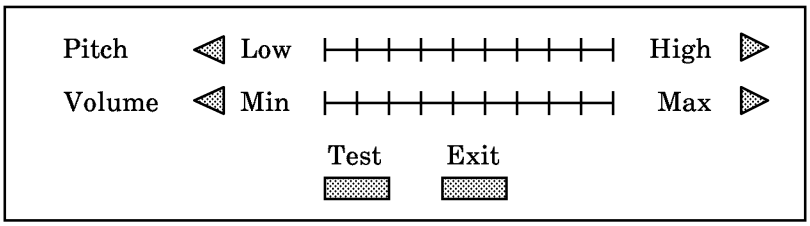
Pen Sound Volume
Sets the volume of Pen sound.

Alarm Sound
Sets the volume and pitch of an alarm bell.

Chime Sound

Sets the volume and pitch of the chime sounded when a task is completed.

When you press the touch key for each item, the following window appears.



Pitch

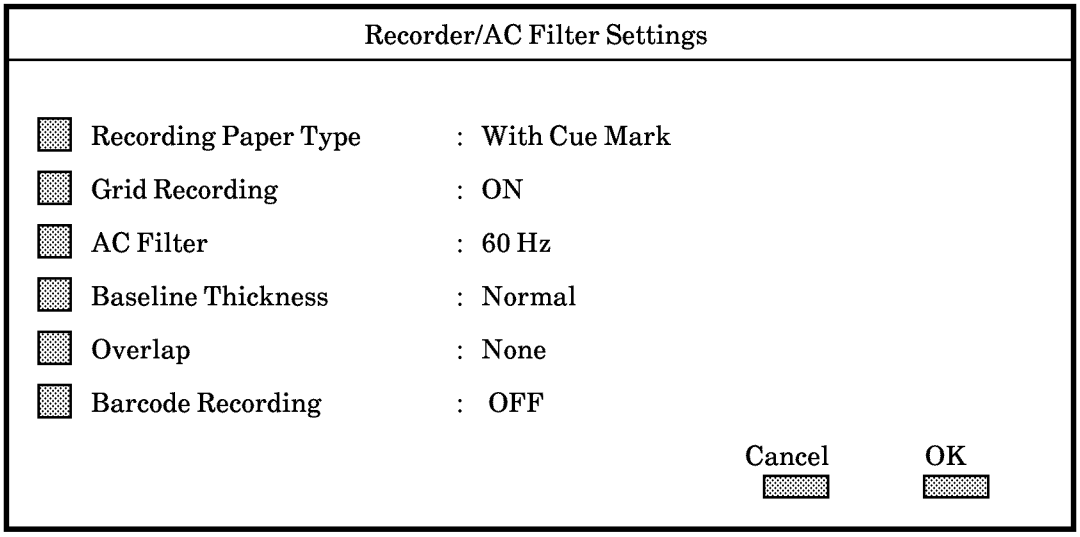
The pitch changes each time you press the Low or High key. Adjust the pitch and test it with the Test key.

Volume

The volume changes each time you press the Min or Max key. When it is set to the left end, no sound is made. Adjust the volume and test it with the Test key.

3-13 Settings for Recorder and AC Filter

Here you are setting basic conditions for general ECG operation. The underlined settings are preset before shipment from the factory.



Recording Paper Type (With Cue Mark, Without Cue Mark)
This item selects use of recording paper with or without a cue mark. The paper feeding by pressing the Paper feed switch on the operation panel changes depending on this setting.

With Cue Mark: Pressing the Paper feed switch moves the recording paper until the system detects a cue mark. Pressing the same switch also stops paper feeding.

Without Cue Mark: The recording paper moves while the Paper feed switch is pressed. The paper stops when a cue mark is detected. To move on again, release and press the Paper feed switch again.

Grid Recording (ON, OFF)
Setting this item ON prints a grid at the waveform part when sectionless paper is used.

AC Filter (50 Hz, 60 Hz, OFF)
This item selects an AC filter to be used.

Baseline Thickness (Thin, Normal, Thick)
This item selects a baseline width for recording waveforms.

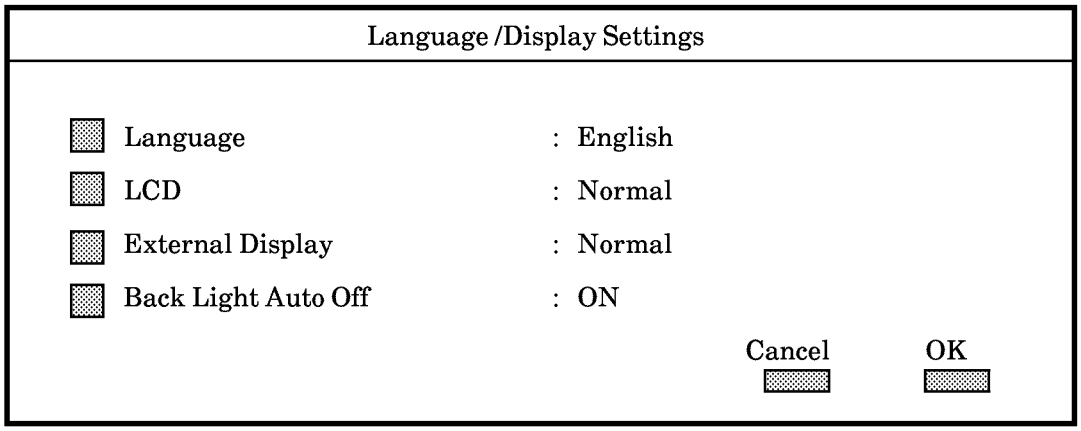
Thin: 1/4 mm (0.25 mm)
Normal: 3/8 mm (0.375 mm)
Thick: 1/2 mm (0.5 mm)

Overlap (Moderate, Slight, None)
This item selects a channel overlap amount for baseline position and automatic gain adjustment.

Barcode Recording (ON, OFF)
Setting this item ON prints a barcode at the end of analysis result recording.

3-14 Settings for Language and LCD

Here you are setting the language and LCD reversed display.
The underlined settings are preset before shipment from the factory.



Language (English, Local Language)
Here you can select whether to use English or your language for descriptions on the screen or recording. Consult your distributor to set the language.

NOTE

When you install your language into the cardiograph, check the descriptions on the screen and ECG finding list prior to use. For the descriptions on screen, you can compare them with the text that your distributor provides. For descriptions of the ECG finding list, you can compare them with the list in the User's Guide "ECAPS 12 B ECG Interpretation Program". If there is any miss translation, contact your distributor to correct it.

To print the ECG finding list:
1. From the Basic screen, press the Menu key. The Menu window appears.
2. Press the System Test key. System Test window appears.
2. Press the ECG Finding List Recording key.

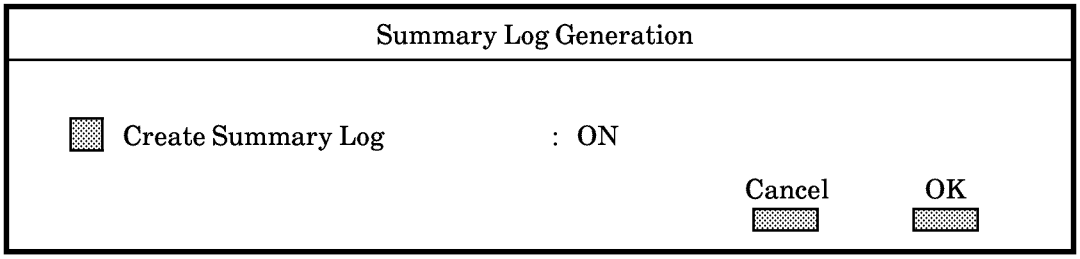
LCD (Normal, Reverse)
This item selects whether the LCD display is reversed or not.

External Display (Normal, Reverse)
This item selects whether the slave monitor display is reversed or not.

Back Light Auto Off (ON, OFF)
This item selects whether the back light of the LCD screen is automatically turned off or not if there is no touch key or switch activity for approximately five minutes.

3-15 Settings for Summary Data Creation

This item selects whether a daily report is logged or not. The underlined setting is preset before shipment from the factory.



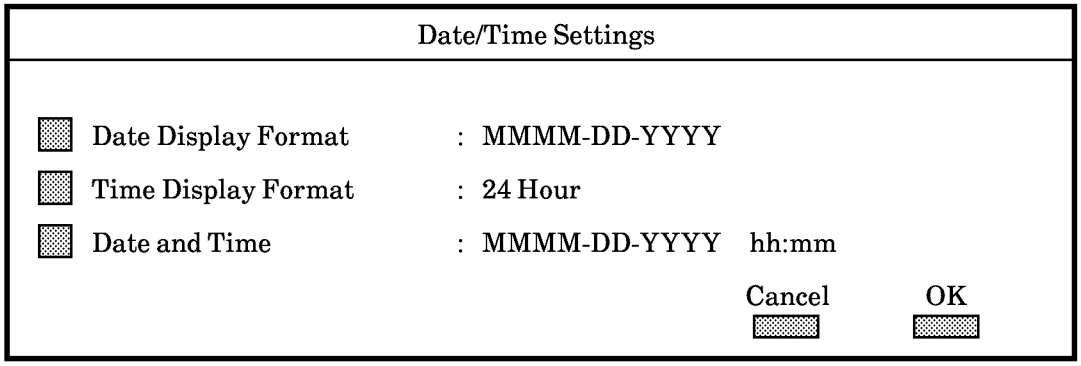
Create Summary Log (ON, OFF)

ON: Summary log is saved.

OFF: Summary log is not created.

3-16 Settings for Date and Time

Here you are setting the date and time display format. The underlined setting is preset before shipment from the factory.



Date Display Format (YYYY-MMMM-DD, MMMM-DD-YYYY, DD-MMMM-YYYY)
This item specifies the order of displaying year, month and date.

Time Display Format (12 Hour, 24 Hour)
This item selects either 12 hours or 24 hours system.

Date and Time
Selecting this item displays numeric keys. Set the date and time according to the format specified in the Date Display Type.

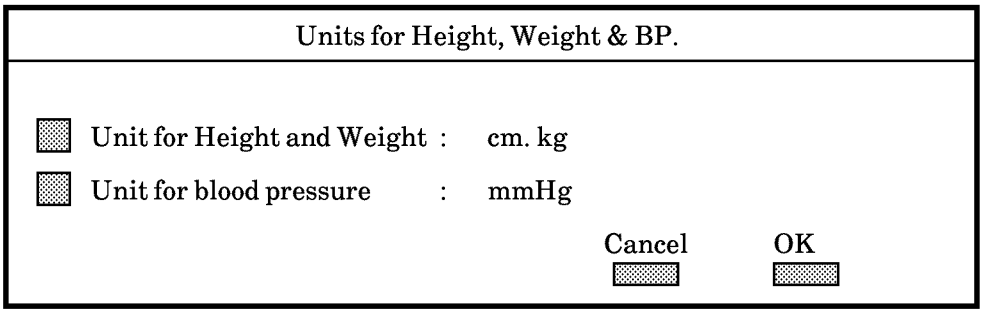
Year: Enter 4 digits.
Month: Specify with 2 digits.
Date: Specify with 2 digits.
Hour: Specify with 24 hour system regardless of the system chosen in the Time Display Type.
Minute: Specify with 2 digits.

Pressing the Exit key brings you back to the System Setup window after displaying a message.

※ Counting starts from 0 seconds when the Exit key is pressed.

3-17 Settings for Height, Weight and Blood Pressure

Here you are setting the units for height, weight and blood pressure.



Units for height and weight (cm.kg, inch.pound)
Select the height and weight units.

Unit for blood pressure (mmHg, kPa)
Select the blood pressure unit.

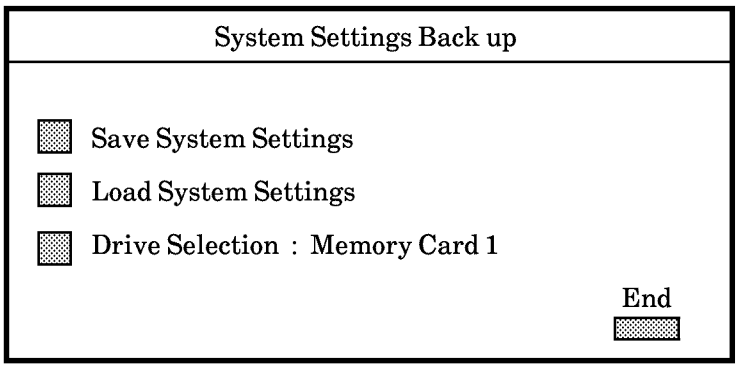
3-18 Saving/Loading the System Settings

3-18-1 Saving the System Settings in the Memory Card or Floppy Disk

The system settings can be saved in the memory card or floppy disk. The saved settings can be loaded another ECG-9320.

1. From the Menu window, press the System Test key. The System Test window appears.

2. Press the System Settings Back up key. The System Settings Back up window appears.



Save System Settings

NOTE

Use the formatted memory card or floppy disk.

Saves the system settings in the memory card or floppy disk.

Load System Settings

Load the system settings saved in the memory card or floppy disk.

Drive Selection

1. Specify the drive that you save or load the system settings.
2. Select the operation that you want to do.
3. Press the End key to close the window.

SECTION 4

ENTERING THE PATIENT INFORMATION

4-1 General 4.1
4-2 Using the Keyboard and Numeric Keypad 4.3
4-2-1 Procedure 4.3
4-2-2 Keyboard and Numeric Keypad 4.4
4-2-3 Procedures to Enter the Patient Information for Each Item 4.5
4-3 Using the Magnetic Card Reader 4.8
4-4 Using the Barcode Reader 4.8
4-5 Using the Data Filing System 4.9
4-6 Patient Index Database (ID Data File) 4.10

4-1 General

You can enter the patient information with the keyboard and numeric keypad on the touch-screen. From the ID card, data filing system and patient index database you can also enter the patient's ID number, date of birth and sex.
To select the entry item refer to Section 3-6.

NOTE

- **Enter age and sex for accurate analysis when QP-911E ECG Interpretation software is installed. In the following items, only age and sex have an actual effect on the analysis. Other items have no direct relevance to analysis and are to be used as reference data. When no age is input, the default data of age 35 is used, and when no sex is specified, the default data of male is used.**
  The cardiograph itself is designed to be able to operate without any patient information.
- **Enter an ID number in order to perform the serial comparison recording.**

Item	Contents
ID number	Up to 12 numbers and/or letters
Name	Up to 20 letters
Sex	Male or Female
Birth Date*	Year: 4 digit numbers, month: 2 digit numbers, date: 2 digit numbers
Age*	Up to 3 numbers
Age unit	Select from age, month, week, or day
Race	Select from Caucasian, Black, Hispanic, Oriental, or Unknown
Height	Up to 3 numbers
Weight	Up to 3 numbers
Systolic blood pressure	Up to 3 numbers
Diastolic blood pressure	Up to 3 numbers
Medication	Select from 14 medications (9 medications are preset in the factory and you can preset 5 medications.) or type a name up to 20 letters. Selection list: 1. Digitalis, 2. Beta blocker, 3. Quindine/Norpace, 4. Diuretic, 5. Calcium antagonist, 6. Pro/Lido/Tocanide, 7. Other antiarrythmic, 8. Psychotropic, 9. Unknown
Room number	Up to 10 numbers and/or letters.
Department	Select from 14 departments that you preset or type up to 20 letters.

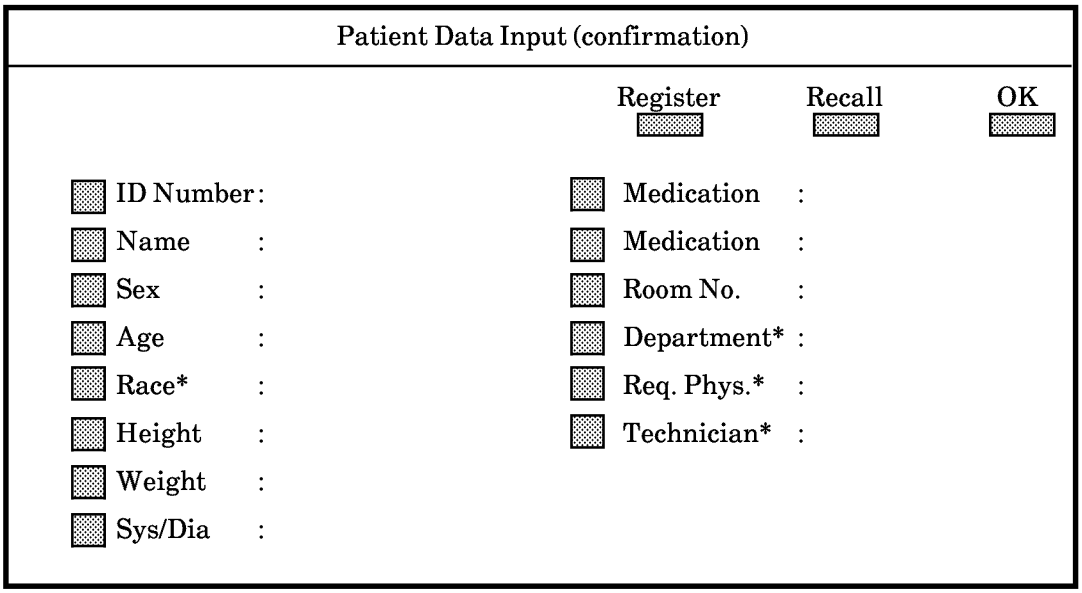
* To enter the age, select “Birth Date” or “Age” by the System Setup.

Request Physician name	Select from 14 names that you preset in each menu or type up to 20 letters.
Technician name	Select from 14 technician names that you preset or type up to 20 letters.

4-2 Using the Keyboard and Numeric Keypad

4-2-1 Procedure

1. From the basic screen, press the ID key to call up the Patient Data Input screen. The cardiograph continues to acquire the ECG waveforms when the Patient Data Input screen is displayed.



* These items are defaultly turned off.

2. Press the key beside the item that you want to enter. Depending on the item, the keyboard, the numeric keypad or a list box is displayed on the screen. For each item refer to Section 4-2-3.

   When you start to enter the ID number, the next item is automatically selected after you press the Enter key.

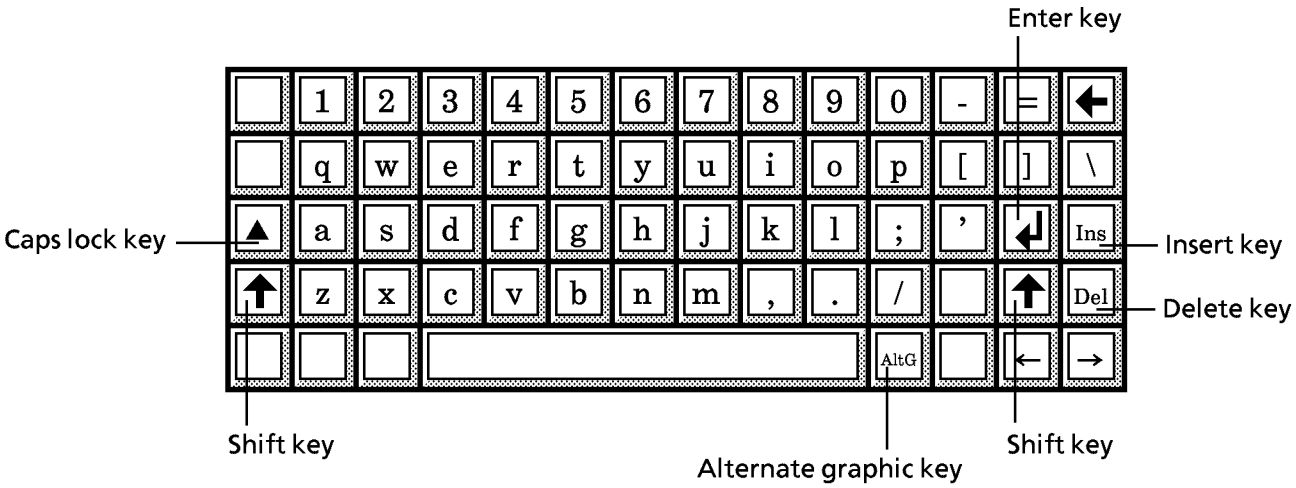
   To call up the data of the previous patient information, press the Recall key.

   To save the ID number, name, sex, date of birth in the flash disk card, press the Register key. This key appears when "Master file" is set to "ON" and the flash disk card is inserted into Slot 3 on the rear panel.

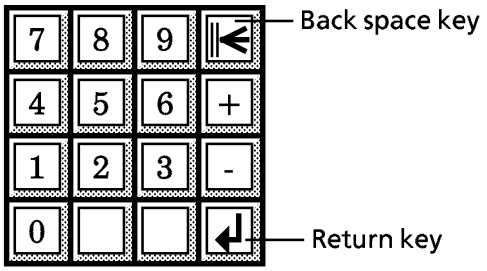
> **CAUTION**
> **If the entered ID number is the same as ID number of previously saved data, the previously saved data is replaced with new one. To avoid overwriting previously saved data, enter a new ID number.**

3. When the patient information entry is complete, press the OK key. The basic screen appears.

4-2-2 Keyboard and Numeric Keypad

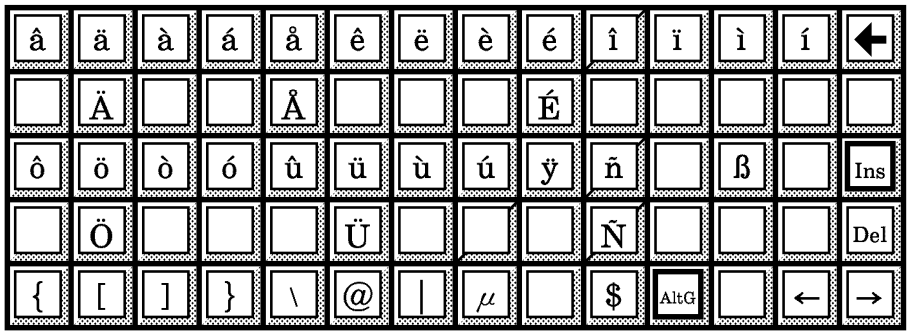


Keyboard



Numeric keypad

To enter the following characters, press AltG key. The keyboard changes shown as below.



NOTE

A space [ ] cannot be entered.

4-2-3 Procedures to Enter the Patient Information for Each Item

1. ID number

NOTE

If you change the ID number, the current patient data is automatically deleted. To save the current patient data, set the "Data Auto Erase" in the System Setup to "No".

1) Press the ID Number key to display the keyboard display.
2) Enter the ID number with the keyboard display. Up to 12 numbers and/or letters can be entered.
3) Press the Enter key to save the ID number.

2. Name
   1) Press the Name key to display the keyboard display.
   2) Enter the name with the keyboard. Up to 20 letters can be entered.
   3) Press the Enter key to save the name.

