受控文件
CONTROLLED FILE

EDAN Agile PLM Electronic Signature Information

--Signatures related to this document and performed in EDAN Agile PLM.

文件名称：FTS-3维修手册_英文
文件编号：01.54.456401
版本：1.3
产品型号：FTS-3
项目编码：2213A000

签批信息:

作者 : 欧阳 飞燕 (ouyangfeiyan)　　2016-10-31 10:22:16

审核人 : 刘 小倩 (liuxiaoqian)　　2016-11-01 16:30:18

审核人 : 罗 崇 (luochong)　　2016-11-02 13:16:33

批准人 : 王 力维 (wangliwei)　　2016-11-08 15:49:36

批准人 : 冀 伟 (jiwei)　　2016-11-04 09:34:50

FTS-3

Fetal Telemetry System

Version 1.3

Service Manual

CE 0123

EDAN

About this Manual

P/N: 01.54.456401

MPN: 01.54.456401013

Release Date: Oct. 2016

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.

EDAN owns the copyrights of this manual. Without prior written consent of EDAN, any materials contained in this manual shall not be photocopied, reproduced or translated into other languages.

Materials protected by the copyright law, including but not limited to confidential information such as technical information and patent information are contained in this manual, the user shall not disclose such information to any irrelevant third party.

The user shall understand that nothing in this manual grants him, expressly or implicitly, any right or license to use any of the intellectual properties of EDAN.

EDAN holds the rights to modify, update, and ultimately explain this manual.

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.

EDAN will make available on request circuit diagrams, component part lists, descriptions, calibration instructions, or other information that will assist SERVICE PERSONNEL to repair those parts of ME EQUIPMENT that are designated by EDAN as repairable by SERVICE PERSONNEL.

Using This Label Guide

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 Warranty and Service

Standard Service

EDAN provides a one-year-warranty for the warranted products (accessories are included). The warranty period begins on the date the products are shipped to customers. If a customer promptly notifies EDAN of customer's warranty claim hereunder, EDAN will repair, adjust or replace (with new or exchange replacement parts) EDAN's products. EDAN warrants that any service it provides to customers will be performed by trained individuals in a workmanlike manner.

Limitation of Warranty

Direct, indirect or final damage and delay caused by the following situations for which EDAN is not responsible may void the warranty:

- ✧ Groupware is dismounted, stretched or redebugged.
- ✧ Unauthorized modification or misuse.
- ✧ Damage caused by operating beyond the environmental specifications for the medical product.
- ✧ Change or remove original serial number label or Manufacturer symbol.
- ✧ Improper use.

Service Procedure

(1) Fill in the **Service Claim Form (SCF)**.

Fill in the SCF with detailed information including: **Model Name**, **Serial Number (SN)** and **Problem Phenomena**.

EDAN should not have any obligation to take over the case without this information. The form can be downloaded at: http://www.edan.com.cn or obtained from EDAN's Service Department.

(2) Send EDAN the SCF and Select a Solution.

Once the service department receives the fully filled SCF, EDAN's engineer will offer a solution in three working days. EDAN will follow out the case based on the two conditions below:

Within Warranty:

There are two options:

i) After receiving the **Return Material Authorization (RMA)** form from EDAN service department, the customer sends EDAN the defective parts and informs about the shipment tracking number. Then we will dispatch new part(s) to your confirmed address with confirmed shipping invoice.

ii) The customer signs the **Declaration Form** and sends it back by email or fax. This form is

legally certificated to make sure the customer or end-user will return the defective parts to EDAN on time. We will, at this option, dispatch the replacement one(s) with confirmed shipping invoice.

NOTE:

1 Both Return Material Authorization Form and Declaration Form are offered by EDAN service department once the SCF is confirmed by service engineer.

2 The customer is responsible for freight & insurance charges when the equipment is shipped to EDAN for service, including custom charges. EDAN is responsible for the freight, insurance & custom charges from EDAN to the customer.

Out of Warranty:

After receiving the RMA form from the service department, the customer sends defective parts to EDAN in advance. We will analyze the problems and discuss with the customer about either repairing or replacing the part(s). Once the maintenance fee is invoiced and paid, we will make sure to dispatch good part(s) to the confirmed address.

NOTE: The customer is responsible for any freight & insurance charge for the returned product.

(3) Obtain the RMA Form.

Before the shipment of the materials, the customer must obtain an RMA form from our service department, in which the RMA number, description of returning parts and shipping instructions are included. The RMA number should be indicated on the outside of the shipping container.

NOTE: EDAN should not have any obligation to the end-user or customer who returns the goods without the notification by EDAN's service department. The sender takes full responsibility for the accounted fee.

(4) Send the Parts to EDAN.

Follow these recommended instructions:

✧ Please disassemble the parts with anti-static facility, do not touch the parts with naked hand.

✧ Please pack the parts safely before return.

✧ Please put the RMA number on the parcel.

✧ Please describe the returned parts as 'sample of *****' and put the total value on the invoice, and note on the invoice as 'sample, no commercial value'.

✧ Please confirm the invoice with EDAN before shipment.

✧ Please send back the parts after EDAN's confirmation.

Contact Information

If you have any question about maintenance, technical specifications or malfunctions of devices,

do not hesitate to contact us.

EDAN Instruments, Inc.

TEL: +86-755-26898321, 26899221

FAX: +86-755-26882223, 26898330

E-mail: support@edan.com.cn

Chapter 2 Overview

NOTE:

This service manual is written to cover the maximum configuration. Therefore, your model may not have some of the parameters/modules described, depending on what you have ordered.

2.1 Introduction

FTS-3 fetal telemetry system can be used with F6 or F9 series fetal/maternal monitor. This service manual is a reference for periodic preventive maintenance and corrective service procedures for FTS-3.

It provides troubleshooting information, assembly procedures, instructions for functional testing and performance verification. It is intended for use only by technically qualified service personnel.

WARNING

When performing a service procedure, follow the instructions exactly as presented in this manual. Failure to do so might damage FTS-3, invalidate the product warranty or lead to serious personal injury.

2.2 General Information

- **FTS-3** fetal telemetry system (hereinafter called **FTS-3**) is designed to comply with the international safety requirements IEC/EN 60601-1 for medical electrical equipment. It is class I equipment.
- The protective degree against electric shock of the patient connections is:

Ultrasound (FHR1, FHR2) External TOCO	Type BF	
DECG, MHR(form MECG)	Type CF	

- FTS-3 described in this manual is not protected against:

a) The effects of high frequency currents

b) The interference of electrosurgery equipment

2.3 Safety Precautions

WARNING and **CAUTION** messages must be observed. To avoid the possibility of injury, observe the following precautions during the maintaining the instrument.

WARNING

1 FTS-3 is provided for the use of qualified physicians or personnel professionally trained. They should be familiar with the contents of this user manual before operation.

2 FTS-3 is not intended for use in intensive care units (ICU), operating rooms or for home use.

3 Do not switch on the base station until all cables have been properly connected and verified.

4 To avoid the danger of introducing additional hazards, do not perform any unauthorized modification of FTS-3.

5 **EXPLOSION HAZARD** - Do not use FTS-3 in the presence of flammable anesthetics or other materials.

6 **SHOCK HAZARD** - Do not attempt to connect or disconnect a power cord with wet hands. Make certain that your hands are clean and dry before touching a power cord.

7 Do not touch accessible parts of non-medical electrical equipment and the patient simultaneously. Do not touch the signal input or output connector and the patient simultaneously.

8 The service personnel should be familiar with the operation of FTS-3. Refer to *F9+F9E Fetal & Maternal Monitor User Manual* for details.

9 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 configurations shall comply with the valid version of the system standard IEC/EN 60601-1. Anybody who connects additional equipment to the signal input connector or signal output connector to configure a medical system must ensure that the system complies with the requirements of the valid version of the system standard IEC/EN 60601-1. If in doubt, consult our technical service department or your local distributor.

10 Do not exceed the maximum permitted load when using multiple portable socket-outlets to supply the system.

11 SHOCK HAZARD - Don't connect non-medical electrical equipment, which has been supplied as a part of the system, directly to the wall outlet when the non-medical equipment is intended to be supplied by a multiple portable socket-outlet with an isolation transformer. If multiple instruments are connected to a patient, the sum of the leakage currents may exceed the limits given in the IEC/EN 60601-1 and may pose a safety hazard. Consult your service personnel.

12 Do not use the additional multiple portable socket-outlet or extension cord in the medical electrical system, unless it's specified as part of the system by manufacturer. And the multiple portable socket-outlets provided with the system shall only be used for supplying power to equipment which is intended to form part of the system.

13 Multiple portable socket-outlets shall not be placed on the floor.

14 **SHOCK HAZARD** - Do not remove the top panel cover during operation or while power is connected.

WARNING

15 Equipment and devices that connect to FTS-3 should form an equipotential body to ensure effective grounding.

16 Only connect accessories supplied or recommended by the manufacturer to the device.

17 Do not apply FTS-3 during electro-surgery or MRI; otherwise it might result in harming the patient or the operator.

18 **Electromagnetic Interference** - Ensure that the environment in which the monitor or FTS-3 is installed is not subject to any source of strong electromagnetic interference, such as CT, radio transmitters, mobile phone base stations, etc. Even though other devices are in accordance with national standard radiation requirements, the monitor or FTS-3 may be interfered.

19 Please arrange a function test periodically for the system.

20 Do not move the system when it is powered on and do not soak it in any liquid.

21 Please check the transducer, cable and base station periodically. If the transducers are damaged, do not use them in water and repair them in time.

22 If the transducer has been beaten or knocked, please check whether the cover is airproof or damaged. If you have any doubt, please contact the manufacturer or local agent.

23 If the battery in the base station is stored alone and not used for a long time, we recommend that the battery should be charged at least once every 6 months to prevent overdischarge.

24 The battery in the wireless transducer should be replaced by the serviceman authorized by EDAN.

25 Do not service or maintain the system or any accessory which is in use with the patient.

CAUTION

1 Turn off the power supply before cleaning.

2 **Electromagnetic Interference** - Do not use mobile phones nearby in the process of monitoring.

3 **Electromagnetic Interference** - FTS-3 system should not be used adjacent to, or stacked with, other equipment unless otherwise specified.

4 Electromagnetic interference is not unique to this system but is characteristic of fetal patient monitoring equipment in use today. This performance is due to very sensitive high gain front end amplifiers required to process the small physiological signals from the patient. Among the various monitoring systems already in clinical use, interference from electromagnetic sources is rarely a problem.

5 The device and reusable accessories could be sent back to the manufacturer for recycling or proper disposal after their useful lives.

