# TMS-6016

# Telemetry Monitoring System

# Service Manual

# Intellectual Property Statement

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# Preface

## Manual Purpose

This manual provides detailed information about the assembling, dissembling, testing and troubleshooting of the equipment to support effective troubleshooting and repair. It is not intended to be a comprehensive, in-depth explanation of the product architecture or technical implementation. Observance of the manual is a prerequisite for proper equipment maintenance and prevents equipment damage and personnel injury.

## Intended Audience

This manual is for biomedical engineers, authorized technicians or service representatives responsible for troubleshooting, repairing and maintaining the defibrillator/ monitors

## Revision History

This manual has a revision number. This revision number changes whenever the manual is updated due to software or technical specification change. Contents of this manual are subject to change without prior notice.

- Version number 3.0
- Release time: October 2008

# Contents

**FOR YOUR NOTES**

# 1 Safety

## 1.1 Safety Information

### ⚠DANGER

- **Indicates an imminent hazard that, if not avoided, will result in death or serious injury.**

### ⚠WARNING

- **Indicates a potential hazard or unsafe practice that, if not avoided, could result in death or serious injury.**

### ⚠CAUTION

- **Indicates a potential hazard or unsafe practice that, if not avoided, could result in minor personal injury or product/property damage.**

### NOTE

- **Provides application tips or other useful information to ensure that you get the most from your product.**

### 1.1.1 DANGER

There are no dangers that refer to the product in general. Specific “Danger” statements may be given in the respective sections of this manual.

### 1.1.2 Warnings

#### ⚠WARNING

- **All installation operations, expansions, changes, modifications and repairs of this product are conducted by Mindray authorized personnel.**
- **There is high voltage inside the system. Never disassemble the system before it is disconnected from the AC power source.**
- **The system must be connected to a properly installed power outlet with protective earth contacts only. If the installation does not provide for a protective earth conductor, disconnect it from the power line.**
- **Dispose of the package material, observing the applicable waste control regulations and keeping it out of children’s reach.**

### 1.1.3 Cautions

#### ⚠CAUTION

- **Make sure that no electromagnetic radiation interferes with the performance of the system when preparing to carry out performance tests. Mobile phone, X-ray equipment or MRI devices are a possible source of interference as they may emit higher levels of electromagnetic radiation.**
- **Before connecting the system to the power line, check that the voltage and frequency ratings of the power line are the same as those indicated on the system’s label or in this manual.**
- **Protect the system from damage caused by drop, impact, strong vibration or other mechanical force during servicing.**

### 1.1.4 Notes

#### NOTE

- **Refer to Operation Manual for detailed operation and other information.**

## 1.2 Equipment Symbols

| | |
|---|---|
|  | Attention: Consult accompanying documents. |
|  | Power on |
|  | Power off |
|  | Alternating current (AC) |
|  | Type CF applied part. The unit displaying this symbol contains an F-type isolated (floating) patient part providing a high degree of protection against shock, and is suitable for use during defibrillation. |
|  | Equipotential terminal |
|  | Non-ionizing electromagnetic radiation |
|  | Network connector |
|  | Antenna interface |
|  | Communication status |
|   | CE marking |
|  | ESD warning symbol for Electrostatic sensitive devices. |

**FOR YOUR NOTES**

# 2 Principles

## 2.1 System Operating Principle

TMS-6016 is a digital telemetry system consisting of the transmitter, receiver, CMS and antenna array. The transmitter sends the patient's physiological information to the receiver, which then transmits the information received to the telemetry CMS for analysis, displaying, storage and printing. The transmitter is attached to the patient, whereas the receiver is used together with the telemetry CMS. The TMS-6016 telemetry system is intended to monitor and display a fixed set of parameters including ECG, $SpO_2$, HR and PR under hospital environments. The $SpO_2$ module is optional.

The following is a diagram illustrating the operating principle of the whole system:

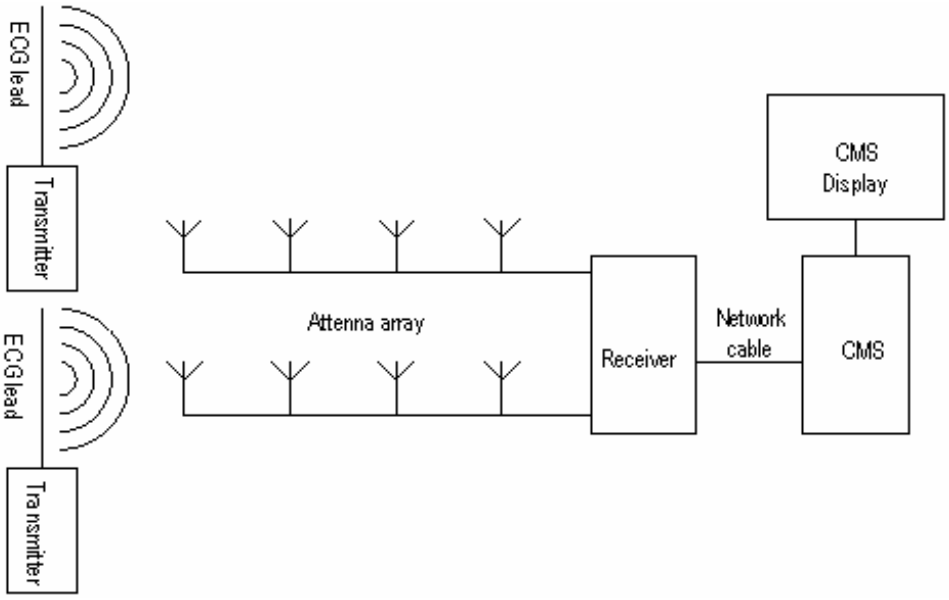


Figure 2-1 system principle diagram

# 2.2 Hardware Operating Principles

## 2.2.1 Transmitter

### 2.2.1.1 Principle diagram

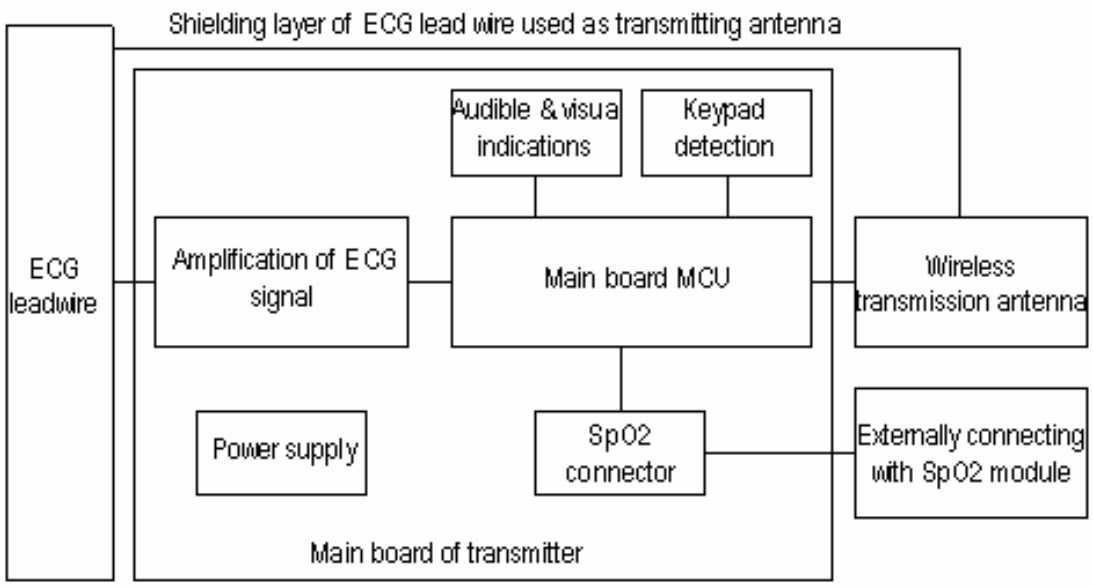


Figure 2-2 Transmitter principle diagram

### 2.2.1.2 Overview

The transmitter mainly consists of the ECG signal amplifying circuit, power supply circuit, MCU, audible and visual alarm indication circuit, wireless transmission module, $SpO_2$ connector, etc. The ECG amplifying circuit provides the amplified ECG signals for three channels, which are respectively called Lead I, II and V.