3. Sex
   1) Press the Sex key to display the Sex check box.
   2) Press the Male or Female key.
   3) Press the Enter key to save the sex.

4. Age

   There are two ways to enter the age. One is entering the age with the numeric keys, the other is automatic calculation of the age from the date of birth. You can select the way in the System Setup.

   To select the unit:
   1) Press the Unit key to display the Unit check box.
   2) Press the Age, Month, Week, or Date key.

   To enter the age with the numeric keys:
   1) Press the Age key to display the numeric key display table.
   2) Enter the age with the numeric key. Up to 3 numbers can be entered.
   3) Press the Enter key to save the age.

   To automatically calculate the age:
   1) Press the Birth Date key to display the numeric key display table.
   2) Enter the date of birth with the numeric keys. When entering the year of the birth, enter 4 digit numeric.
   3) Press the Enter key to save the age. The age is automatically calculated.

5. Race
   1) Press the Race key to display the Race list box.
   2) Press the the Caucasian, Black, Hispanic, Oriental, or Unknown key.
   3) Press the Enter key to save the race.

6. Height
   1) Press the Height key to display the numeric key display table.
   2) Enter the height with the numeric keys. Up to 3 numbers can be entered.
   3) Press the Enter key to save the height.

   For the unit setting, refer to Section 3-17.

7. Weight
   1) Press the Weight key to display the numeric key display table.
   2) Enter the weight with the numeric keys. Up to 3 numbers can be entered.
   3) Press the Enter key to save the weight.

   For the unit setting, refer to Section 3-17.

8. Systolic and diastolic blood pressure
   1) Press the Sys/Dia key to display the numeric key display table. The cursor appears in the Systolic input box.
   2) Enter the systolic blood pressure with the numeric keys. Up to 3 numbers can be entered.
   3) Press the Enter key to move the cursor to the diastolic input box.
   4) Enter the diastolic blood pressure with the numeric keys. Up to 3 numbers can be entered.
   5) Press the Enter key to save the blood pressures.

   For the unit setting, refer to Section 3-17.

9. Medication 1/Medication 2
   You can select a medication from the Medication list box or enter the medication with the keyboard. In the list box, 10 medications are preset in the factory and you can preset up to 5 medications in the System Setup.

   To select the medication in the Medication list box:
   1) Press the Medication 1 or 2 key to display the Medication list box.
   2) Press the Enter to save the medication.

   To enter the medication with the keyboard:
   1) Press the Medication 1 or 2 key to display the Medication list box.
   2) Press the Free key to display the keyboard display.
   3) Enter the medication with the keyboard. Up to 20 letters can be entered.
   4) Press the Enter key to save the medication.

10. Room number
    1) Press the Room No. key to display the numeric key display table.
    2) Enter the room number with the numeric keys. Up to 10 numbers can be entered.
    3) Press the Enter key to save the room number.

11. Department
    You can select the department from the Department list box or enter the department. In the list box, you can preset up to 14 departments in the System Set.

    To select the department from the Department list box:
    1) Press the Department key to display the Department list box.
    2) Press the department key. You can preset up to 14 departments in the System Set.

    To enter the department with the keyboard:
    1) Press the Department key to display the Department list box.
    2) Press the Free key to display the keyboard display.
    3) Enter the department with the keyboard. Up to 20 letters can be entered.
    4) Press the Enter key to save the department.

12. Request doctor name
    You can select the request doctor name in the Request doctor name list box or enter the doctor name. In the list box, you can preset up to 14 request doctor names in the System Setup.

    To select the request doctor name in the Request doctor name list box:
    1) Press the Request Doctor Name key to display the Request doctor name list box.
    2) Press the key beside the request doctor.

    To enter the request doctor name with the keyboard display:
    1) Press the Request Doctor Name key to display the Request doctor list box.
    2) Press the Free key to display the keyboard.
    3) Enter the request doctor name with the keyboard. Up to 20 letters can be entered.
    4) Press the Enter key to save the request doctor name.

13. Technician name
    You can select the technician name in the Technician name list box or enter the technician name. In the list box, you can preset up to 14 technician names in the System Setup.

    To select the technician name in the Technician name list box:
    1) Press the Technician Name key to display the Technician name list box.
    2) Press the key beside the technician name.

    To enter the Technician name with the keyboard:
    1) Press the Technician Name key to display the Technician name list box.
    2) Press the Free key to display the keyboard.
    3) Enter the technician name with the keyboard. Up to 20 letters can be entered.
    4) Press the Enter key to save the technician name.

When the patient information entry is complete, press the OK key. The basic screen appears.

4-3 Using the Magnetic Card Reader

You can enter the following patient information from an ID card by using the Magnetic card reader.
ID card: ID number, name, sex, date of birth, and comment

When this information is entered, the Patient Data Input screen appears and you can enter other patient information with the keyboard and numeric keypad.

In order to use the Magnetic card reader, set the settings in the ID Card Setting of the System Setup according to the specifications for your ID card.

When a data filing system or the flash memory card is installed, the previous patient information (ID number, name, sex, date of birth) saved in the data filing system or flash disk card is automatically found. The found patient information is displayed in the Patient Master Select screen. Refer to Section 4-6.

4-4 Using the Barcode Reader

You can enter the following patient information from barcodes by using the barcode reader.

ID number, name, sex, date of birth

When this information is entered, the Patient Data Input screen appears and you can enter other patient information with the keyboard and numeric keypad.

In order to use the Barcode reader, set the settings in the Barcode Reader Setting of the System Setup according to the specifications for your barcode.

When a data filing system or the flash memory card is installed, the previous patient information (ID number, name, sex, date of birth) saved in the data filing system or flash disk card is automatically found. The found patient information is displayed in the Patient Master Select screen. Refer to Section 4-6.

4-5 Using the Data Filing System

When "Download" is set to "ID number set" in the System Setup, the cardiograph can receive the patient information from the connected Data filing system (PC) through the SIO 1 (Communication port).

To use the Data filing system, set “Download” to “ID Number Set” in the Patient Data Input of the System Setup.

For operation details, refer to the Data filing system Operator's manual.

Procedure

1. Press the ID key to display the ID Number Input box. The keyboard display is also displayed.

2. Type the ID number with the keyboard display.

3. Press the OK key to request the patient information from the Data filing system. To cancel request, press the Cancel key. The Patient Data Input screen is displayed.

   If the patient information is saved in the Data filing system:
   The cardiograph receives it and displays it on the Patient Data Input screen. You can change the patient information.

   If the patient information is not saved:
   The "Invalid ID Number" message is displayed on the screen. Repeat steps 2 to 3 or enter the patient information by using the Patient Data Input screen.

4. Press the OK key. The basic screen is displayed.

4-6 Patient Index Database (ID Data File)

Patient information, ECG waveforms and analysis or measurement result can be saved in an IC memory card, floppy disk, and/or data filing system. In addition to this, a patient index database of up to 5,000 patient index files can be created on the flash disk card. A patient index file consists of ID number, patient name, date of birth and sex. The patient index file can be searched for by ID number or date of birth.

◆Preparation to Use the Patient Index Database

Insert the flash disk card into Slot 3. Refer to Section 2-5-3.
Set the "Age" to "Birth Date" and "Master File" to "ON" in the Patient Data Item window of the System Setup. Refer to Section 3-6.

◆Saving an ID Number, Name, Date of Birth and Sex in the Patient Index Database

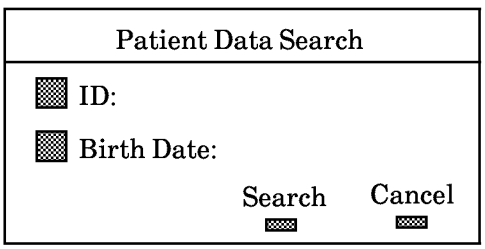
CAUTION

If the entered ID number is the same as ID number of previously saved data, the previously saved data replaced with new one. To avoid overwriting previously saved data, enter a new ID number.

To save the ID number, name, date of birth and sex in the patient index database, press the Register key in the Patient Data Input screen after patient information entry is complete.

◆Searching for a Patient Index File Saved in the Index File Manually

1. Press the ID key in the Basic screen. The Patient Data Search window appears and the Index File Input window appears on the screen.

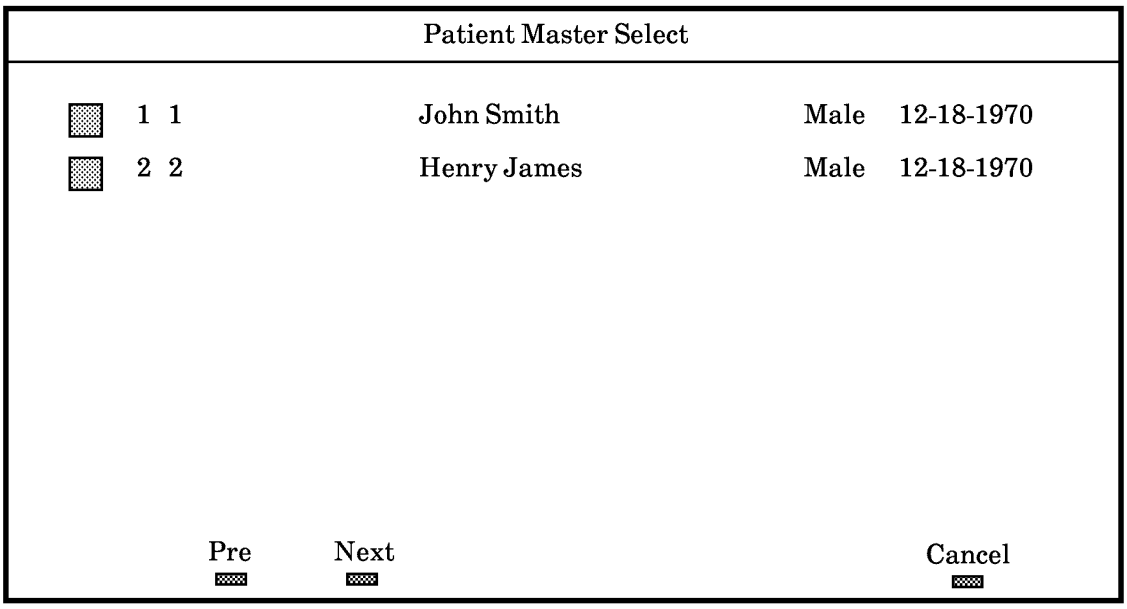


2. Enter the ID number or date of birth.

3. Press the Search key.

4-a) When only one file is found, the data is displayed on the Patient Data Input screen. You can enter other patient information, such as height, weight, etc.

4-b) When two or more files are found, the Patient Master Select window appears.



To select the file, press the key for the file that you want. The data is displayed on the Patient Data Input screen.

To scroll the data, use the Pre or Next key.
To close the screen, press the Cancel key.

◆Searching for a Patient Index File Automatically

To search for a patient index file automatically after entering the ID number by the Magnetic card reader or the barcode reader, set "Master file" to "ON" in the Patient Data Items window of the System Setup.

SECTION 5

PREPARING THE PATIENT

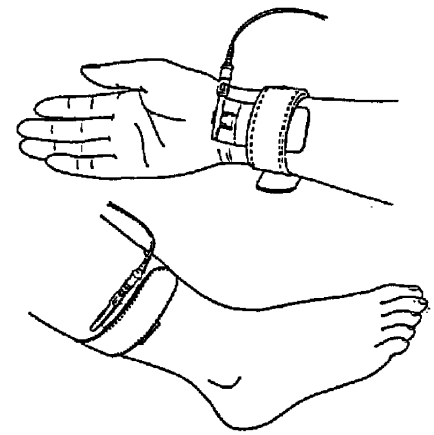
5-1 Attaching the Electrodes for Standard 12 Lead ECG and Cabrera Lead ECG Recording 5.1
5-2 Attaching the Electrode for Nehb Lead ECG Recording 5.3
5-3 Patient Cable Tip Color Coding 5.4
5-4 Lead Connection 5.5
5-5 Error Indication when the Electrode is Not Attached Firmly 5.6

CAUTION

- **Do not touch electrodes or cardiograph connectors to any other ground or conductive object in the room, such as metal bed posts.**
- **Do not use new and old electrodes together, or re-usable and disposable electrodes together. If they are used together, it causes high polarization voltage and baseline wandering.**

5-1 Attaching the Electrodes for Standard 12 Lead ECG and Cabrera Lead ECG Recording

◆ Attaching the Limb Electrodes



Attach four limb electrodes to muscular, not bony, areas on the extremities using the following steps:

1. Clean the skin electrodes with a cotton moistened with alcohol to remove oil.

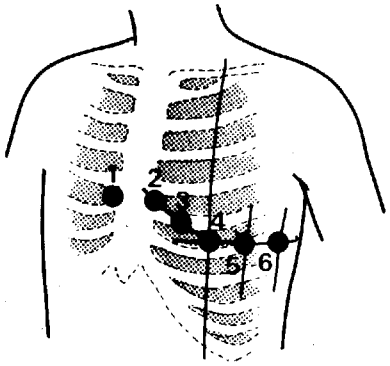
2. Thinly apply electrolyte cream (CardioCream) on the cleaned skin sites and remove it.

3. Apply a small amount of electrolyte cream also on the contact surface of the limb electrodes.

4. Attach the limb electrodes to the cleaned skin sites.
   - R (RA): Right arm
   - L (LA): Left arm
   - RF (RL): Right leg
   - F (LL): Left leg

5. Fasten them with the limb straps. Be sure that the straps fit snugly, but not too tight.

◆ Attaching the Chest Electrodes



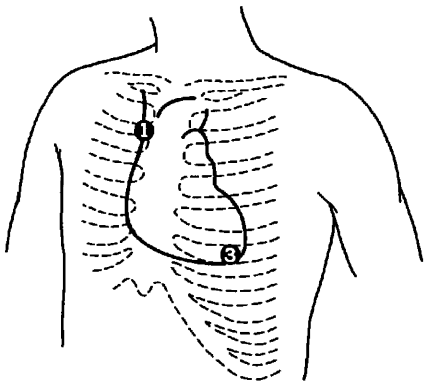
1. Clean the skin where you attach the electrodes with a cotton moistened with alcohol to remove oil.

2. Apply electrolyte cream (CardioCream) on the cleaned skin sites and remove it in well.
   Take care not to allow any electrolyte cream to overlap from one C (V) position to another.

3. Thinly apply electrolyte cream also on the contact part of the chest electrodes.

4. Squeeze the rubber bulb to make the electrode adhere by vacuum suction. Take care not to let the electrodes come in contact with each other.
   - C1 (V1): Fourth intercostal space at the right border of the sternum
   - C2 (V2): Fourth intercostal space at the left border of the sternum
   - C3 (V3): Halfway between C2 (V2) and C4 (V4)
   - C4 (V4): Fifth intercostal space on left midclavicular line
   - C5 (V5): Left anterior axillay line at the horizontal level of C4 (V4)
   - C6 (V6): Left midaxillary at the horizontal level of C4 (V4)

5-2 Attaching the Electrode for Nehb Lead ECG Recording



1. Attach the limb electrodes referring to the procedure "Attaching the limb electrodes" in Section 5-1. The limb electrodes are the same limb positions as the standard 12 lead.

2. Attach the following electrodes with the chest electrode referring to the procedure "Attaching the chest electrodes" in Section 5-1.
   - C1 (V1): Second costal at the right border of the sternum **1**
   - C2 (V2): Posterior apex
   - C3 (V3): Apex **3**
   - C4 (V4) to C6 (V6) electrodes are not used.

5-3 Patient Cable Tip Color Coding

BR-911D (IEC standard, Tip: 3 mm diameter) / BR-912D (IEC/DIN standard, Tip: 4 mm diameter) / BR-913D (IEC/DIN standard, clip)

Symbol in lead		Color (tip/lead)
Standard 12-lead and Cabrera lead	Nehb lead	
R	R	Red/Brown
L	L	Yellow/Brown
F	F	Green/Brown
N (RF)	N (RF)	Black/Brown
C1	C1	Red/White
C2	C2	Yellow/White
C3	C3	Green/White
C4	-	Brown/White
C5	-	Black/White
C6	-	Violet/White

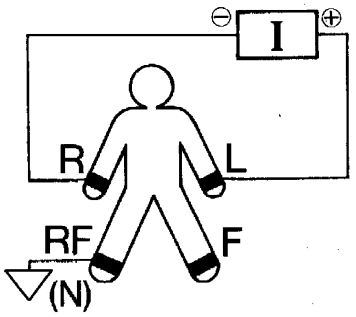
BR-911DA (AHA requirement; Tip: 3 mm diameter) / BR-913DA (AHA requirement, clip)

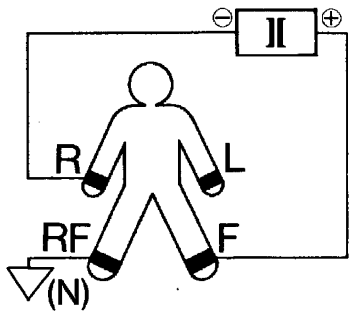
Symbol in lead		Color (tip/lead)
Standard 12-lead and Cabrera lead	Nehb lead	
RA	RA	White/Brown
LA	LA	Black/Brown
LL	LL	Red/Brown
RL	RL	Green/Brown
V1	V1	Red/White
V2	V2	Yellow/White
V3	V3	Green/White
V4	-	Blue/White
V5	-	Orange/White
V6	-	Violet/White

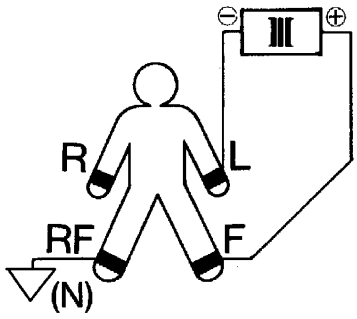
5-4 Lead Connection

◆Standard 12-lead and Cabrera Lead

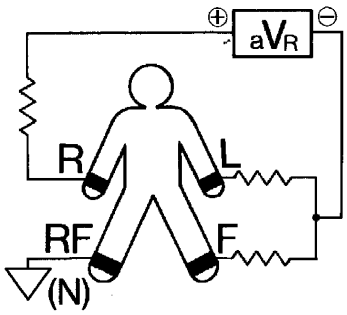
STANDARD LIMB LEADS

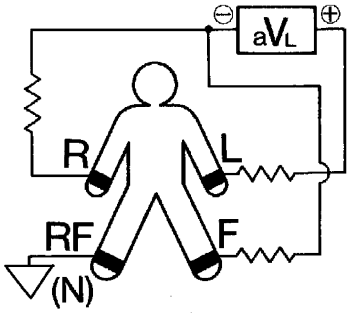


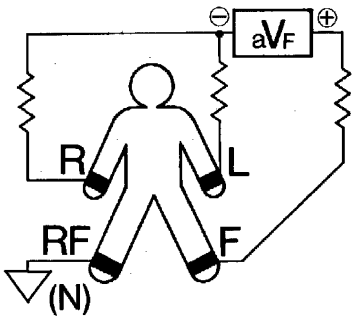




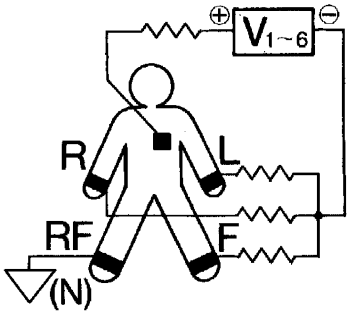
UNIPOLAR LIMB LEADS



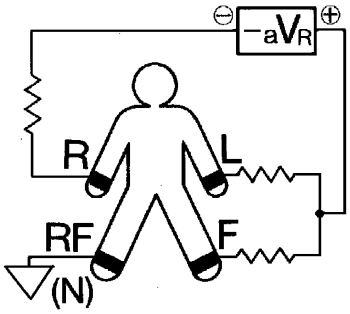




UNIPOLAR CHEST LEADS



−aVR



◆Nehb Lead

The Nehb D, A, and I leads are derived from the standard 12-lead ECG by following equations.

Nehb D = C3 − C1

Nehb A = C2 − C1

Nehb I = C3 − C2

5-5 Error Indication when the Electrode is Not Attached Firmly

Poor electrode Attachment

When an electrode detachment or noise is detected, the following message is displayed in the Electrode indication area on the screen and the corresponding leads off indication lamp on the Input box blinks.

Electrode indication area	Lead off indication lamp	Possible cause
Lead name	Corresponding lamp blinks.	The electrode is detached.
Electrode failure (Limbs)	R, L, F lamps blink.	• The RL electrode is detached. • More than two leads from R, L, or F electrode are detached. • No electrode is attached to the patient. • The electrode cartridge is not connected to the input box firmly.
Electrode noise		Noise is superimposed on the electrode.

During Rhythm recording, the ECG waveforms are highlighted on the screen when an electrode detachment or artifact is detected.

During recording, the following line is recorded on the paper when an electrode detachment or artifact is detected.

If the above indication still remains after checking the electrode attachment, probably due to a large skin voltage (polarization voltage). Clean the skin where the electrode is attached with a cotton moistened with alcohol.

NOTE

The electrode cartridge and the input circuit of the input box provide protection against a defibrillator discharge. After defibrillation, wait at least 5 seconds until the ECG waveforms are stable to record ECG waveforms.

SECTION 6

MEASURING RESTING ECG WAVEFORMS

6-1 General 6.1
6-1-1 Available Recordings and Operation Tools 6.1
6-1-2 Notes for Accurate Measurement 6.3
6-2 Standard 12 Lead ECG Recording and Cabrera Lead ECG Recording 6.4
6-2-1 General 6.4
6-2-2 Factory Default Settings 6.5
6-2-3 Automatic Recording 6.8
6-2-4 Manual Recording 6.10
6-2-5 Rhythm Recording 6.13
6-3 Nehb Lead ECG Recording 6.14
6-3-1 General 6.14
6-3-2 Factory Default Settings 6.14
6-3-3 Automatic Recording 6.17
6-3-4 Manual Recording 6.19
6-3-5 Rhythm Recording 6.20
6-4 Recording a Summary Report 6.21
6-4-1 General 6.21
6-4-2 Recording Procedure 6.22
6-5 Recording Examples 6.23

6-1 General

You can measure the resting standard 12 lead, Cabrera lead, and Nehb lead ECG waveforms by different amplifier settings and recording formats. Rhythm recording is provided to continue to record up to 3 minutes, 1 or 3 channel ECG waveforms. For example, you can check whether the patient has an abnormal ECG waveform by applying some medicine or stress.

After recording, if necessary, you can also copy the ECG recording for a patient history file, physicians' record, lab archives, or insurance invoice, etc. and automatically or manually manage the ECG recording for filing and transferring to another cardiograph or to the Data filing system.

Depending on the optional software program, recording contents and displayed messages are different. Refer to the following table.