CAUTION

6 The wireless transducers are IPX8 waterproof, but the base station should be kept non-soaked and non-condensing. The system may be condensing during transportation in high humidity or low temperature.

7 The use of accessories and cables other than those specified may result in increased electromagnetic emissions or decreased electromagnetic immunity of the system.

8 This equipment generates uses and radiates radio-frequency energy, and if it is not installed and used in accordance with its accompanying documentation, may cause interference to radio communications.

9 When the battery is charged, used or stored, keep it away from objects or materials with static electric charges.

10 If the terminals of the battery become dirty, wipe with a dry cloth before using the battery.

11 The recommended charging temperature for the battery is between 0°C ~ +40°. Please do not exceed the temperature range.

12 Batteries have life cycles. If the time that FTS-3 using battery becomes much shorter than usual, the battery life is at an end. Please contact the manufacturer to replace the battery with a new one of the same specification as the one provided or recommended by the manufacturer.

13 Remove the battery in the base station and store it at a cool and dry environment if the system is not used for a long time.

14 Please remove the battery out of the transducer at the end of their life. Please read the user manual carefully when you install or remove the battery.

2.4 Definitions and Symbols


Non-ionizing electromagnetic radiation

Serial Number


Wireless Transducer Working Indicator


USB Port (Reserved)


Ethernet Port (Reserved)

Channel Adjustment

Chapter 3 Installation

WARNING

Only qualified service engineers should install this equipment.

3.1 Environment Requirements

Environment		
Working	Temperature:	+5 ℃ ~ +40 ℃ (+41 ℉ ~ +104 ℉)
	Relative Humidity:	15% ~ 93% (non-condensing)
	Atmospheric Pressure:	86 kPa ~ 106 kPa
Transport and Storage	Temperature:	-20 ℃ ~ +55 ℃ (-4 ℉ ~ +131 ℉)
	Relative Humidity:	15% ~ 93% (non-condensing)
	Atmospheric Pressure:	70 kPa ~ 106 kPa
Classification		
Anti-electric Shock Type:		Class I equipment with internal power supply
Anti-electric Shock Degree:		FHR1, FHR2, TOCO BF DECG, MHR(form MECG) CF
Transducer Degree of Protection against Harmful Ingress of Water:		IPX8 (Protected against the effects of continuous immersion in water 1.1m deep for 24 hours)
Degree of Safety in Presence of Flammable Gases:		Equipment not suitable for use in presence of flammable gases
Disinfection/Sterilizing Method:		Refer to *User Manual* for details
EMC:		CISPR11 Group 1 Class A
Working System		Continuous running equipment

NOTE:

1. Ensure FTS-3 is not subject to any source of strong electromagnetic interference, such as CT, radio transmitters, mobile phones base stations, etc.
2. Do not install FTS-3 in a flammable atmosphere where concentrations of flammable

anesthetics or other materials may occur.

3. Keep the environment clean. Avoid vibration. Keep it far from corrosive medicine, dust area, high-temperature and humid environment.

3.2 Electrical Requirements

Operating Voltage: 100V-240V~

Operating Frequency: 50Hz/60Hz

Maximum Input Current: < 0.8A

Battery: 14.8VDC/5000mAh

3.3 Safety Requirements

- **SHOCK HAZARD**- The power receptacle must be a three-wire grounded outlet. A hospital grade outlet is required. Never adapt the three-prong plug from the base station to fit a two-slot outlet. If the outlet has only two slots, make sure that it is replaced with a three-slot grounded outlet before attempting to operate the base station.
- Do not touch signal input or output connector and the patient simultaneously.
- Equipment and devices that connect to FTS-3 should form an equipotential body to ensure effective grounding.
- Do not switch on the base station until all cables have been properly connected and verified.

3.4 Installing FTS-3

3.4.1 Installing the Base Station on a Flat Surface

Place FTS-3 on a flat surface. Make sure the surface does not vibrate, and is free of corrosive medicine and dust. Keep it distant from the metal or shielded material and devices with strong radiation. Please donot place it in the shielded room. Keep a distance of at least 1.5m from the device of the same type.

3.4.2 Mounting the Base Station on a Wall

WARNING

1. FTS-3 should only be mounted on a solid concrete or brick wall.
2. Make sure the wall mounting board is firmly fixed to the wall. If there is any doubt, do not hang FTS-3 to this board.
3. Make sure the base station is safely hung on the posts of the board before releasing your hands from the base station.

1. FTS-3 can be used with F3 wall mounting component (02.04.118143) which you can order.

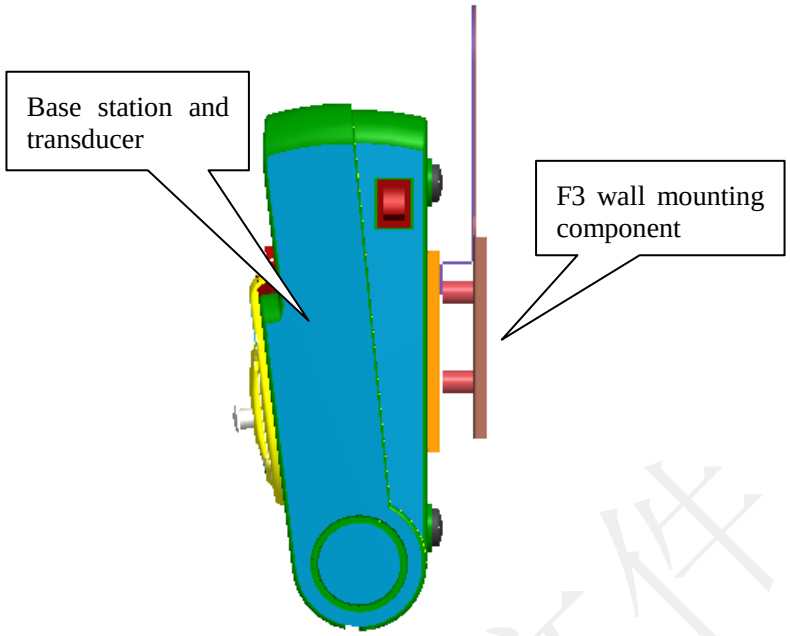


Figure 2- 1

2. Order a outer wall mounting board (01.52.107983), a wall mounting board (01.52.01983) and a connecting board (01.52.107984).

3. Fix the connecting board on the wall mounting board with two M3*6 cross head screws. Fix the connecting board and the wall mounting board in the inner wall mounting board with six M3*8 cross head spring washer and flat washer package M3*8. Fix the outer wall mounting board on the wall with six M3*20pan head cap screw.

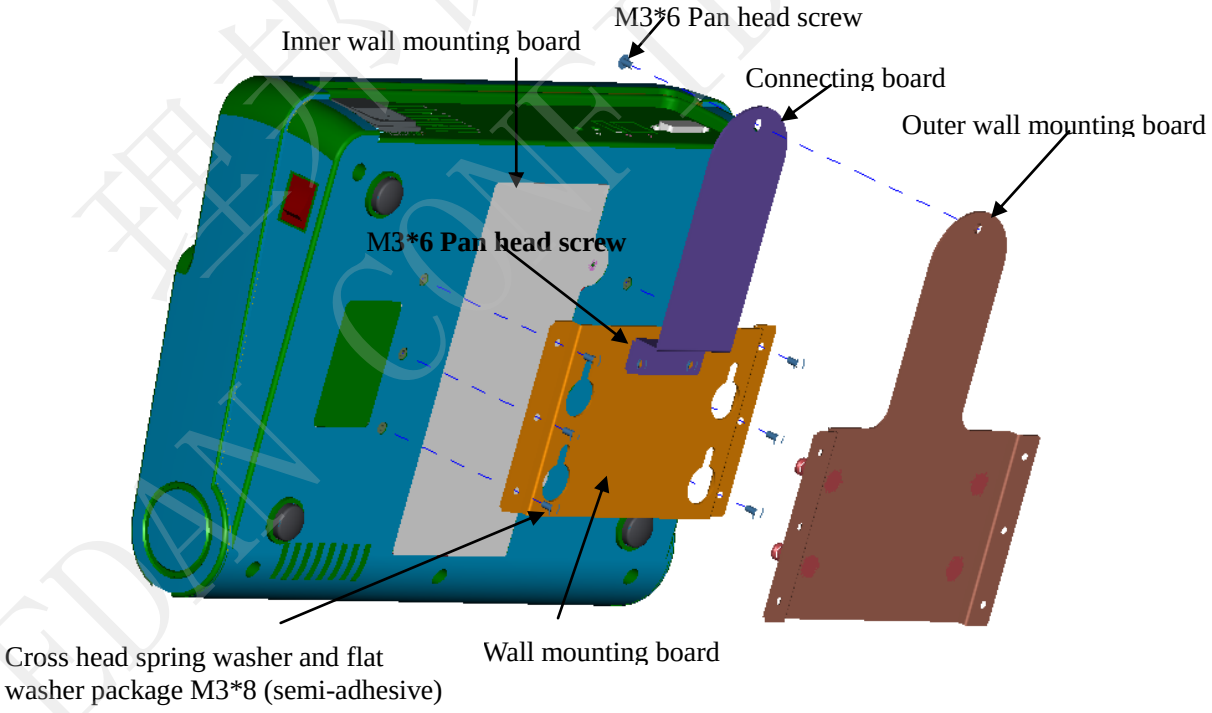


Figure 2- 2

4. Hang the wall mounting board on the hook of the outer wall mounting board and fix the connecting board and the outer wall mounting board with one M3*6 pan head screw.