The MCU circuit is the core of the transmitter, enabling the following functions:

- Button signal detection
- A/D conversion of ECG analog signals
- Audible and visual alarm indication drive
- SpO2 connector
- Status detection, such as ECG overload detection, lead off detection, PACE detection, etc.
- ECG data processing
- Wireless transmission module control
- Baseband signal generation
- The Wireless transmission module is to send ECG data, SpO2 data and status information out .The shielding layer of the ECG lead is the transmitter antenna.

## 2.2.2 Receiver

### 2.2.2.1 Principle diagram

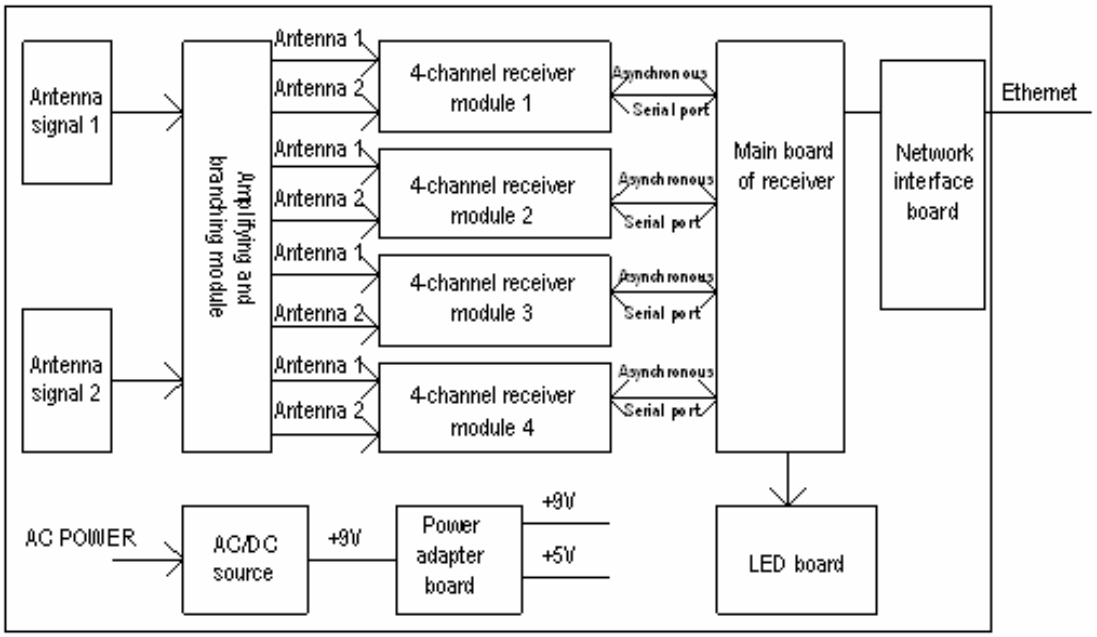


Figure 2-3 Receiver principle diagram

The receiver comprises the AC/DC power source, power adapter board, amplifying and branching module, 4-channel receiver, LED board, main control board and network interface board.

### 2.2.2.2 AC/DC Source

The AC/DC source is to convert the externally inputted AC source into a 9V DC by means of isolation. The inputted AC voltage range is from 90V to 264V, and the outputted voltage/current is 9V/6.5A.

### 2.2.2.3 Power Adapter Board

The power adapter board is to drop the 9V DC coming from the AC/DC source to a 5V DC and then output it with the 9V DC.

### 2.2.2.4 Amplifying and branching Module

The amplifying and branching module is to amplify, filter and branch RF signals. The module allows two amplifying, filtering & branching circuits with circuit parameters in full symmetry. Each circuit amplifies, filters and branches the RF signals received by its corresponding antenna and then outputs 4 channels of RF signals. Therefore, there are a total of 8 channels of RF signals, which are then sent to the 4-channel receiver for processing. The 9V DC linearly drops down to an 8V DC, which then goes to the amplifying and branching module. The antenna array is shared by all receiving modules. Therefore, in order to compensate for the branching attenuation of the signal, an LNA (low noise amplification) is added before the branch divider. Besides, to avoid that the LNA is blocked by strong out-band signal interference, filtering circuits shall be added in front of and behind the LNA.

### 2.2.2.5 4-Channel Receiver

The 4-channel receiver divides the two channels of antenna signals coming from the amplifying and branching module into four channels of RF signals through the 4-channel branch divider. The MCU of the 4-channel receiving board will estimate the received signal strength (RSSI) and then select the corresponding antenna signals through the antenna switch. The selected signals will be respectively sent to the receiving modules for filtering, amplifying, mixing, filtering and demodulating. The demodulated 4-channel analog signals will then be sent to the MCU system for clock and data regenerating. The regenerated data is packed by CPU and then delivered via the asynchronous serial port to the main control board for processing. The 9V DC linearly drops down to an 8V DC, which is then stabilized into a 5V and a 3.5 V supplying power for the 4-channel receiver.

### 2.2.2.6 Main Control Board

After receiving the data coming from the 4-channel receiving board, the main control board will pack them and then delivers them to the CMS through the Ethernet. The speaker of the main control board will give a short beep when the initialization is over, and will beep continuously when an initialization failure or a hardware fault occurs.

### 2.2.2.7 LED Board

The LED board has two green LEDs, respectively indicating the power status and the communication status of the receiving module.

### 2.2.2.8 Network Interface Board

The interface between the main control board and Ethernet consists of the network isolating transformer and interface connector.

## 2.2.3 Antenna Array

The antenna array consists of multiple external antennas which interconnect through the 8-way power splitters, cables and TNC connectors as shown below.

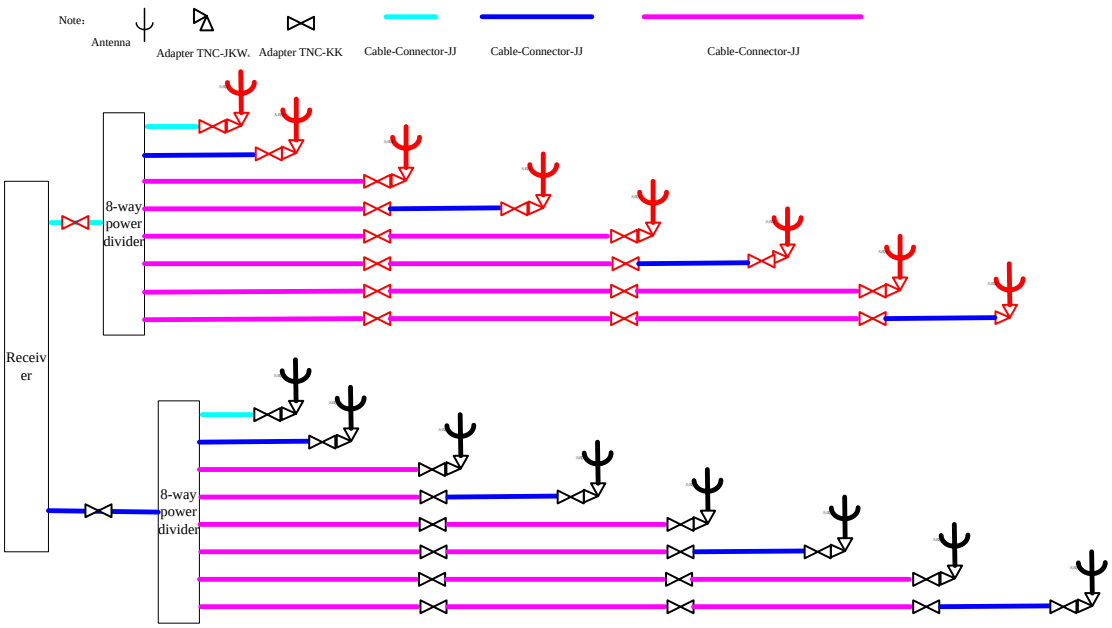


Figure 2-4 Antenna array diagram

## 2.2.4 Central Monitoring System

The computer of the CMS should be highly reliable and stable.
The commercial computer we recommend is HP-DC7800.