6-1-1 Available Recordings and Operation Tools

○: Available, ×: Not available

		Standard 12 lead ECG / Cabrera lead recording			Nehb lead recording		
		Without QP-911E / 910E	With QP-911E	With QP-910E	Without QP-911E / 910E	With QP-911E	With QP-910E
Automatic recording	Interpretation result recording	×	○	×	×	×	×
	Measurement table recording	×	○	○	×	×	×
	Report recording	○	○	○	○	○	○
	Automatic filing	○	○	○	○	○	○
	Automatic file transfer	○	○	○	○	○	○
	Manual filing	○	○	○	○	○	○
	Manual file transfer	○	○	○	○	○	○

		Standard 12 lead ECG / Cabrera lead recording			Nehb lead recording		
		Without QP-911E / 910E	With QP-911E	With QP-910E	Without QP-911E / 910E	With QP-911E	With QP-910E
Manual recording	Interpretation result recording	×	○	×	×	×	×
	Measurement table recording	×	○	○	×	×	×
	Report recording	×	○	○	×	○	○
	Automatic filing	×	○	○	×	×	×
	Automatic file transfer	×	○	○	×	×	×
	Manual filing	×	○	○	×	×	×
	Manual file transfer	×	○	○	×	×	×
Rhythm recording	Report recording	×	×	×	×	×	×
	Automatic filing	○	○	○	○	○	○
	Automatic file transfer	○	○	○	○	○	○
	Manual filing	×	×	×	×	×	×
	Manual file transfer	×	×	×	×	×	×

QP-910E: ECG Measurement software

QP-911E: ECG Interpretation software

In manual recording mode, the report recording is available when 10 seconds of ECG is recorded.

6-1-2 Notes for Accurate Measurement

1. Before starting recording confirm the followings:
   - The "Ready" message is displayed on the screen. This message is displayed 2 seconds after the error message "Electrode failure" or "Electrode noise" disappears.
   - The heart rate displayed is stable.
   - The " ♥ " is displayed and blinks in synchronization with the QRS wave.

2. Wait at least 10 seconds for stable ECG waveforms. The ECG waveforms may be unstable because of polarization voltage immediately after electrodes are placed.

   Wait at least 12 seconds to start recording in the delayed recording. If the 10 seconds ECG waveforms are not stored in memory, i.e. you start recording within 10 seconds after electrodes have been placed, an alarm sounds to prompt you that there is not enough data stored in memory to perform ECG analysis or measurement.

◆Detecting QRS Waves

The cardiograph detects QRS complexes from leads II, V1, and V5. Take care to minimize superimposed artifact on these leads to assure QRS detection accuracy. Also QRS amplitudes must exceed 0.5 mV to be detected.

If the QRS complexes are not detected, the analysis or measurement process will not be performed. QRS size may be increased by repositioning the II, V1 and V5 electrodes, though analysis or measurement accuracy may be reduced.

◆Counting the Heart Rate

The cardiograph counts the heart rate by averaging the most recent six QRS waves. The heart rate displayed on the screen is renewed every two seconds. The heart rate cannot be displayed until six QRS waves are detected after the electrodes are placed. When the ECG waveforms are printed, heart rate displayed at the start of the recording is used.

◆Using the High-cut Filter

When using the 25 Hz high-cut filter, the quality of ECG recording may be reduced. However, the high-cut filter does not affect the ECG analysis.

6-2 Standard 12 Lead ECG Recording and Cabrera Lead ECG Recording

6-2-1 General

The only difference between the standard 12 lead recording and Cabrera lead recording is the recording order of the standard limb leads and augment limb leads, as shown below.

Standard 12 lead recording	I	II	III	aVR	aVL	aVF
Cabrera lead recording	aVL	I	-aVR	II	aVF	III

When the QP-910E ECG Measurement software is installed, the cardiograph can analyze the acquired ECG waveforms and print the measurement table.

When the QP-911E ECG Interpretation software is installed, the cardiograph can analyze and classify the acquired ECG waveforms and print the measurement table and interpretation result including classified ECG finding.

When the ECG analysis is performed, you can automatically or manually file and/or transfer the acquired ECG waveforms into the storage media or personal computer.

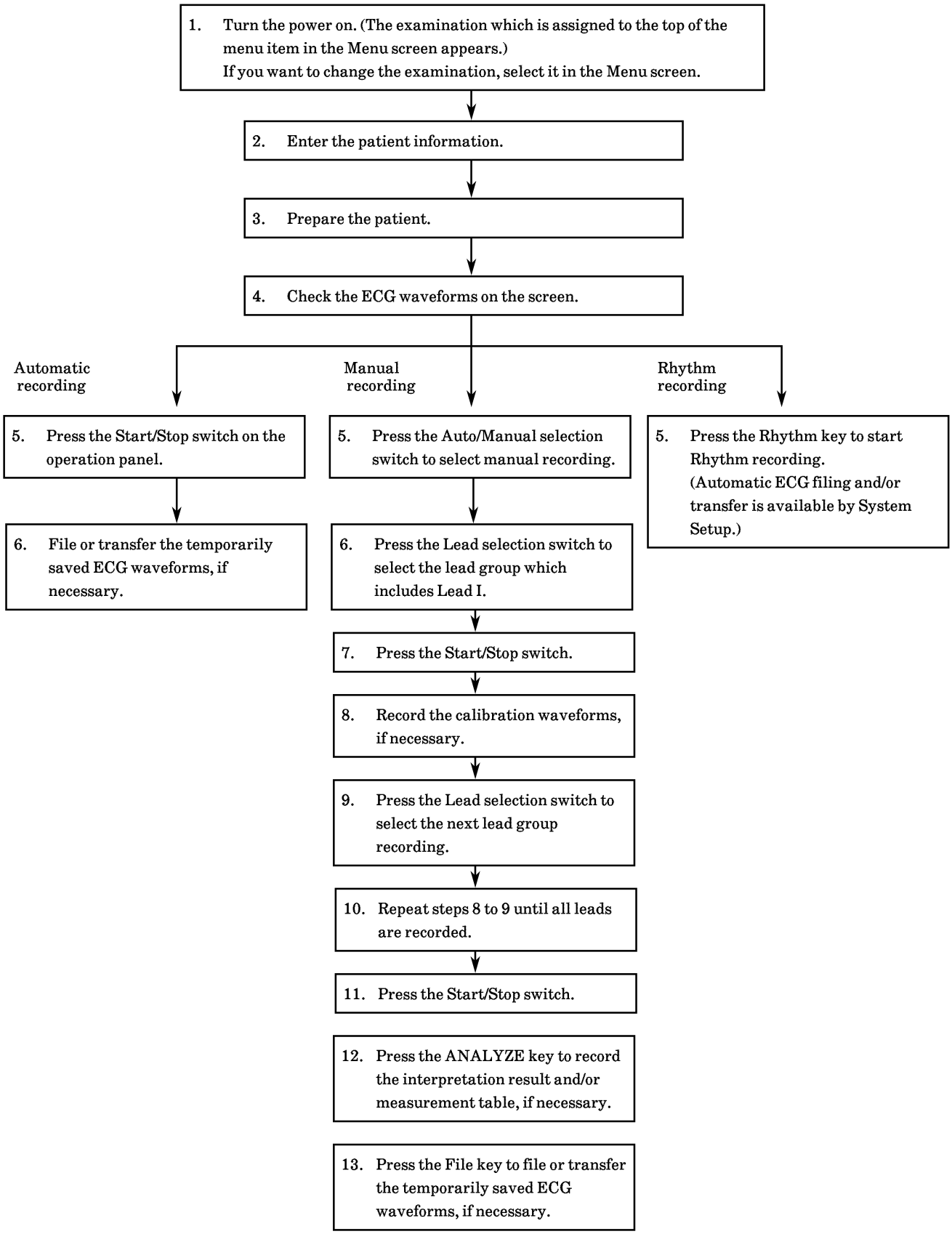
6-2-2 Factory Default Settings

Screens in the System Set	Settings	Default setting
Manual Recording	Auto Position	ON
	Analysis Result Format*2	Result + Average + Rhythm (Full-page)
	Measurement Table*2	OFF
	Automatic Calibration	After each sequence
Auto Recording	ECG Data Pre-acquisition	OFF
	Waveform Recording Format	6 Ch (12-lead)
	Auto Gain	ON
	Analysis Result Format*2	Result + Average + Rhythm (Full-page)
	Interpretation Findings*1	Findings + Reason
	Measurement Table*2	OFF
	Additional 3-lead Rhythm	OFF
	Serial Comparison*2	OFF
Rhythm Recording	Rhythm Recording Format	Single-lead 1 min
	Rhythm Recording Time	1 min
Post-processing	10-second Leads	OFF
	Post-processing Conditions	All Data
	Rhythm Leads	OFF
Report Recording	Auto Recording	OFF
	Format	Duplicate
	Number of Copies	1

Screens in the System Set	Settings	Default setting
Format Settings (for Report recording)	Waveform Recording Format	6 Ch (12-lead)
	Auto Gain	ON
	Analysis Result Format*2	Result + Average + Rhythm (Full-page)
	Interpretation Findings*1	Findings + Reason
	Measurement Table*2	OFF
	Additional 3-lead Rhythm	OFF
	Serial Comparison*2	OFF
Rhythm Lead	1 Ch Lead	II
	3 Ch Lead	II, V1, V5
Extra 6 Ch Lead	Ch 1 to Ch 6	I, II, aVF, V1, V5, V6
Slow Recording/Hi Cut Filter	Slow Paper Speed	5 mm/s
	Hi Cut Filter	35 Hz, 150 Hz
Power Up	Waveform Display Format	12 Ch
	Rhythm Waveform Display	ON
	Auto or Manual Recording	Auto
	Recording Channels	6 Ch
	Baseline Drift Suppression	ON
	Paper Speed	25 mm/s
	Age Unit	Years
	External Output	EXTRA lead
Request Phys. Registration		-

*1: The optional QP-911E ECG Interpretation software is required.
*2: The optional QP-911E ECG Interpretation software or QP-910E ECG Measurement software is required.

Recording Flowchart



6-2-3 Automatic Recording

NOTES

1. **Before starting recording change the following settings, if necessary. During recording the keys or switches corresponding to the settings either disappear or do not have function and you cannot change the settings**
   - **Sens (Sensitivity selection key)**
   - **1/2 (Sensitivity 1/2 switch)**
   - **High-cut filter selection key**
   - **Speed (Paper speed key)**
2. **To analyze the ECG waveform, more than 10 second ECG waveform recording is required.**
   When the QP-911E ECG Interpretation software or QP-910E ECG Measurement software is installed, the automatic ECG analysis and automatic ECG filing and/or transfer are available. You can set these automatic functions (automatic ECG analysis: "Analysis Result Format" in the System Setup, automatic ECG filing and/or transfer: "10-second Leads" in the System Setup).
3. **The waveform recording format and analysis result format printed at 25 mm/s recording speed is slightly different from that of 50 mm/s. However, the recorded information is the same.**

1. Turn the power on. The examination which is assigned to the top of the menu item in the Menu screen appears. If the required examination screen is displayed, go to step 4.

2. Press the Menu key to call up the Menu screen.

3. Press the key beside the examination that you want to select.

4. Enter the patient information. Refer to Section 4.

5. Attach the electrodes to the patient. Refer to Section 5.

6. Check that the ECG waveforms displayed on the screen have no artifact. When 3 or 6 channel display is selected, change the lead group one by one in sequence with the Lead selection switch.
   If the "Electrode failure" or "Electrode noise" message is displayed, reattach the electrode or remove the cause of artifact. Then wait until the "Ready" message is displayed.

7. Check that the Auto/Manual selection lamp lights up. If the Auto/Manual selection lamp does not light up, press the Auto/Manual selection switch to select the automatic recording.
   - When the manual recording is required, press the Auto/Manual selection switch then go to Section 6-2-4 step 8.
   - When the rhythm lead recording is required, go to Section 6-2-5 step 7.

8. Press the Start/Stop switch to start recording. The recording is performed according to the preset recording format and settings. To stop recording, press the Start/Stop switch.

When the QP-911E ECG Interpretation software or QP-910E ECG Measurement software is installed:
If the automatic ECG analysis is set to on, the cardiograph automatically analyze the acquired ECG waveform according the installed software and print the analysis result.

If the automatic ECG analysis is set to off, the automatic analysis is not performed. However the Analyze key appears to indicate that manual ECG analysis is available. To perform the manual ECG analysis, press this key.

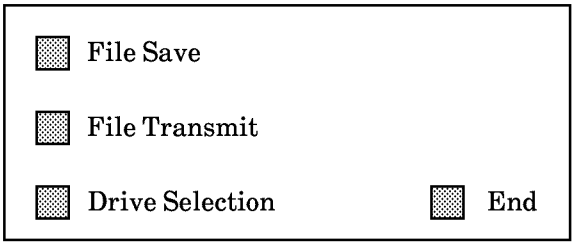
◆ECG Filing and/or Transfer

After ECG analysis result is printed, if the automatic ECG filing and/or transfer is set to on, the cardiograph automatically file and/or transfer the acquired ECG waveforms according to the selected settings.

If the automatic ECG filing and/or transfer is set to off, the File key appears to indicate that the manual ECG filing and/or transfer is available.

To file and/or transfer the acquired ECG waveforms:

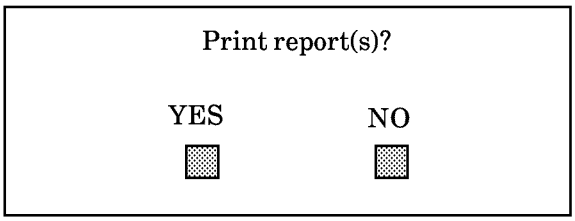
1. Press the File key. The following check box appears.



2. Press the key beside the operation that you want to select. When the "File Media Select" is selected, you can select the floppy disk or IC memory card.
   To cancel filing or transfer, press the File mark key "  " at the top of the screen.

◆**Report Recording**

When the "Auto Recording" is set to "ON" in the System Setup, the confirmation window appears after recording. You can print the recording results any numbers of times. For number of times and recording format, refer to Section 3-5-6.



To print the recording results, press the YES key.

When "Auto Recording" is set to "OFF" in the System Setup, the Report key appears after recording and the Report recording is available until the next recording is started. To start recording, press the Report key.

6-2-4 Manual Recording

NOTES

To analyze the ECG waveform, more than 10 second ECG waveform recording is required.

When the QP-911E ECG Interpretation software or QP-910E ECG Measurement software is installed, the manual ECG analysis and automatic ECG filing and/or transfer are available.

1. Turn the power on. The examination which is assigned to the top menu item in the Menu screen appears. If the required examination is displayed, go to step 4.

2. Press the Menu key to call up the Menu screen.

3. Press the key beside the examination that you want to select.

4. Enter the patient information. Refer to Section 4.

5. Attach the electrodes to the patient. Refer to Section 5.

6. Check that the ECG waveforms displayed on the screen have no artifact. When 3 or 6 channel display is selected, change the lead group one by one in sequence with the Lead selection switch.

   If the "Electrode failure" or "Noise" message is displayed, reattach the electrode or remove the cause of artifact. To change the number of recording channels, press the Rec. key.

7. Check that the Auto/Manual selection lamp dose not light up. If the Auto/Manual selection lamp lights up, press the Auto/Manual selection switch to select the manual recording.
   If the rhythm lead recording is required, go to Section 6-2-5 step 7.

8. Press the Lead selection switch to select the lead group which includes Lead I.

9. Press the Start/Stop switch to start recording.

10. Press the Calibration key to record the calibration waveform.
    The calibration waveform can be automatically recorded before or after changing the lead group by the System Setup.

11. Press the Lead selection switch to select the next lead group recording.

12. Repeat steps 10 to 11 to record each lead group.

13. Press the Start/Stop switch to stop recording.

◆ECG Analysis

When the QP-911E ECG Interpretation software or QP-910E ECG Measurement software is installed, if the recording time is more than 10 seconds, the Analyze key appears to indicate that the manual ECG analysis is available. To perform the manual ECG analysis, press this key.

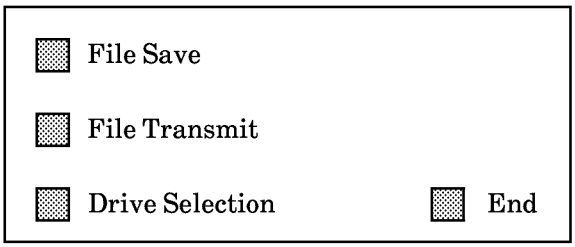
◆ECG Filing and/or Transfer

After ECG analysis result is printed, if the Automatic ECG filing and/or transfer is set to on, the cardiograph automatically file and/or transfer the acquired ECG waveforms according to the selected settings.

If the automatic ECG filing and/or transfer is set to off, the File key appears to indicate that the manual ECG filing and/or transfer is available.

To file and/or transfer the acquired ECG waveforms:

1. Press the File key. The following check box appears.



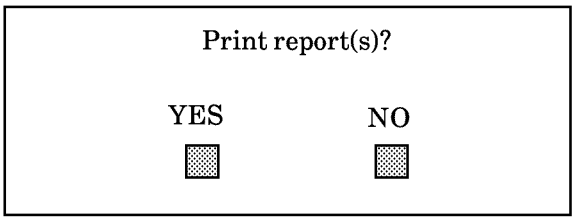
2. Press the key beside the operation that you want to select. When "File Media Select" is selected, you can select the floppy disk or IC memory card.
   To cancel the filing or transfer, press the File mark key " " at the top of the screen.

◆Report Recording

NOTE

This function is only available after ECG analysis is performed.

When the "Auto Recording" is set to "ON" in the System Setup, the confirmation window appears after recording. You can print the recording results any numbers of times. For number of times and recording format, refer to Section 3-5-6.



To print the recording results, press the YES key.

When "Auto Recording" is set to "OFF" in the System Setup, the Report key appears after recording and the Report recording is available until the next recording is started. To start recording, press the Report key.

6-2-5 Rhythm Recording

◆General

You can make a 1 or 3 channel ECG waveforms trend recording. The following table shows the recording format.

Number of recording channels	Recording time per page (corresponds to 280 length)	Total recording time
1	1 or 3 minute(s)	1 or 3 minute(s)
3	20 seconds or 1 minute	1 or 3 minute(s)

To select the lead, use the System Setup.

During the Rhythm recording, you can perform automatic or manual recording.
When "10-second Leads" is set to "Save", "Transmit" or "Save + Transmit" in the System Setup, ECG filing and/or transfer is automatically performed.

◆Recording Procedure

NOTE

Change the High-cut filter setting before recording, if necessary. During recording, this key disappears and you cannot change the settings.

1. Turn the power on. The examination which is assigned to the top of the menu item in the Menu screen appears. If the required examination is displayed, go to step 4.
2. Press the Menu key to call up the Menu Select screen.
3. Press the key beside the examination that you want to select.
4. Enter the patient information. Refer to Section 4.
5. Attach the electrodes to the patient. Refer to Section 5.
6. Check that the ECG waveforms displayed on the screen have no artifact.
7. Press the Rhythm key on the bottom of the screen. The cardiograph starts acquiring ECG waveforms. The Rhythm key changes to the Stop key. When one page of ECG waveforms are saved in memory, recording starts.
   To record an event mark, press the Event key.
   To stop saving, press the Stop key. The saved ECG waveforms are recorded.

6-3 Nehb Lead ECG Recording

6-3-1 General

You can automatically or manually record the Nehb lead ECG waveforms.
You can also perform a 1 or 3 channel trend recording.

When the Nehb lead recording is selected, the Lead indication lamp on the front panel lights up to indicate the lead according to the following table.

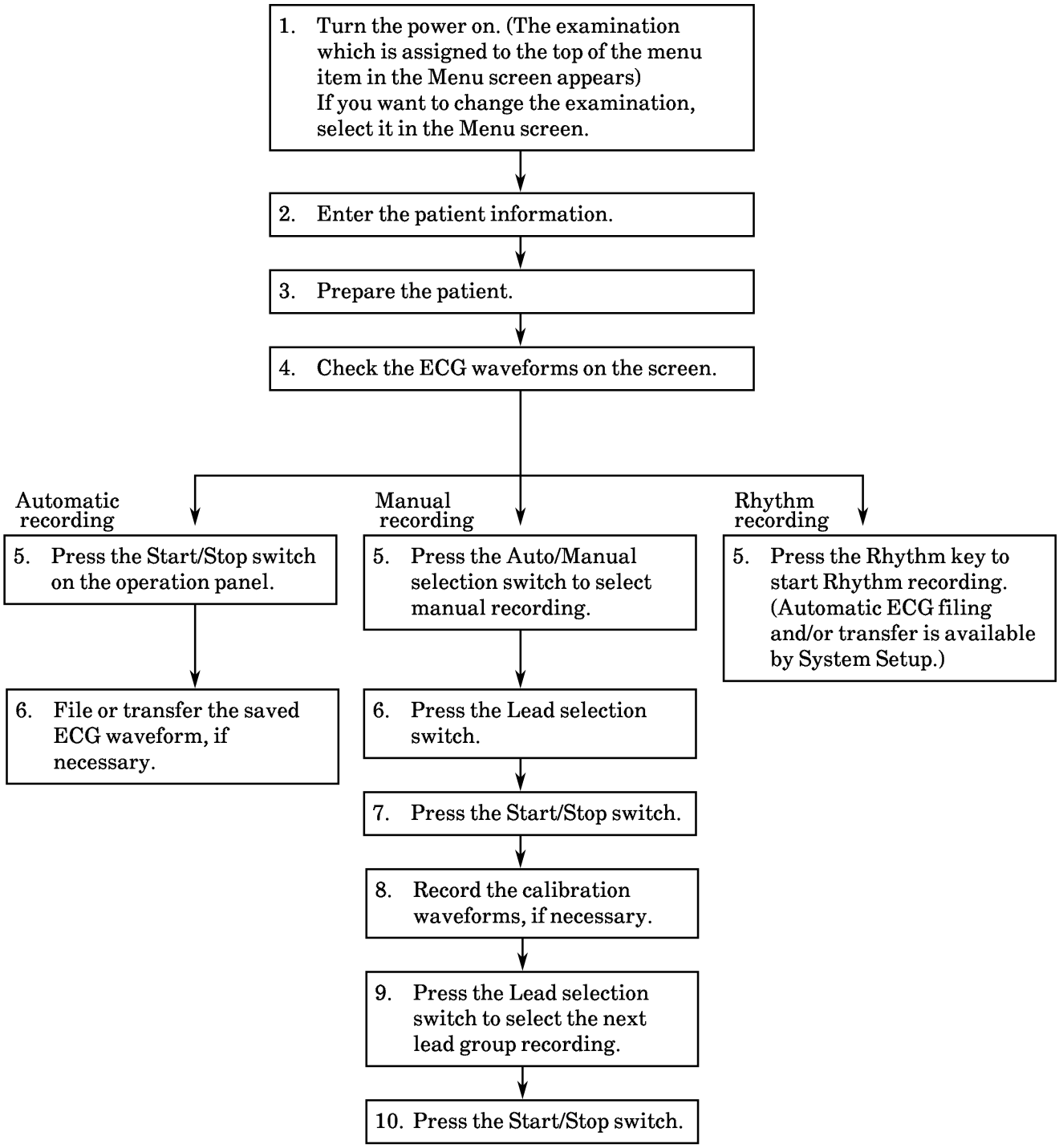
Lead indication lamp	I	II	III	V1	V2	V3
Corresponding Nehb lead	I	II	III	ND	NA	NI

6-3-2 Factory Default Settings

Screens in the System Set	Settings	Default setting
Manual Recording	Auto Position	ON
	Automatic Calibration	After each sequence
Auto Recording	ECG Data Pre-acquisition	OFF
	Waveform Recording Format	6 Ch
	Auto Gain	ON
Rhythm Recording	Rhythm Recording Format	Single-lead 1 min
	Rhythm Recording Time	1 min
Post-processing	10-second Leads	OFF
	Rhythm Leads	OFF
Report Recording	Auto Recording	OFF
	Format	Duplicate
	Number of Copies	1
	Waveform Recording Format	6 Ch
	Auto Gain	ON

Screens in the System Set	Settings	Default setting
Rhythm Lead	1 Ch Lead	II
	3 Ch Lead	II, ND, NA
Slow Recording/Hi Cut Filter	Slow Paper Speed	5 mm/s
	Hi Cut Filter	35 Hz, 150 Hz
Power Up	Waveform Display Format	6 Ch
	Rhythm Waveform Display	ON
	Auto or Manual Recording	Auto
	Recording Channels	6 Ch
	Baseline Drift Suppression	ON
	Paper Speed	25 mm/s
	Age Unit	Years
Request Phys. Registration		-

Recording Flowchart



6-3-3 Automatic Recording

NOTE

Before starting recording change the following settings, if necessary. During recording the keys correspond to the settings either disappear or do not have function and you cannot change the settings.

