User Manual

EDAN

# 12-Channel

## Electrocardiograph

Release 1.7 with Software Revision 1.8

CE 0123

# About this Manual

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# Statement

This manual will help you understand the operation and maintenance of the product better. It is reminded that the product shall be used strictly complying with this manual. User's operation failing to comply with this manual may result in malfunction or accident for which EDAN INSTRUMENTS, INC. (hereinafter called EDAN) can not be held liable.

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# Product Information

**Product Name:** Electrocardiograph

**Model:** SE-12, SE-12 Express

# Responsibility of the Manufacturer

EDAN only considers itself responsible for any effect on safety, reliability and performance of the equipment if:

Assembly operations, extensions, re-adjustments, modifications or repairs are carried out by persons authorized by EDAN, and

The electrical installation of the relevant room complies with national standards, and

The instrument is used in accordance with the instructions for use.

Upon request, EDAN may provide, with compensation, necessary circuit diagrams, and other information to help qualified technician to maintain and repair some parts, which EDAN may define as user serviceable.

# Terms Used in this Manual

This guide is designed to give key concepts on safety precautions.

**WARNING**

A **WARNING** label advises against certain actions or situations that could result in personal injury or death.

**CAUTION**

A **CAUTION** label advises against actions or situations that could damage equipment, produce inaccurate data, or invalidate a procedure.

**NOTE:** A NOTE provides useful information regarding a function or a procedure.

# Table of Contents

**Chapter 1 Safety Guidance ..... 1**

1.1 Intended Use ..... 1
1.2 Warnings and Cautions ..... 1
1.2.1 Safety Warnings ..... 1
1.2.2 Battery Care Warnings ..... 3
1.2.3 General Cautions ..... 4
1.2.4 Cleaning & Disinfection Cautions ..... 6
1.2.5 Preparation and Operation Warnings (for SE-12 Express Exercise ECG) ..... 6
1.2.6 Contraindications (for SE-12 Express Exercise ECG) ..... 7
1.3 List of Symbols ..... 8

**Chapter 2 Introduction ..... 11**

2.1 Top Panel ..... 12
2.2 Keyboard and Keys ..... 13
2.3 Front Panel ..... 17
2.4 Rear Panel ..... 18
2.5 Right Panel ..... 19
2.6 Bottom Panel ..... 23
2.7 Function Features ..... 25

**Chapter 3 About the Electrocardiograph Application ..... 27**

3.1 Selecting Menu Functions ..... 27
3.2 Entering Data ..... 28
3.3 Selecting an Item ..... 29
3.4 About the Main Interface ..... 30
3.5 About the Main Interface of Exercise ECG (Optional for SE-12 Express) ..... 32
3.6 About the System Setup Interface ..... 36
3.7 About the File Manager Interface ..... 38

**Chapter 4 Operation Preparations ..... 41**

4.1 Power and Earthing ..... 41
4.2 Loading/Replacing Recorder Paper ..... 42
4.3 Preparing the Patient ..... 46
4.3.1 Instructing the Patient ..... 46
4.3.2 Preparing the Skin ..... 47
4.4 Connecting the Patient Cable to the Electrocardiograph and Electrodes ..... 48
4.5 Attaching Electrodes to the Patient (for Resting ECG) ..... 49

4.5.1 Lead Placement ..... 49
4.5.2 Electrode Placement ..... 51
4.6 Attaching Electrodes to the Patient (for Exercise ECG) ..... 54
4.7 Inspection Before Power-On ..... 56

**Chapter 5 Turning On the Electrocardiograph ..... 58**

**Chapter 6 Entering Patient Information ..... 59**

6.1 Entering Patient ID ..... 59
6.2 Entering Other Information ..... 60
6.3 Using a Bar Code Reader ..... 62

**Chapter 7 Freezing ECG Waves ..... 66**

**Chapter 8 Printing ECG Reports ..... 68**

8.1 Auto Mode ..... 68
8.2 Manual Mode ..... 72
8.3 Rhythm Mode ..... 74
8.4 R-R Analysis Mode ..... 76
8.5 Copy Printing ..... 78
8.6 ECG Reports ..... 79
8.6.1 ECG Reports in the Auto Mode ..... 79
8.6.2 ECG Reports in the Rhythm Mode ..... 84
8.6.3 ECG Reports in the Manual Mode ..... 85
8.6.4 ECG Reports in the R-R Analysis Mode ..... 86
8.6.5 ECG Reports Printed by the USB Printer ..... 90
8.6.6 ECG Report of Patient with Pacemaker ..... 91
8.6.7 ECG Report of Nehb Lead ..... 92

**Chapter 9 Transmitting ECG Data Automatically ..... 94**

9.1 Transmitting ECG Data to the PC ..... 94
9.1.1 Transmitting ECG Data in DAT Format Through Serial Cable ..... 94
9.1.2 Transmitting ECG Data in DAT Format Through Net Cable ..... 96
9.1.3 Transmitting ECG Data in SCP/FDA-XML/PDF Format Through Net Cable ..... 98
9.2 Exporting ECG Data to the U Disk Automatically ..... 101
9.3 Real-time Transmission to PC ECG ..... 102

**Chapter 10 Managing Files ..... 104**

10.1 Transmitting Files to the PC ..... 106
10.1.1 Transmitting DAT Files Through Serial Cable ..... 107
10.1.2 Transmitting DAT Files Through Net Cable ..... 108

10.1.3 Transmitting SCP/FDA-XML/PDF Files Through Net Cable ..... 109
10.2 Exporting Files to the U Disk ..... 110
10.3 Deleting Files ..... 111
10.4 Searching Files ..... 112
10.5 Importing Files ..... 113
10.6 Editing Patient Information ..... 113
10.7 Printing Files ..... 114
10.8 Previewing a File ..... 114

**Chapter 11 System Setup ..... 118**

11.1 Work Mode Setup ..... 118
11.1.1 Selecting Work Mode ..... 119
11.1.2 Selecting Manual Style ..... 120
11.1.3 Selecting Rhythm Style ..... 120
11.1.4 Selecting Auto Display Style ..... 120
11.1.5 Selecting Sampling Mode ..... 121
11.1.6 Setting Interval and Duration ..... 122
11.1.7 Selecting Preview Function ..... 122
11.1.8 Selecting Auto Extend Record ..... 122
11.2 Filter Setup ..... 122
11.2.1 Setting AC Filter ..... 123
11.2.2 Setting DFT Filter ..... 123
11.2.3 Setting EMG Filter ..... 124
11.2.4 Setting Lowpass Filter ..... 124
11.3 Record Info Setup ..... 125
11.3.1 Setup 1 ..... 125
11.3.2 Setup 2 ..... 129
11.4 Patient Information Setup ..... 130
11.4.1 Selecting First/Last Name / Gender / D.O.B / Height / Weight / BP / Race / Pacemaker / Medication / Room No. / Department / Physician / Technician / Ref-Physician ..... 131
11.4.2 Selecting ID Mode ..... 132
11.4.3 Selecting ID Hint ..... 132
11.4.4 Setting Prompt ..... 132
11.4.5 Selecting H/W Unit ..... 132
11.4.6 Selecting BP Unit ..... 133
11.4.7 Selecting Next Patient ..... 133
11.4.8 Setting the Time to Clear Patient Information ..... 134
11.4.9 Inputting Customized Information ..... 134
11.5 Transmission Setup ..... 135

11.5.1 Setting Device No. ..... 136
11.5.2 Selecting Auto Transmission ..... 136
11.5.3 Selecting Transmission Mode ..... 136
11.5.4 Setting FTP Information ..... 137
11.5.5 Setting IP Addresses ..... 137
11.6 Lead Setup ..... 137
11.6.1 Setting Rhythm Lead1/2/3 ..... 138
11.6.2 Setting Lead Sequence ..... 139
11.6.3 Selecting Nehb ..... 139
11.7 Display&Sound Setup ..... 139
11.7.1 Setting Brightness ..... 140
11.7.2 Selecting Display Colors (Only for SE-12 Express) ..... 140
11.7.3 Selecting Antialiasing ..... 140
11.7.4 Setting Key Volume ..... 141
11.7.5 Setting Hint Volume ..... 141
11.7.6 Setting QRS Volume ..... 141
11.8 Date&Time Setup ..... 141
11.8.1 Setting Date and Time ..... 142
11.8.2 Setting Date Mode ..... 142
11.8.3 Setting Time Mode ..... 143
11.8.4 Setting Power-Off Time ..... 143
11.8.5 Setting LCD Off Time ..... 143
11.9 File Setup ..... 143
11.9.1 Selecting Auto Save ..... 144
11.9.2 Setting Saving Path ..... 144
11.9.3 Setting File Format ..... 145
11.9.4 Selecting Deleting Files After Transmission or Export ..... 145
11.9.5 Selecting Replacing When Memory is Full ..... 145
11.9.6 Selecting SCP File Compression ..... 145
11.10 System Maintenance Setup ..... 146
11.10.1 Exporting System Settings to U Disk ..... 146
11.10.2 Loading System Settings from U Disk ..... 147
11.10.3 Backing Up Settings ..... 147
11.10.4 Loading Backup Settings ..... 147
11.10.5 Printing System Settings ..... 147
11.10.6 Loading Factory Settings ..... 147
11.10.7 Setting System Password ..... 151
11.11 Other Setup ..... 152

11.11.1 Entering Institution ..... 152
11.11.2 Selecting a Language ..... 152
11.11.3 Selecting Caps Lock ..... 153
11.11.4 Setting External Input ..... 153
11.11.5 Setting External Output ..... 153
11.11.6 Setting Pacemaker Detection Sensitivity ..... 154

**Chapter 12 Operation Instructions for Exercise ECG (Configurable for SE-12 Express) . 155**

12.1 Activating Exercise ECG Function ..... 155
12.2 Operation Preparation ..... 156
12.3 Exercise Test ..... 163
12.4 System Setup for Exercise Test ..... 164
12.4.1 General Information Setup ..... 165
12.4.2 Record Information Setup ..... 167
12.4.3 Protocol Manager ..... 169

**Chapter 13 Turning Off the Electrocardiograph ..... 173**

**Chapter 14 Hint Information ..... 174**

**Chapter 15 Cleaning, Care and Maintenance ..... 176**

15.1 Cleaning ..... 176
15.1.1 Cleaning the Main Unit and the Patient Cable ..... 176
15.1.2 Cleaning the Reusable Electrodes ..... 176
15.1.3 Cleaning the Print Head ..... 176
15.2 Disinfection ..... 177
15.3 Care and Maintenance ..... 177
15.3.1 Recharge and Replacement of Battery ..... 177
15.3.2 Recorder Paper ..... 178
15.3.3 Maintenance of the Main Unit and the Patient Cable ..... 179

**Chapter 16 Accessories ..... 181**

16.1 Standard Accessories ..... 181
16.2 Optional Accessories ..... 182

**Chapter 17 Warranty & Service Policy ..... 184**

17.1 Warranty ..... 184
17.2 Service Policy ..... 184

**Appendix 1 Technical Specifications ..... 186**

A1.1 Safety Specifications ..... 186

A1.2 Environment Specifications ..... 187
A1.3 Physical Specifications ..... 187
A1.4 Power Supply Specifications ..... 187
A1.5 Performance Specifications ..... 188
**Appendix 2 EMC Information ..... 191**
**Appendix 3 Abbreviation ..... 196**

# Chapter 1 Safety Guidance

This chapter provides important safety information related to the use of the 12-channel electrocardiograph.

## 1.1 Intended Use

The intended use of the 12-channel electrocardiograph is to acquire ECG signals from adult and pediatric patients through body surface ECG electrodes. The electrocardiograph is only intended to be used in hospitals or healthcare facilities by doctors and trained healthcare professionals. The cardiogram recorded by the electrocardiograph can help users to analyze and diagnose heart disease. However, the interpreted ECG with measurements and interpretive statements is offered to clinicians on an advisory basis only.

## 1.2 Warnings and Cautions

In order to use the electrocardiograph safely and effectively, and avoid possible dangers caused by improper operation, please read through the user manual and be sure to be familiar with all functions of the equipment and proper operation procedures before use.

Please pay more attention to the following warning and caution information.

**Notes:**

1 This device is not intended for home use.

2 The pictures and interfaces in this manual are for reference only.

### 1.2.1 Safety Warnings

**WARNING**

1 The electrocardiograph is intended to be used by qualified physicians or personnel professionally trained. They should be familiar with the contents of this user manual before operation.

2 Only qualified service engineers can install this equipment, and only service engineers authorized by the manufacturer can open the shell.

## WARNING

3 The results given by the equipment should be examined based on the overall clinical condition of the patient, and they can not substitute for regular checking.

4 This device is not intended for treatment.

5 **EXPLOSION HAZARD** - Do not use the electrocardiograph in the presence of flammable anesthetic mixtures with oxygen or other flammable agents.

6 **SHOCK HAZARD** - The power receptacle must be a hospital grade grounded outlet. Never try to adapt the three-prong plug to fit a two-slot outlet.

7 If the integrity of the external protective conductor is in doubt, the equipment should be powered by a built-in rechargeable battery.

8 Do not use this equipment in the presence of high static electricity or high voltage equipment which may generate sparks.

9 This equipment is not designed for internal use or direct cardiac application.

10 Only the patient cable and other accessories supplied by the manufacturer can be used. Or else, the performance and electric shock protection can not be guaranteed.

11 Make sure that all electrodes are connected to the patient correctly before operation.

12 Ensure that the conductive parts of electrodes and associated connectors, including neutral electrodes, do not come in contact with earth or any other conducting objects.

13 Electrodes with defibrillator protection should be used while defibrillating.

14 If reusable electrodes with electrode gel are used during defibrillation, ECG recovery will take more than 10 seconds. The manufacturer recommends the use of disposable electrodes at all times.

15 Electrodes of dissimilar metals should not be used; otherwise it may cause a high polarization voltage.

16 To the patient with a pacemaker, the results given by the equipment may be invalid.

17 Do not touch the patient, bed, table or the equipment while using the ECG together with a defibrillator.

**WARNING**

18 In order to avoid being burnt, please keep the electrodes far away from the radio knife while using electrosurgical equipment.

19 Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC/EN standards (e.g. IEC/EN 60950 for data processing equipment and IEC/EN 60601-1 for medical equipment). Furthermore all configuration shall comply with the valid version of the standard IEC/EN 60601-1-1. Therefore anybody, who connects additional equipment to the signal input or output connector to configure a medical system, must make sure that it complies with the requirements of the valid version of the system standard IEC/EN 60601-1-1. If in doubt, consult our technical service department or your local distributor.

20 The summation of leakage current should never exceed leakage current limits while several other units are used at the same time.

21 The potential equalization bar can be connected to that of other equipment when necessary. Make sure that all these devices are connected to the potential equalization terminal.

22 The equipment is protected against malfunctions caused by electrosurgery according to the clause 36.202.101 in the standard IEC 60601-2-25.

23 The disposable electrodes can only be used for one time.

24 If the wireless AP technology is used, in order to maintain compliance with the FCC RF exposure guidelines, the wireless AP should be installed and operated with a minimum distance of 20cm between the radiator and the human body. Use the supplied antenna only. There should be no shield in or around the room where the wireless AP is used.

25 Fix attention on the examination to avoid missing important ECG waves.

## 1.2.2 Battery Care Warnings

**WARNING**

1 Improper operation may cause the battery to be hot, ignited or exploded, and it may lead to the decrease of the battery capacity. It is necessary to read the user manual

carefully and pay more attention to warning messages.

2 Only qualified service engineers authorized by the manufacturer can open the battery compartment and replace the battery, and batteries of the same model and specification should be used.

3 **DANGER OF EXPLOSION** -- Do not reverse the anode and the cathode when installing the battery.

4 Do not heat or splash the battery or throw it into fire or water.

5 When leakage or foul smell is found, stop using the battery immediately. If your skin or cloth comes into contact with the leakage liquid, cleanse it with clean water at once. If the leakage liquid splashes into your eyes, do not wipe them. Irrigate them with clean water first and go to see a doctor immediately.

6 Only when the device is off can the battery be installed or removed.

## 1.2.3 General Cautions

**CAUTION**

1 Avoid liquid splash and excessive temperature. The temperature must be kept between 5 ºC and 40 ºC during operation, and it should be kept between -20 ºC and 55 ºC during transportation and storage.

2 Do not use the equipment in a dusty environment with bad ventilation or in the presence of corrosive.

3 Make sure that there is no intense electromagnetic interference source around the equipment, such as radio transmitters or mobile phones etc. Attention: large medical electrical equipment such as electrosurgical equipment, radiological equipment and magnetic resonance imaging equipment etc. is likely to bring electromagnetic interference.

4 Before use, the equipment, patient cable and electrodes etc. should be checked. Replacement should be taken if there is any evident defectiveness or aging symptom which may impair the safety or the performance.

5 The following safety checks should be performed at least every 24 months by a qualified person who has adequate training, knowledge, and practical experience to perform these tests.

**CAUTION**

a) Inspect the equipment and accessories for mechanical and functional damage.

b) Inspect the safety related labels for legibility.

c) Inspect the fuse to verify compliance with the rated current and circuit-breaking characteristics.

d) Verify that the device functions properly as described in the instructions for use.

e) Test the protection earth resistance according to IEC/EN 60601-1: Limit: 0.1 ohm.

f) Test the earth leakage current according to IEC/EN 60601-1: Limit: NC 500 μA, SFC 1000μA.

g) Test the enclosure leakage current according to IEC/EN 60601-1: Limit: NC 100μA, SFC 500μA.

h) Test the patient leakage current according to IEC/EN 60601-1: Limit: NC a.c. 10μA, d.c. 10μA; SFC a.c. 50μA, d.c. 50μA.

i) Test the patient auxiliary current according to IEC/EN 60601-1: Limit: NC a.c. 10μA, d.c. 10μA; SFC a.c. 50μA, d.c. 50μA.

j) Test the patient leakage current under single fault condition with mains voltage on the applied part according to IEC/EN 60601-1: Limit: 50μA (CF).

The data should be recorded in an equipment log. If the device is not functioning properly or fails any of the above tests, the device has to be repaired.

6 Ruptured fuse must only be replaced with that of the same type and rating as the original.

7 The device and accessories are to be disposed of according to local regulations after their useful lives. Alternatively, they can be returned to the dealer or the manufacturer for recycling or proper disposal. Batteries are hazardous waste. Do NOT dispose of them together with house-hold garbage. At the end of their lives hand the batteries over to the applicable collection points for the recycling of waste batteries. For more detailed information about recycling of this product or battery, please contact your local Civic Office, or the shop where you purchased the product.

8 Federal (U.S.) law restricts this device to sale by or on the order of a physician.

## 1.2.4 Cleaning & Disinfection Cautions

**CAUTION**

1 Turn off the power before cleaning and disinfection. If the mains supply is used, the power cord should be dragged out of the outlet. Prevent the detergent from seeping into the equipment.

2 Do not immerse the unit or the patient cable into liquid under any circumstances.

3 Do not clean the unit and accessories with abrasive fabric and avoid scratching the electrodes.

4 Any remainder of detergent should be removed from the unit and the patient cable after cleaning.

5 Do not use chloric disinfectant such as chloride, sodium hypochlorite etc.

## 1.2.5 Preparation and Operation Warnings (for SE-12 Express Exercise ECG)

**WARNING**

1 Ensure that the main unit and the treadmill/ergometer are effectively grounded.

2 Test the emergency stop switch of the treadmill before using the system.

3 During the exercise test, ensure that there are at least 2 experienced physicians present. One of them observes the patient and deals with the emergency.

4 Make sure that there is necessary valid first-aid equipment such as defibrillators, blood-pressure meters etc, and necessary valid medication in the exercise test room.

5 Turn off the system power and disconnect the power cord from the wall outlet after using the system.

6 Press down the emergency stop switch of the treadmill before defibrillating to avoid the hazard to the patient and the operator.

7 Keep the treadmill/ergometer on a horizontal place and make sure it’s stably working.

8 Make sure that the power cable of the treadmill/ergometer is grounded. Don’t use other electrical equipment with the same power supply line.

**WARNING**

9 Keep the power cable far away from the running treadmill area and the heat surface.

10 Examine the treadmill/ergometer carefully before using it.

11 Do not take an exercise test if the treadmill/ergometer is wet.

12 Do not use the treadmill/ergometer in the open air.

13 The patient undergoing the stress exercise test should wear suitable clothes and shoes.

14 During the stress exercise test, the patient should not get on or off the treadmill.

15 Remind patients to take care not to fall down from the treadmill.

16 Keep hands, hair, jewelry and loose clothing away from moving parts of the treadmill.

17 After the exercise test, slow the speed of the treadmill to the minimum, and then stop the treadmill.

18 Children are prohibited from approaching the treadmill/ergometer alone.

19 Don’t insert anything into the treadmill, or place anything on its surface.

20 Press down the emergency stop switch to stop the treadmill immediately an emergency happens.

## 1.2.6 Contraindications (for SE-12 Express Exercise ECG)

**Absolute Contraindications**:

1 Acute MI (within 2 days)

2 High-risk unstable angina

3 Hemodynamic compromise caused by uncontrolled cardiac arrhythmia

4 Active endocarditis

5 Symptomatic severe aortic stenosis

6 Decompensated symptomatic heart failure

7 Acute pulmonary embolus or pulmonary infarction

8 Acute noncardiac disorder that may affect exercise performance or be aggravated by exercise (eg, infection, renal failure, thyrotoxicosis)

9 Acute myocarditis or pericarditis

10 Physical disability that would preclude safe and adequate test performance

11 The patient opposes the test.

**Relative Contraindications**:

1 Left main coronary stenosis or its equivalent

2 Moderate stenotic valvular heart disease

3 Electrolyte abnormalities

4 Tachyarrhythmias or bradyarrhythmias

5 Atrial fibrillation with uncontrolled ventricular rate

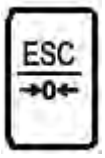
6 Hypertrophic cardiomyopathy

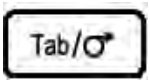
7 Patients can not cooperate because of mental impairment

8 High-degree AV block

# 1.3 List of Symbols

| | |
|---|---|
|  | External output |
|  | External input |
|  | Equipment or part of CF type with defibrillator proof |
|  | Caution |
|  | Consult Instructions for Use |

| | |
|---|---|
|  | Potential equalization |
|  | Mains supply |
|  | USB port |
|  | Battery indicator |
|  | Battery recharging indicator |
|  | Delete key |
|  | Enter key |
|   | Esc key/Reset key |
|  | Shift key |
|   | Fn key |
|  | Power On/Off key |
|   | COPY key |
|   | MODE key |
|   | SLEEP/WAKE UP key |

| | |
|---|---|
|   | START/STOP key |
|   | Tab key/Feed paper key |
|  | UP/DOWN/LEFT/RIGHT Arrow key |
|  | Recycle |
| P/N | Part Number |
|   | Serial Number |
|  | Date of Manufacture |
|  | Manufacturer |
|   | Authorized Representative in the European Community |
|   | The symbol indicates that the device complies with the European Council Directive 93/42/EEC concerning medical devices. |
| **Rx only (U.S.)** | Federal (US) law restricts this device to sale by or on the order of a physician. |
|  | It indicates that the device should be sent to the special agencies according to local regulations for separate collection after its useful life. |

# Chapter 2 Introduction

The 12-channel electrocardiograph gathers ECG signals of 12 leads simultaneously. It displays the operation menu, ECG parameters as well as electrocardiograms.

The 12-channel ECG waves can be viewed on the LCD screen and printed out by using a high-quality thermal recorder. The sampled ECG data can be saved, transmitted and exported.

The manual, auto, rhythm, R-R analysis or off mode can be chosen freely.

For SE-12 Express, the exercise ECG function is optional. When a patient with coronary heart disease runs, the added heart load will cause myocardium hypotension, and then the ECG will change abnormally. Therefore, the exercise ECG function of SE-12 Express can be used to diagnose concealed coronary heart disease and atypical angina pectoris, prescribe the workload for patients with myocardial infarction before they leave hospital, and assess the effect of the treatment.

The 12-channel electrocardiograph can be powered by the mains supply or a built-in rechargeable lithium battery.

With a high resolution thermal recorder, a 32-bit processor and a large-capacity memorizer, the 12-channel electrocardiograph has advanced performance and high reliability. The compact size makes it suitable for clinic and hospital uses.

The 12-channel electrocardiograph has two models: SE-12 and SE-12 Express.

SE-12 adopts 320×240 dot single color LCD screen; SE-12 Express adopts 800×600 multicolor LCD screen.

**Configuration**: main unit, power cord, patient cable, chest electrodes, limb electrodes, disposable electrodes, alligator clips, thermal recorder paper, fuses, lithium battery.

**WARNING**

1 This equipment is intended for use on adult and pediatric patients only.

2 This equipment is not designed for internal use or direct cardiac application.

3 The results given by the equipment should be examined based on the overall clinical condition of the patient, and they can not substitute for regular checking.

# 2.1 Top Panel

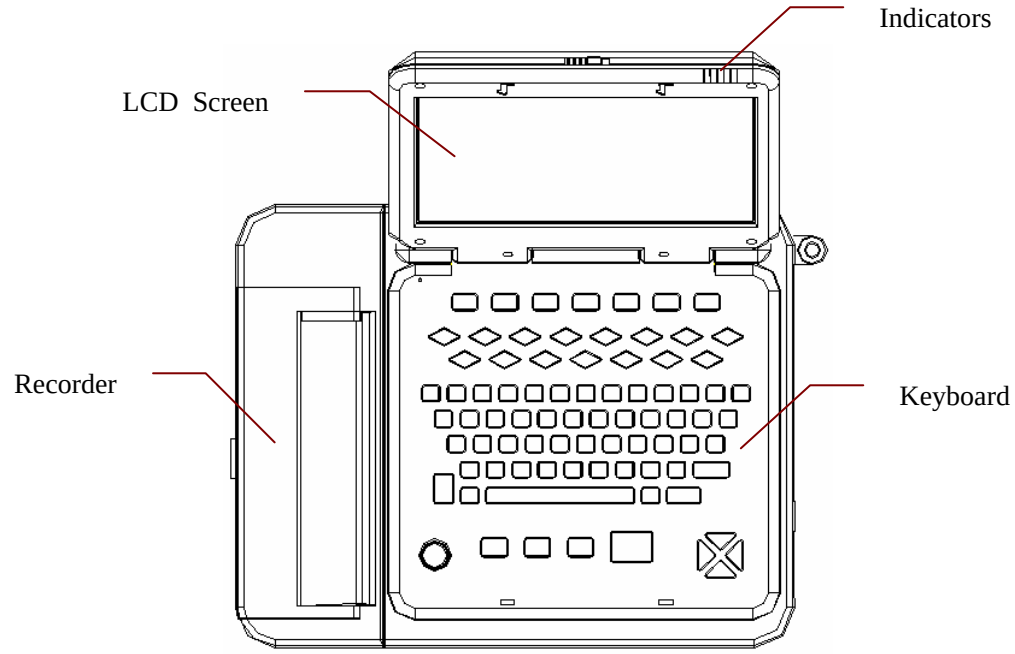



Figure 2-1 SE-12 Express

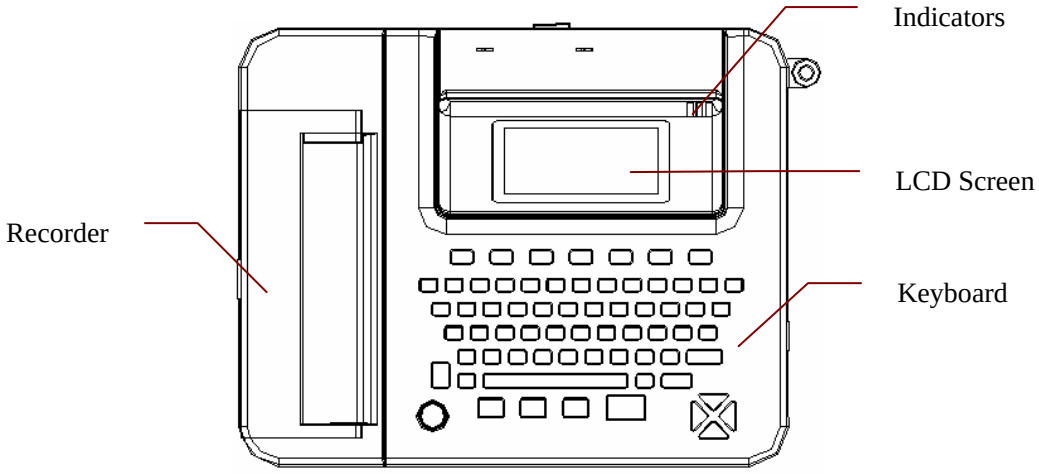



Figure 2-2 SE-12

# 2.2 Keyboard and Keys

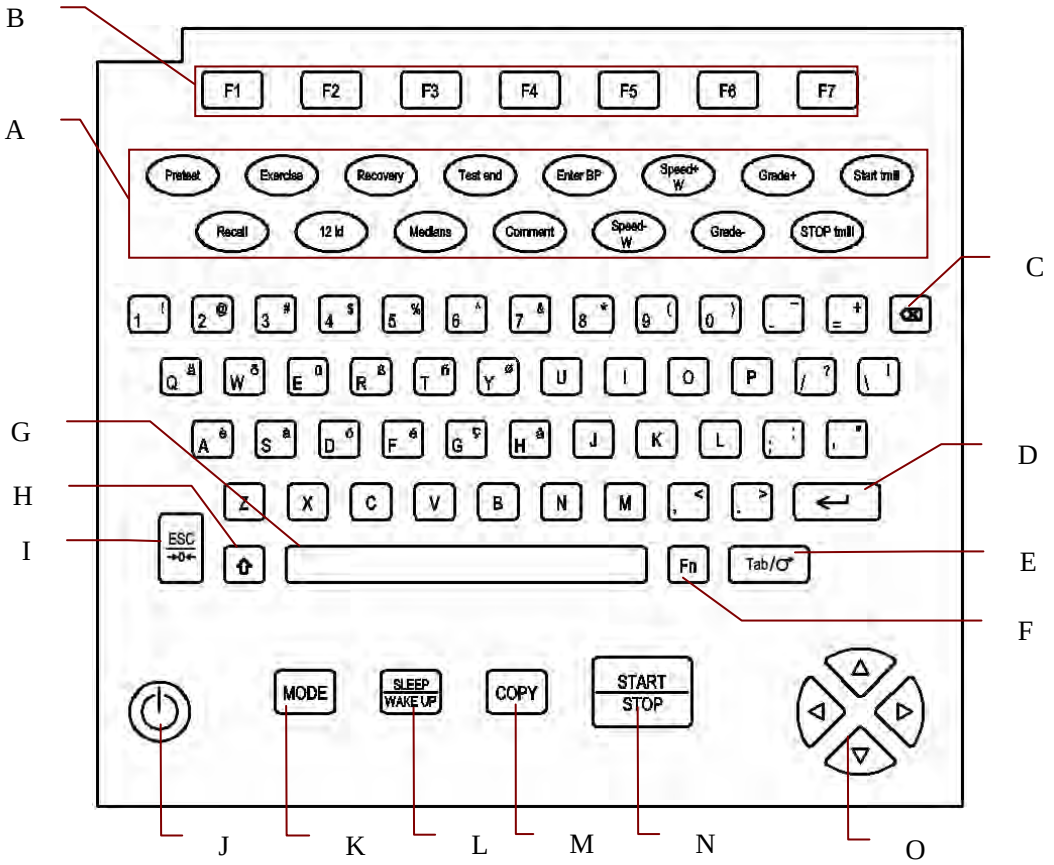



Figure 2-3 SE-12 Express Keyboard

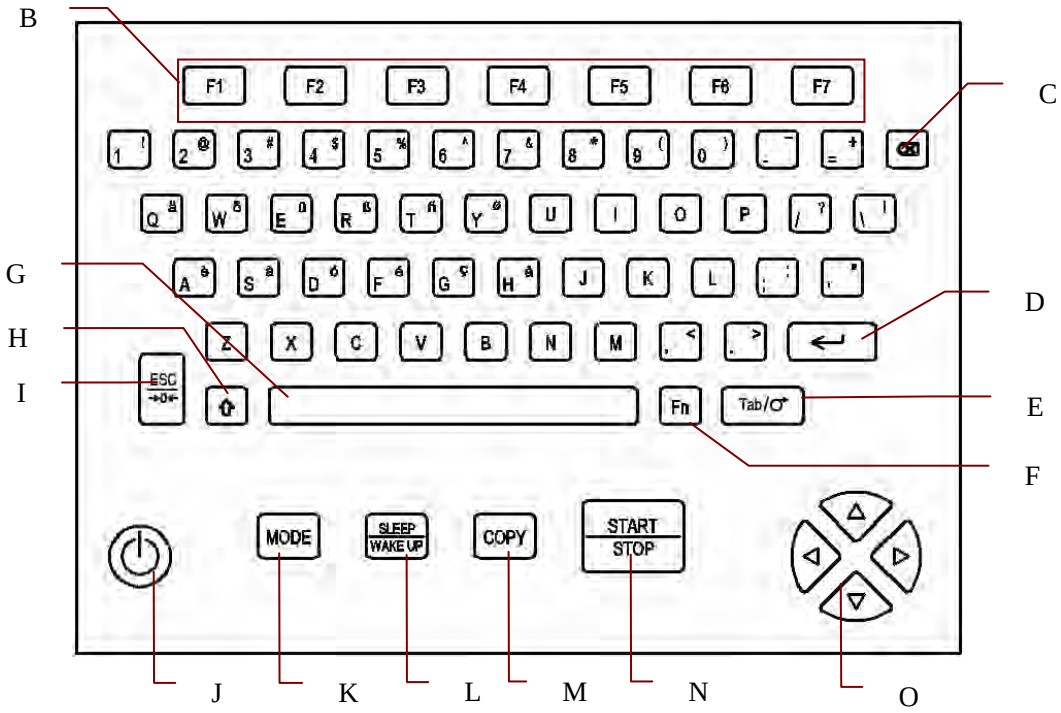



Figure 2-4 SE-12 Keyboard

| | Name | Explanation |
|---|---|---|
| A<br>**Note:** Only if the stress ECG function is activated, can these keys be available. | Pretest | When the main interface is displayed, press this key to display the main interface of the exercise test.<br>When the main interface of the exercise test is displayed, press this key to enter the pretest phase. The length of the pretest phase is not fixed. |
| | Exercise | Press this key to enter the exercise phase. In the exercise phase, press this key to enter the next stage of the exercise phase. |
| | Recovery | Press this key to enter the recovery phase. In the recovery phase, press this key to enter the next stage of the recovery phase. |
| | Test end | Press this key to display a pop-up dialog box, and then you can decide whether the exercise test should be terminated. |
| | Enter BP | Press this key to display the **Input BP** dialog box, and then enter the BP values manually. |
| | Recall | During the exercise test, press this key to review 10s data and print out the 12-channel ECG report of the reviewed 10s data. |
| | 12 ld | During the exercise test, press this key to sample 10s data and print out the 12-channel ECG report of the sampled 10s data. |
| | Medians | During the exercise test, press this key to print out the average template report. |
| | Comment | Press this key to display the **Comment** dialog box, and then you can annotate in the dialog box. The annotations will be displayed in the summary report. Press this key again to close the dialog box. |
| | Speed +/-W | Press **Speed +/-W** to change the speed of the treadmill during the exercise phase.<br>**Note**: The two keys are available for the customized treadmill protocol only. |
| | Grade +/- | Press **Grade +/-** to change the grade of the treadmill during the exercise phase.<br>**Note**: The two keys are available for the customized |

| | | |
|---|---|---|
| | | treadmill protocol only. |
| | Start/Stop tmill | Before the exercise test, press **Start tmill** to test the connection between the electrocardiograph and the treadmill, and then press **Stop tmill** to stop the connection test. |
| B | Function Key | Selecting menu functions on the screen |
| C | Delete | Deleting characters |
| D | Enter | Confirming operation |
| E | Tab/Feed paper | Moving the cursor<br>Pressing **Tab** can move the cursor forward, and pressing Shift + **Tab** can move the cursor backward.<br>Feed paper: when the main interface is displayed, if **Paper Marker** is set to **Yes**, you can press the **Tab** key to advance the recorder paper to the next black marker; if **Paper Marker** is set to **No,** you can press the **Tab** key to advance the paper for 2.5cm. Press the **Tab** key again to stop advancing the paper. |
| F | Fn | Inputting special characters. Press **Fn** + **a** to type **è**. |
| G | Spacebar | Adding a space between typed characters or selecting/deselecting a checkbox |
| H | Shift | Pressing Shift + **Tab** can move the cursor backward.<br>Press Shift and a number key to input the special character in the top right corner of the key.<br>If **Caps Lock** is set to **Off**, pressing Shift + **P** can type a capital **P**.<br>If **Caps Lock** is set to **On**, pressing Shift + **P** can type a lowercase **p**. |
| I | Esc/Reset | Canceling operation<br>**Note:** A large polarization voltage may cause baseline drift. On the main interface, pressing the **ESC** key can decrease the polarization voltage and draw the baseline to zero quickly. |
| J | Power On/Off | Power-on/Power-off |
| K | MODE | Press this key to select a working mode among the auto, manual, rhythm, R-R analysis, and off modes.<br>**Note:** Only if a working mode is ticked on the **Work** |

| | | |
|---|---|---|
| | | **Mode Setup** interface, can the working mode be selected by pressing the **MODE** key when the main interface is displayed. |
| L | SLEEP/WAKE UP | Resting/wakening the electrocardiograph |
| M | COPY | In the auto mode, pressing the **Copy** key can print the ECG report which was printed out last time. |
| N | START/STOP | Start/Stop printing reports |
| O | Arrow Keys | Moving the cursor (Up, Down, Left, Right)<br>In the manual mode, press the Up or Down arrow to switch the lead groups.<br>During the exercise test, pressing the Up or Down arrow can switch the display style. When the display style is 3×1, pressing the Left or Right arrow can switch the lead group. |

# 2.3 Front Panel

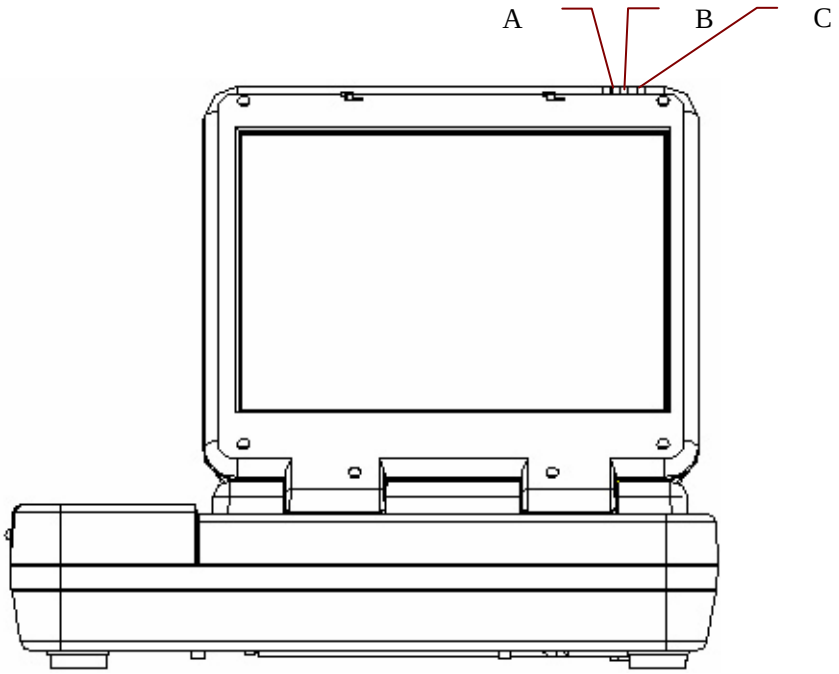



Figure 2-5 SE-12 Express Front Panel

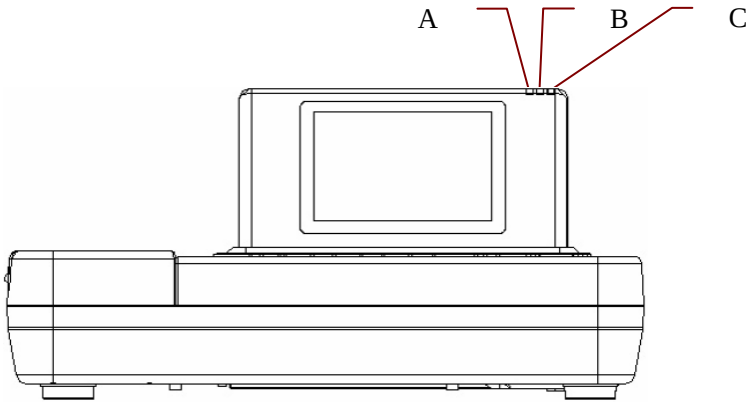



Figure 2-6 SE-12 Front Panel

| | Symbol | Name | Explanation |
|---|---|---|---|
| A | ~ | Mains supply indicator | When the device is powered by the mains supply, this indicator is lit. |
| B | | Battery indicator | When the device is powered by the built-in rechargeable lithium battery, this indicator is lit. |
| C | | Battery recharging indicator | When the battery is being recharged, this indicator is lit. |

# 2.4 Rear Panel

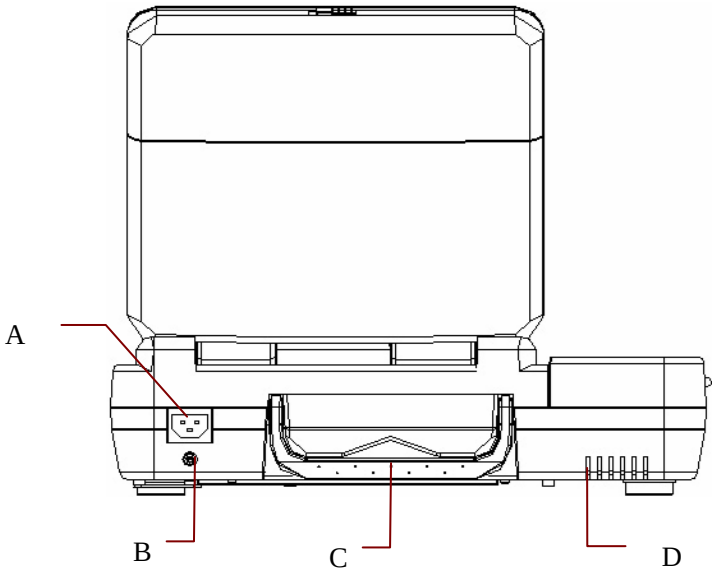



Figure 2-7 SE-12 Express Rear Panel

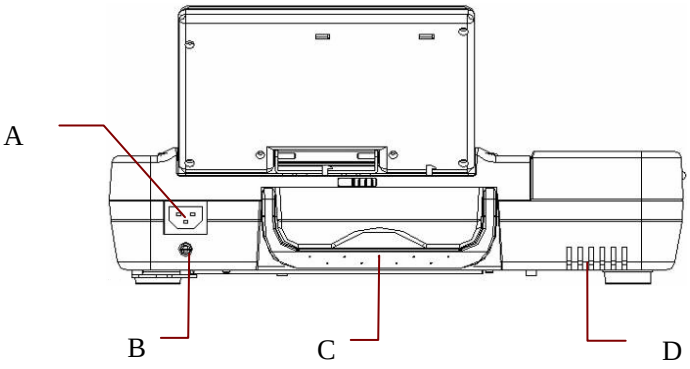



Figure 2-8 SE-12 Rear Panel

| | Name | Explanation |
|---|---|---|
| A | Mains Supply Socket | ~ AC SOURCE: alternating current supply socket |
| B | Potential Equalization Conductor | Potential equalization conductor provides a connection between the unit and the potential equalization bus bar of the electrical installation. |
| C | Handle | Part for people to hold |
| D | Heat Emission Hole | Path for internal heat emission |

# 2.5 Right Panel

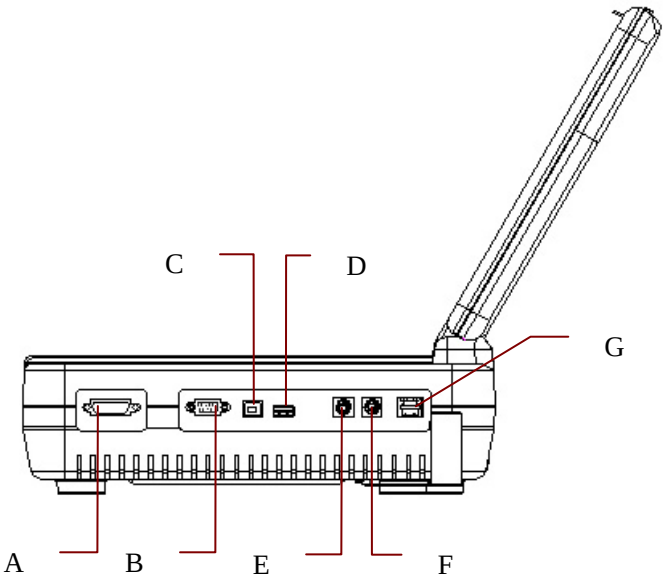



Figure 2-9 SE-12 Express Right Panel

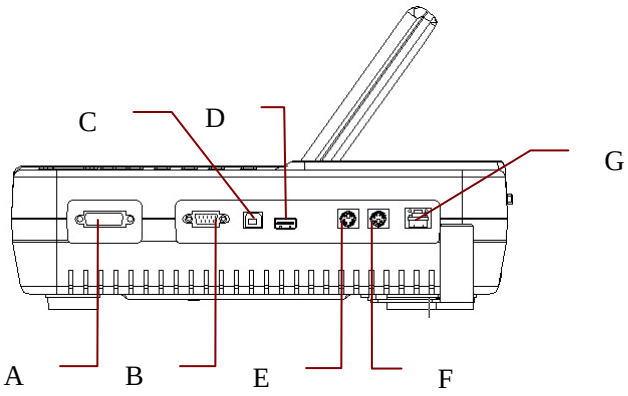
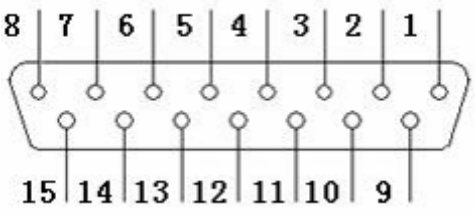



Figure 2-10 SE-12 Right Panel

| | Name | Explanation |
|---|---|---|
| A | Patient Cable Socket | Connecting to the patient cable |
| B | Serial Port 1 | Connecting to a PC<br>In the exercise test, connecting to the treadmill/ergometer |
| C | USB Socket 1 (Optional) | Standard USB socket, connecting to a PC |
| D | USB Socket 2 (Optional) | Standard USB socket, connecting to a U disk, a bar code reader or a USB printer recommended by the manufacturer |
| E | External Input / Output Socket | Connecting to the external signal device |

| | | |
|---|---|---|
| F | Serial Port 2 | In the exercise test, connecting to the stress BP monitor |
| G | Net port | Standard net port, connecting to a PC |

**1) Patient Cable Socket**




: Applied part of type CF with defibrillator proof

: Caution

Definitions of corresponding pins:

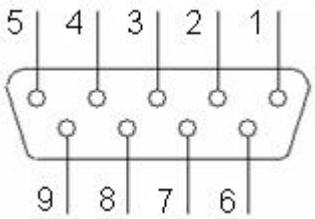
| Pin | Signal | Pin | Signal | Pin | Signal |
|---|---|---|---|---|---|
| **1** | C2 / V2 | **6** | SH | **11** | F / LL |
| **2** | C3 / V3 | **7** | NC | **12** | C1 / V1 or NC |
| **3** | C4 / V4 | **8** | NC | **13** | C1 / V1 |
| **4** | C5 / V5 | **9** | R / RA | **14** | RF (N) /RL or NC |
| **5** | C6 / V6 | **10** | L / LA | **15** | RF (N) / RL |

**Note**: The left side of "/" is European standard, and the right side is American standard.

**2) Serial Port 1**

**WARNING**

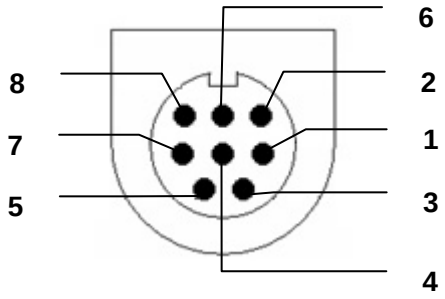
The isolated intensity of serial port 1 is 1500V AC and the maximum voltage applied should not exceed +15V DC.




Definitions of corresponding pins:

| Pin | Signal | Pin | Signal | Pin | Signal |
|---|---|---|---|---|---|
| **1** | NC | **4** | NC | **7** | NC |
| **2** | RxD (input) | **5** | GND | **8** | NC |
| **3** | TxD (output) | **6** | NC | **9** | NC |

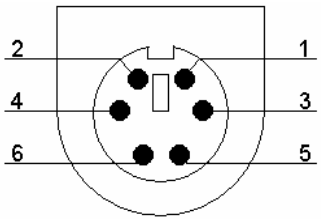
**3) Serial Port 2**




Definitions of corresponding pins:

| Pin | Signal | Pin | Signal |
|---|---|---|---|
| **1** | TxD (output) | **5** | NC |
| **2** | RxD (input) | **6** | NC |
| **3** | NC | **7** | GND |
| **4** | NC | **8** | GND |

**4) External Input/Output Socket**

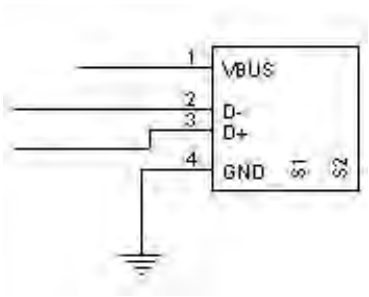



Definitions of corresponding pins:

| Pin | Signal | Pin | Signal |
|---|---|---|---|
| **1** | GND | **4** | GND |

| | | | |
|---|---|---|---|
| **2** | GND | **5** | ECG Signal (input) |
| **3** | GND | **6** | ECG Signal (output) |

**5) USB Socket 1/USB Socket 2 (Optional)**




**CAUTION**

Only the USB equipment recommended by the manufacturer can be connected to the USB interface.

Definitions of corresponding pins:

| Pin | Signal | Pin | Signal |
|---|---|---|---|
| **1** | +5V | **3** | D+ |
| **2** | D- | **4** | GND |

**WARNING**

1 Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC/EN standards (e.g. IEC/EN 60950 for data processing equipment and IEC/EN 60601-1 for medical equipment). Furthermore all configuration shall comply with the valid version of the standard IEC/EN 60601-1-1. Therefore anybody, who connects additional equipment to the signal input or output connector to configure a medical system, must make sure that it complies with the requirements of the valid version of the system standard IEC/EN 60601-1-1. If in doubt, consult our technical service department or your local distributor.

2 The summation of leakage current should never exceed leakage current limits while several other units are used at the same time.

# 2.6 Bottom Panel

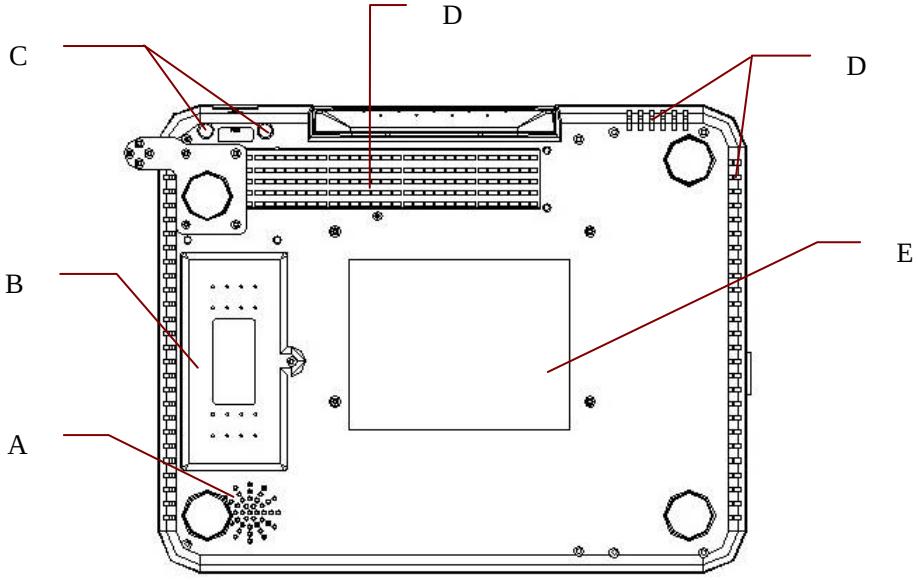



Figure 2-11 SE-12 Express Bottom Panel

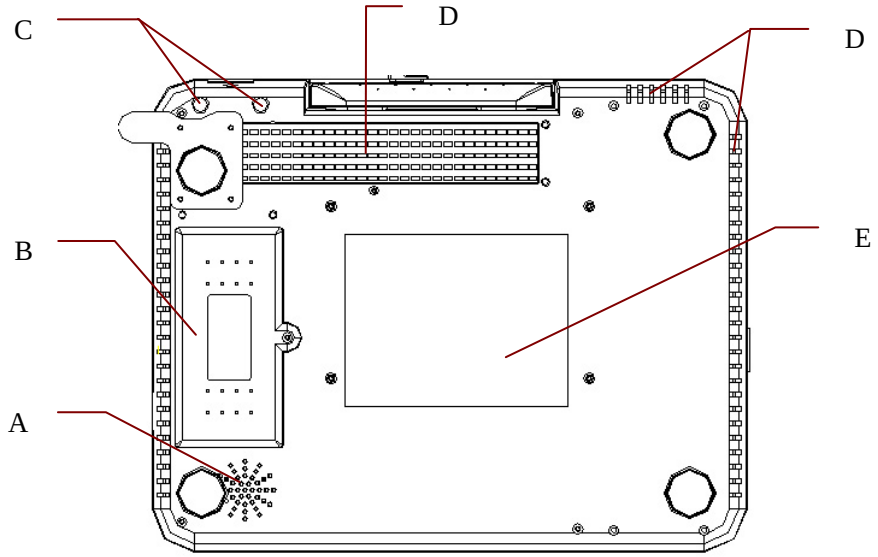



Figure 2-12 SE-12 Bottom Panel

| | Name | Explanation |
|---|---|---|
| A | Speaker Hole | Path for sound from speaker |
| B | Battery Compartment | Compartment for lithium battery |
| C | Fuse | The specification is: T1AL250VP Ø5×20 |
| D | Heat Emission Hole | Path for internal heat emission |
| E | Label | Position for product information label |

**1) Battery Compartment**

The rated voltage and the rated capacity of the rechargeable lithium battery pack are as follows:

**SE-12 Express**: Rated Voltage: 14.8V; Rated Capacity: 4400mAh

**SE-12**: Rated Voltage: 14.8V; Rated Capacity: 2200mAh

**WARNING**

1. Improper operation may cause the battery to be hot, ignited or exploded, and it may lead to the decrease of the battery capacity. Therefore, it is necessary to read the user manual carefully and pay more attention to warning messages.
2. When leakage or foul smell is found, stop using the battery immediately. If your skin or cloth comes into contact with the leakage liquid, cleanse it with clean water at once. If the leakage liquid splashes into your eyes, do not wipe them. Irrigate them with clean water first and go to see a doctor immediately.
3. Only qualified service engineers authorized by the manufacturer can open the battery compartment and replace the battery, and batteries of the same model and specification must be used.
4. Only when the device is off can the battery be installed or removed.

**Note**: If the battery has not been used for two months or more, you should recharge it before using it again.

**2) Fuse**

There are two fuses of the same specification installed on the bottom of the main unit. The specification is: T1AL250VP Ø5×20.

**WARNING**

Ruptured fuses must only be replaced with those of the same type and rating as the original.