Recommended configurations of DC7800 are:

| Components | Requirements |
|---|---|
| System | Meet the IEC60950 requirements defined for ITE equipment, and comply with CE low voltage directives (LVD) and EMC directives. |
| Host | DualCore Intel Core 2 Duo E6750, 2660MHz<br>2G minimum DDR II-667<br>80G minimum, 7200rpm SATA Hard Disk<br>100M/100M/1000M Network adapter, Base-T, Ethernet 802.3, RJ45 port<br>2 or more USB ports<br>1 or more serial ports<br>1 or more parallel ports |
| Display | 17"LCD minimum, 1280×1024, length: width 4:3 or 5:4, with CE marking. |
| Dual-display graphic card | Minimum 256M;<br>NVADIA 8500 |
| Mouse | With CE marking. |
| Keyboard | With CE marking. |
| Recorder | Mindray thermal array, serial port. |
| Printer | HP LaserJet, supporting A4 and Letter paper. |
| Speaker | Built in the computer or the display. Give alarm tones (45 to 85 dB), alarm tones comply with IEC60601-1-8. |

### NOTE

- **The configuration above is for reference only.**

# 2.3 Software Principles

## 2.3.1 Transmitter Software System

### 2.3.1.1 Overview

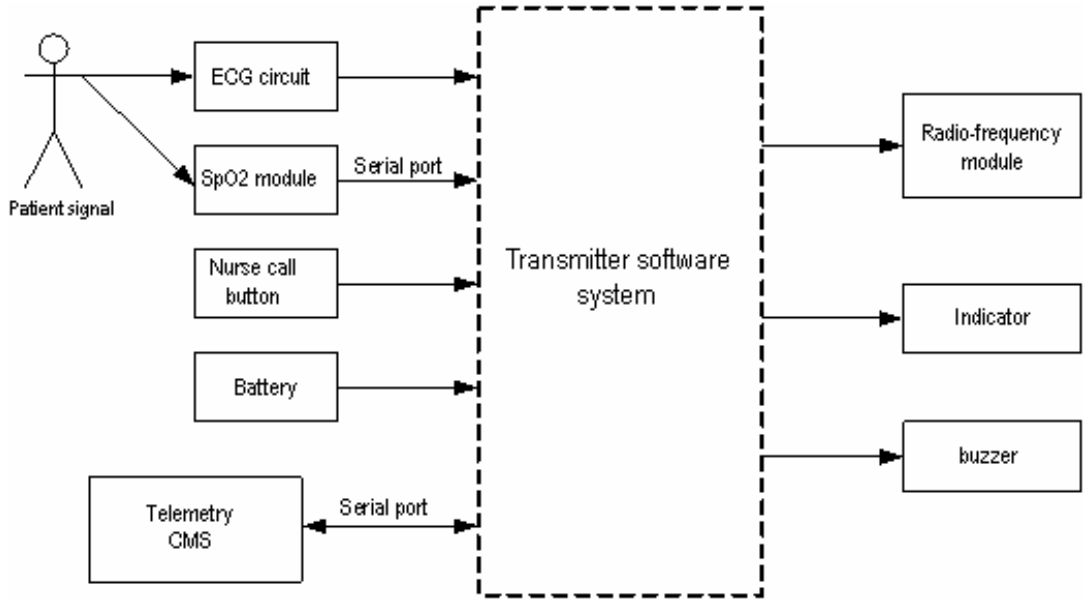


Figure 2-5 Interfacing diagram between the transmitter single-chip software and peripherals

Inside the dashed frame is the transmitter software system (hereinafter called the software system), and outside the dashed frame are the inputs and outputs of the software system. The patient's ECG data are inputted into the software system by means of sampling.

The external $SpO_2$ module communicates with the transmitter through the serial port, and the collected $SpO_2$ data are inputted into the software system via the serial port. The CMS and external $SpO_2$ module communicate with the transmitter through the same serial port. The user commands and online upgrade files of the transmitter software are inputted into the software system through this serial port.

Patient calls can be inputted into the software system through the nurse call button. The patient's ECG and $SpO_2$ parameter signals and the transmitter's status data are processed by the software system and then transmitted to the RF module. In addition, the indicator and speaker are also controlled by the software system.

#### 2.3.1.2 Transmitter system task

The transmitter collects the patient's ECG and $SpO_2$ signals, and then detects the pace pulse, $SpO_2$ and other status information in them by amplifying and digitalizing them, and finally sends the detected information to the receiver through wireless channels.

The transmitter supports the auto detection of 3-lead or 5-lead leadwire, lead off detection and PACE detection. It also supports the external $SpO_2$ module though the $SpO_2$ connector, through which the CMS can perform the parameter configuration and online software upgrade to the transmitter.

The transmitter also enables these functions including battery voltage detection, call button detection and event button detection. Besides, it supports audible and visual alarms and enables the standby mode.

### 2.3.2 Receiver System Software

#### 2.3.2.1 Overview

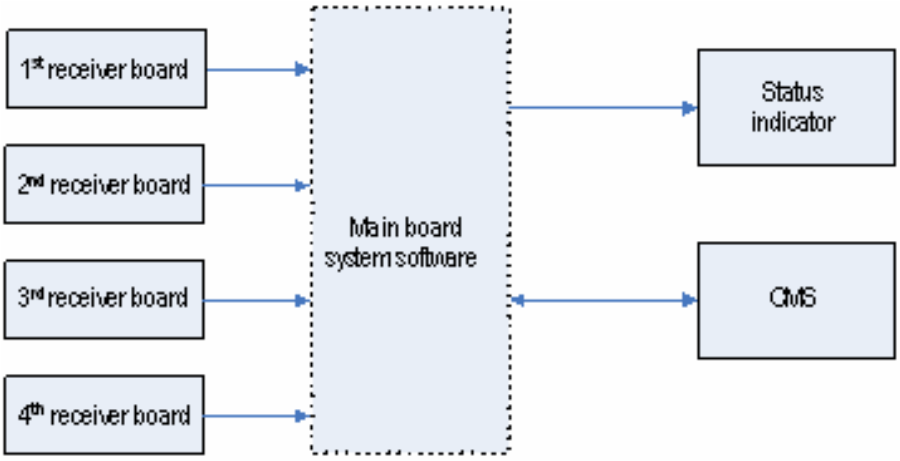


Figure 2-6 Receiver system software diagram

Inside the dashed frame is the system software of the main control board (hereinafter called the software system), and outside the dashed frame is the inputs and outputs of the software system. The data coming from the 4-channel receiver are sent to the software system through the serial port.

The main control board and receiver controller communicate through the serial port. The main control board directly controls the LED indicator through the I/O port and communicates with the CMS through the Ethernet.

### 2.3.2.2 Receiver system task

The receiver receives data from boards, descrambles data, analyzes the integrity of data, generates relevant alarm messages and sends them together with data to the CMS.

Through the receiving controller, the receiver obtains and controls the operating status of the receiving demodulator, including the operating frequency and signal strength of the demodulator. After detecting the operating status, the receiver will give prompt information through the communication status indicator.

### 2.3.2.3 Overview of the 4-channel receiver software

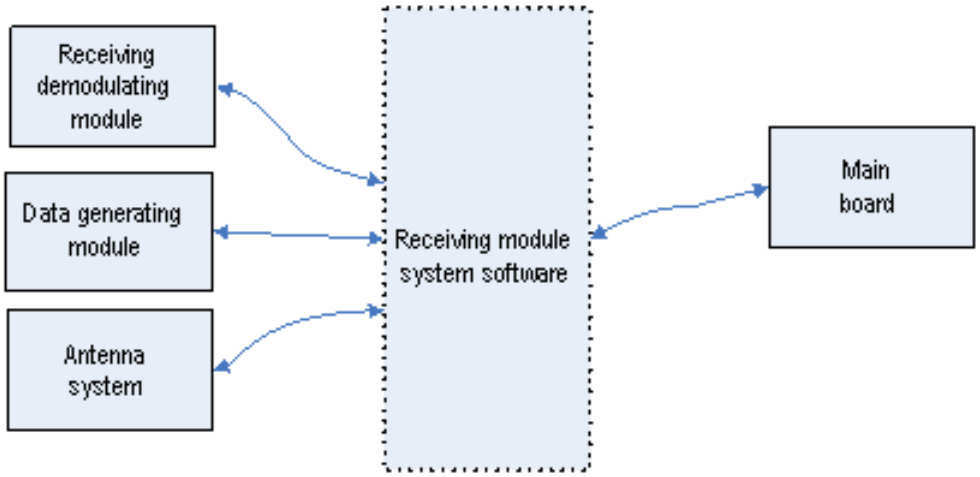


Figure 2-7 Diagram for the 4-channel receiver software

Inside the dashed frame is the receiving module control software (hereinafter call software system), and outside the dashed frame are the inputs and outputs of the software system. Through the serial port and signal line, the software system communicates with the receiving demodulator, resolves the data coming from the data-generating module and controls the antenna system via switch. Besides, it also communicates with the main control board via the serial port.