- **Sens (Sensitivity selection key)**
- **1/2 (Sensitivity 1/2 switch)**
- **High-cut filter selection key**
- **Speed (Paper speed key)**

1. Turn the power on. The examination assigned to the top menu item in the Menu screen appears. If the required examination screen is displayed, go to step 4.

2. Press the Menu key to call up the Menu screen.

3. Press the key beside the examination that you want to select.

4. Enter the patient information. Refer to Section 4.

5. Attach the electrodes to the patient. Refer to Section 5.

6. Check that the ECG waveforms displayed on the screen have no artifact by changing the lead group one by one in sequence with the Lead selection switch.
   If the "Electrode failure" or "Electrode noise" message is displayed, reattach the electrode or remove the cause of artifact. Then wait until the "Ready" message is displayed.

7. Check that the Auto/Manual selection lamp lights up. If the Auto/Manual selection lamp does not light up, press the Auto/Manual selection switch to select the automatic recording.
   - When the manual recording is required, press the Auto/Manual selection switch then go to Section 6-3-4 step 8.
   - When the rhythm lead recording is required, go to Section 6-3-5 step 7.

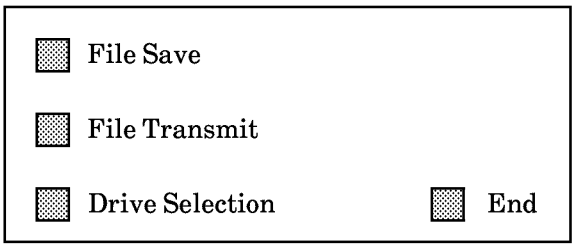
8. Press the Start/Stop switch to start recording. The recording starts with the currently selected lead group. The recording is performed according to the preset recording format and settings. To stop recording, press the Start/Stop switch. After the lead group containing the lead ND, NA and NI is recorded, the recording automatically stops.

◆ ECG Filing and/or Transfer

After recording, you can automatically or manually file and/or transfer the temporarily saved ECG waveforms and patient information. If the "10-second leads" is set to "OFF" (automatic ECG filing and/or transfer is set to off) in the System Setup, the File key appears on the screen and you can manually file and/or transfer the ECG waveforms.

To file and/or transfer the ECG waveforms:

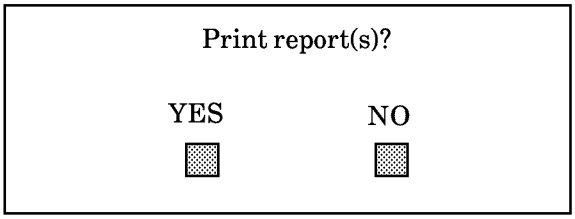
1. Press the File key. The following check box appears.



2. Press the key beside the operation that you want to select. When the "File Media Select" is selected, you can select the floppy disk or IC memory card.
   To cancel filing or transfer, press the File mark key "  " at the top of the screen.

◆ Report Recording

When the "Auto Recording" is set to "ON" in the System Setup, the confirmation window appears after recording. You can print the recording results any number of times. For number of times and recording format, refer to Section 3-5-6.



To print the recording results, press the YES key.

When "Auto Recording" is set to "OFF" in the System Setup, the Report key appears after recording and the Report recording is available until the next recording is started. To start recording, press the Report key.

6-3-4 Manual Recording

1. Turn the power on. The examination which is assigned to the top menu item in the Menu screen appears. If the required examination is displayed, go to step 4.

2. Press the Menu key to call up the Menu Select screen.

3. Press the key beside the examination that you want to select.

4. Enter the patient information. Refer to Section 4.

5. Attach the electrodes to the patient. Refer to Section 5.

6. Check that the ECG waveforms displayed on the screen have no artifact.
   If the "Electrode failure" or "Electrode noise" message is displayed, reattach the electrode or remove the cause of artifact. Then wait until the "Ready" message is displayed. To change the number of recording channels, press the Rec. key.

7. Check that the Auto/Manual selection lamp dose not light up. If the Auto/Manual selection lamp lights up, press the Auto/Manual selection switch.

8. Press the Lead selection switch to select the lead group which includes the Lead I.

9. Press the Start/Stop switch to start recording.

10. Press the Calibration key to record the calibration waveform.
    The calibration waveform can be automatically recorded before or after changing the lead group by the System Setup.

11. Press the Lead selection switch to select the next lead group recording.

12. Repeat steps 10 to 11 to record each lead group.

13. Press the Start/Stop switch to stop recording.

6-3-5 Rhythm Recording

◆General

You can make the 1 or 3 channel ECG waveforms trend recording. The following table shows the recording format.

Number of recording channels	Recording time per page (corresponds to 280 length)	Total recording time
1	1 or 3 minute(s)	1 or 3 minute(s)
3	20 seconds or 1 minute	1 or 3 minute(s)

To select the lead, use the System Setup screen.

During the Rhythm recording, you can perform automatic or manual recording.

When "10-second Leads" is set to "Save", "Transmit" or "Save + Transmit" in the System Setup, ECG filing and/or transfer is automatically performed.

◆Recording Procedure

NOTE

Change the High-cut filter and Drift filter settings before recording, if necessary. During recording these keys disappear and you cannot change the settings.

1. Turn the power on. The examination which is assigned to the top of the menu item in the Menu Select screen appears. If the required examination is displayed, go to step 4.

2. Press the Menu key to call up the Menu Select screen.

3. Press the key beside the examination that you want to select.

4. Enter the patient information. Refer to Section 4.

5. Attach the electrodes to the patient. Refer to Section 5.

6. Check that the ECG waveforms displayed on the screen have no artifact.

7. Press the Rhythm key on the bottom of the screen. The cardiograph starts acquiring ECG waveforms. The Rhythm key changes to the Stop key. When one page of ECG waveforms are saved in memory, recording starts.

   To record an event mark, press the Event key.

   To stop saving, press the Stop key. The saved ECG waveforms are recorded.

6-4 Recording a Summary Report

6-4-1 General

◆What is a Summary Report?

At any time, you can record a summary report of up to 150 previous examinations. One page contains data for 20 examinations. The following two lines of data are printed for each examination.

Examination date and time, Patient ID, Sex, Age, Technician's name
Examination type, Interpretation findings code (when the QP-911E is installed.)

To save summary report data, set "Create Summary Log" to "ON" in the System Setup. Refer to Section 3-15.

Depending on the optional software, the summary data is not saved for certain examinations, as shown in the following table.

	Recording type	ECG-9320 only	with QP-910E	with QP-911E
Standard 12 Lead and Cabrera Lead ECG Recording	Auto	saved	saved	saved
	Manual	not saved	saved*1	saved*1
	Rhythm	saved	saved*2	saved*2
Nehb Lead ECG Recording	Auto	saved	saved	saved
	Manual	not saved	not saved	not saved
	Rhythm	saved*2	saved*2	saved*2
External Signal Recording	Freeze	saved*2	saved*2	saved*2
	Manual	not saved	not saved	not saved

*1 Analysis is required in order to save summary data.
*2 Summary data is not saved if this examination has the same Patient ID Number as the preceding examination.

For external signal recording, refer to Section 7.

◆When the Memory Gets Full

Data for up to 150 examinations can be saved. After data for 140 examination is saved, an alarm sounds and the following message appears after each examination:

"Not enough free memory to store summary data"

To make space for new summary data, delete the saved summary data. Otherwise, when data for 150 examination is saved, no more data can be saved and the following message appears:

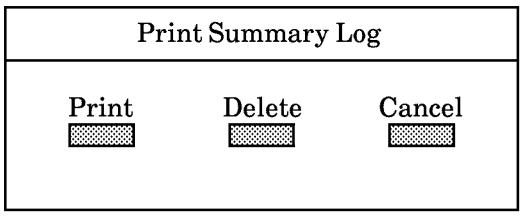
"Summary data cannot be stored"

6-4-2 Recording Procedure

1. Turn the power on. The examination which is assigned to the top of the menu item in the Menu screen appears.

2. Press the Menu to display the Menu screen.

3. Press the Print Summary Log key. The following window appears.



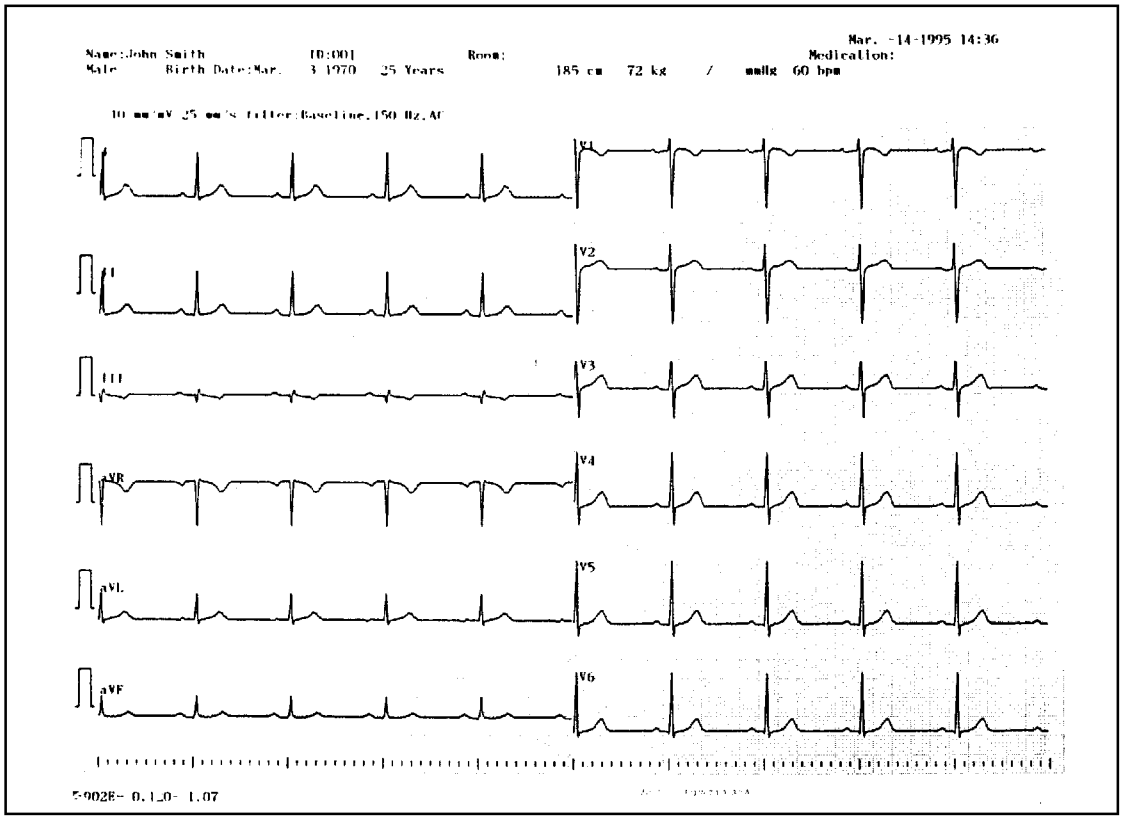
To record the saved summary data, press the Print key.

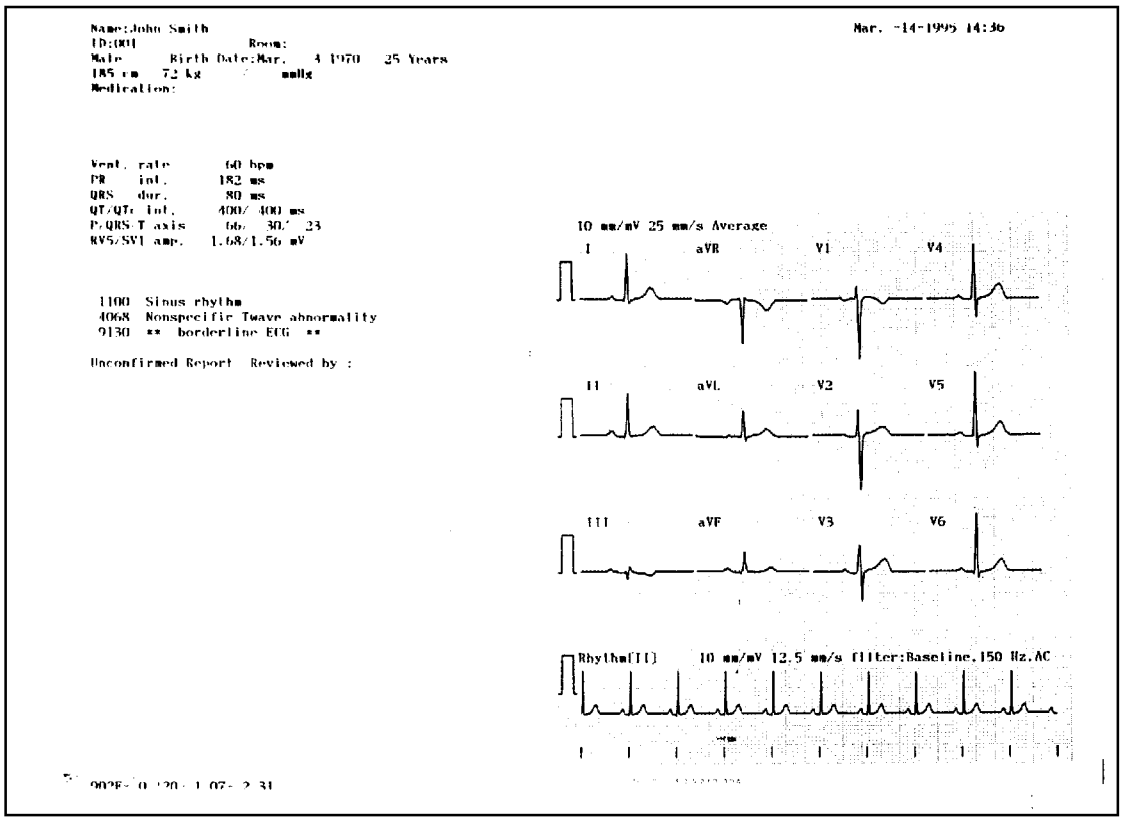
To delete the saved summary data, press the Delete key.

To cancel recording or close the window, press the Cancel key.

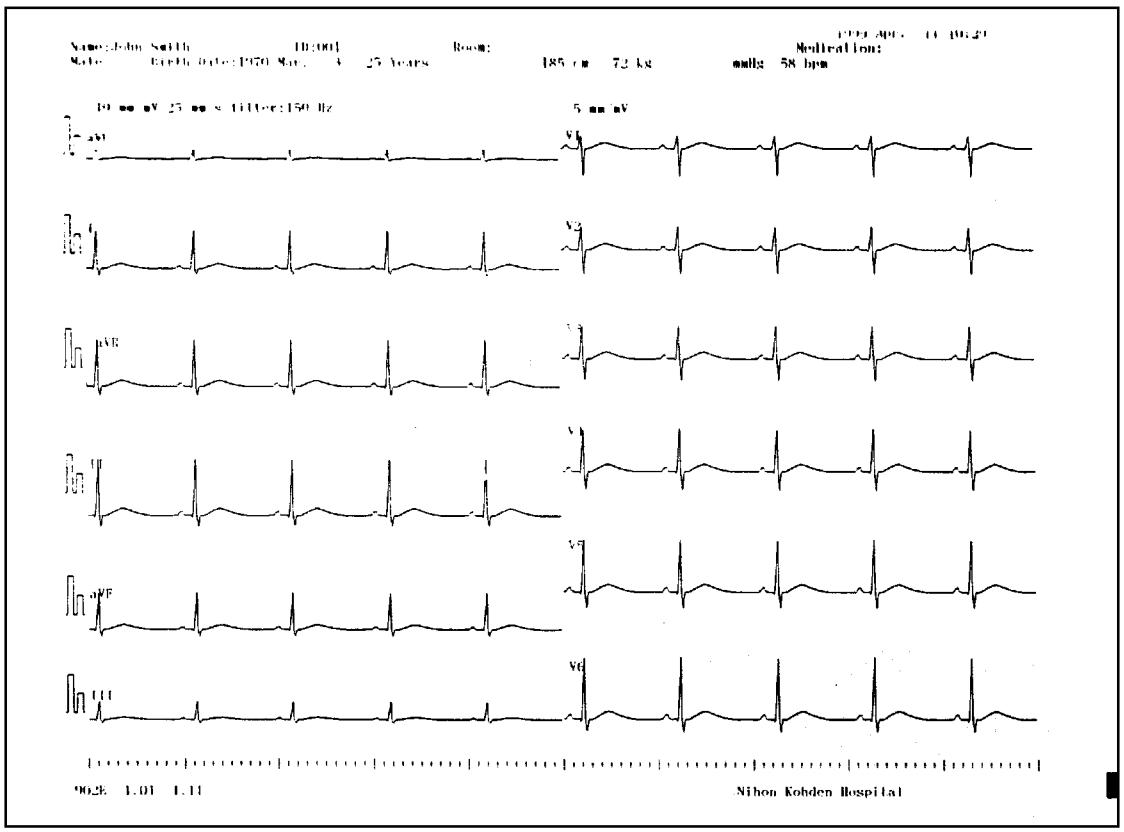
6-5 Recording Examples

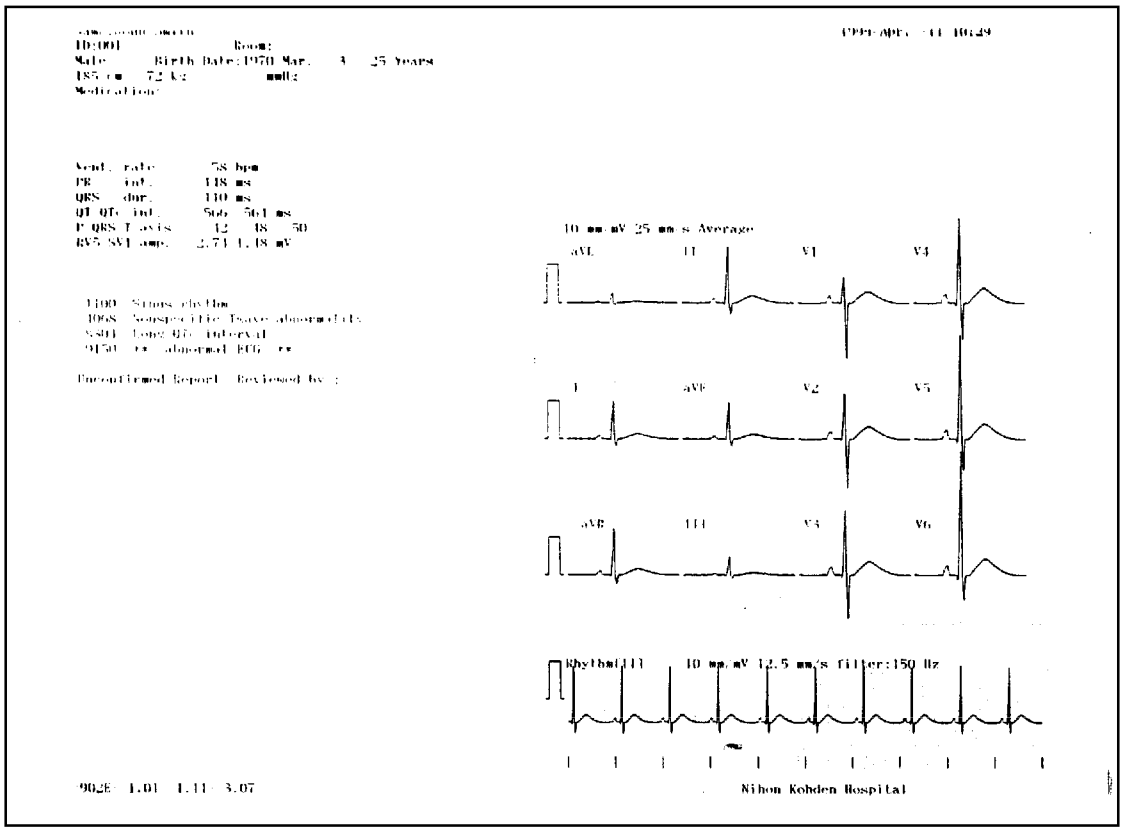
Standard 12-lead ECG 6 CH, Result + Average + Rhythm (at 25 mm/s)