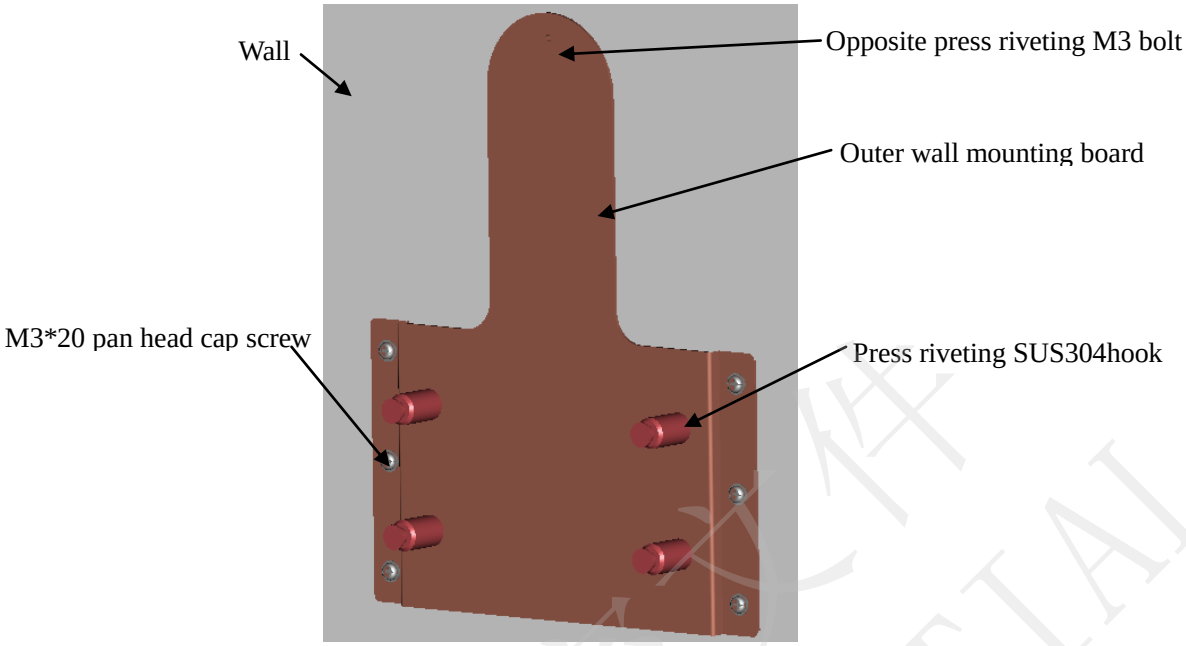


Figure 2- 3

3.4.3 Installing FTS-3 on a Roll Stand/Trolley

FTS-3 can also be used with MT-803.

1. Stick the Velcro fixing tape on the bottom of the base station.

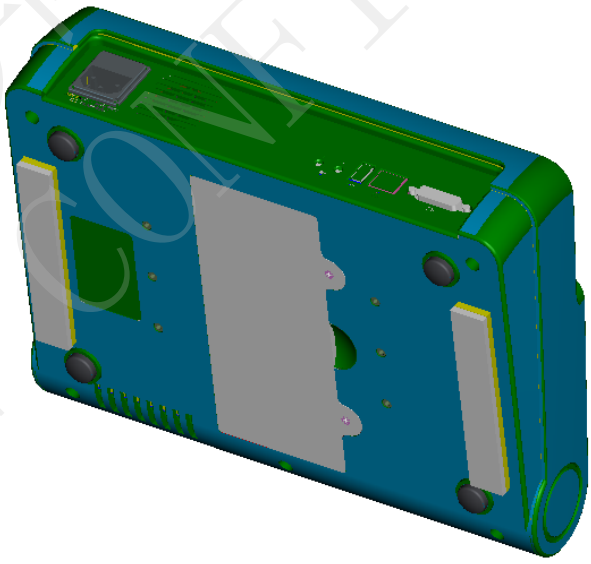


Figure 2- 4

2. Fix the base station on the middle tray and ensure that it will not fall off when crossing the steps.

Figure 2- 5 FTS-3 on a Trolley (Sketch Map)

3.5 Connecting Power Cable

Make sure the AC power supply of the system complies with the following specification: 100V-240V~, 50Hz/60Hz.

WARNING

If the protective grounding (protective earth) system is doubtful, the power of the system must be supplied by internal power supply only.

NOTE:

1 Make sure the system and the power outlet are placed at a place where it is easy to connect and disconnect the power cord.

2 When AC mains are interrupted, the device switches to internal power supply and operates normally if the battery is installed. If the battery is not installed, the system shuts down and resumes the previous settings at the subsequent operation.

3 After the AC power supply is connected, please wait for at least 2 seconds before pressing the POWER switch to turn on the system.

Chapter 4 Functional Checks

This section describes the procedure of a complete functional test to support recommended preventive-maintenance schedules.

You are not required to open the device case for functional checks.

WARNING

Only qualified service personnel should perform a full functional check procedure.

Whenever the system is serviced or problems are suspected, the manufacturer recommends a full functional check procedure.

Please test the system after each service.

1. Power on the base station and connect it to the fetal monitor.
2. Charge the transducer.
3. Power on the monitor.
4. Take up the US-T transducer and test the following function:
   - The US-T transducer screen displays the standard start interface.
   - The US-T transducer indicator is green.
   - The fetal monitor screen displays US1 or US2.
5. Simulate the audio frequency signal：
   - The fetal monitor displays FHR.
6. Take up the TOCO-T transducer or TOCO-E transducer and test the following function:
   - The TOCO-T or TOCO-E transducer screen displays the standard start interface.
   - The TOCO-T or TOCO-E transducer indicator is green.
   - The monitor screen displays TOCO.
7. Touch the measuring area of the TOCO-T or TOCO-E transducer gently：
   - The fetal monitor displays TOCO value change.
8. Install the US-T transducer to charge：
   - The US-T transducer screen displays charging interface and charging state.
   - The US-T transducer indicator is off.
   - The fetal monitor screen has no display.
9. Install the TOCO-T or TOCO-E transducer to charge：
   - The TOCO-T or TOCO-E transducer screen displays charging interface and charging state.
   - The TOCO-T or TOCO-E transducer indicator is off.
   - The fetal monitor screen has no display.
10. It takes about 3.5 hours to fully charge the US-T transducer, TOCO-T transducer and TOCO-E transducer.

Chapter 5 System Configuration

The end users can not change the system configurations. As a service engineer, you need to change these configurations for them after FTS-3 is installed and checked properly.

NOTE:

Restart the base station after changing the settings.

5.1 Adjusting the Working Channel

If the fetal heart sound is with interference or it cannot be played smoothly, the working channel is probably interfered. Put all the transducers back in the docking slots and press the adjustment button  in back of the base station. The channel range is 1-14.

Restart the system when it enters the charging interface.

NOTE：

The working channel number used by a system cannot be duplicated with that used by a device of the same type.

Chapter 6 Maintenance

6.1 Maintenance Inspection

(1) Visual Inspection

Please perform the following check before you use FTS-3:

- Check the base station and transducers to see if there is any visible damage that may affect patient's safety.
- Check all the outer cables, power socket and power cables.
- Check if the system functions properly.

If any damage is detected, replace the damage part(s) or contact EDAN immediately.

(2) Routine Inspection

The overall check of FTS-3, including the safety check and functional check, should be performed by qualified personnel every 6 to 12 months, and each time after service.

The equipment should undergo periodic safety test to insure proper patient isolation from live parts. This should include leakage current measurement and insulation testing. The recommended testing interval is once a year or as specified in the institution's test and inspection protocol.

Ground Leakage Current (Limit)	N.C. S.F.C. 500 μA 1000 μA
Enclosure Leakage Current (Limit)	N.C. S.F.C. 100 μA 500 μA
Patient Leakage Current (Limit) FHR1, FHR2, TOCO	N.C. S.F.C. d.c. 10 μA 50 μA a.c. 100 μA 500 μA
Patient Auxiliary Current (Limit) FHR1, FHR2, TOCO	N.C. S.F.C. d.c. 10 μA 50 μA a.c. 100 μA 500 μA
Patient Leakage Current (Limit) DECG, MHR(from MECG)	N.C. S.F.C. d.c. 10 μA 50 μA a.c. 10 μA 50 μA
Patient Auxiliary Current (Limit) DECG, MHR(from MECG)	N.C. S.F.C. d.c. 10 μA 50 μA a.c. 10 μA 50 μA

(3) Mechanical Inspection

Make sure all exposed screws are tightly fixed.

Check the external cables for splits, cracks or signs of twisting.

Pay particular attention to the supply socket. Replace any cable that shows serious damage.

WARNING

Failure on the part of the responsible individual hospital or institution employing the use of this equipment to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards.

6.2 Maintenance of the Base Station

Keep the exterior surface of the base station clean, free of dust and dirt.

The gathering of dew may occur with abrupt temperature or humidity changes. A stable environment is recommended. Please contact the serviceman when the base station gets wet.

Avoid high voltage and static charge.

6.3 Maintenance of the Transducers

Wipe off coupling gel from the ultrasound transducer after use to prolong its life.

Handle the transducers with care. Rough handling could damage the cover, piezoelectric crystals and mechanical movement. Contacting the transducers with hard or sharp objects should be avoided.

The transducers must be cleaned before docking in the base station after each use. Make sure that there is no residual coupling gel. Besides, the transducers must be thoroughly cleaned and disinfected at least once a month. When cleaning, please firstly use a lint-free cloth moistened with mild near neutral detergent, ethanol 75% solution or isopropanol 70% alcohol-based solution to clean the transducers. Then use a cotton cloth moistened with clear water to clean again. At last, use a dry, soft cloth to dry them.

In case of unsuccessful charge or poor contact, please use detergent with abrasive effect to rub the electrodes of the transducers in order to clear away the oxide of coupling gel.

Do not scratch or damage the screen.

Chapter 7 Principle Introduction

7.1 System Principle Block Diagram

FTS-3 system consists of two US-T transducers, one TOCO-T or TOCO-E transducer and one base station. Place the transducers back into the docking slot for charging when they are not in use. When the transducer is taked up from the base station, it starts to work.

The transducer has a batch of serial ports and battery input. When the transducer is put in the docking slot, the transducer communicates with the monitor through the serial port and tranmit the related messages. When the transducer is taked up, it communicates with the monitor wirelessly and is supplied by its battery inside.

The system principle block diagram goes as follows.