### 2.3.2.4 4-channel receiver software task

The 4-channel receiver mainly undertakes the following tasks:

- Recover and resolve the wireless transmission space protocol;
- Configure frequency for the 4-channel receiver on the receiving board;
- Collect the RSSI from the 4-channel receiver on the receiving board;
- Select antenna according to the received signal strength;
- Collect the status information of the 4-channel receiver on the receiving board;
- Carry out the communication with the main control board.

**FOR YOUR NOTES**

# 3 Configuring Functions

## 3.1 Overview

You can configure the frequencies of the transmitter and receiver through the TMS-6016 telemetry monitoring system, so that the interfered frequency point can be easily evaded when there is interference with the transmitting frequency point. As a result, the stability and reliability of the system is improved.

### NOTE

- **The configuration of telemetry system may cause malfunction of the product. Please do this with caution.**
- **Please use new batteries during the configuration, avoiding invalid configurations due to power-off of batteries. The transmitter cannot be configured in case the batteries are not loaded or the battery voltage is too low.**

## 3.2 Configuration Method

1. Connect one end of the dedicated configuration cable to the serial port 1 (COM1) on the PC, and the other end to the SpO2 connector on the transmitter.
2. Click the “System Setup” icon at the lower right corner of the screen of the CMS.

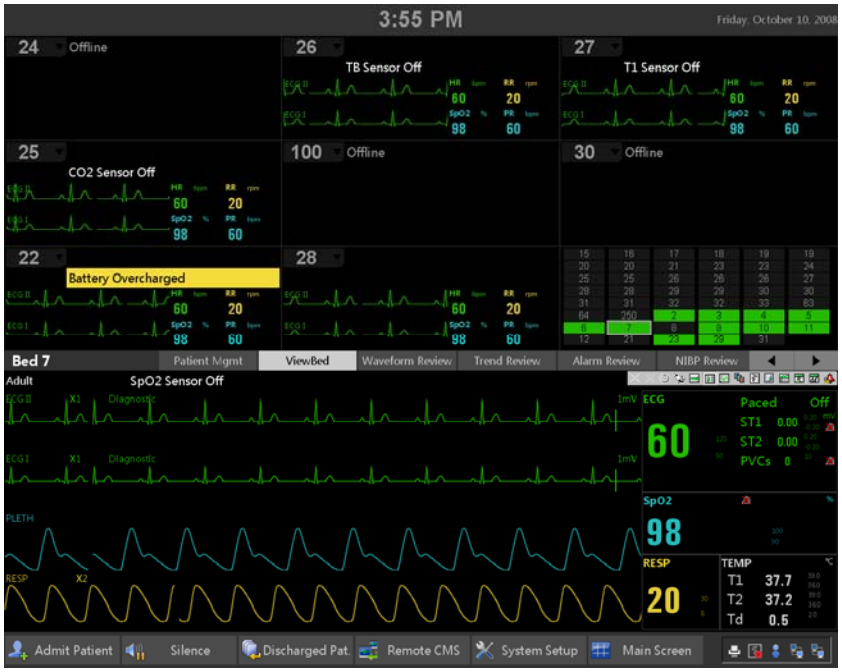


Figure 3-1 User screen

3. Click the “User Setup” icon. A dialog box will be displayed asking you to input user password.

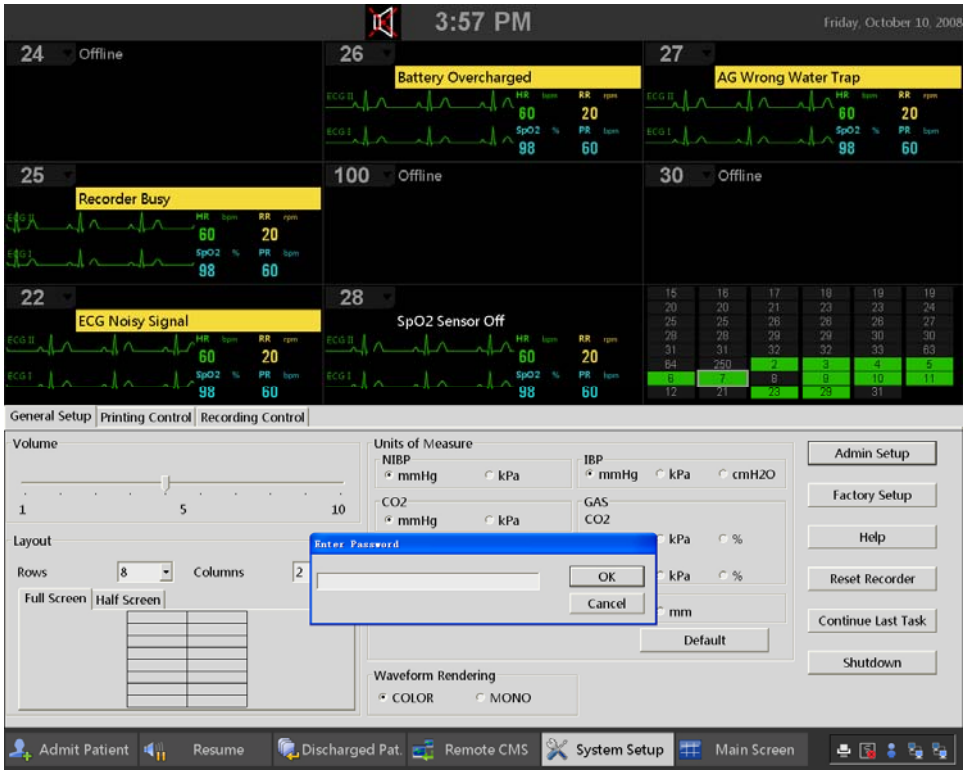


Figure 3-2 System Setup Tab Sheet

4. Input the correct user password. The following screen will be displayed.

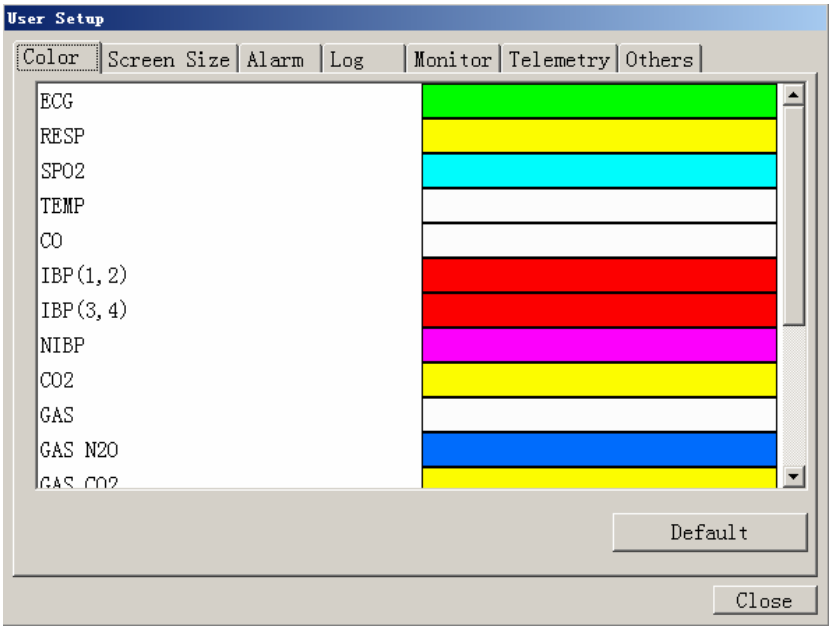


Figure 3-3 The screen appeared after inputting the correct password

5. Click the “Telemetry” icon at the upper right corner of the screen. the system will enter the configuration screen as below.