# 2.7 Function Features

- Supporting multi-language
- Full alphanumeric keyboard (For SE-12 Express, touch screen is available)
- Built-in rechargeable lithium battery with large capacity
- ECG signals of 12 leads are gathered and amplified simultaneously, 12-channel waves are displayed and recorded simultaneously
- High resolution thermal recorder, recording frequency response ≤150Hz
- Supporting external USB printer
- Flexible printing formats
- The auto, manual, rhythm, R-R analysis and off modes can be chosen freely
- Automatic baseline adjustment for optimal printing
- Convenient operation of system setup and file management
- Multiple file formats: DAT/SCP/FDA-XML/PDF
- Measurement function and interpretation function
- Hint information of lead off, lack of paper, low battery capacity etc.
- Supporting bar code reader
- ECG data can be transmitted to the PC software through the serial cable, net cable, or wireless AP (optional).
- Real-time transmission to PC ECG

**The following features are only for the exercise test function of SE-12 Express (optional)**

- Real-time analysis, ST segment and trend are applied while sampling;
- Real-time display and print of 12-lead simultaneous ECG waveforms;

- ST segment analysis while sampling; ST position is adjustable while sampling;
- Providing average templates of three rhythm leads in every stage to observe the change of ST segments between every two stages
- Automatically forming elaborate reports, including Summary Report, ST Scope Report and Trend Graph Report
- Providing classical exercise protocols; exercise protocols can be edited and created
- Automatically controlling and adjusting the speed and grade of the treadmill or the power of the ergometer
- Supporting multi-types of treadmill or ergometer

# Chapter 3 About the Electrocardiograph Application

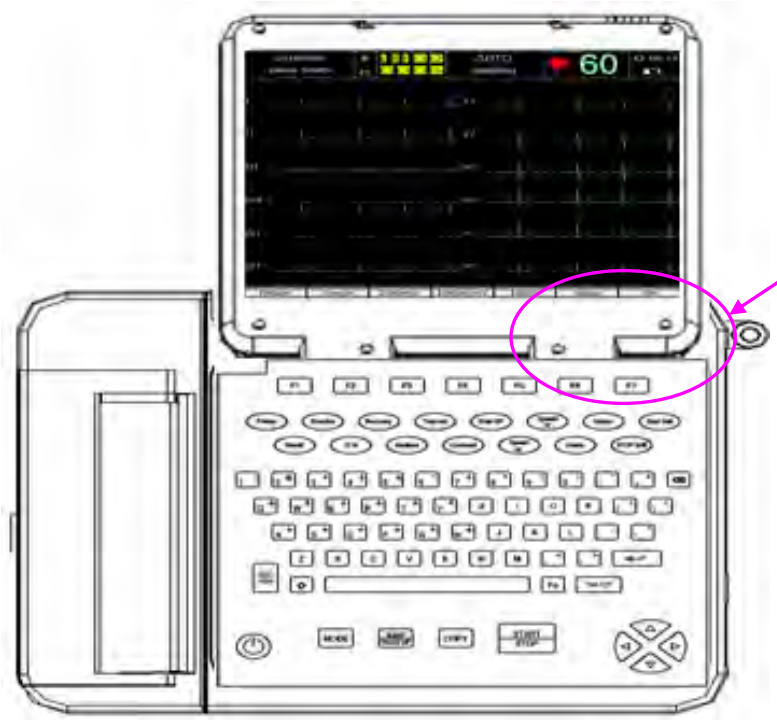
The following sections provide an overview of the main operations and functions.

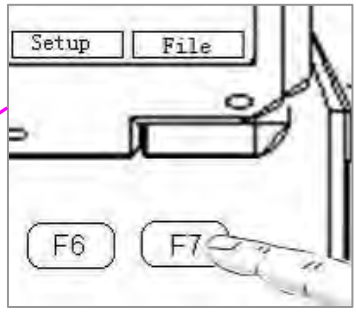
You can operate the electrocardiograph by using the keyboard. For SE-12 Express, you can also carry out the operations by using the touch screen.

**CAUTION**

Do not touch the LCD screen with sharp things such as pencils or pens; otherwise, it will be damaged.

## 3.1 Selecting Menu Functions



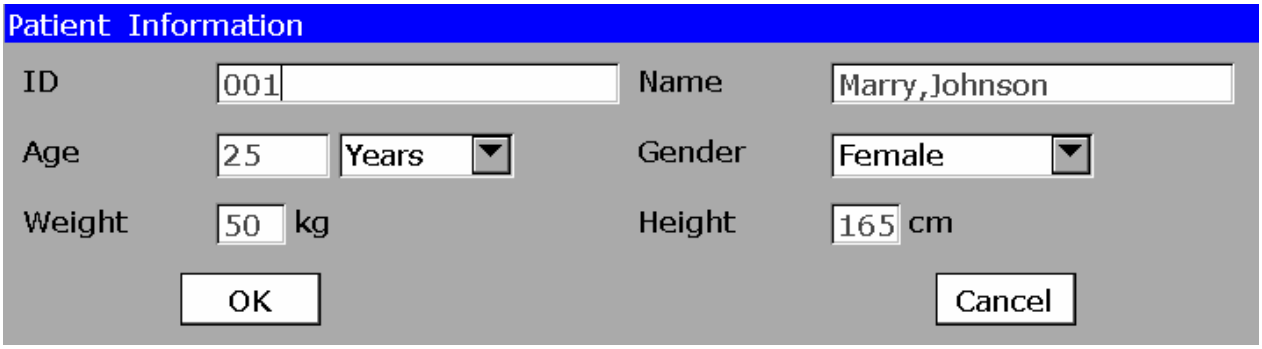



Press **F7** below **File** to select **File** and open the **File Manager** interface.

To select **Patient**, press the function key **F1** below **Patient**.

To select **Setup**, press the function key **F6** below **Setup**.

# 3.2 Entering Data

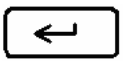
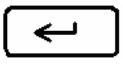


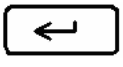

1. When the main interface is displayed, press the function key **F1** below **Patient** to open the **Patient Information** window.

2. Press **Tab** or Shift + **Tab** to move the cursor to the **Name** textbox.

3. Press  on the keyboard to erase the typed information.

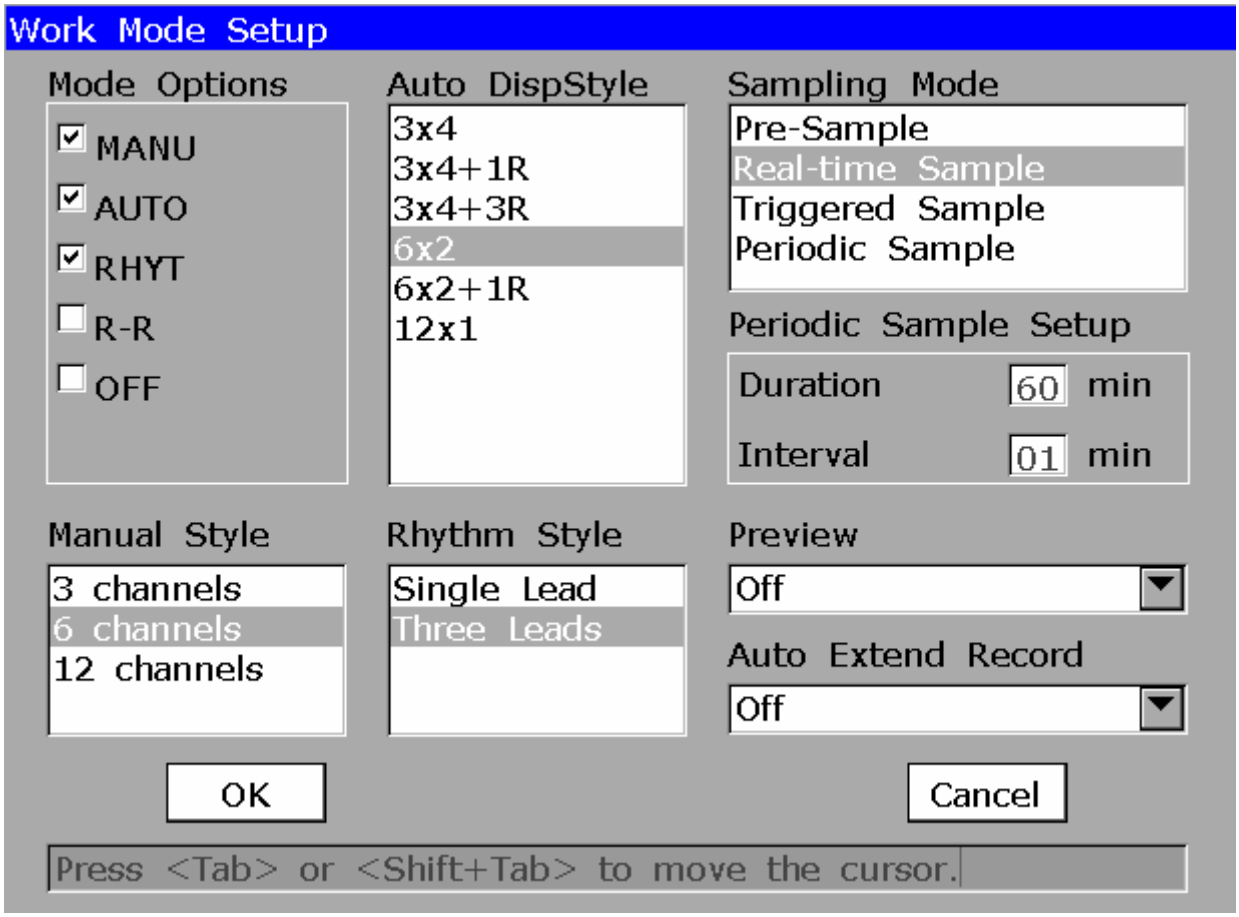
4. Press the letter or number keys on the keyboard to input patient name. Press **Fn** and a letter key to input the special character in the top right corner of the key. Press Shift  and a number key to input the special character in the top right corner of the key. For example, press **Fn** + **a** to input **è**, and press Shift + **3** to input **#**. If **Caps Lock** is set to **Off**, pressing Shift  and a letter key can input a capital letter. If **Caps Lock** is set to **On**, pressing Shift  and a letter key can input a lowercase letter.

5. Press  to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press  to confirm.

6. Press **ESC** to cancel the operation, or press **Tab** or Shift + **Tab** to move the cursor to the **Cancel** button, and then press  to cancel the operation.

# 3.3 Selecting an Item

When the main interface is displayed, press the function key **F6** below **Setup** to open the **System Setup** window. The cursor is on **Work Mode**. Press ↵ to open the **Work Mode Setup** interface.




1. Press **Tab** or Shift + **Tab** to move the cursor to **R-R**, press Spacebar to select it, and then a check mark √ appears in the box before **R-R**.

2. Press **Tab** or Shift + **Tab** to move the cursor to the **Rhythm Style** list box. Press the Up or Down arrow to highlight **Single Lead** or **Three Leads**.

3. Press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm.

4. Press **ESC** to cancel the operation, or press **Tab** or Shift + **Tab** to move the cursor to the **Cancel** button, and then press ↵ to cancel the operation.

# 3.4 About the Main Interface

After you turn on the device, the main interface pops up.


Figure 3-1 SE-12 Express Main Interface

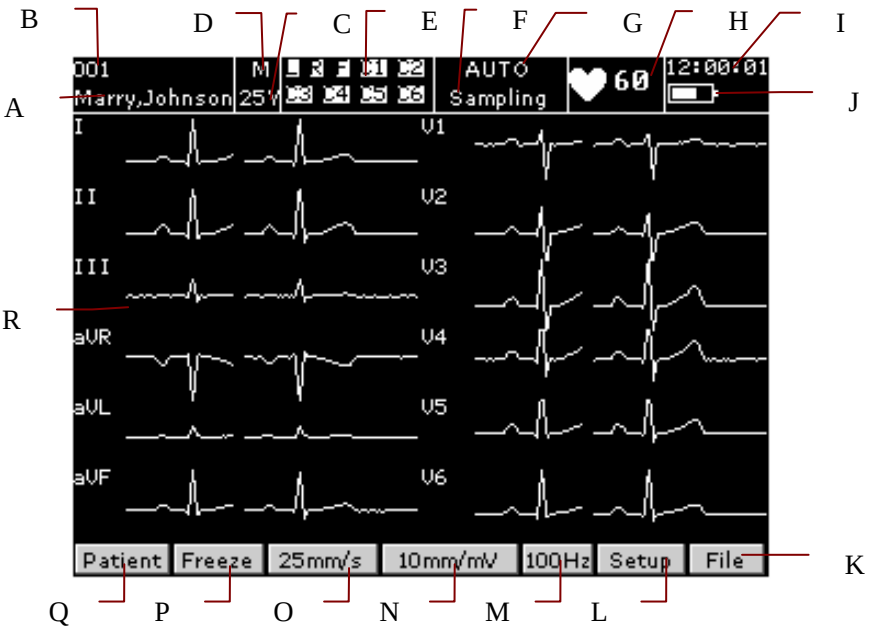



Figure 3-2 SE-12 Main Interface

| | Name | Explanation |
|---|---|---|
| A | Name | Patient Name: within 60 ASCII characters or the equivalent number of other characters that can be supported by equivalent memory used by 60 ASCII characters |
| B | ID | When **ID Mode** is set to **Manual**, the patient ID is within 30 ASCII characters.<br>When **ID Mode** is set to **Auto**, the patient ID is 0~1999, 999, 999.<br>When **ID Mode** is set to **Time**, the patient ID is within 10 characters. |
| C | Age | Patient Age<br>The patient age value and the age unit can be set in the **Patient Information** window. |
| D | Gender | Patient Gender (Male/Female/Empty) |
| E | Hint Information 1 | Including *DEMO*, *Module Error*, *Overload*, Lead Name (When the leads are off, the lead names will be shown in black on a yellow background in SE-12 Express, while in SE-12, they will be shown in black on a white background.) |
| F | Hint Information 2 | Including *No Paper*, *Paper Error*, *Battery Weak*, *Sampling*, *Analyzing*, *Recording*, *Testing*, *Learning*, *Transmitting*, *Transmit Fail*, *Detecting*, *Memory Full*, *U Disk*, *USB Printer*, *Lead Off*, *USB Scanner* |
| G | Work Mode | Manual, Auto, Rhythm, R-R Analysis or Off |
| H | Heart Rate | Actual Heart Rate |
| I | Current Time | Current examination time. Refer to Section 11.8.1, “Setting Date and Time”. |
| J | Battery Symbol | Identify the current capacity of the rechargeable battery |
| K | File | Press the function key **F7** below **File** to open the **File Manager** interface. For details, please refer to Chapter 10, “Managing Files”. |
| L | Setup | Press the function key **F6** below **Setup** to display the **System Setup** interface. For details, please refer to Chapter 11, “System Setup”. |
| M | Filter | EMG Filter: 25Hz, 35Hz or 45Hz<br>Lowpass Filter: 75Hz, 100Hz or 150Hz<br>**Note**: This setup can’t be saved if it is modified on the main interface. |

| | | |
|---|---|---|
| N | Gain | Gain: 2.5 mm/mV, 5 mm/mV, 10 mm/mV, 20 mm/mV, 10/5 mm/mV or AGC<br>**Note**: This setup can't be saved if it is modified on the main interface. |
| O | Speed | In the manual mode, you can set **Speed** to **5mm/s**, **6.25mm/s**, **10mm/s**, **12.5mm/s**, **25mm/s** or **50mm/s**. In the auto and rhythm modes, only **25mm/s** and **50mm/s** are available. In the R-R analysis mode, only **25mm/s** is available.<br>**Note**: This setup can't be saved if it is modified on the main interface. |
| P | Freeze | Freezing ECG waves. For details, please refer to Chapter 7, "Freezing ECG Waves". |
| Q | Patient | Press the function key **F1** below **Patient** to open the **Patient Information** window. For details, please refer to Chapter 6, "Entering Patient Information". |
| R | ECG waveform | Display ECG waveform |

# 3.5 About the Main Interface of Exercise ECG (Optional for SE-12 Express)

After turning on the electrocardiograph, press **Pretest** on the keyboard to open the main interface of the exercise test (Figure 3-3). During the exercise test, the main interface of ST Trend (Figure 3-4) or the main interface of Template (Figure 3-5) will appear.

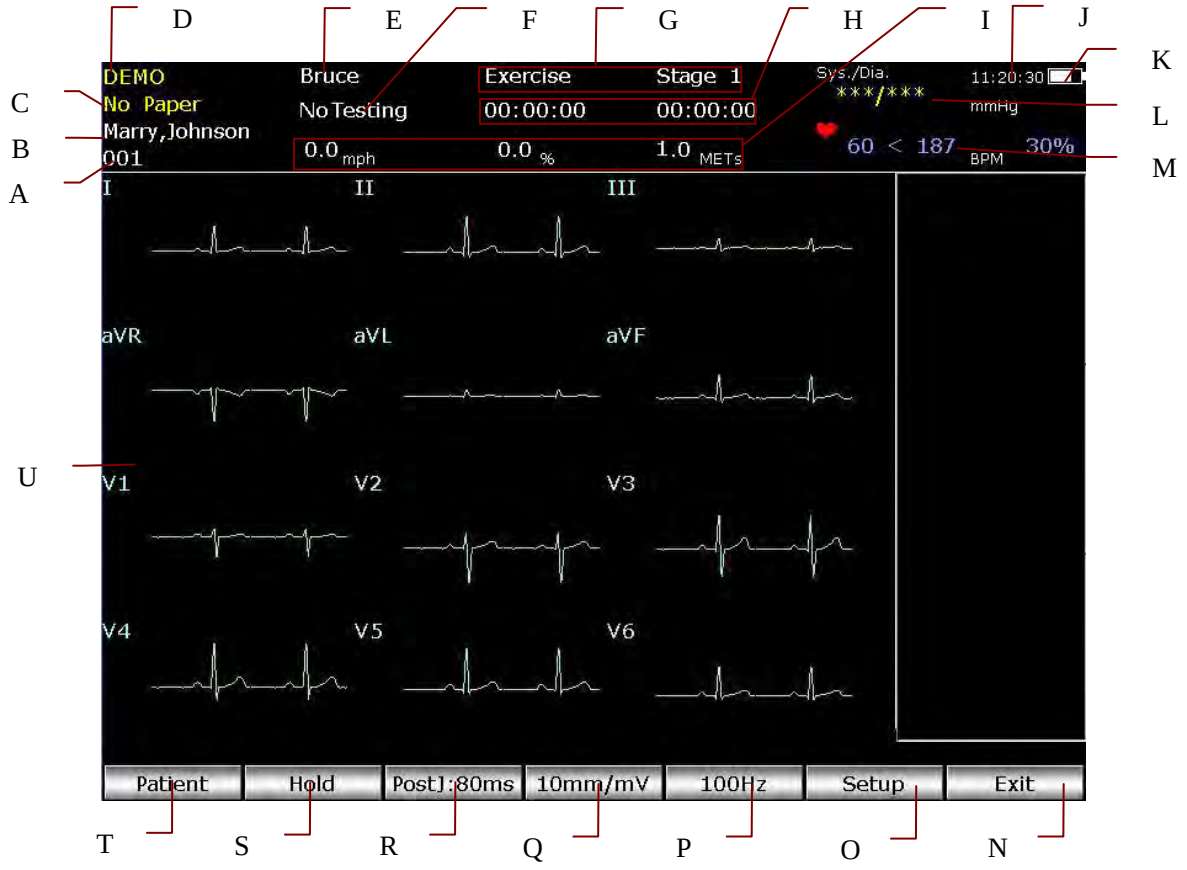



Figure 3-3 Main Interface of Exercise Test

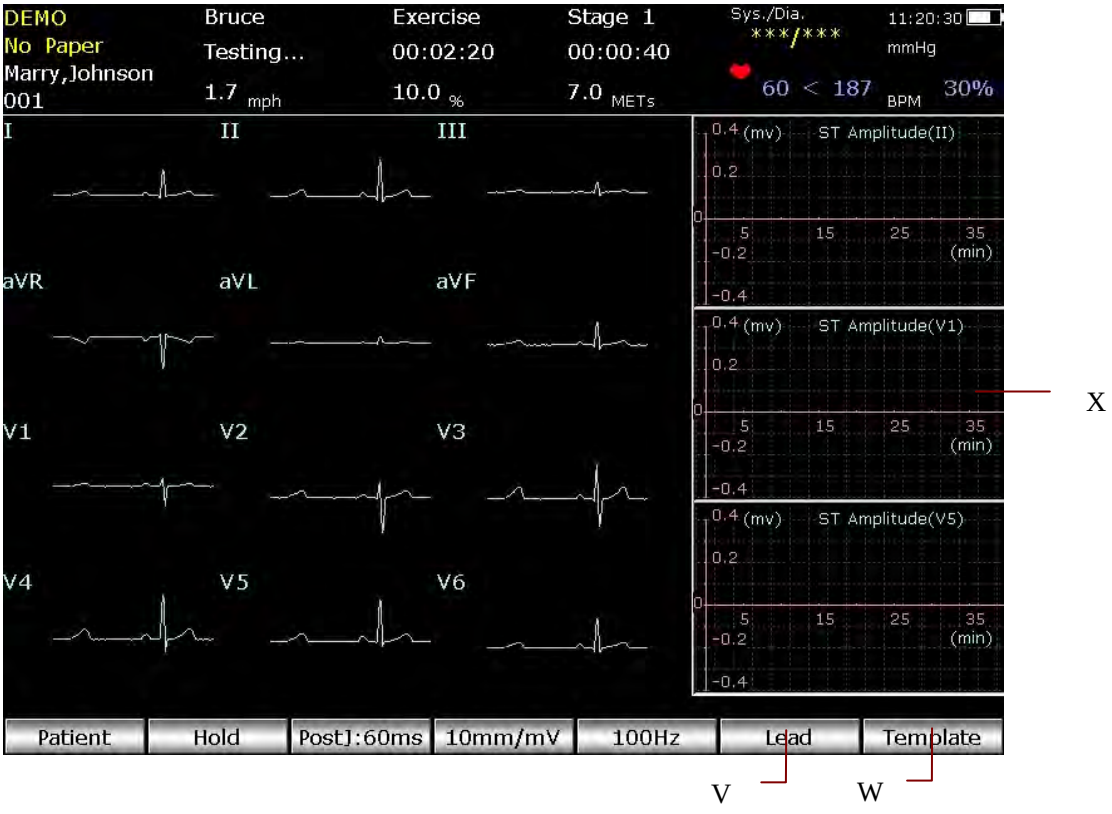



Figure 3-4 Main Interface of ST Trend

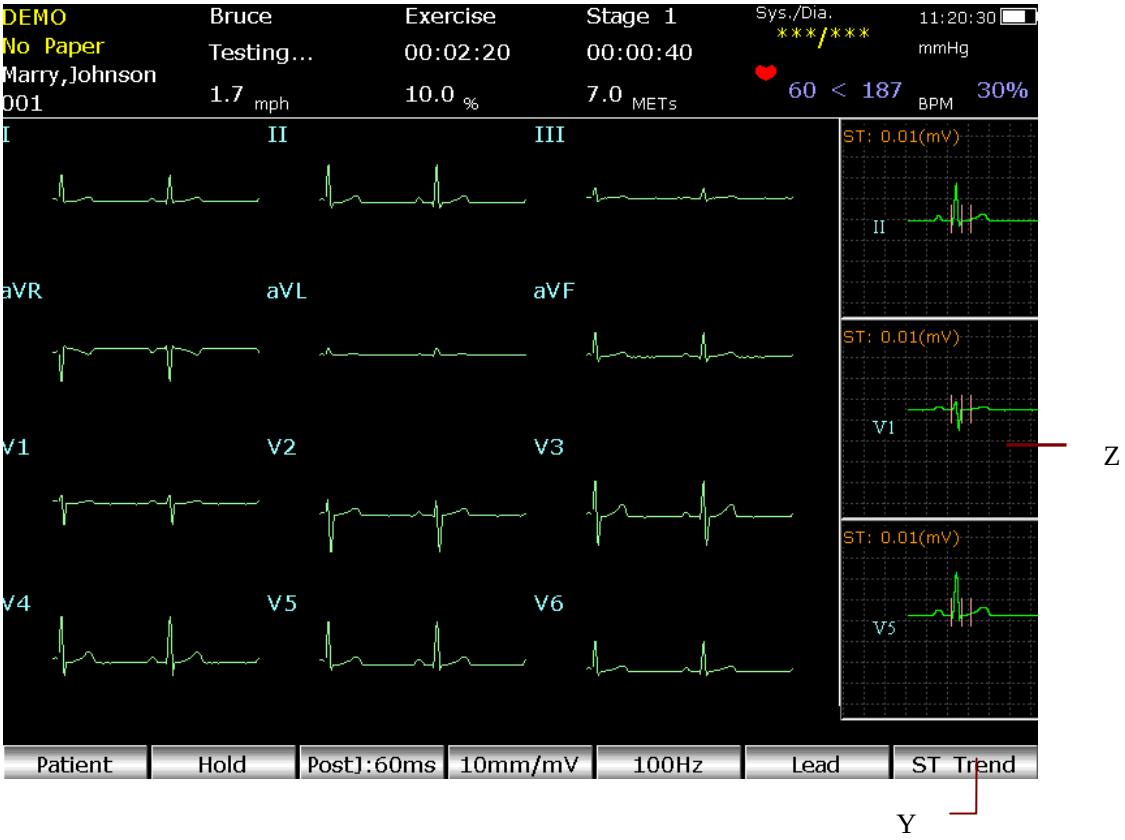



Figure 3-5 Main Interface of Template

| | | |
|---|---|---|
| A | ID | When **ID Mode** is set to **Manual**, the patient ID is within 30 characters.<br>When **ID Mode** is set to **Auto**, the patient ID is 0~1999, 999, 999.<br>When **ID Mode** is set to **Time**, the patient ID is within 10 characters. |
| B | Name | Patient Name: within 60 ASCII characters or the equivalent number of other characters that can be supported by equivalent memory used by 60 ASCII characters |
| C | Hint Information1 | *HR Overrange!*, *Sys. Overrange!*, *Dia. Overrange!*, *Battery Weak*, *No Paper*, *Paper Error* |
| D | Hint Information2 | *DEMO*, *Module Error*, *Lead X Off*, *Overload* |
| E | Current Protocol | The selected protocol name |
| F | Hint Information3 | *No Testing*, *Testing…*, *Testing Stop*<br>During the exercise test, the count from 0 to 9 is displayed after the **12ld** key on the keyboard is pressed. |
| G | Current Phase and Stage | The current phase and stage of the exercise test |

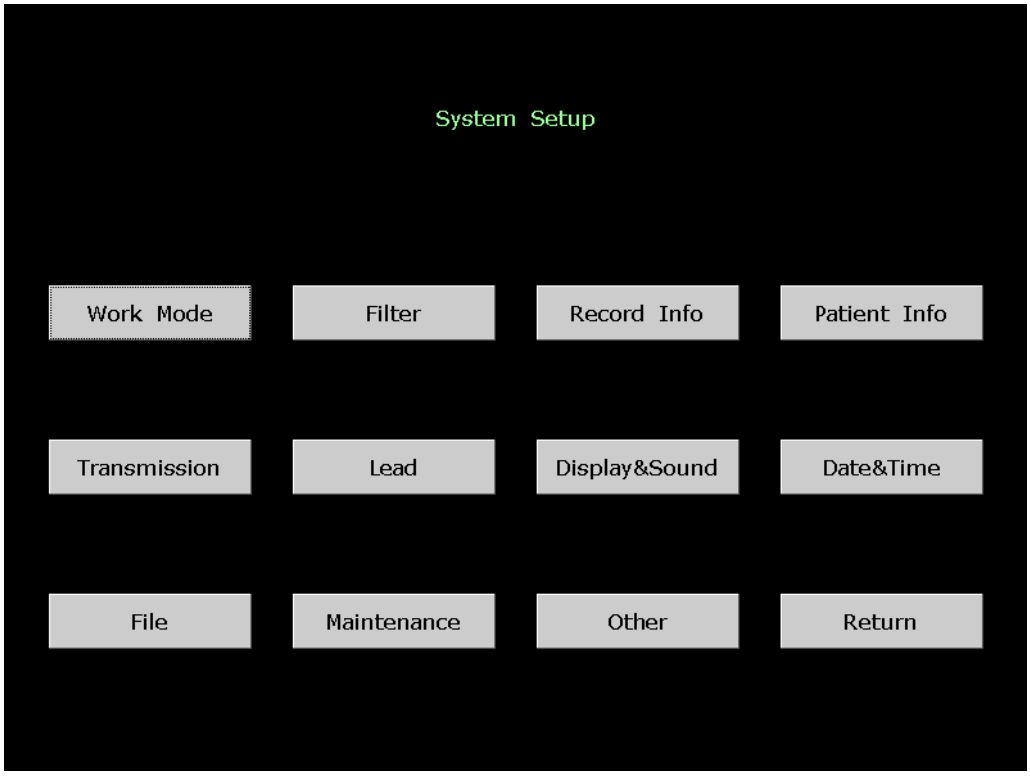
| | | |
|---|---|---|
| H | Total Time and Stage Time | The left number is the total time, which is counted from the beginning of the pretest phase to the end of the exercise test.<br>The right number is the stage time, which shows the running time of the current stage. |
| I | Current Speed or Rotation Speed, Grade or Power, Workload | When the treadmill is used, the current speed, grade and workload of the treadmill will be displayed on the main interface; When the ergometer is used, the current rotation speed and power of the ergometer will be displayed on the main interface. |
| J | Current Time | Current examination time. Refer to Section 11.8.1, “Setting Date and Time”. |
| K | Battery Symbol | Identify the current capacity of the rechargeable battery<br>  : Full capacity;  : 2/3 capacity;  : 1/3 capacity;<br>  : Low capacity |
| L | Systolic Blood Pressure and Diastolic Blood Pressure | The left number is the systolic blood pressure, and the right number is the diastolic blood pressure. |
| M | Current Heart Rate and Target Heart Rate | The left number is the current heart rate, and the right number is the target heart rate.<br>**30%** is the percentage of the current heart rate to the target heart rate. |
| N | Exit | Press the function key **F7** below **Exit** to exit the main interface of the exercise test.<br>In the exercise test, the **Exit** button changes into the **ST Trend** or **Template** button. |
| O | Setup | Press the function key **F6** below **Setup** to open the **System Setup** interface.<br>In the exercise phase, the **Setup** button changes into the **Lead** button. |
| P | Filter | EMG Filter: 25Hz, 35Hz or 45Hz<br>Lowpass Filter: 75Hz, 100Hz or 150Hz |
| Q | Gain | Gain: 2.5 mm/mV, 5 mm/mV, 10 mm/mV, 20 mm/mV, 10/5 mm/mV or AGC |
| R | Post J: 80ms | Post J is the length after J point of ST segment. Press the function key **F3** below **Post J** to set Post J to 0, 20ms, 40ms, 60ms or 80ms.<br>**Note**: J point is the connection point between the end of QRS complex and the start of ST segment. It is the standard point to |

| | | |
|---|---|---|
| | | fix the position of ST segment. Please select a proper option based on the patient's actual ECG waves. |
| S | Hold | Press the function key **F2** below **Hold**, and then the system will not follow the previous settings to change the speed and grade of the treadmill, but keep the current speed and grade until this key is pressed again. |
| T | Patient | Press the function key **F1** below **Patient** to open the **Patient Information** window. It is invalid in the exercise test. |
| U | ECG waveforms | Display real-time ECG waveforms |
| V | Lead | Press the function key **F6** below **Lead** to open the **Lead Setup** interface. |
| W | Template Button | Press the function key **F7** below **Template**, and then the 3-lead average templates will be displayed, and the **Template** button will change into the **ST Trend** button. |
| X | ST Trend | Display 3-lead ST trends |
| Y | ST Trend Button | Press the function key **F7** below **ST Trend**, and then the 3-lead ST trends will be displayed, and the **ST Trend** button will change into the **Template** button. |
| Z | Average Template | The 3-lead average waves which are updated every 10 seconds, and the positions of the calibration lines<br>The 3 leads can be selected on the **Lead Setup** interface of the exercise test. |

# 3.6 About the System Setup Interface

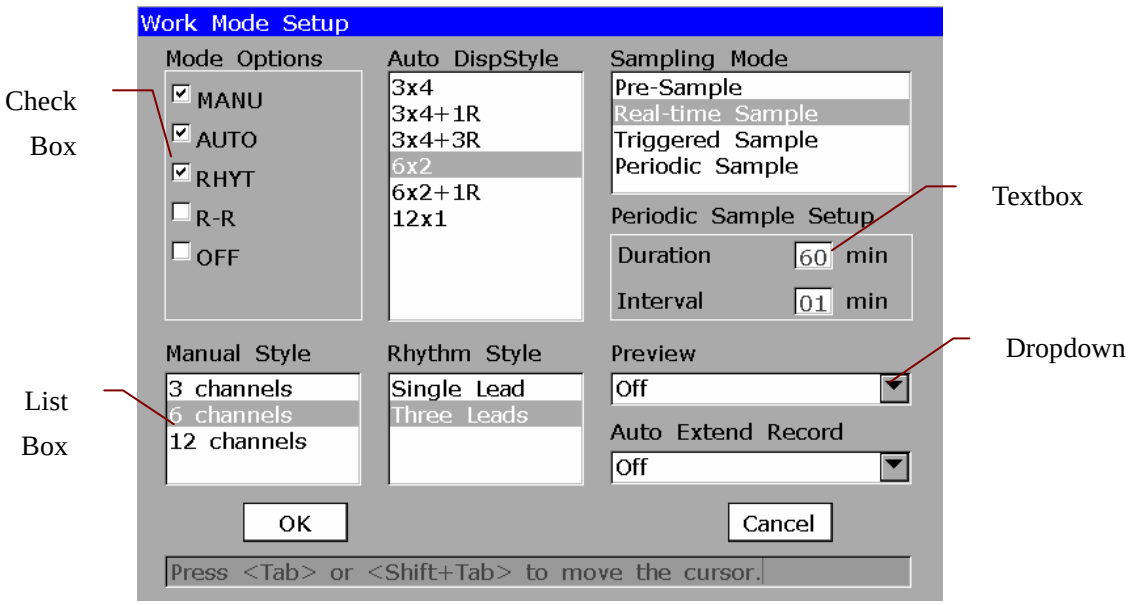
When the main interface is displayed, press the function key **F6** below **Setup** to display the **System Setup** interface.

**Note:** If you set the system password on the **System Maintenance** interface, you need enter the password before opening the **System Setup** interface. For details, refer to Section 11.10.7, "Setting System Password".




On the **System Setup** interface, press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on an item, press ↵ to open the setup interface of the item.

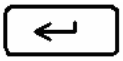
Take the **Work Mode Setup** interface for example:

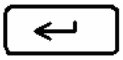



1. On the **Work Mode Setup** interface, press **Tab** or Shift + **Tab** to move the cursor among different check boxes. Press Spacebar to select a check box, and a check mark √ appears in the box.

2. On the **Work Mode Setup** interface, press **Tab** or Shift **+ Tab** to move the cursor to a list box or dropdown. Press the Up or Down arrow to highlight an option.

3. On the **Work Mode Setup** interface, press **Tab** or Shift + **Tab** to move the cursor to a textbox. Fill in the selected textbox.

4. Press  to confirm, or press **Tab** or Shift **+ Tab** to move the cursor to the **OK** button, and then press  to confirm.

5. Press **ESC** to cancel the operation, or press **Tab** or Shift **+ Tab** to move the cursor to the **Cancel** button, and then press  to cancel the operation.

# 3.7 About the File Manager Interface

When the main interface is displayed, press the function key **F7** below **File** to open the **File Manager** interface1. Press the Up or Down arrow to highlight a file on the **File Manager** interface1, and then press the function key **F4** below **Select** to select the file and display the **File Manager** interface2. Then press the function key **F7** below **Return** to return to the **File Manager** interface1. Press the function key **F7** below **Return** on the **File Manager** interface1 to return to the main interface.

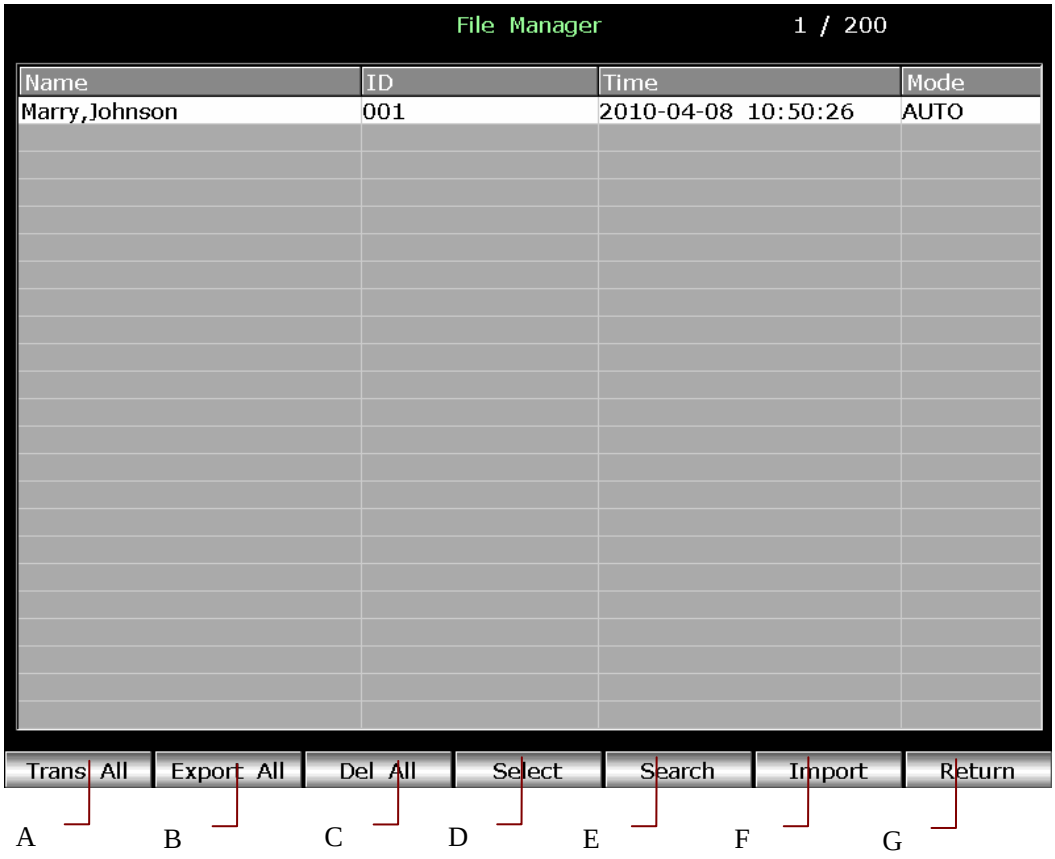



Figure 3-6 File Manager Interface1

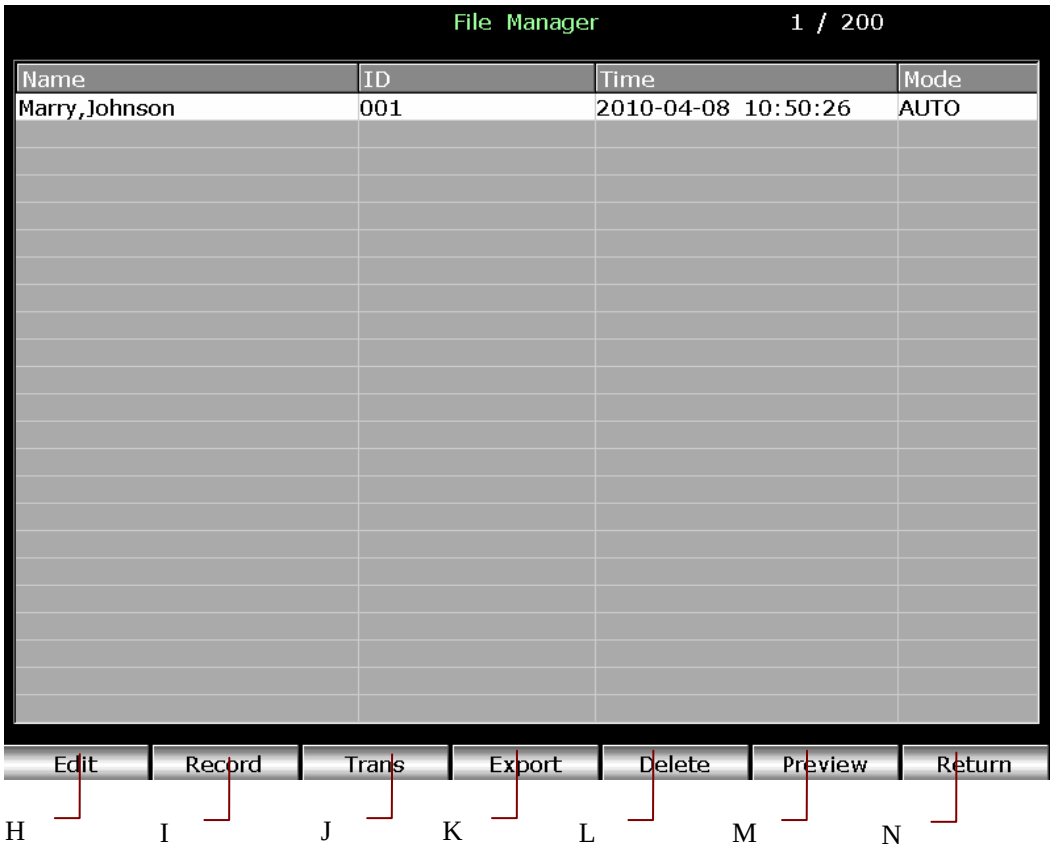



Figure 3-7 File Manager Interface2

| | Name | Explanation |
|---|---|---|
| A | Trans All | Press the function key **F1** below **Trans All** to transmit all the files to the PC. |
| B | Export All | Press the function key **F2** below **Export All** to export all the files from the electrocardiograph to the U disk. |
| C | Del All | Press the function key **F3** below **Del All** to delete all the files from the electrocardiograph. |
| D | Select | Press the Up or Down arrow to highlight a file on the **File Manager** interface1, and then press the function key **F4** below **Select** to select the file and display the **File Manager** interface2. |
| E | Search | Press the function key **F5** below **Search** to open the **SearchInfo Setup** window. |
| F | Import | Press the function key **F6** below **Import** to import files from the U disk to the electrocardiograph. |
| G | Return | Press the function key **F7** below **Return** to return to the main interface. |
| H | Edit | Press the function key **F1** below **Edit** to open the **Patient Information** window. Then you can edit the patient information. |
| I | Record | Press the function key **F2** below **Record** to print the selected file. |
| J | Trans | Press the function key **F3** below **Trans** to transmit the selected file to the PC. |
| K | Export | Press the function key **F4** below **Export** to export the selected file from the electrocardiograph to the U disk. |
| L | Delete | Press the function key **F5** below **Delete** to delete the selected file from the electrocardiograph. |
| M | Preview | Press the function key **F6** below **Preview** to open the file preview interface. |
| N | Return | Press the function key **F7** below **Return** to return to the **File Manager** interface1. |

# Chapter 4 Operation Preparations

**WARNING**

Before use, the equipment, patient cable and electrodes should be checked. Replace them if there is any evident defectiveness or aging which may impair the safety or the performance, and make sure that the equipment is in proper working condition.

## 4.1 Power and Earthing

**WARNING**

If the integrity of the external protective conductor is in doubt, the equipment should be powered by the built-in rechargeable battery.

**Power Supply**

The electrocardiograph can be powered by either the mains supply or the built-in rechargeable lithium battery.

- **Mains Supply**

  The mains socket is on the rear panel of the unit. If the mains supply is used, connect the power cord to the socket first, and then connect the power cord to the hospital grade outlet.

  Operating voltage: 100V-240V~

  Operating frequency: 50Hz/60Hz

  Input power: 70VA

  Make sure that the mains supply meets the above requirements before power-on, and then press on the keyboard to power on the unit. The mains supply indicator (~) is lit.

  If the built-in rechargeable battery is weak when the mains supply is used, it will be recharged automatically at the same time. Both the mains supply indicator (~) and the battery recharging indicator (⇥▭) will be lit.

♦ **Built-in Rechargeable Battery**

When the built-in rechargeable lithium battery is used, turn on the unit by pressing  on the keyboard. Then the battery indicator (  ) will be lit and the battery symbol will be displayed on the LCD screen. Because of the consumption during the storage and transport course, the battery capacity may not be full. If the symbol  and the hint information *Battery Weak* are displayed, which means the battery capacity is low, please recharge the battery first.

**CAUTION**

If the electrocardiograph is turned off automatically because of low battery capacity, the settings may not be saved.

When the battery is fully charged, SE-12 can work normally about 4 hours, and print about 300 ECG reports of 3×4+1R in the auto mode; SE-12 Express can work normally about 5 hours, and print about 350 ECG reports of 3×4+1R in the auto mode.

Please refer to the maintenance section for how to recharge the battery. When the battery is being recharged, the electrocardiograph can be powered by the mains supply.

**WARNING**

Potential equalization conductor of the unit should be connected to the potential equalization bus bar of the electrical installation when necessary.

# 4.2 Loading/Replacing Recorder Paper

Two kinds of recorder paper can be used. One is the folded thermal paper, and the other is the rolled thermal paper.

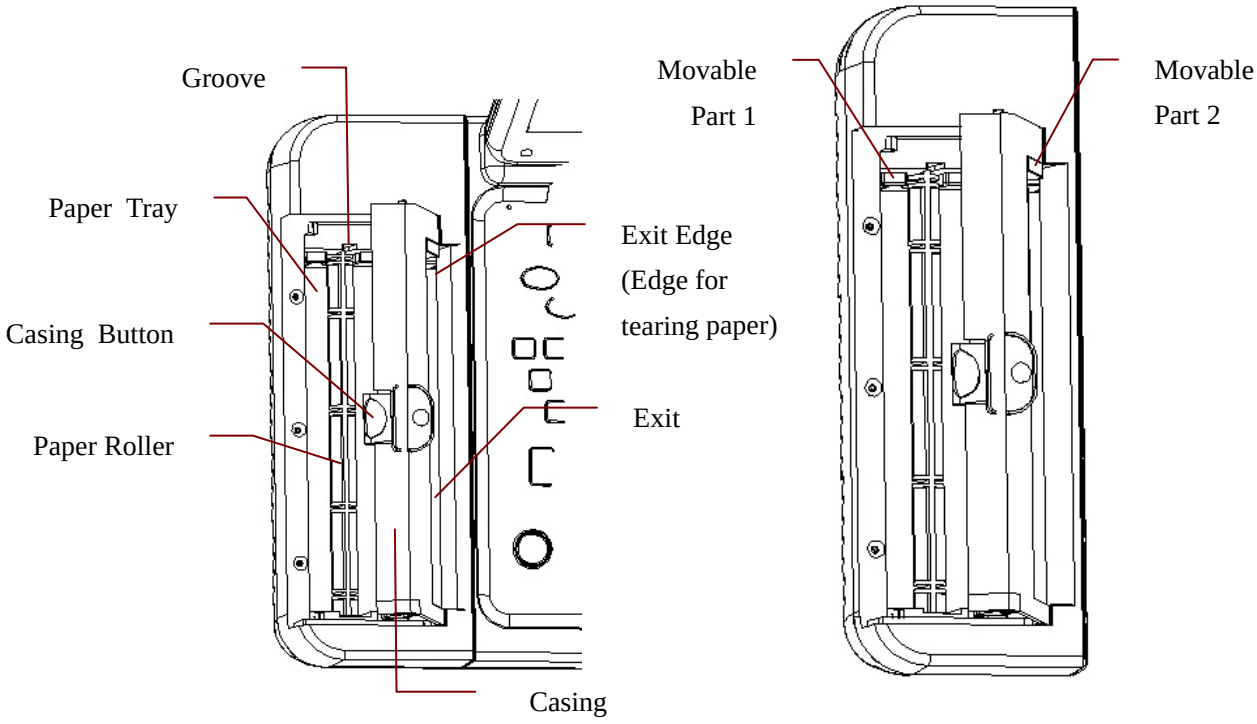
**Notes**:

1. When the folded thermal paper is used, the paper roller is unnecessary and must be taken out.
2. When using the paper of 216mm in width, the two movable parts should be removed.
3. The exit edge can help you tear the recorder paper.

**CAUTION**

Make sure that the recorder paper, especially the rolled paper, is installed in the center of the recorder, and the paper edge is parallel with the casing edge in the direction of advancing paper, in order to avoid paper deviation or damage to the paper edge.

When the recorder paper runs out or is not loaded, the hint message *No Paper* will appear on the screen. Then you should load or replace the recorder paper immediately.




**Loading/Replacing Process of Folded Paper:**

1) Press the casing button downwards and remove the casing to open the recorder.

2) Remove the remainder paper from the paper tray if necessary.

3) Take off the wrapper of the new folded paper, and then put it in the paper tray.

4) Pull the paper out with the grid side facing the thermal print head, and replace the casing on the recorder.

5) Press down the recorder casing firmly.

6) To select **Paper Marker**.

Press on the keyboard to turn on the unit. After the main interface is displayed, press the function key **F6** below **Setup** to display the **System Setup** interface. Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Record Info** on the **System Setup** interface, press to open the **Record Info Setup** interface. Press **Tab** or Shift + **Tab** to move the cursor to the **Paper Marker** list box, and then press the Up or Down arrow to highlight **No** or **Yes**. Press to confirm, and then the **System Setup** interface appears. Press **ESC** to return

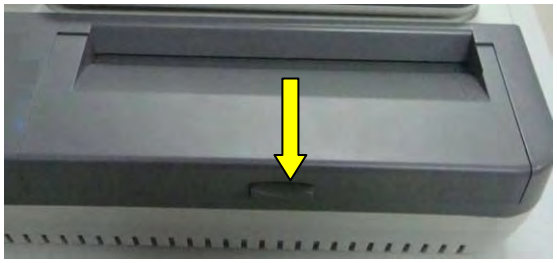
to the main interface.

7) Advance the recorder paper.

When the main interface is displayed, if **Paper Marker** is set to **Yes**, you can press Tab/♂ to advance the recorder paper to the next black marker; if **Paper Marker** is set to **No,** you can press Tab/♂ to advance the paper for 2.5cm. Press Tab/♂ again to stop advancing the paper.

**Loading/Replacing Process of Rolled Paper:**

1) Press the casing button downwards and remove the casing to open the recorder.



2) Take out the paper roller, and remove remainder paper from the roller if necessary.

3) Take off the wrapper of the new thermal paper roll, and then put the paper roll through the roller.

4) Place the paper and the roller gently in the recorder with the roller pin clicking into the groove.


5) Pull the paper out with the grid side facing the thermal print head, and replace the casing

on the recorder.

6) Press down the recorder casing firmly.

7) To select **Paper Marker**.

Press ⏻ on the keyboard to turn on the unit. After the main interface is displayed, press the function key **F6** below **Setup** to display the **System Setup** interface. Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Record Info** on the **System Setup** interface, press ↵ to open the **Record Info Setup** interface. Press **Tab** or Shift + **Tab** to move the cursor to the **Paper Marker** list box, and then press the Up or Down arrow to highlight **No**. Press ↵ to confirm, and then the **System Setup** interface appears. Press **ESC** to return to the main interface.

8) Advance the recorder paper.

When the main interface is displayed, you can press Tab/♂ to advance the paper for 2.5cm. Press Tab/♂ again to stop advancing the paper.

# 4.3 Preparing the Patient

## 4.3.1 Instructing the Patient

Before attaching the electrodes, greet the patient and explain the procedure. Explaining the procedure decreases the patient's anxiety. Reassure the patient that the procedure is painless.

Privacy is important for relaxation. When possible, prepare the patient in a quiet room or area where others can’t see the patient. Make sure that the patient is comfortable. The more relaxed the patient is, the less the ECG will be affected by noise.

## 4.3.2 Preparing the Skin

Thorough skin preparation is very important. The skin is a poor conductor of electricity and frequently creates artifacts that distort the ECG signals. By performing methodical skin preparation, you can greatly reduce the possibility of noise caused by muscle tremor and baseline drift, ensuring high-quality ECG waves. There is natural resistance on the skin surface due to dry, dead epidermal cells, oils and dirt.

**To Prepare the Skin**

1 Shave hair from electrode sites, if necessary. Excessive hair prevents a good connection.

2 Wash the area thoroughly with soap and water.

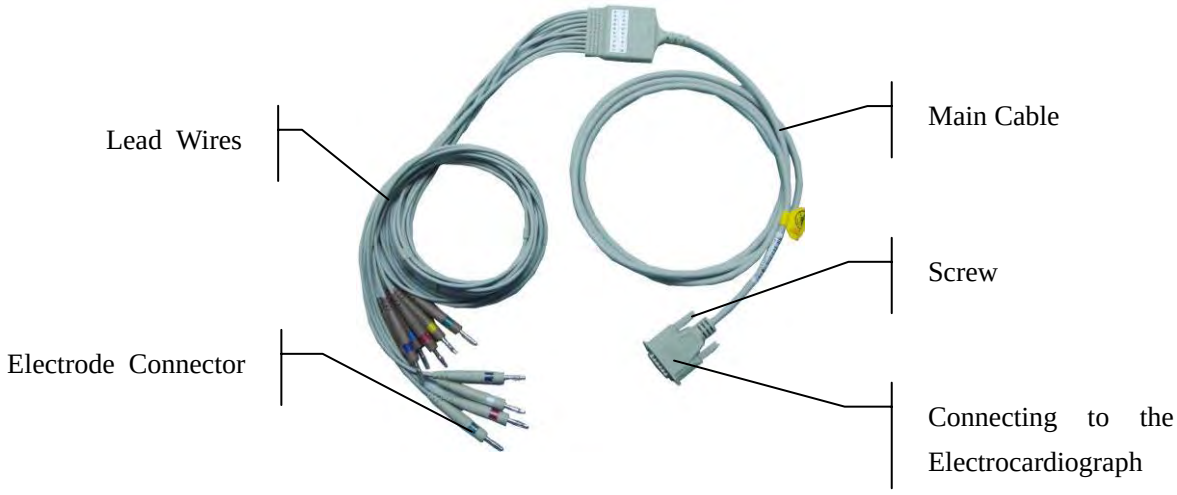
3 Dry the skin with a gauze pad to increase capillary blood flow to the tissues and to remove the dead, dry skin cells and oils.

# 4.4 Connecting the Patient Cable to the Electrocardiograph and Electrodes

**WARNING**

The performance and electric shock protection can be guaranteed only if the original patient cable and electrodes of the manufacturer are used.

The patient cable includes the main cable and lead wires which can be connected to electrodes.




Patient Cable for Resting ECG


Patient Cable for Exercise ECG

**1. Connecting the Patient Cable to the Electrocardiograph**

Connect the patient cable to the patient cable socket on the right side of the main unit, and then

secure them with two screws.

**2. Connecting the Patient Cable to Electrodes**

Align all lead wires of the patient cable to avoid twisting, and connect the lead wires to the reusable electrodes or the alligator clips. Firmly attach them.

# 4.5 Attaching Electrodes to the Patient (for Resting ECG)

## 4.5.1 Lead Placement

### 4.5.1.1 Standard 12-Lead Placement

The identifiers and color codes of electrode connectors used comply with IEC/EN requirements. In order to avoid incorrect connection, the identifiers and color codes are specified in Table 4-1. Moreover the equivalent codes according to European requirements are given in Table 4-1 too.