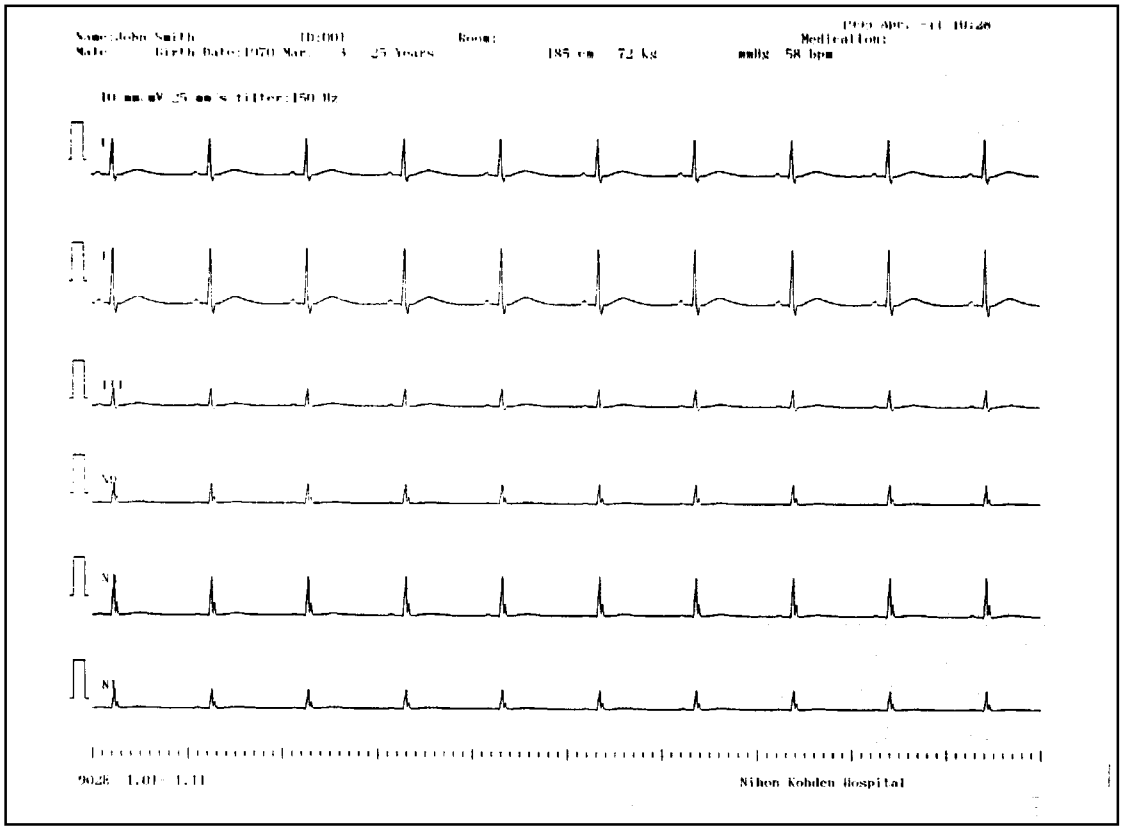


Cabrera lead ECG **6 CH, Result + Average + Rhythm (Full page) (at 25 mm/s)**

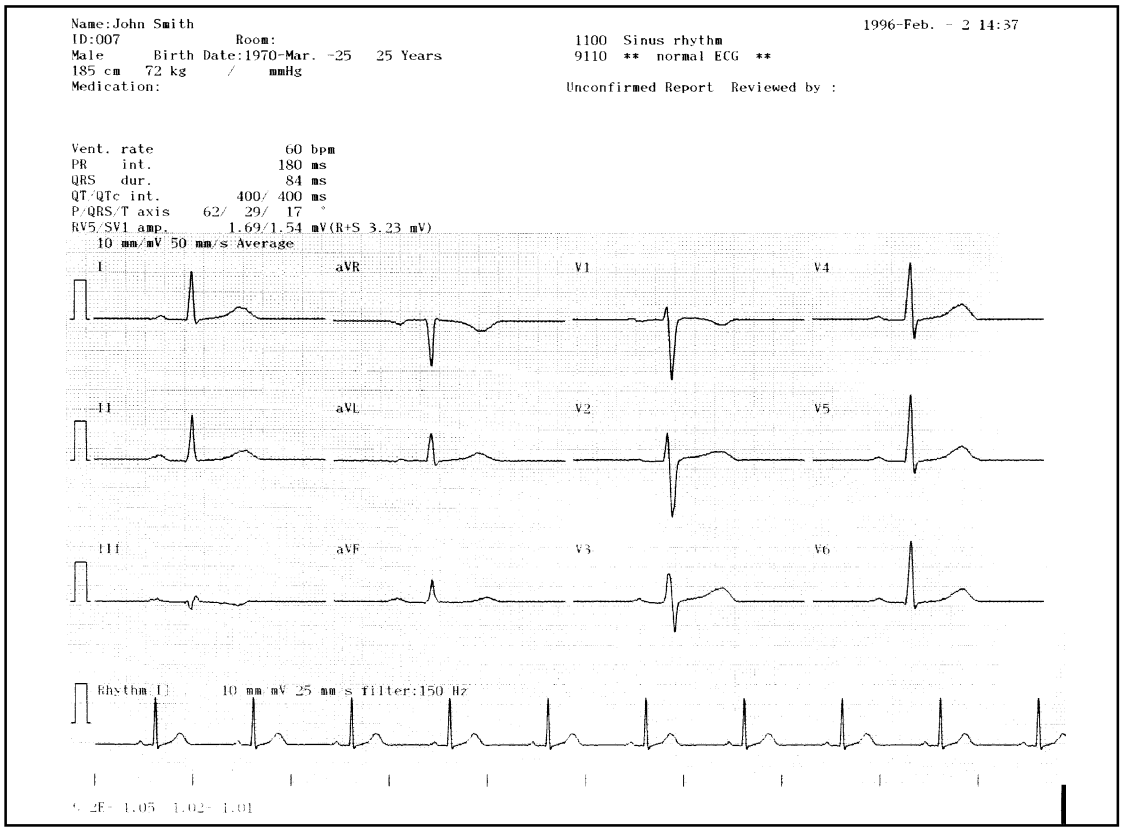




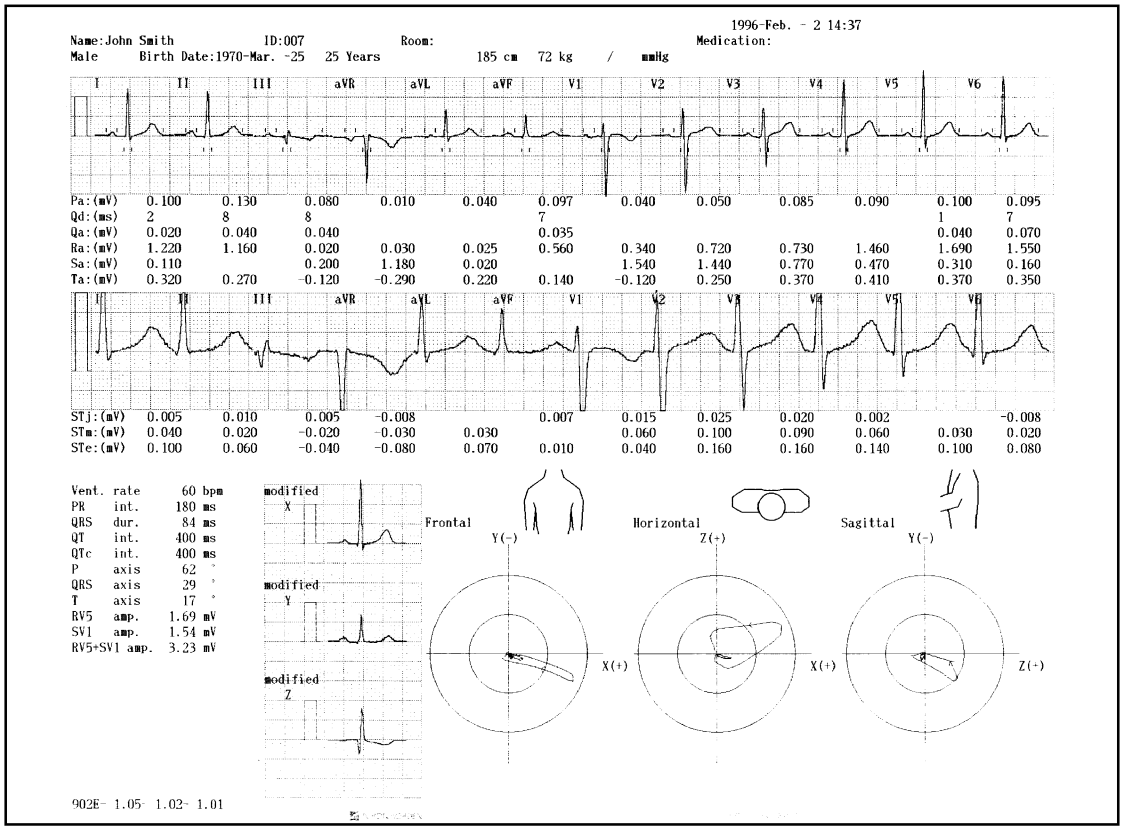
Nehb Lead ECG 6 CH



Standard 12-lead ECG Result + Average + Rhythm (Full page) at 50 mm/s



Standard 12-lead ECG Average + Measurement Table + M.XYZ



SECTION 7

RECORDING THE EXTERNAL SIGNAL

7-1 General 7.1
7-2 Recording Procedure 7.3
7-2-1 Freeze Recording 7.3
7-2-2 Manual Recording 7.4

7-1 General

Here you can record up to two input signals data from an external device. You can either record after confirming a screen display by freezing or you can record manually. You cannot file or transfer input signal from an external device.

◆Input Socket

The following sockets are used to input an external signal.

CAUTION

Do not use more than two sockets simultaneously.

- External signal input socket on the front panel
- External input/output socket on the rear panel
- Extension I/O socket on the EXTENSION I/O BD

Channel 1: EXT-IN 1
Channel 2: EXT-IN 2
Channel 3: ECG lead set in the System Setup

◆Initial Settings

For External Signal Recording in Setup Menu, the following options are preset before shipment from the factory. You can change any settings in the System Setup screen.

Manual Recording	Auto Position	ON
	Automatic Calibration	OFF
Lead Selection	ECG Lead	II
Slow Recording/Hi Cut Filter	Slow Paper Speed	5 mm/s
	High Cut Filter	35 Hz, 150 Hz
Power Up	Baseline Drift Suppression	ON
	Paper Speed	50 mm/s
	Age Unit	Years
Requesting Phys. Registration		-

◆Recording Type

There are two ways of recording external signals: freeze waveform and manual record:

Freeze waveform recording: Waveforms for one screen (for 10 seconds) are recorded after they have been frozen on the screen for waveform check.

Manual recording: You can start and stop recording manually.

	Freeze recording	Manual recording
No. of recording channels	3	3
Copy recording	Yes	No
Event mark	No	No
File save	No	No
File transfer	No	No

7-2 Recording Procedure

7-2-1 Freeze Recording

1. Turn the power on. The examination which is assigned to the top menu item in the Menu screen appears. If the required examination is displayed, go to step 4.

2. Press the Menu key to call up the Menu screen.

3. Press the key beside the examination that you want to select.

4. Enter the patient information. Refer to Section 4.

5. Check the input waveform displayed on the screen.

6. Press the Freeze key.

7. Change the Sens (Sensitivity selection key), High-cut filter selection key, and Speed (Paper speed key) settings , if necessary.

NOTE

- **During recording these keys disappear and you cannot change the settings.**
- **The sensitivity and high-cut filter selections are only available for the ECG waveforms input from the ECG Input box.**

8. Press the Start/Stop switch.
   If a frozen screen is acceptable, start recording by pressing the Start/Stop switch on the operation panel. The waveforms on the screen are recorded then the recording stops.

9. Defreezing waveform
   Press the Freeze key again to release the frozen waveforms.

◆Copying Recording

While waveforms are frozen, the same waveforms can be recorded repeatedly by pressing the Start/Stop switch repeatedly.

7-2-2 Manual Recording

1. Turn the power on. The examination which is assigned to the top menu item in the Menu screen appears. If the required examination is displayed, go to step 4.

2. Press the Menu key to call up the Menu screen.

3. Press the key beside the examination that you want to select.

4. Enter the patient information. Refer to Section 4.

5. Check the input waveform displayed on the screen.

6. Change the Sens (Sensitivity selection key), High-cut filter selection key, and Speed (Paper speed key) settings, if necessary.

NOTE

The sensitivity and high-cut filter selections are only available for the ECG waveforms input from the ECG Input box.

7. Press the Start/Stop switch on the operation panel to start recording.

8. Press the Start/Stop switch to stop recording.

SECTION 8

MANAGING SAVED FILES

8-1 General 8.1
8-2 Calling Up the Data Management Screen 8.4
8-3 Searching for Files 8.5
8-4 Selecting Files 8.7
8-5 Serial Comparison Recording (Recording the Files Chronologically) 8.7
8-6 Recording Files 8.8
8-6-1 Recording Files 8.8
8-6-2 Recording Files with Changing the Recording Format 8.8
8-7 Transferring Files 8.11
8-8 Editing Files 8.12
8-8-1 Retrieving Files and Selecting Operations 8.12
8-8-2 Editing Patient Information 8.14
8-8-3 Analyzing Retrieved ECG Waveforms 8.15
8-8-4 Recording the Retrieved Files 8.15
8-8-5 Closing the File Edit Window 8.16
8-9 Deleting Files 8.17
8-10 Copying Files 8.19
8-11 Formatting an IC Memory Card and Floppy Disk 8.21
8-11-1 Formatting the IC Memory Card 8.21
8-11-2 Formatting the Floppy Disk 8.23

8-1 General

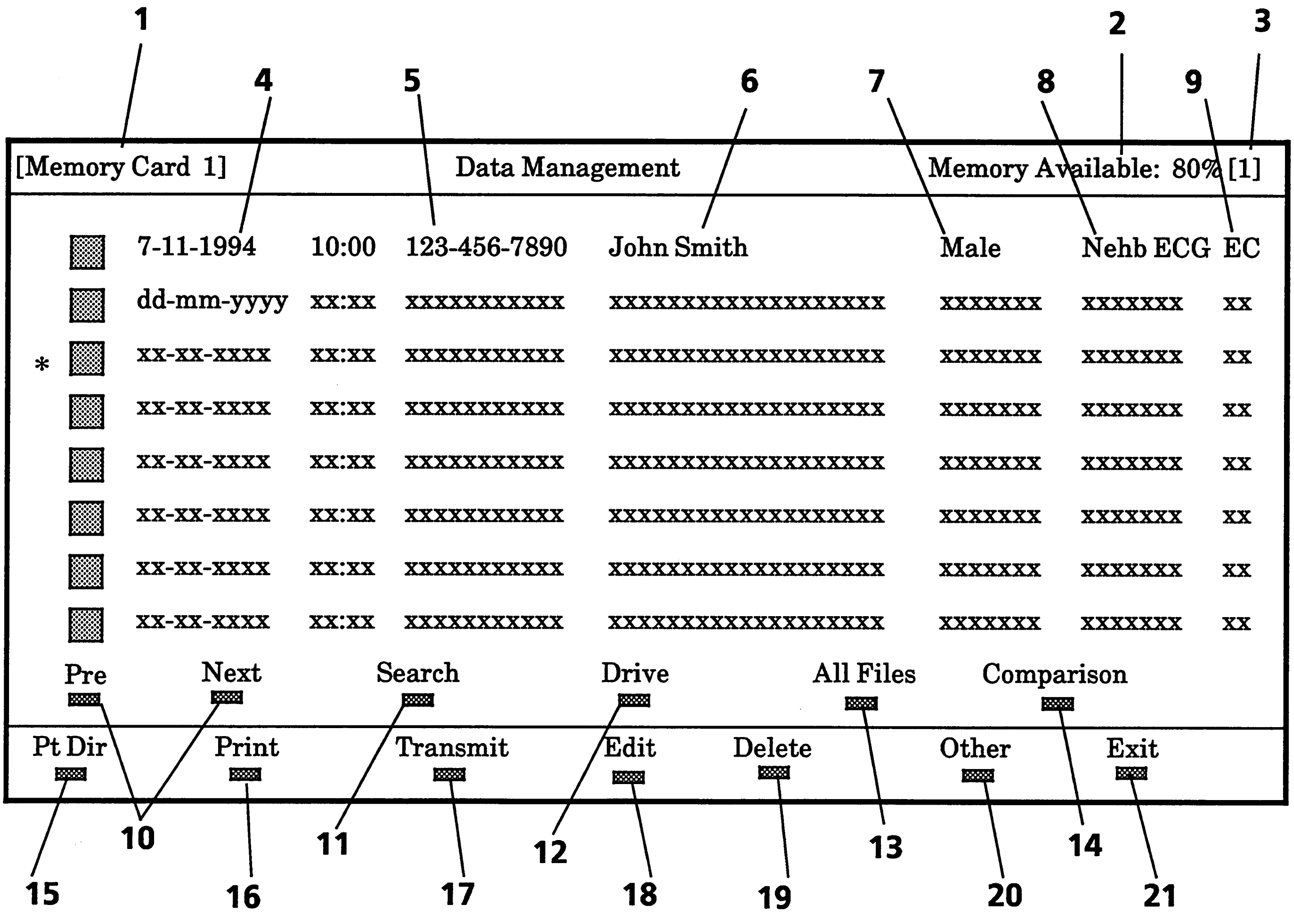
Using the Data Management screen, you can search, record, transfer, edit, delete and copy the saved files of an IC memory card or floppy disk (to use a floppy disk, the optional floppy disk drive is required) and you can transfer the saved file to another cardiograph or personal computer. You can also change the patient information and analyze the ECG waveforms saved in the file.

The file information (examination date, ID number, name, sex, examination name and attribution) of up to 8 latest ECG files in the selected drive are displayed chronologically with the last recording at the top.

CAUTION

- **Format the IC memory card only on the ECG-9320 electrocardiograph, otherwise the IC memory card cannot be used with ECG-9320. For formatting the IC memory card, refer to Section 8-11-1.**
- **Set the write protect switch to "WP" (on) when you read the data from the IC memory card on any other equipment which is not specified by Nihon Kohden. If write protect is off and any data is written to the IC memory card by any other equipment, the IC memory card may become unusable with the ECG-9320.**

◆Screen Explanation



* indicates that the file is selected

1 Drive name
Displays the selected drive (storage media) name. The default drive (floppy disk, IC memory card 1, IC memory card 2, or IC memory card 3) can be preset in the System Setup. Refer to Section 3. To change the drive, press the Drive key (12).

2 Memory Available
Displays the remaining capacity of the selected storage media.

3 Page number
Displays the currently selected page number.

4 Examination date

5 ID number

6 Patient name

7 Sex

8 Examination type

9 File status (attribution)
E: This file has been edited.
C: This file has been copied and/or transferred to other IC memory card/floppy disk or cardiofax/personal computer.

10 Pre / Next (Scroll keys)
Scrolls one page of the screen forward or backward.

11 Search (Search key)
Use to search the file.

12 Drive (Drive select key)
Use to select the drive (Floppy disk, IC memory card 1, IC memory card 2, IC memory card 3).

13 All Files (All files select key)
Selects all files in the currently selected drive.

14 Comparison (Serial comparison key)
Records the selected files chronologically by examination date. Refer to Section 8-5.

15 Pt Dir (Print directory key)
Records information of all the files in the selected drive.

16 Print (Print key)
Records the selected file. During recording, the window appears, displaying the file information of the currently recorded file. The file number is also displayed to the right of the box. To cancel recording, press the Cancel key in the window.

17 Transmit (Transmit key)
Use to transfer the selected file(s) to another cardiofax or personal computer.

18 Edit (Edit key)
Use to edit the selected file(s).

19 Delete (Delete key)
Use to delete the selected file(s).

20 Other (Other key)
Use to copy a file, format an IC memory card and floppy disk, or print the received file. For formatting, refer to Section 8-11 Formatting an IC Memory Card and Floppy Disk. For copying a file, refer to Section 8-8 Copying Files.

21 Exit (Exit key)
Closes the Data Management screen and calls up the basic screen.

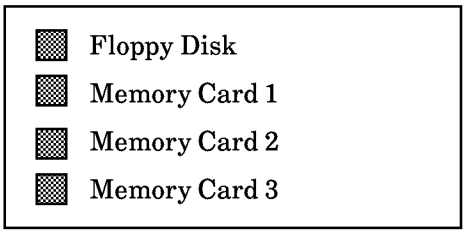
8-2 Calling Up the Data Management Screen

1. Turn the power on. The examination screen which is assigned to the top menu item in the Menu screen appears.

2. Press the Menu key to call up the Menu screen.

3. Press the Data Management key on the Menu screen. The message "Loading File(s)" appears, then the Data Management screen appears.

   If the floppy disk drive or IC memory card is not inserted into the specified drive, the message "Select File(s)" appears. To select the currently inserted IC memory card or floppy disk, press the Drive key. The Drive selection window appears.



* "Floppy Disk" only appears when the optional floppy disk drive is installed.

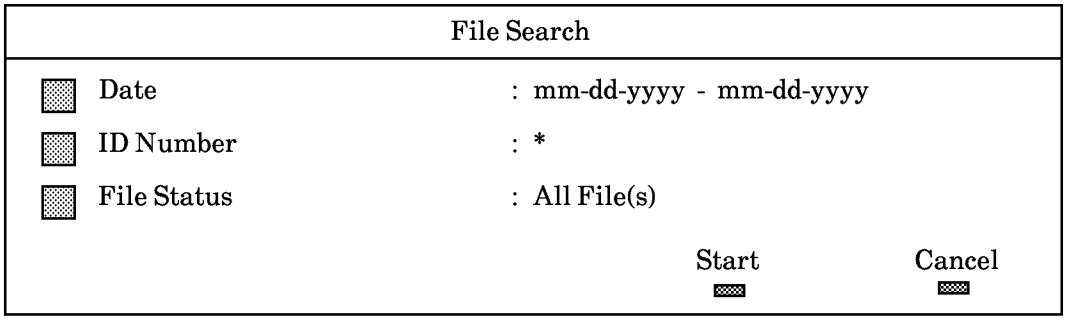
8-3 Searching for Files

◆General

You can search for one or more files saved in a floppy disk or IC memory card by specifying the examination date, ID number, and/or file status (attribution). When searching is complete, the file information (examination date, ID number, name, sex, examination type, and attribution) appears on the Data Management screen.

◆Procedure

1. From the Data Management screen, press the Search key. The File Search window appears.



The default settings of the key word are shown in the above figure.

2. Press the key for appropriate criterion.

2-a) To search for files by the examination date

1) Press the Date key. The numeric key display table appears.
2) Enter the first date, and the last date with the numeric key display table. The default setting of the first and last examination date is today.
3) Press the Enter key.

To search for all files on and before the specified date

1) Press the |< key, then press the Enter key. Repeat this step for three times to delete the first examination date.
2) Enter the desired date with the numeric key display table for the last examination date.
3) Press the Entry key.