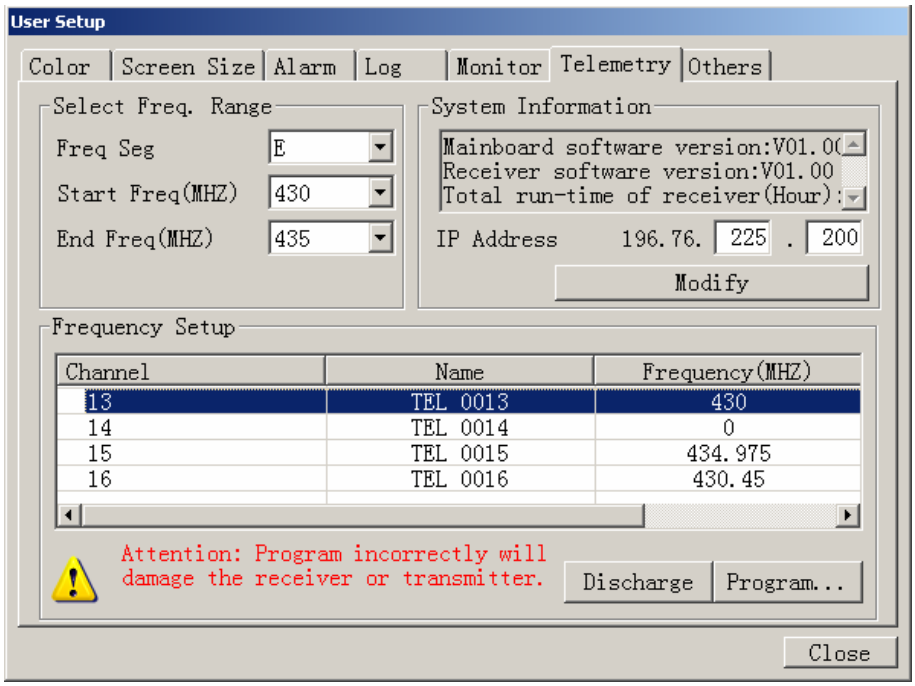


Figure 3-4 Configuration screen

6. Select an appropriate frequency segment from “Select Freq. Range” area.
7. Select a channel correspond to the transmitter (here channel 13 is selected) and click the “Program” button at the lower right corner. The following dialog box will be displayed as below:

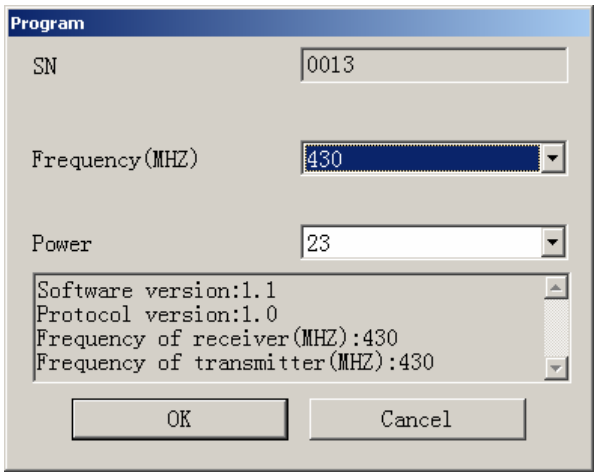


Figure 3-5 Programming screen

8. After enter this dialog box, input the frequency you want to set, and then you can press either the “Ok” button to start programming or the “Cancel” button to exit the programming.
9. After the programming succeeds, the following message “frequency is set successfully” will be displayed.
10. Click “Ok” to close the current dialog box. So far the programming of a pair of transmitter and receiver modules is finished.
11. If you want to program another pair of transmitter and receiver module, repeat the above step 6-10.

# 4 Structure and Troubleshooting

## 4.1 Exploded View of a Transmitter

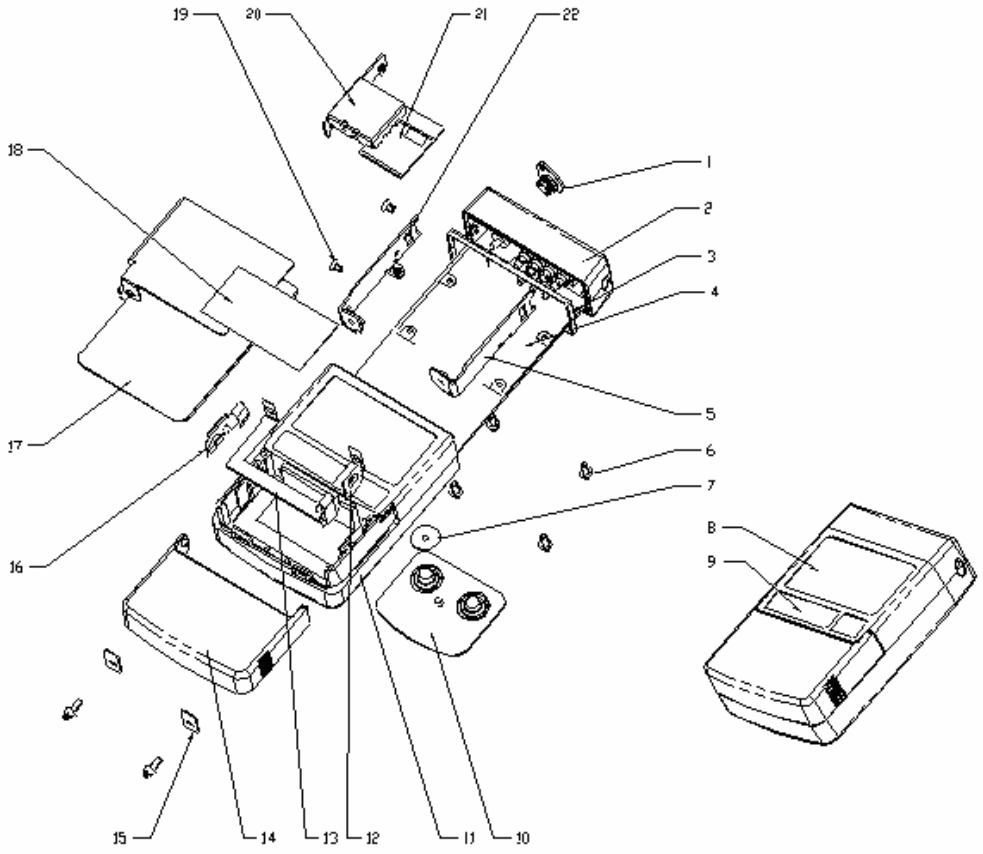


Figure 4-1 Exploded view of a transmitter

| No | P/N | Name and Specifications | Quantity |
|---|---|---|---|
| 1 | 0152-20-39707 | silicone stopper | 1 |
| 2 | 0152-20-39704-51 | upper cover | 1 |
| 3 | 0152-20-39711 | stripper rubber | 1 |
| 4 | 0152-30-39700 | main board of the transmitter | 1 |
| 5 | 0152-20-39709 | left shoe plate | 1 |
| 6 | M04-051045--- | cross pan head screw (M2.5×6) | 6 |
| 7 | 0152-20-39715 | anti-dazzling screen | 1 |
| 8 | 0152-20-39756 | label on the transmitter | 1 |
| 9 | 0000-20-10953 | neutral blank label(35*9mm) | 1 |
| 10 | 0152-20-39708 | silicone key | 1 |
| 11 | 0152-20-39705 | shell | 1 |
| 12 | 0152-20-39716 | positive reed | 1 |
| 13 | 0152-20-39717 | negative reed | 1 |
| 14 | 0152-20-39706 | battery door | 1 |
| 15 | 0152-20-39713 | plain washer | 2 |
| 16 | 0152-20-39718 | positive and negative reeds of the battery | 1 |
| 17 | 0152-20-39712 | shielding cover | 1 |
| 18 | 0152-20-39763 | battery compartment label | 1 |
| 19 | M04-006005 | cross recessed countersunk head screw(M2.0×4) | 2 |
| 20 | 0152-20-39714 | RF shielding cover of the transmitter | 1 |
| 21 | 0152-30-39770 | RF board (420-440) | 1 |
| 22 | 0152-20-39710 | right shoe plate | 1 |