Table 4-1 Electrode Connectors and Their Identifiers and Color Codes

| | European | | American | |
|---|---|---|---|---|
| **Electrode Connectors** | **Identifier** | **Color Code** | **Identifier** | **Color Code** |
| Right arm/Right deltoid | R | Red | RA | White |
| Left arm/Left deltoid | L | Yellow | LA | Black |
| Right leg/Upper leg as close to torso as possible | N or RF | Black | RL | Green |
| Left leg/Upper leg as close to torso as possible | F | Green | LL | Red |
| Chest 1 | C1 | White/Red | V1 | Brown/Red |
| Chest 2 | C2 | White/Yellow | V2 | Brown/Yellow |
| Chest 3 | C3 | White/Green | V3 | Brown/Green |
| Chest 4 | C4 | White/Brown | V4 | Brown/Blue |

| | | | | |
|---|---|---|---|---|
| Chest 5 | C5 | White/Black | V5 | Brown/Orange |
| Chest 6 | C6 | White/Violet | V6 | Brown/Violet |

As the following figure shows, the positions of chest electrodes on the body surface are

C1: Fourth intercostal space at the right border of the sternum

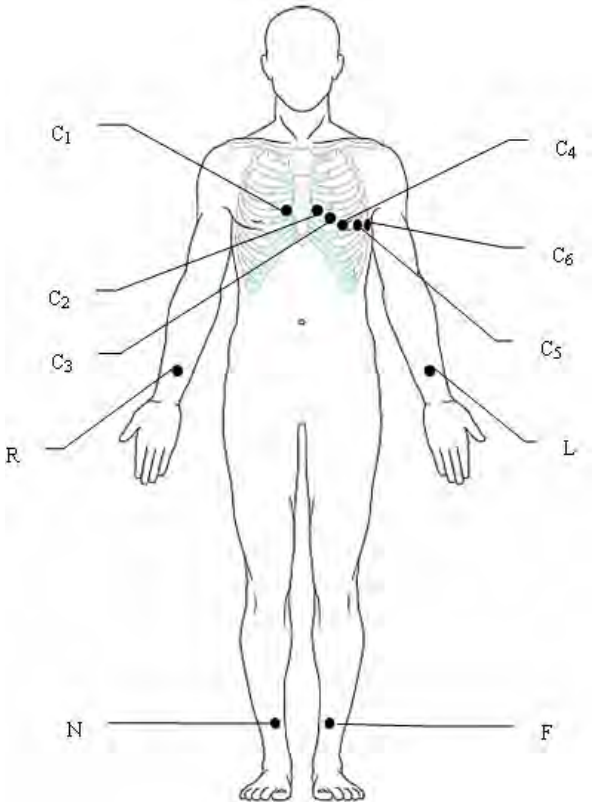
C2: Fourth intercostal space at the left border of the sternum

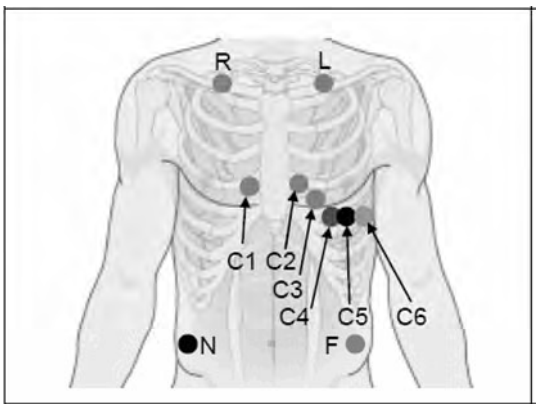
C3: Fifth rib between C2 and C4

C4: Fifth intercostal space on the left midclavicular line

C5: Left anterior axillary line at the horizontal level of C4

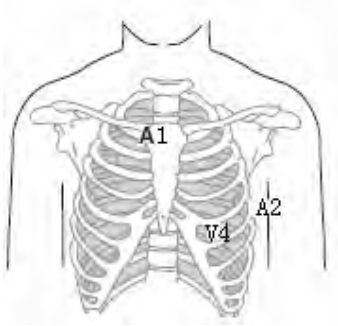
C6: Left midaxillary line at the horizontal level of C4



### 4.5.1.2 NEHB Placement

The electrodes' positions on the body surface are shown in the following table and figure.



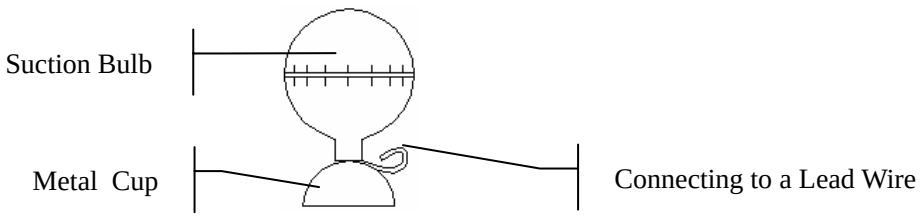

| American Label | European Label | Electrode Placement |
|---|---|---|
| A1 | $N_{st}$ | Attachment point of the second rib to the right sternal edge |
| A2 | $N_{ax}$ | Fifth intercostal space on the left posterior axillary line |
| V4 | $N_{ap}$ | Left mid-clavicular line in the fifth intercostal space |
| RA | R | Right arm |
| LA | L | Left arm |
| RL | N or RF | Right leg |
| LL | F | Left leg |

## 4.5.2 Electrode Placement

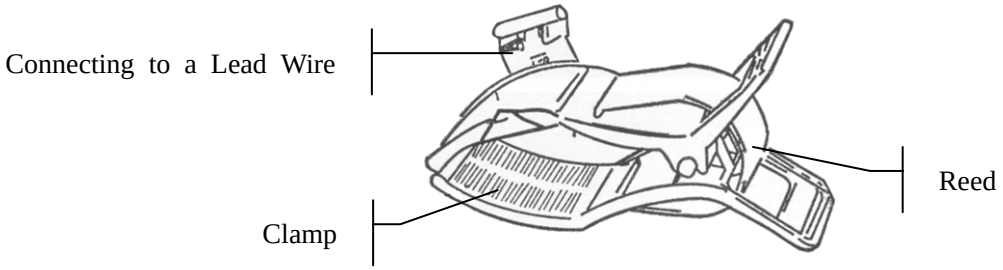
Two kinds of electrode can be used, one is the reusable electrode, and the other is the disposable electrode.

### 4.5.2.1 Reusable Electrodes

Reusable electrodes include limb electrodes and chest electrodes, as the following figures show.




Chest Electrode




Limb Electrode

**Chest Electrode Connection:**

1) Ensure that the electrodes are clean;
2) Align all lead wires of the patient cable to avoid twisting, and connect the lead wires to the corresponding electrodes according to the colors and identifiers;
3) Clean the electrode area on the chest surface with 75% alcohol;
4) Daub the round area of 25mm in diameter on each electrode site with gel evenly;
5) Place a small amount of gel on the brim of the chest electrode's metal cup;
6) Place the electrode on the chest electrode site and squeeze the suction bulb. Unclench it and the electrode is adsorbed on the chest;
7) Attach all chest electrodes in the same way.

**Note:** Long-time measurement with a strong negative pressure on the suction bulb may cause reddening of the skin. When using the electrode on small children or patients with delicate skin, squeeze the suction ball lightly.

**Limb Electrode Connection:**

1) Ensure that the electrodes are clean;
2) Align all lead wires of the patient cable to avoid twisting, and connect the lead wires to the corresponding electrodes according to the colors and identifiers;
3) Clean the electrode area which is a short distance above the ankle or the wrist with 75% alcohol;
4) Daub the electrode area on the limb with gel evenly;
5) Place a small amount of gel on the metal part of the limb electrode clamp;
6) Connect the electrode to the limb, and make sure that the metal part is placed on the electrode area above the ankle or the wrist;
7) Attach all limb electrodes in the same way.

### 4.5.2.2 Disposable Electrodes

**Disposable Electrode:**


**Alligator Clip:**

Disposable electrodes must be used together with alligator clips.

**Disposable Electrode Connection**

1) Align all lead wires of the patient cable to avoid twisting, and connect the alligator clips to the lead wires.
2) Clean the electrode areas on the body surface with 75% alcohol.
3) Attach the disposable electrodes to the electrode positions on the body surface.
4) Clip the disposable electrodes with the alligator clips.

The quality of ECG waveform will be affected by the contact resistance between the patient and the electrode. In order to get a high-quality ECG, the skin-electrode resistance must be minimized while connecting electrodes.

**WARNING**

1. Make sure that all electrodes are connected to the patient correctly before operation.
2. Ensure that the conductive parts of electrodes and associated connectors, including neutral electrodes, do not come in contact with earth or any other conducting objects.

**CAUTION**

The disposable electrodes can only be used for one time.

# 4.6 Attaching Electrodes to the Patient (for Exercise ECG)

The identifiers and color codes of electrodes used comply with IEC/EN requirements. In order to avoid incorrect connections, the electrode identifiers and color codes are specified in Table 4-2. Moreover the equivalent codes according to American requirements are given in Table 4-2 too.

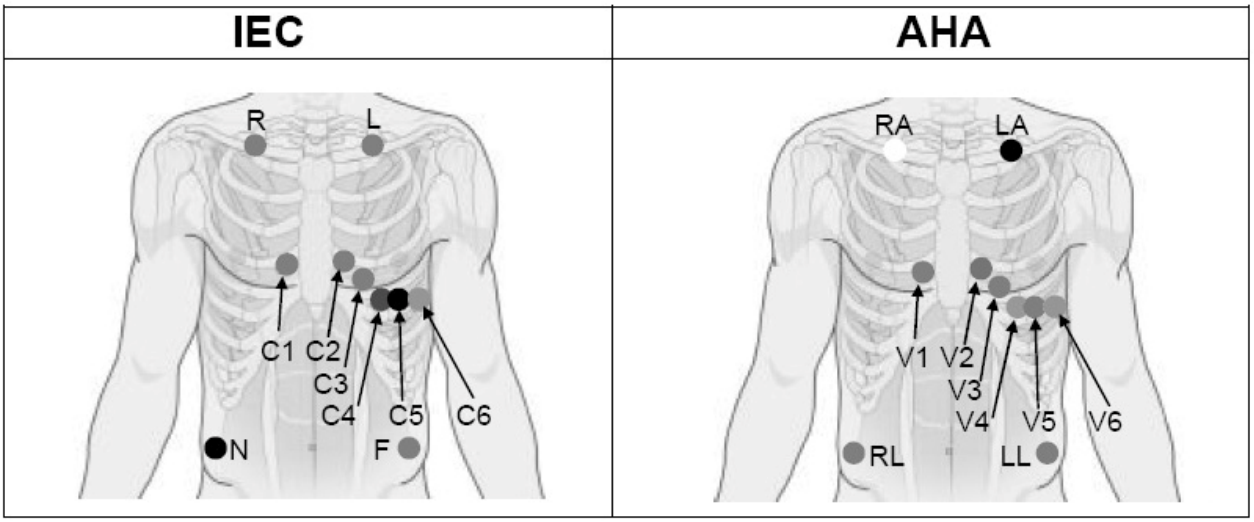



Table 4-2 Electrodes and Their Identifiers and Color Codes

| European | | American | |
|---|---|---|---|
| **Electrodes** | **Color Code** | **Electrodes** | **Color Code** |
| R | Red | RA | White |
| L | Yellow | LA | Black |
| N or RF | Black | RL | Green |
| F | Green | LL | Red |
| C1 | White/Red | V1 | Brown/Red |
| C2 | White/Yellow | V2 | Brown/Yellow |
| C3 | White/Green | V3 | Brown/Green |
| C4 | White/Brown | V4 | Brown/Blue |
| C5 | White/Black | V5 | Brown/Orange |
| C6 | White/Violet | V6 | Brown/Violet |

**The Precordial Electrodes' Positions on Body Surface:**

C1: Fourth intercostal space at the right border of the sternum

C2: Fourth intercostal space at the left border of the sternum

C3: Fifth rib between C2 and C4

C4: Fifth intercostal space on the left midclavicular line

C5: Left anterior axillary line at the horizontal level of C4

C6: Left midaxillary line at the horizontal level of C4

**The Extremity Electrodes' Positions on Body Surface:**

R/L: below the right/left clavicle

N/F: below the right/left rib

The quality of ECG waveform will be affected by the contact resistance between the patient and the electrode. In order to get a high-quality ECG, the skin-electrode resistance must be minimized while connecting electrodes.

**Electrodes Connection:**

1) Align all lead wires of the patient cable to avoid twisting, and connect the disposable electrodes to the lead wires.
2) Clean the electrode areas on the body surface with 75% alcohol.
3) Attach the disposable electrodes to the electrode sites.

**Note**: The quality and the placement of the electrode will directly influence the quality of exercise ECG. The wrong placement and use of electrodes will cause incorrect analysis results.

**WARNING**

1. Make sure that all electrodes are connected to the patient correctly before operation.
2. Ensure that the conductive parts of electrodes and associated connectors, including neutral electrodes, do not come in contact with earth or any other conducting objects.

**CAUTION**

The disposable electrodes can only be used for one time.

# 4.7 Inspection Before Power-On

In order to avoid safety hazards and get good ECG records, the following inspection procedure is recommended before power-on and operation.

1) **Environment**:

- ♦ Make sure that there is no electromagnetic interference source around the equipment, especially large medical electrical equipment such as electrosurgical equipment, radiological equipment, magnetic resonance imaging equipment etc. Turn off these devices when necessary.
- ♦ Keep the examination room warm to avoid muscle tremor voltages in ECG signals caused by cold.

2) **Power Supply**:

- ♦ If the mains supply is used, please check whether the power cord is connected to the unit well. The grounded three-slot outlet should be used.
- ♦ When the battery capacity is low, recharge the battery before use.

3) **Patient Cable**:

- ♦ Make sure that the patient cable is connected to the unit firmly, and keep it far away from the power cord.

4) **Electrodes**:

- ♦ Make sure that all electrodes are connected to lead wires of the patient cable correctly.
- ♦ Ensure that the chest electrodes do not contact.

5) **Recorder Paper**:

- ♦ Ensure that there is enough recorder paper loaded correctly.

6) **Patient**:

- ♦ The patient should not come into contact with conducting objects such as earth, metal parts etc.

- Ensure that the patient is warm and relaxed, and breathes calmly.

**WARNING**

The electrocardiograph is intended to be used by qualified physicians or personnel professionally trained, and they should be familiar with the contents of this user manual before operation.

# Chapter 5 Turning On the Electrocardiograph

- When the mains supply is used, connect the power cord, and the mains supply indicator (∿) is lit. Then press ⏻ on the keyboard to turn on the unit. The logo will be displayed on the LCD screen after self-test. Then the electrocardiograph is ready for use.

- When a built-in rechargeable lithium battery is used, press ⏻ on the keyboard directly to turn on the unit, and then the battery indicator (▭) is lit. The logo will be displayed on the LCD screen after self-test. Then the electrocardiograph is ready for use.

# Chapter 6 Entering Patient Information

After the electrocardiograph is turned on, the main interface appears. For SE-12 Express, pressing the **Pretest** key can open the main interface of the exercise test.

## 6.1 Entering Patient ID

1. By default, the system generates the patient ID automatically. The range of the patient ID is 0 ~ 1999, 999, 999.

2. Or the system can generate the patient ID according to the time when you press the **START/STOP** key to print an ECG report.

The procedures are as follows:

1) Press the function key **F6** below **Setup** to open the **System Setup** interface.

2) Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Patient Info**, press  .

3) Press **Tab** or Shift + **Tab** to move the cursor to **ID Mode**, and then press the Up or Down arrow to select **Time**.

4) Press  , or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press  .

5) Press **ESC** to return to the main interface.

Then the system will generate the patient ID according to the time when you press the **START/STOP** key to print an ECG report.

3. Or you can enter the patient ID manually.

The procedures are as follows:

1) Press the function key **F6** below **Setup** to open the **System Setup** interface.

2) Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Patient Info**, press  .

3) Press **Tab** or Shift + **Tab** to move the cursor to **ID Mode**, and then press the Up or Down arrow to select **Manual**.

4) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.

5) Press **ESC** to return to the main interface.

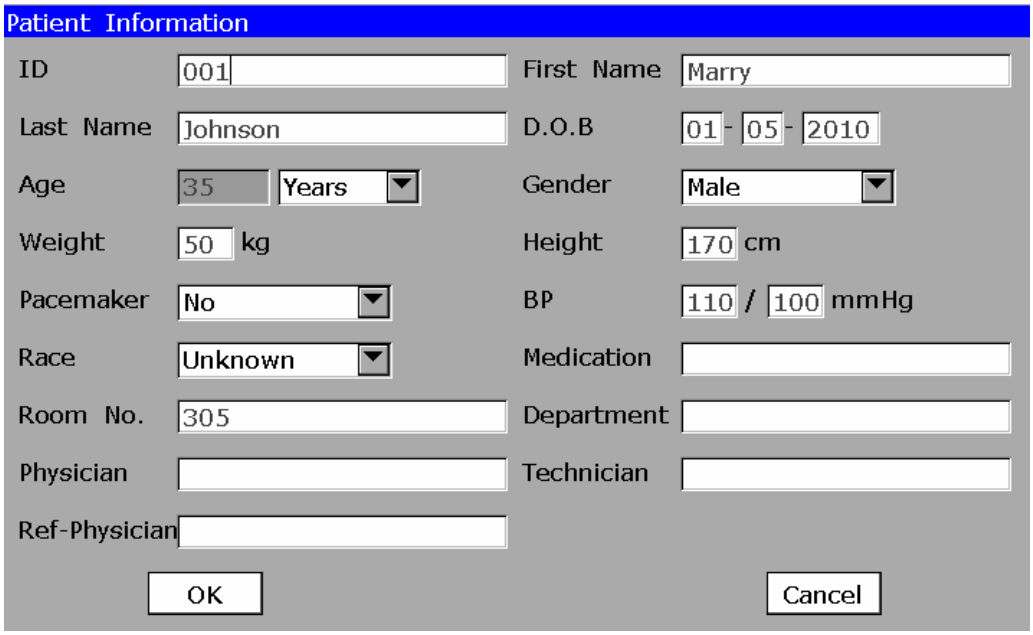
6) Press the function key **F1** below **Patient** to open the **Patient Information** window. Press **Tab** or Shift + **Tab** to move the cursor. When the cursor is in the **ID** textbox, enter the patient ID manually.

7) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.

**Note:** In the auto, rhythm or off mode, when **ID Mode** is set to **Manual** and **ID Hint** is set to **On**, if you do not input the patient ID before pressing the **START/STOP** key, a hint will pop up to remind you to input the patient ID.

## 6.2 Entering Other Information

When the main interface is displayed, press the function key **F1** below **Patient** to open the **Patient Information** window.



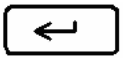
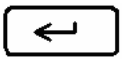
| | |
|---|---|
| First Name | Within 30 ASCII characters |
| Last Name | Within 30 ASCII characters |
| Age | Age Unit: **Years**, **Months**, **Weeks** or **Days** |
| Gender | Patient Gender (Male/Female/Empty) |
| Weight (kg) | Patient Weight (Range 0~999) |
| Height (cm) | Patient Height (Range 0~999) |
| Pacemaker | If you select **Pacemaker** on the **Patient Information Setup** interface, **Pacemaker** appears in the **Patient Information** window. If **Pacemaker** is set to **Yes**, the pacemaker signals are easy to be detected. If **Pacemaker** is set to **No**, the pacemaker signals are not easy to be detected. |
| BP (mmHg) | Patient Systolic Blood Pressure/Diastolic Blood Pressure |
| Race | Patient Race (unknown/ Oriental/ Caucasian/ Black/ Indian/ Mongolian/ Hispanic/ Asian/ Pacific/ other) |
| Medication | The medication which patient took previously (Within 30 ASCII characters) |
| Room No. | Room Number (Within 10 ASCII characters) |
| Department | Within 30 ASCII characters |
| Physician | Physician Name (Within 35 ASCII characters) |
| Technician | Technician Name (Within 35 ASCII characters) |
| Ref-Physician | Referring Physician Name (Within 35 ASCII characters) |

**Note:** The total number of supported characters may be fewer if either special Latin characters or Chinese characters are entered.

Operation Procedures are as follows:

1. Press **Tab** or Shift + **Tab** to move the cursor to a textbox. Fill in the selected textbox. For details on inputting data, please refer to Section 3.2, “Entering Data”.

2. Press **Tab** or Shift + **Tab** to move the cursor to a list box. Press the Up or Down arrow to select an option.

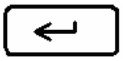
3. After inputting all the information, press  to confirm; or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press  to confirm.

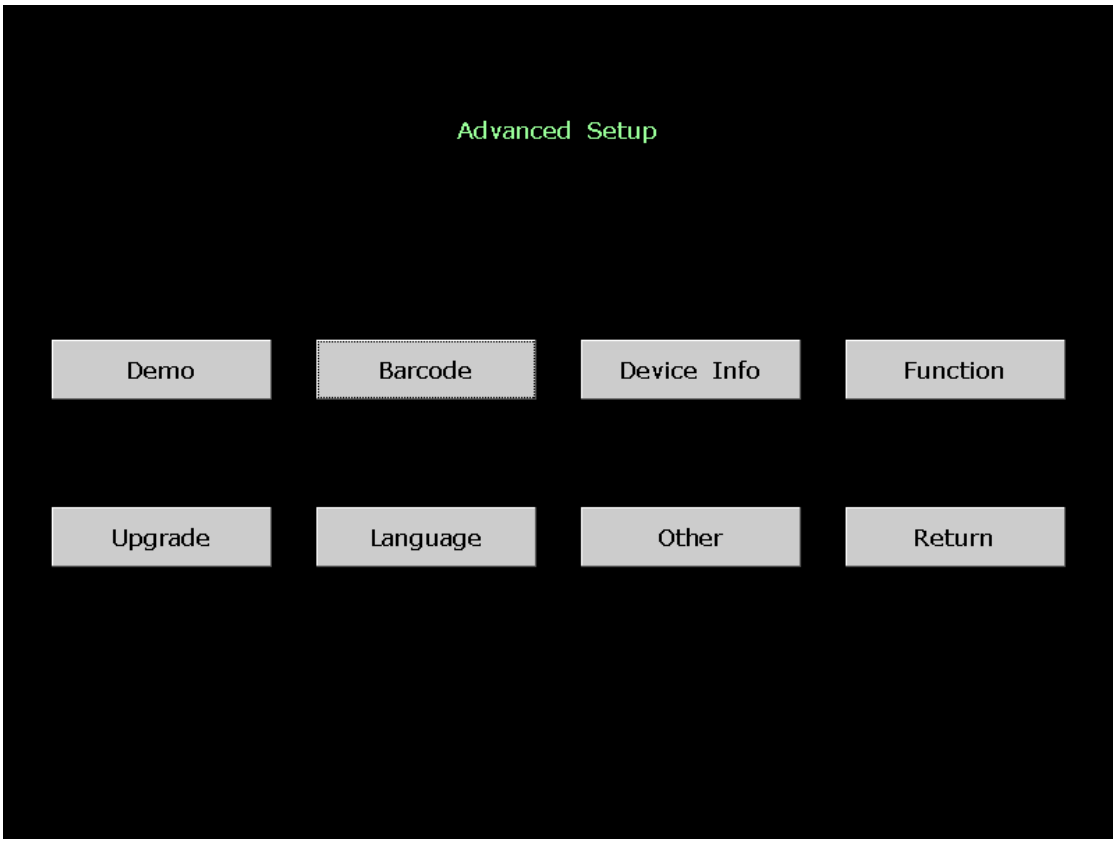
**Note:** If you select **D.O.B** on the **Patient Information Setup** interface, the **D.O.B** textbox appears and the **Age** textbox becomes unavailable in the **Patient Information** window, you can enter the birthday of the patient, and the system will calculate the patient age automatically.

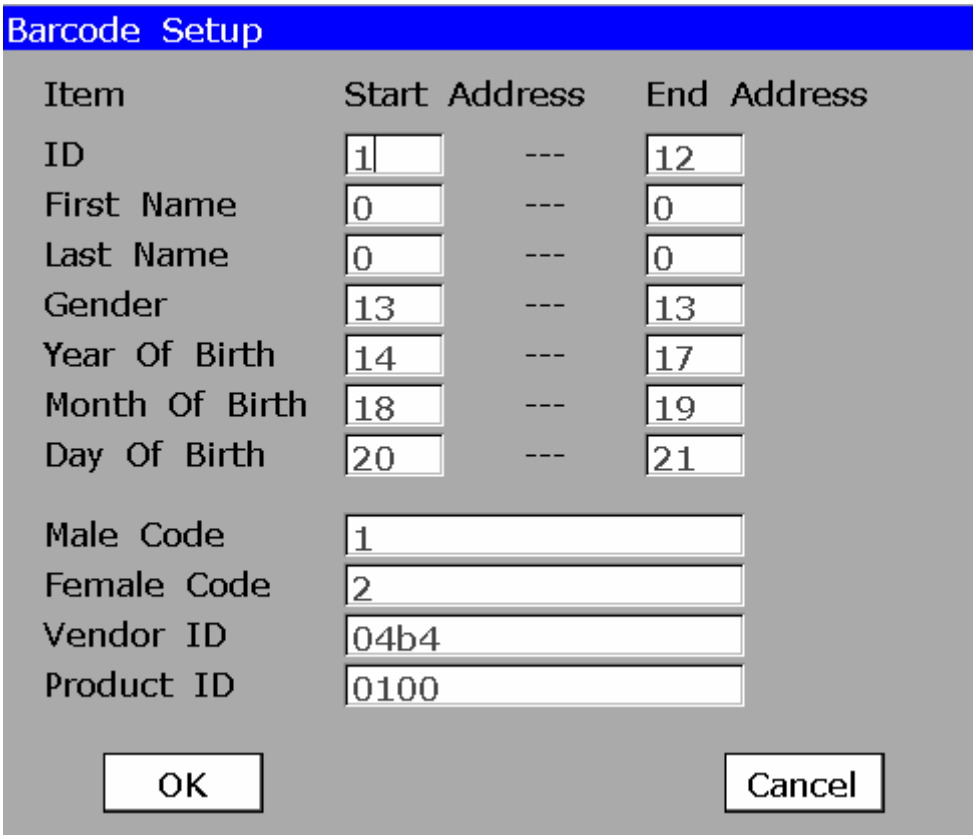
# 6.3 Using a Bar Code Reader

1. Configure the bar code

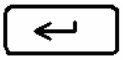
1) When the main interface is displayed, press the function key **F6** below **Setup** to open the **System Setup** interface.

2) Press **F1** to display the **Service Password** window. Then enter the password and press  to open the **Advanced Setup** interface. Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Barcode**, and then press  to open the **Barcode Setup** window.



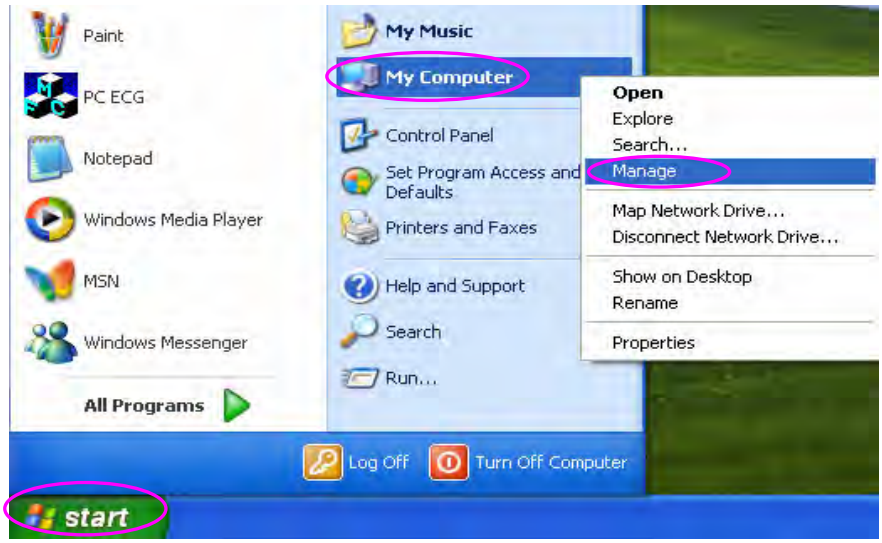

3) Enter the start and end addresses, the male and female codes, the vendor ID and the product ID,

and then press  to confirm.

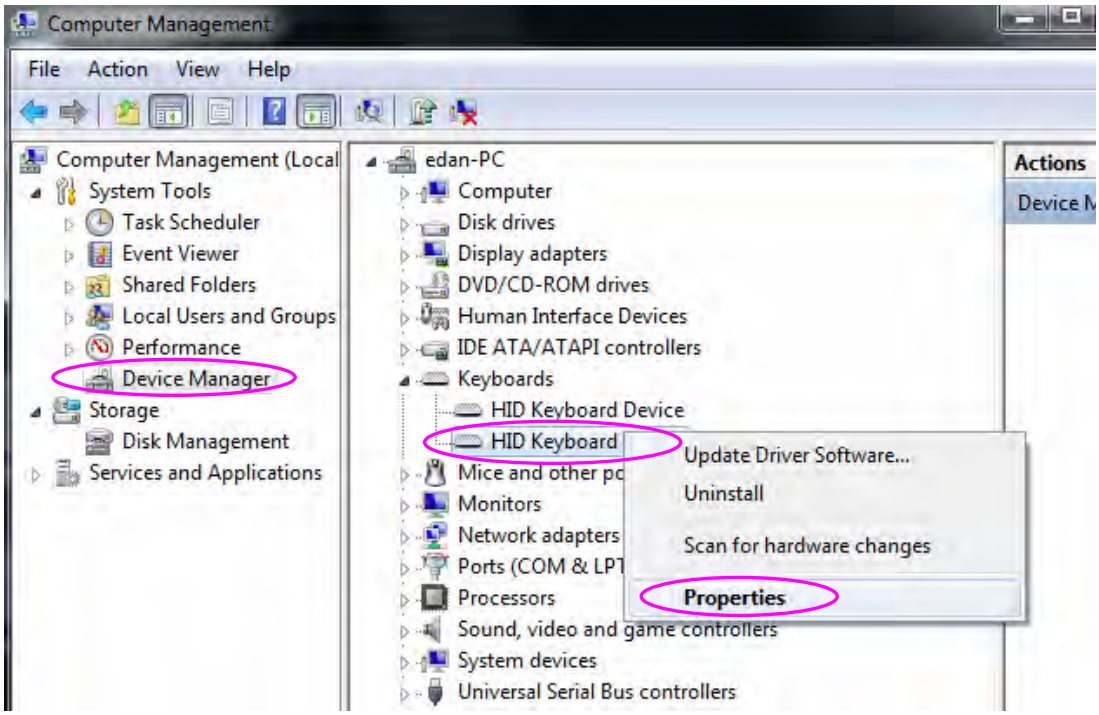
View the vendor ID and product ID on the PC:

a) Connect the bar code reader to the PC

b) Click on **start**, right-click on **My Computer**, and then select **Manage** in the pop-up menu to open the **Computer Management** interface.

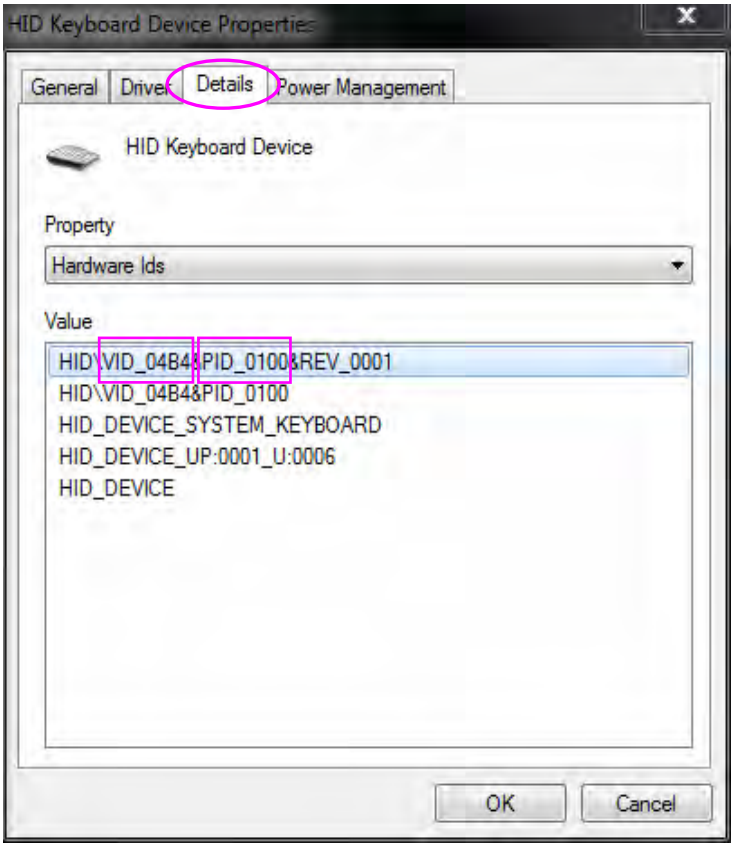



c) On the **Computer Management** interface, click on **Device Manager**. Right-click on **HID Keyboard Device**, and then select **Properties** in the pop-up menu.




d) Click on the **Details** tab on the **HID Keyboard Device Properties** interface. View the vector ID (VID) and the product ID (PID). Take the following figure for example, the vector ID is 04B4,

and the product ID is 0100.




4) Press **ESC** to return to the main interface.

2. Connect the bar code reader to USB socket 2 on the right panel of the electrocardiograph.

3. When the main interface is displayed, scan the patient's bar code with the bar code reader, and then the patient information will appear in the corresponding box.

**Note:** Only bar code readers recommended by the manufacturer can be used.

# Chapter 7 Freezing ECG Waves

You can freeze the ECG waves displayed on the main interface.

**Operation Method:**

1) Press the function key **F2** below **Freeze** to display the freezing interface.

**Note:** Within ten seconds after returning to the main interface, pressing the function key **F2** can not display the freezing interface.

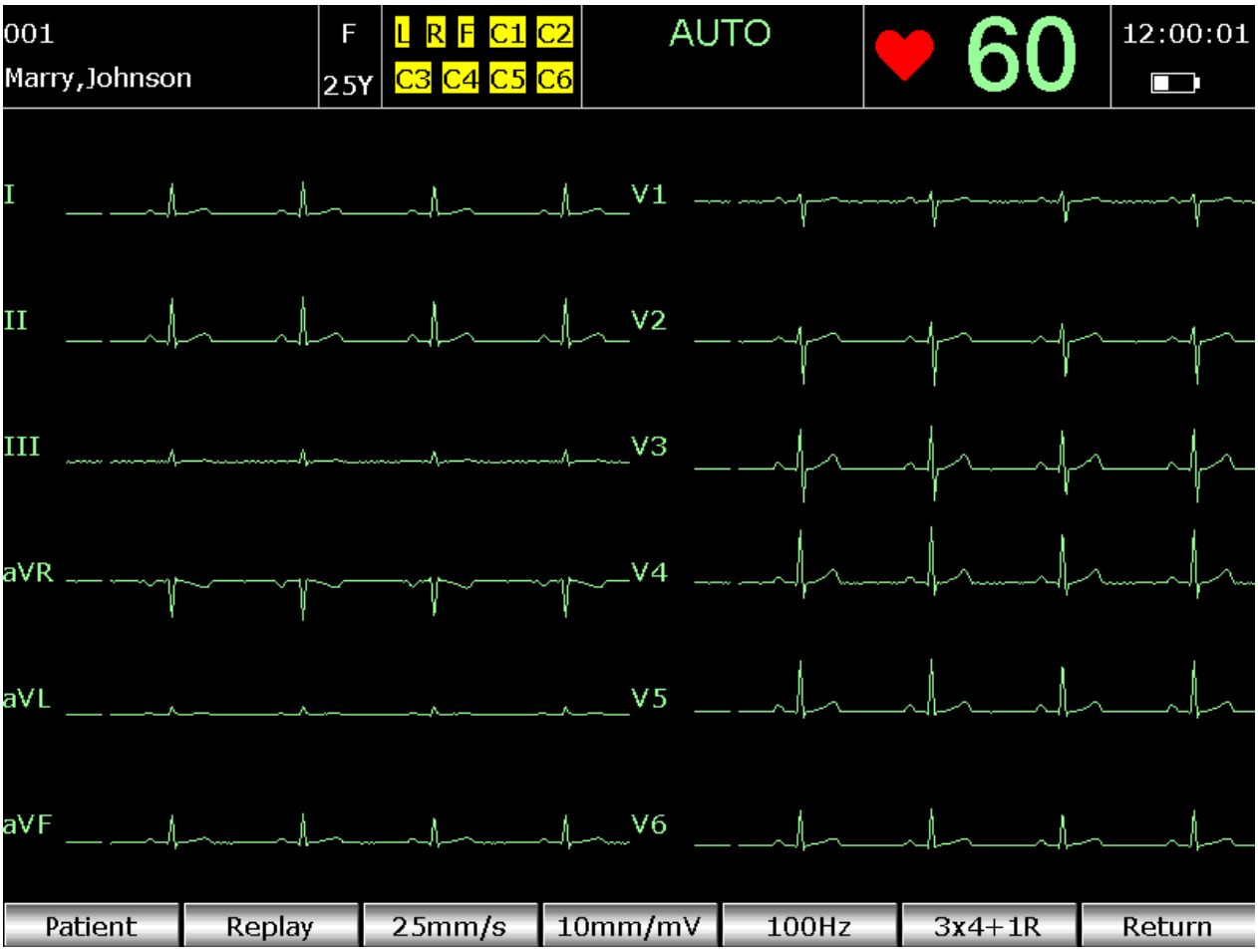



Figure 7-1 Freezing Interface

2) Press the function key **F3** to set the paper speed, press the function key **F4** to set the gain, press the function key **F5** to set the filter, and press the function key **F6** to set the printing style.

**Note:** When you press the function key **F7** below **Return** to exit the freezing interface, these settings will not be saved.

3) Press the function key **F2** below **Replay** to replay the frozen ECG waves on the **Replay** interface.

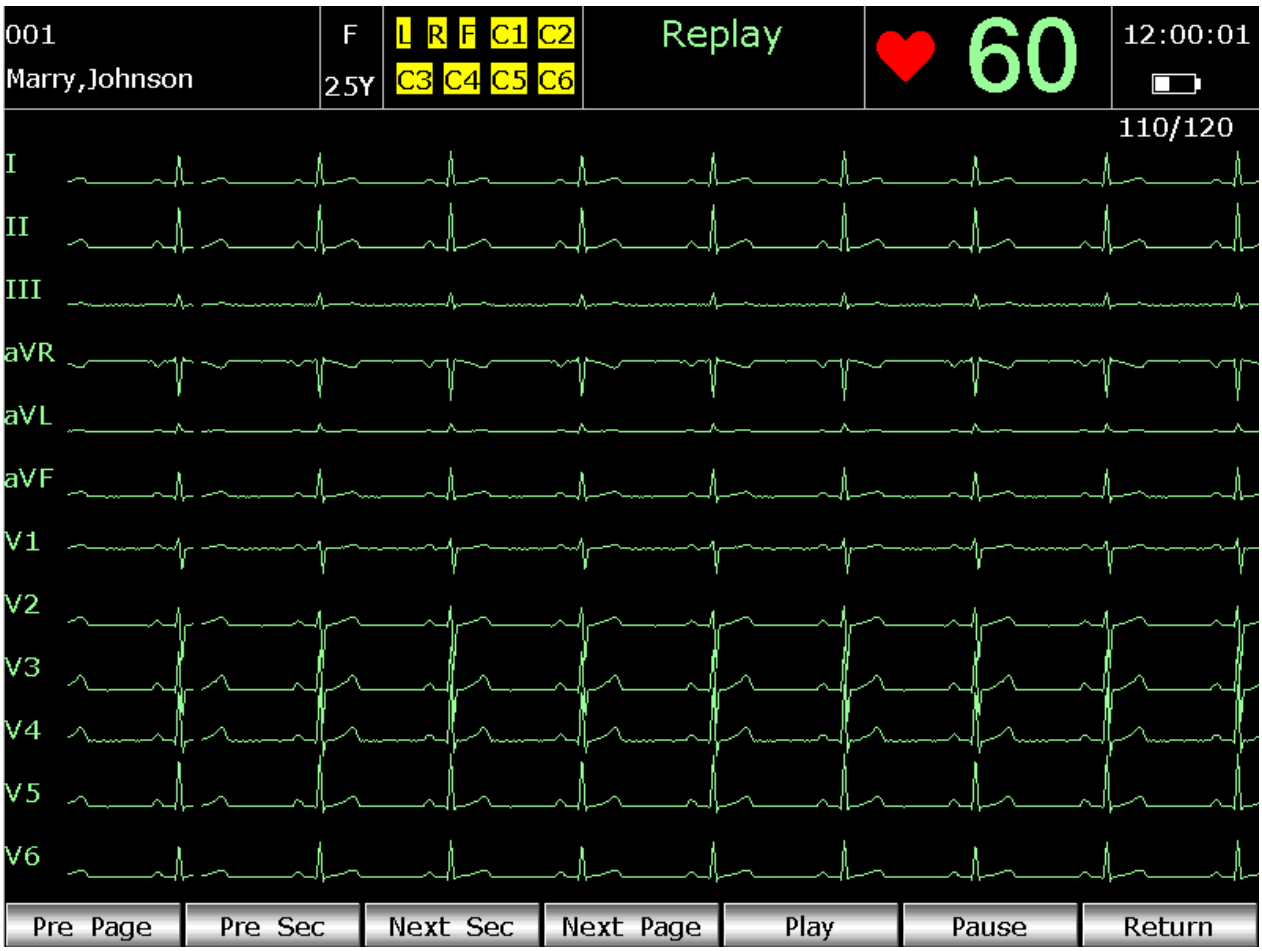



Figure 7-2 Replay Interface

4) Press **F1** below **Pre Page** or **F4** below **Next Page** to turn pages.
5) Press **F2** below **Pre Sec** or **F3** below **Next Sec** to view the ECG waves of the previous or next second.
6) Press the function key **F5** below **Play** to display ECG waves continuously.
7) Press the function key **F6** below **Pause** to stop playing ECG waves.
8) Press the function key **F7** below **Return** to return to the main interface.

# Chapter 8 Printing ECG Reports

There are four modes to print ECG reports.

In the auto mode, the lead groups are switched automatically according to the lead sequence during the printing course. After the ECG waves of one lead group are printed within a certain time, the system switches to print ECG waves of another lead group automatically. A 1mV calibration mark will be printed at the beginning of an ECG report.

In the manual mode, you can determine the lead group to be displayed and printed by pressing the Up or Down arrow.

In the rhythm mode, you can print 60s rhythm-lead ECG waveform of one lead in the **Single Lead** style or 20s rhythm-lead ECG waveform of three leads in the **Three Leads** style.

In the R-R analysis mode, you can select a lead to print its R-R histogram, R-R trend chart, 180s compressed ECG waveform and all the R-R interval values.

**Notes:**

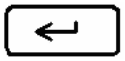
1. The working mode can not be changed during the printing course. Stop printing reports before changing the working mode.

2. Within three seconds after returning to the main interface, if you press the **START/STOP** key to print an ECG report in the auto quick mode or the manual mode, the recorder will not respond.

## 8.1 Auto Mode

**Operation Method:**

1. To set **Mode Options**, **Auto DispStyle**, **Sampling Mode**, **Preview**, **Record Style**, **Rhythm Lead1/2/3**, or **Lead Sequence** (Optional)

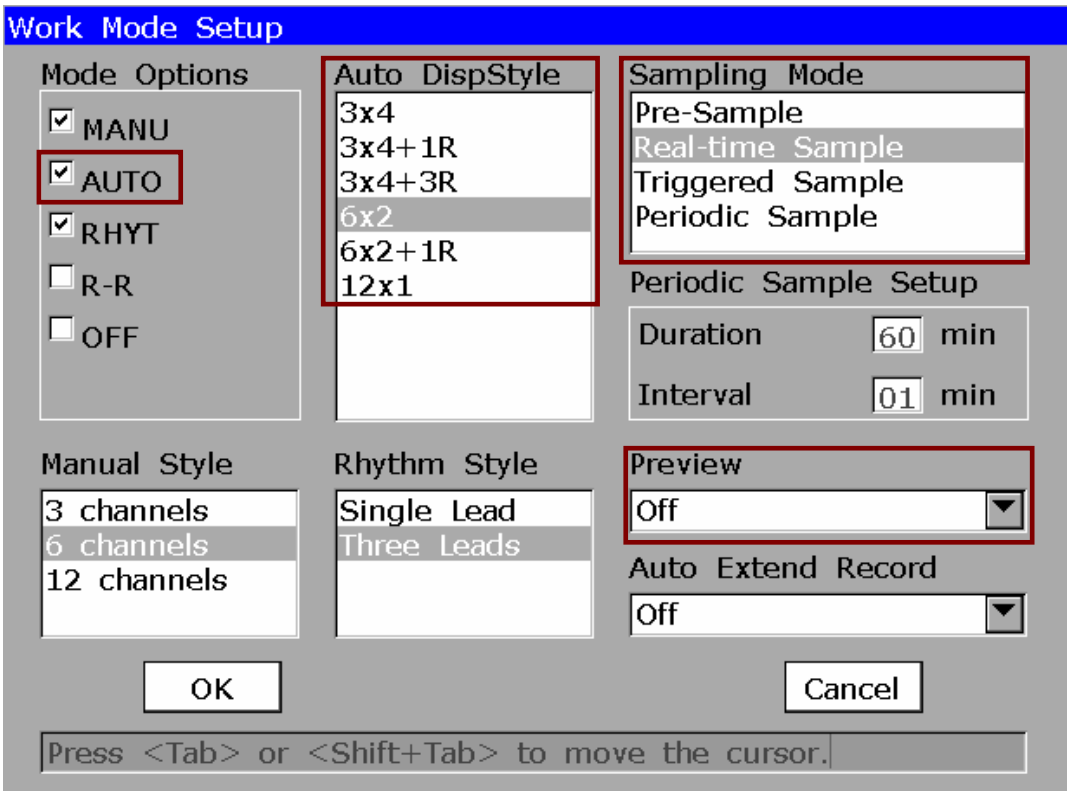
   When the main interface is displayed, press the function key **F6** below **Setup** to open the **System Setup** interface. The cursor is on **Work Mode**. Press  to open the **Work Mode Setup** interface.

   1) Press **Tab** or Shift + **Tab** to move the cursor to **AUTO**, press Spacebar to select it, and then a check mark √ appears in the box before **AUTO**.
   2) Press **Tab** or Shift + **Tab** to move the cursor to the **Auto DispStyle** list box, and then press the Up or Down arrow to highlight a style.
   3) Press **Tab** or Shift + **Tab** to move the cursor to the **Sampling Mode** list box, and then

press the Up or Down arrow to highlight a sampling mode. For details of the sampling mode, refer to Section 11.1.5, “Selecting Sampling Mode”.

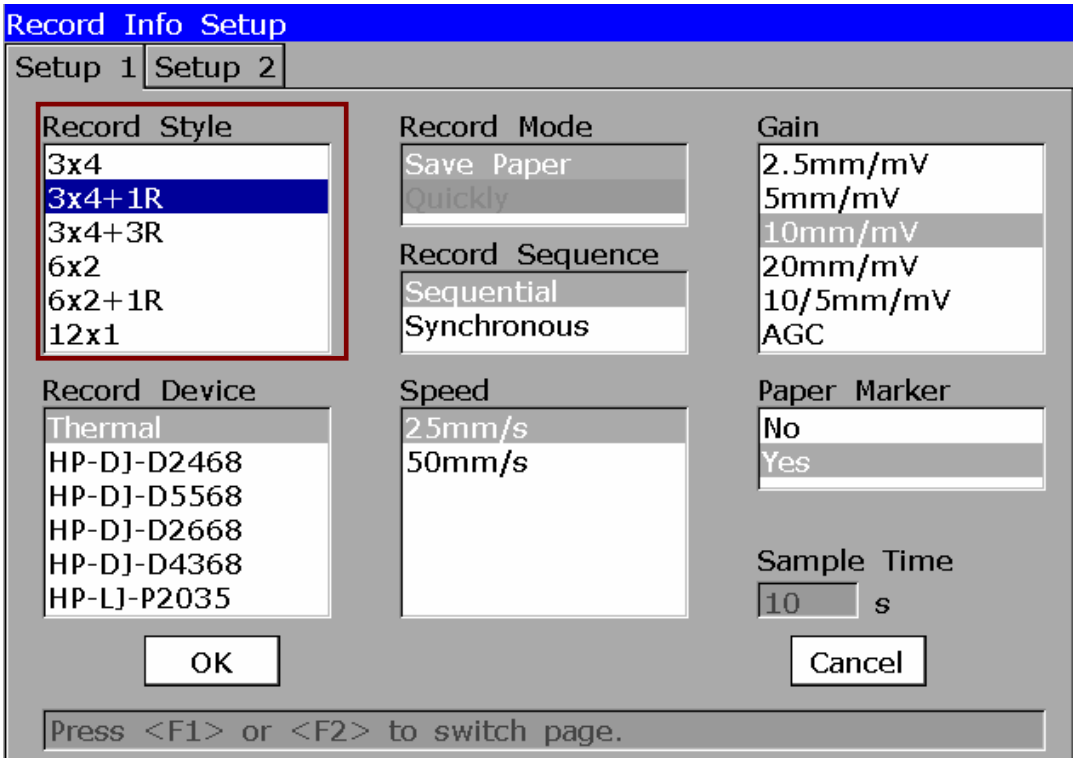
4) Press **Tab** or Shift + **Tab** to move the cursor to **Preview**, and then press the Up or Down arrow to highlight **Off** or **On**.

5) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.




6) On the **System Setup** interface, press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Record Info**, press ↵ to open the **Record Info Setup** interface.

7) Press **Tab** or Shift + **Tab** to move the cursor to the **Record Style** list box, and then press the Up or Down arrow to select a style.



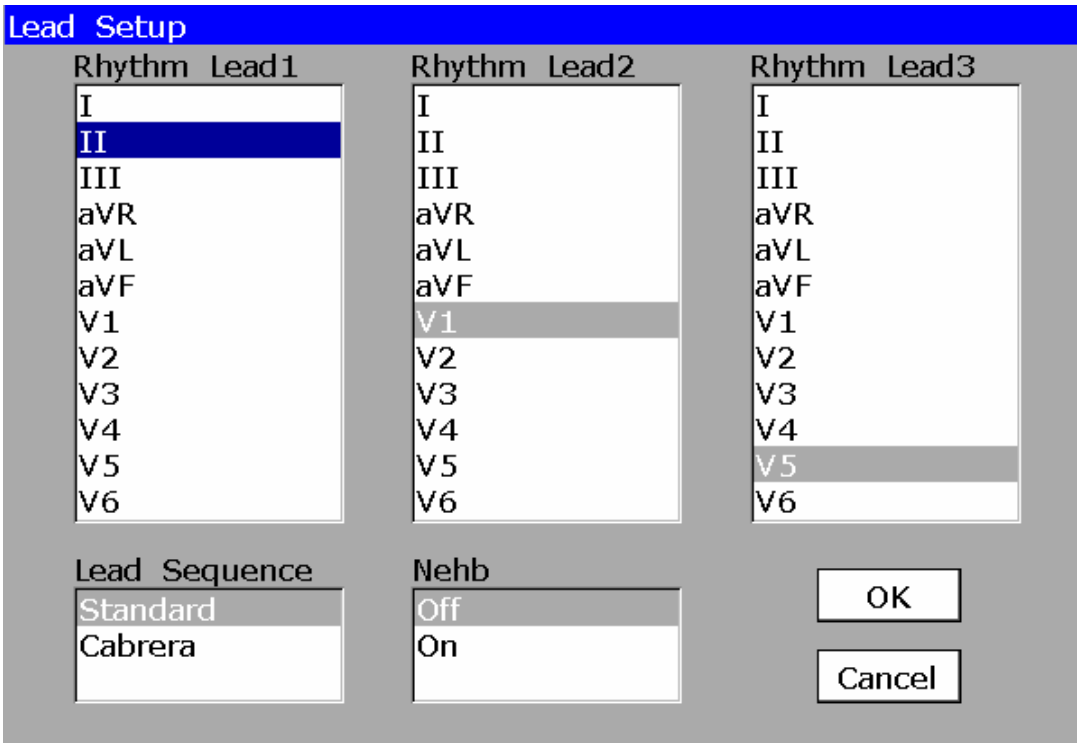

8) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.

9) On the **System Setup** interface, press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Lead**, press ↵ to open the **Lead Setup** interface.

10) Press **Tab** or Shift + **Tab** to move the cursor to the **Rhythm Lead1/2/3** list box, and then press the Up or Down arrow to select a lead.

11) Press **Tab** or Shift + **Tab** to move the cursor to the **Lead Sequence** list box, and then press the Up or Down arrow to select a sequence.

12) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.




After setup, press **ESC** to return to the main interface.

2. When the main interface is displayed, press the **MODE** key to select the auto mode. Press **F3** to select a paper speed. Press **F4** to switch the gain. Press **F5** to set the EMG filter or the Lowpass filter.
3. Press the **START/STOP** key to print an ECG report. It will stop automatically after printing a complete ECG report of 12 leads. Or press the **START/STOP** key again to stop printing the report.
4. If **Preview** is set to **On** on the **Work Mode Setup** interface, press the **START/STOP** key to display the preview interface.

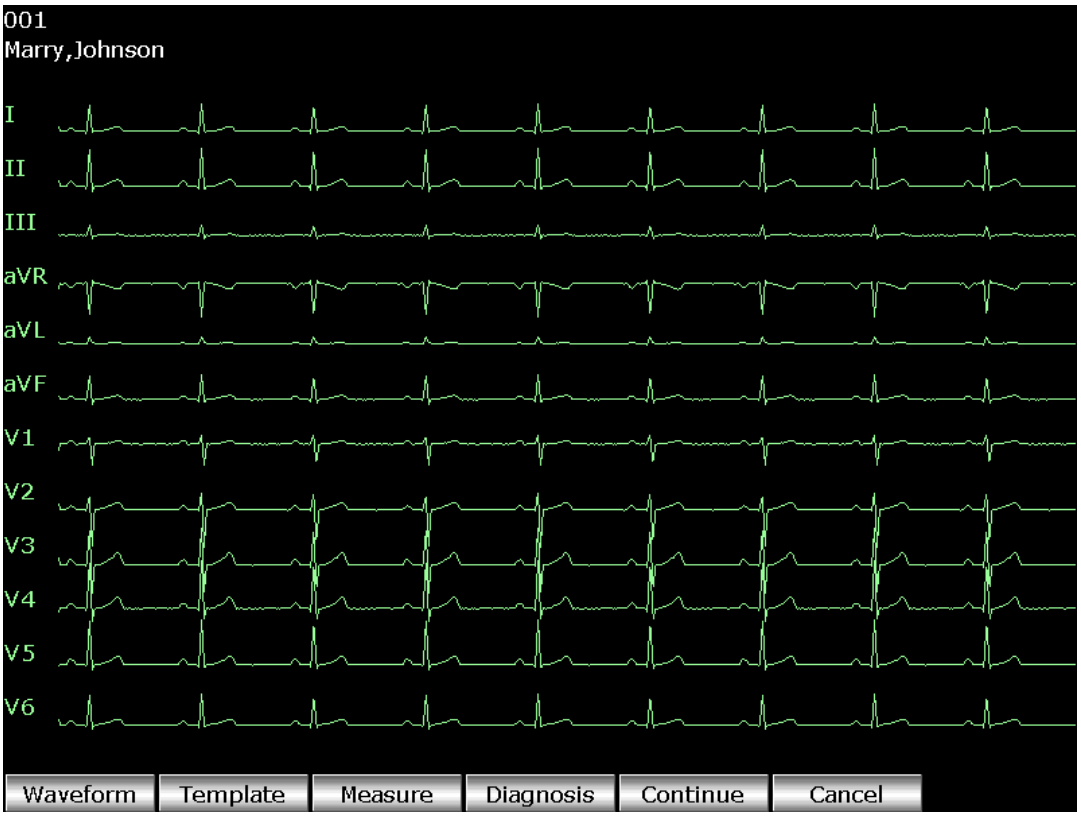



Figure 8-1 Waveform Preview Interface

1) Press the function key **F1** below **Waveform** to display the waveform preview interface.
2) Press the function key **F2** below **Template** to display the template preview interface.
3) Press the function key **F3** below **Measure** to display the measure preview interface.
4) Press the function key **F4** below **Diagnosis** to open the diagnosis preview interface.
5) Press the function key **F5** below **Continue** to print an ECG report.
6) Press the function key **F6** below **Cancel** to stop printing the ECG report.

# 8.2 Manual Mode

**Operation Method:**

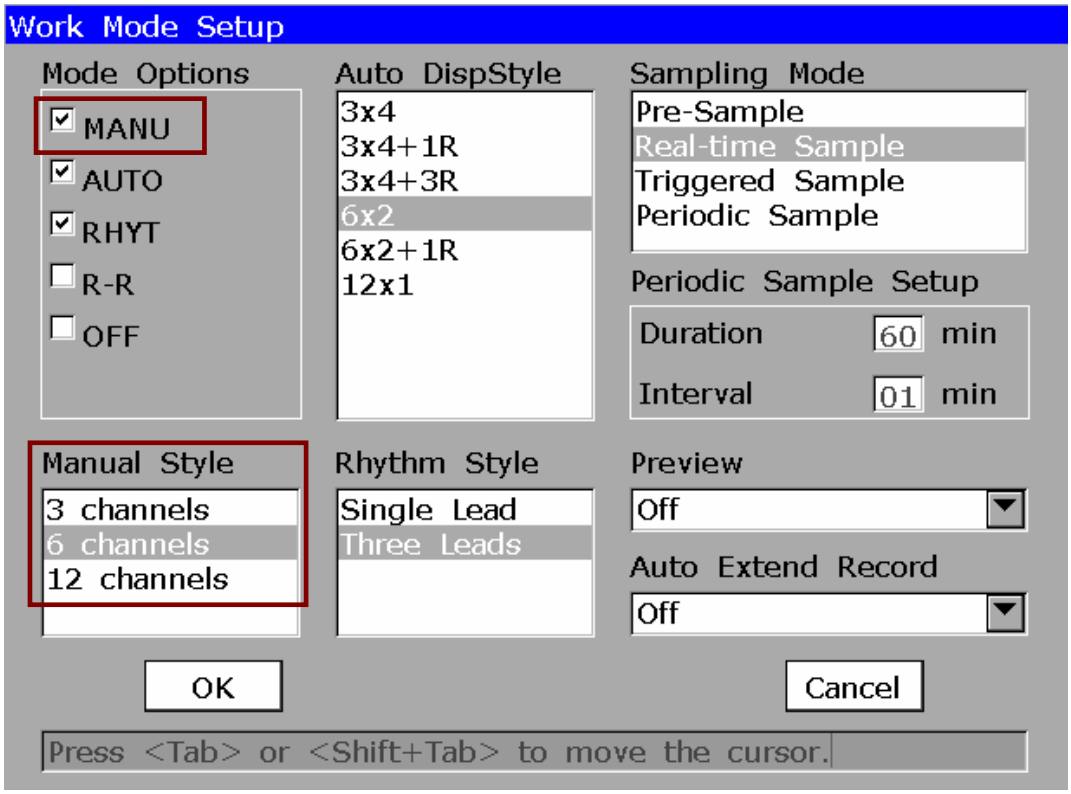
1. To set **Mode Options**, **Manual Style** or **Lead Sequence** (Optional)

   When the main interface is displayed, press the function key **F6** below **Setup** to open the **System Setup** interface. The cursor is on **Work Mode**. Press ↵ to open the **Work Mode Setup** interface.