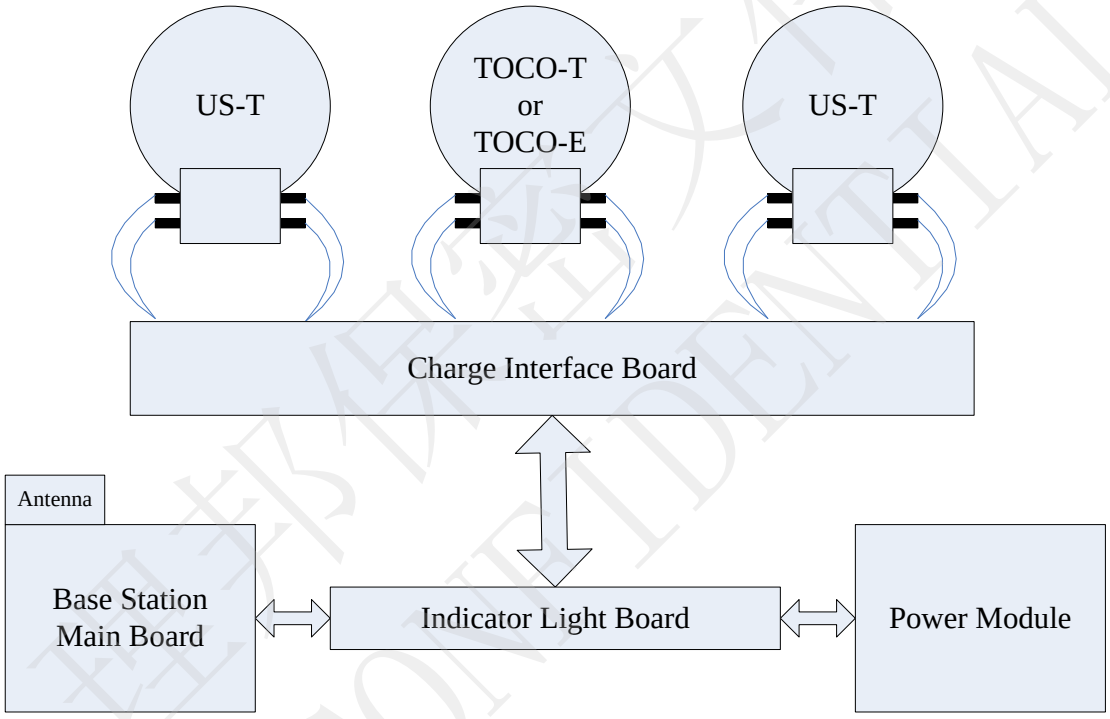


Figure 7- 1 FTS-3 system principle block diagram

7.1.1 Main Board

The main board of the base station acts as the center of the whole system and is responsible for receiving the wireless data, controlling LED indicator, communicating with the bedside monitor and modular control.

The parameters of this main board are listed below:

Power	+5V、+12V
Processor	Control MCU: STM32F103VDT6 Work frequency: 64MHz RAM: 64K byte Flash: 384K byte RF MCU: STM32L152RBT6 Work frequency: 20MHz RAM: 16K byte Flash: 128K byte
Serial Port	5serial ports
USB	1 standard USB HOST interface
Watchdog Timer	1.6s
Power Consumption	100mA @ +5V(max)
Size	130mm×76 mm

Main board ports to indicative light board

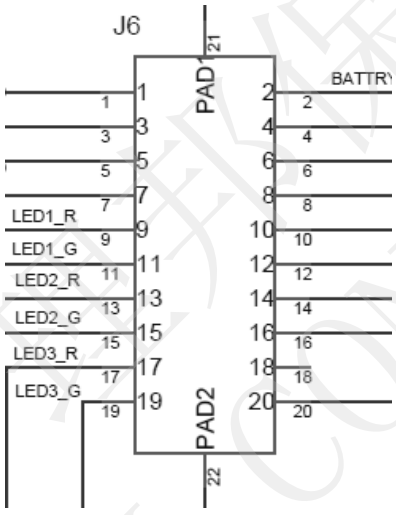


Figure 7- 2

Pin No.	Symbol
1,3	VCC
5,7	GND
4	+12V
7	LED1_R
9	LED1_G
11	LED2_R
13	LED2_G
15	LED3_R
17	LED3_G
6	TRANS1_TX
8	TRANS1_RX
10	TRANS2_TX
12	TRANS2_RX
14	TRANS3_TX
16	TRANS3_RX
20	POWER_RXD

7.1.2 Indicative Light Board

Indicative light board controls power light, AC light, battery charge light and transducer working status. Meanwhile, the board is in charge of transforming +12V into +5.5V for charging the transducer.

（1） Indicative light board ports to main board

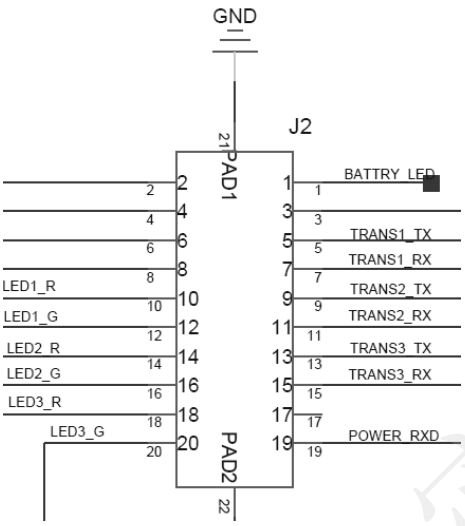
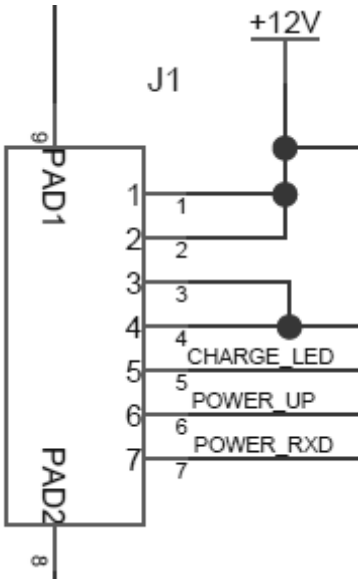


Figure 7- 3

Pin No.	Symbol
1,3	VCC
5,7	GND
4	+12V
7	LED1_R
9	LED1_G
11	LED2_R
13	LED2_G
15	LED3_R
17	LED3_G
6	TRANS1_TX
8	TRANS1_RX
10	TRANS2_TX
12	TRANS2_RX
14	TRANS3_TX
16	TRANS3_RX
20	POWER_RXD

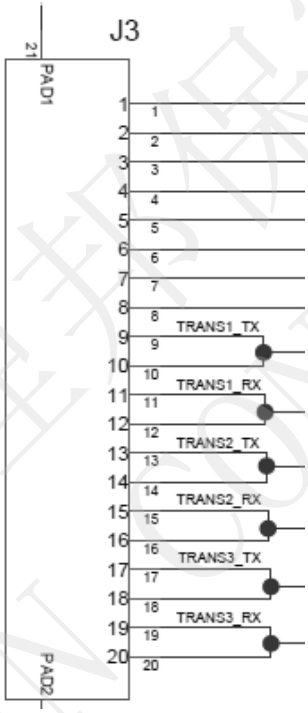
（2） Indicative light ports to power module



Pin No.	Symbol
1,2	DC12V
3,4	GND
5	CHARGE_LED
6	POWER_UP
7	POWER_RXD

Figure 7- 4

（3） Indicative light board ports to charge interface board



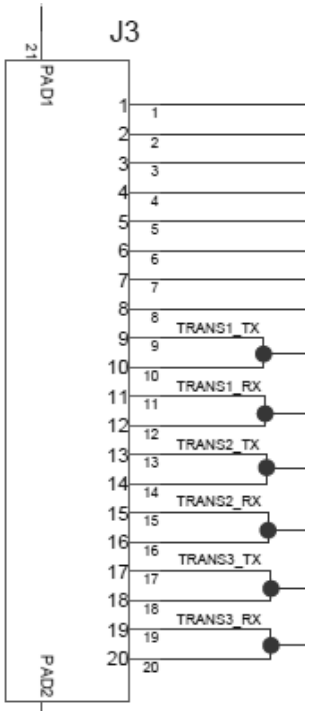
Pin No.	Symbol
1,2,3,4	VCC
5,6,7,8	GND
9,10	TRANS1_TX
11,12	TRANS1_RX
13,14	TRANS2_TX
15,16	TRANS2_RX
17,18	TRANS3_TX
19,20	TRANS3_RX

Figure 7- 5

7.1.3 Charge Interface Board

Charge interface board is the adapter plate of transducer charging and communication and is responsible for connecting power and communication ports.

Charge interface board ports to indicative light board



Pin No.	Symbol
1,2,3,4	VCC
5,6,7,8	GND
9,10	TRANS1_TX
11,12	TRANS1_RX
13,14	TRANS2_TX
15,16	TRANS2_RX
17,18	TRANS3_TX
19,20	TRANS3_RX

Figure 7- 6

7.1.4 Power module

Power module outputs ＋12V and ＋5V and is responsible for charging management.

When the system is supplied by 90-264VAC power, power module transfers AC mains into 12V DC and 5V DC power. When the system is cut off from the 90-264VAC powe, the power modules transfer the battery power inside into 12V DC and 5V DC power.

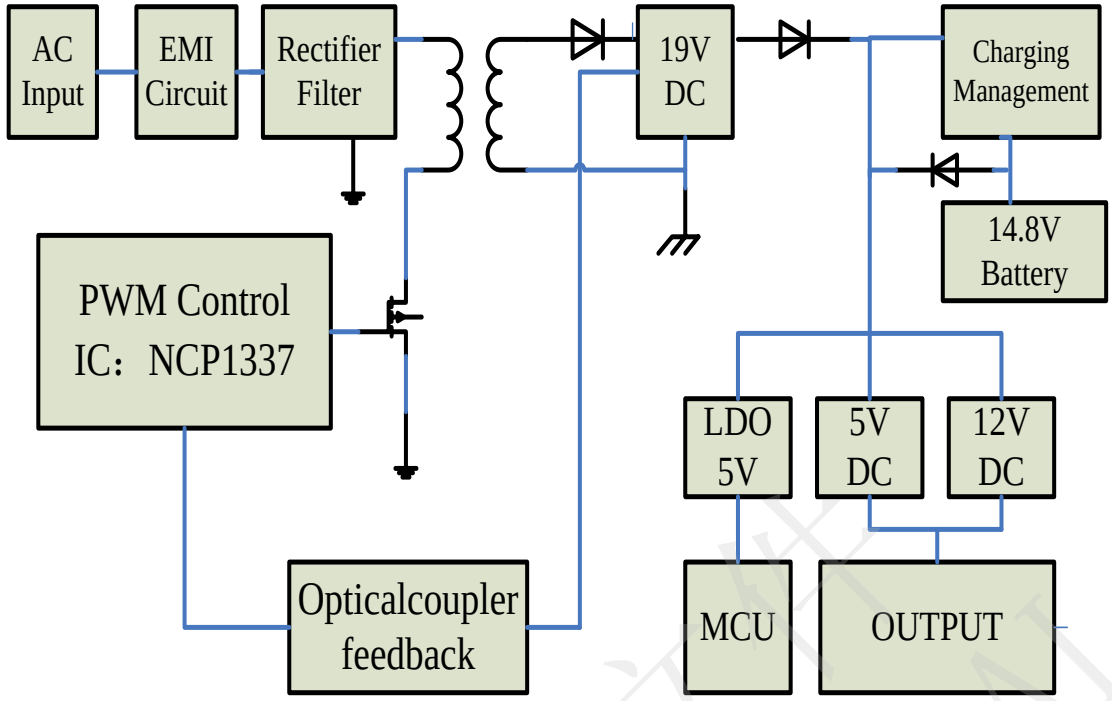


Figure 7- 7 Power Module Principle Block Diagram

7.2 Interface and Key

At the back of the base station, there is an interface and two keys.