2-b) To search for files by the ID number

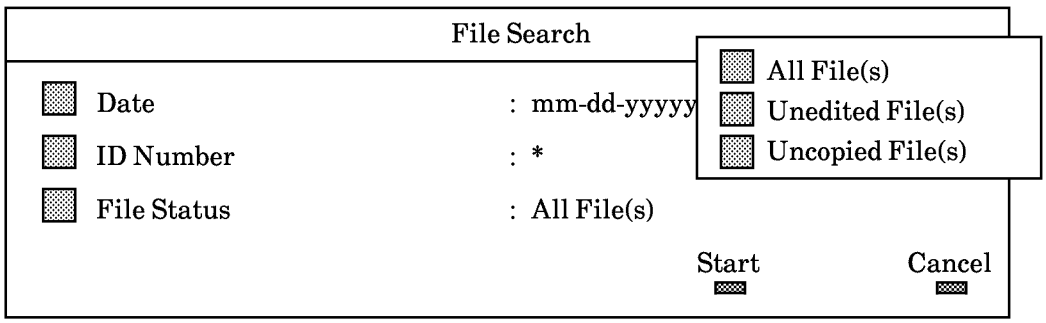
NOTE

When no ID number is specified, all files that do not have ID number will be searched for.

1) Press the ID Number key. The keyboard display appears.
2) Enter the ID number with the keyboard display. You can use the asterisk mark as wild cards to search for the similar ID numbers. For example, to search for all files that begin with 123, enter 123* with the keyboard display.
3) Press the Enter key.

2-c) To search for files by the file status (attribute)

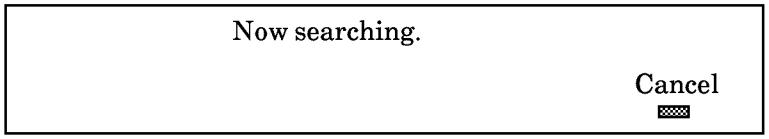
1) Press the File Status (attribution) key. The File status window appears.



All File(s): searches for all files.
Unedited file(s): searches for all the files that have not been edited.
Uncopied file(s): searches for all the files that have not been copied or transferred.

2) Press the key beside the item that you want to select.

3. Press the Start key to start searching. During searching, the message window appears.



To cancel searching, press the Cancel key in the window.

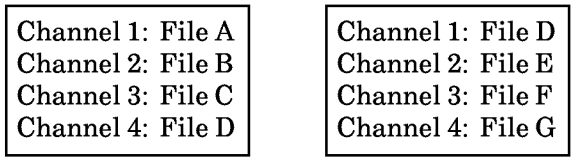
When searching is complete, the file information is displayed on the screen.

8-4 Selecting Files

From the Data Management screen, press the key beside the file information that you want. The asterisk mark (*) appears beside the key of the selected files. To easily find the file, refer to Section 8-3 Searching for Files. To cancel the selection, press the key again.

8-5 Serial Comparison Recording (Recording the Files Chronologically)

You can chronologically record the files having the same ID number. Four files are sequentially recorded on one page for 4 channels. When you select five or more files, the last file on a page is repeated at the top of the next page as shown below.



Page 1 Page 2

1. From the Data Management screen, press the key beside the file information to select the file. To easily find the file, refer to Section 8-3 Searching for Files.

2. Press the Comparison key to start recording. During recording, the window appears, displaying the file information of the currently recorded file. To cancel recording, press the Cancel key in the window. The Data Management screen appears.

8-6 Recording Files

You can record selected files with or without changing the recording format (Copy).

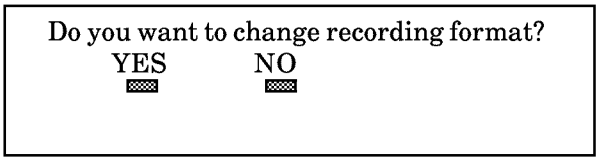
8-6-1 Recording Files

NOTE

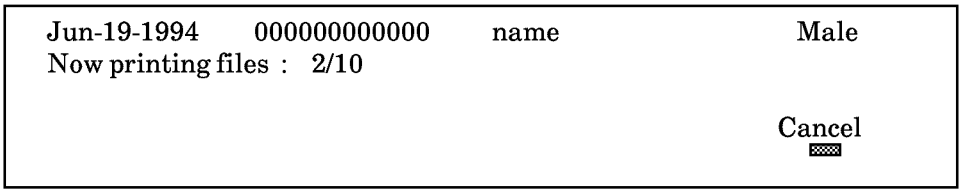
You can preset the number of copies in the System Setup. Refer to Section 3-5-7.

1. From the Data Management screen, press the key beside the file information to select the file. To easily find the file, refer to Section 8-3 Searching for Files.

2. Press the Print key on the screen. The confirmation window appears.



3. Press the NO key. The selected files are recorded in the saved format and chronologically by the examination date. During recording, the window appears, displaying the file information of the currently recorded file.



The file number is also displayed to the right of the window.

To cancel recording, press the Cancel key in the window.

8-6-2 Recording Files with Changing the Recording Format

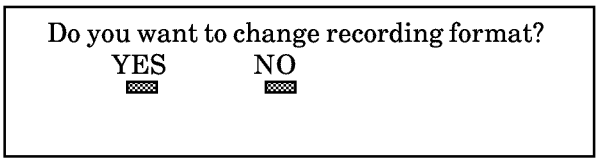
The setting of the following items can be changed:

- Waveform Recording Format
- Analysis Result Format (When the ECG Interpretation or ECG Measurement software is installed)
- Interpretation Findings (When the ECG Interpretation software is installed)
- Measurement Table (When the ECG Interpretation or ECG Measurement software is installed)
- Additional 3-lead Rhythm (Standard 12 lead ECG recording or Cabrera lead ECG recording)
- High Cut Filter
- Auto Gain

- Sensitivity
- Paper Speed

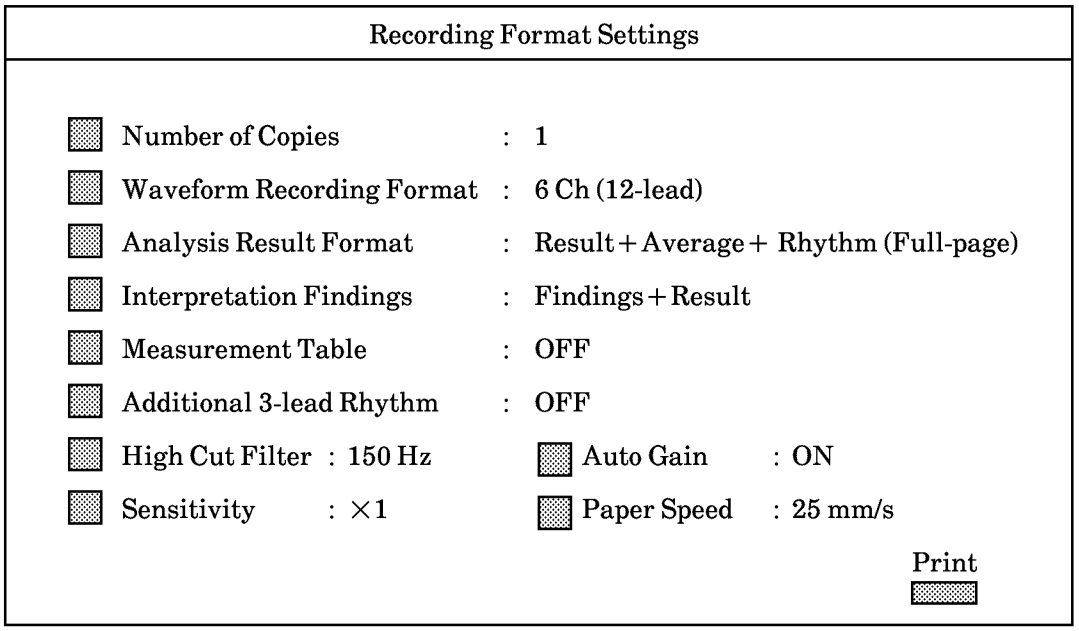
1. From the Data Management screen, press the key beside the file information to select the file. To easily find the file, refer to Section 8-3 Searching for Files.

2. Press the Print key on the screen. The confirmation window appears.

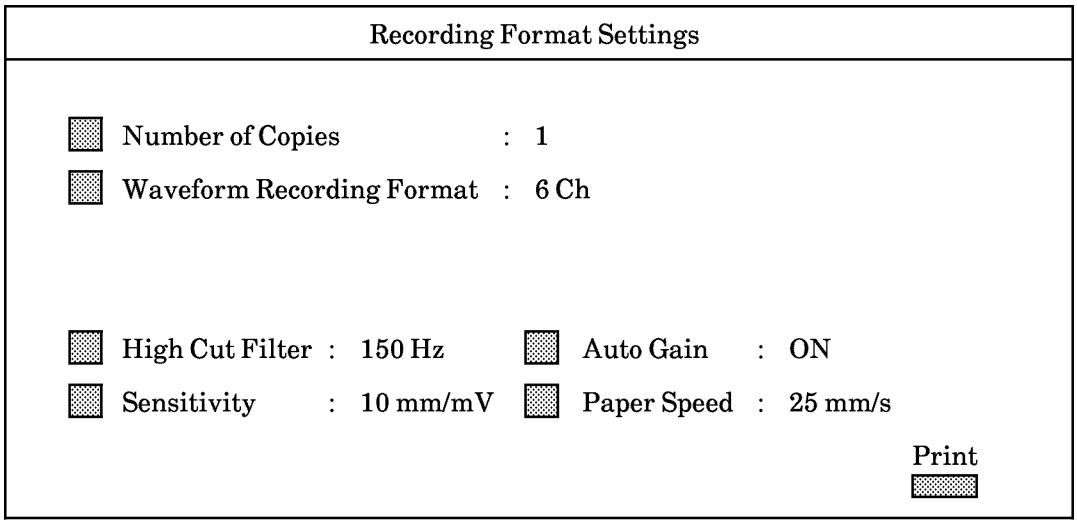


3. Press the YES key. The Recording Format Settings screen for the standard 12 lead ECG recording and the Cabrera lead ECG recording or Nehb lead ECG recording appears according to the examination type of the selected file.

Recording Format Settings screen for the standard 12 lead ECG recording and the Cabrera lead ECG recording



Recording Format Settings screen for Nehb lead ECG recording

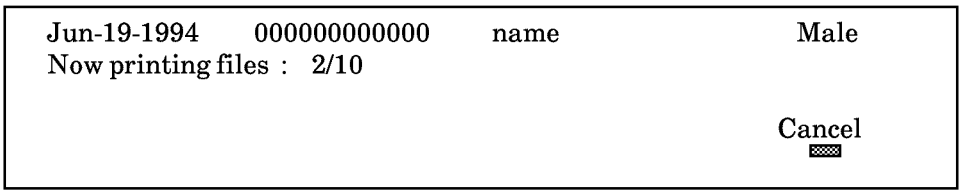


4. Press the key beside the item that you want to change the setting. The window of the selected item appears.

5. Press the key beside the setting that you want to select, then press the OK key. To cancel setting, press the Cancel key.

6. Repeat steps 4 to 5 for all items that you want to change the setting.

7. Press the Print key to start recording. During recording, the window appears, displaying the file information of the currently recorded file.



The file number is also displayed to the right side of the window.

To cancel recording, press the Cancel key in the window.

When you select more than two files:

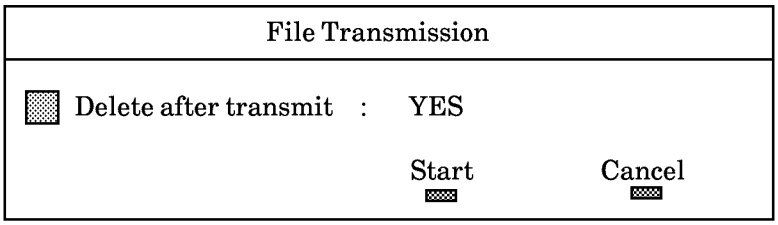
- If the first file and the following files are the same settings set in the System Setup and are listed consecutively, the changed settings for the first file affect the following files and the following files are sequentially recorded.
- If any following files are not same settings set in the System Setup, when the first file is recorded, the Recording Format Settings screen for the examination type appears to let you change the settings.

8-7 Transferring Files

You can manually transfer files to another cardiofax or personal computer.
Refer to Section 2-9 for automatic file transfer after measuring resting ECG waveforms.

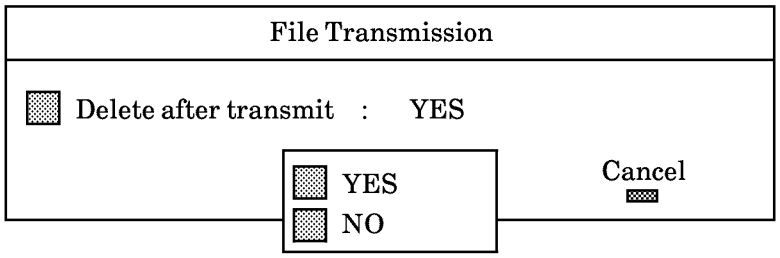
1. From the Data Management screen, select the file to be transferred. To easily find the file, refer to Section 8-3 Searching for Files.

2. Press the Transmit key. The File Transmission window appears.



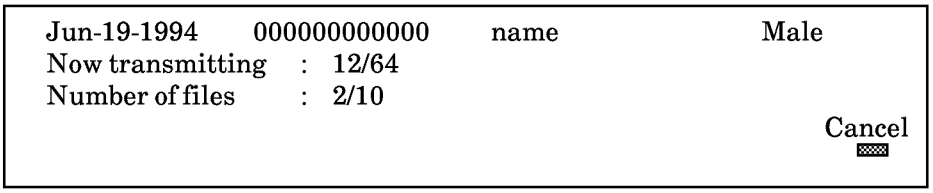
To delete the file after transferring:

1) Press the Delete after transmit key. The YES/NO confirmation box appears.



2) Press the YES key. To cancel deleting after transferring, press the NO key.

3. Press the Start key to start transferring. During transferring, the window appears, displaying the file information of the currently transferred file and the file number.



To cancel transferring, press the Cancel key.
When transferring is complete, the File Transmission window appears.

4. Press the End key. The File Transmission window disappears.

8-8 Editing Files

Using the File Edit window, you can edit the patient information of the selected file and record the changed result. When the QP-911E ECG interpretation software is installed, you can also analyze the saved ECG waveforms in the IC memory card or floppy disk.

NOTE

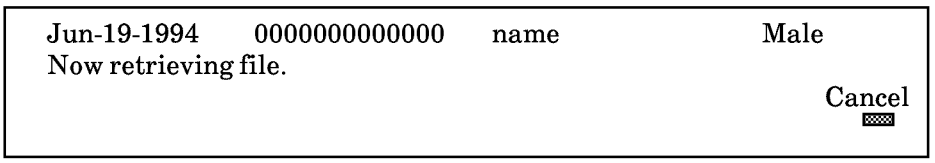
Before saving the changes, make sure that there are remaining free memory space in the IC memory card or floppy disk.

8-8-1 Retrieving Files and Selecting Operations

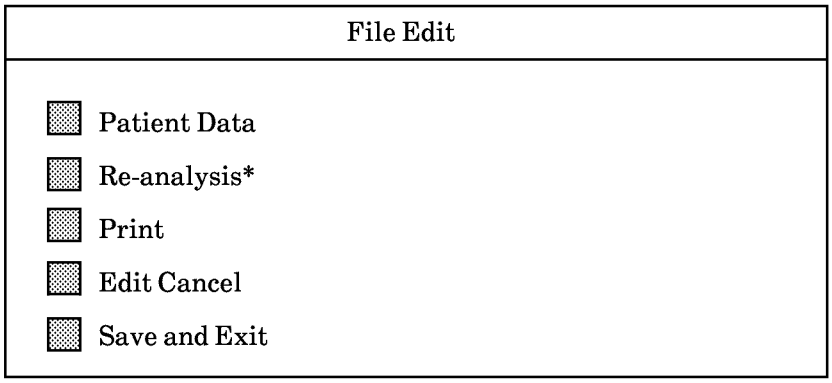
◆When One File is Selected

1. From the Data Management screen, select the file. To easily find the file, refer to Section 8-3 Searching for Files.

2. Press the Edit key to start retrieving the file. During retrieving, the window appears, displaying the file information of the currently retrieved file.



To cancel retrieving, press the Cancel key. When retrieving is complete, the File Edit window appears.



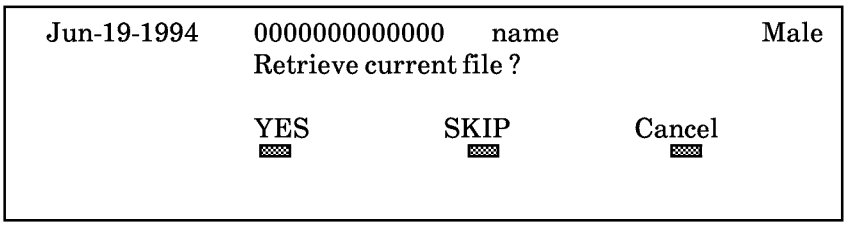
* Appears only when the QP-911E ECG Interpretation software is installed.

3. Press the key beside the item that you want to execute.

◆When More than Two Files are Selected

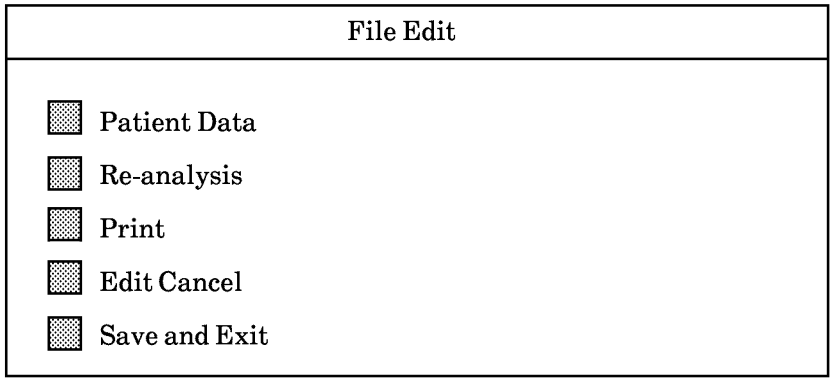
1. From the Data Management screen, select the files. To easily find the file, refer to Section 8-3 Searching for Files.

2. Press the Edit key to start retrieving the files. During retrieving, the window appears, displaying the file information of the currently retrieved file.



3. Do one of the followings.
   - To retrieve the current file, press the YES key.
   - To skip the current file, press the SKIP key.
   - To cancel retrieving all files, press the Cancel key.

   When retrieving is complete, the File Edit window appears.

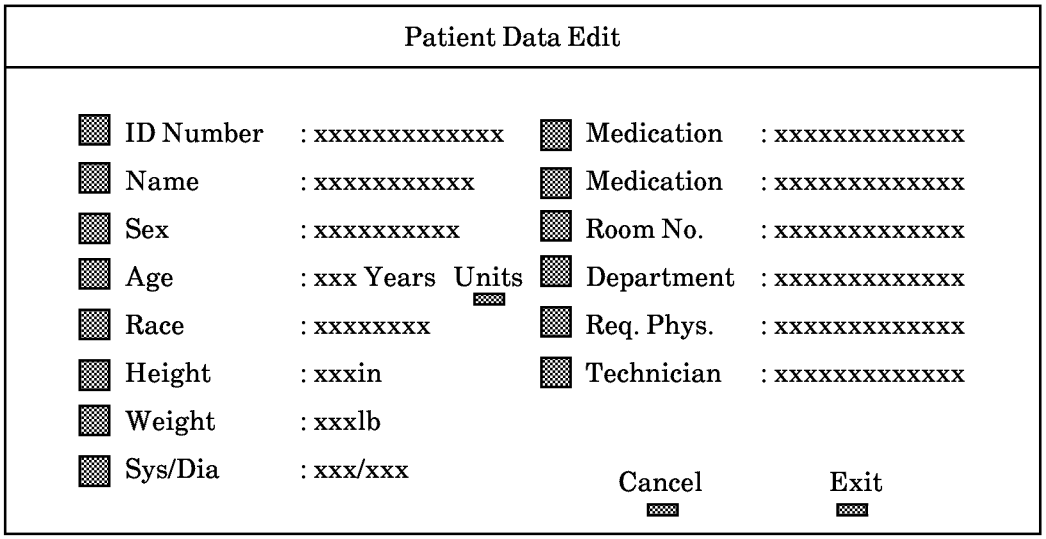


4. Press the key beside the item that you want to execute.

5. Repeat steps 3 and 4 for each selected file.

8-8-2 Editing Patient Information

When "Patient Data" is selected in the File Edit window, the Patient Data Edit screen appears.



You can change the patient information. To change the patient information, refer to Section 4 Entering the Patient Information.

NOTE

In this screen, even if "Data Auto Erase" is set to "ON" in the System Setup, the current patient data is not deleted when you change the ID number.

8-8-3 Analyzing Retrieved ECG Waveforms

When the QP-911E ECG Interpretation software is installed, you can analyze the ECG waveforms saved in an IC memory card or floppy disk.

◆To Analyze the ECG Waveforms

1. Retrieve the file. Refer to Section 8-8-1 Retrieving Files and Selecting the Operations.

2. Change the patient information. (Refer to Section 8-8-2 Editing Patient Information.)

3. Press the Re-analysis key in the File Edit window. The retrieved ECG waveforms are analyzed according to the changed patient information and the analysis result is recorded.

During analyzing, the message box appears.

To cancel analyzing, press the Cancel key in the window.

8-8-4 Recording the Retrieved Files

You can record the retrieved file by pressing the Print key in the File Edit window. When this key is pressed, the confirmation window appears on the screen.

Perform the procedure in Section 8-6 Recording Files.

During recording, the message box appears.

To cancel recording, press the Cancel key in the window.

8-8-5 Closing the File Edit Window

You can close the File Edit window with or without saving the changed patient information and re-newed analysis result in the file.

◆ To Close the Window without Saving the Changes

1. Press the Edit Cancel key in the File Edit window. The confirmation window appears.

2. Press the YES key not to save the changes. To cancel this operation, press the NO key.

   When only one file is selected, the File Edit window closes.

   When more than two files are selected, the File Edit window appears again. Repeat steps 1 and 2 for the remaining files.

◆ To Close the File Edit Window with Saving the Changes

NOTE

Before saving the changes, make sure that there are remaining free memory space in the IC memory card or floppy disk.

1. Press the Save and Exit key in the File Edit window. The confirmation window appears.

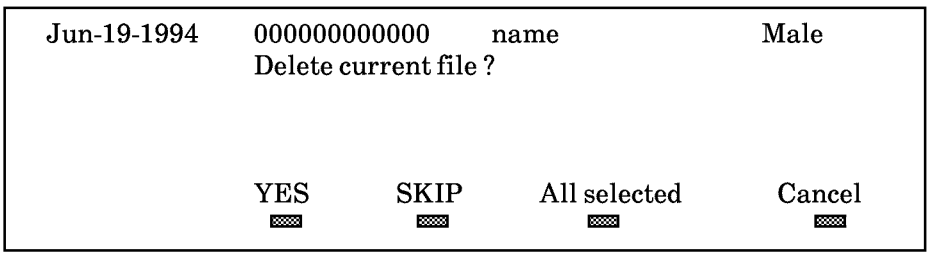
2. Press the YES key to save the changes in the file. The attribute of the file is changed to E. To cancel this operation, press the NO key in the confirmation window.
   When only one file is selected, the File Edit window closes.
   When more than two files are selected, the File Edit window appears again. Repeat steps 1 and 2 for the remaining files.
   When all the selected files are saved, the screen returns back to the Data Management screen.

