

HUNTLEIGH

SF1-SL

Anwendungshinweise

Kullanım Talimatları

Brugsvejledning

Instrucciones de uso

χρήσης

使用方

Mode d'emploi

Bruksanvisning

Gebruiksaanwijzing

aanwijzing

INSTRUCTIONS FOR USE

Bruksan

alimatları

使用方法

Käyttöohjeet

Instruções de Utilização

Istruzioni per l'uso

Anwendungshinweise

Οδηγίες χρήσης

Anwendungshinweise

sonicaidTM**Freedom**

Contents

1. Introduction	4
1.1 <i>Indications of Use</i>	4
1.2 <i>Contraindications</i>	4
1.3 <i>Unpacking / Preliminary Checks</i>	5
2. Safety	6
2.1 <i>WARNINGS</i>	7
3. Product Information	9
3.1 <i>System Overview</i>	9
3.2 <i>The Receiver Unit</i>	10
3.2.1 <i>Operation</i>	10
3.2.2 <i>Front Panel Indicators</i>	11
3.2.3 <i>Rear Panel controls and Indicators</i>	13
3.3 <i>The Transducers</i>	14
3.4 <i>Product Labelling</i>	16
4. Setup	17
4.1 <i>Receiver Connection</i>	17
4.2 <i>Testing the Basic Functions</i>	18
5. Operation	20
5.1 <i>Getting Started</i>	20
5.2 <i>Application of the Transducers</i>	20
5.3 <i>Ambulatory Monitoring</i>	22
5.4 <i>Water Birth Monitoring</i>	22
5.5 <i>Ending Monitoring / Switching Off</i>	23
6. Care and Cleaning	24
6.1 <i>General Care</i>	24
6.2 <i>Cleaning and Disinfecting</i>	25
6.2.1 <i>Transducers</i>	25
6.2.2 <i>Receiver Unit</i>	27
7. Maintenance	28
7.1 <i>Mechanical Inspection</i>	28
7.2 <i>Corrective Maintenance</i>	28
7.3 <i>Charging Transducer Batteries</i>	28
7.4 <i>Transducer Battery Replacement</i>	28
7.5 <i>Servicing</i>	28

8. Trouble Shooting	29
8.1 <i>Manually Switching off the Transducers</i>	31
8.2 <i>Re-enabling Transducers.....</i>	32
8.3 <i>Changing the RF-channel</i>	33
9. Specifications	34
9.1 <i>Equipment Classification</i>	34
9.2 <i>Receiver Unit (SF1-EUR / SF1-SL).....</i>	34
9.3 <i>US-Transducer (SF1-US).....</i>	35
9.4 <i>TOCO-Transducer (SF1-TOCO)</i>	35
9.5 <i>Environmental</i>	35
9.6 <i>Directives and Standards Compliance*.....</i>	36
9.7 <i>Recommended Consumables & Accessories*</i>	36
10. Electromagnetic Compatibility	37
11. Ultrasound Safety Considerations	38
12. End of Life Disposal.....	42
13. Warranty & Service	43
Appendix 1 - WMTS Channel Allocation	44
Appendix 2 - ISM Channel Allocation	46

1. Introduction

1.1 Indications of Use

The Sonicaid™ Freedom ('Freedom') is a wireless fetal monitoring system for the monitoring of fetal heart movement and maternal contractions during intrapartum and antepartum periods of pregnancy.

It is an optional accessory for use with Huntleigh Healthcare Limited's Sonicaid FM820 and FM830 Encore Fetal Monitors ('FM800E Monitors') as an alternative to their wired transducers. When connected to an FM800E Monitor, the system monitors:

- Uterine activity by using an external, pressure-sensitive TOCO transducer, and
- Fetal heart rate (FHR) by pulsed Doppler ultrasound using an external Ultrasound transducer.

Freedom is suitable for use in clinical and hospital facilities for use on pregnant woman. The transducers are water tight allowing pregnant women to be monitored while they are mobile, stationary or in a bath or shower environment.

This system should only be used by, or under the supervision of, a licensed physician or other health practitioner who is trained in the use of FHR monitors.

1.2 Contraindications



Sonicaid™ Freedom is not intended for use with patients fitted with cardiac pacemakers, during defibrillation, while undergoing surgery, or while MRI scanning is taking place.



Sonicaid™ Freedom must not be used in intensive care units or operating rooms.