- DB15 interface
- Working channel key ─ and +

7.2.1 DB15 Interface

All the base stations are provided with DB15 interfaces. You can connect FTS-3 to F6/F9 series fetal/maternal monitor via DB15 interface.

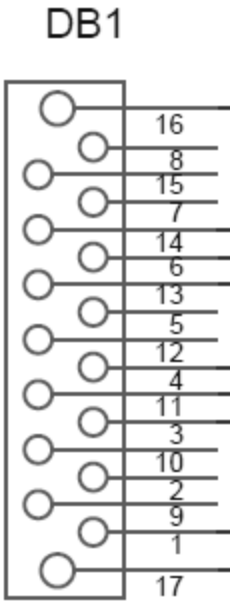


Figure 7- 8

Pin No.	Symbol
1	US1 Signal
2	NC
3	ECG_TXD
4	ECG_RXD
5	NC
6	GND
7	NC
8	NC
9	NC
10	NC
11	US2 Signal
12	NC
13	GND
14	EN Signal
15	NC

7.2.2 Working Channel Key

All the base stations are provided with working channel keys. You can adjust the working channel though the two keys.

Chapter 8 Troubleshooting

This troubleshooting guide introduces the suitable actions for correcting the problems or replacing the accessory or calling the service person. It can also help you to have more exact descriptions of the fault symptoms when calling for service.

EDAN supports replacement of PCBs and major subassemblies for this product. Verify the malfunction of the PCBAs/Modules prior to disassembling with the method described in chapter *9 Modules' Malfunction Verification*. When replacement is needed, follow the procedures described in *Chapter 10 Disassembling FTS-3*.

Phenomenon	Possible Cause	Solution
Take out the US-T transducer, but it cannot power on.	• It runs out of power. • The base station cannot communicate with the transducer by RF.	• Recharge the transducer. • Put it back in the docking slot and take it up again.
The wireless connection indicator is green but the fetal monitor shows no signal.	• Loose or damaged cable to the monitor socket	• Tighten or repair the cable.
FHR or TOCO record interrupts.	• Transducer is placed incorrectly. • Transducer slides. • The patient walks in strong tramps. • RF interference or out of prescriptive area.	• Check the transducer position. • Tighten the transducer of apply little coupling gel. • Ask the patient to walk slightly. • Ask the patent to walk in the prescriptive area.
The battery icon does not display when charging the battery.	• The transducer does not connect to the charging point tightly. • The base station is not supplied by AC power.	• Press the transducer to touch the charging point. • Ensure the base station is not supplied by AC power.
The charging board or charging point is corrosive.	• It is wet or polluted by the coupling gel.	• Clean the transducer before charging. Replace the charging point if necessary.

Chapter 9 Modules' Malfunction Verification

When a module is suspected of malfunction, verify it with the method described in this chapter.

NOTE:

For all the interfaces, the first pin is the one with a square solder pad.

9.1 Verifying Malfunction of the Main Board

To verify the main board,

1) Open the base station using the procedures described in section 10.3.
2) Switch on the base station. (Powered by AC or battery.)
3) Measure the voltage to earth of the pins listed below, using a multimeter:

Item	Pin	Reference result
①	TP1	+5V5 (4.95~6.05) V
②	TP4	+3V（2.7~3.3）V
③	TP5	+2V5 (2.25~2.75) V
④	TP9	RF_3V3（2.97~3.63）V
⑤	TP10	VCC (2.97~3.63) V
⑥	TP11	+5V (4.5~5.5) V

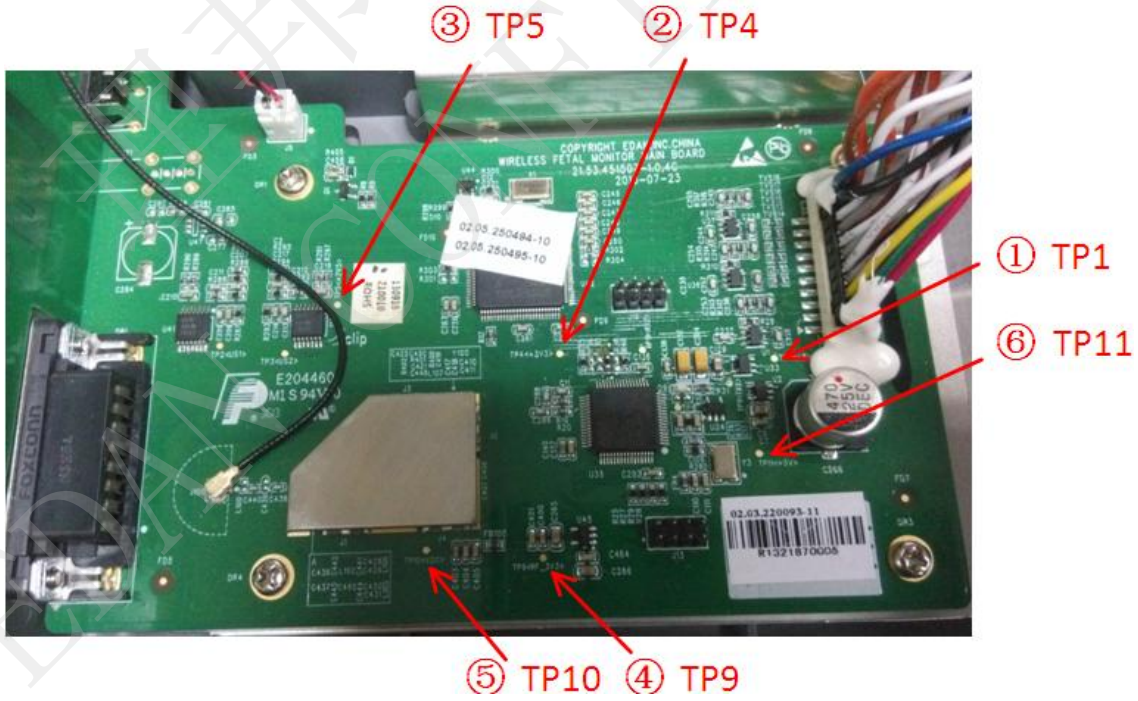


Figure 9- 1 Main Bboard

4) Compare the measurement results with the reference results in the list. If any one of the results exceeds the reference range, the main board defection is confirmed. Replacement of the main board is recommended.

9.2 Verifying Malfunction of the Power module

To verify the power module,

1) Open the base station using the procedures described in section 10.3.
2) Measure the voltage to earth of the following pin on the bottom interface board, using a multimeter.

Item	Pin	Reference result
①	5th pin of J3	(+12±10%) V

Figure 9- 2 Power module

3) If any one of the results exceeds the reference range, the power module defection is confirmed. Replacement of the module is recommended.

9.3 Verifying Malfunction of the Indicative Light Board

To verify the indicative light board,

1) Open the base station using the procedures described in section 10.3.
2) Measure the voltage to earth of the following pin on the bottom interface board, using a multimeter.

Item	Pin	Reference result
①	TP2	VCC(+5.5±10%) V
②	TP3	+12V(+12±10%) V

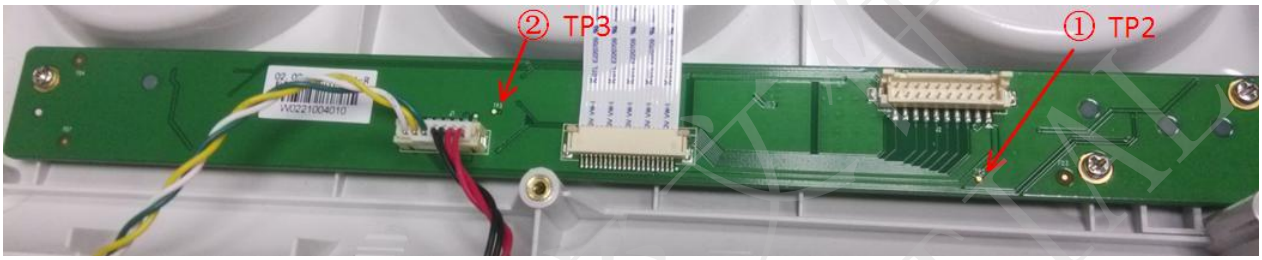


Figure 9- 3 Indicative light board

3) If any one of the results exceeds the reference range, the power module defection is confirmed. Replacement of the board is recommended.

Chapter 10 Disassembling FTS-3

WARNING

1 Only qualified service personnel should open the base station.

2 Switch off the base station and remove the AC power cable before disassembling the base station.

3 After any repair of the base station, perform safety tests before using the base staion again.

10.1 Tools Required

1 - A cross-head screwdriver

2 - A pair of pliers

3 –A pair of tweezers

Figure 10- 1

10.2 Blown Fuses

WARNING

Switch off the base station and remove the power cord before changing the fuse.

Replace the fuse when it is blown.

The two fuses of the base station are located on the rear panel, their specifications are:

Size: Φ5mm*20mm; Model: T2AH250V.

To replace a fuse:

1) Place the base station on a flat surface and remove the power cord.
2) Reverse the base station and pull the fuse container out as far as it can go.

Figure 10- 2

3) Use a screw driver or a pair of pliers to push the fuse up from the bottom of the container.

Figure 10- 3

4) Take the fuse out and replace it with a new one that is supplied by the manufacturer or of the same specifications.

10.3 Disassembling the Base Station

The main unit consists of two major parts: upper assembly and lower assembly.