# 4.2 Structure of a Receiver

## 4.2.1 Exploded view of a receiver

### 4.2.1.1 Exploded view –1 of a receiver

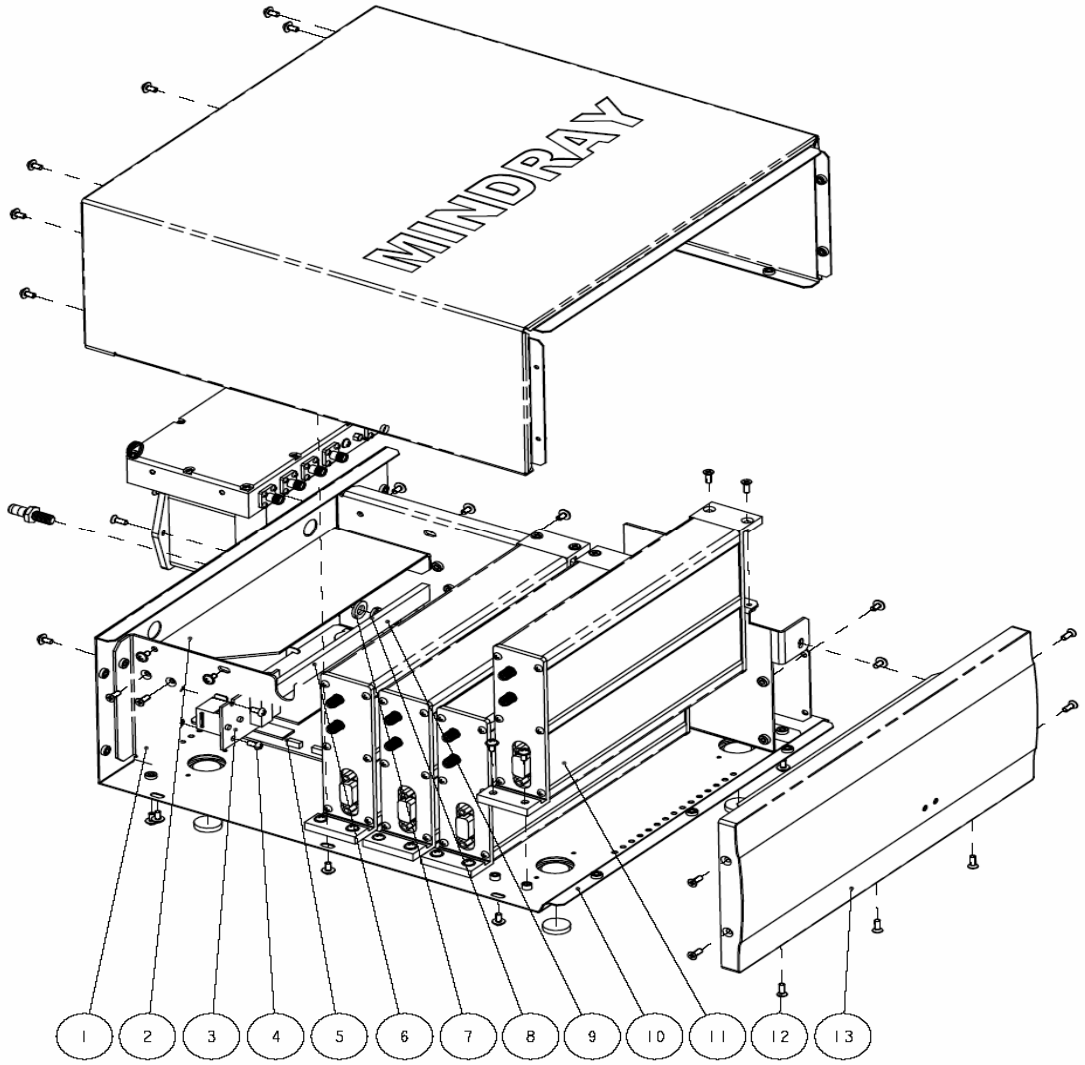


Figure 4-2 Exploded view –1 of a receiver

### 4.2.1.2 Exploded view –2 of a receiver

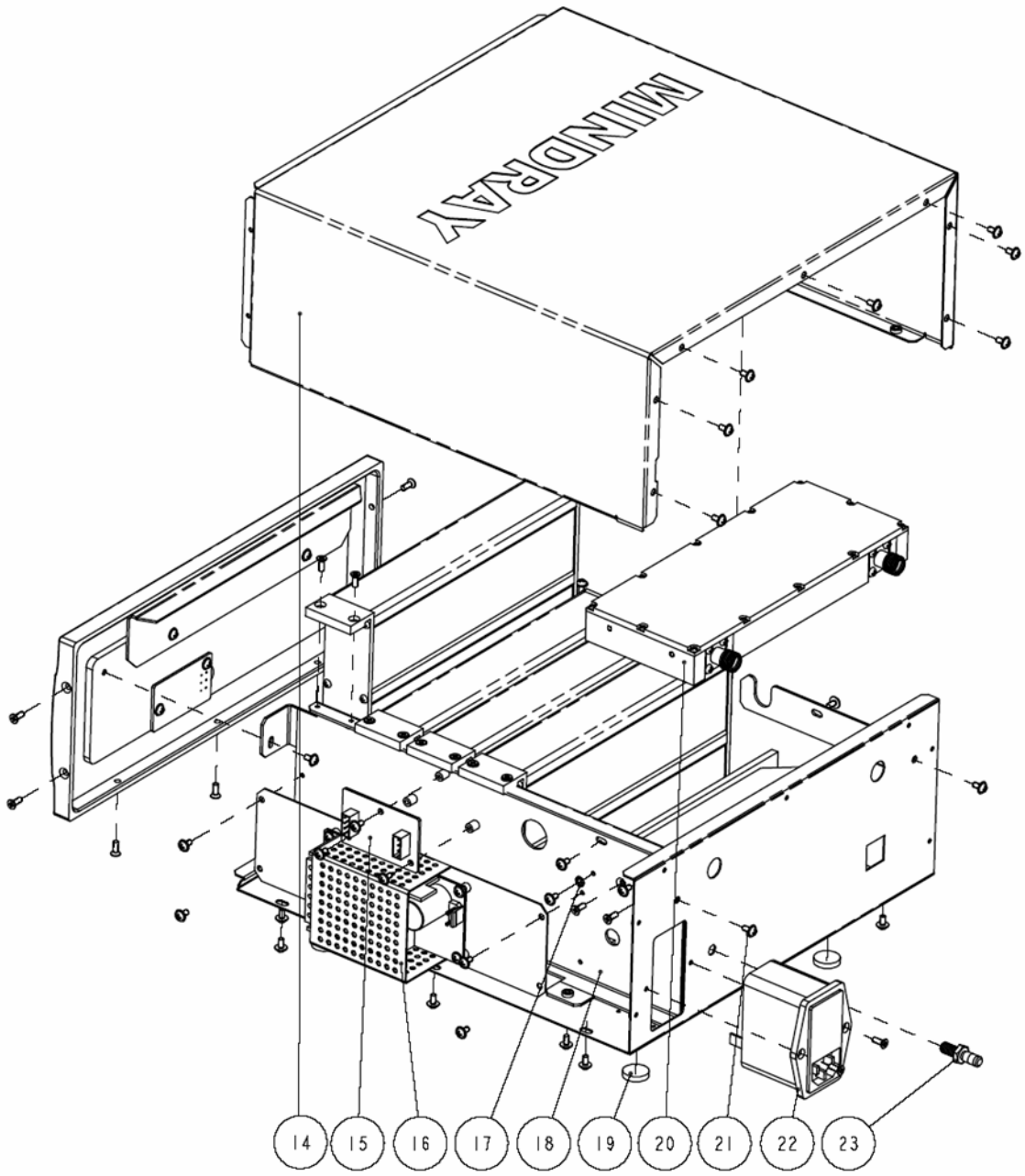


Figure 4-3 Exploded view –2 of a receiver

| No | P/N | Name and Specifications | Quantity |
|---|---|---|---|
| 1 | 0152-20-39747 | main bracket 3 of the receiver | 1 |
| 2 | 0152-20-39746 | main bracket 2 of the receiver | 1 |
| 3 | 9210-30-30152 | Ethernet interface board | 1 |
| 4 | M04-002505--- | cross pan head screw M3×6 | 2 |
| 5 | 9210-30-30150 | 9210 main control board | 1 |
| 6 | 900E-20-04894 | dust washer1 | 1 |
| 7 | M04-021003--- | plain washer GB97.26 | 1 |
| 8 | M04-004504--- | spring washer BF93 6 | 4 |
| 9 | M04-004401--- | stainless steel hexagon nut M6 | 1 |
| 10 | 0152-20-39744 | bottom plate of the receiver | 1 |
| 11 | 0152-30-39805 | 4-channel receiver (430-435) | 4 |
| 12 | M04-000405--- | cross recessed countersunk screw M3×8 | 21 |
| 13 | 0152-30-39729 | front cover assembly of the receiver | 1 |
| 14 | 0152-30-39749 | upper cover of the receiver | 1 |
| 15 | 0152-30-39724 | power adapter board | 1 |
| 16 | 0152-30-39738 | power assembly of the receiver | 1 |
| 17 | M04-000603--- | lock washer, nickle plating | 1 |
| 18 | 0152-00-39745 | main bracket 1 of the receiver | 1 |
| 19 | 0152-20-39732 | rubber foot of the receiver | 1 |
| 20 | 0152-30-39834 | amplifying and branching assembly of the receiver (420-470) | 1 |
| 21 | M04-004012--- | cross pan head screw with washer M3×6 | 41 |
| 22 | 0030-10-13055 | Filter power 115/250VAC6A panel mount | 1 |
| 23 | 0509-20-00098 | ground pole | 1 |