8-9 Deleting Files

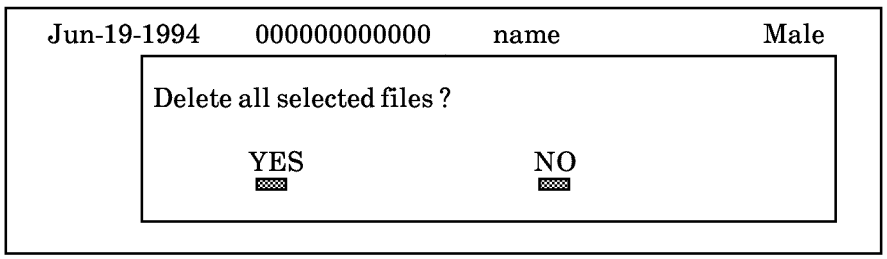
You can delete the files in an IC memory card or floppy disk.

1. From the Data Management screen, select the file(s) to be deleted. To easily find the file, refer to Section 8-3 Searching for Files.

2. Press the Delete key. The confirmation window appears, displaying the currently selected file information.



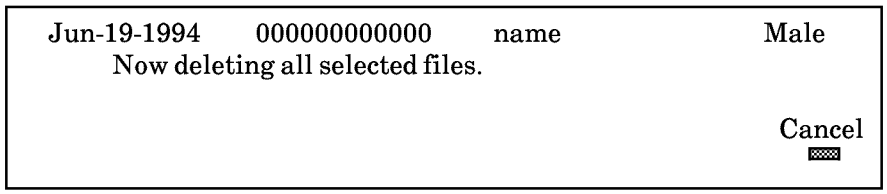
3. Do one of the following.
   - To delete the current file, press the YES key. The confirmation window appears again, displaying the information of the next file when more than two files are selected.
   - To skip and not delete the current file, press the SKIP key. The confirmation window appears again, displaying the next file information when more than two files are selected.
   - To cancel deleting, press the Cancel key in the window.
   - To delete all the selected files simultaneously, press the All selected key. The confirmation window appears to confirm deleting.



To execute deleting, press the YES key in the window.

Not to execute deleting, press the NO key.

During deleting, the message window appears, displaying the file information of the currently deleted file.



To cancel deleting, press the Cancel key in the window. When the Cancel key in the window is pressed during deleting, the current file is deleted, but the following files are not deleted.

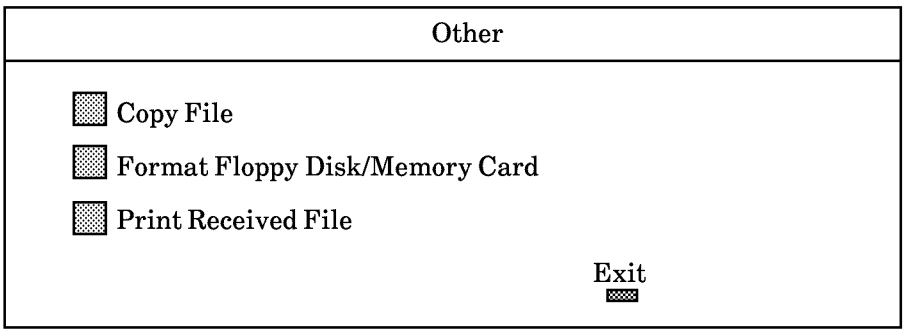
When deleting the selected file(s) is completed, the end confirmation window appears. Press the Exit key to return to the Data Management screen.

8-10 Copying Files

1. Insert the destination IC memory card into the IC memory card slot or insert the floppy disk into the floppy disk drive.

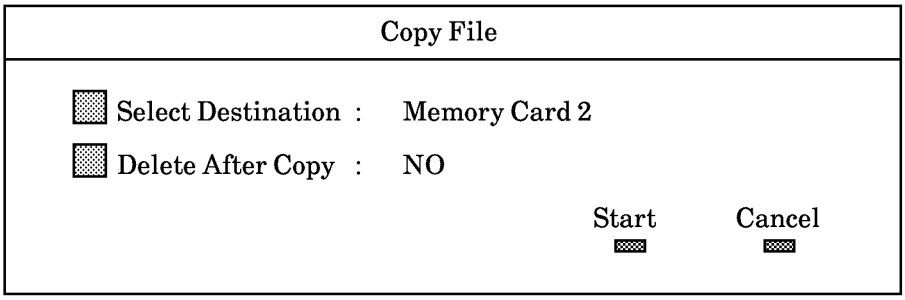
2. From the Data Management screen, select the file(s) to be copied. To easily find the file, refer to Section 8-3 Searching for Files.

3. Press the Other key on the screen. The Other window appears.

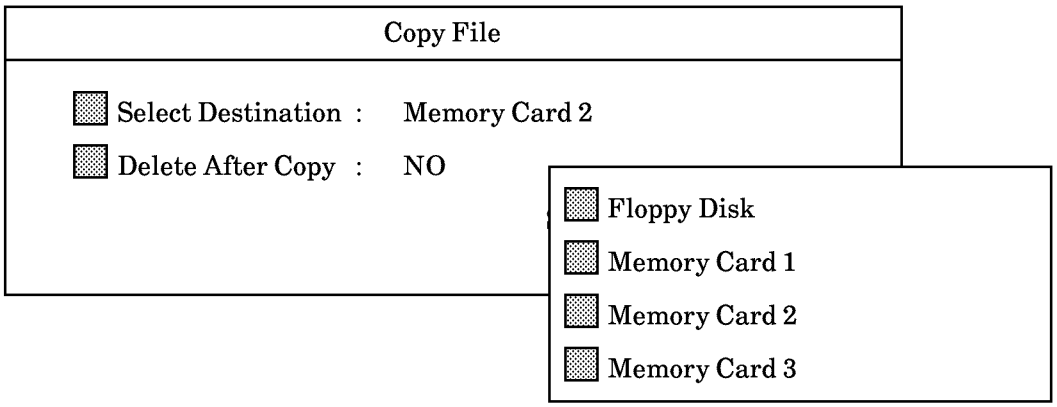


The Print Received File key only appears when there is a received file in the IC memory card. For this key function, refer to Section 2-10.

4. Press the Copy File key. The Copy File window appears.



5. Press the Select Destination key. The window appears, displaying the destination drive.

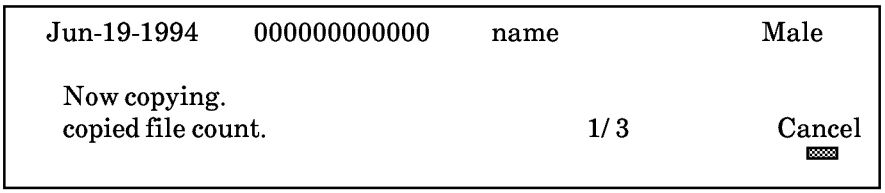


"Floppy Disk" appears only when the optional floppy disk drive is installed.

6. Press the drive key that you want to copy to.

7. Press the Delete After Copy key to decide whether or not to delete the source file after copying. The YES/NO window appears. To delete the source file, press the YES key. If not, press the NO key. When the NO key is pressed, the attribution of the file is changed to C.

8. Press the Start key to start copying. During copying, the message box appears.



When more than two files are selected, the number of the currently copied file is displayed to the right of the window.

To cancel copying, press the Cancel key in the message window.

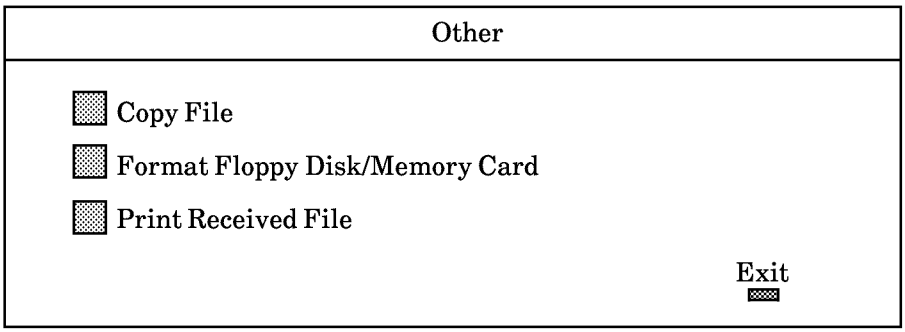
9. Press the End key to close the Copy File window.

8-11 Formatting an IC Memory Card and Floppy Disk

8-11-1 Formatting the IC Memory Card

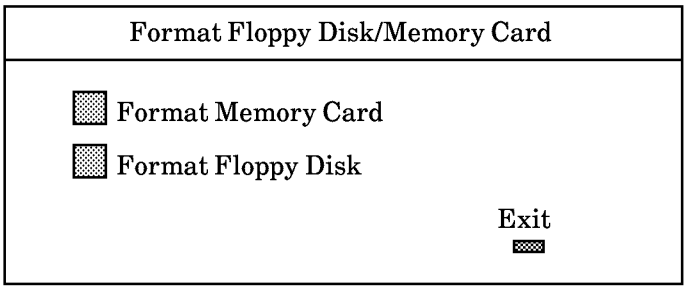
1. Insert the IC memory card into the IC memory card slot.

2. From the Data Management screen, press the Other key. The Other window appears.

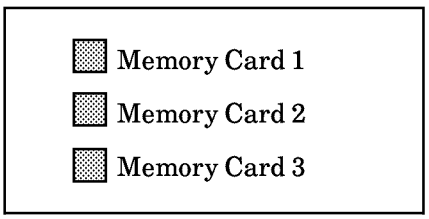


   To cancel formatting, press the Exit key.

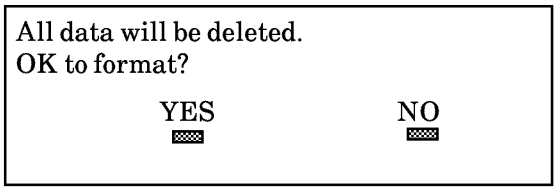
3. Press the Format Floppy Disk/Memory Card key. The Format Floppy Disk/Memory Card window appears.



4. Press the Format Memory Card key. The memory card selection window appears.

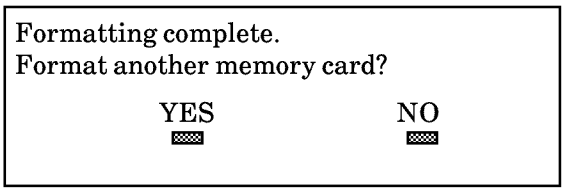


5. Select the card to be formatted. The confirmation window appears.



6. Press the YES key. To cancel formatting, press the NO key.

   When formatting is complete, the chime sounds and the window appears, prompting you to indicate whether you want to format another memory card.



   To format another card, replace the disk and press the YES key. If not, press the NO key. The Data Management screen appears.

8-11-2 Formatting the Floppy Disk

CAUTION

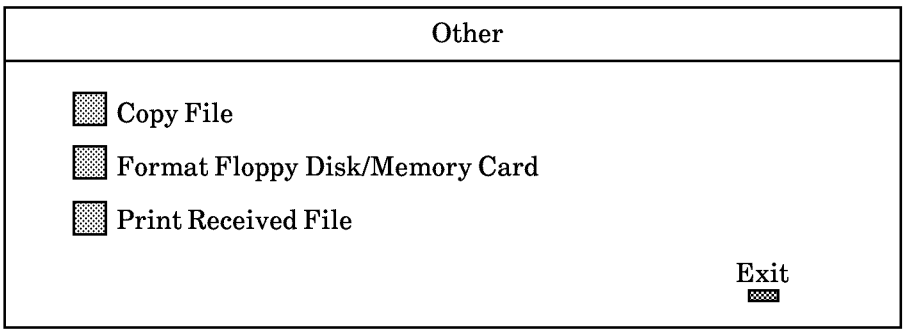
- **Do not touch the surface of the disk inside of the casing.**
  If the surface of the magnetic disk becomes contaminated with any foreign substances such as dust and fingerprints, reading and writing data is not available.
- **Use and store the floppy disk at the following temperatures and humidity**
  temperature: from 10 to 40° C
  humidity: from 25 to 80 %
  If the disk is exposed to direct sunlight or high temperature, the casing may deform.
- **Do not handle the floppy disk while smoking or eating.**
- **Remove the old label before attaching a new one.**
- **Do not let magnets or magnetic-field generating tools get close to the floppy disk. It may damage the saved data.**
- **Do not insert or remove the floppy disk when the green lamp on the floppy disk drive is lit.**

NOTE

This operation is only available when the optional floppy disk drive is installed.

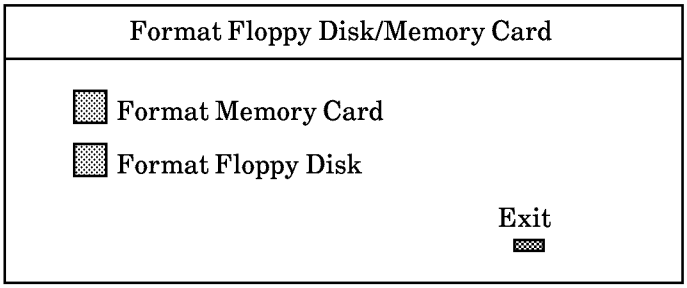
1. Insert the floppy disk into the floppy disk drive.

2. From the Data Management screen, press the Other key. The Other window appears.

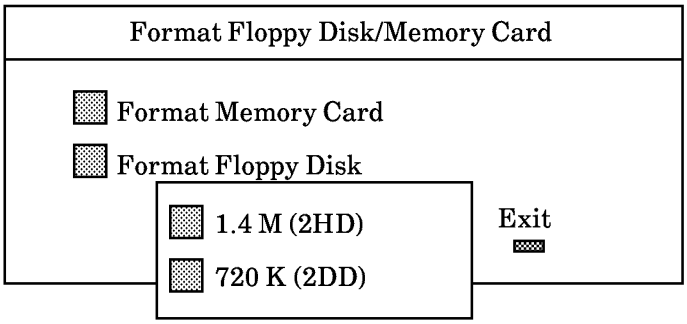


To cancel formatting, press the Exit key.

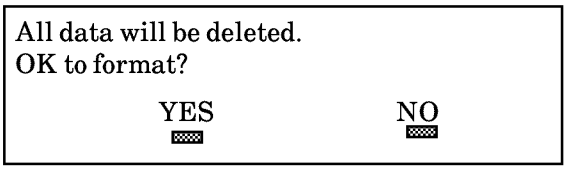
3. Press the Format Floppy Disk/Memory Card key. The Format Floppy Disk/Memory Card window appears.



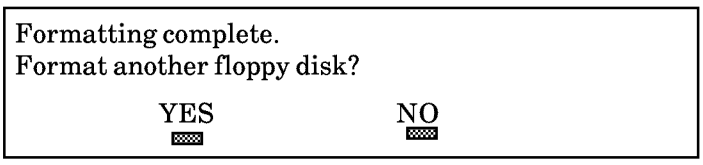
4. Press the Format Floppy Disk key. The capacity selection window appears.



5. Press the key beside the appropriate capacity of the disk. The confirmation window appears.



6. Press the YES key. To cancel formatting, press the NO key.
When formatting is complete, the chime sounds and the window appears, prompting you to indicate whether you want to format another floppy disk.



To format another floppy disk, replace the disk and press the YES key. If not, press the NO key. The Data Management screen appears.

SECTION 9

TROUBLESHOOTING AND ERROR MESSAGES

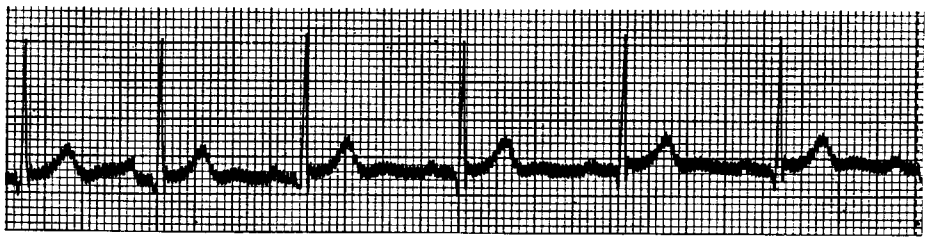
9-1 Recording Clear ECG Waveforms 9.1
9-1-1 AC Interference 9.1
9-1-2 Muscle Tremor Interference (EMG) 9.2
9-1-3 Wandering Baseline 9.2
9-1-4 Abnormal Printout 9.3
9-2 Troubleshooting 9.4
9-3 Error Message 9.6

9-1 Recording Clear ECG Waveforms

When artifact is superimposed on the ECG waveforms, you can remove the noise to get clear ECG recording and accurate ECG analysis results. This section explains causes of artifact.

9-1-1 AC Interference

Appears on the ECG as even-peaked, regular voltage superimposed throughout the ECG waveforms. It may appear in conjunction with muscle tremor.



Causes:

- Inadequate skin preparation with CardioCream
- Dirty or corroded lead wire tips or electrodes
- Loose connection to an electrode
- Patient or technician touching an electrode during recording
- Patient touching any metal parts of an examination bed or table
- Broken lead wire (electrode lead cartridge), ECG input box cable, or power cord
- Electrical devices in the immediate area, lighting, concealed wiring in walls and/or floors
- Improperly grounded electrical outlet
- Incorrect AC filter frequency setting or AC filter is turned off.

9-1-2 Muscle Tremor Interference (EMG)

Appears on the ECG as random, irregular voltage superimposed on the ECG waveforms. It may resemble or occur in conjunction with AC interference.

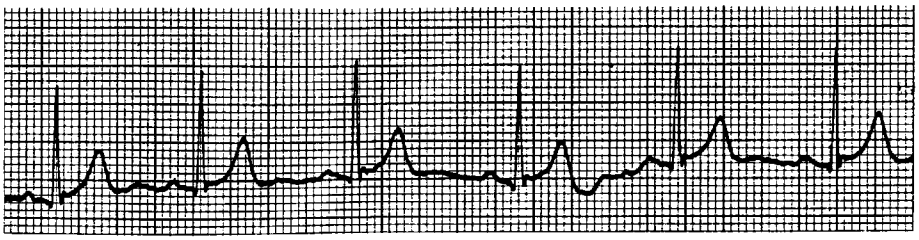
Causes:

- Patient is uncomfortable, tense, nervous or apprehensive.
- Patient is cold and shivering.
- Examination bed is too narrow or short to comfortably support the limbs.
- Limb electrode straps are too tight.

When EMG cannot be removed, use the lower high-cut filter.

9-1-3 Wandering Baseline

Appears on the ECG as an upward and downward fluctuation of the tracing.



Causes:

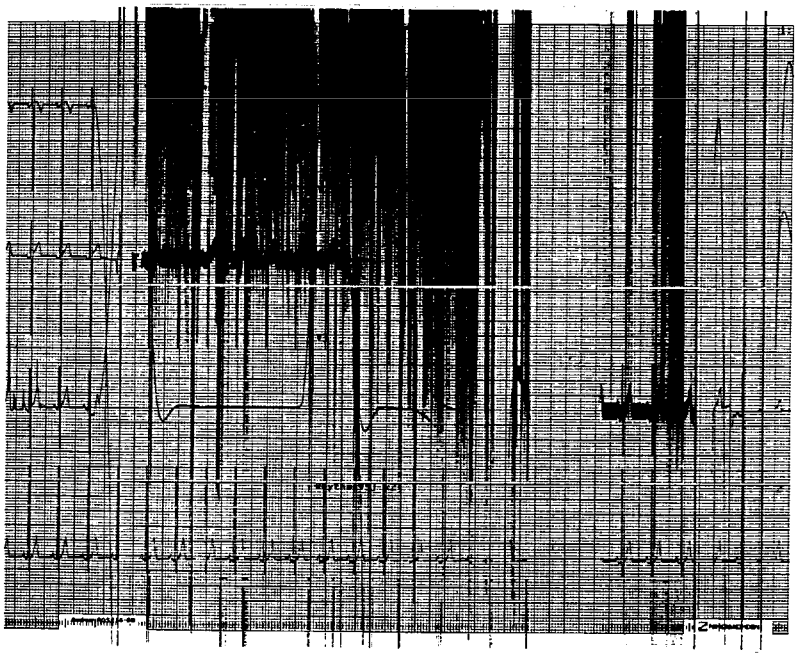
- Dirty or corroded electrodes
- Loose electrodes or electrodes position on bony area
- Insufficient or dried CardioCream
- Oily skin or body lotions and creams
- Rising and falling of chest during normal or apprehensive respiration

NOTE

Clean skin with alcohol or acetone, reposition the electrodes, and assist patient in relaxation, if necessary.

When wandering baseline cannot be removed, use the Baseline drift suppression filter. Refer to Section 3-5-11.

9-1-4 Abnormal Printout



During ECG recording, loose or poor electrode contact causes waveform saturation, excessive AC interference, etc. In this case, the cardiograph stops printout to protect the thermal head.

Check the electrode attachment.

9-2 Troubleshooting

Trouble	Action
When the Power switch is pressed the cardiograph is not operative. (AC power operation)	1. Check that the Main power switch on the rear panel is turned on. 2. Check that the power cord is firmly connected to the AC outlet and the cardiograph. 3. Check for a blown fuse. The fuse should be replaced by a qualified technical person.
When the Power switch is pressed the cardiograph is not operative. (Battery power operation)	Check the battery. If it is almost discharged, charge the battery soon or operate the cardiograph on AC power.
Nothing can be recorded.	1. If the "  " mark blinks, load new paper. 2. Check that the magazine is closed firmly. If not, push it in firmly. 3. Check that the Start/Stop lamp lights. If not, press the Start/Stop switch again. When the key is activated, the Start/Stop lamp lights and "Click " sounds.
No ECG waveform can be recorded even when the electrodes are placed correctly.	1. Check the conductivity of the ECG electrode lead cartridge with a multimeter. Replace it with a new one if it is faulty. 2. Check if the electrodes are dirty or corroded. Replace them with new ones if dirty or corroded. When replacing electrodes, replace all electrodes with new ones at the same time. If not, large offset voltage may occur. 3. When mismatched electrodes are used together, i.e. new and old electrodes, or reusable and disposable electrodes, it can cause high polarization voltage and baseline wandering. Do not use them together. 4. Check that the ECG input box cable is connected to the patient cable input socket of the selected patient. If not, connect it to the correct input socket. 5. Check that the correct patient is selected. If not, select the patient with the Patient A/B selection key.
Analysis result recording or Measurement table recording cannot be performed, even when the optional QP-911E or QP-910E is installed.	1. When the recording time is less than 10 seconds, record the ECG waveform again for more than 10 seconds. 2. Set the "analysis Result Format" to ON in the "Auto Recording " of the System Setup. 3. Check that the QRS wave is correctly detected. If not, ECG analysis cannot be performed. Refer to Section 6-1-2 Note for Accurate Measurement.
The screen is not bright and the waveform cannot be read.	1. Check the LCD Brightness and LCD Contrast controls. 2. Touch anywhere on the screen or press any one of the switches on the operation panel.