1.3 Unpacking / Preliminary Checks

Contents (supplied with each system)

Item	Item	Item
1 x Sonicaid™ Freedom Receiver Unit (WMTS: SF1-SL or ISM: SF1-EUR)	1 x Instructions for Use CD	1 x Receiving Antenna (Gainflex - GF430TNC)
1 x Ultrasound Transducer (SF1-US)	1 x Interface Cable	2 x Transducer Clips
1 x TOCO Transducer (SF1-TOCO)	1 x Mains Lead	1 x FM800E to Sonicaid™ Freedom Fixing Kit

Delivery Inspection

Huntleigh takes every precaution to ensure that goods reach you in perfect condition. However, accidental damage can occur in transit and storage. For this reason we recommend that a thorough visual inspection is made immediately the unit is received. Should any damage be evident or any parts missing, ensure that Huntleigh or your distributor is informed at once.

Storage

Should the unit not be required for immediate use, it should be re-sealed into its original packing after carrying out the initial delivery inspection, and stored under covered conditions at a temperature between -10°C to +50°C, and relative humidity of 10% to 93% non-condensing.

2. Safety



Before using this equipment, please study this manual carefully and familiarise yourself with the receiver, transducers, the indicators and operation. Ensure that each user fully understands the safety and operation of the unit, as mis-use may cause harm to the user or patient, or damage to the product.



Ultrasound monitoring should be performed in accordance with current guidelines. The ALARA guideline (AIUM) recommends that ultrasound exposure should be kept As Low As Reasonably Achievable.

Rx Only

This system should only be used by, or under supervision of, a licensed physician or other health practitioner who is trained in the use of fetal heart monitors.



General Warning / Residual risks are those risks that require a warning or caution to be entered into this manual. They are identified by the proximity of this symbol.



This device may only be used in combination with one of Huntleigh Healthcare Ltd's ('Huntleigh') Sonicaid™ FM800E fetal monitor range. The FM800E monitor range includes model numbers FM820E and FM830E.

Please keep these Instructions for Use to hand for future reference.

Refer to the FM800E Instructions for Use for details of operation and handling.

Refer to Section 3.4 of this manual for definitions of all symbols used on product labelling.

2.1 WARNINGS



The Sonicaid™ Freedom should only be used by personnel familiar with the operation of electro-medical equipment, especially for electronic monitoring of the fetal heart rate.



A possible explosion hazard exists if used in the presence of flammable anaesthetics.



The Sonicaid™ Freedom should not be used at temperatures lower than 10 or higher than 40 degrees centigrade.



Do not mount the unit directly above the patient. Locate the unit so that it will not cause harm should it fall.



Do not operate the unit from the mains supply if the mains cable is damaged.



Do not immerse any portion of the receiver unit in water or other liquids. The transducers are watertight and may be used in water (IPX8 - TRANSDUCERS ONLY).



If there is any damage to the transducer housings, do not use the transducer under water. Refer the transducer to Huntleigh Healthcare qualified service personnel for repair.



The transducers are protected from damage if dropped. Never use the transducer without its protective sleeve. It can be removed for cleaning in accordance with the Cleaning and Disinfection Procedure in Section 6.



If this product is connected to another item of electrical equipment, it is important that the system is fully compliant with IEC60601-1.



The device is generating RF-radiation. It is designed for use in hospitals and other clinical settings, also outside of shielded areas. As in other medical electrical devices, fixed and mobile RF-communication devices may disrupt the performance of the Sonicaid™ Freedom.



The telemetry equipment is classified as IIb according to Medical Devices Directive 93/42/EEC. The receiver unit is connected to the AC line without a protective earth (Class 2). The line voltage may be between 100 and 240V with 50 to 60Hz. The transducer units are powered by safe current limited low voltage re-chargeable batteries of 3.7V. Transducers are Class CF.



In case of a discharge of static electricity at the receiver, the functions of the receiver may become disabled. Please disconnect the mains lead for about 5 seconds.



To disconnect from the mains, the plug must be removed. Always ensure that the plug is easily accessible.



The receiver unit should be plugged into the same mains supply circuit as other equipment in use on the same patient.



Use only recommended accessories listed in this manual.



Do not modify this equipment without authorisation of the manufacturer.