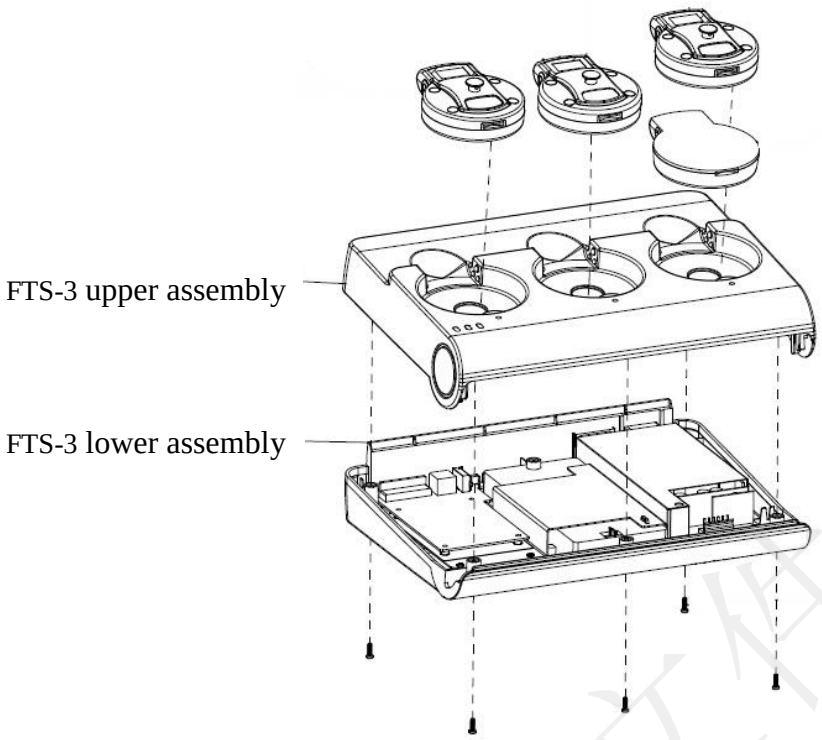


Figure 10- 4

Perform the following steps to disassembly the base station:

(1) Place FTS-3 upside down on a flat surface covered with cloth or another type of protecting pad.

(2) Remove the screws of the battery compartment using a cross-head screw driver.

Figure 10- 5

(3) Remove the battery compartment and take the battery out.

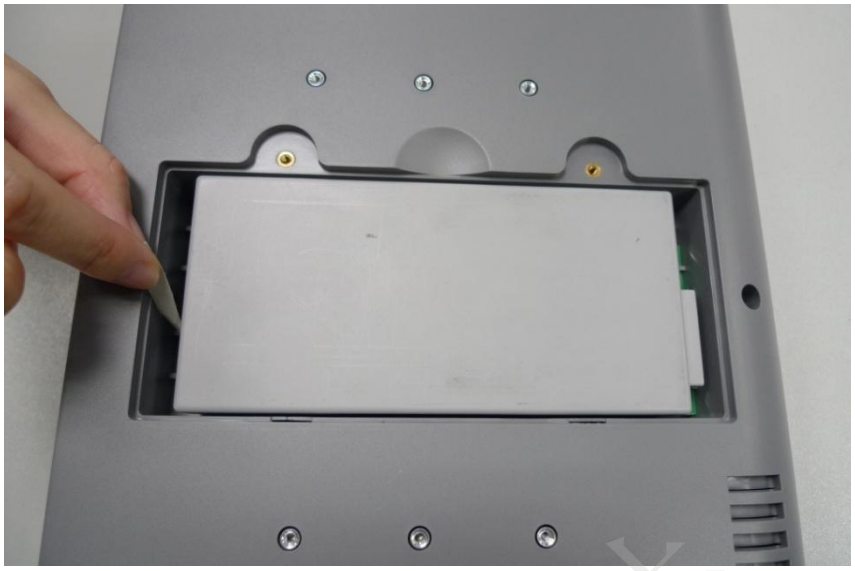


Figure 10- 6

(4) Remove the six screws with a cross-head screw driver.

Figure 10- 7

(5) Hold and turn over the upper and lower assembly with the bottom of base station downwards.

(6) Carefully lift up the upper assembly and place it upside down on the right side of the lower assembly.

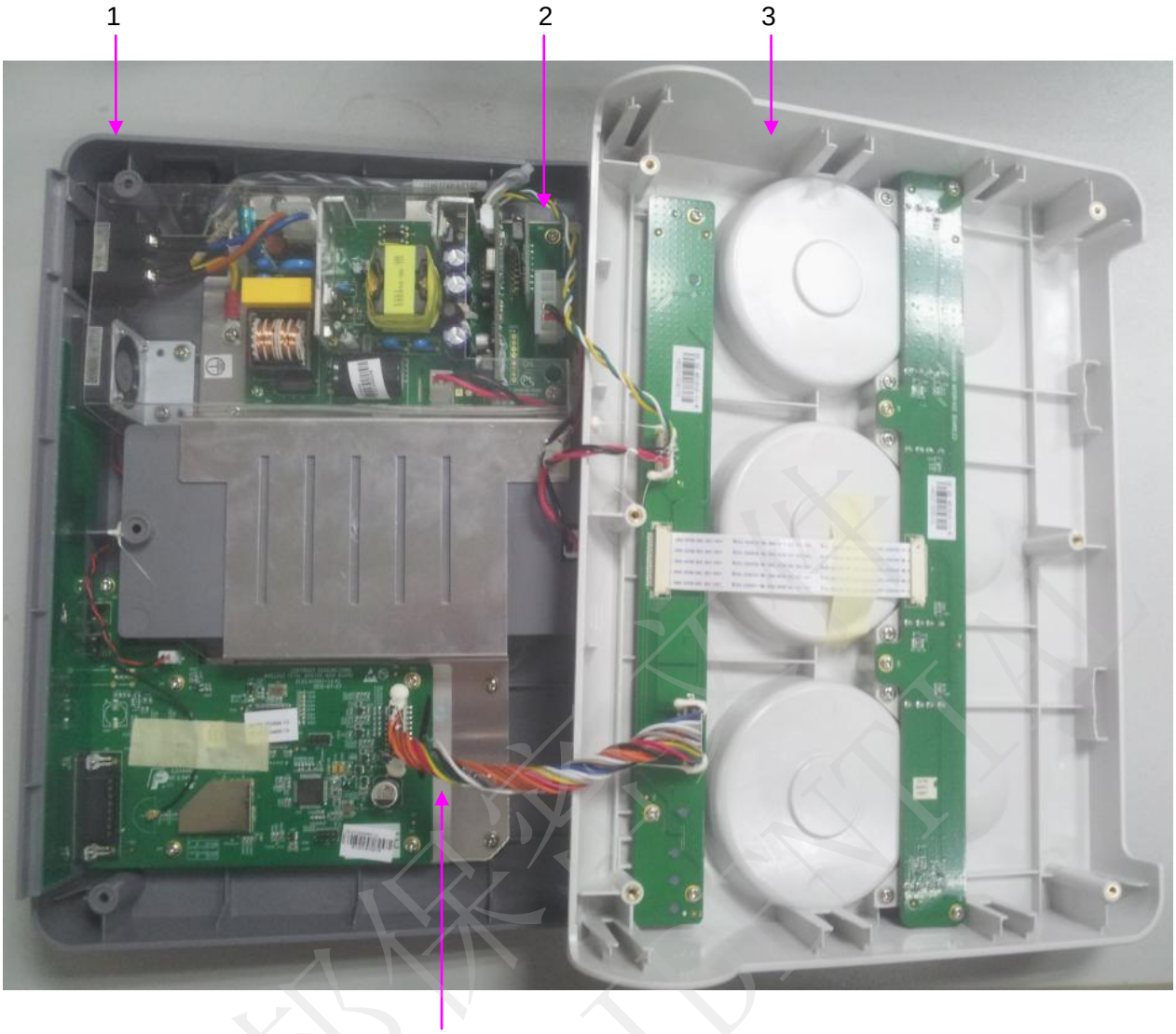


Figure 10- 8

No.	Part
1	Upper Assembly
2	Power connecting line to indicative light board
3	Lower Assembly
4	Main board connecting line to indicative light board

(7) Disconnect the cables/wires to separate the two parts.

NOTE:

The interfaces of the connecting line are fixed with the melt adhesive. Please drop alchol and remove the melt adhesive with a pair of pliers. And the remove the pull out the connecting line.

10.4 Disassembling the Upper assembly

10.4.1 Replacing the Charging Interface Board

To remove the charging interface board,

(1) Separate the upper assembly and the lower assembly.

(2) Turn on the connector swich with both index fingertips and remove the adhesive tape.

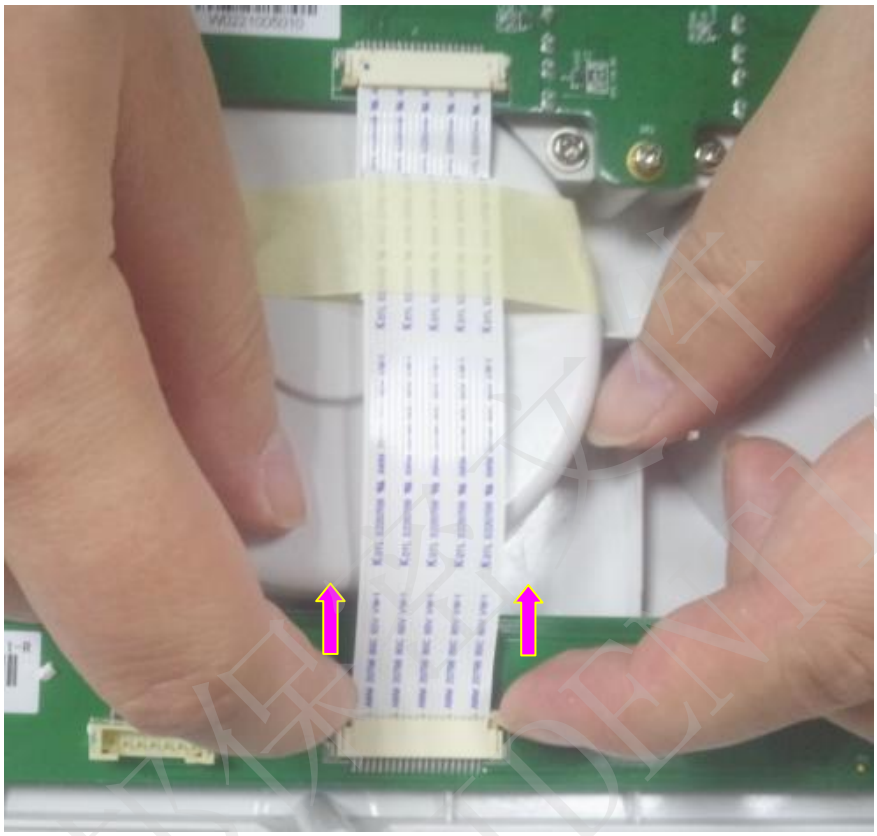


Figure 10- 9

(3) Disconnect the wire.

(4) Remove four screws securing the charging interface board.

To install the charging interface board,

Install the charging interface board in a reverse procedure. Refer to the following illustration when connecting the wires. Ensure it is correctly connected.