Trouble	Action
The time and date is not correct.	Replace the backup battery. The replacement should be done only by qualified technical person.
Recording result is thin.	1. Remove the recording paper and load it again. 2. Clean the thermal head with the thermal head cleaner.
Paper wanders as it feeds.	1. Remove the recording paper and load it again. 2. Clean the thermal head with the thermal head cleaner.
The examination is not registered.	1. When you are registering or changing an examination in the System Setup window, if the Menu or Exit key is pressed or the power is turned off, the settings are lost. Register or change the examination again. 2. The backup battery is almost discharged. Contact your service staff or distributor to replace it with a new one.

9-3 Error Message

Message	Possible cause	Action
Battery low.	The internal rechargeable battery is discharged.	Recharge the battery (Refer to Section 2-3), or operate the cardiograph on AC power.
Battery/circuit malfunction.	The internal rechargeable battery voltage exceeds specified voltage.	Turn off the cardiograph and contact your distributor. Do not use the cardiograph until the distributor checks it.
Cannot access file.	1. No IC memory card or floppy disk in the drive, or it has been inserted incorrectly. 2. The file has been saved by another program.	1-a) Insert the IC memory card or floppy disk correctly, and try the function again. 1-b) Insert the correct program card, and try the function again. 2. Load the correct program.
Cannot access source file.	You are attempting to copy the file to the source drive.	Select the correct destination drive.
Cannot change recording format.	The recording format change is not available in this program.	-
Cannot copy.	1. The IC memory card or floppy disk is write-protected. 2. The destination or source IC memory card or floppy disk is faulty.	1. Release the write-protect lock, and try again.
Cannot delete received file(s).	The IC memory card is write-protected.	Release the write-protect lock, and try again.
Cannot delete selected file.	The IC memory card or floppy disk is write-protected.	Release the write-protect lock, and try again.
Cannot delete selected menu.	The examination assigned to the top of the menu item cannot be deleted.	-
Cannot loading system settings.	There is no saved system settings in the selected memory card or floppy disk.	Insert the memory card or floppy disk which contains the system settings.
Cannot perform analysis.	Excessive artifact is superimposed on the ECG waveforms.	Remove the cause of artifact, then record the ECG waveform again.
Cannot perform serial comparison.	The selected ID number has not been saved in the IC memory card or floppy disk.	-
Cannot print file(s).	The recording paper is used up, or the IC memory card or floppy disk is faulty.	Load the paper, and try the function again.
Cannot print received file(s).	1. The recording paper is used up. 2. The paper magazine is not set correctly.	1. Load the paper, and manually print the received file. 2. Set the magazine correctly.
Cannot read floppy disk.	The floppy disk is faulty.	-
Cannot read memory card.	The IC memory card is faulty.	-

Message	Possible cause	Action
Cannot retrieve current file. Retry?	The IC memory card or floppy disk is faulty, or it has been inserted incorrectly.	Insert the disk into the floppy disk drive correctly, and try the function again.
Cannot retrieve file. Retry?	The IC memory card or floppy disk is faulty, or it has been inserted incorrectly.	Insert the disk into the floppy disk drive correctly, and try the function again.
Cannot save data.	The IC memory card or floppy disk is write-protected.	Release the write-protect lock, and try again.
Cannot start. In data acquisition mode.	When preparing the ECG analysis, the Start switch is not operative.	Wait more than 10 seconds to start recording.
Cannot transmit data.	The destination cardiograph or personal computer is not operative, or cable connection is not connected.	1. Check the connection between the cardiograph and another cardiofax or personal computer. 2. Turn the destination on, and activate the file receiving function.
Cannot use this input box.	The type of the ECG input box does not correspond to the selected examination or program.	Replace the input box with the correct one.
Check memory card battery.	The battery of the memory card is discharged or not installed.	Replace the battery with a new one or install it.
Check the paper or recorder.	The recording paper is used up.	Load the paper inside the magazine.
Clock error. - Reset time and date.	The backup battery or clock circuit is faulty.	Contact your distributor.
Connect input box.	The ECG input box is not connected to the cardiograph, or connected incorrectly.	Connect the ECG input box to the cardiograph, then record the ECG waveforms.
Enter telephone number.	Telephone number is not specified.	Specify the destination phone number in the Communication Settings screens of the System Setup.
File not found.	The target file does not exist in the current IC memory card or floppy disk.	Replace the floppy disk or IC memory card.
File not received.	The communication line is faulty. (The file is not received.)	Check the cable connection of the communication line and the communication settings of the cardiograph or personal computer that transfers the file.
Floppy disk full.	There is no space to save data in the disk.	Replace it with a new one.
Floppy disk write protected.	The disk is write-protected.	Release the write-protect lock, and try again.
Initializing system settings.	Appears when the System Setup settings are initialized.	-
Input box malfunction.	Hardware error in Input box.	Contact your distributor.
Input box receiving error.	The ECG input box is connected to the cardiofax incorrectly.	Connect the input box and try again.
Input box transmission error.	The ECG input box is connected to the cardiofax incorrectly.	Connect the input box and try again.
Insert floppy disk.	No floppy disk in the drive, or it has been inserted incorrectly.	Insert the disk into the floppy disk drive correctly, and try the function again.

Message	Possible cause	Action
Insert memory card.	No IC memory card is in the slot, or it has been inserted incorrectly.	Insert the card into the IC memory card slot, and try the function again.
Insert program card (optional).	No program card is in the slot, or it has been inserted incorrectly.	Insert the program card correctly, and try the function again.
Interface malfunction.	The communication line is not operative.	1. Check the cable connection of the communication line. 2. Turn on the cardiograph or personal computer that transfers the file.
Internal data lost.	The backup battery is discharged, or the memory circuit for System Setup settings or summary data is faulty.	Contact your distributor.
Invalid date of birth.	The input date is out of range.	Input the date within the specified range.
Invalid entry./ Invalid entry. Please retry.	The input data is out of the specified range.	Input the data within the specified range.
Invalid program card.	The selected program and inserted program card are different.	Replace the program card and load the program.
Line engaged. (The phone line is busy)	-	-
Line in use. Please retry.	-	-
Memory card full.	There is no space to save data.	Replace it with new one.
Memory card write protected.	The card is write-protected.	Release the write-protect lock, and try again.
Memory full. Cannot store summary.	The memory to save summary data is full.	Print the summary and delete the data.
Not enough free memory to store summary.	The memory to save summary data is almost used up.	Print the summary and delete the data.
Now creating file.	Opening the System Setting screen when the cardiograph is processing some information.	Wait until the file is created before proceeding with the next operation.
Re-enter date and time.	The input time or date is out of the specified range.	Input the time and date within the specified range.
Receiving error.	The communication line is faulty. (The file is not received.)	Check the cable connection of the communication line and the communication settings of the cardiograph or personal computer that transfers the file.
Setting at default. - Re-enter settings.	The backup battery or memory circuit for the System Setup settings is faulty.	Contact your distributor.
Summary log lost.	The summary data is deleted because of a faulty backup battery or faulty memory.	Contact your distributor.
System setting not registered.	Malfunction in hardware.	Contact your distributor.
This ID data is not exist.	The ID data of the patient does not exist in the cardiograph or data filing system.	Input this ID into the cardiograph or registed it in the data filing system and repeat the operation.

Message	Possible cause	Action
Transmission error.	The communication line is not operative. (The file is not transferred.)	1. Check the communication settings. 2. Check the cable connection of communication line. 3. Turn on the cardiograph or personal computer that transfers the file.
Use AC power for maintenance program.	AC power is not supplied when the maintenance program is selected.	Operate the cardiograph on AC power.

SECTION 10

MAINTENANCE

10-1 Cleaning and Disinfection 10.1
10-1-1 Cleaning Schedule 10.1
10-1-2 Cleaning 10.1
10-1-3 Disinfecting the Electrodes 10.2
10-1-4 Cleaning the Thermal Head 10.2
10-1-5 Cleaning the Floppy Disk Drive Unit 10.3
10-2 Testing the System 10.4
10-3 Periodically Replacement Schedule 10.4

10-1 Cleaning and Disinfection

10-1-1 Cleaning Schedule

To maintain the performance of the instrument, the parts listed in the table below must be regularly cleaned.

Part	Frequency	Perform by
Instrument (external)	Before or after use	User
Thermal Head	1 time a month	User
Platen Roller ASSY	1 time a year	User
Paper Mark Detection Sensor	1 time a month	Qualified service personnel
Paper Empty Sensor	1 time a month	Qualified service personnel
Motor sensor	1 time a year	Qualified service personnel
Floppy Disk Drive Unit	1 time a month	User

10-1-2 Cleaning

CAUTION

- **Avoid rubbing hard over the lettering.**
- **Do not use solvents or detergents for cleaning.**
- **Before cleaning, turn the power off and disconnect the AC power from the cardiograph.**
- **The "CAUTION LABEL" contains important information for operating the instrument. Clean the label If it is dirty. If the label is damaged or difficult to read, contact your distributor to replace it with a new one.**

Before or after use:

- To remove dirt, clean the exterior surface of the cardiograph with a soft cloth lightly moistened with water.
- Clean the straps, and cable chips with soap and warm water and dry them.
- Clean the LCD touch-screen with a soft cloth.

10-1-3 Disinfecting the Electrodes

CAUTION

Do not wash the electrodes with any abrasive. Scratches on the surface of the electrodes may cause inaccurate ECG recording.

After use:

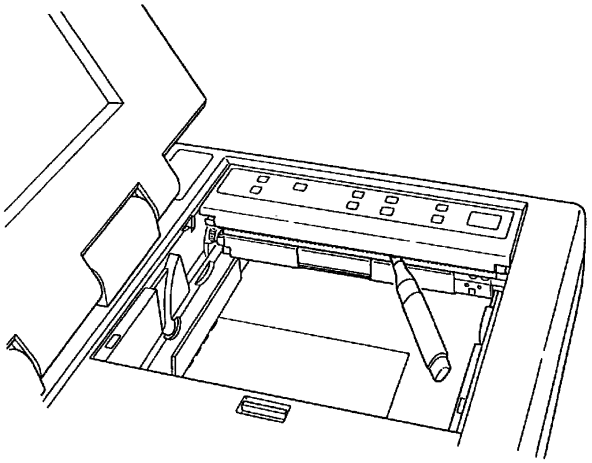
1. Remove the electrolyte cream (Cardio cream) completely from the electrode surfaces.

2. Wipe the electrodes with absorbent cotton soaked with alcohol and dry them.

10-1-4 Cleaning the Thermal Head

CAUTION

Before cleaning, turn the power off and disconnect the AC power from the cardiograph.



Before loading new paper, clean the thermal head with the thermal head cleaner pen (Y-011).

Pull out the felt tip slightly to reach the tip to the head, if necessary. (The felt tip returns to its original position when the cap is put back.)

If the felt tip gets dirty, pull it out and insert the dirty end into the pen to expose the clean head.

10-1-5 Cleaning the Floppy Disk Drive Unit

Clean the optional floppy disk drive every month with a locally available floppy disk drive cleaning kit to assure read and write data quality.

◆Procedure

1. Insert the cleaning floppy disk into the floppy disk drive.
2. Do the procedure in Section 8-11-2.
3. Repeat step 2 twice or 3 times.

After the green lamp on the floppy disk drive turns off, remove the cleaning floppy disk. For cleaning details, refer to the operation instruction of the floppy disk drive cleaning kit.

CAUTION

After using a wet type cleaning floppy disk, wait at least three minutes before inserting a floppy disk into the cleaned floppy disk drive.

10-2 Testing the System

The cardiograph provides the following test items to check the operation manually.

- Recorder test
- Key test
- Memory test
- Magnetic card reader test
- Floppy disk drive test
- LCD/LED test
- Input box text
- Communication test
- Barcode reader test

For detailed explanation, refer to the Service Manual.

10-3 Periodically Replacement Schedule

To maintain the performance of the instrument, the following parts, listed in the table below, must be periodically replaced by qualified service personnel.

Description	Recommendation
Litium battery	After 3 years
Battery	* See below
Thermal head	After 30 km of recording
LCD Module	After 25000 hours
Motor ASSY	After 1000 hours

* Replace the battery when it cannot last more than 30 minutes during battery operation.

CAUTION

Before disposing of the battery, check with your local solid waste officials for details in your area for recycling options or proper disposal. The battery is recyclable. At the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream.

SECTION 11

REFERENCE

11-1 Specifications 11.1
11-2 Standard Accessories 11.4
11-3 Options 11.5
11-3-1 Hardware Options 11.5
11-3-2 Software Options 11.6
11-4 Slave Monitor Interface Board 11.7
11-5 Attaching the Ferrite Core 11.8

11-1 Specifications

1. ECG input

Number of ECG input box sockets	2
ECG leads	Standard 12 lead, Cabrera lead, Nehb lead
Input circuit	Isolated and defibrillation protected
Input impedance	≧ 10 MΩ
Electrode offset tolerance	≧ ± 400 mV
CMRR	≧ 110 dB
Frequency response	0.05 to 150 Hz (−3 dB) at Drift filter set to off and high-cut filter set to 150 Hz
Internal noise	< 20 μVpp

2. Wave data processor

Sampling rate	500 samples/s
AC line filter	50/60 Hz −40 dB, Off
High-cut filter	25, 35, 75, 100,150 Hz
Time constant	> 3.2 s
Artifact detection	Provided for each electrode except RF (N)/RL
Electrode detachment detection	Provided for each electrode except RF (N)/RL

3. External input/output

Analog input	Number of channels:	2
	Sensitivity:	10 mm/0.5 V
Analog output	Number of channels:	1
	Sensitivity:	0.5 V/1 mV
IC memory card	Standard:	according to PCMCIA Type I
	Number of slots:	2
	Standard:	according to PCMCIA Type II
	Number of slots:	1
Barcode reader	Interface is provided	
Communication port	Communication method:	RS-232C
	Number of ports:	1
	(Additional 2 ports optionally available)	
	Baud rate: 1200, 2400, 4800, 9600	

4. Liquid crystal display (monochrome with CCFT backlight)

Size	211.17 mm width, 158.37 mm height
Dots	640 × 480
ECG waveform	3, 6 channel: 10 s 12 channel: 5 s Rhythm lead: 20 s
Data display	Patient information, operating mode, recording settings, heat rate, QRS mark, error messages, electrode detachment, noise

5. Digital recorder

Printing method	High resolution thermal printer head
Printing density	Horizontal: 40 dots/mm at 25 mm/s
	Vertical: 8 dots/mm
Recording width	210 mm
Number of recording channels	3, 4, 6, 12
Recording sensitivity	2.5, 5, 10, 20 mm/mV ± 5 %
Paper speed	5, 10, 12.5, 25, 50 mm/s
Data record	Model, program name, version, date, time, paper speed, sensitivity, lead name, used filters, hospital name, patient information, patient information from barcode, electrode failure, electrode noise

6. Power requirement

Line voltage	220 to 240 VAC ±10%
	115 to 127 VAC ±10%
	110 VAC ±10%
Line frequency	50 or 60 Hz
Power input	180 VA (maximum)
Built-in battery	Voltage: 12 V
	Current: Approx. 8 A

7. Environment

Operating temperature	10 to 40 °C	
Operating humidity	25 to 95 % RH	
Storage temperature	2 weeks or less;	−20 to 60 °C
(Depends on the battery)	Between 2 weeks and one year;	−15 to 40 °C
	Over one year;	−15 to 25 °C
Storage humidity	15 to 95 % RH (0 to 40 °C non condensing)	
Atmospheric pressure	70 to 106 kPa	

8. Dimensions and weight

Cardiograph:

Dimensions	425 W × 173 H × 400 D mm
Weight	Approx. 13.8 kg

ECG input box set

Dimensions	120 W × 40 H × 118 D mm
Weight	Approx. 500 g

9. Safety

Safety standard	IEC 601-1 Amendment 1,2 and IEC601-2-25
Type of protection against electrical shock	AC power Class I Battery power Internally powered equipment
Degree of protection against electrical shock	Defibrillation - Proof Type CF applied part
Degree of protection against harmful ingress of water	Ordinary equipment
Degree of safety of application in the presence of a flammable anaesthetic mixture with air, oxygen or nitrous oxide	Equipment not suitable for use in the presence of flammable anaesthetic mixture with air, oxygen or nitrous oxide
Mode of operation	Continuous
Chassis leakage current	≦0.1 mA
Patient leakage current I	≦ 0.01 mA
Patient leakage current II	≦ 0.05 mA
Patient auxiliary current	≦ 0.01 mA
1500 V across primary and chassis 4000 V across patient circuit and primary for 1 minute	

11-2 Standard Accessories

NOTE

When ordering the following accessories/consumables, specify the supply code no. When the supply code no. is not provided with the accessory, specify the model or code no.

No.	Description	Code no.	Qty.	Supply code no.
1	Power cord, Type H (Flat blade) or Type GB or Type N-10A	186656 483415 314839A	1	L935 — L936
2	Ground lead, Type D	098029	1	L912
3	Input box, JC-901D		1	—
4	Electrode lead (Electrode cartridge with tips for limb/chest electrodes) BR-911D, IEC, 3 mm or BR-912D, IEC, 4 mm or BR-913D, IEC, clip type or BR-911DA, AHA, 3 mm		1	 K093A K093C K093D K093B
5	Input box connection cable, 2 m	443245	1	K096A
6	Limb electrode, 3 mm, for adults, 4 pcs/set or 4 mm, for adults, 4 pcs/set	6144-000552B 6144-000579B	1	H057 H059
7	Limb electrode strap, 4 pcs/set	6144-000597A	1	H061
8	Chest electrode, 3 mm, for adults, 3 pcs/set or 4 mm, for adults, 3 pcs/set	6144-000427B 6144-001881B	2	H041 H043
9	Recording paper FQW210-10-295	6112-005331	1	A134K
10	Fuse 218001 (1 A)	274026	2	—
11	Thermal head cleaner	301898	1	Y001
12	Input box checker, JX-901D		1	—

11-3 Options

11-3-1 Hardware Options

1. ECG input box set
   - Electrode lead
     BR-913E: Electrode cartridge with DIN type clips for exercise test.
     BR-913EA: Electrode cartridge with AHA type clips for exercise test.
     BR-913DA: Electrode cartridge with AHA type clips for disposable electrodes.
   - Input box connection cable 5 m/10 m

2. Cart KD-901E

   CAUTION
   Use only this cart for the ECG-9320 cardiograph. If other cart is used, it may tip over or the cardiograph may fall off.

   A 300 m fixed type paper can be set on the DI-901D Cart tray ASSY.

3. Patient cable hanger KH-801E
   Used to attach the ECG input box, connection cables, and electrode leads. This hanger prevents the leads or cables from getting tangled.

4. Magnetic card reader QI-911E/912E
   Magnetic card reader can be installed into the cardiograph. You can select the types of ID card according to your country's standard.
   QI-911E (Track 1: IATA, Track 2: ABA)
   QI-912E (Track 2: ABA, Track 3: THRIFT)

5. Barcode reader MSH-230

6. Extension input/output board QI-902D
   This increases the number of available external output signals from 1 to 6. You can also add 2 channels (RS-232C ports) on this board.

7. Slave monitor interface board QI-901D
   Used to out put the video signal to an external VGA monitor.

8. 3.5 inch floppy disk unit QM-501D
   Used to save the ECG waveforms, analysis and/or measurement results, and patient information.
   720 kB and 1.44 MB formatted disk is available. This disk drive can be installed into the cardiograph.
   Dimensions and weight: 103.6 W × 38 H × 157.7 D mm, 455 g

9. Mechanocardiograph amplifier AK-101E
   You can record phonocardiograph and pulse waves by connecting this amplifier to the cardiograph.

10. Memory card
    QM-002V: 256 kB, SRAM card. Used to save the ECG waveforms, analysis or measurement result, and patient information.
    QM-001P: 1 MB, SRAM card. Used to save the ECG waveforms, analysis or measurement result, and patient information.

    Flash disk card: 20MB or 40 MB. SanDisk Corporation, USA (SDP-5/SDP-3B)
    Used to save the ECG waveforms, analysis or measurement result, patient information, and patient information master file.

11. Paper shaft YZ-026D5

11-3-2 Software Options

1. ECG Measurement software QP-910E
   Used to record the ECG measurement table.

2. ECG Interpretation software QP-911E
   Used to analyze the ECG waveforms. ECG measurement table recording is also available.

3. Program card QP-932E: Exercise test software

4. Program card QP-941E: Ambulatory ECG software
   The saved ECG waveform by the RAC-1202K "Digital Ambulatory ECG Recorder " can be recorded by the cardiograph.

11-4 Slave Monitor Interface Board

CAUTION

The cardiograph should only be connected to an external instrument which complies with the CISPR 11 Second Edition 1990-09, Group 1 and Class B standard.

1. Slave monitor socket

   - Output signal
     Video: 0.7 Vp-p analog RGB
     Sync: Horizontal scanning signal - TTL, 33.4 kHz
     Vertical scanning signal - TTL, 64 Hz
   - Display mode VGA, 640×480

2. Color Selector

Position	Color	Position	Color
0	black	8	dark green
1	dark blue	9	blue
2	red	A	orange
3	purple	B	pink
4	green	C	green
5	light blue	D	light blue
6	yellow	E	yellow
7	white	F	white

11-5 Attaching the Ferrite Core

When connecting an external instrument to the following sockets, an unwanted radio frequency signal is generated from this connection. Therefore, to reduce this unwanted radio frequency signal, attach the optional ferrite core to the cable of the external instrument.

CAUTION

The cardiograph should only be connected to an external instrument which complies with the CISPR 11 Second Edition 1990-09, Group 1 and Class B standard.

◆Optional Ferrite Cores Descriptions

Socket Name	Ferrite Core Model	Wrapping Requirement	Code No.
External signal input socket	RI-14-28-6	Wrap the cable once around the ferrite core	493182
SIO (1) socket 1	SFC-8	Not required	361814
SIO (2) socket 2	SFC-8	Not required	361814
SIO (3) socket 3	SFC-8	Not required	361814
External input/output socket	RI-16.5-28-8	Not required	493208
Bar code reader socket	TFC-23-11-14	Wrap the cable once around the ferrite core	488464
Slave monitor socket	SFC-8	Not required	361814
Extension I/O socket	TR-28-16-20	Wrap the cable once around the ferrite core	493217

NOTE

Some sockets described in the above table are only available if the optional boards are installed.

Please contact your nearest Nihon Kohden Corporation subsidiary or distributor for those optional ferrite cores.

◆Example of Wrapping

NOTE

Attach and fix the ferrite core near the connector of the cable that connects to the input socket.