## 4.2.2 Front cover assembly of a receiver

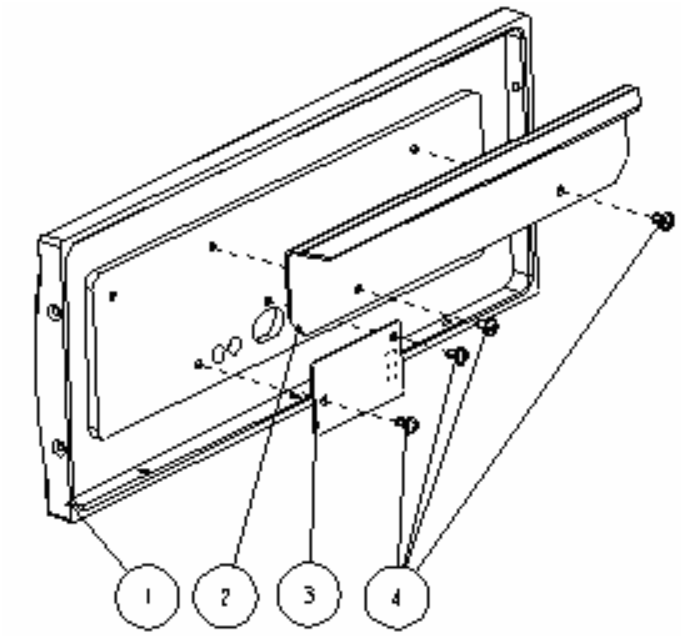


Figure 4-4 Front cover assembly of a receiver

| No | P/N | Name and Specifications | Quantity |
|---|---|---|---|
| 1 | 0152-20-39730 | front cover of the receiver | 1 |
| 2 | 0152-20-39748 | main bracket 4 of the receiver | 1 |
| 3 | 0152-30-39726 | LED indicator board | 1 |
| 4 | M04-004012--- | cross pan head screw with washer M3×6 | 4 |

## 4.2.3 Amplifying and branching assembly of a receiver

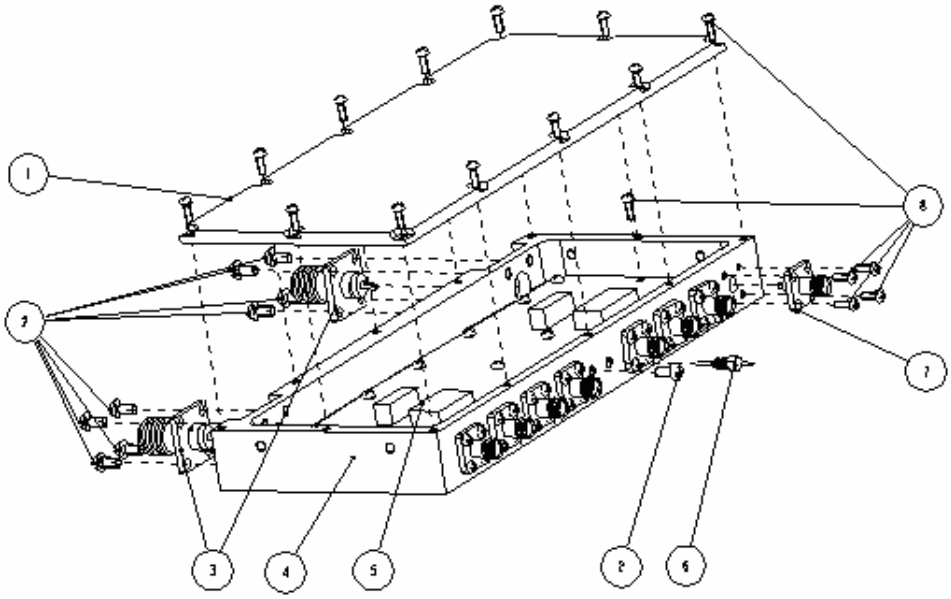

Figure 4-5 Amplifying and branching assembly of a receiver

| No | P/N | Name and Specifications | Quantity |
|---|---|---|---|
| 1 | 0152-20-39735 | upper cover of the amplifying and branching assembly of the receiver | 1 |
| 2 | M04-002505--- | cross pan head screw M3×6 | 9 |
| 3 | M39-000143--- | antenna socket | 2 |
| 4 | 0152-20-39736 | lower cover of the amplifying and branching assembly of the receiver | 1 |
| 5 | 0152-30-39720 | amplifying and branching board(420-470) | 1 |
| 6 | M40-A00014--- | bushing-type capacitor | 1 |
| 7 | M39-000140--- | SMA RF socket | 8 |
| 8 | M04-002405--- | cross pan head screw M2×6 | 66 |

## 4.2.4 Power assembly of a receiver

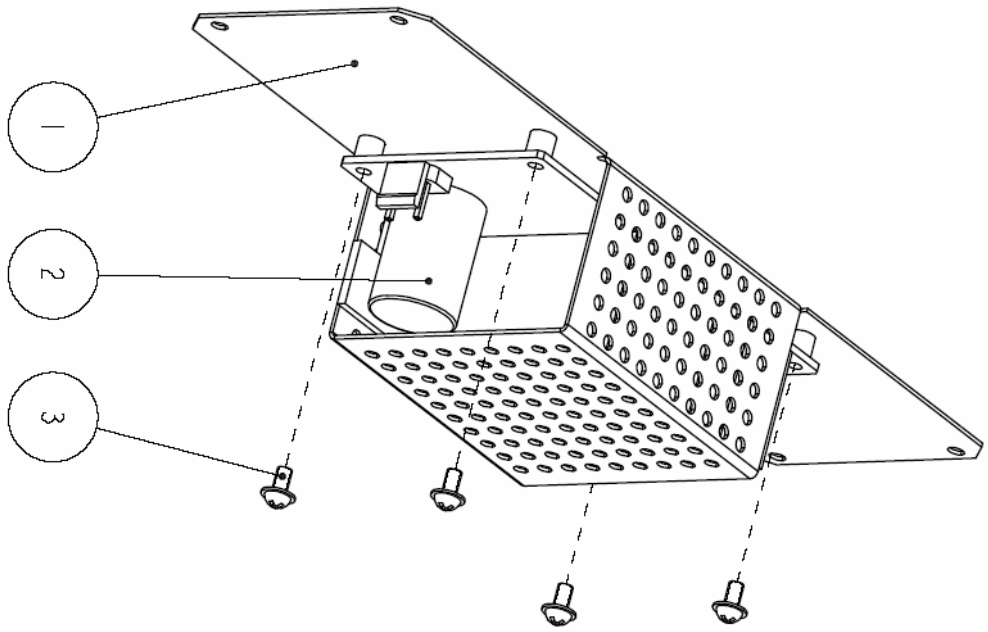


Figure 4-6 Power assembly of a receiver

| No | P/N | Name and Specifications | Quantity |
|---|---|---|---|
| 1 | 0152-20-40046 | power cover of the receiver | 1 |
| 2 | 0000-10-11152 | Power module AC/DC 90-264VAC 9VDC | 1 |
| 3 | M04-004012--- | cross pan head screw M3×6 | 4 |