   1) Press **Tab** or Shift + **Tab** to move the cursor to **MANU**, press Spacebar to select it, and then a check mark √ appears in the box before **MANU**.
   2) Press **Tab** or Shift + **Tab** to move the cursor to the **Manual Style** list box, and then press

the Up or Down arrow to highlight a style.

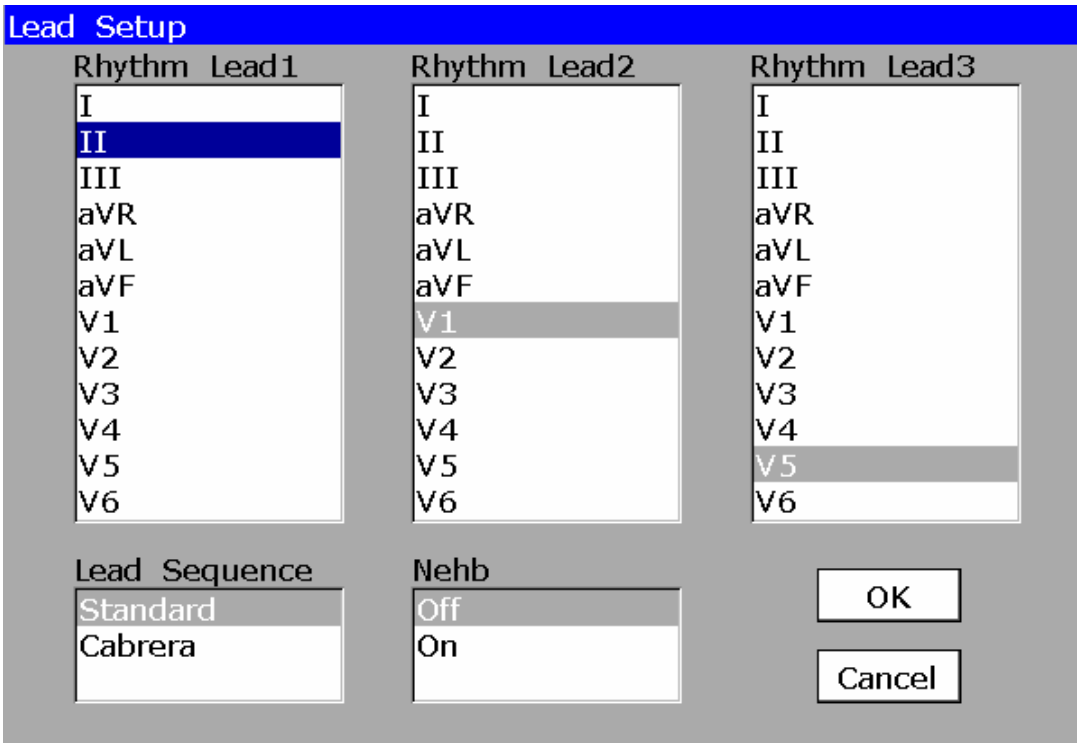
3) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.




4) On the **System Setup** interface, press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Lead**, press ↵ to open the **Lead Setup** interface.

5) Press **Tab** or Shift + **Tab** to move the cursor to the **Lead Sequence** list box, and then press the Up or Down arrow to select a sequence.

6) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.




After setup, press **ESC** to return to the main interface.

2. When the main interface is displayed, press the **MODE** key to select the manual mode. Press **F3** to select a paper speed. Press **F4** to switch the gain. Press **F5** to set the EMG filter or the Lowpass filter.
3. Press the Up or Down arrow to select the lead group to be displayed and printed.
4. Press the **START/STOP** key to print an ECG report.
5. Press the **START/STOP** key to stop printing the ECG report.

# 8.3 Rhythm Mode

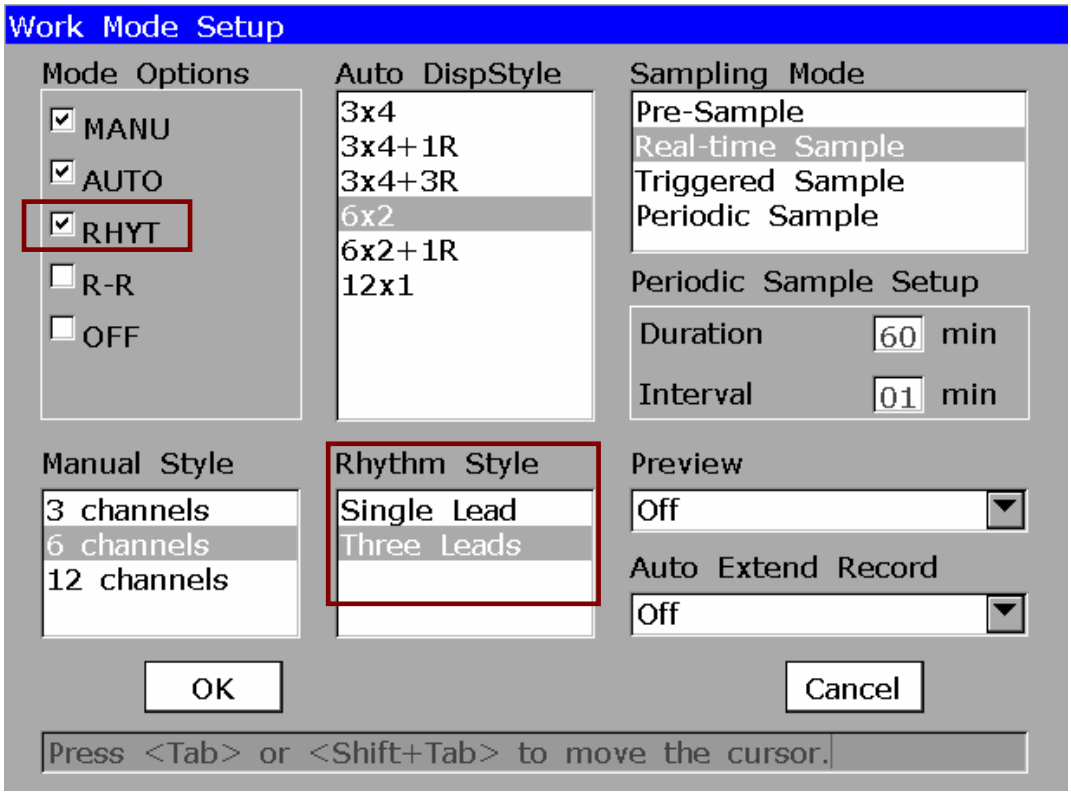
**Operation Method:**

1. To set **Mode Options**, **Rhythm Style**, **Rhythm Lead1/2/3** or **Lead Sequence** (Optional)

   When the main interface is displayed, press the function key **F6** below **Setup** to open the **System Setup** interface. The cursor is on **Work Mode**. Press ↵ to open the **Work Mode Setup** interface.

   1) Press **Tab** or Shift + **Tab** to move the cursor to **RHYT**, press Spacebar to select it, and then a check mark √ appears in the box before **RHYT**.
   2) Press **Tab** or Shift + **Tab** to move the cursor to the **Rhythm Style** list box, and then press the Up or Down arrow to highlight a style.

3) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.

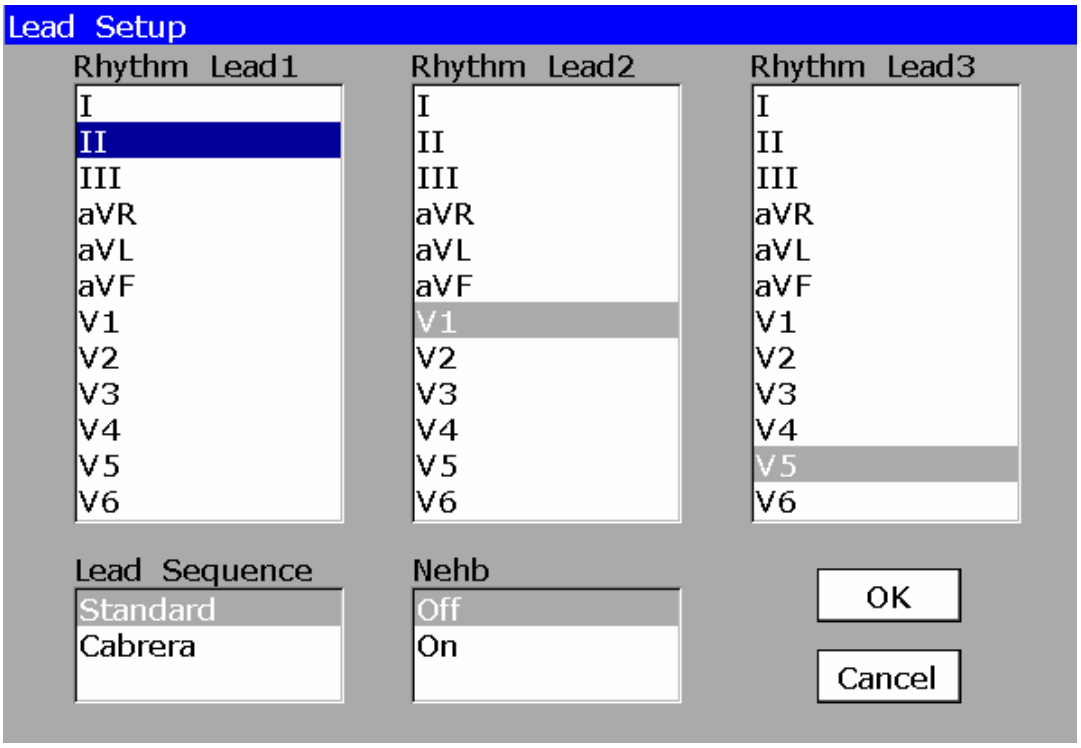



4) On the **System Setup** interface, press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Lead**, press ↵ to open the **Lead Setup** interface.

5) Press **Tab** or Shift + **Tab** to move the cursor to the **Rhythm Lead1/2/3** list box, and then press the Up or Down arrow to select a lead.

6) Press **Tab** or Shift + **Tab** to move the cursor to the **Lead Sequence** list box, and then press the Up or Down arrow to select a sequence.

7) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.



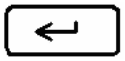

After setup, press **ESC** to return to the main interface.

2. When the main interface is displayed, press the **MODE** key to select the rhythm mode. Press **F3** to select a paper speed. Press **F4** to switch the gain. Press **F5** to set the EMG filter or the Lowpass filter.
3. Press the **START/STOP** key to begin to count the sampling time. When the sampling time reaches 60s in the **Single Lead** style or 20s in the **Three Leads** style, it begins to print an ECG report.
4. It will stop automatically after printing a complete report of rhythm-lead ECG waveforms. Or press the **START/STOP** key again to stop printing the ECG report.

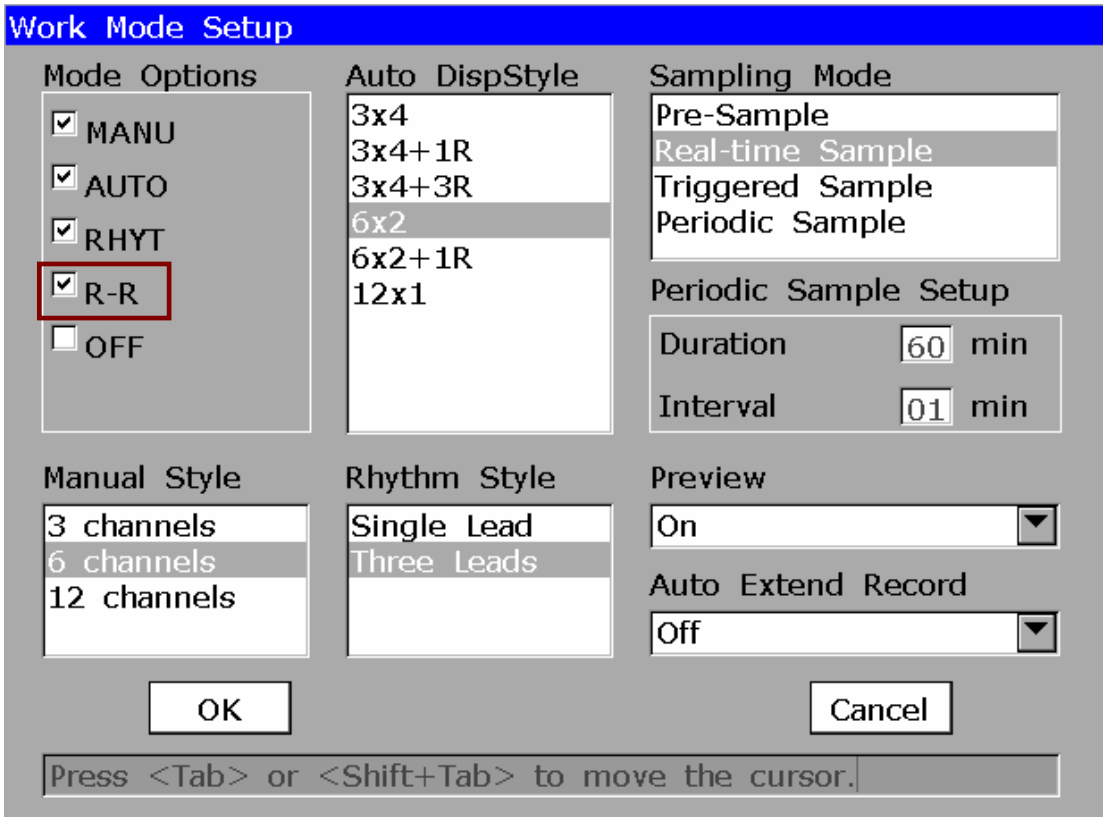
# 8.4 R-R Analysis Mode

**Operation Method:**

1. To set **Mode Options** or **Rhythm Lead1**

   When the main interface is displayed, press the function key **F6** below **Setup** to open the **System Setup** interface. The cursor is on **Work Mode**. Press  to open the **Work Mode Setup** interface.

   1) Press **Tab** or Shift + **Tab** to move the cursor to **R-R**, press Spacebar to select it, and then a check mark √ appears in the box before **R-R**.

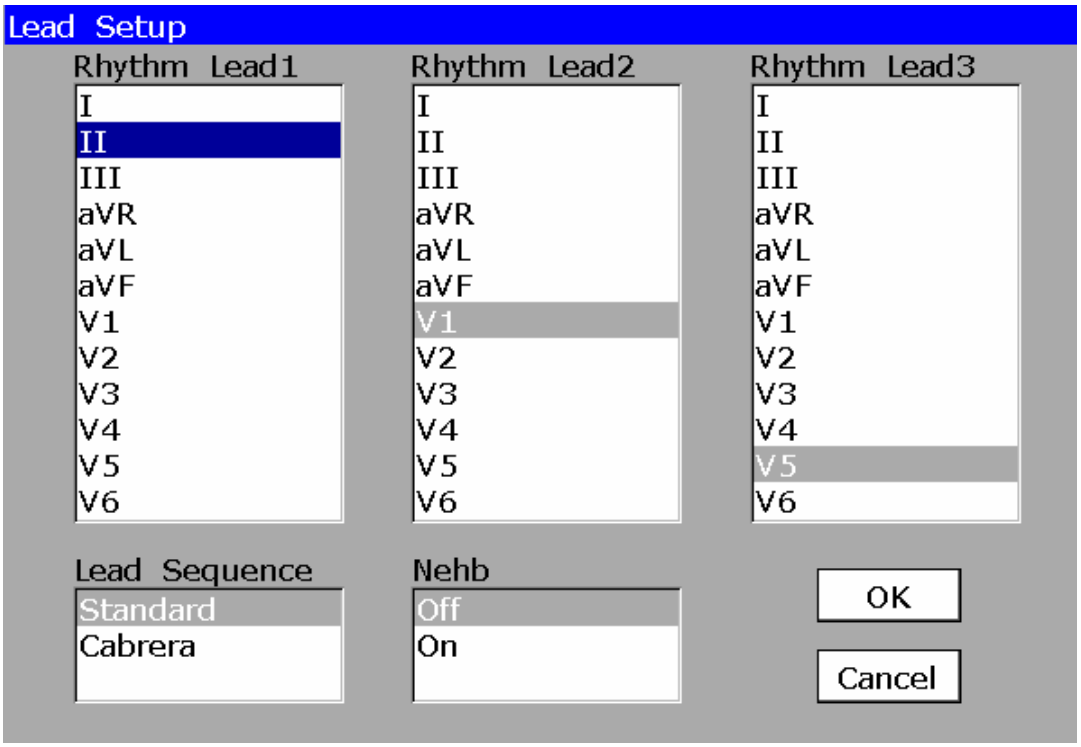



2) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.

3) On the **System Setup** interface, press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Lead**, press ↵ to open the **Lead Setup** interface.

4) Press **Tab** or Shift + **Tab** to move the cursor to the **Rhythm Lead1** list box, and then press the Up or Down arrow to select a lead.

5) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.




After setup, press **ESC** to return to the main interface.

2. When the main interface is displayed, press the **MODE** key to select the R-R analysis mode. Press **F4** to switch the gain. Press **F5** to set the EMG filter or the Lowpass filter.
3. Press the **START/STOP** key to begin to count the sampling time. When the sampling time reaches 180s, it begins to print an ECG report.
4. It will stop automatically after a complete R-R analysis report is printed, or press the **START/STOP** key to stop printing the ECG report.

**Note**: In the R-R analysis mode, you can not set the speed. The constant speed is 25mm/s and the printing speed is 5mm/s, because in the R-R analysis mode, the ECG wave length is compressed to one fifth of the original wave length.

## 8.5 Copy Printing

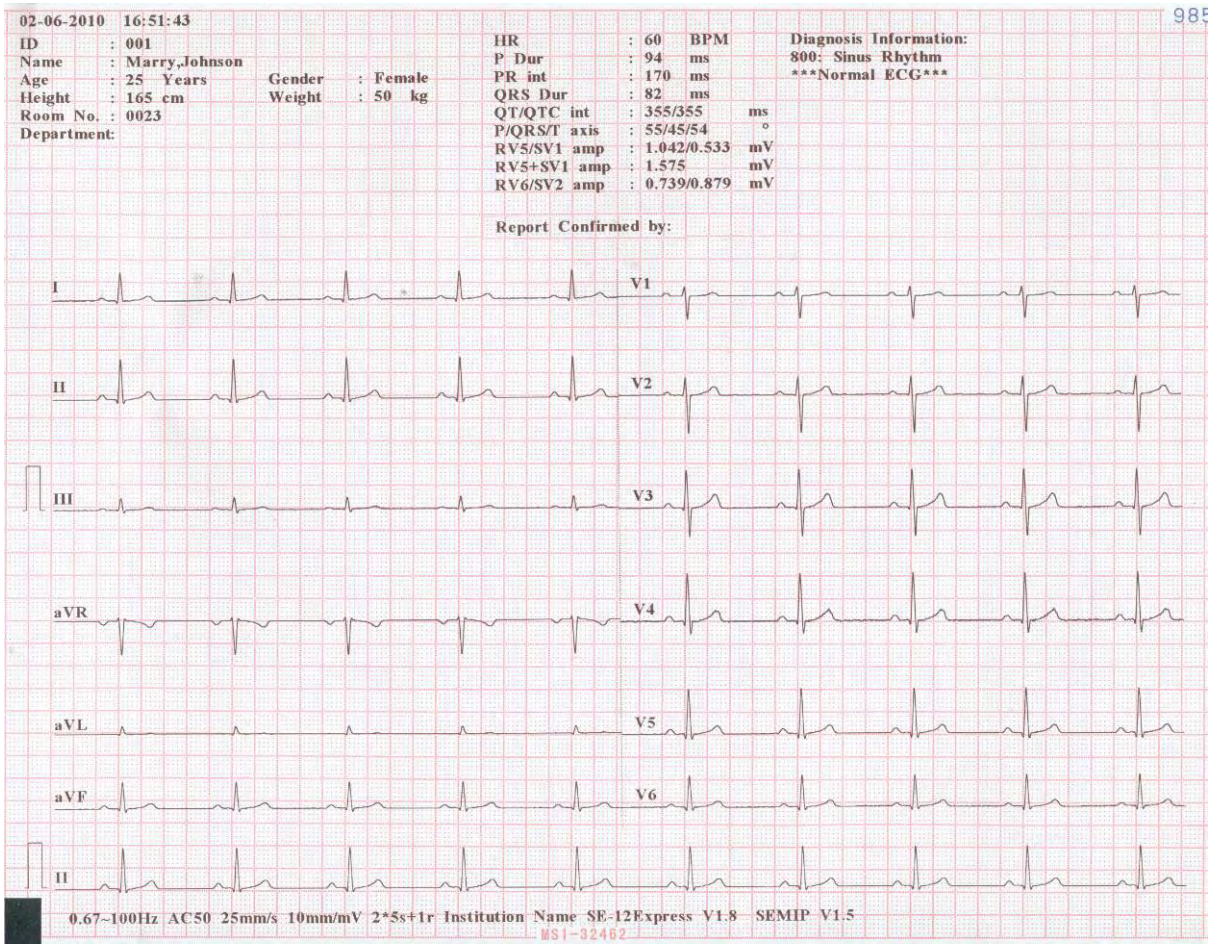
In the auto mode, pressing the **COPY** key can print the ECG report which was printed out last time. Pressing the **START/STOP** key can stop printing the ECG report.

# 8.6 ECG Reports

## 8.6.1 ECG Reports in the Auto Mode

### 8.6.1.1 Example of 6×2+1R

**Save Paper Mode**




The above figure shows an ECG report in the auto mode. The style is 6×2+1R. The ECG report includes:

Patient Information, Measure Information, Diagnosis Information, Report Confirmed by

Current Date and Current Time

6×2+1R ECG waves

0.67~100Hz (0.67Hz DFT Filter, 100Hz Lowpass Filter) AC50 (50Hz AC Filter)

25mm/s (Paper Speed) 10mm/mV (Gain)

2*5s+1r (12 leads are printed in 2 groups of 6, and every group is printed for about 5s, with one

rhythm lead at the bottom simultaneously)

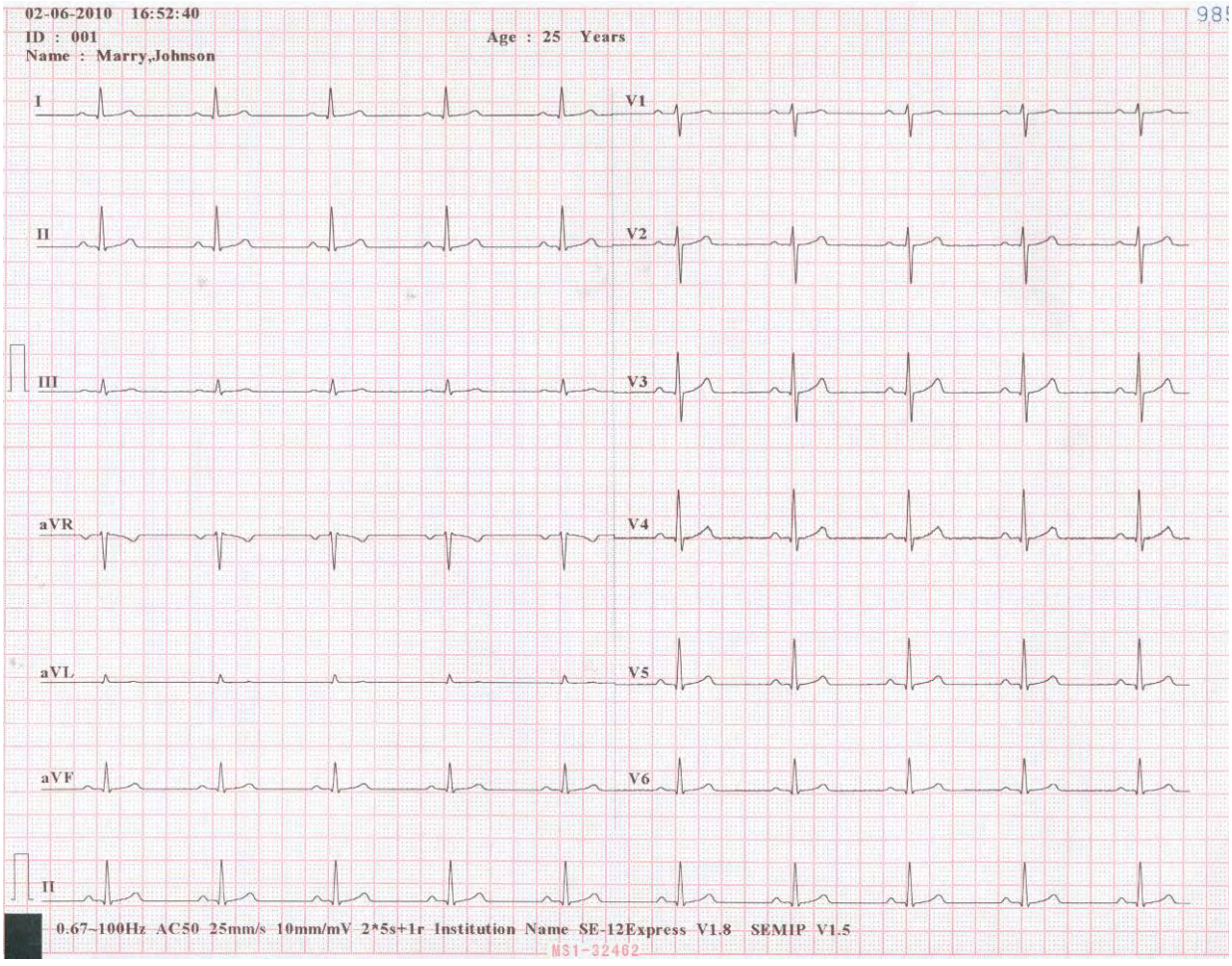
Institution Name

SE-12 Express (Electrocardiograph Model)

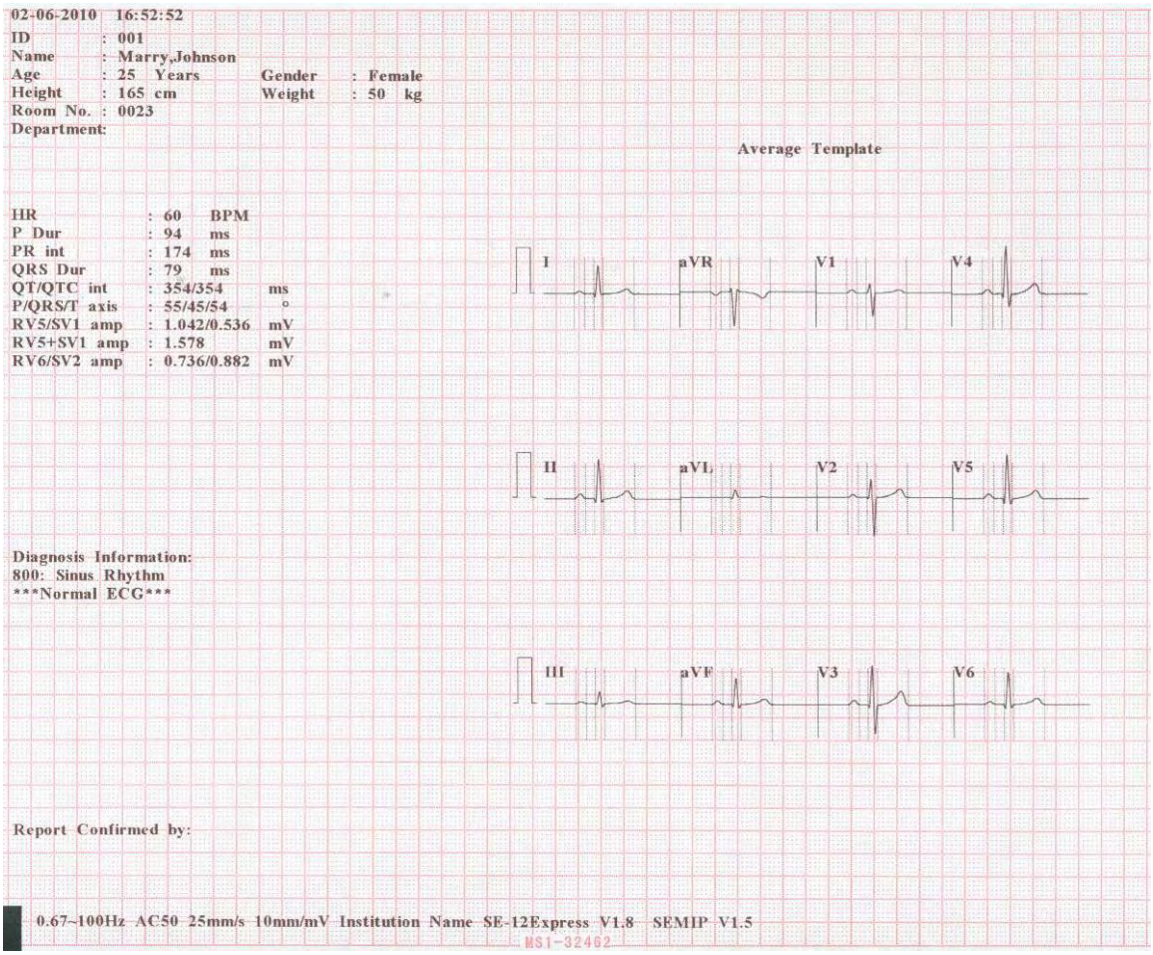
V1.8 (Software Version Number)

SEMIP V1.5(Algorithm Version Number)

## Quick Mode




(a)




(b)

The above figure (a) and (b) show an ECG report in the auto mode. **Template** is selected, and **Record Style** is set to **6×2+1R**.

Figure (a) shows:

02-06-2010 16:52:40 (Current Date & Current Time)

ID: 001 (Patient ID)

Name: Marry, Johnson (Patient Name)

Age: 25 Years (Patient Age)

(1mV calibration mark)

I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6 (12 standard leads) and ECG waves

II on the bottom (Rhythm Lead) and rhythm wave

0.67~100Hz (0.67Hz DFT Filter, 100Hz Lowpass Filter)

AC50 (50Hz AC Filter)

25mm/s (Paper Speed)

10mm/mV (Gain)

2*5s+1r (12 leads are printed in 2 groups of 6, and every group is printed for about 5s, with one rhythm lead at the bottom simultaneously)

Institution Name

SE-12 Express (Electrocardiograph Model)

V1.8 (Software Version Number)

SEMIP V1.5(Algorithm Version Number)

Figure (b) shows: Patient Information, Measure Information, Minnesota Code, Diagnosis Information, Average Template, Report Confirmed by, Current Date and Current Time, 0.67Hz (DFT Filter), 100Hz (Lowpass Filter), AC50 (50Hz AC Filter), 25mm/s (Paper Speed), 10mm/mV (Gain), Institution Name, SE-12 Express (Electrocardiograph Model), V1.8 (Software Version Number), SEMIP V1.5(Algorithm Version Number).

Patient Information includes:

ID, Name, Age, Gender, Height, Weight, Room No., Department

Measure Information includes:

HR (Heart Rate)

P Dur----P wave duration: the average P-wave duration from several selected dominant beats;

PR int----P-R interval: the average P-R interval from several selected dominant beats;

QRS Dur----QRS complex duration: the average QRS complex duration from several selected dominant beats;

QT/QTC int----Q-T interval: the average Q-T interval from several selected dominant beats / Normalized QT interval;

P/QRS/T axis----Dominant direction of the average integrated ECG vectors;

RV5/SV1 amp----The maximum of the amplitude of R or R' wave of one selected dominant beat from lead V5 / The maximum absolute value of the amplitude of S or S' wave of one selected dominant beat from lead V1;

RV5+SV1 amp---- Sum of RV5 and SV1;

RV6/SV2 amp---- The maximum of the amplitude of R or R' wave of one selected dominant beat from lead V6 / The maximum absolute value of the amplitude of S or S' wave of one selected dominant beat from lead V2;

Diagnosis Information:

Diagnosis information shows the auto diagnosis result.

Average Template:

Average template shows the average value of 10s sampled ECG signals of every lead.

The broken lines on the template are position markers. They respectively mark the start and end points of the P and QRS waves, and the end point of the T wave.

### 8.6.1.2 Example of 3×4+1R


The above figure shows an ECG report in the auto mode. The style is 3×4+1R. The ECG report includes:

Patient Information, Measure Information, Diagnosis Information, Minnesota Code, Report Confirmed by

02-06-2010 16:53:52 (Current Date and Current Time)

3×4+1R ECG waves

0.67~100Hz (0.67Hz DFT Filter, 100Hz Lowpass Filter) AC50 (50Hz AC Filter)

25mm/s (Paper Speed) 10mm/mV (Gain)

4*2.5s+1r (12 leads are printed in 4 groups of 3, and every group is printed for about 2.5s, with one rhythm lead at the bottom simultaneously)

Institution Name

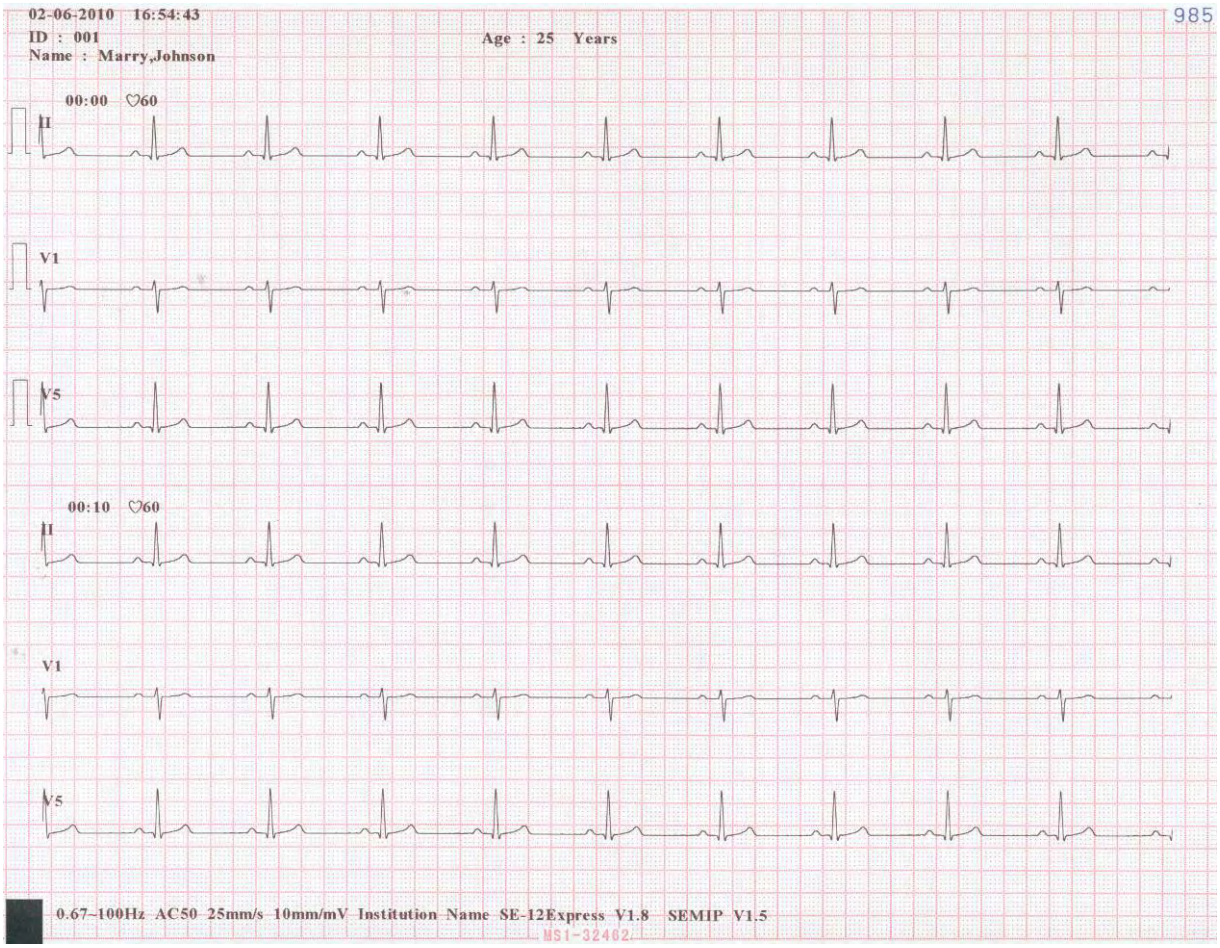
SE-12 Express (Electrocardiograph Model)

V1.8 (Software Version Number)

SEMIP V1.5(Algorithm Version Number)

**Note:** Please refer to Section 8.6.1.1 for the explanation of the patient information, measure information and diagnosis information.

## 8.6.2 ECG Reports in the Rhythm Mode




The above figure shows an ECG report in the rhythm mode, and **Rhythm Style** is set to **Three Leads**.

02-06-2010 16:54:43 (Current Date & Current Time)

ID: 001 (Patient ID)

Age: 25 Years (Patient Age)

Name: Marry, Johnson (Patient Name)

00:00, 00:10 (Timer)

60 (Heart Rate)

(1mV calibration mark) II, V1, V5 (Rhythm Lead Name)

20s rhythm waveform of lead II / V1 / V5

0.67~100Hz (0.67Hz DFT Filter, 100Hz Lowpass Filter)

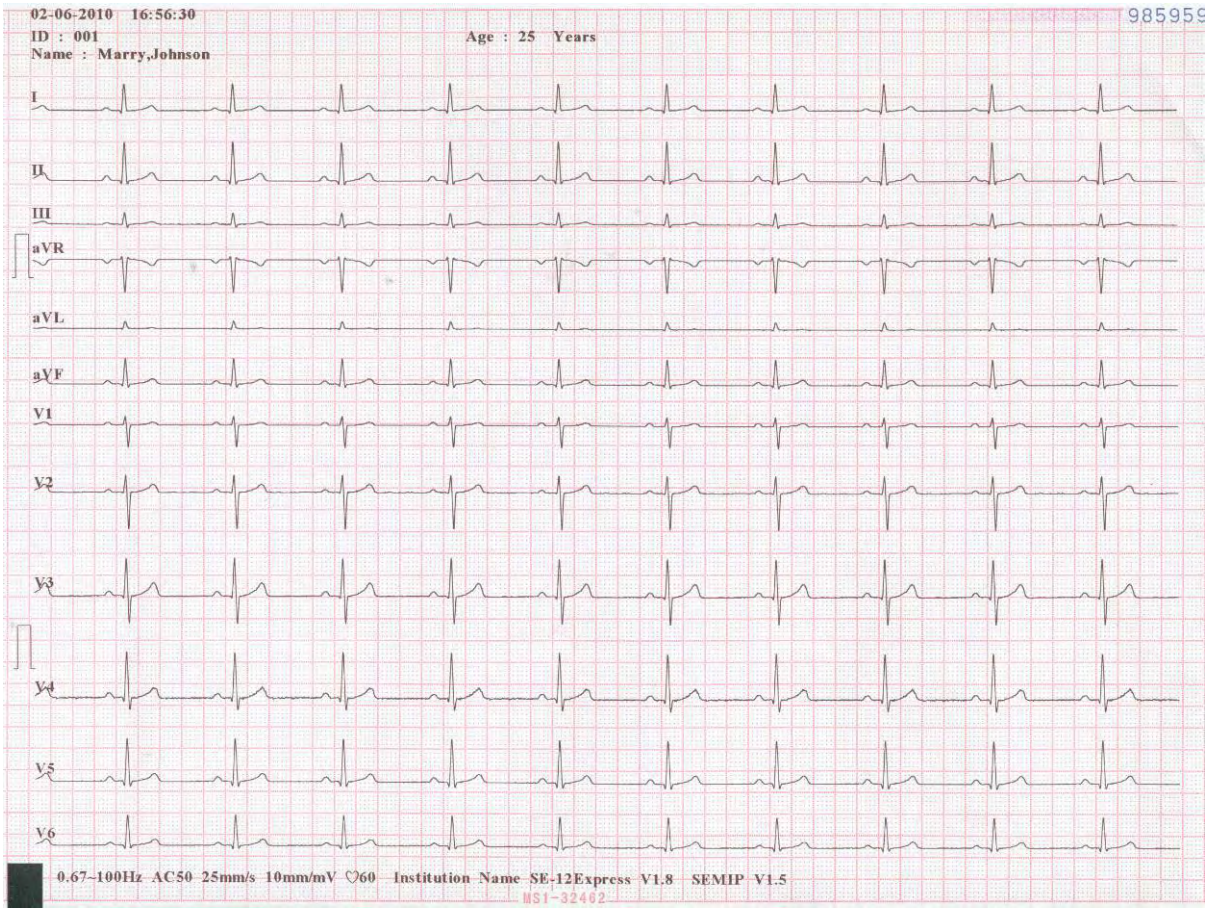
AC50 (50Hz AC Filter) 25mm/s (Paper Speed)

10mm/mV (Gain) Institution Name

SE-12 Express (Electrocardiograph Model) V1.8 (Software Version Number)

SEMIP V1.5(Algorithm Version Number)

## 8.6.3 ECG Reports in the Manual Mode




The above figure shows an ECG report in the manual mode, and **Manual Style** is set to **12 channels**.

02-06-2010 16:56:30 (Current Date & Current Time)

ID: 001 (Patient ID)

Age: 25 Years (Patient Age)

Name: Marry, Johnson (Patient Name)

(1mV calibration mark)

I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6 (12 standard leads)

ECG waveform of 12 standard leads

0.67~100Hz (0.67Hz DFT Filter, 100Hz Lowpass Filter)

AC50 (50Hz AC Filter) 25mm/s (Paper Speed)

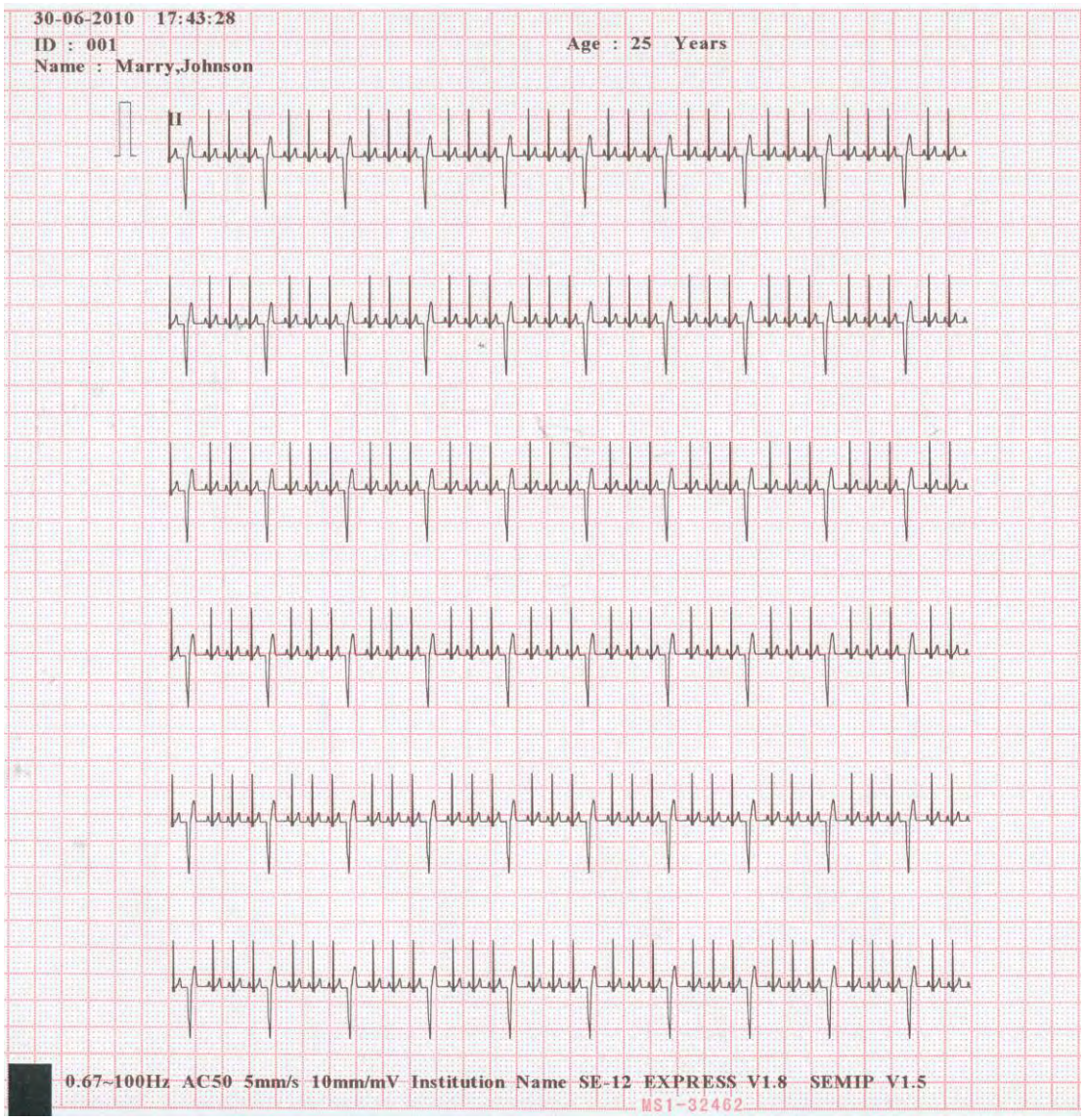
10mm/mV (Gain) 60 (Heart Rate)

Institution Name SE-12 Express (Electrocardiograph Model)

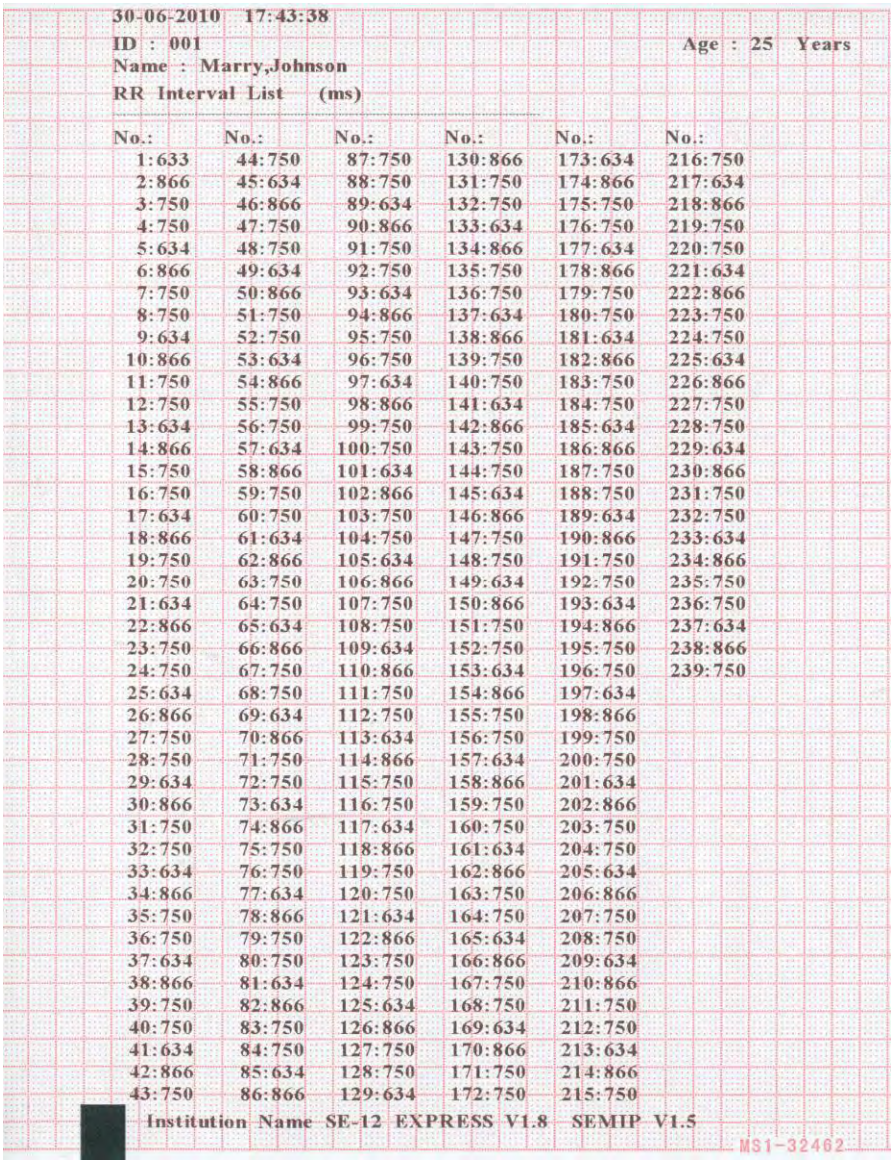
V1.8 (Software Version Number) SEMIP V1.5(Algorithm Version Number)

## 8.6.4 ECG Reports in the R-R Analysis Mode


(a)


30-06-2010 17:43:28
ID : 001
Name : Marry,Johnson
Age : 25 Years
II
0.67~100Hz AC50 5mm/s 10mm/mV Institution Name SE-12 EXPRESS V1.8 SEMIP V1.5
MS1-32462

(b)



30-06-2010 17:43:38
ID : 001 Age : 25 Years
Name : Marry,Johnson
RR Interval List (ms)

| No.: | No.: | No.: | No.: | No.: | No.: |
|---|---|---|---|---|---|
| 1:633 | 44:750 | 87:750 | 130:866 | 173:634 | 216:750 |
| 2:866 | 45:634 | 88:750 | 131:750 | 174:866 | 217:634 |
| 3:750 | 46:866 | 89:634 | 132:750 | 175:750 | 218:866 |
| 4:750 | 47:750 | 90:866 | 133:634 | 176:750 | 219:750 |
| 5:634 | 48:750 | 91:750 | 134:866 | 177:634 | 220:750 |
| 6:866 | 49:634 | 92:750 | 135:750 | 178:866 | 221:634 |
| 7:750 | 50:866 | 93:634 | 136:750 | 179:750 | 222:866 |
| 8:750 | 51:750 | 94:866 | 137:634 | 180:750 | 223:750 |
| 9:634 | 52:750 | 95:750 | 138:866 | 181:634 | 224:750 |
| 10:866 | 53:634 | 96:750 | 139:750 | 182:866 | 225:634 |
| 11:750 | 54:866 | 97:634 | 140:750 | 183:750 | 226:866 |
| 12:750 | 55:750 | 98:866 | 141:634 | 184:750 | 227:750 |
| 13:634 | 56:750 | 99:750 | 142:866 | 185:634 | 228:750 |
| 14:866 | 57:634 | 100:750 | 143:750 | 186:866 | 229:634 |
| 15:750 | 58:866 | 101:634 | 144:750 | 187:750 | 230:866 |
| 16:750 | 59:750 | 102:866 | 145:634 | 188:750 | 231:750 |
| 17:634 | 60:750 | 103:750 | 146:866 | 189:634 | 232:750 |
| 18:866 | 61:634 | 104:750 | 147:750 | 190:866 | 233:634 |
| 19:750 | 62:866 | 105:634 | 148:750 | 191:750 | 234:866 |
| 20:750 | 63:750 | 106:866 | 149:634 | 192:750 | 235:750 |
| 21:634 | 64:750 | 107:750 | 150:866 | 193:634 | 236:750 |
| 22:866 | 65:634 | 108:750 | 151:750 | 194:866 | 237:634 |
| 23:750 | 66:866 | 109:634 | 152:750 | 195:750 | 238:866 |
| 24:750 | 67:750 | 110:866 | 153:634 | 196:750 | 239:750 |
| 25:634 | 68:750 | 111:750 | 154:866 | 197:634 | |
| 26:866 | 69:634 | 112:750 | 155:750 | 198:866 | |
| 27:750 | 70:866 | 113:634 | 156:750 | 199:750 | |
| 28:750 | 71:750 | 114:866 | 157:634 | 200:750 | |
| 29:634 | 72:750 | 115:750 | 158:866 | 201:634 | |
| 30:866 | 73:634 | 116:750 | 159:750 | 202:866 | |
| 31:750 | 74:866 | 117:634 | 160:750 | 203:750 | |
| 32:750 | 75:750 | 118:866 | 161:634 | 204:750 | |
| 33:634 | 76:750 | 119:750 | 162:866 | 205:634 | |
| 34:866 | 77:634 | 120:750 | 163:750 | 206:866 | |
| 35:750 | 78:866 | 121:634 | 164:750 | 207:750 | |
| 36:750 | 79:750 | 122:866 | 165:634 | 208:750 | |
| 37:634 | 80:750 | 123:750 | 166:866 | 209:634 | |
| 38:866 | 81:634 | 124:750 | 167:750 | 210:866 | |
| 39:750 | 82:866 | 125:634 | 168:750 | 211:750 | |
| 40:750 | 83:750 | 126:866 | 169:634 | 212:750 | |
| 41:634 | 84:750 | 127:750 | 170:866 | 213:634 | |
| 42:866 | 85:634 | 128:750 | 171:750 | 214:866 | |
| 43:750 | 86:866 | 129:634 | 172:750 | 215:750 | |

Institution Name SE-12 EXPRESS V1.8 SEMIP V1.5
MS1-32402

(c)

The above figure (a), (b) and (c) show an ECG report in the R-R analysis mode.