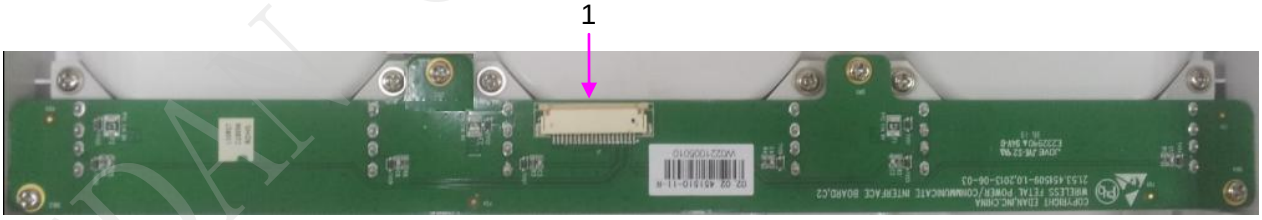


Figure 10- 10

No.	Connect to
1	Indicative Light board

10.4.2 Replacing the Indicative Light Board

To remove the indicative light board,

(1) Separate the upper assembly and the lower assembly.

(2) Turn on the connector swich with both index fingertips and remove the adhesive tape. Refer to *Figure 10-9*.

(3) Disconnect the wire.

(4) Remove four screws securing the charging interface board.

To install the charging interface board,

Install the indicative light board, in a reverse procedure. Refer to the following illustration when connecting the wires. Ensure it is correctly connected.

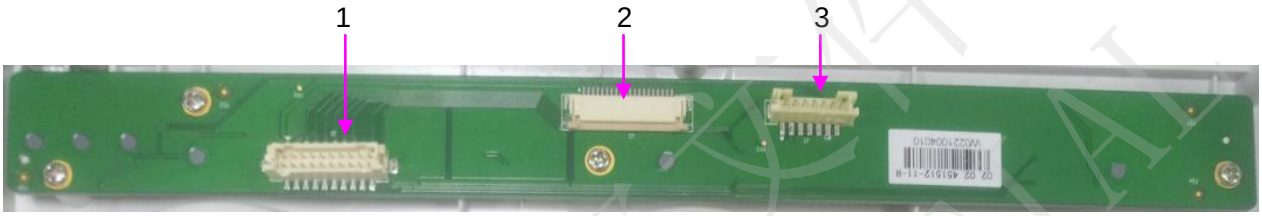


Figure 10- 11

No.	Connect to
1	Main Borad
2	Charging Interface Board
3	Batery Module

10.5 Disassembling the Lower assembly

10.5.1 Replacing the Power Module

To remove the power module,

(1) Separate the upper assembly and the lower assembly.

(2) Remove the transparent cover over the power module.

Figure 10- 12

(3) Disconnect all the wires.

(4) Remove four screws securing the power module.

To install the power module,

Install the power module, in a reverse procedure. Refer to the following illustration when connecting the wires. Ensure they are correctly connected.

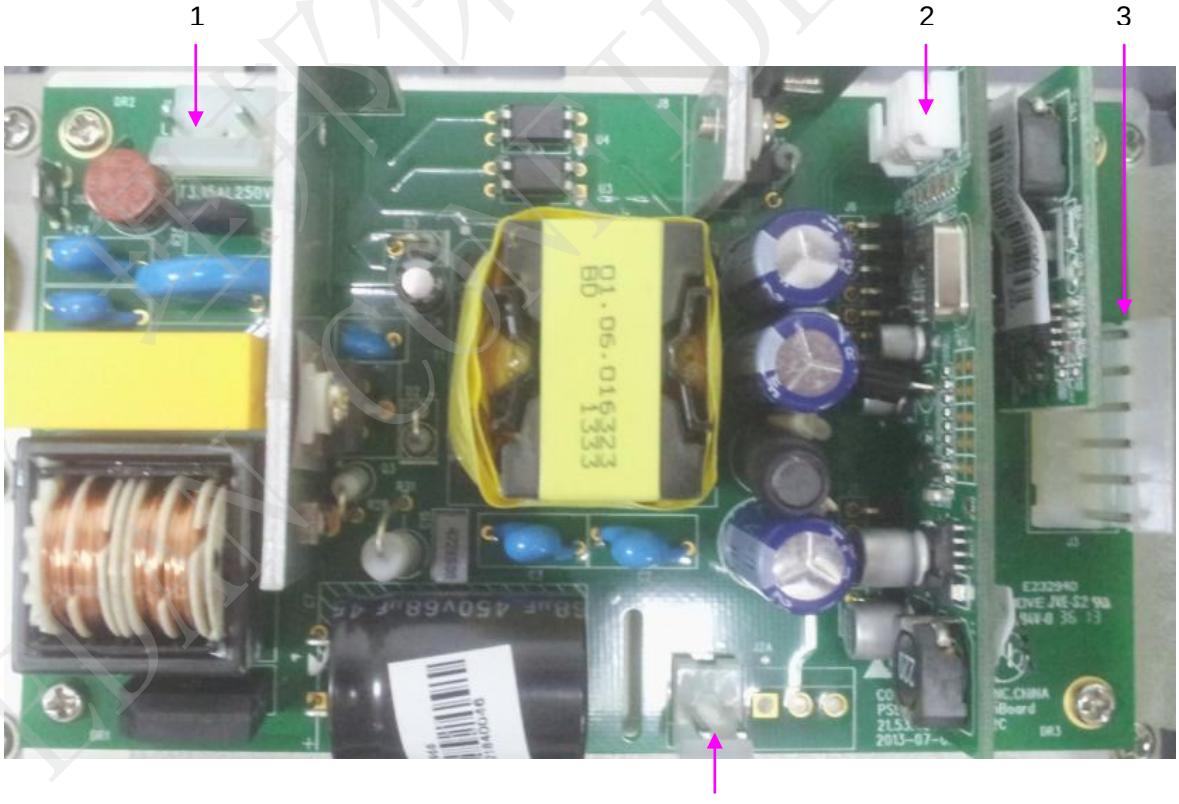


Figure 10- 13

No.	Connect to
1	AC Power Interface
2	Power Switch
3	Indicative Light Board
4	Base Station Battery Interface

10.5.2 Replacing the Main Board

To remove the main board,

(1) Separate the upper assembly and the lower assembly.

(2) Remove the adhesive paper and all the connecting lines.

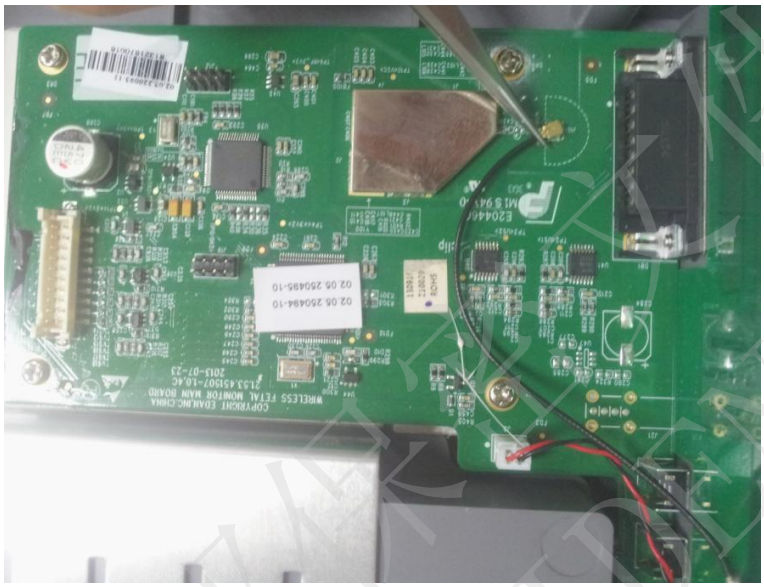


Figure 10- 14

(5) Remove five screws securing the power module.

To install the main board,

Install the main board, in a reverse procedure. Refer to the following illustration when connecting the wires. Ensure they are correctly connected.

Figure 10- 15

No.	Connect to
1	Indicative Light Board

10.5.3 Replacing the Fan

To remove the fan,

1) Separate the upper assembly and the lower assembly.
2) Unplug the fan wires connector from the power cable bundle.
3) Remove the two screws securing the fan frame.
4) Remove the three screws and sponge.

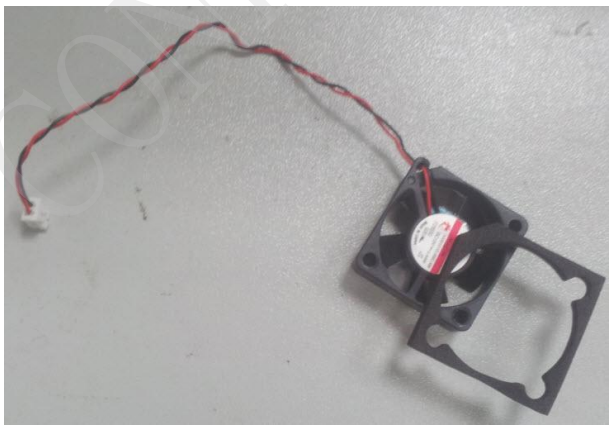


Figure 10- 16

To install the fan,

Install the fan in a reverse procedure. Ensure the wires' connector is correctly connected to connector on the power cable bundle.

Chapter 11 Periodic Tests

11.1 Safety Tests

Safety tests should be performed by qualified personnel every 6 to 12 months, and each time after service.

Use a standard safety tester to perform safety tests. The tester must comply with IEC/EN 60601-1 or the local standards and statutes.

Refer to the accompanying operation instructions of the tester for test procedure details.

11.2 Performance Tests

The performance test should be done once every 12 months or when you suspect the measurement is incorrect.

11.2.1 FHR Performance Test

This test checks the FHR performance.