## 4.2.5 4-channel receiving module assembly of a receiver

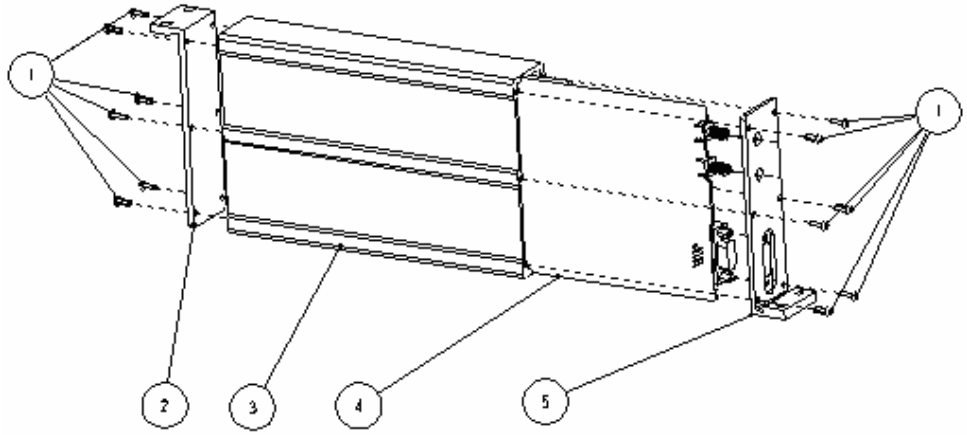


Figure 4-7 4-channel receiving module assembly of a receiver

| No | P/N | Name and Specifications | Quantity |
|---|---|---|---|
| 1 | M04-051121--- | cross pan head screw M2.5×8 | 12 |
| 2 | 0152-20-39743 | rear plate of the receiver module | 1 |
| 3 | 0152-20-39741 | receiver module cavity | 1 |
| 4 | 0152-30-39722 | 4-channel receiving board | 1 |
| 5 | 0152-20-39742 | front plate of the receiving board | 1 |

# 4.3 Troubleshooting

## 4.3.1 Troubleshooting table

| Alarm message | Description | Processing method |
|---|---|---|
| Battery voltage low | The battery energy of the transmitter is about to use up. | Replace the battery of the transmitter. |
| No RF signal | The receiver hasn't received valid data for 5 s. | Check if the battery energy of the transmitter is used up;<br>Check if the transmitter enters the power saving mode;<br>Check if the patient walks out of the covering range;<br>Check if the antenna array cables are properly connected;<br>Check if the transmitter is installed with the lead wire serving as antenna; |
| RF interference | The transmitter has received 3 erroneous data frames. | Check if the patient is at the margin of the covering range, or inside of the elevator, or behind the reinforced concrete wall;<br>Check if there is an intense RF interference source; |
| Wrong ID | The receiver has received the data transmitted by the transmitter, but the ID code doesn't belong to this system. | Check if there is another telemetry system nearby, and contact the maintenance technicians to reconfigure the frequency points. |
| Offline | The CMS and the receiver cannot set up the networking connection. | Check if the receiver is turned on;<br>Check if the networking cable between the receiver and the CMS is properly connected. |
| ECG noise | The ECG waveforms are superimposed with noise interference. | Check if the ECG leadwire is intertwined with cables of other devices. |
| ECG signal saturation | The transmitter detects that signals of the ECG amplifying channel are saturated and overloaded. | Check the quality of the ECG electrodes;<br>Check the connection of the ECG electrode and skin; |

| | | |
|---|---|---|
| SpO2 Out of Track | The SpO2 signal is too low or too weak. | Check the patient's condition and change the sensor application site. If the error persists, replace the sensor. |
| Transmitter key error | The transmitter detects that a key has been pressed for over 10 s. | Check if the key is pressed by an foreign object or jammed. |
| Transmitter or $SpO_2$ module restarting repeatedly. | The transmitter's battery capacity is to be depleted. | Replace the transmitter's battery. |
| Receiver Fault | An error occurred to the receiver. | Restart the receiver. |

**FOR YOUR NOTES**

# 5 List of Materials

## NOTE

- **Here we list most replaceable parts. If you need more parts, please contact our Customer Service Department.**

| No | P/N | Material Description |
|---|---|---|
| 1. | 0030-10-13055 | power filter |
| 2. | 0152-20-39732 | rubber foot of the receiver |
| 3. | 0152-20-39744 | bottom plate of the receiver |
| 4. | 0152-20-39745 | main bracket 1 of the receiver |
| 5. | 0152-20-39746 | main bracket 2 of the receiver |
| 6. | 0152-20-39747 | main bracket 3 of the receiver |
| 7. | 0152-20-39749 | upper cover of the receiver |
| 8. | 0152-20-39753 | output wire of the power adapter board |
| 9. | 0152-20-40047 | input wire of the power adapter board |
| 10. | 0152-20-39731 | input wire of the power module |
| 11. | 0152-20-39764 | network connection cable |
| 12. | 0152-30-39724 | power adapter board |
| 13. | 0152-20-39730 | front cover of the receiver |
| 14. | 0152-20-39748 | main bracket 4 of the receiver |
| 15. | 0152-30-39726 | LED indicator board |
| 16. | 0152-30-39734 | amplifying and branching assembly of the receiver (185-205) |
| 17. | 0152-30-39834 | amplifying and branching assembly of the receiver (420-470) |
| 18. | 0152-20-39750 | power wire of the amplifying and branching assembly |
| 19. | 0000-10-11152 | Power module AC/DC 90-264VAC 9VDC |
| 20. | 0152-20-40046 | power cover of the receiver |
| 21. | 9210-30-30150 | main control board |
| 22. | 9210-30-30152 | network connection board |
| 23. | 0000-10-10962 | flexible cable with 10 pins and spacing 0.5mm |
| 24. | 0152-20-39704 | upper cover |
| 25. | 0152-20-39705 | shell |
| 26. | 0152-20-39706 | battery door |

| | | |
|---|---|---|
| 27. | 0152-20-39707 | silicone stopper |
| 28. | 0152-20-39708 | silicone key |
| 29. | 0152-20-39709 | left shoe plate |
| 30. | 0152-20-39710 | right shoe plate |
| 31. | 0152-20-39711 | stripper rubber |
| 32. | 0152-20-39712 | shielding shell |
| 33. | 0152-20-39713 | plain washer |
| 34. | 0152-20-39715 | anti-dazzling screen |
| 35. | 0152-20-39716 | positive reed of the battery |
| 36. | 0152-20-39717 | negative reed of the battery |
| 37. | 0152-20-39718 | positive and negative reeds of the battery |
| 38. | 0152-30-39700 | transmitting main board |
| 39. | 0152-20-39786 | connecting wire of ceramic speaker |
| 40. | M39-000408--- | connector-- 4-pin plastic PCB socket |
| 41. | 0152-30-39768 | main unit of the transmitter (189-196) |
| 42. | 0152-30-39838 | main unit of the transmitter (420-440) |
| 43. | 0152-30-39839 | main unit of the transmitter (440-470) |
| 44. | 0152-30-39767 | transmitter assembly |
| 45. | 0152-30-39769 | RF module assembly (189-196) |
| 46. | 0152-30-39836 | RF module assembly (420-440) |
| 47. | 0152-30-39837 | RF module assembly (440-470) |
| 48. | 0000-10-10967 | RF MODULE 425-430MHz |
| 49. | 0000-10-10968 | RF MODULE 430-435MHz |
| 50. | 0000-10-10969 | RF MODULE 189.75-191.75MHz |
| 51. | 0000-10-10970 | RF MODULE 194-196MHz |
| 52. | 0000-10-10988 | RF MODULE 420-425MHz |
| 53. | 0000-10-10989 | RF MODULE 435-440MHz |
| 54. | 0000-10-10990 | RF MODULE 440-445MHz |
| 55. | 0000-10-10991 | RF MODULE 445-450MHz |
| 56. | 0000-10-10992 | RF MODULE 450-455MHz |
| 57. | 0000-10-10993 | RF MODULE 455-460MHz |
| 58. | 0000-10-10994 | RF MODULE 460-465MHz |
| 59. | 0000-10-10995 | RF MODULE 465-470MHz |
| 60. | 0152-20-39741 | receiver module cavity |
| 61. | 0152-20-39743 | rear plate of the receiver module |
| 62. | 0152-20-39751 | serial port wire |

| | | |
|---|---|---|
| 63. | 0152-30-39722 | 4-channel receiving board |
| 64. | 0152-20-39742 | front plate of the receiver module |

**FOR YOUR NOTES**