Figure (a) shows:

Current Date & Current Time

Patient Information (Name, ID, Gender, Age, Height, Weight)

Measuring Time

Total Beat Number

HR (Heart Rate)

RR Avg Interval (Average RR interval)

RR Max Interval (Maximum RR interval)

RR Min Interval (Minimum RR interval)

Max/Min (Ratio of Maximum RR interval to Minimum RR interval)

SDNN (Standard Deviation of Normal to Normal Intervals)

RMSSD (Root Mean Square Successive Difference)

RR Histogram

RR Trend

Figure (b) shows:

Current Date & Current Time

Patient Information (Name, ID, Age)

Gain, Speed, Filter

 (1mV calibration mark)

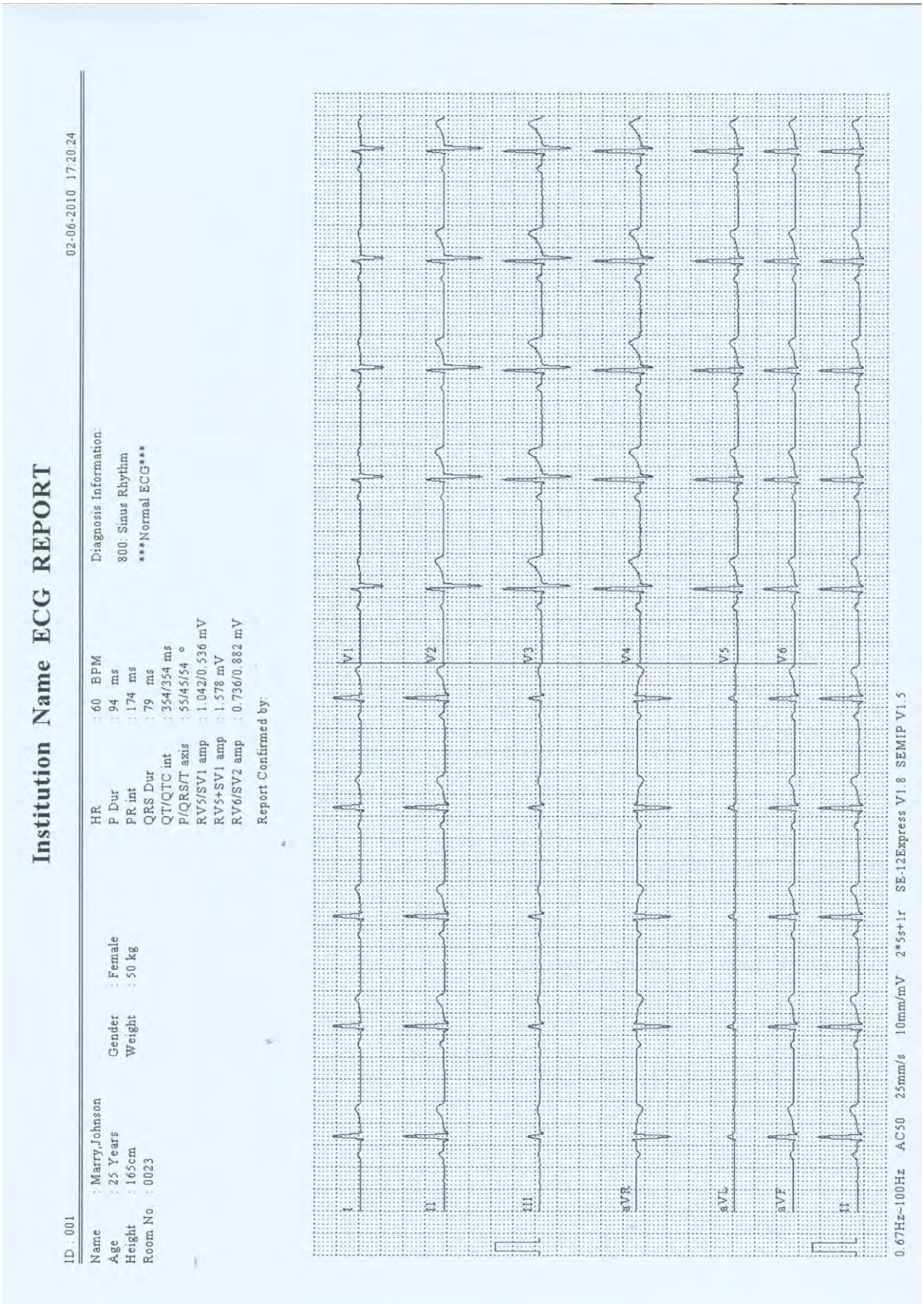
II (Lead name)

180s compressed ECG wave of Lead II

Figure (c) shows:

All the RR interval values within the measuring time

## 8.6.5 ECG Reports Printed by the USB Printer



As the above figure shows, the ECG report printed by the USB printer includes:

Institution Name Date and Time

Patient Information

Measurement Information

Minnesota Code;

Diagnosis Information;

Report Confirmed by;

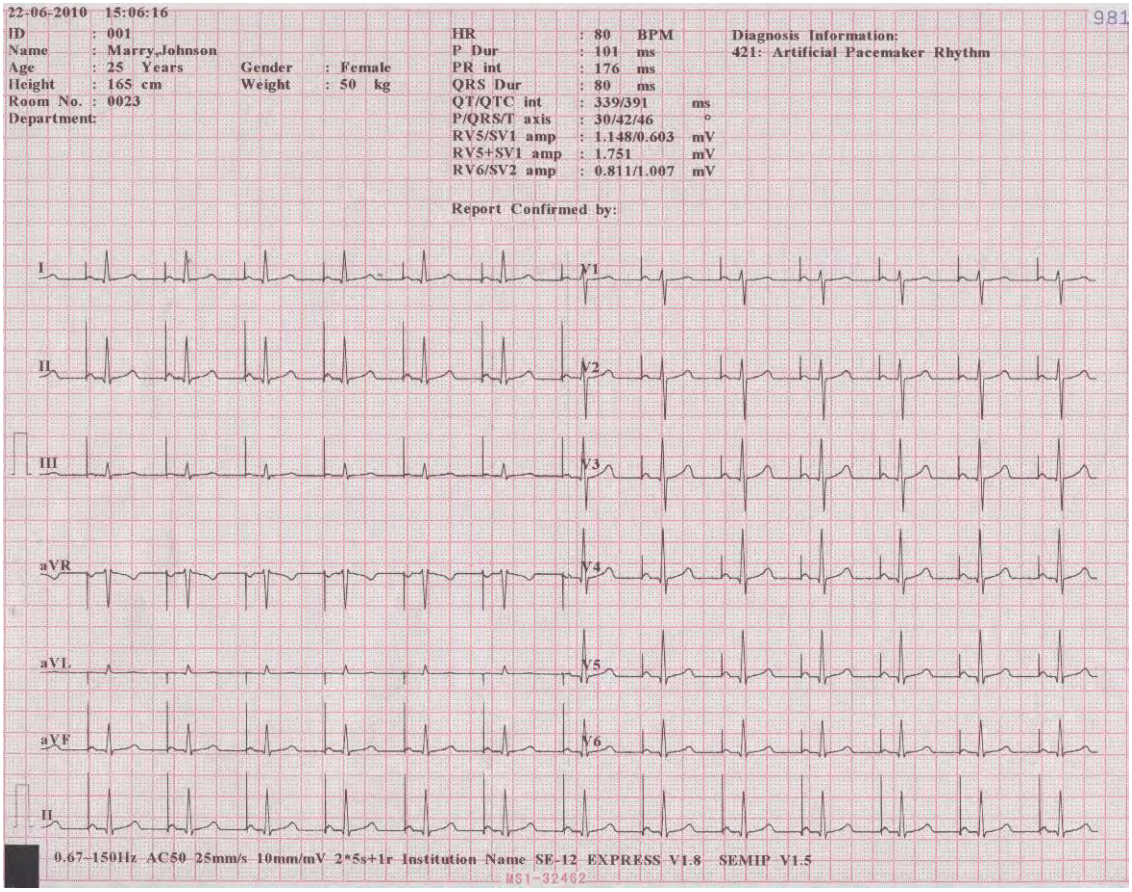
ECG waves of 12 leads

DFT Filter, Lowpass Filter, AC Filter, Paper Speed, Gain;

SE-12 Express (Electrocardiograph Model) V1.8 (Software Version Number)

SEMIP V1.5(Algorithm Version Number)

## 8.6.6 ECG Report of Patient with Pacemaker



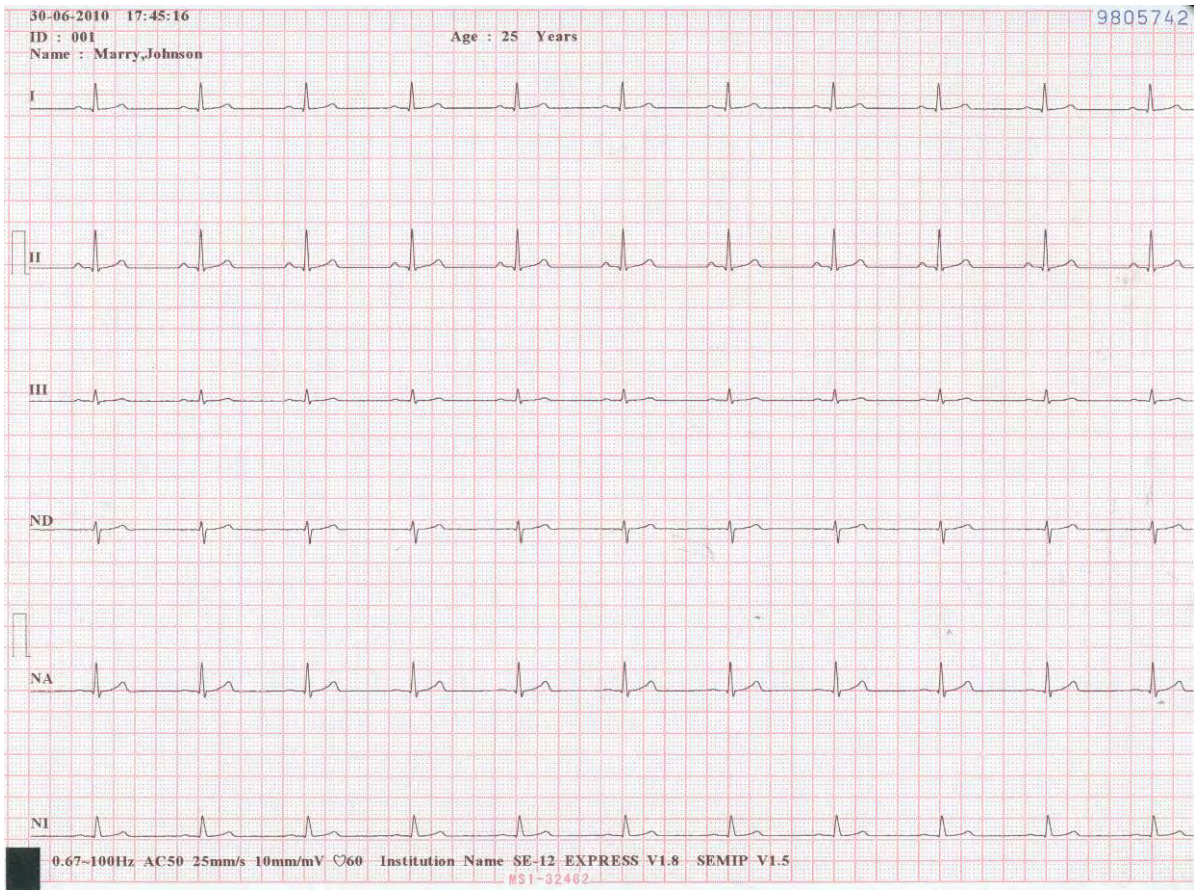

The above figure shows the ECG report of a patient with a pacemaker. **Pacemaker Detection Sens.** is set to **High**, and the Lowpass filter is set to **150Hz**.

**Notes:**

1. To the patient with a pacemaker, the EMG filter should be set to **Off** and the Lowpass filter should be set to **150Hz**; or else, the amplitude of the pulses may decrease, the width may increase, and the diagnosis results may not include the pacemaker information.

2. To the patient with a pacemaker, the results given by the equipment may be invalid.

## 8.6.7 ECG Report of Nehb Lead




ECG report of Nehb lead includes:

30-06-2010 17:45:16 (Current Date & Current Time)

ID: 001 (Patient ID)

Age: 25 Years (Patient Age)

Name: Marry, Johnson (Patient Name)

(1mV calibration mark)

I, II, III, ND, NA, NI (Nehb leads)

0.67~100Hz (0.67Hz DFT Filter, 100Hz Lowpass Filter)

AC50 (50Hz AC Filter) 25mm/s (Paper Speed)

10mm/mV (Gain) ♡60 (Heart Rate)

Institution Name SE-12 Express (Electrocardiograph Model)

V1.8 (Software Version Number) SEMIP V1.5(Algorithm Version Number)

# Chapter 9 Transmitting ECG Data Automatically

## 9.1 Transmitting ECG Data to the PC

**Notes:**

1. To transmit ECG data in DAT format to the PC, the Smart ECG Viewer software of the manufacturer must be installed in the PC. You should log into the Smart ECG Viewer software before transmission.

2. To transmit ECG data in SCP/FDA-XML/PDF format to the PC, the FTP receiving software must be installed in the PC. You should log into the FTP receiving software before transmission.

3. By default, the ECG file format is DAT. You can activate SCP/FDA-XML/PDF function on the **Advanced Setup** interface. For details, refer to Section 9.1.3, “Transmitting ECG Data in SCP/FDA-XML/PDF Format Through Net Cable”.

### 9.1.1 Transmitting ECG Data in DAT Format Through Serial Cable

1. Connect the RS232 socket of the PC to the RS232 socket of the electrocardiograph with an RS232 cable.

2. Or if the PC has no RS232 socket, connect the USB socket of the PC to the RS232 socket of the electrocardiograph by using the RS232-USB assembly.

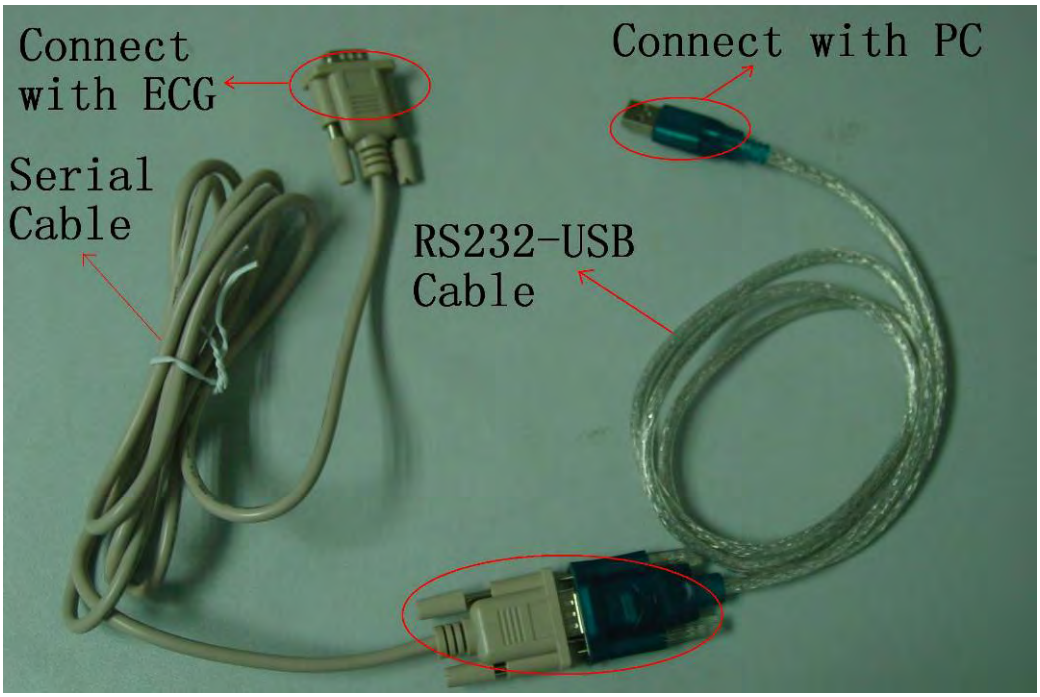



Figure 9-1 RS232-USB Assembly

3. Set **Auto Transmission** to **On** and **Transmission Mode** to **UART** on the **Transmission Setup** interface.

1) When the main interface is displayed, press the function key **F6** below **Setup** to open the **System Setup** interface.

2) Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Transmission**, press ↵ to open the **Transmission Setup** interface.

3) Press **Tab** or Shift + **Tab** to move the cursor to the **Auto Transmission** list box, and then press the Up or Down arrow to select **On**. Press **Tab** or Shift + **Tab** to move the cursor to the **Transmission Mode** list box, and then press the Up or Down arrow to select **UART**.

4) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.

5) Press **ESC** to return to the main interface.

4. Log into the Smart ECG Viewer software.

5. In the auto or rhythm mode, ECG data will be transmitted through the serial cable

automatically after an ECG report is printed out. In the off mode, ECG data will be transmitted through the serial cable automatically after the **START/STOP** key is pressed.

## 9.1.2 Transmitting ECG Data in DAT Format Through Net Cable

1. Connect the electrocardiograph to the network of the PC with an Ethernet cable recommended by the manufacturer.

If the wireless AP transmission is used, connect the PC to the server wireless AP, and connect the electrocardiograph to the client wireless AP. Only the wireless AP recommended by the manufacturer can be used.

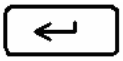
**Notes:**

1. For details on configuring the wireless AP, please refer to the user manual delivered with the wireless AP.

2. There should be no shield in or around the room where the wireless AP is used, or else the wireless transmission may fail.

2. Set **Auto Transmission** to **On** and **Transmission Mode** to **Ethernet** on the **Transmission Setup** interface. Set the IP addresses.

1) When the main interface is displayed, press the function key **F6** below **Setup** to open the **System Setup** interface.

2) Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Transmission**, press  to open the **Transmission Setup** interface.

3) Press **Tab** or Shift + **Tab** to move the cursor to the **Auto Transmission** list box, and then press the Up or Down arrow to select **On**.

4) Press **Tab** or Shift + **Tab** to move the cursor to the **Transmission Mode** list box, and then press the Up or Down arrow to select **Ethernet**.

5) Press **Tab** or Shift + **Tab** to move the cursor to the **Server IP** item. Set the **Server IP** item to the IP of the PC.

6) Press **Tab** or Shift + **Tab** to move the cursor to the **Local IP** item.

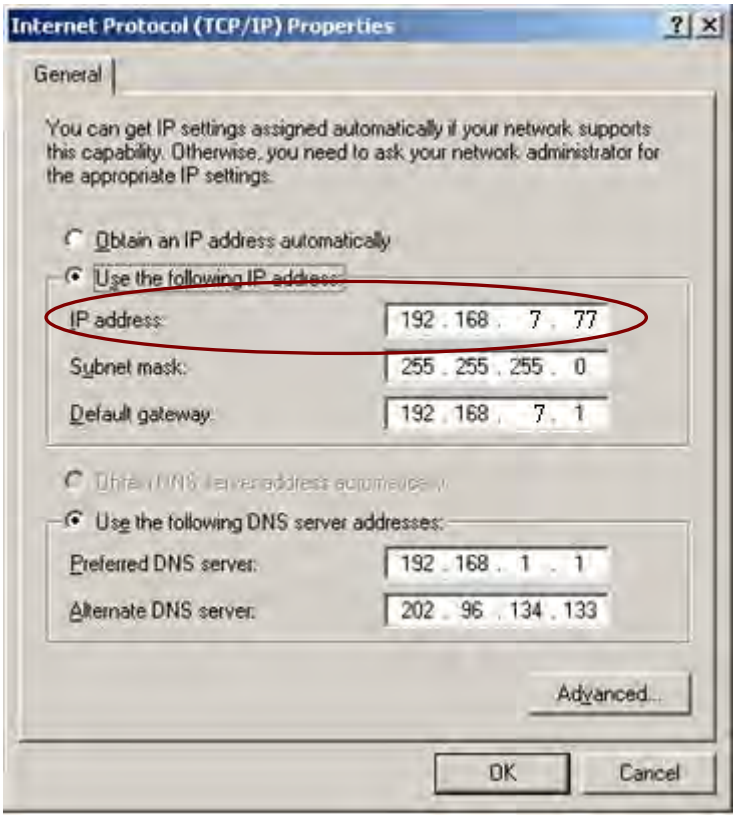
For the cross-network transmission, set the first two sections of the **Local IP** item to the first two sections of the IP of the PC. Set the third section of the **Local IP** item to the network segment of the electrocardiograph which depends on the configuration of Router. The last section of the **Local IP** item can be set at random.

For the same network transmission, set the first three sections of the **Local IP** item to the first three sections of the IP of the PC. The last section of the **Local IP** item can be set at random, but it can't be the same as the last section of the IP of the PC.

7) Press **Tab** or Shift + **Tab** to move the cursor to the **Gateway** item. Set the first three sections of the **Gateway** item to the first three sections of the IP of the electrocardiograph. The last section of the **Gateway** item must be set to **1**.

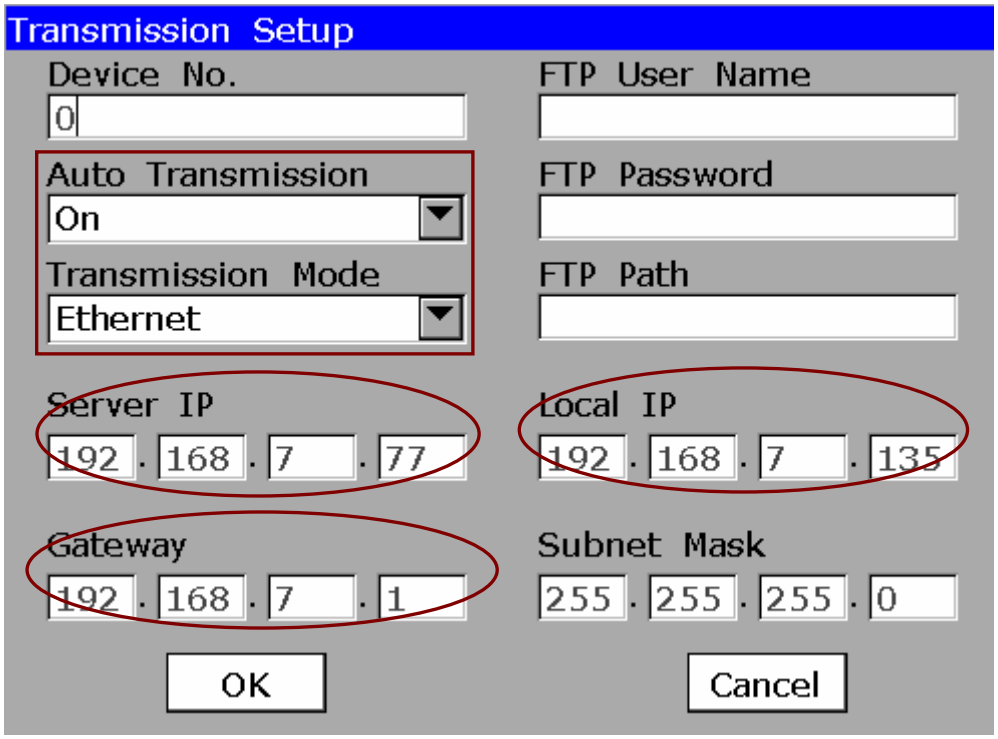
**Note:** For more information on configuring network settings, see your Network Administrator.

Take the same network transmission for example:
View the IP of the PC.




On the **Transmission Setup** interface of the electrocardiograph, set **Transmission Mode** to **Ethernet**. Set the **Server IP** item to the IP of the PC. Set the first three sections of the **Local IP** item to the first three sections of the IP of the PC. The last section of the **Local IP** item is

not the same as the last section of the IP of the PC. Set the first three sections of the **Gateway** item to the first three sections of the IP of the electrocardiograph. The last section of the **Gateway** item must be set to **1**. Commonly, **Subnet Mask** is set to **255.255.255.0**.




8) Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵.

9) Press **ESC** to return to the main interface.

3. Log into the Smart ECG Viewer software.

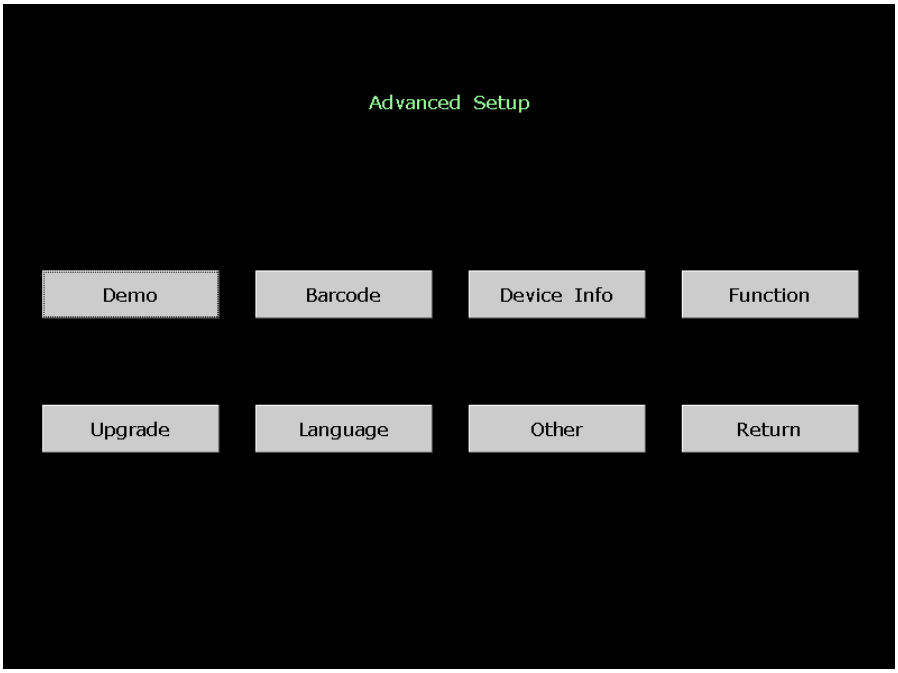
4. In the auto or rhythm mode, ECG data will be transmitted through the net cable automatically after an ECG report is printed out. In the off mode, ECG data will be transmitted through the net cable automatically after the **START/STOP** key is pressed.

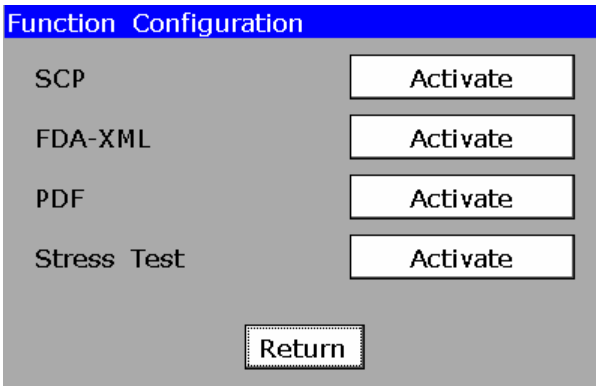
### 9.1.3 Transmitting ECG Data in SCP/FDA-XML/PDF Format Through Net Cable

1. Activate SCP/FDA-XML/PDF function on the **Advanced Setup** interface

1) When the main interface is displayed, press the function key **F6** below **Setup** to open the **System Setup** interface.

2) Press **F1** to display the **Service Password** window. Then enter the password and press ↵ to open the **Advanced Setup** interface. Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Function**, and then press ↵ to open the **Function Configuration** window.



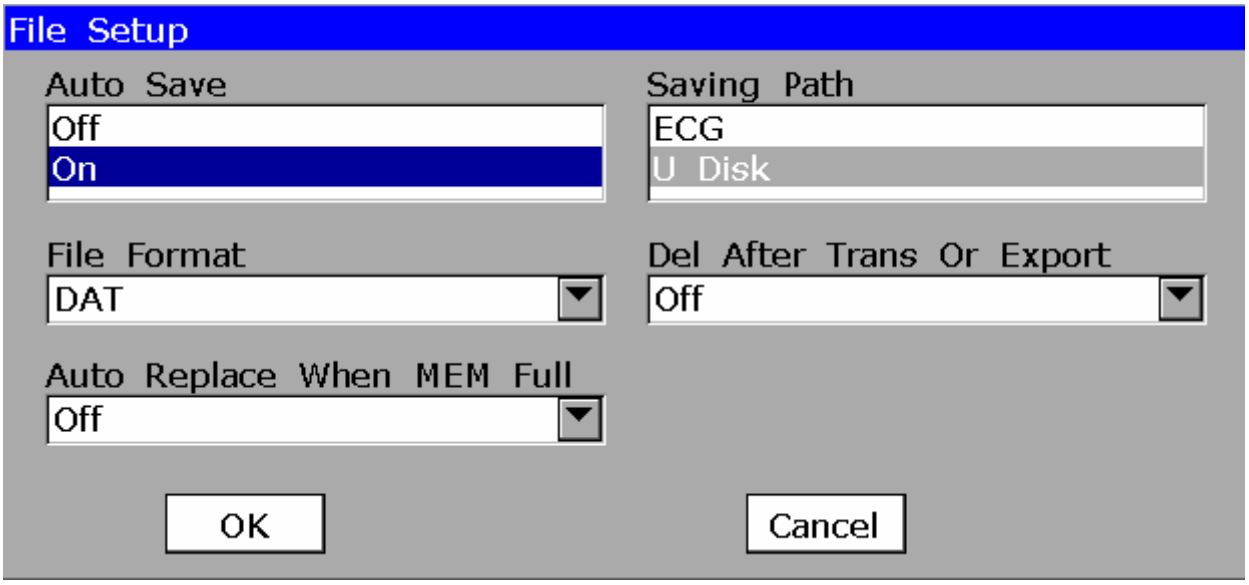

3) Press **Tab** or Shift + **Tab** to move the cursor to the **Activate** button after the function to be activated. Press ↵ to open the **Activate Password** window. Enter the password and press ↵ to activate the function.

**Note:** Please contact local distributors to get the service password and the activating

password.

2. Set file format to SCP/FDA-XML/PDF

When the main interface is displayed, press the function key **F6** below **Setup** to open the **System Setup** interface. Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **File**, press ↵ to open the **File Setup** interface. Press **Tab** or Shift + **Tab** to move the cursor to **File Format**, and then press the Up or Down arrow to select a format.




3. Transmit ECG data in SCP/FDA-XML/PDF format through the net cable

1) Connect the electrocardiograph to the network of the PC with an Ethernet cable recommended by the manufacturer.

If the wireless AP transmission is used, connect the PC to the server wireless AP, and connect the electrocardiograph to the client wireless AP. Only the wireless AP recommended by the manufacturer can be used.

2) Input the correct FTP path, FTP user name and password. Set **Auto Transmission** to **On** and **Transmission Mode** to **Ethernet**. Set the IP addresses. For details, please refer to Section 9.1.2, “Transmitting ECG Data in DAT Format Through Net Cable”.

3) Log into the FTP receiving software. The FTP port is 21.

4) In the auto or rhythm mode, ECG data will be transmitted through the net cable automatically after an ECG report is printed out. In the off mode, ECG data will be transmitted through the net

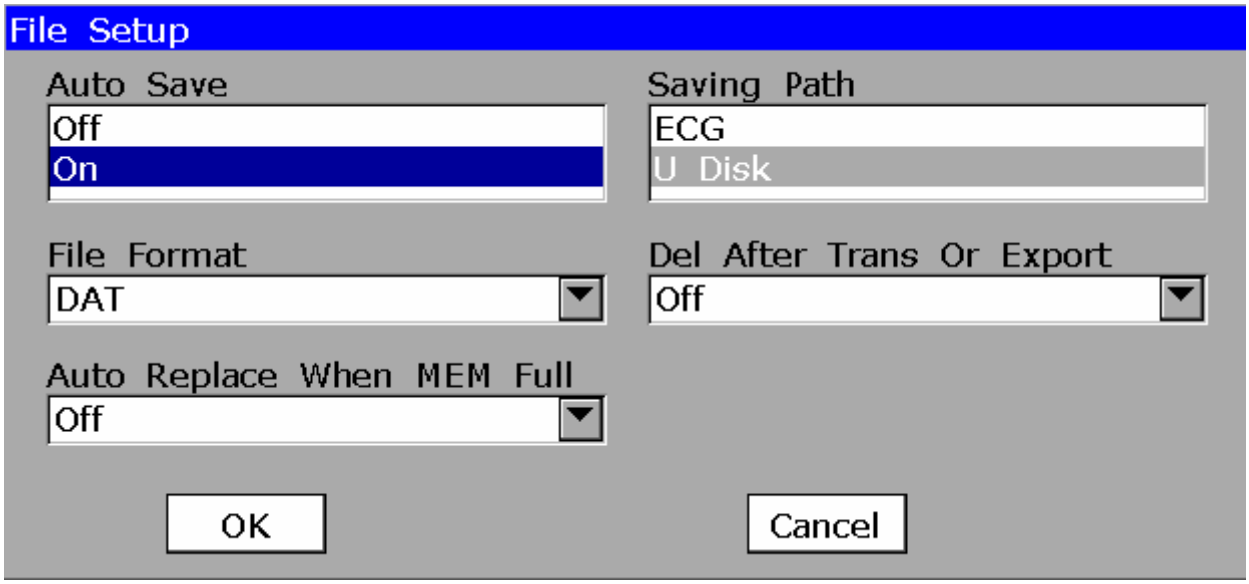
cable automatically after the **START/STOP** key is pressed.

## 9.2 Exporting ECG Data to the U Disk Automatically

1. Insert the U disk recommended by the manufacturer to USB socket 2 of the electrocardiograph.

2. When the main interface is displayed, press the function key **F6** below **Setup** to open the **System Setup** interface. Press **Tab** or Shift **+ Tab**, or the Up, Down, Left or Right arrow to move the cursor to **File**, press ↵ to open the **File Setup** interface.

3. Press **Tab** or Shift + **Tab** to move the cursor to the **Auto Save** list box, and then press the Up or Down arrow to select **On**. Press **Tab** or Shift + **Tab** to move the cursor to the **Saving Path** list box, and then press the Up or Down arrow to select **U Disk**. Press **Tab** or Shift + **Tab** to move the cursor to **File Format**, and then press the Up or Down arrow to select DAT/SCP/FDA-XML/PDF. For details on activating SCP/FDA-XML/PDF function on the **Advanced Setup** interface, refer to Section 9.1.3, “Transmitting ECG Data in SCP/FDA-XML/PDF Format Through Net Cable”.




Press ↵, or press **Tab** or Shift **+ Tab** to move the cursor to the **OK** button, and then press ↵. When the **System Setup** interface is displayed, press **ESC** to return to the main interface.

4. In the auto or rhythm mode, ECG data will be automatically exported to the directory of ECGDATA\ECG-X\Store\Examination Date of the U disk after an ECG report is printed out. In

the off mode, ECG data will be automatically exported to the directory of ECGDATA\ECG-X\Store\Examination Date of the U disk after the **START/STOP** key is pressed.

**Note:** X can be set in the **Device No.** textbox on the **Transmission Setup** interface.

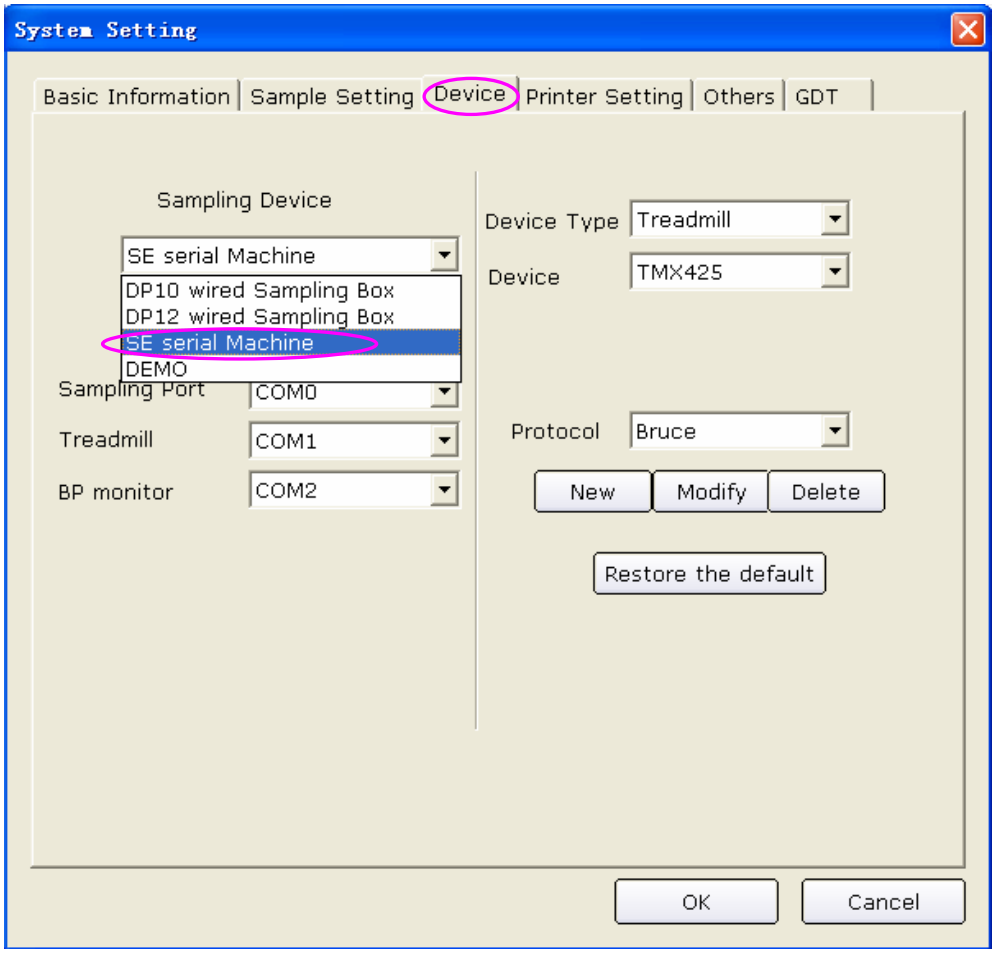
## 9.3 Real-time Transmission to PC ECG

**Note:** For the real-time transmission, the PC ECG software of the manufacturer must be installed in the PC.

1. Run the PC ECG software and configure it for the real-time transmission.

Double-click on the shortcut icon 

on the desktop to start up the PC ECG software. Click on the **System Setting** button to open the **System Setting** interface. Click on the **Device** tab. Select **SE serial Machine** from the **Sampling Device** pull-down list on the device setup interface. After setup, click on the **OK** button to confirm.




2. Connect USB socket 1 of the electrocardiograph to the USB socket of the PC by using the high-speed USB cable

3. Start the real-time transmission

The electrocardiograph transmits to the PC the ECG signals acquired from the patient. Acquisition and transmission are simultaneous. The ECG signals are displayed on the PC monitor and eventually analyzed. For more details, refer to the user manual of the PC ECG software.

In the real-time transmission, the function of the electrocardiograph is the same as that of the ECG sampling box.

# Chapter 10 Managing Files

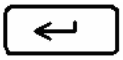
If you want to save the ECG data in the electrocardiograph, you should set **Auto Save** to **On** and **Saving Path** to **ECG**. By default, **Auto Save** is **On** and **Saving Path** is **ECG**. Then the ECG data in the auto, off or rhythm mode will be saved on the **File Manager** interface automatically.

**To Set Auto Save to On and Saving Path to ECG**

1. When the main interface is displayed, press the function key **F6** below **Setup** to open the **System Setup** interface.

2. Press **Tab** or Shift **+ Tab**, or the Up, Down, Left or Right arrow to move the cursor to **File**, press  .

3. Press **Tab** or Shift + **Tab** to move the cursor to the **Auto Save** list box, and then press the Up or Down arrow to select **On**. Press **Tab** or Shift + **Tab** to move the cursor to the **Saving Path** list box, and then press the Up or Down arrow to select **ECG**.

4. Press  , or press **Tab** or Shift **+ Tab** to move the cursor to the **OK** button, and then press  .

5. When the **System Setup** interface is displayed, press **ESC** to return to the main interface.

**To Switch to the File Manager Interface 1/2**

When the main interface is displayed, press the function key **F7** below **File** to open the **File Manager** interface1. Press the Up or Down arrow to highlight a file on the **File Manager** interface1, and then press the function key **F4** below **Select** to select the file and display the **File Manager** interface2. Then press the function key **F7** below **Return** to return to the **File Manager** interface1. Press the function key **F7** below **Return** on the **File Manager** interface1 to return to the main interface.


Figure 10-1 File Manager Interface1

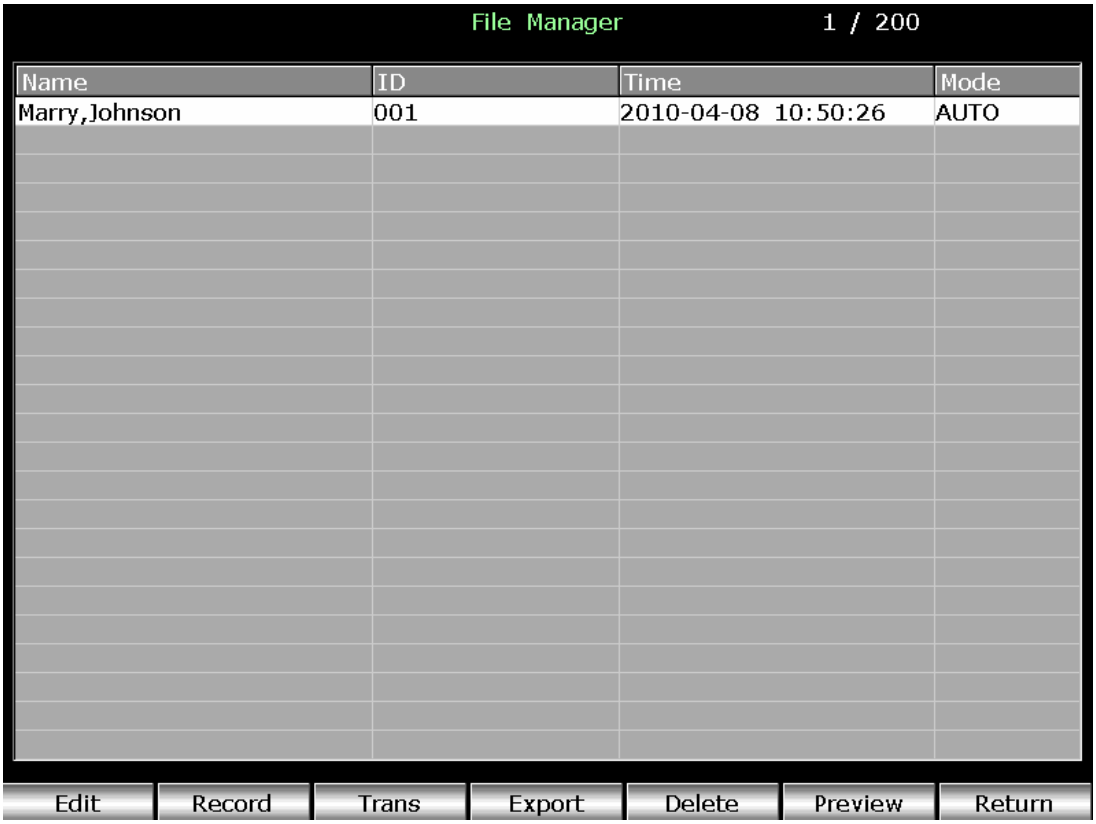



Figure 10-2 File Manager Interface2

On the **File Manager** interface, files can be printed, transmitted, exported, displayed, edited

searched or deleted. SE-12 can accommodate 100 files, and SE-12 Express can accommodate 200 files.

If there is no file on the **File Manager** interface, the following dialog box will pop up when you press function keys.


**CAUTION**

1 When files are being printed, transmitted, deleted or exported, you can not turn off the electrocardiograph.

2 Do not cut off the mains supply directly when no battery is installed in the device, or else, the stored data may be lost.

# 10.1 Transmitting Files to the PC

**Notes:**

1. To transmit DAT files to the PC, the Smart ECG Viewer software of the manufacturer must be installed in the PC. You should log into the Smart ECG Viewer software before transmission.

2. To transmit SCP/FDA-XML/PDF files to the PC, the FTP receiving software must be installed in the PC. You should log into the FTP receiving software before transmission.

3. By default, the ECG file format is DAT. You can activate SCP/FDA-XML/PDF function on the **Advanced Setup** interface. For details, refer to Section 9.1.3, “Transmitting ECG Data in SCP/FDA-XML/PDF Format Through Net Cable”.

4. If you select **Delete After Trans. Or Export** on the **File Setup** interface, the files will be deleted from the **File Manager** interface after they are transmitted.

**CAUTION**

It is forbidden to connect or disconnect a U disk or a USB printer during the transmission course.

## 10.1.1 Transmitting DAT Files Through Serial Cable

1. Connect the RS232 socket of the PC to the RS232 socket of the electrocardiograph with an RS232 cable.

2. Or if the PC has no RS232 socket, connect the USB socket of the PC to the RS232 socket of the electrocardiograph by using the RS232-USB assembly. For details of the RS232-USB assembly, please refer to Section 9.1.1, “Transmitting ECG Data in DAT Format Through Serial Cable”.

3. Log into the Smart ECG Viewer software.

**Note:** If you don’t connect the RS232 socket of the electrocardiograph to the PC, or you do not log into Smart ECG Viewer before transmission, the following hint will pop up.


4. Set **Transmission Mode** to **UART** on the **Transmission Setup** interface. For details, refer to Section 9.1.1, “Transmitting ECG Data in DAT Format Through Serial Cable”.

5. Press the function key **F7** below **File** to display the **File Manager** interface1.

6. Press the function key **F1** below **Trans All** to transmit all the files to the PC. After all the files are transmitted, the following hint will pop up.


7. Or press the Up or Down arrow to highlight a file on the **File Manager** interface1, and then press the function key **F4** below **Select** to select the file and display the **File Manager** interface2. Press the function key **F3** below **Trans** to transmit the selected file to the PC.

## 10.1.2 Transmitting DAT Files Through Net Cable

1. Connect the electrocardiograph to the network of the PC with an Ethernet cable recommended by the manufacturer.

If the wireless AP transmission is used, connect the PC to the server wireless AP, and connect the electrocardiograph to the client wireless AP. Only the wireless AP recommended by the manufacturer can be used.

**Notes:**

1. For details on configuring the wireless AP, please refer to the user manual delivered with the wireless AP.

2. There should be no shield in or around the room where the wireless AP is used, or else the wireless transmission may fail.

2. Log into the Smart ECG Viewer software.

**Note:** If you don't connect the electrocardiograph to the network of the PC (or if you don't connect the electrocardiograph/PC to the wireless AP), or you do not log into Smart ECG Viewer before transmission, the following hint will pop up.


3. Set **Transmission Mode** to **Ethernet** on the **Transmission Setup** interface. Set the IP addresses. For details on setting the transmission mode and the IP addresses, please see Section 9.1.2, "Transmitting ECG Data in DAT Format Through Net Cable".

4. Press the function key **F7** below **File** to display the **File Manager** interface1.

5. Press the function key **F1** below **Trans All** to transmit all the files to the PC. After all the files are transmitted, the following hint will pop up.

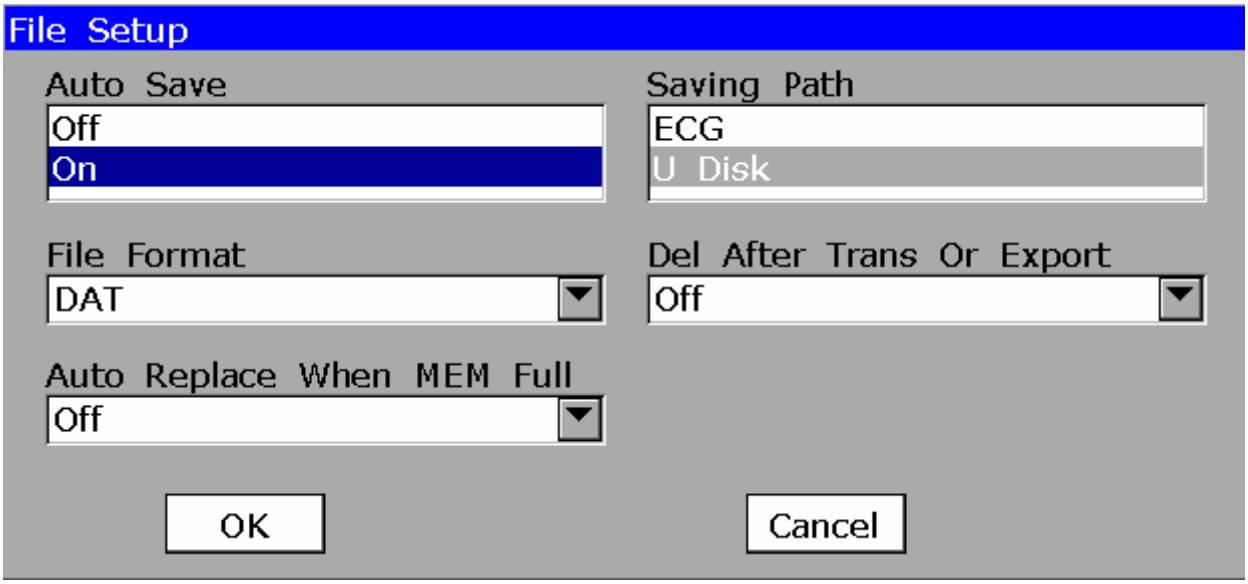

6. Or press the Up or Down arrow to highlight a file on the **File Manager** interface1, and then press the function key **F4** below **Select** to select the file and display the **File Manager** interface2. Press the function key **F3** below **Trans** to transmit the selected file to the PC.

## 10.1.3 Transmitting SCP/FDA-XML/PDF Files Through Net Cable

1. Activate SCP/FDA-XML/PDF function on the **Advanced Setup** interface. For details, refer to Section 9.1.3, “Transmitting ECG Data in SCP/FDA-XML/PDF Format Through Net Cable”.

2. Set file format to SCP/FDA-XML/PDF

When the main interface is displayed, press the function key **F6** below **Setup** to open the **System Setup** interface. Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **File**, press ↵ to open the **File Setup** interface. Press **Tab** or Shift + **Tab** to move the cursor to **File Format**, and then press the Up or Down arrow to select a format.




3. Transmit SCP/FDA-XML/PDF files through the net cable

1) Connect the electrocardiograph to the network of the PC with an Ethernet cable recommended by the manufacturer.

If the wireless AP transmission is used, connect the PC to the server wireless AP, and connect the electrocardiograph to the client wireless AP. Only the wireless AP recommended by the manufacturer can be used.

2) Log into the FTP receiving software. The FTP port is 21.

3) Input the correct FTP path, FTP user name and password. Set **Transmission Mode** to **Ethernet**. Set the IP addresses. For details, please see Section 9.1.3, "Transmitting ECG Data in SCP/FDA-XML/PDF Format to the PC Through Net Cable".

4) Press the function key **F7** below **File** to display the **File Manager** interface1.

5) Press the function key **F1** below **Trans All** to transmit all the files to the PC. After all the files are transmitted, the following hint will pop up.


6) Or press the Up or Down arrow to highlight a file on the **File Manager** interface1, and then press the function key **F4** below **Select** to select the file and display the **File Manager** interface2. Press the function key **F3** below **Trans** to transmit the selected file to the PC.

## 10.2 Exporting Files to the U Disk

1. Insert the U disk recommended by the manufacturer to USB socket 2 of the electrocardiograph.

2. When the main interface is displayed, press the function key **F7** below **File** to open the **File Manager** interface1.

3. Press the function key **F2** below **Export All** to export all the files to the directory of ECGDATA\ECG-X\Export\Examination Date and Time of the U disk.

4. Or press the Up or Down arrow to highlight a file on the **File Manager** interface1, and then press the function key **F4** below **Select** to select the file and display the **File Manager** interface2. Press the function key **F4** below **Export** to export the selected file to the directory of ECGDATA\ECG-X\Export\Examination Date and Time of the U disk.

If the U disk is not connected well, the hint *U disk is not ready!* will be displayed on the LCD screen of the electrocardiograph, and then you should connect the U disk again. If the electrocardiograph fails to export files, the hint *Exporting fails!* will pop up. After the electrocardiograph successfully exports files, the hint *Exporting succeeds!* will be displayed.

**Notes:**

1. Please insert the U disk or the SD card reader recommended by the manufacturer. Please set the format to **FAT** or **FAT32** when formatting the U disk.

2. The format of the exported files can be set to DAT/SCP/FDA-XML/PDF. For details, refer to Section 9.2, “Exporting ECG Data to the U Disk Automatically”.

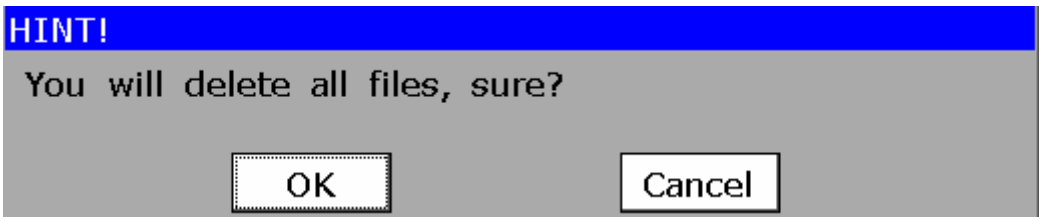
3. X can be set in the **Device No.** textbox on the **Transmission Setup** interface.

4. If you select **Delete After Trans. Or Export** on the **File Setup** interface, the files will be deleted from the **File Manager** interface after they are exported.

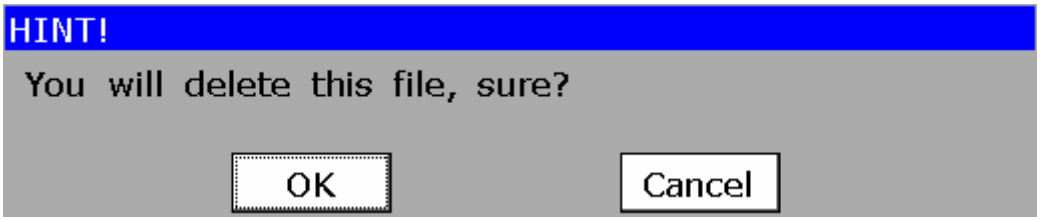
## 10.3 Deleting Files

1. When the main interface is displayed, press the function key **F7** below **File** to open the **File Manager** interface1.

2. Press the function key **F3** below **Del All** to display the following hint, press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to delete all the files from the electrocardiograph.




3. Or press the Up or Down arrow to highlight a file on the **File Manager** interface1, and then press the function key **F4** below **Select** to select the file and display the **File Manager** interface2. Press the function key **F5** below **Delete** to display the following hint, press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to delete the selected file from the electrocardiograph.

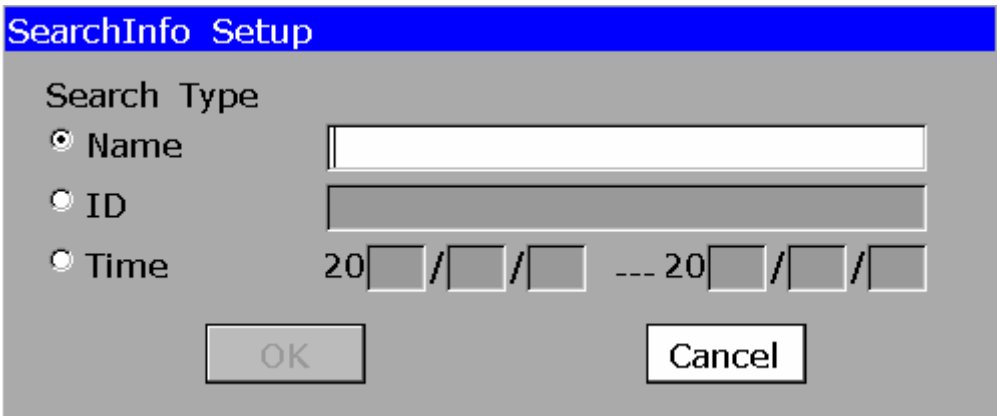



# 10.4 Searching Files

**To Open the SearchInfo Setup Window**

1. When the main interface is displayed, press the function key **F7** below **File** to open the **File Manager** interface1.

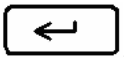
2. Press the function key **F5** below **Search** to open the **SearchInfo Setup** window.




**To Search Files**

1. Press **Tab**, Shift + **Tab**, or the Up or Down arrow to select **Name**, and then input the patient name. Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵. Then all the files with the input patient name will be displayed on the **File Manager** interface1.

2. Press **Tab**, Shift + **Tab**, or the Up or Down arrow to select **ID**, and then input the patient ID. Press ↵, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵. Then all the files with the input patient ID will be displayed on the **File Manager** interface1.

3. Press **Tab**, Shift + **Tab**, or the Up or Down arrow to select **Time**, and then input the examination time range. Press  , or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press  . Then all the corresponding files from the start time to the end time will be displayed on the **File Manager** interface1.

**Note:** The time mode is year-month-day on the **SearchInfo Setup** interface.

# 10.5 Importing Files

1. Insert the U disk recommended by the manufacturer to USB socket 2 of the electrocardiograph.

2. When the main interface is displayed, press the function key **F7** below **File** to open the **File Manager** interface1.

3. Press the function key **F6** below **Import** to import files from the directory of ECGDATA/ECG-X/Import of the U disk to the electrocardiograph.

**Notes:**

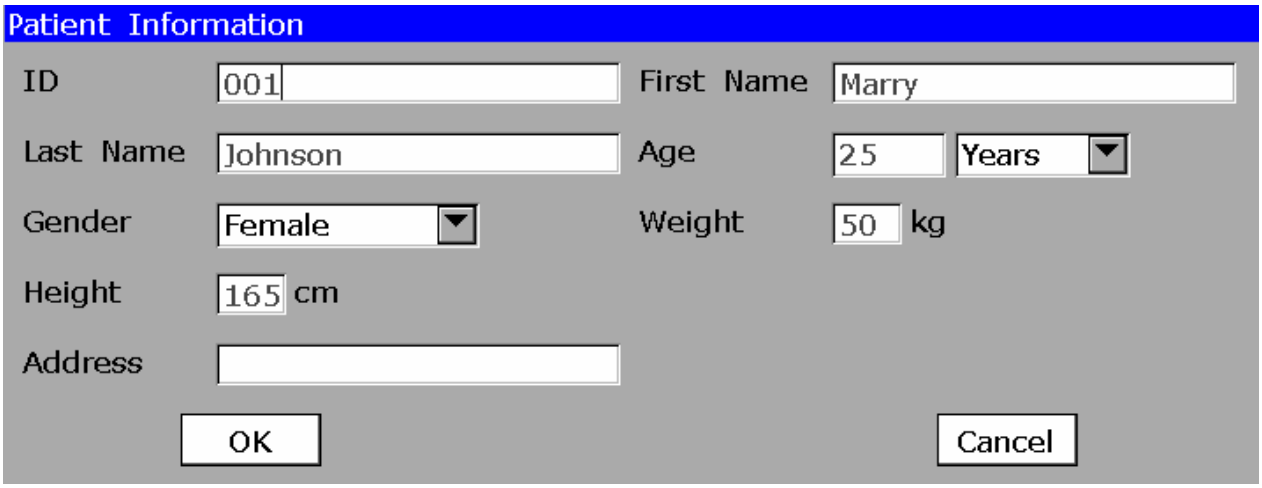
1. X can be set in the **Device No.** textbox on the **Transmission Setup** interface.