Required Equipment: Ultrasonic Doppler FHR Accuracy Tester System

1) Connect the equipment, monitor and FTS-3 as shown below:

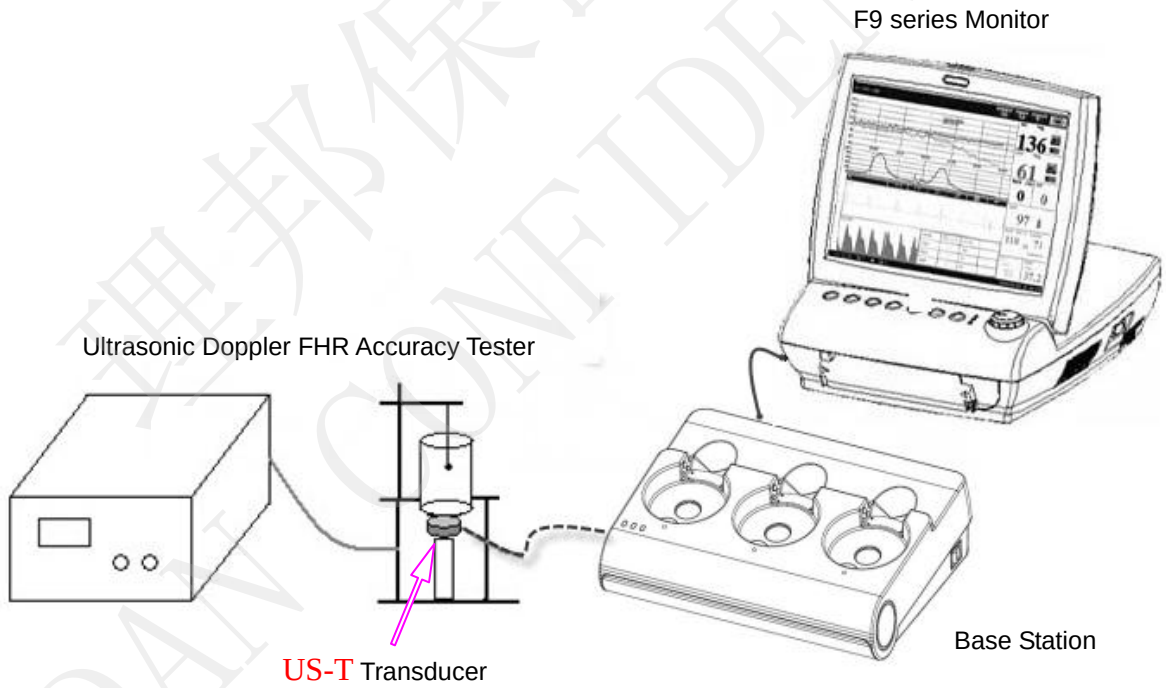


Figure 11- 1

2) Switch on the monitor and base station, and put one US-T transducer on the tester.
3) Set the heart rate as 50 bpm, 90 bpm, 120 bpm, 150 bpm, 180 bpm and 210 bpm in turn.
4) Check if the FHR value displayed on the screen is accurate. Error within ±2 bpm is

acceptable.

5) Connect the ultrasound transducer to the other US-T socket and perform the same test.

Or, use FLUKE PS320 simulator to test.

1) Connect the monitor and the FTS-3 base station as shown in figure 11-1.
2) Switch on the monitor and the FTS-3 system. Take one US transducer and apply some coupling gel on it. Place the vibrate transducer of the simulator on the US transducer, as shown below.

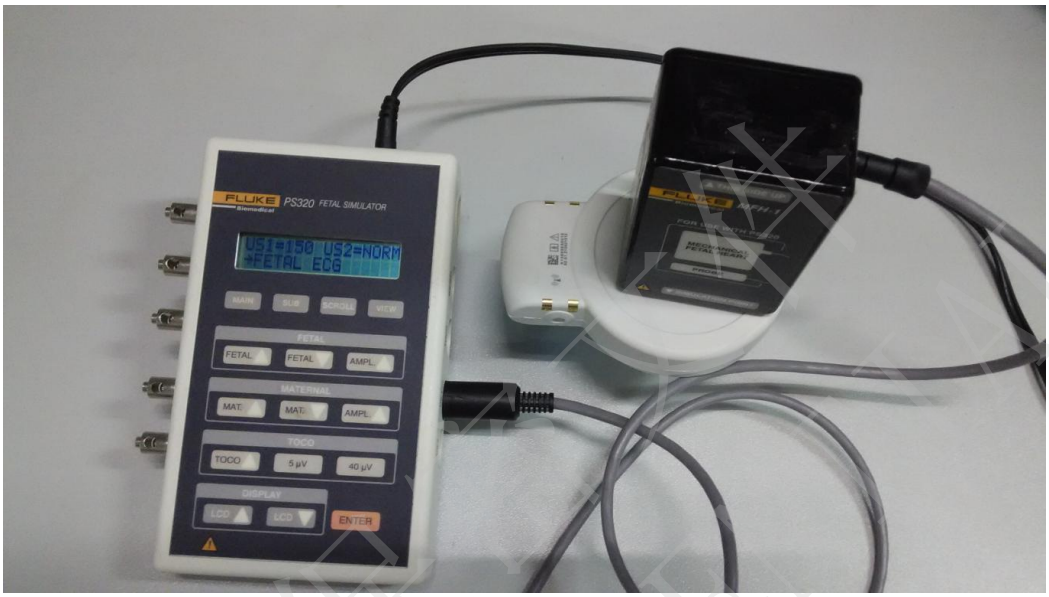


Figure 11-2

3) Set the heart rate as 60 bpm, 90 bpm, 120 bpm, 150 bpm, 180 bpm and 210 bpm in turn.
4) Check if the FHR value displayed on the monitor screen is accrate. Error within ±2 bpm is acceptable.
5) Take the other US transducer and test following the above procedure, if dual-FHR is available for the monitor.

11.2.2 TOCO Performance Test

This test checks the TOCO performance.

1) Switch on the monitor and base station, and connect them well.
2) Take the TOCO-T transducer or the TOCO-E transducer from the base station and the transducer is powered on.
3) Gently press the center of the transducer.

Figure 11-3

4) Check that the value on the display shows this change in pressure.

If a TOCO-T or TOCO-E transducer fails the test, repeat this test with another transducer. If the second one passes the test, defect of the first transducer is confirmed. Replace it with a good one. If the second transducer fails the test as well, check the monitor and FTS-3 system.

11.2.3 ECG Performance Test

This test checks the MHR performance of the TOCO-E transducer.

Required equipment: FLUKE PS320 simulator.

1) Connect the FTS-3 base station to the monitor and switch on them.

2) Take the TOCO-E transducer from the base station and the transducer will switvh on. Use the ECG cable to connect the transducer and the simulator as shown below.

Figure 11-4

3) Set the MHR as 60 bpm, 80 bpm, 100 bpm, 120 bpm and 140 bpm in turn.

4) Check if the value displayed on the monitor screen is accurate. Error within ±2 bpm is acceptable.

11.2.4 DECG Performance Test

This test checks the DECG performance of the TOCO-E transducer.

Required equipment: FLUKE PS320 simulator.

1) Connect the FTS-3 base station to the monitor and switch on them.

2) Take the TOCO-E transducer from the base station and the transducer will switvh on. Use the DECG cable to connect the transducer and the simulator as shown below.

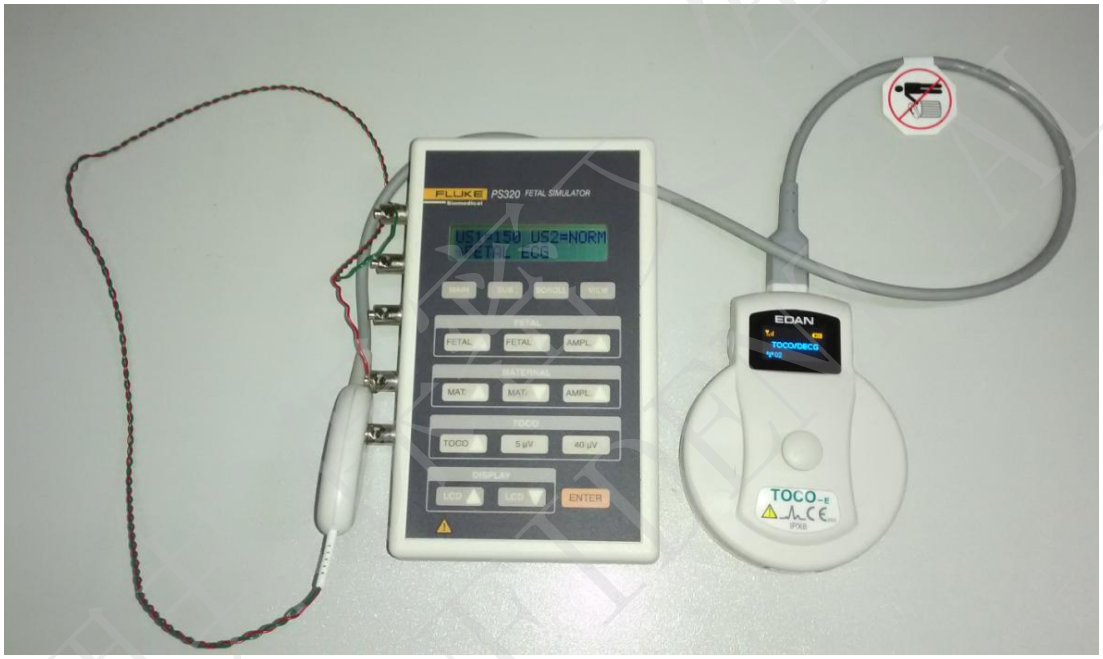


Figure 11-5

3) Set the FHR as 60 bpm, 90 bpm, 120 bpm, 150 bpm, 180 bpm and 210 bpm in turn.

4) Check if the value displayed on the monitor screen is accurate. Error within ±2 bpm is acceptable.

Appendix 1 Renewal Parts

CAUTION

Only connect the renewal parts supplied by EDAN to FTS-3.

Part	Number
US-T Wireless Transducer (European Standard)	02.01.210821
TOCO-T Wireless Transducer (European Standard)	02.01.210823
TOCO-E Transducer (European Standard)	02.01.211642
FTS-3 DECG Cable (DECG-WT)	01.57.471610
FTS-3 DECG Cable (DECG-WQ)	01.57.471608
FTS-3 DECG Cable (DECG-WP)	01.57.471609
FTS-3 MECG Cable (American Standard, Snap Style)	01.57.471501
FTS-3 MECG Cable (American Standard, Grabber Style)	01.57.471503
FTS-3 MECG Cable (European Standard, Snap Style)	01.57.471502
FTS-3 MECG Cable (European Standard, Grabber Style)	01.57.471504
Base Station Main Board	02.03.220093
Indicative Light Board	02.03.451512
Charge Interface Board	02.02.451510
Power Module	02.01.210966
Fan	01.58.472037
Fuse	21.21.064181
Base Station Battery	01.21.064143
Wireless Transducer Connecting Line	01.13.036299
Y-Shape Signal Cable	01.13.036301

P/N: 01.54.456401
MPN: 01.54.456401013

EC REPRESENTATIVE
Shanghai International Holding Corp. GmbH (Europe)
Eiffestrasse 80, D-20537 Hamburg Germany
TEL: +49-40-2513175 FAX: +49-40-255726
E-mail: shholding@hotmail.com

EDAN INSTRUMENTS, INC.
#15 Jinhui Road, Jinsha Community, Kengzi Sub-District
Pingshan District, 518122 Shenzhen, P.R.China
Email: info@edan.com.cn
TEL: +86-755-2689 8326 FAX: +86-755-2689 8330

www.edan.com.cn