2. Only the ECG files in DAT format produced by the electrocardiograph of the manufacturer can be imported.

3. For SE-12, a maximum of 100 files can be imported at one time. For SE-12 Express, a maximum of 200 files can be imported at one time.

# 10.6 Editing Patient Information

When the main interface is displayed, press the function key **F7** below **File** to open the **File Manager** interface1. Press the Up or Down arrow to highlight a file on the **File Manager** interface1, and then press the function key **F4** below **Select** to select the file and display the **File Manager** interface2. Press the function key **F1** below **Edit** to open the **Patient Information** window.




**Note:** The **Address** item is customized.

1. Press **Tab** or Shift + **Tab** to move the cursor to a textbox. Fill in the selected textbox.

2. Press **Tab** or Shift + **Tab** to move the cursor to a list box. Press the Up or Down arrow to select an option.

3. After inputting all the information, press ↵ to confirm; or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm.

For details on inputting data, please refer to Section 3.2, “Entering Data”.

# 10.7 Printing Files

When the main interface is displayed, press the function key **F7** below **File** to open the **File Manager** interface1. Press the Up or Down arrow to highlight a file on the **File Manager** interface1, and then press the function key **F4** below **Select** to select the file and display the **File Manager** interface2. Press **START/STOP** or the function key **F2** below **Record** to print the selected file. Pressing **START/STOP** or the function key **F2** below **Stop** can stop printing the file.

# 10.8 Previewing a File

**To Open the File Preview Interface**

1. When the main interface is displayed, press the function key **F7** below **File** to open the **File**

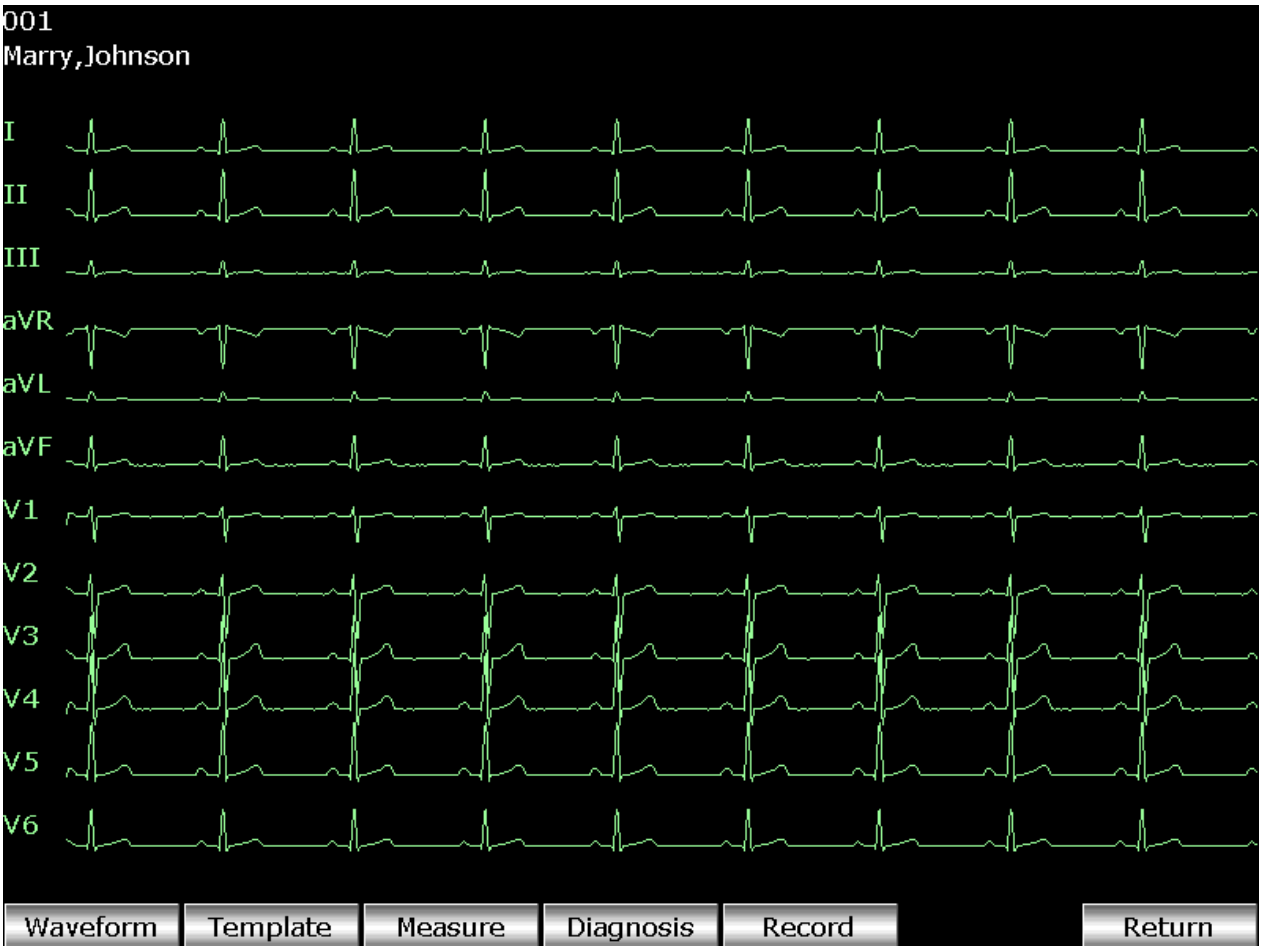
**Manager** interface1.

2. Press the Up or Down arrow to highlight a file on the **File Manager** interface1, and then press the function key **F4** below **Select** to select the file and display the **File Manager** interface2.

3. Press the function key **F6** below **Preview** to open the file preview interface.

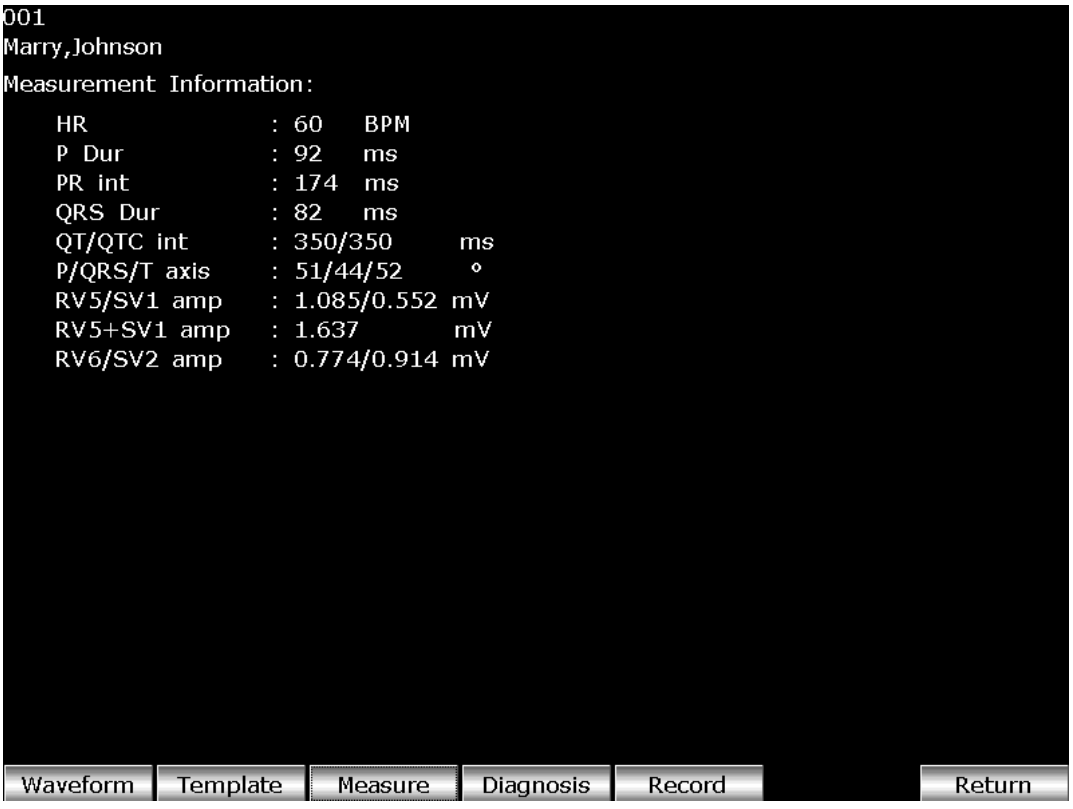
**To Preview the File**

1. Press the function key **F1** below **Waveform** to display the waveform interface.

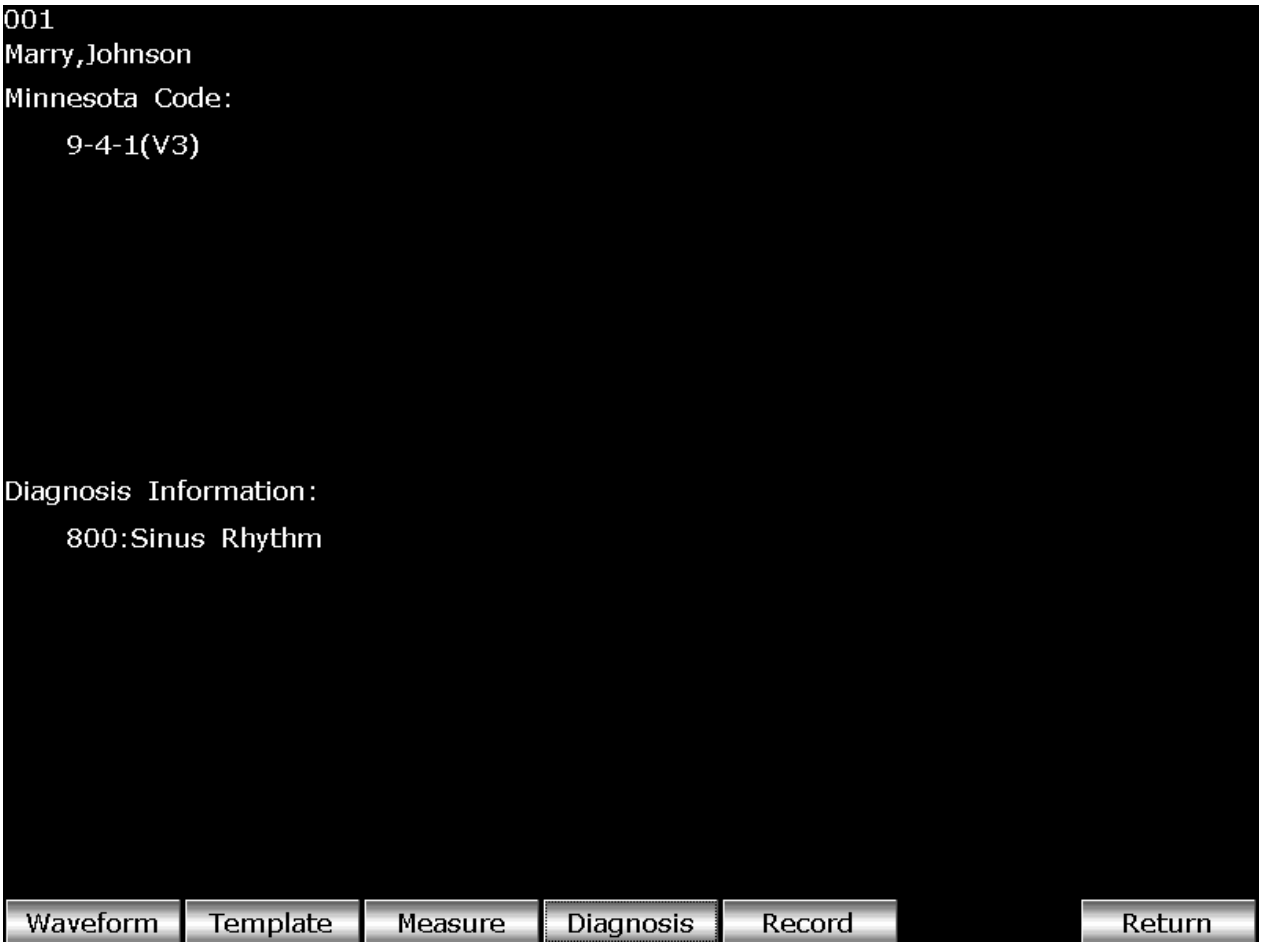


2. Press the function key **F2** below **Template** to display the template interface.


3. Press the function key **F3** below **Measure** to display the measure interface which shows Patient Name, Patient ID, Heart Rate, P Duration, PR interval, QRS Duration, QT/QTC interval, P/QRS/T axis, RV5/SV1 amplitude, RV5+SV1 amplitude, and RV6/SV2 amplitude.



4. Press the function key **F4** below **Diagnosis** to show Minnesota Code and Diagnosis Information.




5. Press **START/STOP** or the function key **F5** below **Record** to print the file. Pressing **START/STOP** or the function key **F5** below **Stop** can stop printing the file.

6. Press the function key **F7** below **Return** to return to the **File Manager** interface2.

**Note**: Rhythm data can not be previewed.

# Chapter 11 System Setup

After you turn on the device, the main interface pops up. Press the function key **F6** below **Setup** to display the **System Setup** interface.

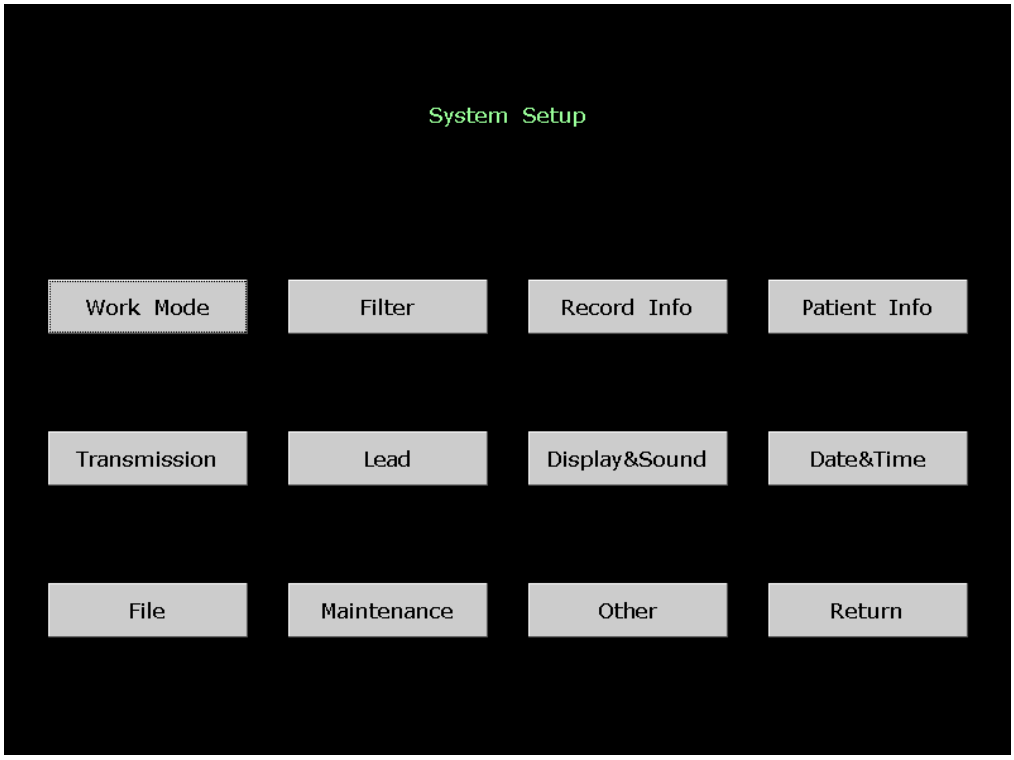



Figure 11-1 System Setup Interface

After setup,

1. Press **ESC** to return to the main interface.

2. Or press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Return**, and then press ↵ to return to the main interface.

## 11.1 Work Mode Setup

When the cursor is on **Work Mode** on the **System Setup** interface, press ↵ to open the **Work Mode Setup** interface.

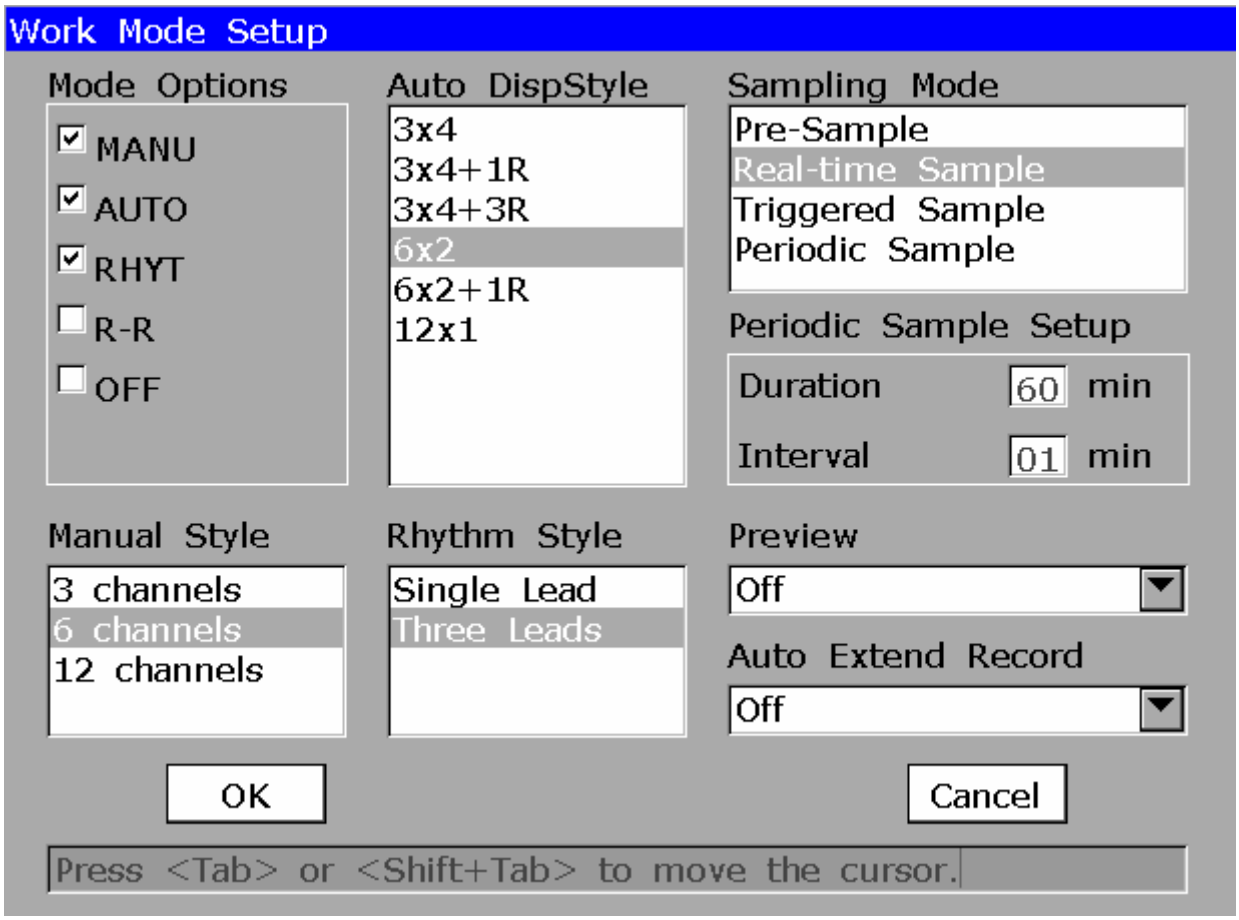



Figure 11-2 Work Mode Setup Interface

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup** interface appears.

## 11.1.1 Selecting Work Mode

Press **Tab** or Shift + **Tab** to move the cursor to a work mode, press Spacebar to select it, and then a check mark √ appears in the box before the work mode.

**Note:** Only if a work mode is selected on the **Work Mode Setup** interface, can the work mode be selected by pressing the **MODE** key when the main interface is displayed.

**MANU:** In the manual mode, you can determine the lead group to be displayed and printed.

**AUTO:** In the auto mode, the lead groups are switched automatically according to the lead sequence during the printing course. After the ECG waves of one lead group are printed within a certain time, the system switches to print ECG waves of another lead group automatically.

**RHYT:** In the rhythm mode, you can select rhythm leads to print 60s or 20s rhythm-lead ECG waves.

**R-R:** In the R-R analysis mode, you can select a lead to print its R-R histogram, R-R trend chart, 180s compressed ECG waveform and all the R-R interval values.

**OFF:** In the off mode, the lead groups are switched automatically according to the lead sequence. When the main interface is displayed, after pressing the **START/STOP** key, the sampled ECG data can be saved and transmitted, but can not be printed.

## 11.1.2 Selecting Manual Style

Press **Tab** or Shift **+ Tab** to move the cursor to the **Manual Style** list box on the **Work Mode Setup** interface, and then press the Up or Down arrow to highlight **3 channels**, **6 channels** or **12 channels**.

When **Manual Style** is set to **3 channels**, ECG waves of 3 leads are displayed and printed in the manual mode.

When **Manual Style** is set to **6 channels**, ECG waves of 6 leads are displayed and printed in the manual mode.

When **Manual Style** is set to **12 channels**, ECG waves of 12 leads are displayed and printed in the manual mode.

## 11.1.3 Selecting Rhythm Style

Press **Tab** or Shift **+ Tab** to move the cursor to the **Rhythm Style** list box on the **Work Mode Setup** interface, and then press the Up or Down arrow to highlight **Single Lead** or **Three Leads**.

When **Rhythm Style** is set to **Single Lead**, in the rhythm mode, 60s ECG waves of the appointed single rhythm lead will be printed.

When **Rhythm Style** is set to **Three Leads**, in the rhythm mode, 20s ECG waves of three appointed rhythm leads will be printed.

## 11.1.4 Selecting Auto Display Style

Press **Tab** or Shift **+ Tab** to move the cursor to the **Auto DispStyle** list box on the **Work Mode**

**Setup** interface, and then press the Up or Down arrow to highlight an option.

When the auto display style is set to **3×4**, ECG waves of 12 leads are displayed in 4 groups of 3.

When the auto display style is set to **3×4+1R**, ECG waves of 12 leads are displayed in 4 groups of 3, with the ECG wave of one rhythm lead on the bottom.

When the auto display style is set to **3×4+3R**, ECG waves of 12 leads are displayed in 4 groups of 3, with ECG waves of three rhythm leads on the bottom.

When the auto display style is set to **6×2**, ECG waves of 12 leads are displayed in 2 groups of 6.

When the auto display style is set to **6×2+1R**, ECG waves of 12 leads are displayed in 2 groups of 6, with the ECG wave of one rhythm lead on the bottom.

When the auto display style is set to **12×1**, ECG waves of 12 leads are displayed on one screen simultaneously.

## 11.1.5 Selecting Sampling Mode

Press **Tab** or Shift + **Tab** to move the cursor to the **Sampling Mode** list box on the **Work Mode Setup** interface, and then press the Up or Down arrow to highlight an option.

When **Sampling Mode** is set to **Pre-Sample**, 10s ECG data sampled before pressing the **START/STOP** key will be printed out.

**Note:** When **Sampling Mode** is set to **Pre-Sample**, if you press the **START/STOP** key before the electrocardiograph samples for 10s, the recorder will not respond.

When **Sampling Mode** is set to **Real-time Sample**, 10s ECG data sampled after pressing the **START/STOP** key will be printed out.

When **Sampling Mode** is set to **Triggered Sample**, after pressing the **START/STOP** key, if Arrhythmia ECG data, including Asystole, Ventricular Fibrillation/Ventricular Tachycardia, 5>PVCS>=3, Paired PVCS, Bigeminy, Trigeminy, R ON T, single PVC and Missed Beat, is detected during the learning course, the printing will be triggered automatically.

When **Sampling Mode** is set to **Periodic Sample**, first you should set **Duration** and **Interval**. For example, if **Interval** is set to **2 min**, and **Duration** is set to **24 min**, after pressing the **START/STOP** key, the printing will be performed every two minutes and come to 12 times.

**Notes:**

1. There is no saving, exporting or transmitting in the **Periodic Sample** mode.
2. ID and patient information will not be changed while carrying out the periodic printing.

### 11.1.6 Setting Interval and Duration

Press **Tab** or Shift + **Tab** to move the cursor to the **Duration** and **Interval** textboxes on the **Work Mode Setup** interface, and then input the duration and the interval manually.

In the auto mode, when **Sampling Mode** is set to **Periodic Sample**, if **Interval** is set to **2 min**, **Duration** is set to **24 min**, after pressing the **START/STOP** key, the printing will be performed every two minutes and come to 12 times.

### 11.1.7 Selecting Preview Function

Press **Tab** or Shift + **Tab** to move the cursor to **Preview** on the **Work Mode Setup** interface, and then press the Up or Down arrow to highlight **Off** or **On**.

When **Preview** is set to **On**, the preview interface will appear after you press the **START/STOP** key in the auto or off mode.

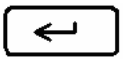
When **Preview** is set to **Off**, the preview interface will not appear after you press the **START/STOP** key.

### 11.1.8 Selecting Auto Extend Record

Press **Tab** or Shift + **Tab** to move the cursor to **Auto Extend Record** on the **Work Mode Setup** interface, and then press the Up or Down arrow to highlight **Off** or **On**.

When **Auto Extend Record** is set to **On**, if arrhythmia is detected in the auto or off mode, a hint will pop up to ask you whether to print an extra rhythm report after the 12-lead ECG report.

## 11.2 Filter Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Filter** on the **System Setup** interface, press  to open the **Filter Setup** interface.

On the **Filter Setup** interface, you can set **AC Filter**, **EMG Filter**, **DFT Filter**, and **Lowpass Filter**.

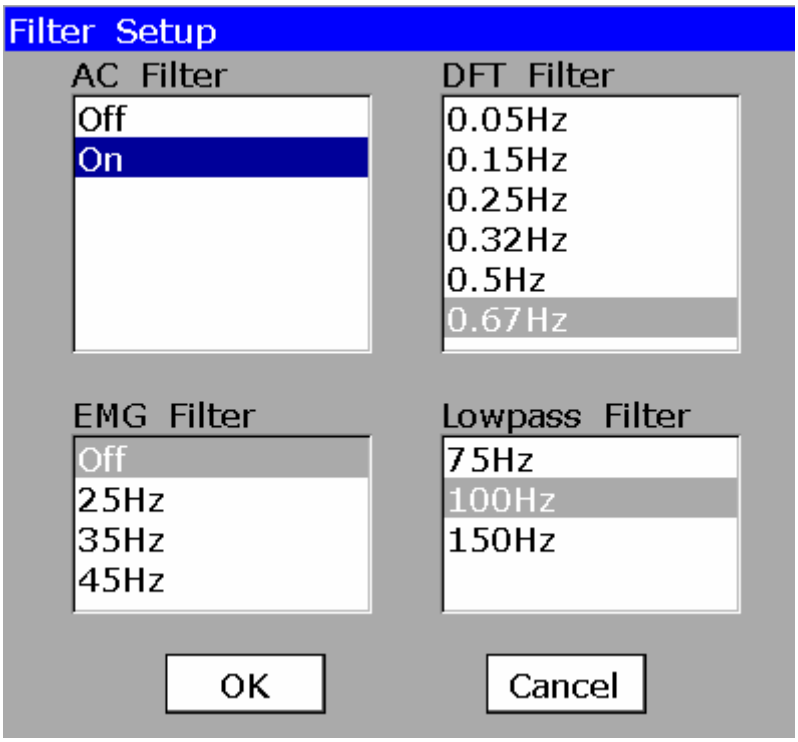



Figure 11-3 Filter Setup Interface

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup** interface appears.

## 11.2.1 Setting AC Filter

Press **Tab** or Shift + **Tab** to move the cursor to the **AC Filter** list box on the **Filter Setup** interface. Press the Up or Down arrow to highlight **Off** or **On**.

AC Filter suppresses AC interference without attenuating or distorting the ECG signals. Select **On** to turn on the function and select **Off** to turn it off.

**Note:** AC frequency can be set to **50Hz** or **60Hz** on the **Advanced Setup** interface according to local mains supply specifications.

## 11.2.2 Setting DFT Filter

Press **Tab** or Shift + **Tab** to move the cursor to the **DFT Filter** list box on the **Filter Setup** interface. Press the Up or Down arrow to highlight an option.

DFT Filter greatly reduces the baseline fluctuations without affecting the ECG signals. The purpose of this filter is to keep the ECG signals on the baseline of the printout. The set value is the low limit of the frequency range, including **0.05Hz**, **0.15Hz**, **0.25Hz**, **0.32Hz**, **0.5Hz** and **0.67Hz**.

### 11.2.3 Setting EMG Filter

Press **Tab** or Shift + **Tab** to move the cursor to the **EMG Filter** list box on the **Filter Setup** interface. Press the Up or Down arrow to highlight an option.

EMG Filter suppresses disturbance caused by strong muscle tremor. The cutoff frequency can be set to **25Hz**, **35Hz** or **45Hz**. Select **Off** to turn off the function.

### 11.2.4 Setting Lowpass Filter

Press **Tab** or Shift + **Tab** to move the cursor to the **Lowpass Filter** list box. Press the Up or Down arrow to highlight an option.

Lowpass Filter restricts the bandwidth of input signals. The cutoff frequency can be set to **150Hz**, **100Hz** or **75Hz**. All the input signals whose frequency is higher than the set cutoff frequency will be attenuated.

**Notes:**

1. Only when **EMG Filter** is set to **Off**, can the setting of **Lowpass Filter** be effective.
2. To the patient with a pacemaker, the EMG filter should be set to **Off** and the Lowpass filter should be set to **150Hz**; or else, the amplitude of the pulses may decrease, the width may increase, and the diagnosis results may not include the pacemaker information.

# 11.3 Record Info Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Record Info** on the **System Setup** interface, press ↵ to open the **Record Info Setup** interface.

You can press **F1** or **F2** to switch between **Setup 1** and **Setup 2**.

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup** interface appears.

## 11.3.1 Setup 1

Press **F1** or **F2** to switch to the **Setup 1** interface.

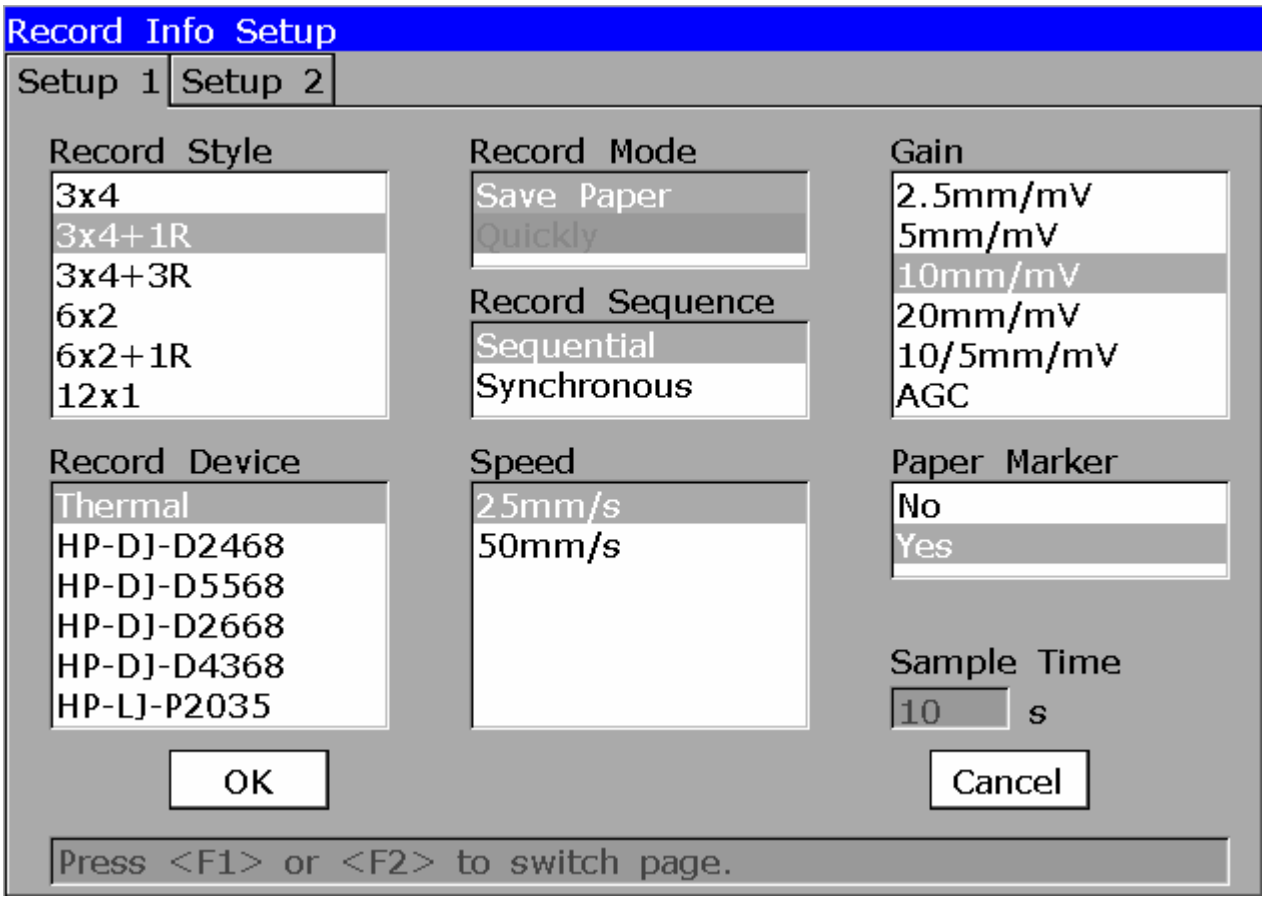



Figure 11-4 Record Info Setup1

### 11.3.1.1 Selecting Auto Recording Style

Press **Tab** or Shift + **Tab** to move the cursor to the **Record Style** list box on the **Setup 1** interface, and then press the Up or Down arrow to highlight an option.

In the auto mode, when **Record Style** is set to **3×4**, ECG waves of 12 leads are printed in 4 groups of 3.

In the auto mode, when **Record Style** is set to **3×4+1R**, ECG waves of 12 leads are printed in 4 groups of 3, with the ECG wave of one rhythm lead on the bottom of the ECG reports.

In the auto mode, when **Record Style** is set to **3×4+3R**, ECG waves of 12 leads are printed in 4 groups of 3, with the ECG waves of three rhythm leads on the bottom of the ECG reports.

In the auto mode, when **Record Style** is set to **6×2**, ECG waves of 12 leads are printed in 2 groups of 6.

In the auto mode, when **Record Style** is set to **6×2+1R**, ECG waves of 12 leads are printed in 2 groups of 6, with the ECG wave of one rhythm lead on the bottom of the ECG reports.

In the auto mode, when **Record Style** is set to **12×1**, ECG waves of 12 leads are printed simultaneously.

### 11.3.1.2 Selecting Recording Mode

Press **Tab** or Shift + **Tab** to move the cursor to the **Record Mode** list box on the **Setup 1** interface, and then press the Up or Down arrow to highlight **Save Paper** or **Quickly**.

When **Record Mode** is set to **Save Paper**, 10s after pressing the **START/STOP** key on the main interface, an ECG report is printed. The patient information, measure information, interpretation and ECG waves are printed on the same paper.

When **Record Mode** is set to **Quickly**, pressing the **START/STOP** key on the main interface to begin printing an ECG report immediately, the patient information, measure information, interpretation and ECG waves are printed on two pieces of paper.

**Notes:**

1. In the auto mode, only when **Sampling Mode** is set to **Real-time Sample**, **Quickly** is available.

2. When **Record Style** is set to **3×4**, **3×4+1R** or **3×4+3R**, only **Save Paper** is available. When **Record Style** is set to **12×1,** only **Quickly** is available.

### 11.3.1.3 Selecting Recording Sequence

Press **Tab** or Shift + **Tab** to move the cursor to the **Record Sequence** list box on the **Setup 1** interface, and then press the Up or Down arrow to highlight **Sequential** or **Synchronous**.

When **Record Sequence** is set to **Sequential**, the lead group is printed one by one in a certain sequence. The start time of a lead group is just the end time of the previous lead group.

When **Record Sequence** is set to **Synchronous**, all leads are printed simultaneously. The start time of each group is the same.

### 11.3.1.4 Setting Gain

Press **Tab** or Shift + **Tab** to move the cursor to the **Gain** list box on the **Setup 1** interface, and then press the Up or Down arrow to highlight an option.

You can set the indicated height of 1mV ECG on the paper.

You can set **Gain** to **10mm/mV**, **20mm/mV**, **10/5mm/mV**, **AGC**, **2.5mm/mV** or **5mm/mV**.

**AGC** means auto gain control. When ECG signals vary greatly, **AGC** can be selected to adjust the gain automatically according to actual signals.

**10/5mm/mV** means that the gain of limb leads is set to **10mm/mV**, while the gain of chest leads is set to **5mm/mV**.

### 11.3.1.5 Selecting Recording Device

Press **Tab** or Shift + **Tab** to move the cursor to the **Record Device** list box on the **Setup 1** interface. Press the Up or Down arrow to select an option.

You can set **Record Device** to **Thermal**, **HP-DJ-D2468**, **HP-DJ-D5568**, **HP-DJ-D2668**, **HP-DJ-D4368** or **HP-LJ-P2035**.

**HP-DJ-D2468**, **HP-DJ-D5568**, **HP-DJ-D2668**, **HP-DJ-D4368** and **HP-LJ-P2035** are the types of the USB printer, when **HP-DJ-D2468**, **HP-DJ-D5568**, **HP-DJ-D2668**, **HP-DJ-D4368** or **HP-LJ-P2035** is selected, you should connect the corresponding USB printer to USB socket 2 of the electrocardiograph with a special cable. Press the **START/STOP** key to print ECG reports by

using the USB printer.

| Options | Corresponding USB Printers |
|---|---|
| HP-DJ-D2468 | HP Deskjet 3938 |
| | HP Deskjet D2368 |
| | HP Deskjet D2468 |
| HP-DJ-D5568 | HP Deskjet D2568 |
| | HP Deskjet D5568 |
| HP-LJ-P2035 | HP Laserjet P2015 |
| | HP Laserjet P2035 |

**Notes**:

1. During the USB printing course，pressing the **START/STOP** key again can not stop printing ECG reports.

2. For details of the ECG report printed by the USB printer, please refer to Section 8.6.5, “ECG Reports Printed by the USB Printer”.

3. USB printing is ineffective in the auto periodic sampling mode, auto 11~24s sampling mode, manual mode and R-R analysis mode.

4. Make sure that paper is installed in the USB printer before printing. Error may occur if no paper is loaded in the USB Printer.

**CAUTION**

It is forbidden to frequently connect or disconnect the U disk or the USB printer.

### 11.3.1.6 Setting Speed

Press **Tab** or Shift + **Tab** to move the cursor to the **Speed** list box on the **Setup 1** interface, and then press the Up or Down arrow to highlight an option.

In the manual mode, you can set **Speed** to **5mm/s**, **6.25mm/s**, **10mm/s**, **12.5mm/s**, **25mm/s** or **50mm/s**. In the auto and rhythm modes, only **25mm/s** and **50mm/s** are available. In the R-R analysis mode, only **25mm/s** is available.

### 11.3.1.7 Selecting Paper Marker

Press **Tab** or Shift + **Tab** to move the cursor to the **Paper Marker** list box on the **Setup 1**

interface, and then press the Up or Down arrow to highlight **No** or **Yes**.

**Paper Marker** is used to identify the start point of each page of the recorder paper.

When the paper with black markers on the bottom is used and **Paper Marker** is set to **Yes**, the device can identify the start point of each page of the recorder paper while printing ECG reports.

When **Paper Marker** is set to **No**, the device can not identify the start point of each page of the recorder paper while printing ECG reports.

#### 11.3.1.8 Setting Sampling Time

If **Record Style** is set to **12x1**, you can set the time period. Press **Tab** or Shift + **Tab** to move the cursor to the **Sample Time** textbox, and then input the time period manually.

If the time period is set from 11 to 24 seconds, in the auto mode, after pressing the **START/STOP** key, the ECG waves of the set time period are printed.

**Note**: If the time period is set from 11 to 24 seconds, the ECG data sampled will not be analyzed automatically or stored.

### 11.3.2 Setup 2

Press **F1** or **F2** to switch to the **Setup 2** interface.

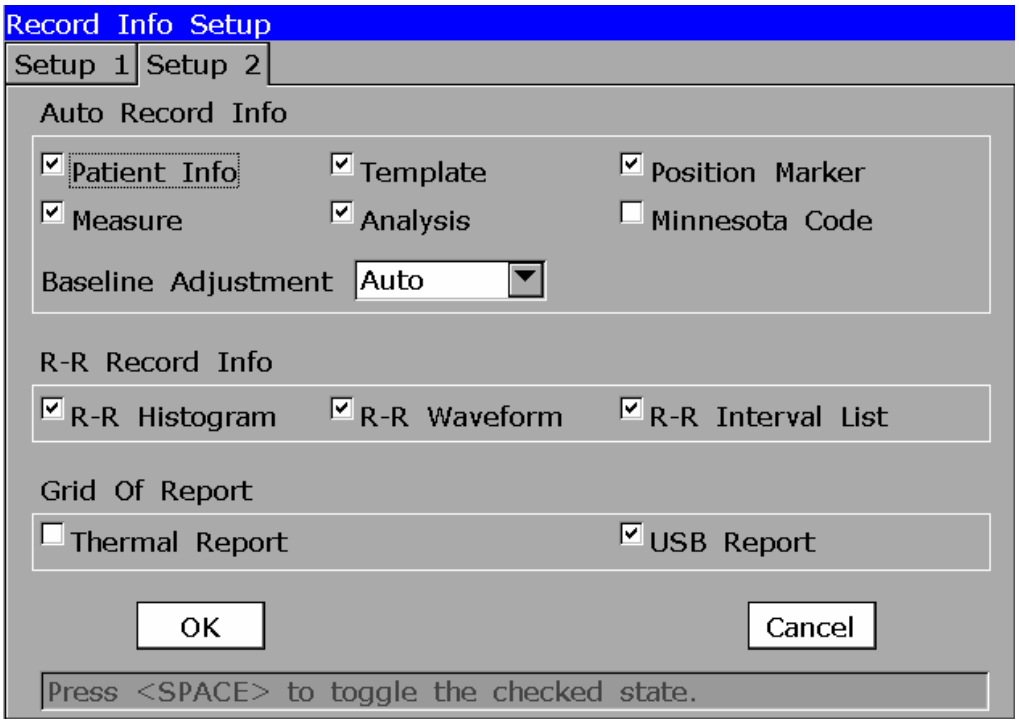



Figure 11-5 Record Info Setup2

Press **Tab** or Shift + **Tab** to move the cursor to an item, and then press Spacebar to select or deselect the item.

**Auto Record Info** includes **Patient Info**, **Position Marker**, **Analysis**, **Template**, **Measure**, **Minnesota Code** and **Baseline Adjustment**.

When **Patient Info**, **Position Marker**, **Analysis**, **Template**, **Measure** or **Minnesota Code** is selected, it will be printed in the ECG reports.

When **Baseline Adjustment** is set to **Auto**, the baselines of the lead groups are adjusted respectively.

When **Baseline Adjustment** is set to **Horizontal**, the baselines of the lead groups are adjusted simultaneously, and the baselines of the leads in the same row are on the same line.

**R-R Record Info** includes **R-R Histogram**, **R-R Waveform** and **R-R Interval List**.

When **R-R Histogram**, **R-R Waveform** or **R-R Interval List** is selected, it will be printed in the ECG reports.

**Grid of Report** includes **Thermal Report** and **USB Report**.

When **Thermal Report** is selected, the grid will be printed while printing ECG reports with the thermal recorder.

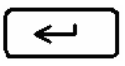
When **USB Report** is selected, the grid will be printed while printing ECG reports with a USB printer.

**Notes:**

1. The items of **Auto Record Info** are available only in the auto mode, and Template and Position Marker do not work in the auto style of 3×4, 3×4+1R and 3×4+3R, and the style of 6x2 and 6x2+1R in the **Save Paper** mode.

2. To get more information about the above contents, please refer to Section 8.6.1, “ECG Reports in the Auto Mode”.

# 11.4 Patient Information Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Patient Info** on the **System Setup** interface, press  to open the **Patient Information Setup** interface.

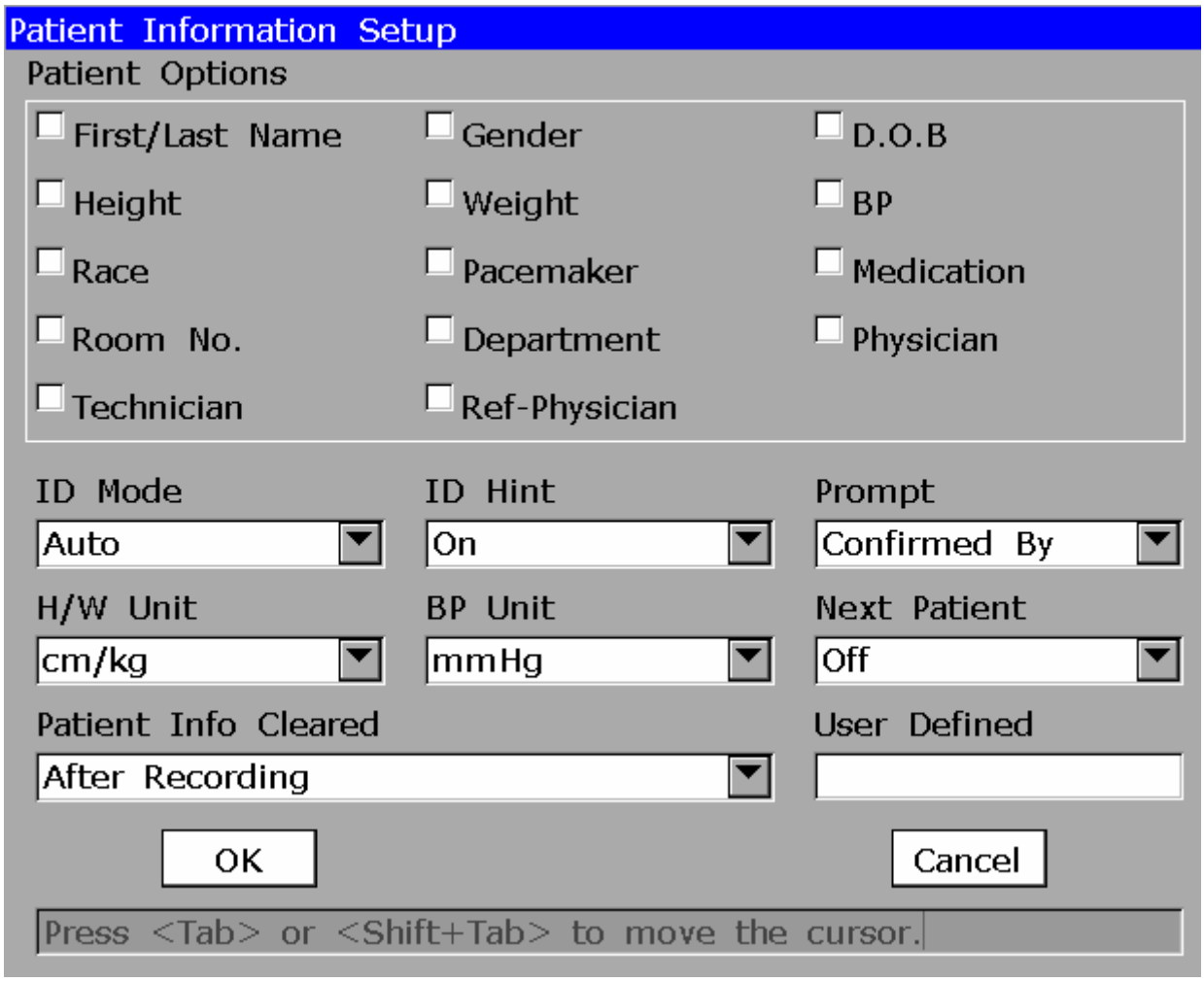



Figure 11-6 Patient Information Setup Interface

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup** interface appears.

## 11.4.1 Selecting First/Last Name / Gender / D.O.B / Height / Weight / BP / Race / Pacemaker / Medication / Room No. / Department / Physician / Technician / Ref-Physician

Press **Tab** or Shift + **Tab** to move the cursor to an item on the **Patient Information Setup** interface, and then press Spacebar to select or deselect the item.

When **First/Last Name**, **Gender**, **D.O.B**, **Height**, **Weight**, **BP**, **Race**, **Pacemaker**, **Medication**, **Room No.**, **Department**, **Physician**, **Technician**, or **Ref-Physician** is selected, the item will be displayed in the **Patient Information** window.

## 11.4.2 Selecting ID Mode

Press **Tab** or Shift + **Tab** to move the cursor to **ID Mode** on the **Patient Information Setup** interface, and then press the Up or Down arrow to select a mode.

You can set **ID Mode** to **Auto**, **Time** or **Manual**.

When **ID Mode** is set to **Auto,** the patient ID can be automatically generated. The patient ID range is 0~1999, 999, 999.

When **ID Mode** is set to **Time**, the patient ID can be automatically generated according to the time when you press the **START/STOP** key to print an ECG report.

When **ID Mode** is set to **Manual**, you can enter the patient ID manually in the **Patient Information** window. (Only 30 ASCII characters can be input.)

## 11.4.3 Selecting ID Hint

Press **Tab** or Shift + **Tab** to move the cursor to **ID Hint** on the **Patient Information Setup** interface, and then press the Up or Down arrow to select **On** or **Off**.

In the auto, rhythm or off mode, when **ID Mode** is set to **Manual** and **ID Hint** is set to **On**, if you do not input the patient ID before pressing the **START/STOP** key, a hint will pop up to remind you to input the patient ID.

## 11.4.4 Setting Prompt

Press **Tab** or Shift + **Tab** to move the cursor to **Prompt** on the **Patient Information Setup** interface, and then press the Up or Down arrow to select **Confirmed By** or **Unconfirmed**.

When **Prompt** is set to **Confirmed By,** if **Physician** is selected and the physician name is input in the **Patient Information** window, the physician's name is printed in the ECG reports.
When **Prompt** is set to **Unconfirmed**, **Unconfirmed Report** is printed in the ECG reports.

## 11.4.5 Selecting H/W Unit

Press **Tab** or Shift + **Tab** to move the cursor to **H/W Unit** on the **Patient Information Setup**

interface, and then press the Up or Down arrow to select **cm/kg** or **inch/lb.**.

## 11.4.6 Selecting BP Unit

Press **Tab** or Shift + **Tab** to move the cursor to **BP Unit** on the **Patient Information Setup** interface, and then press the Up or Down arrow to select **mmHg** or **kpa**.

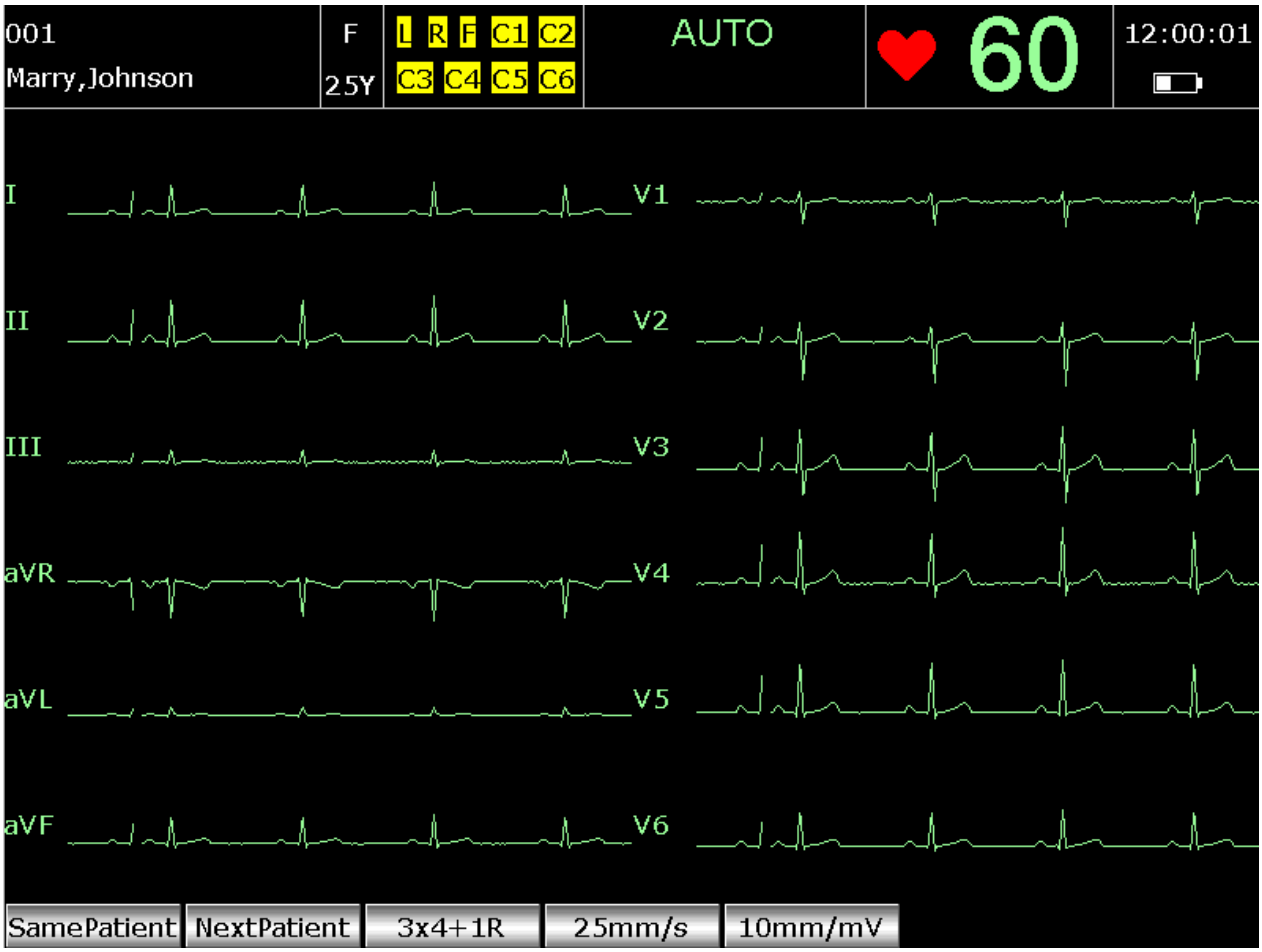
When **BP Unit** is set to **kpa**, two extra edit boxes will be displayed in the **Patient Information** window for inputting decimal fraction.

## 11.4.7 Selecting Next Patient

Press **Tab** or Shift + **Tab** to move the cursor to **Next Patient** on the **Patient Information Setup** interface. Press the Up or Down arrow to highlight **Off** or **On**.

When **Next Patient** is set to **On**, in the auto mode, press the **START/STOP** key to print an ECG report, and the system will automatically open the next patient interface after a complete ECG report is printed.

On the next patient interface, pressing the function key **F1** below **Same Patient** can return to the main interface, all the patient information will keep the same; pressing the function key **F2** below **Next Patient** can return to the main interface, all the patient information will be changed except gender; pressing **F3** can switch the auto recording style; pressing **F4** can switch the paper speed, and pressing **F5** can switch the gain. Press the **START/STOP** key to print the previous ECG report again, according to the settings of the auto style, speed and gain which are shown on the bottom of the interface.




When **Next Patient** is set to **Off**, in the auto mode, the system will not automatically display the next patient interface after a complete ECG report is printed.

## 11.4.8 Setting the Time to Clear Patient Information

Press **Tab** or Shift + **Tab** to move the cursor to **Patient Info Cleared** on the **Patient Information Setup** interface. Press the Up or Down arrow to highlight an option.

If **Patient Info Cleared** is set to **After Recording**, the patient information will be cleared after the ECG report is printed out.

If **Patient Info Cleared** is set to **After Recording And Lead Off**, the patient information will be cleared after the ECG report is printed out and all the leads are off.

**Note:** This function is unavailable in the manual mode.

## 11.4.9 Inputting Customized Information

Press **Tab** or Shift + **Tab** to move the cursor to the **User Defined** textbox on the **Patient Information Setup** interface, and then manually input customized information such as **Address**,

which will be displayed in the **Patient Information** window.

## 11.5 Transmission Setup

**Notes:**

1. To transmit ECG data in DAT format to the PC, the Smart ECG Viewer software of the manufacturer must be installed in the PC. You should log into the Smart ECG Viewer software before transmission.

2. To transmit ECG data in SCP/FDA-XML/PDF format to the PC, the FTP receiving software must be installed in the PC. You should log into the FTP receiving software before transmission.

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Transmission** on the **System Setup** interface, press ↵ to open the **Transmission Setup** interface.

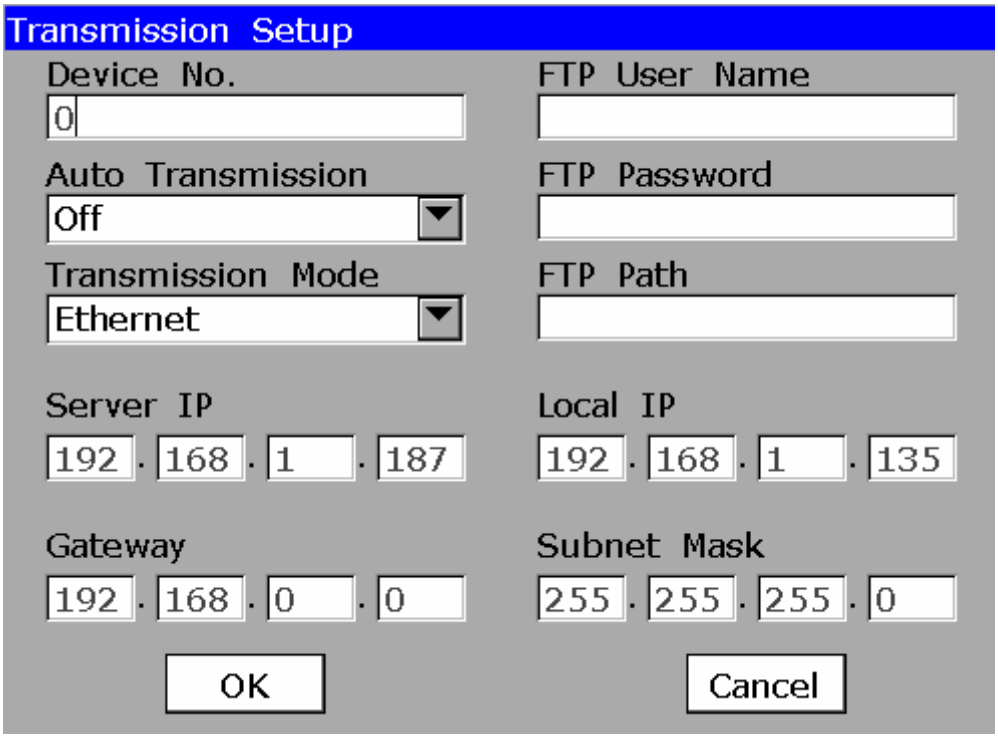



Figure 11-7 Transmission Setup Interface

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup** interface appears.

### 11.5.1 Setting Device No.

Press **Tab** or Shift + **Tab** to move the cursor to the **Device No.** textbox, and then fill in the textbox.

If you input **1** in the **Device No.** textbox, after you save data to the U disk, the data will be in the directory of ECGDATA\ECG-01\Store\Examination Date of the U disk; after you export files from the electrocardiograph to the U disk, the files will be in the directory of ECGDATA\ECG-01\Export\Examination Date and Time of the U disk; after you import files from the U disk to the electrocardiograph, the files in the directory of ECGDATA\ECG-01\Import of the U disk will be imported.

### 11.5.2 Selecting Auto Transmission

Press **Tab** or Shift + **Tab** to move the cursor to **Auto Transmission**, and then press the Up or Down arrow to select **On** or **Off**.

When **Auto Transmission** is set to **On**, in the auto or rhythm mode, ECG data will be transmitted automatically after an ECG report is printed out; in the off mode, ECG data will be transmitted automatically after the **START/STOP** key is pressed.

### 11.5.3 Selecting Transmission Mode

Press **Tab** or Shift + **Tab** to move the cursor to **Transmission Mode**, and then press the Up or Down arrow to highlight **Ethernet** or **UART**.

When **Transmission Mode** is set to **Ethernet**, first connect the net port of the electrocardiograph to the net port of the PC by using an Ethernet cable recommended by the manufacturer. Then set all the items on the **Transmission Setup** interface. In the auto, rhythm or off mode, ECG data can be transmitted through the net cable automatically.

When **Transmission Mode** is set to **UART**, first connect serial port 1 of the electrocardiograph to the serial port of the PC by using a serial cable recommended by the manufacturer. In the auto, rhythm or off mode, ECG data can be transmitted through the serial cable automatically.

### 11.5.4 Setting FTP Information

**To Enter FTP Path, FTP User Name and Password**

Press **Tab** or Shift + **Tab** to move the cursor to the **FTP Path**, **FTP User Name**, and **Password** textboxes, and then fill in these textboxes.

### 11.5.5 Setting IP Addresses

**To Set Server IP**

Set the **Server IP** item to the IP of the PC.

**To Set Local IP**

For the cross-network transmission, set the first two sections of the **Local IP** item to the first two sections of the IP of the PC. Set the third section of the **Local IP** item to the network segment of the electrocardiograph which depends on the configuration of Router. The last section of the **Local IP** item can be set at random.

For the same network transmission, set the first three sections of the **Local IP** item to the first three sections of the IP of the PC. The last section of the **Local IP** item can be set at random, but it can’t be the same as the last section of the IP of the PC.

**To Set Gateway**

Set the first three sections of the **Gateway** item to the first three sections of the IP of the PC. The last section of the **Gateway** item must be set to **1**.

**To Set Subnet Mask**

You can set **Subnet Mask** on the **Transmission Setup** interface. Commonly, **Subnet Mask** is set to **255.255.255.000**.

## 11.6 Lead Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the

cursor is on **Lead** on the **System Setup** interface, press ↵ to open the **Lead Setup** interface.

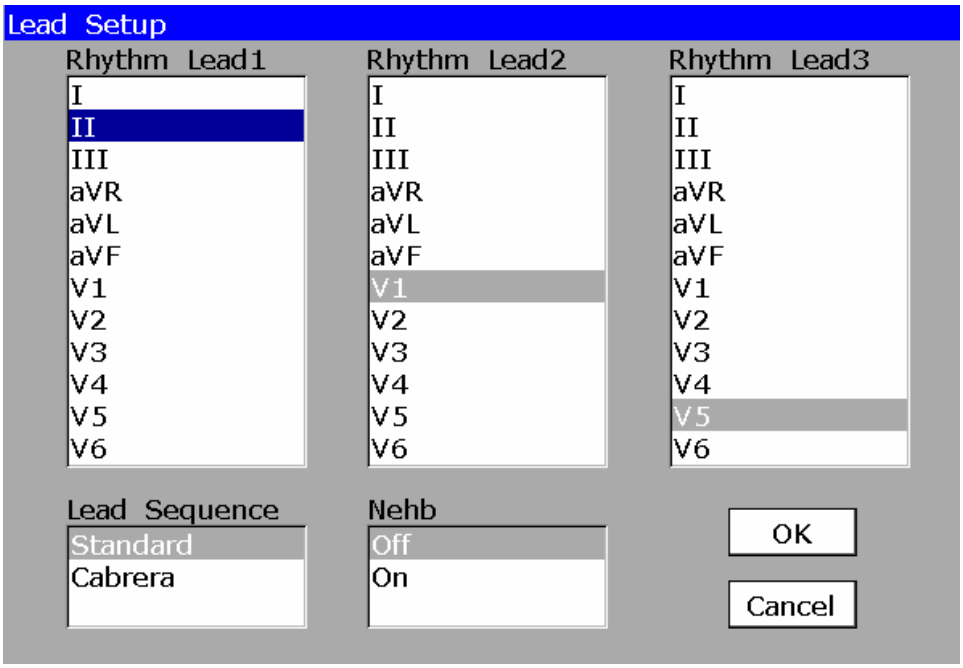



Figure 11-8 Lead Setup Interface

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup** interface appears.

## 11.6.1 Setting Rhythm Lead1/2/3

Press **Tab** or Shift + **Tab** to move the cursor to the **Rhythm Lead1/2/3** list box on the **Lead Setup** interface, and then press the Up or Down arrow to highlight an option.

The rhythm lead can be one of 12 standard leads: I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, or V6.

In the auto mode, when **Record Style** is set to **3×4+1R** or **6×2+1R**, the rhythm lead selected in the **Rhythm Lead1** list box will be printed in the ECG reports; when **Record Style** is set to **3×4+3R**, 3 rhythm leads selected respectively in the **Rhythm Lead1/2/3** list box will be printed in the ECG reports.

In the rhythm mode, when **Rhythm Style** is set to **Single Lead**, 60s wave of the rhythm lead selected in the **Rhythm Lead1** list box will be printed in the ECG reports; when **Rhythm Style** is

set to **Three Leads**, 20s waves of three rhythm leads selected respectively in the **Rhythm Lead1/2/3** list box will be printed in the ECG reports.

In the R-R analysis mode, the R-R analysis report of the rhythm lead selected in the **Rhythm Lead1** list box will be printed.

### 11.6.2 Setting Lead Sequence

Press **Tab** or Shift + **Tab** to move the cursor to the **Lead Sequence** list box on the **Lead Setup** interface, and then press the Up or Down arrow to highlight **Standard** or **Cabrera**.

| Lead Sequence | Lead group 1 | Lead group 2 | Lead group 3 | Lead group 4 |
|---|---|---|---|---|
| **Standard** | I, II, III | aVR, aVL, aVF | V1, V2, V3 | V4, V5, V6 |
| **Cabrera** | aVL, I, -aVR | II, aVF, III | V1, V2, V3 | V4, V5, V6 |

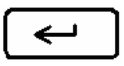
### 11.6.3 Selecting Nehb

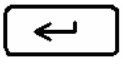
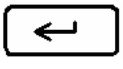
Press **Tab** or Shift + **Tab** to move the cursor to the **Nehb** list box on the **Lead Setup** interface, and then press the Up or Down arrow to highlight **Off** or **On**.

Lead Sequence: I, II, III, ND, NA, NI

**Note:** If you set **Nehb** to **On**, the working mode is fixed to be manual.

## 11.7 Display&Sound Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Display&Sound** on the **System Setup** interface, press  to open the **Display&Sound Setup** interface.

After setup, press  to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press  to confirm. Then the **System Setup** interface appears.

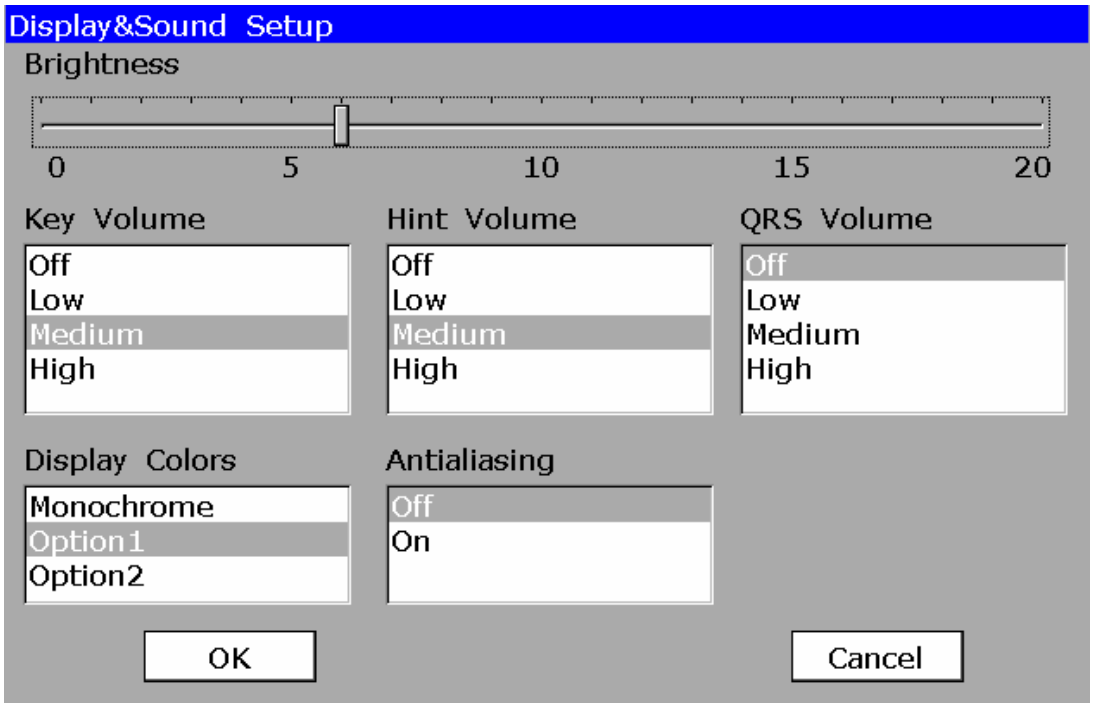



Figure 11-9 Display&Sound Setup Interface

## 11.7.1 Setting Brightness

Press **Tab** or Shift + **Tab** to move the cursor to the **Brightness** progress bar on the **Display&Sound Setup** interface, and then press the Left or Right arrow to adjust the brightness of the LCD screen. You can set the brightness within 0~20.

## 11.7.2 Selecting Display Colors (Only for SE-12 Express)

Press **Tab** or Shift + **Tab** to move the cursor to the **Display Colors** list box on the **Display&Sound Setup** interface, and then press the Up or Down arrow to highlight **Monochrome**, **Option1** or **Option2**.

## 11.7.3 Selecting Antialiasing

Press **Tab** or Shift + **Tab** to move the cursor to the **Antialiasing** list box on the **Display&Sound Setup** interface, and then press the Up or Down arrow to highlight **Off** or **On**.

When **Antialiasing** is set to **On**, the system will automatically make the waveform smooth.

When **Antialiasing** is set to **Off**, the system will not make the waveform smooth.

### 11.7.4 Setting Key Volume

Press **Tab** or Shift + **Tab** to move the cursor to the **Key Volume** list box on the **Display&Sound Setup** interface, and then press the Up or Down arrow to highlight an option.

When you press keys on the keyboard, the electrocardiograph gives a short sound. You can set **Key Volume** to **Low**, **Medium**, **High** or **Off**. When it is set to **Off**, there is no sound when you press keys.

### 11.7.5 Setting Hint Volume

Press **Tab** or Shift + **Tab** to move the cursor to the **Hint Volume** list box on the **Display&Sound Setup** interface, and then press the Up or Down arrow to highlight an option.

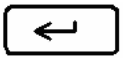
When the electrocardiograph displays a hint such as *Lead Off*, *Overload*, *Battery Weak* etc., there is a sound. You can set **Hint Volume** to **Low**, **Medium**, **High** or **Off**. When it is set to **Off**, there is no hint sound.

### 11.7.6 Setting QRS Volume

Press **Tab** or Shift + **Tab** to move the cursor to the **QRS Volume** list box on the **Display&Sound Setup** interface, and then press the Up or Down arrow to highlight an option.

When an R wave is detected, there is a sound. You can set **QRS Volume** to **Low**, **Medium**, **High** or **Off**. When it is set to **Off**, there is no sound when an R wave is detected.

## 11.8 Date&Time Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Date&Time** on the **System Setup** interface, press  to open the **Date&Time Setup** interface.

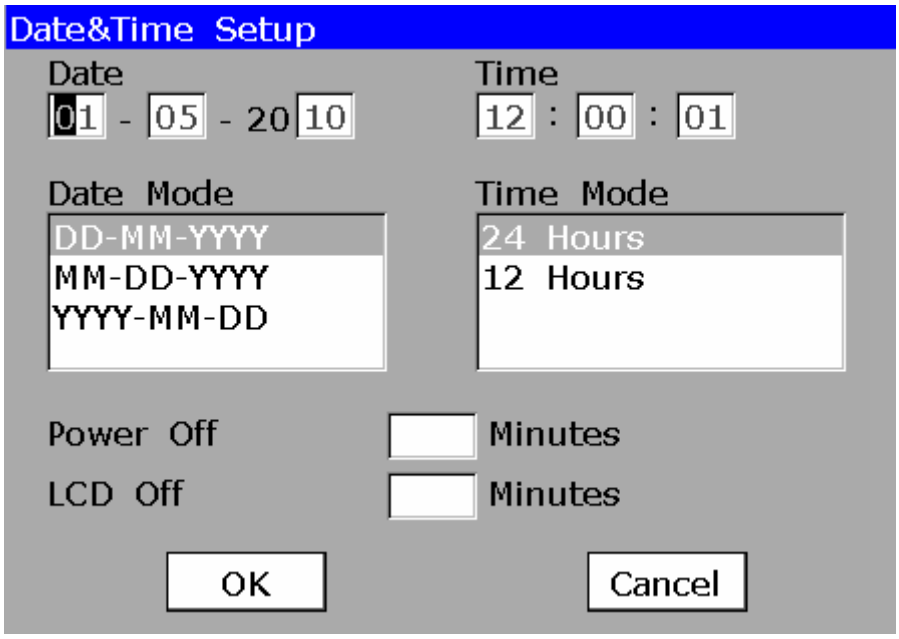



Figure 11-10 Date&Time Setup Interface

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup** interface appears.

## 11.8.1 Setting Date and Time

Press **Tab** or Shift + **Tab** to move the cursor to the **Date** or **Time** textbox on the **Date&Time Setup** interface, and then input the date or the time manually.

The time will be displayed on the main interface, and the date and the time will be printed in the ECG reports.

## 11.8.2 Setting Date Mode

Press **Tab** or Shift + **Tab** to move the cursor to the **Date Mode** list box on the **Date&Time Setup** interface, and then press the Up or Down arrow to highlight **DD-MM-YYYY**, **MM-DD-YYYY** or **YYYY-MM-DD**.

**Note:** After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the new setup will become effective.

### 11.8.3 Setting Time Mode

Press **Tab** or Shift + **Tab** to move the cursor to the **Time Mode** list box, and then press the Up or Down arrow to highlight **24 Hours** or **12 Hours**.

### 11.8.4 Setting Power-Off Time

Press **Tab** or Shift + **Tab** to move the cursor to the **Power Off** textbox on the **Date&Time Setup** interface, and then input the power-off time manually.

When **Power Off** is not set or is set to **0 Minutes**, this function will not be effective.

**Notes:**

1. Power-off time is counted from the time when you last press the keys on the keyboard.
2. Only when the device is powered by the built-in rechargeable lithium battery, can the set automatic power-off time be effective.

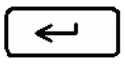
### 11.8.5 Setting LCD Off Time

Press **Tab** or Shift + **Tab** to move the cursor to the **LCD Off** textbox on the **Date&Time Setup** interface, and then input the LCD off time manually.

When **LCD Off** is not set or is set to **0 Minutes**, this function will not be effective.

**Note:** LCD Off time is counted from the time when you last press the keys on the keyboard.

## 11.9 File Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **File** on the **System Setup** interface, press  to open the **File Setup** interface.

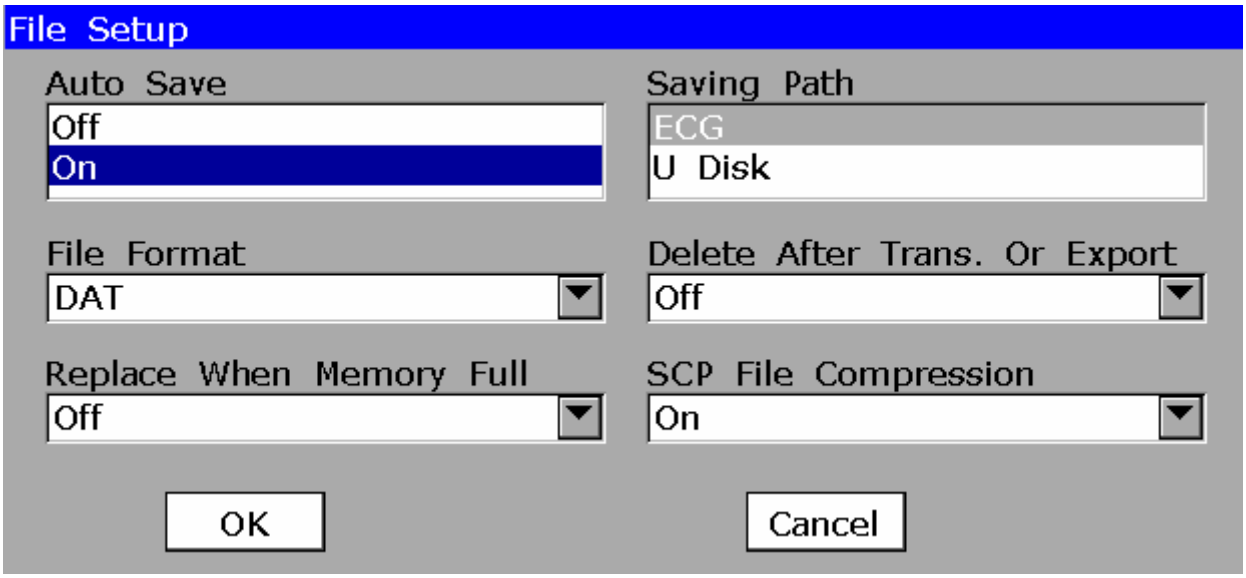



Figure 11-11 File Setup Interface

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup** interface appears.

## 11.9.1 Selecting Auto Save

Press **Tab** or Shift + **Tab** to move the cursor to the **Auto Save** list box on the **File Setup** interface, and then press the Up or Down arrow to highlight **Off** or **On**.

When **Auto Save** is set to **On**, ECG data in the auto, rhythm or off mode will be saved in the ECG or the U disk automatically.

When **Auto Save** is set to **Off**, ECG data will not be saved.

## 11.9.2 Setting Saving Path

Press **Tab** or Shift + **Tab** to move the cursor to the **Saving Path** list box on the **File Setup** interface, and then press the Up or Down arrow to highlight **ECG** or **U Disk**.

When **Saving Path** is set to **ECG**, if **Auto Save** is set to **On**, ECG data in the auto, rhythm or off mode will be saved in the ECG automatically.

When **Saving Path** is set to **U Disk**, if **Auto Save** is set to **On**, ECG data in the auto, rhythm or off mode will be saved in the U disk automatically.

## 11.9.3 Setting File Format

Press **Tab** or Shift + **Tab** to move the cursor to **File Format** on the **File Setup** interface, and then press the Up or Down arrow to highlight an option.

If you want to set **File Format** to **SCP/FDA-XML/PDF**, first activate the SCP/FDA-XML/PDF function on the **Advanced Setup** Interface. For details on activating the SCP/FDA-XML/PDF function, please refer to Section 9.1.3, “Transmitting ECG Data in SCP/FDA-XML/PDF Format Through Net Cable”.

## 11.9.4 Selecting Deleting Files After Transmission or Export

Press **Tab** or Shift + **Tab** to move the cursor to **Delete After Trans. Or Export** on the **File Setup** interface, and then press the Up or Down arrow to highlight **Off** or **On**.

When **Delete After Trans. Or Export** is set to **On**, the files will be automatically deleted from the **File Manager** interface after they are transmitted to the PC or exported to the U disk.

## 11.9.5 Selecting Replacing When Memory is Full

Press **Tab** or Shift + **Tab** to move the cursor to **Replace When Memory Full** on the **File Setup** interface, and then press the Up or Down arrow to highlight **Off** or **On**.

When **Replace When Memory Full** is set to **On**, if there is no space on the memory, the files will replace the earliest ones automatically.

## 11.9.6 Selecting SCP File Compression

Press **Tab** or Shift + **Tab** to move the cursor to **SCP File Compression** on the **File Setup** interface, and then press the Up or Down arrow to highlight **On** or **Off**.

If **SCP File Compression** is set to **On**, the SCP file will be compressed.

After the SCP function is activated, **SCP File Compression** appears on the **File Setup** interface. For details on activating the SCP function, please refer to Section 9.1.3, “Transmitting ECG Data in SCP/FDA-XML/PDF Format Through Net Cable”.

# 11.10 System Maintenance Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Maintenance** on the **System Setup** interface, press ↵ to open the **System Maintenance** interface.

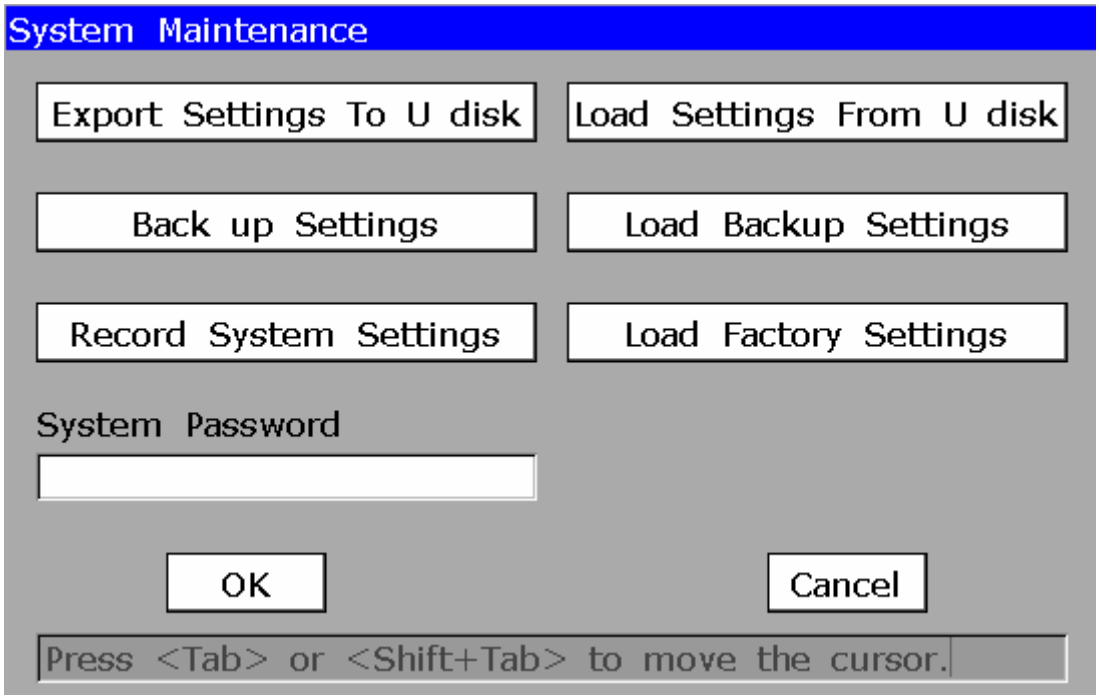



Figure 11-12 System Maintenance Interface

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup** interface appears.

## 11.10.1 Exporting System Settings to U Disk

1. Connect a U disk to the electrocardiograph.

2. Press **Tab** or Shift + **Tab** to move the cursor to the **Export Settings To U disk** button on the **System Maintenance** interface, and then press ↵ to export the system settings to the U disk.

## 11.10.2 Loading System Settings from U Disk

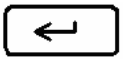
1. Connect the U disk containing the system settings to the electrocardiograph.

2. Press **Tab** or Shift + **Tab** to move the cursor to the **Load Settings From U disk** button on the **System Maintenance** interface, and then press  to load the system settings from the U disk to the electrocardiograph.

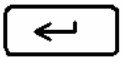
## 11.10.3 Backing Up Settings

Press **Tab** or Shift + **Tab** to move the cursor to the **Back up Settings** button on the **System Maintenance** interface, and then press  to back up the system settings to the ECG.

## 11.10.4 Loading Backup Settings

Press **Tab** or Shift + **Tab** to move the cursor to the **Load Backup Settings** button on the **System Maintenance** interface, and then press  to load the backup settings from the ECG.

## 11.10.5 Printing System Settings

Press **Tab** or Shift + **Tab** to move the cursor to the **Record System Settings** button on the **System Maintenance** interface, and then press  to print the system settings. Pressing this button again can stop printing system settings.

## 11.10.6 Loading Factory Settings

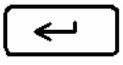
Press **Tab** or Shift + **Tab** to move the cursor to the **Load Factory Settings** button on the **System Maintenance** interface, and then press  to restore the factory settings shown in the following table.

Table 11-1 System Setup Defaults

| **Resting ECG** | | |
|---|---|---|
| | **Setup** | **Default** |
| 1 | Mode Options | Auto, Manual, Rhythm |
| 2 | Manual Style | 6 channels |
| 3 | Auto Display Style | 6x2 |
| 4 | Rhythm Style | Three Leads |
| 5 | Sampling Mode | Real-time Sample |
| 6 | Duration (Periodic Sample) | 60 min |
| 7 | Interval (Periodic Sample) | 1 min |
| 8 | Preview | Off |
| 9 | Auto Extend Record | Off |
| 10 | AC filter | On |
| 11 | EMG filter | Off |
| 12 | DFT filter | 0.67Hz |
| 13 | Lowpass filter | 100Hz |
| 14 | Record Style | 6×2 |
| 15 | Record Mode | Save Paper |
| 16 | Record Sequence | Sequential |
| 17 | Gain | 10mm/mV |
| 18 | Record Device | Thermal |
| 19 | Speed | 25mm/s |
| 20 | Paper Marker | Yes |
| 21 | Sample Time | 10s |
| 22 | Patient Information | On |
| 23 | Template | On |
| 24 | Position Marker | On |
| 25 | Measure | On |
| 26 | Analysis | On |

| | | |
|---|---|---|
| 27 | Minnesota Code | Off |
| 28 | Baseline Adjustment | Auto |
| 29 | R-R Histogram | On |
| 30 | R-R Interval List | On |
| 31 | R-R Waveform | On |
| 32 | Grid of Thermal Report | Off |
| 33 | Grid of USB Report | On |
| 34 | Gender\Height\Weight | On |
| 35 | First/Last Name \ D.O.B \ BP \ Race \ Pacemaker \ Medication \ Room No. \ Department \ Physician \ Technician \ Ref-Physician | Off |
| 36 | ID Hint | On |
| 37 | Next Patient | Off |
| 38 | ID Mode | Auto |
| 39 | Patient Information Cleared | After Recording |
| 40 | H/W Unit | cm/kg |
| 41 | BP Unit | mmHg |
| 42 | Prompt | Confirmed By |
| 43 | User Defined | Cleared |
| 44 | Auto Transmission | Off |
| 45 | Transmission Mode | Ethernet |
| 46 | FTP User Name/FTP Password/FTP Path | Cleared |
| 47 | Lead Sequence | Standard |
| 48 | Nehb | Off |
| 49 | Rhythm Lead 1 | II |
| 50 | Rhythm Lead 2 | V1 |
| 51 | Rhythm Lead 3 | V5 |
| 52 | Screen Colors(Only for SE-12 Express) | Option 1 |

| | | |
|---|---|---|
| 53 | Antialiasing | Off |
| 54 | QRS Volume | Off |
| 55 | Hint Volume | Medium |
| 56 | Key Volume | Medium |
| 57 | Date Mode | DD-MM-YYYY |
| 58 | Time Mode | 24 Hours |
| 59 | Power Off | 0 |
| 60 | LCD Off | 0 |
| 61 | Auto Save | On |
| 62 | Saving Path | ECG |
| 63 | File Format | DAT |
| 64 | Delete After Trans. Or Export | Off |
| 65 | Replace When Memory Full | Off |
| 66 | SCP File Compression | On |
| 67 | System Password | Cleared |
| 68 | Caps Lock | Off |
| 69 | Pacemaker Detection Sensitivity | Low |
| **Exercise ECG** | | |
| 1 | Display Style | 4x3 |
| 2 | Speed Unit | mph |
| 3 | Post J | 60ms |
| 4 | Device Type | Treadmill |
| 5 | Device Model | TM400(M) |
| 6 | Ergometer | Ergoline |
| 7 | BP Monitor | In Ergometer |
| 8 | Maximum Systole | 220mmHg |
| 9 | Maximum Diastole | 90 mmHg |
| 10 | Minimum Systole | 110 mmHg |
| 11 | Minimum Diastole | 60 mmHg |

| | | |
|---|---|---|
| 12 | Max Predicted HR | 220 |
| 13 | The proportion of Target HR in Max Predicted HR | 85 |
| 14 | AC Filter | On |
| 15 | DFT Filter | 0.67Hz |
| 16 | EMG Filter | Off |
| 17 | Lowpass Filter | 100Hz |
| 18 | Rhythm Lead 1 | II |
| 19 | Rhythm Lead 2 | V1 |
| 20 | Rhythm Lead 3 | V5 |
| 21 | Lead Sequence | Standard |
| 22 | Gain | 10mm/mV |
| 23 | Paper Marker | Yes |
| 24 | Exercise Report | Late Stage |
| 25 | Report Style | 6x2+1 |
| 26 | Recovery Report | On |
| 27 | Start time of Recovery Report | 10s |
| 28 | Interval of Recovery Report | 2min |
| 29 | Summary Report | On |
| 30 | ST Scope Report | On |
| 31 | Trend Graph Report | On |
| 32 | Edit Conclusion | On |

## 11.10.7 Setting System Password

Press **Tab** or Shift + **Tab** to move the cursor to the **System Password** textbox on the **System Maintenance** interface, and then enter the password.

If you set the system password, after you press the function key **F6** below **Setup**, the **System Password** window will pop up. After you enter the correct password, the **System Setup** interface will be displayed.

# 11.11 Other Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Other** on the **System Setup** interface, press ↵ to open the **More Setup** interface.

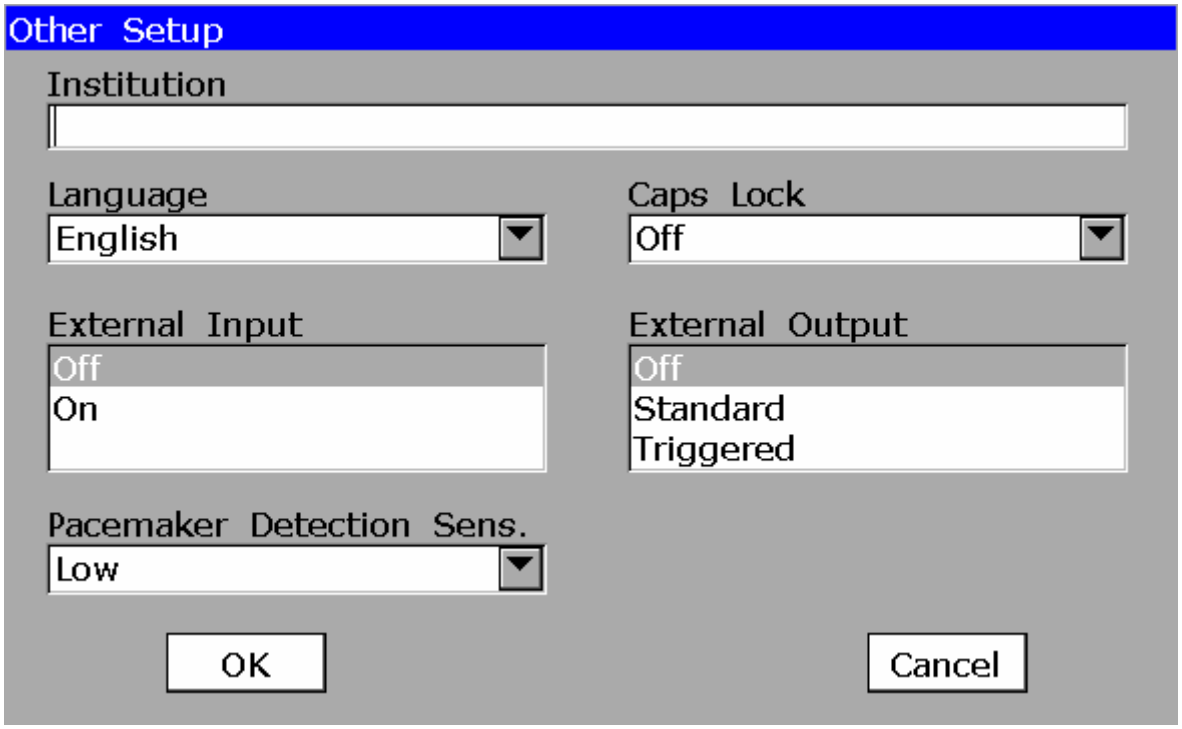



Figure 11-13 Other Setup Interface

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup** interface appears.

## 11.11.1 Entering Institution

Press **Tab** or Shift + **Tab** to move the cursor to the **Institution** textbox on the **Other Setup** interface, and then manually input the institution name within 40 ASCII characters.

**Note:** The total number of supported characters may be fewer if either special Latin characters or Chinese characters are entered.

## 11.11.2 Selecting a Language

Press **Tab** or Shift + **Tab** to move the cursor to **Language** on the **Other Setup** interface, and then

press the Up or Down arrow to highlight a language.

## 11.11.3 Selecting Caps Lock

Press **Tab** or Shift + **Tab** to move the cursor to **Caps Lock** on the **Other Setup** interface, and then press the Up or Down arrow to highlight **Off** or **On**.

When **Caps Lock** is set to **On**, the letters entered will be capital. Pressing Shift  and a letter key can input a lowercase letter.

When **Caps Lock** is set to **Off**, the letters entered will be lowercase. Pressing Shift  and a letter key can input a capital letter.

## 11.11.4 Setting External Input

Press **Tab** or Shift + **Tab** to move the cursor to the **External Input** list box on the **Other Setup** interface, and then press the Up or Down arrow to highlight **Off** or **On**.

The extern input socket is equipped in the electrocardiograph, through which the electrocardiograph can receive signals from the external equipment.

**Note:** When **External Input** is set to **On**, the touch screen becomes ineffective, and then you should operate the device by using the keyboard.

## 11.11.5 Setting External Output

Press **Tab** or Shift + **Tab** to move the cursor to the **External Output** list box on the **Other Setup** interface, and then press the Up or Down arrow to highlight an option.

The extern output socket is equipped in the electrocardiograph, through which the electrocardiograph can send signals to the external equipment.

If **External Input** is set to **On**, and **External Output** is set to **Standard** or **Triggered**, the electrocardiograph sends the signals which it receives.

If **External Input** is set to **Off**, and **External Output** is set to **Standard**, the electrocardiograph sends ECG signals of rhythm lead I.

If **External Input** is set to **Off**, and **External Output** is set to **Triggered**, the electrocardiograph

sends pulses with the height of 4V and the width of 40ms, based on the data of rhythm lead I.

## 11.11.6 Setting Pacemaker Detection Sensitivity

Press **Tab** or Shift + **Tab** to move the cursor to **Pacemaker Detection Sens.** on the **Other Setup** interface, and then press the Up or Down arrow to highlight **Low** or **High**.

When **Pacemaker Detection Sens.** is set to **High**, the pacemaker signals are easy to be detected.

When **Pacemaker Detection Sens.** is set to **Low**, the pacemaker signals are not easy to be detected.

For more information about the detectable parameter ranges, please refer to Appendix 1, “Technical Specifications”.

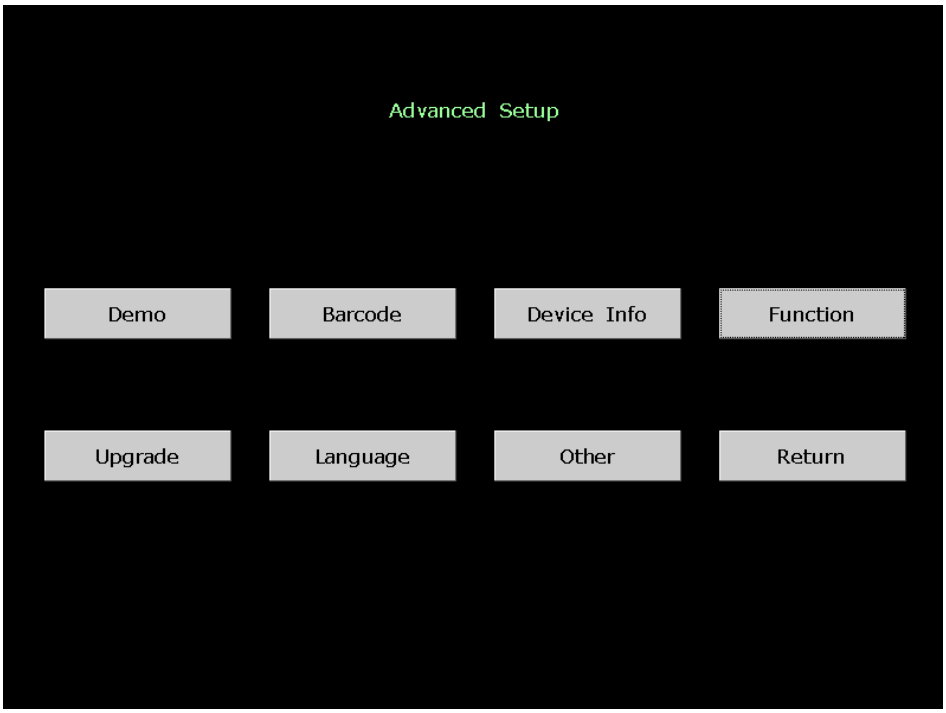
**Note:** If you select **Pacemaker** on the **Patient Information Setup** interface, the pacemaker sensitivity can only be set in the **Patient Information** window, and the setting of **Pacemaker Detection Sens.** on the **Other Setup** interface is ineffective.

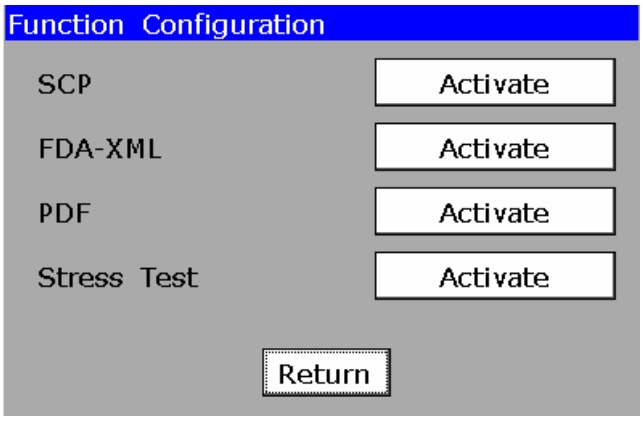
# Chapter 12 Operation Instructions for Exercise ECG (Configurable for SE-12 Express)

## 12.1 Activating Exercise ECG Function

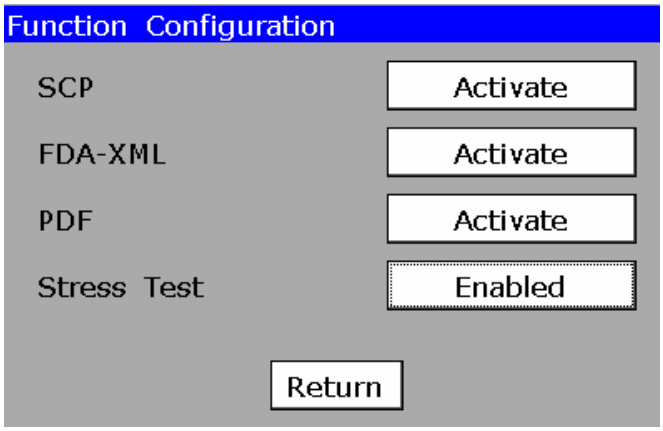
1. When the main interface is displayed, press the function key **F6** below **Setup** to open the **System Setup** interface.

2. Press **F1** to display the **Service Password** window. Then enter the password and press ↵ to open the **Advanced Setup** interface. Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Function**, and then press ↵ to open the **Function Configuration** window.






3. Press **Tab** or Shift + **Tab** to move the cursor to the **Activate** button after **Stress Test**. Press ↵ to open the **Activate Password** window. Enter the password and press ↵ to activate the exercise ECG function.




**Note:** Please contact local distributors to get the service password and the activating password.

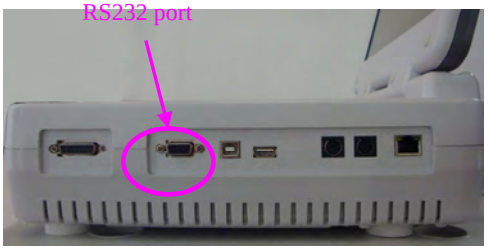
# 12.2 Operation Preparation

1. Turn on the electrocardiograph

**Note:** Turn on the electrocardiograph before connecting the treadmill or the ergometer; or else, the start-up of the electrocardiograph may be abnormal.

2. Connect the electrocardiograph to the treadmill or the ergometer.

1) Connect the electrocardiograph to the treadmill


Connect the RS232 port of the treadmill to the RS232 port of the electrocardiograph with an RS232 cable.

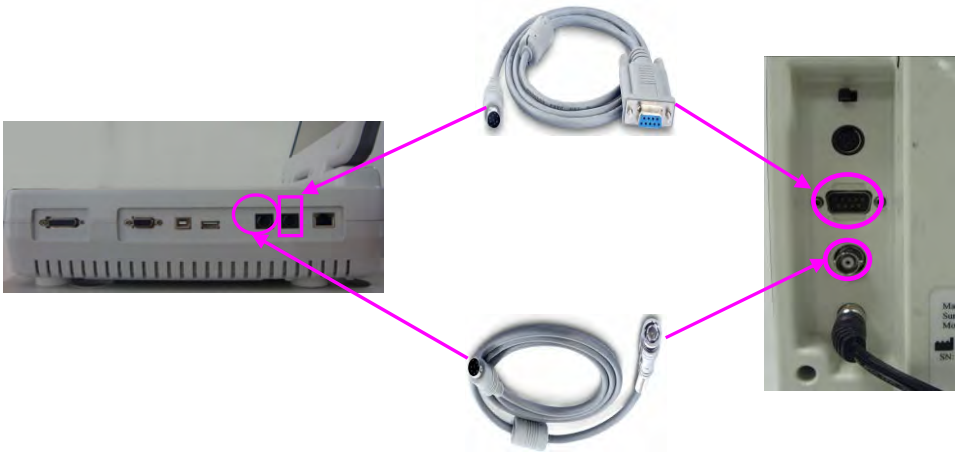
**Note:** The position of the RS232 port may be different on different treadmills.

2) Connect the electrocardiograph to the ergometer


Connect the RS232 in port of the ergometer to the RS232 port of the electrocardiograph with an RS232 cable.

**Note:** The position of the RS232 in port may be different on different ergometers.

3. Connect the electrocardiograph to the stress BP monitor



4. Connect the power cords, and connect the earth wire (when necessary)

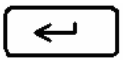
5. Load the recorder paper

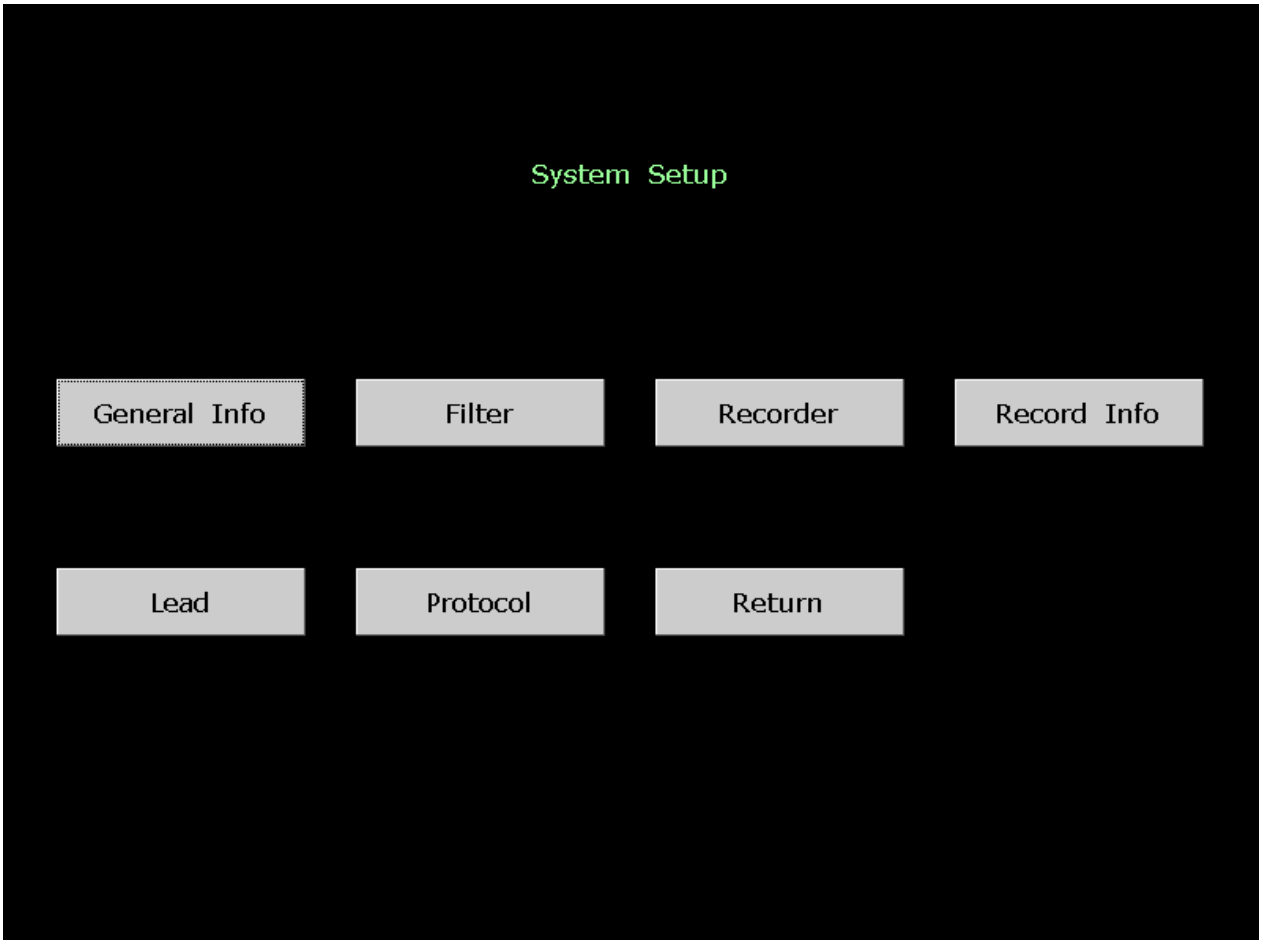
6. Turn on the stress BP monitor and treadmill/ergometer

7. Set the electrocardiograph

1) After turning on the electrocardiograph, press **Pretest** on the keyboard to open the main interface of the exercise test.

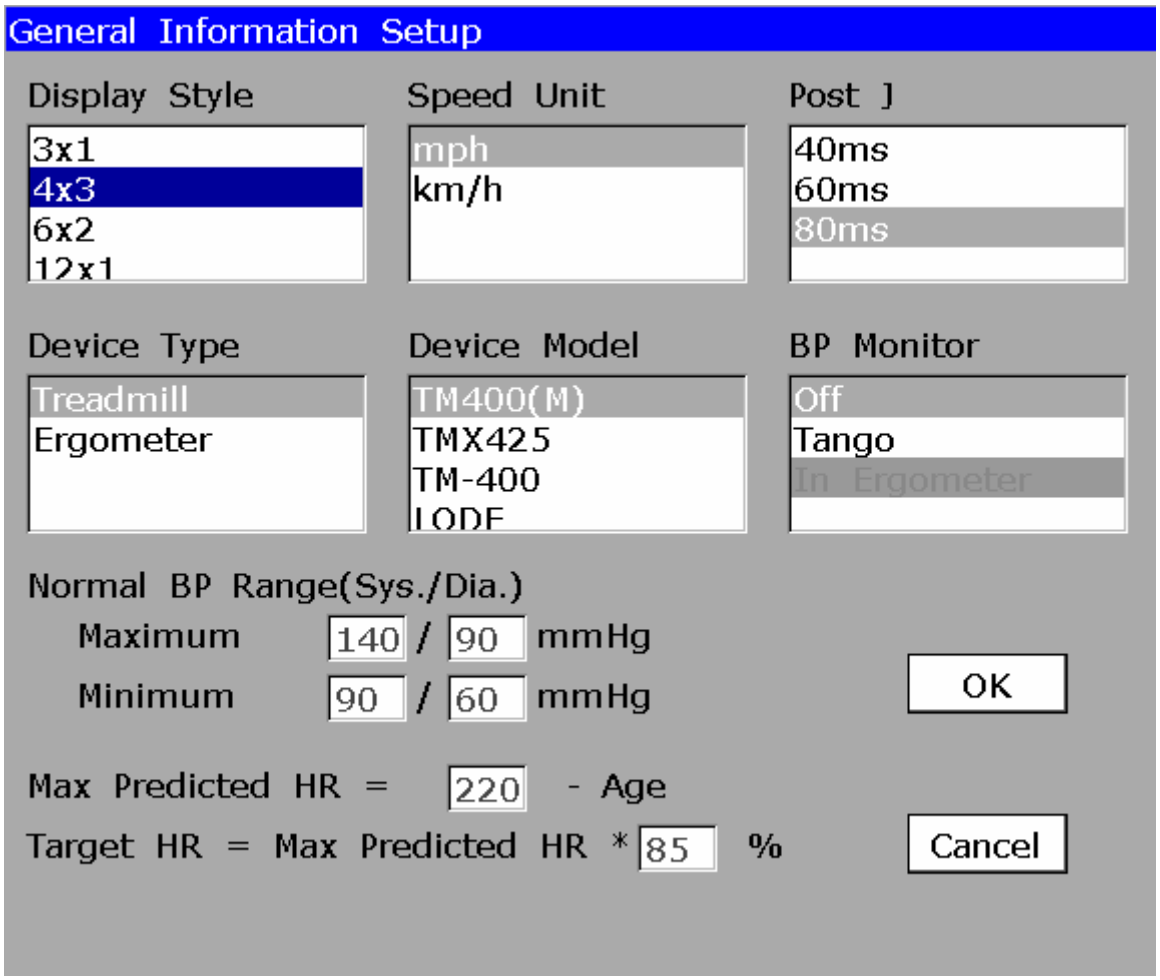
2) Press the function key **F6** below **Setup** to open the **System Setup** interface.

3) Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **General Info** on the **System Setup** interface, press  to open the **General Information Setup** interface.



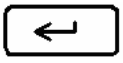

4) Set **Device Type**, **Device Mode**, and **BP Monitor**

Press **Tab** or Shift + **Tab** to move the cursor to the **Device Type** list box, and then press the Up or Down arrow to highlight **Treadmill** or **Ergometer**. Press **Tab** or Shift + **Tab** to move the cursor to the **Device Model** list box, and then press the Up or Down arrow to specify the device model. Press **Tab** or Shift + **Tab** to move the cursor to the **BP Monitor** list box, and then press the Up or Down arrow to highlight **Off**, **Tango** or **In Ergometer**.




5) Press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup** interface appears.

6). Press **Tab** or Shift **+ Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Protocol** on the **System Setup** interface, press ↵ to open the **Protocol Manager** interface. Select a protocol by pressing the Up or Down arrow. Then press the function key **F7** below **Return** to return to the **System Setup** interface.

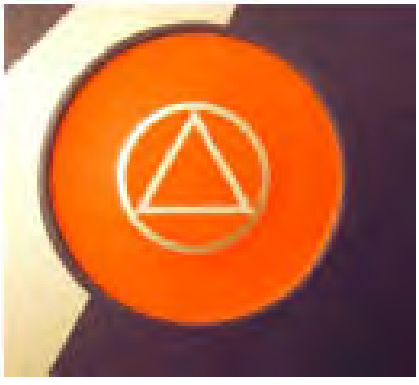

7) Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Return**, and then press  to return to the main interface of the exercise test.

8. Setting the treadmill or the ergometer for external control

1) For TM-400 treadmill, it is ready for external control and needn't be set.

2) For Lode Treadmill Valiant

Hold down the following two keys for 10 seconds, and then you will enter the service menu of the Valiant.



By default, the Valiant is shipped with the Lode RS232 communication protocol. It should be set to the Trackmaster RS232 protocol. You can change the communication protocol by following the procedures below:

- Select **Prot id** and select the second RS232 protocol which is the Trackmaster

communication protocol

- Select **Baudrate** and set this to **4800 Baud**
- Press the red button to leave the service menu
- Turn off the Valiant

3) For Lode ergometer

- Turn on the ergometer

  By default, the Corival ergometer is shipped with the LODE RS232 communication protocol. It should be set to the ERGOLINE P4 protocol.

  You can change the RS232 protocol by following the procedures below:

  - Turn on the ergometer and press **Enter**
  - You will be in **MAINMENU**
  - Select, by using the Up/Down keys, the menu **SYSTEM PARAMETER** and press **Enter**
  - Select, by using the Up/Down keys, the menu **SETTINGS** and press **Enter**
  - Select, by using the Up/Down keys, the menu **RS232 PROTOCOL** and press **Enter**
  - Select, by using the Up/Down keys, **ERGOLINE P4** and press **Enter**
  - Save the selected RS232 protocol or restore the default RS232 protocol, which is also the LODE PROTOCOL.
  - Turn off the ergometer

- For controlling the ergometer by SE-12 Express, the ergometer should be set in the **ANALOG** mode. The **ANALOG** mode should be selected as follows. After turning on the ergometer, press **Enter**, select **ANALOG** and press **Enter** again.

**NOTE:** You can also let the ergometer start up in the **ANALOG** mode every time you turn on the ergometer, by using the default start menu.

To set the ergometer for starting up in the **ANALOG** mode, proceed as follows:

- Turn on the ergometer and press **Enter**
- You will be in **MAINMENU**
- Select, by using the Up/Down keys, the menu **SYSTEM PARAMETER** and press **Enter**
- Select, by using the Up/Down keys, the menu **SETTINGS** and press **Enter**
- Press **Enter** to confirm the menu **DEFAULTSTARTMENU** and press **Enter**

If you turn off the ergometer, it will start up in the **ANALOG** mode every time the ergometer is turned on again.

- The Lode ergometer is now ready for external control

For details on setting other models for external control, please refer to the connection instruction of the models.

9. When the main interface of the exercise test is displayed, press the function key **F1** below **Patient** to open the **Patient Information** window. Enter the patient information. For details on entering patient information, please refer to Chapter 6, “Entering Patient Information”.

**Note:** If you do not enter the patient age or the birthday before pressing the **Pretest** key to begin the exercise test, a hint will pop up to remind you to input the patient age.

## 12.3 Exercise Test

Attach all the electrodes to the patient, Apply the stress BP monitor to the patient.

Press the **Pretest** key to begin the pretest phase. After pretest, the patient can get on the treadmill or the ergometer.

Press the **Exercise** key to enter the exercise phase, and then observe the ECG waveforms, heart rate, blood pressure and the patient’s state.

When the target heart rate is reached, press the **Recovery** key to enter the recovery phase, and then observe the ECG waveforms, heart rate, blood pressure and the patient’s state.

When the patient’s heart rate resumes the normal value, press the **Test end** key to terminate the exercise test. Take off the patient cable and electrodes.

Press **START/STOP** to print the summary report, ST scope report and trend graph report.

Pressing **START/STOP** again can stop printing the reports.

# 12.4 System Setup for Exercise Test

After turning on the electrocardiograph, press **Pretest** on the keyboard to open the main interface of the exercise test. Press the function key **F6** below **Setup** to open the **System Setup** interface.

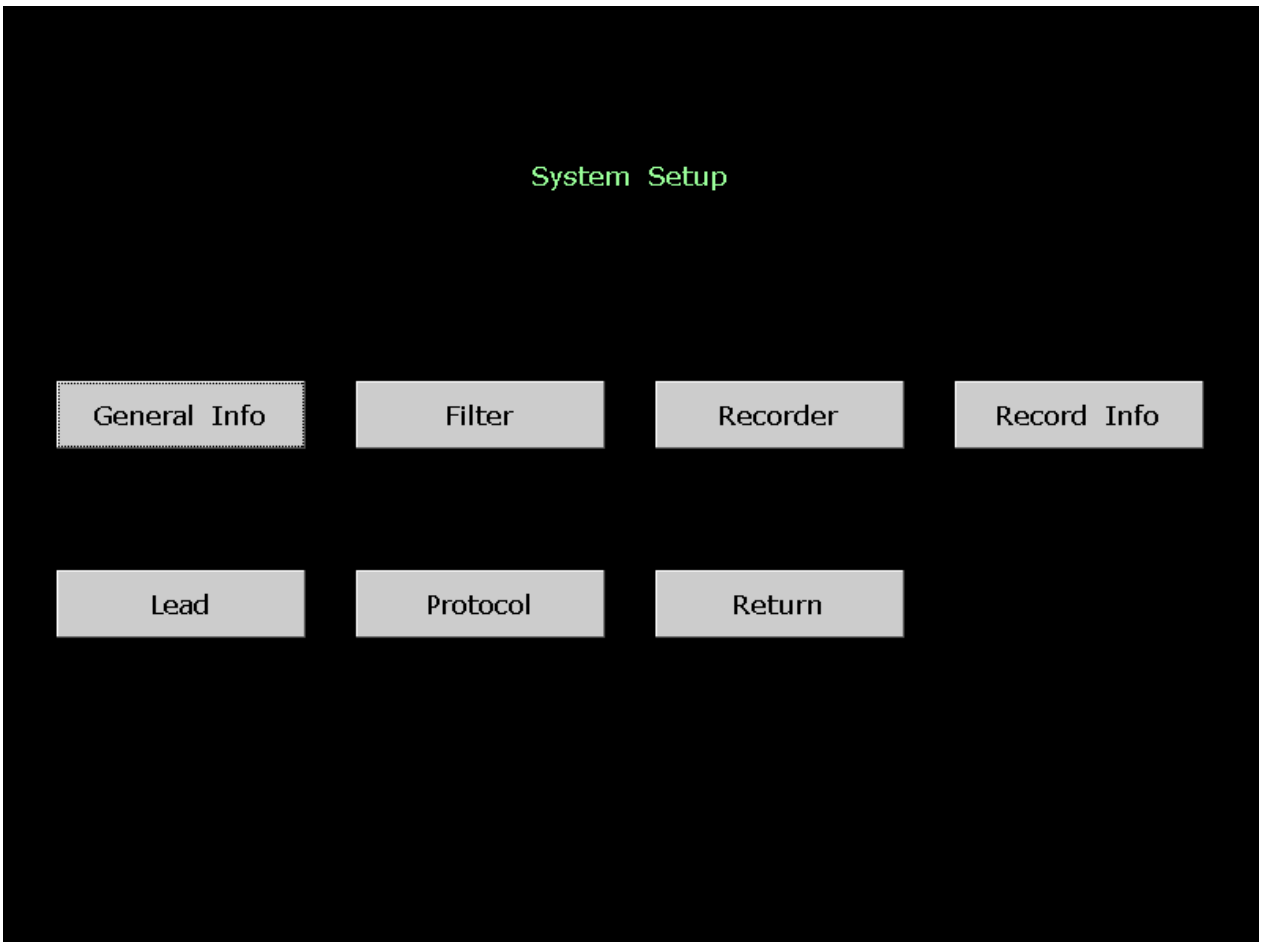



Figure 12-1 System Setup Interface for Exercise Test

After setup,

1. Press **ESC** to return to the main interface of the exercise test.

2. Or press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor to **Return**, and then press ↵ to return to the main interface of the exercise test.

**Note**: The setting methods of filter, recorder and lead of the exercise ECG are the same as those of the resting ECG. For details about the setting methods, please refer to Section 11.2 “Filter Setup”, Section 11.3.1 “Setup 1”, and Section 11.6 “Lead Setup”.

## 12.4.1 General Information Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **General Info** on the **System Setup** interface, press ↵ to open the **General Information Setup** interface.

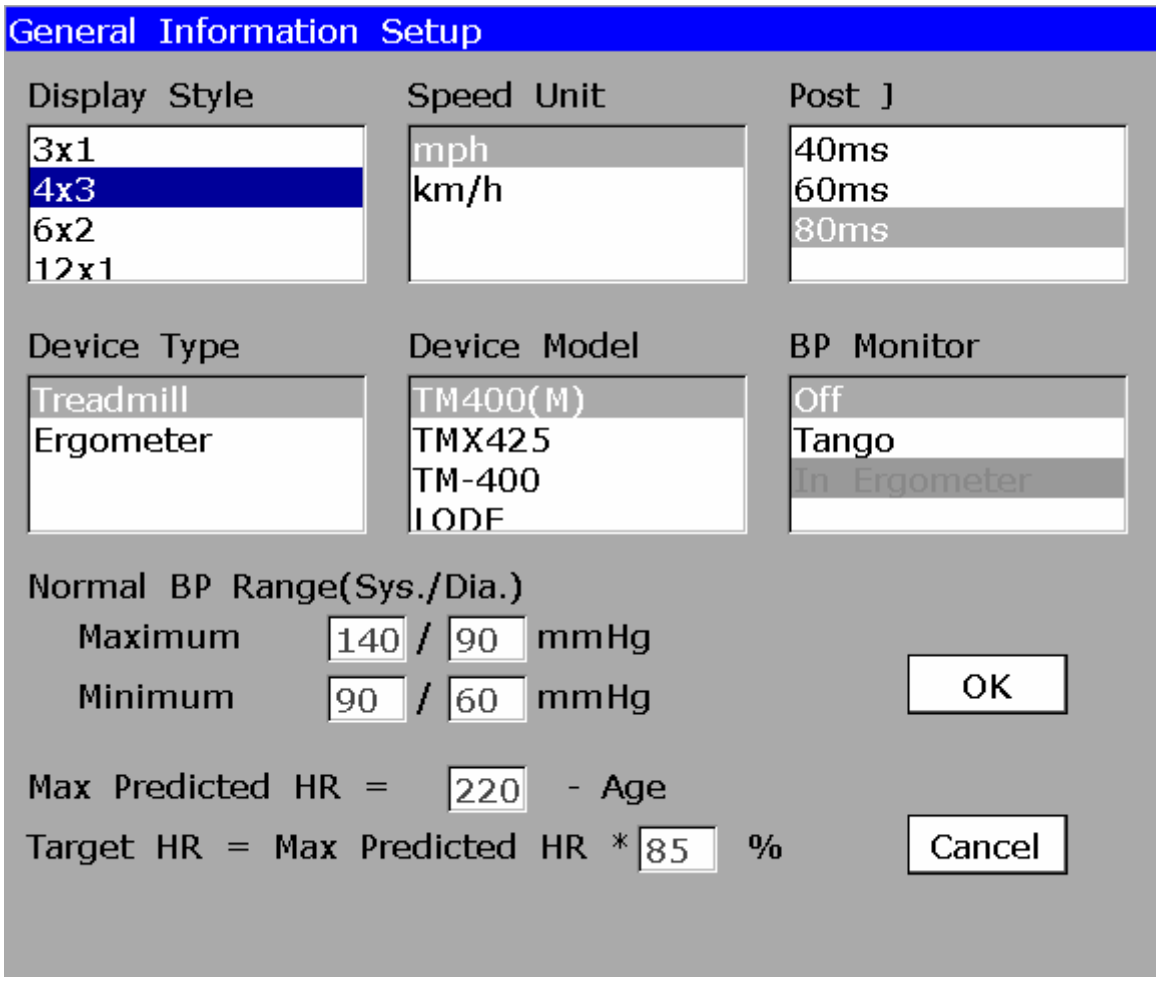



Figure 12-2 General Information Setup Interface

Press **Tab** or Shift + **Tab** to move the cursor to a list box, and then press the Up or Down arrow to highlight an option. Or press **Tab** or Shift + **Tab** to move the cursor to a textbox, and then fill in the textbox.

After setup, press ↵ to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm. Then the **System Setup** interface appears.

**1. Display Style**

When **Display Style** is set to **3×1**, 3-channel ECG waves are displayed on the main interface of

the exercise test.

When **Display Style** is set to **4×3**, 12-channel ECG waves are displayed in 3 groups of 4 on the main interface of the exercise test.

When **Display Style** is set to **6×2**, 12-channel ECG waves are displayed in 2 groups of 6 on the main interface of the exercise test.

When **Display Style** is set to **12×1**, 12-channel ECG waves are displayed on the main interface of the exercise test.

**Note**: When the main interface of the exercise test is displayed, pressing the Up or Down arrow on the keyboard can switch the display styles. When the display style is 3×1, pressing the Left or Right arrow on the keyboard can switch the lead groups.

**2. Speed Unit**

You can set **Speed Unit** to **mph** or **km/h**.

**3. Post J**

Post J is the length after J point of ST segment. You can set **Post J** to **0ms**, **20ms**, **40ms**, **60ms** or **80ms**.

**Note**: J point is the connection point between the end of QRS complex and the start of ST segment. It is the standard point to fix the position of ST segment. Please select a proper option based on the patient's actual ECG waves.

**4. Device Type/Device Model/BP Monitor**

Press **Tab** or Shift + **Tab** to move the cursor to the **Device Type** list box, and then press the Up or Down arrow to highlight **Treadmill** or **Ergometer**. Press **Tab** or Shift + **Tab** to move the cursor to the **Device Model** list box, and then press the Up or Down arrow to specify the device model. Press **Tab** or Shift + **Tab** to move the cursor to the **BP Monitor** list box, and then press the Up or Down arrow to highlight **Off**, **Tango** or **In Ergometer**.

**Notes:**

1. You should test whether the treadmill is controlled by SE-12 Express well when SE-12 Express is connected to the treadmill for the first time.

2. Do not stand on the treadmill when testing it for the first time.

3. Before the exercise test, be sure to be familiar with the user manual of the treadmill or the ergometer.

4. If you have any questions about the operation, please contact us or your local distributor.

**5. Normal BP Range**

You can set the normal range of the systolic/diastolic blood pressure. If the patient's blood pressure values exceed the normal BP ranges, the system will give a hint.

**6. Max Predicted HR and Target HR**

The following formulas are applied to calculate the target heart rate.

Max Predicted HR = 220 - Age

Target HR = Max Predicted HR * 85%

**Note**: **220** and **85** are default values, and you can modify them in different situations.

## 12.4.2 Record Information Setup

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Record Info** on the **System Setup** interface, press ↵ to open the **Record Info Setup** interface.

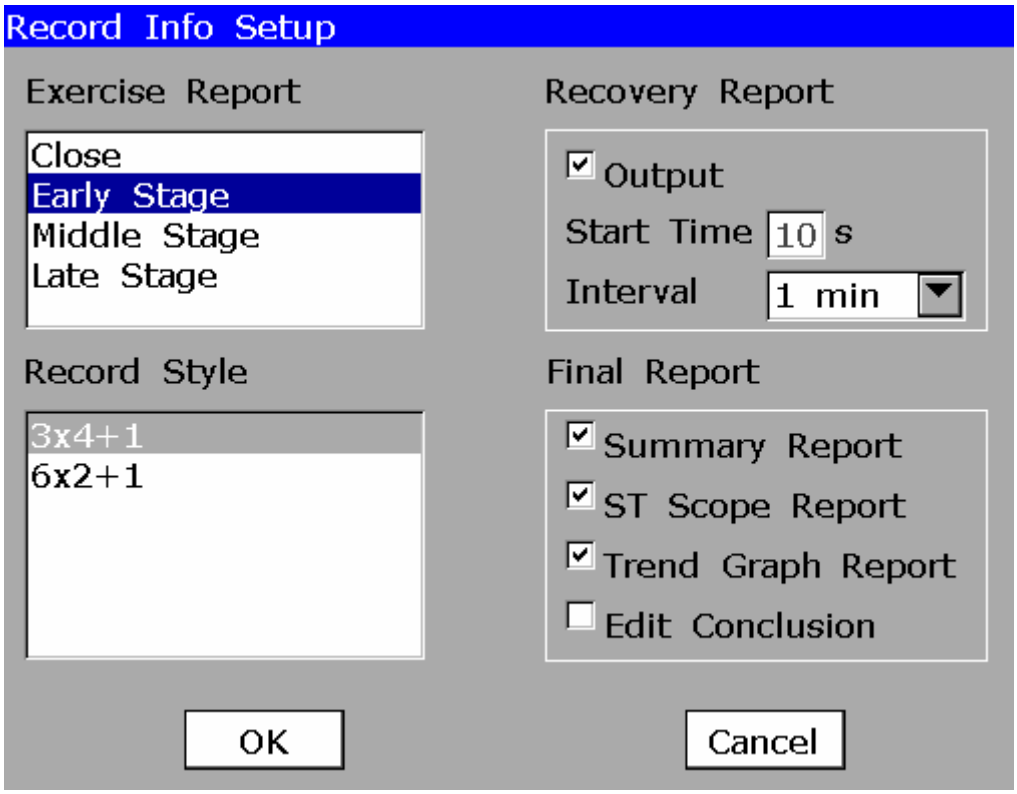
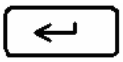



Figure 12-3 Record Info Setup Interface

Press **Tab** or Shift + **Tab** to move the cursor to a list box, and then press the Up or Down arrow to highlight an option. Or press **Tab** or Shift + **Tab** to move the cursor to a textbox, and then fill in the textbox. Or press **Tab** or Shift + **Tab** to move the cursor to a checkbox, and then press Spacebar to select or deselect it.

After setup, press  to confirm, or press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press  to confirm. Then the **System Setup** interface appears.

**1. Exercise Report**

When **Close** is highlighted, 12-lead ECG report of the exercise phase will not be printed out automatically during the exercise test.

When **Early Stage** is highlighted, 12-lead ECG report will be printed out automatically at the early period of each stage of the exercise phase.

When **Middle Stage** is highlighted, 12-lead ECG report will be printed out automatically at the middle period of each stage of the exercise phase.

When **Late Stage** is highlighted, 12-lead ECG report will be printed out automatically at the late period of each stage of the exercise phase.

**2. Recovery Report**

When **Output** is deselected, 12-lead ECG report of the recovery phase will not be printed out automatically during the exercise test.

When **Output** is selected, 12-lead ECG report of the recovery phase will be printed out automatically during the exercise test. You can set the start time to print the first recovery report by filling in the **Start Time** textbox. For example, if you fill **10** in the **Start Time** textbox, the first recovery report will be printed out 10s after entering the recovery phase. You can set the interval to print the later recovery reports in the **Interval** pull-down list. For example, if you select **1 min** in the **Interval** pull-down list, the later recovery reports will be printed out every 1 min.

**3. Report Style**

When **Report Style** is set to **3×4+1**, ECG waves of 12 leads are printed in 4 groups of 3, with the ECG wave of one rhythm lead on the bottom of the ECG reports.

When **Report Style** is set to **6×2+1**, ECG waves of 12 leads are printed in 2 groups of 6, with the ECG wave of one rhythm lead on the bottom of the ECG reports.

**4. Final Report**

You can select **Summary Report**, **ST Scope Report**, **Trend Graph Report** and **Edit Conclusion** as the final reports. After an exercise test is terminated, you can press the **START/STOP** key on the keyboard to print out the selected final reports.

**Note**: Pressing the **START/STOP** key during the printing course can stop printing.

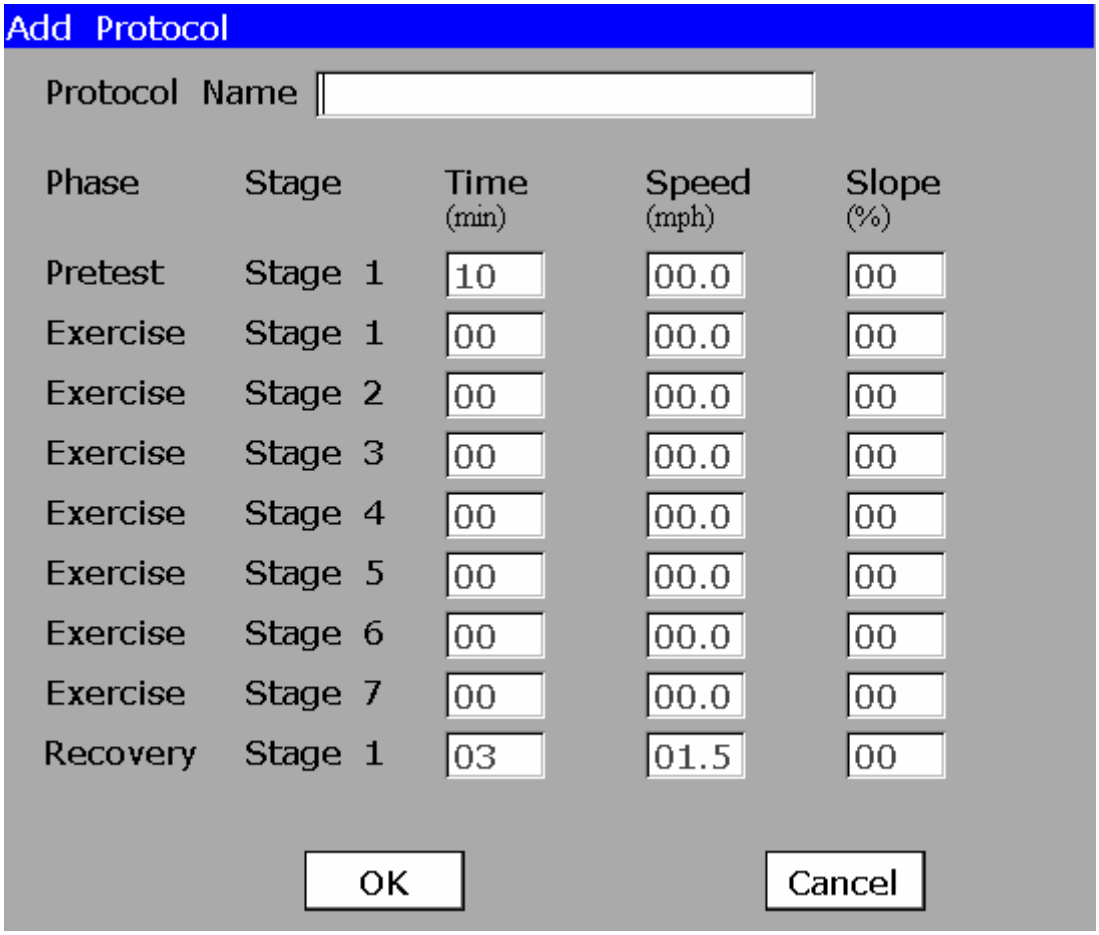
## 12.4.3 Protocol Manager

Press **Tab** or Shift + **Tab**, or the Up, Down, Left or Right arrow to move the cursor. When the cursor is on **Protocol** on the **System Setup** interface, press  to open the **Protocol Manager** interface.


Figure 12-4 Protocol Manager Interface

**1. Add**

Press the function key **F1** below **Add** to display the following dialog box.

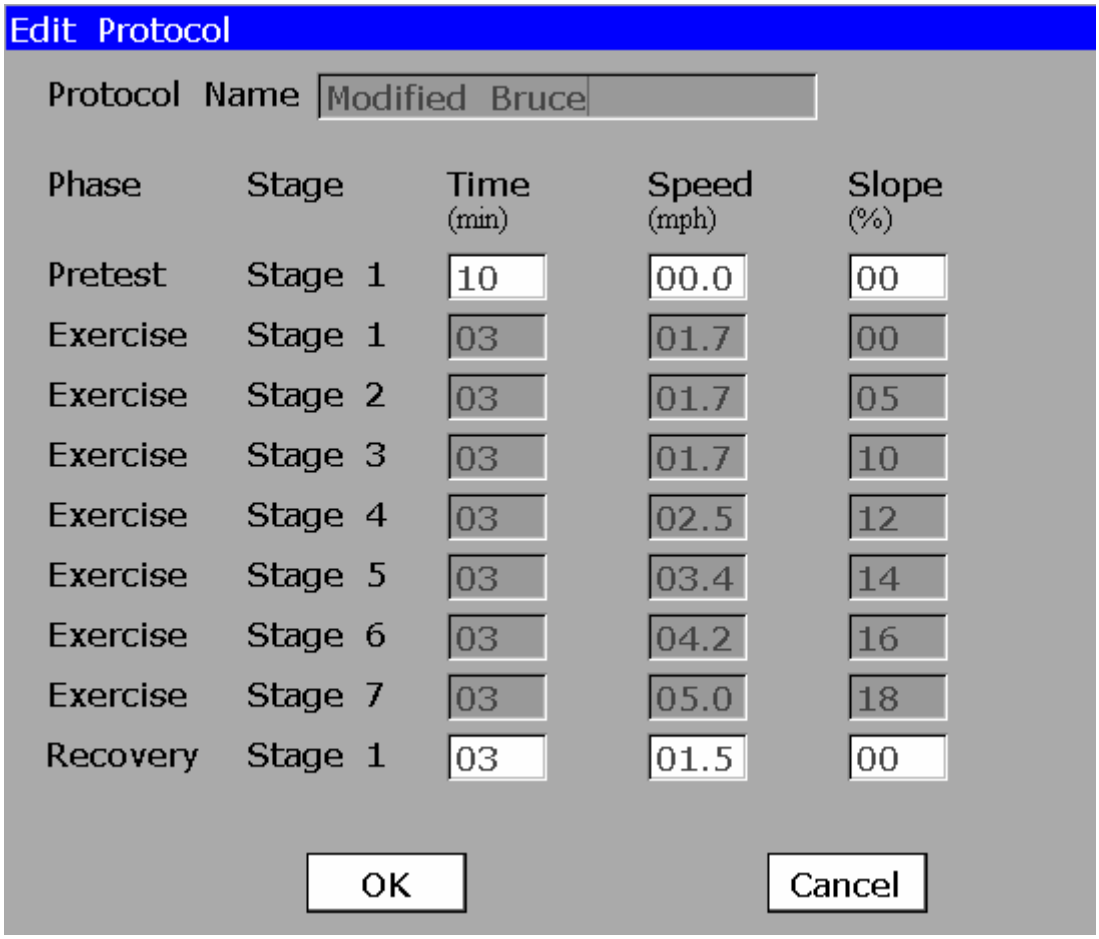



In the **Add Protocol** dialog box, firstly you should enter the new protocol name in the **Protocol Name** textbox, and then enter the stage information of every stage, including the time, speed and grade. After that, press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to confirm.

**Note**: When **Time** of a stage in the exercise phase is set to **00**, this stage and its following stages in the exercise phase will not be carried out.

**2. Edit**

Select a protocol on the **Protocol Manager** interface by pressing the Up or Down arrow, and press the function key **F2** below **Edit** to display the **Edit Protocol** dialog box. Then you can edit the protocol information.



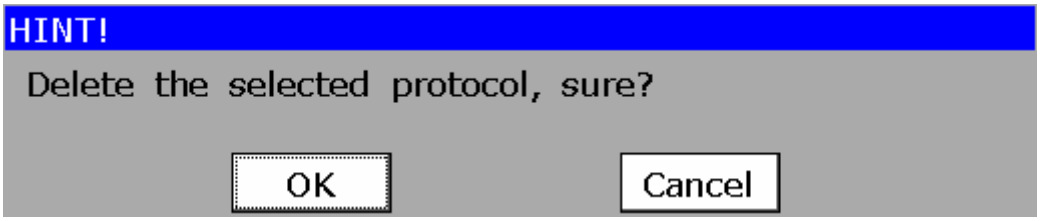

**Note**: For the Bruce or Modified Bruce protocol, only the stage information of the pretest and recovery phases can be edited.

**3. Select**

Select a protocol on the **Protocol Manager** interface by pressing the Up or Down arrow, and press the function key **F3** below **Select** to set the selected protocol as the default protocol.

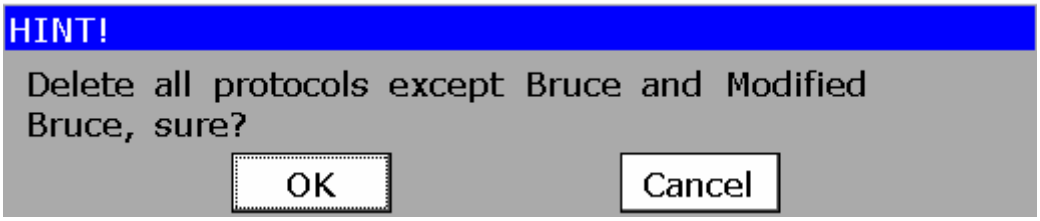
**4. Delete**

Select a protocol on the **Protocol Manager** interface by pressing the Up or Down arrow, and press the function key **F4** below **Delete** to display the following dialog box. Press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to delete the selected protocol.



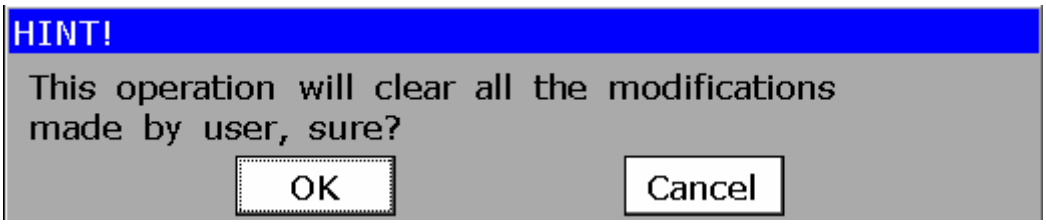
**5. Del All**

To delete all the protocols from the **Protocol Manager** interface, you can press the function key **F5** below **Del All** to display the following dialog box. Press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to delete all the protocols.




**6. Restore**

Press the function key **F6** below **Restore** to display the following dialog box. Press **Tab** or Shift + **Tab** to move the cursor to the **OK** button, and then press ↵ to restore the factory settings.




**7. Return**

Press the function key **F7** below **Return** to return to the **System Setup** interface.

# Chapter 13 Turning Off the Electrocardiograph

When the built-in battery is used, hold down the  key to display the hint *System is shutting down…* on the screen. Then the device will be off a few seconds later.

When the mains supply is used, hold down the  key to display the hint *System is shutting down…* on the screen. Then the device will be off a few seconds later. Remove the plug from the outlet.

**Notes**:

1. When turning off the device, follow the above sequence strictly, or else there will be something wrong on the screen.

2. Do not hold down the  key when the device displays the hint information *System is shutting down…* on the screen.

# Chapter 14 Hint Information

Hint information and the corresponding causes provided by the electrocardiograph are listed in the following tables.

Table 14-1 Hint Information and Causes

| Hint Information | Causes |
|---|---|
| Lead off | Electrodes fall off the patient or the patient cable falls off the unit. |
| Battery Weak | The built-in battery is weak. |
| No Paper | Recorder paper runs out or is not loaded. |
| Paper Error | When **Paper Marker** is set to **Yes**, the electrocardiograph advances the recorder paper to the next black marker. If it advances the paper for 300mm and can not find the next black marker, the hint *Paper Error* is displayed. |
| Testing | The ECG data is being sampled periodically. |
| Sampling/Analyzing/ Recording | ECG signals are being sampled / analyzed / recorded. |
| Learning | The self-study process of arrhythmia arithmetic in the **Trigger Sample** mode |
| Detecting | The examining process of arrhythmia data in the **Trigger Sample** mode |
| Transmitting | ECG data is being transmitted from the electrocardiograph to the PC through the net or serial cable in the auto, rhythm or off mode. |
| Transmit Fail | ECG data fails to be transmitted from the electrocardiograph to the PC through the net or serial cable in the auto, rhythm or off mode. |
| Memory Full | The amount of files on the **File Manager** interface of SE-12 exceeds 100.<br>The amount of files on the **File Manager** interface of SE-12 Express exceeds 200. |
| Module Error | There is something wrong with the signal sample module. |
| DEMO | The system is in the demonstration mode. |
| Overload | The direct current offset voltage on an electrode is too high. |
| U Disk / USB Printer / USB Scanner | A U disk, a USB printer or a bar code reader is connected to the USB interface. |

Table 14-2 Hint Information and Causes for Exercise ECG

| **Hint Information** | **Causes** |
|---|---|
| Battery Weak | The built-in battery is weak. |
| No Paper | Recorder paper runs out or is not loaded. |
| Paper Error | When **Paper Marker** is set to **Yes**, the electrocardiograph advances the recorder paper to the next black marker. If it advances the paper for 300mm and can not find the next black marker, the hint *Paper Error* is displayed. |
| Module Error | There is something wrong with the signal sample module. |
| DEMO | The system is in the demonstration mode. |
| Lead X off | Electrodes fall off the patient or the patient cable falls off the unit. |
| Overload | The direct current offset voltage on an electrode is too high. |
| No Testing | No test is being carried out. |
| Testing… | An exercise test is being carried out. |
| Testing Stop | An exercise test is terminated. |
| HR Overrange! | Heart rate exceeds the normal range. |
| Sys. Overrange! | Systolic blood pressure exceeds the normal range. |
| Dia. Overrange! | Diastolic blood pressure exceeds the normal range. |

# Chapter 15 Cleaning, Care and Maintenance

## 15.1 Cleaning

**CAUTION**

Turn off the power before cleaning and disinfection. The mains supply must be switched off if it is used.

### 15.1.1 Cleaning the Main Unit and the Patient Cable

The surfaces of the main unit and the patient cable can be wiped with a clean soft cloth damped in soapy water or non-caustic neutral detergent. After that, remove detergent remainder with a clean dry cloth.

### 15.1.2 Cleaning the Reusable Electrodes

Remove the remainder gel from the electrodes with a clean soft cloth first. Take suction bulbs and metal cups of chest electrodes apart, and take clamps and metal parts of limb electrodes apart. Clean them in warm water and make sure there is no remainder gel. Dry the electrodes with a clean dry cloth or air dry naturally.

### 15.1.3 Cleaning the Print Head

Dirty and soiled thermal print head will deteriorate the printing definition. So it should be cleaned at least once a month regularly.

Open the recorder casing and remove the paper. Wipe the print head gently with a clean soft cloth damped in 75% alcohol. For stubborn stain, soak it with a little alcohol first and wipe it off with a clean soft cloth. After air drying, load the recorder paper and shut the recorder casing.

**CAUTION**

1 Prevent the detergent from seeping into the main unit while cleaning. Do not immerse the unit or the patient cable into liquid under any circumstances.

2 Do not clean the unit and accessories with abrasive fabric and avoid scratching the electrodes.

# 15.2 Disinfection

To avoid permanent damage to the equipment, disinfection can be performed only when it is considered as necessary according to your hospital's regulations.

Before disinfection, clean the equipment first. Then wipe the surfaces of the unit and the patient cable with hospital standard disinfectant.

**Note:** Clean and disinfect the chest and limb electrodes after each use.

**CAUTION**

Do not use chloric disinfectant such as chloride, sodium hypochlorite etc.

# 15.3 Care and Maintenance

## 15.3.1 Recharge and Replacement of Battery

**1) Capacity Identification**

The current capacity of the rechargeable battery can be identified according to the battery symbol in the top right corner of the LCD screen.

: Full capacity;

: 2/3 capacity;

: 1/3 capacity;

: Low capacity

**2) Recharge**

The 12-channel electrocardiograph is equipped with the recharge control circuit together with the built-in rechargeable lithium battery. When the unit is connected to the mains supply, the battery will be recharged automatically. Then the battery recharging indicator (→▭) and the mains supply indicator (∿) will be lit at the same time. During the recharging course, the symbol ▭ flashes in the top right corner of the LCD screen. After the battery is fully recharged, the symbol stops flashing, and the battery recharging indicator (→▭) is black.

Because of the capacity consumption during the storage and transport course, the battery capacity is not full when it is used for the first time. Battery recharge should be considered before the first use.

**3) Replacement**

When the useful life of the battery is over, or foul smell and leakage are found, please contact the manufacturer or the local distributor for replacement.

**WARNING**

1. Only qualified service engineers authorized by the manufacturer can open the battery compartment and replace the battery, and the battery of the same model and specification provided by the manufacturer must be used.
2. Danger of explosion -- Do not reverse the anode and the cathode when installing the battery.
3. When the battery's useful life is over, contact the manufacturer or the local distributor for disposal or dispose of the battery according to local regulations.

## 15.3.2 Recorder Paper

**Note**: Recorder paper provided by the manufacturer should be used. Other paper may shorten the life of the thermal print head. The deteriorated print head may lead to illegible ECG reports and block the advance of the paper.

**Storage Requirements:**

- Recorder paper should be stored in a dry, dark and cool area, avoiding excessive temperature, humidity and sunshine.
- Do not put the recorder paper under fluorescence for a long time.
- Make sure that there is no polyvinyl chloride or other chemicals in the storage environment, which will lead to color change of the paper.
- Do not overlap the recorder paper for a long time, or else the ECG reports may trans-print each other.

## 15.3.3 Maintenance of the Main Unit and the Patient Cable

The following safety checks should be performed at least every 24 months by a qualified person who has adequate training, knowledge, and practical experience to perform these tests.

b) Inspect the equipment and accessories for mechanical and functional damage.

c) Inspect the safety related labels for legibility.

d) Inspect the fuse to verify compliance with the rated current and circuit-breaking characteristics.

e) Verify that the device functions properly as described in the instructions for use.

f) Test the protection earth resistance according to IEC/EN 60601-1: Limit: 0.1 ohm.

g) Test the earth leakage current according to IEC/EN 60601-1: Limit: NC 500μA, SFC 1000μA.

h) Test the enclosure leakage current according to IEC/EN 60601-1: Limit: NC 100μA, SFC 500μA.

i) Test the patient leakage current according to IEC/EN 60601-1: Limit: NC a.c. 10μA, d.c. 10μA; SFC a.c. 50μA, d.c. 50μA.

j) Test the patient auxiliary current according to IEC/EN 60601-1: Limit: NC a.c. 10μA, d.c. 10μA; SFC a.c. 50μA, d.c. 50μA.

k) Test the patient leakage current under single fault condition with mains voltage on the applied part according to IEC/EN 60601-1: Limit: 50μA (CF).

The leakage current should never exceed the limit. The data should be recorded in an equipment log. If the device is not functioning properly or fails any of the above tests, the device has to be repaired.

**WARNING**

Failure on the part of the responsible individual hospital or institution employing this equipment to implement a satisfactory maintenance schedule may cause undue equipment failures and possible health hazards.

**1) Main Unit**

- Avoid excessive temperature, sunshine, humidity and dirt.
- Put the dustproof coat on the main unit after use and prevent shaking it violently when moving it to another place.
- Prevent any liquid from seeping into the equipment; otherwise the safety and the performance of the electrocardiograph can not be guaranteed.

**2) Patient Cable**

- Integrity of the patient cable, including the main cable and lead wires, should be checked regularly. Make sure that it is conductible.
- Do not drag or twist the patient cable with excessive stress while using it. Hold the connector plug instead of the cable when connecting or disconnecting the patient cable.
- Align the patient cable to avoid twisting, knotting or crooking in a closed angle while using it.
- Store the lead wires in a big wheel to prevent any people from stumbling.
- Once damage or aging of the patient cable is found, replace it with a new one immediately.

**3) Reusable Electrodes**

- Electrodes must be cleansed after use and make sure there is no remainder gel on them.
- Keep suction bulbs of chest electrodes away from sunshine and excessive temperature.
- After long-term use, the surfaces of electrodes will be oxidized because of erosion and other causes. By this time, electrodes should be replaced to achieve high-quality ECG records.

**CAUTION**

The device and accessories are to be disposed of according to local regulations after their useful lives. Alternatively, they can be returned to the dealer or the manufacturer for recycling or proper disposal.

# Chapter 16 Accessories

## 16.1 Standard Accessories

**WARNING**

Only the patient cable and other accessories supplied by the manufacturer can be used. Or else, the performance and electric shock protection can not be guaranteed.

Table 16-1 Standard Accessory List

| Accessory | Part Number |
|---|---|
| Power Cord | 01.13.036106 |
| Patient Cable (American) | 01.57.107048 |
| Patient Cable (European) | 01.57.106902 |
| Alligator Clip/Banana Socket Adapters | 01.57.040173 |
| Disposable Resting Tab Electrodes | 11.57.040189 |
| Paper Roller | 01.51.30340-01 |
| Thermal Recorder Paper | 01.57.107371 |
| Fuse | 11.21.64073 |
| Rechargeable Lithium Battery | 11.21.064119 |
| Suction Electrode | 01.57.040163 |
| Clamp Electrode | 01.57.040162 |

# 16.2 Optional Accessories

Table 16-2 Optional Accessory List

| Accessory | Part Number |
|---|---|
| Patient Cable (American) | 01.57.110375 |
| | 01.57.110266 |
| Patient Cable (European) | 01.57.107402 |
| | 01.57.110265 |
| Input/Output Connector | 11.13.19907 |
| Grounding Wire | 11.13.114214 |
| Pediatric Suction Electrode | 01.57.040168 |
| Pediatric Clamp Electrode | 01.57.040169 |
| Disposable Electrode | 11.57.40090 |
| Disposable Pediatric Electrode | 11.57.40024 |
| Disposable Neonatal Electrode | 11.57.40109 |
| Smart ECG Viewer Software | 03.24.38952 |
| | 03.24.38953 |
| Snap Clip | 01.57.040172 |
| Electrode Gel | 11.25.78047 |
| RS232 Cable | 11.13.20117 |
| Ethernet Cable | 11.13.20096 |
| Smart ECG viewer Software Key/TINY-SPRO | 01.18.47116 |
| Smart ECG viewer Software Key/USB | 12.01.47194 |
| DeskJet/HP2368 | 11.18.52168 |
| U Disk | 11.18.78105 |
| ECG Bag | 11.56.78118 |
| SD Card Reader | 11.17.047324 |
| MT-201 Trolley | 03.28.107059 |
| MT-801 Trolley | 03.20.107625 |

| | |
|---|---|
| 12V Vehicle-carried Inverter | 11.21.64056 |
| Bar Code Reader | 11.23.068003 |
| Wireless AP | 11.17.047338 |

The 12-channel electrocardiograph and accessories are available by contacting the manufacturer or your local distributor.

# Chapter 17 Warranty & Service Policy

## 17.1 Warranty

EDAN warrants that EDAN's products meet the labeled specifications of the products and are free from defects in materials and workmanship that occur within warranty period. The warranty period begins on the date the products are shipped to distributors.

The warranty is void in the cases of:

a) damage caused by handling during shipping.

b) subsequent damage caused by improper use or maintenance.

c) damage caused by alteration or repair by anyone not authorized by EDAN.

d) damage caused by accidents.

e) replacement or removal of serial number label and manufacture label.

If a product covered by this warranty is found to be defective because of defective materials, components, or workmanship, and the warranty claim is made within the warranty period, EDAN will, at its discretion, repair or replace the defective part(s) free of charge. EDAN will not provide a substitute product for use when the defective product is being repaired.

## 17.2 Service Policy

All repairs on products must be performed or approved by EDAN. Unauthorized repairs will void the warranty. In addition, whether covered under warranty or not, any product repair shall be exclusively be performed by EDAN certified service personnel.

If the product fails to function properly, or if you need assistance, service, or spare parts, contact EDAN's service center. A representative will assist you in troubleshooting the problem and will make every effort to solve it over the phone or by email, avoiding potential unnecessary returns.

In case a return can not be avoided, the representative will record all necessary information and will provide a Return Material Authorization (RMA) form that includes the appropriate return address and instructions. An RMA form must be obtained prior to any return.

***Freight policy:***

Under warranty: the service claimer is responsible for freight & insurance charges when a return is shipped to EDAN for service including custom charges. EDAN is responsible for freight, insurance & custom charges from EDAN to service claimer.

Out of warranty: the service claimer is responsible for any freight, insurance & custom charges for product.

***Contact information:***

If you have any question about maintenance, technical specifications or malfunctions of devices, contact your local distributor.

Alternatively, you can send an email to EDAN service department at: support@edan.com.cn.

# Appendix 1 Technical Specifications

## A1.1 Safety Specifications

| | | |
|---|---|---|
| Comply with: | | IEC 60601-1: 1988+A1+A2, EN 60601-1:1990+A1+A2, IEC/EN60601-1-2: 2001+A1, IEC/EN60601-2-25, ANSI/AAMI EC11, IEC/EN 60601-2-51 |
| Anti-electric-shock type: | | Class I with internal power supply |
| Anti-electric-shock degree: | | Type CF |
| Degree of protection against harmful ingress of water: | | Ordinary equipment (Sealed equipment without liquid proof) |
| Disinfection/sterilization method: | | Refer to the user manual for details |
| Degree of safety of application in the presence of flammable gas: | | Equipment not suitable for use in the presence of flammable gas |
| Working mode: | | Continuous operation |
| EMC: | | Group I, Class A |
| Patient Leakage Current: | NC | <10μA (AC) / <10μA (DC) |
| | SFC | <50μA (AC) / <50μA (DC) |
| Patient Auxiliary Current: | NC | <10μA (AC) / <10μA (DC) |
| | SFC | <50μA (AC) / <50μA (DC) |

# A1.2 Environment Specifications

| | Transport & Storage | Working |
|---|---|---|
| Temperature: | -20℃ (-4ºF) ~ +55℃ (+131ºF) | +5ºC (+41ºF) ~ +40ºC (+104ºF) |
| Relative Humidity: | 25%~93%<br>Non-Condensing | 25%~80%<br>Non-Condensing |
| Atmospheric Pressure: | 700hPa ~1060hPa | 860hPa ~1060hPa |

# A1.3 Physical Specifications

| | |
|---|---|
| Dimensions | SE-12: 420mm×330mm×105mm (16.5in×13.0in×4.1in)<br>SE-12 Express: 420mm×330mm×120mm (16.5in×13.0in×4.7in) |
| Weight | SE-12: approx. 5.0kg (11.0 lbs); SE-12 Express: approx. 6.5kg (14.3 lbs)<br>(Excluding recorder paper and battery) |
| Display | 320×240 dot single color LCD Screen<br>800×600 multicolor LCD Screen |

# A1.4 Power Supply Specifications

| | |
|---|---|
| Mains Supply: | Operating Voltage = 100V-240V~ |
| | Operating Frequency = 50Hz/60Hz |
| | Input Power = 70VA |
| Built-in Lithium Battery Pack: | SE-12 Express: Rated voltage = 14.8V<br>SE-12: Rated voltage = 14.8V |
| | SE-12 Express: Rated capacity = 4400mAh<br>SE-12: Rated capacity = 2200mAh |

| | |
|---|---|
| | When the battery is fully charged, SE-12 can work normally about 4 hours, and it can continually print about 1.5 hours in the manual mode or print about 300 ECG reports of 3×4+1R in the auto mode; SE-12 Express can work normally about 5 hours, and it can continually print about 2.5 hours in the manual mode or print about 350 ECG reports of 3×4+1R in the auto mode. |
| | Charge mode: Constant current/voltage |
| | SE-12 Express: Charge current (standard) = 0.14 $C_5$A (600mA)<br>SE-12: Charge current (standard) = 0.28 $C_5$A (600mA) |
| | Charge voltage (standard) = (16.8-0.1V) |
| | Necessary Charge time:<br>SE-12 Express: 9.5 hours<br>SE-12: 5 hours |
| | Cycle life ≥ 300 times |
| Power Consumption: | 70VA (max) |
| Fuse: | T1AL250VP Ø5×20 |

# A1.5 Performance Specifications

| **Recording** | |
|---|---|
| Recorder: | Thermal dot-matrix recorder |
| Printing Density | 8 dots per mm / 200 dots per inch (amplitude axes)<br>40 dots per mm / 1000 dots per inch (time axes, @ 25 mm/s) |
| Recorder Paper: | Folded thermal paper: 210mm×295mm×100pages<br>Folded thermal paper: 216mm×280mm×100pages (Optional)<br>Rolled thermal paper: 216mm×30m (Optional) |
| Effective Width: | 203mm |
| Paper Speed: | 5mm/s, 6.25mm/s, 10mm/s, 12.5mm/s, 25mm/s, 50mm/s（±3%） |
| Accuracy of data: | ±5% (x-axis), ±5%(y-axis) |

| | |
|---|---|
| **HR Recognition** | |
| Technique: | Peak-peak detection |
| HR Range: | 30 BPM ~300 BPM |
| Accuracy: | ±1 BPM |
| **ECG Unit** | |
| Leads: | 12 standard leads |
| Acquisition Mode: | simultaneously 12 leads |
| A/D Resolution: | 24 bits |
| Time Constant: | ≥3.2s |
| Frequency Response: | 0.05Hz ~ 150Hz (-3dB) |
| Gain: | 2.5, 5, 10, 20, 10/5, AGC (mm/mV) |
| Input Impedance: | ≥50MΩ(10Hz) |
| Input Circuit Current: | ≤0.01μA |
| Input Voltage Range | <±5 mVpp |
| Calibration Voltage: | 1mV±2% |
| DC Offset Voltage: | ±600mV |
| Noise: | ≤12.5 μVp-p |
| Multichannel crosstalk | ≤0.5mm |
| Filter | AC Filter: On/Off |
| | DFT Filter: 0.05Hz/0.15Hz/0.25Hz/0.32Hz/0.5Hz/0.67Hz |
| | EMG Filter: 25Hz/35Hz/45Hz/OFF |
| | LOWPASS Filter:150Hz/100Hz/75Hz |
| CMRR | ≥115dB |
| Sampling Frequency | 1000 Hz |
| **Pacemaker Detection** | |
| Amplitude | ±2 to ±700 mV |
| Width | 0.1 to 2.0 ms |

| | |
|---|---|
| Sampling Frequency | 10,000/sec/channel |
| **External Input/Output (Optional)** | |
| Input | ≥100kΩ; Sensitivity 10mm/V±5%;<br>Single ended |
| Output | ≤100Ω; Sensitivity 1V/mV±5%;<br>Single ended |

**Note:** Test the accuracy of input signal reproduction according to the methods described in clause 4.2.7.2 in ANSI/AAMI EC11:1991/(R) 2001, and the result complies with the clause 3.2.7.2 in ANSI/AAMI EC11:1991/(R) 2001.

# Appendix 2 EMC Information

**Guidance and manufacture's declaration – electromagnetic emissions-**
**for all EQUIPMENT and SYSTEMS**

<table>
<tr><th colspan="3">Guidance and manufacture's declaration – electromagnetic emission</th></tr>
<tr><td colspan="3">The 12-channel electrocardiograph is intended for use in the electromagnetic environment specified below. The customer or the user of the 12-channel electrocardiograph should assure that it is used in such an environment.</td></tr>
<tr><th>Emission test</th><th>Compliance</th><th>Electromagnetic environment – guidance</th></tr>
<tr><td>RF emissions<br>CISPR 11</td><td>Group 1</td><td>The 12-channel electrocardiograph uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.</td></tr>
<tr><td>RF emission<br>CISPR 11</td><td>Class A</td><td rowspan="3">The 12-channel electrocardiograph is suitable for use in all establishments, other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.</td></tr>
<tr><td>Harmonic emissions<br>IEC/EN 61000-3-2</td><td>Class A</td></tr>
<tr><td>Voltage fluctuations/ flicker emissions<br>IEC/EN 61000-3-3</td><td>Complies</td></tr>
</table>

**Guidance and manufacture's declaration – electromagnetic immunity – for all EQUIPMENT and SYSTEMS**

| **Guidance and manufacture's declaration – electromagnetic immunity** | | | |
|---|---|---|---|
| The 12-channel electrocardiograph is intended for use in the electromagnetic environment specified below. The customer or the user of 12-channel electrocardiograph should assure that it is used in such an environment. | | | |
| **Immunity test** | **IEC/EN 60601 test level** | **Compliance level** | **Electromagnetic environment - guidance** |
| Electrostatic discharge (ESD) IEC/EN 61000-4-2 | ±6 kV contact<br>±8 kV air | ±6 kV contact<br>±8 kV air | Floors should be wood, concrete or ceramic tile. If floor are covered with synthetic material, the relative humidity should be at least 30%. |
| Electrical fast transient/burst IEC/EN 61000-4-4 | ±2 kV for power supply lines | ±2 kV for power supply lines | Mains power quality should be that of a typical commercial or hospital environment. |
| Surge IEC/EN 61000-4-5 | ±1 kV line to line<br>±2 kV line to ground | ±1 kV line to line<br>±2 kV line to ground | Mains power quality should be that of a typical commercial or hospital environment. |
| Power frequency (50Hz) magnetic field IEC/EN 61000-4-8 | 3A/m | 3A/m | Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment. |
| Voltage dips, short interruptions and voltage variations on power supply input lines IEC/EN 61000-4-11 | <5% $U_T$<br>(>95% dip in $U_T$)<br>for 0.5 cycle<br><br>40% $U_T$<br>(60% dip in $U_T$)<br>for 5 cycles<br><br>70% $U_T$<br>(30% dip in $U_T$)<br>for 25 cycles | <5% $U_T$<br>(>95% dip in $U_T$)<br>for 0.5 cycle<br><br>40% $U_T$<br>(60% dip in $U_T$)<br>for 5 cycles<br><br>70% $U_T$<br>(30% dip in $U_T$)<br>for 25 cycles | Mains power quality should be that of a typical commercial or hospital environment. If the user of the 12-channel electrocardiograph requires continued operation during power mains interruptions, it is recommended that the 12-channel electrocardiograph be powered from an |

| | | | |
|---|---|---|---|
| | <5% $U_T$ (>95% dip in $U_T$) for 5 sec | <5% $U_T$ (>95% dip in $U_T$) for 5 sec | uninterruptible power supply or a battery. |
| NOTE $U_T$ is the a.c. mains voltage prior to application of the test level. | | | |

**Guidance and manufacture's declaration – electromagnetic immunity – for EQUIPMENT and SYSTEMS that are not LIFE-SUPPORTING**

| **Guidance and manufacture's declaration – electromagnetic immunity** | | | |
|---|---|---|---|
| The 12-channel electrocardiograph is intended for use in the electromagnetic environment specified below. The customer or the user of the 12-channel electrocardiograph should assure that it is used in such an environment. | | | |
| **Immunity test** | **IEC/EN 60601 test level** | **Compliance level** | **Electromagnetic environment - guidance** |
| Conducted RF IEC/EN 61000-4-6<br><br>Radiated RF IEC/EN 61000-4-3 | 3 $V_{rms}$ 150 kHz to 80 MHz<br><br>3 V/m 80 MHz to 2.5 GHz | $3V_{rms}$<br><br>3 V/m | Portable and mobile RF communications equipment should be used no closer to any part of the 12-channel electrocardiograph, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.<br>**Recommended separation distance**<br>$d = 1.2\sqrt{P}$<br>$d = 1.2\sqrt{P}$ 80 MHz to 800 MHz<br>$d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz<br>Where $P$ is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and $d$ is the recommended separation distance in metres (m).<br>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b]<br>Interference may occur in the vicinity |

| | | | |
|---|---|---|---|
| | | | of equipment marked with the following symbol:  |

NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.

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

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the 12-channel electrocardiograph is used exceeds the applicable RF compliance level above, the 12-channel electrocardiograph should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the 12-channel electrocardiograph.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 1 V/m.

**Recommended separation distances between portable and mobile RF communications equipment and the EQUIPMENT or SYSTEM – for EQUIPMENT or SYSTEM that are not LIFE-SUPPORTING**

**Recommended separation distances between portable and mobile RF communications equipment and the 12-channel Electrocardiograph**

The 12-channel electrocardiograph is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the 12-channel electrocardiograph can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the 12-channel electrocardiograph as recommended below, according to the maximum output power of the communications equipment.

| **Rated maximum output power of transmitter (W)** | **Separation distance according to frequency of transmitter (m)** | | |
|---|---|---|---|
| | **150 kHz to 80 MHz** $d = 1.2\sqrt{P}$ | **80 MHz to 800 MHz** $d = 1.2\sqrt{P}$ | **800 MHz to 2.5 GHz** $d = 2.3\sqrt{P}$ |
| 0.01 | **0.12** | **0.12** | **0.23** |
| 0.1 | **0.38** | **0.38** | **0.73** |
| 1 | **1.2** | **1.2** | **2.3** |
| 10 | **3.8** | **3.8** | **7.3** |
| 100 | **12** | **12** | **23** |

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

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

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

# Appendix 3 Abbreviation

| **Abbr** | **English** |
|---|---|
| LCD | Liquid Crystal Display |
| BP | Blood Pressure |
| ECG | Electrocardiogram/Electrocardiograph |
| HR | Heart Rate |
| aVF | Left Foot Augmented Lead |
| aVL | Left Arm Augmented Lead |
| aVR | Right Arm Augmented Lead |
| LA | Left Arm |
| LL | Left Leg |
| RA | Right Arm |
| RL | Right Leg |
| ID | Identification |
| AC | Alternating Current |
| USB | Universal Serial Bus |
| AGC | Auto Gain Control |