3. Product Information

3.1 System Overview

Freedom consists of three components: the Ultrasound transducer (SF1-US), the TOCO transducer (SF1-TOCO) and the Receiver (SF1-SL). There are two receiver models operating at different radio frequencies for different markets. "SF1-EUR" is for use in regions that use the ISM wireless standard; "SF1-SL" is for use in regions that use the WMTS wireless standard. When in use, the TOCO transducer sends signals to the US transducer, which then transmits both signals to the Freedom receiver unit. The receiver converts these signals into the required format for input to the attached FM800E system. The system monitors two physiological parameters:

- Fetal Heart Rate
- Uterine activity

Key features:

- Transducers are small, light in weight and water tight
- Low voltage wireless transmission is safe for use in water
- No cables gives the patient greater freedom of movement in & out of bed
- The system is easy for the users to operate
- The transducers are powered by rechargeable Li-Ion batteries
- Batteries will automatically recharge when docked with the receiver

Transducers

The transducers contain radio frequency (RF) transmitters. Signals are transmitted in an ISM or WMTS band according to location and local regulations. The SF1-EUR (ISM) has 26 channels, and SF1-SL (WMTS) has 100 channels. The range depends on the local conditions. The exact range of any telemetry system can only be determined by a field test. When the US transducer is used under water the range will be reduced compared with transmission in air.

During use the battery capacity of the transducers are monitored. The receiver has a battery indicator for each transducer consisting of four green LEDs; four LEDs indicating that the transducer is fully charged. When the battery becomes discharged the transducer is automatically shut off.

Receiver

The receiver has two docking areas for the TOCO and US transducers, three sets of visual indicators (charging, battery level and transducer status) and the antenna for receiving transmissions from the US transducer when in use. In addition, the rear panel includes the receiving antenna, RF-Channel selector, interface for connecting to the FM800 Encore Monitors, and line voltage input for power.

The receiver and transducers have no buttons to operate. When identified transducers are undocked, they are switched on automatically and the receiver indicates the status of batteries and the quality of the incoming RF-signal. When unidentified transducers are undocked, they are switched off.

To start monitoring, the transducers are undocked from the receiver and applied to the patient. It is recommended that the US transducer be applied to the patient first.

The TOCO-Transducer transmits its signal to the US-transducer. The US transducer transmits both the US and TOCO signals to the receiver.

3.2 The Receiver Unit

3.2.1 Operation

The receiver does not have a mains switch. To turn on, connect the mains lead from the rear mains input to mains supply. Always leave the receiver connected to allow the transducers to be charged. If you want to switch off Freedom, dock both transducers first, wait for charging indication, then disconnect the supply, wait 10 seconds. All units are now switched off. All modules are turned on when the receiver is powered again.

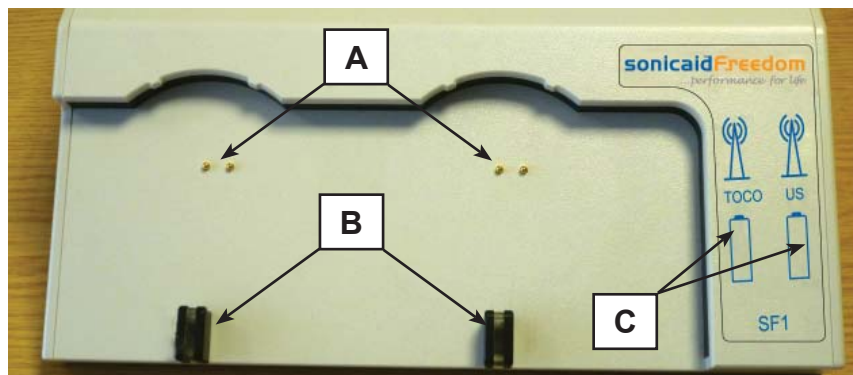
When power is applied with an ultrasound transducer docked in the charging bay, it is automatically registered as belonging to this particular receiver (referred to as "pairing" or "paired"). This ensures that, where multiple wireless systems are being used in close proximity, there is no interference between systems. Successful pairing is indicated by the charge position LED switching on (not flashing).



***To disconnect from the mains, the plug must be removed.
Always ensure that the plug is easily accessible.***

3.2.2 Front Panel Indicators

Docking Transducers



A - Docking/Charge Bays

Ensure there is no water or gel on the contact panels of the receiver or transducer when charging, as this may prevent good contact.

Dock the transducers in position A when not in use. Place the transducers with the golden charging rings facing the charging pins and snap into place.

The transducers are equipped with re-chargeable lithium polymer batteries. When the transducer is docked the battery is charged automatically, provided the receiver is connected to the mains supply.

Once a transducer has been positioned correctly for charging, a Green LED in the corresponding holder (B) turns on.

It doesn't matter in which of the two positions a transducer is docked. However, to ensure the transducers are recognised without delay, the Ultrasound transducer should be placed in the holder first. If the TOCO transducer is inserted first, there may be a delay in the transducer being recognised.

Note: *The gold plated contact rings **MUST** be clean & dry before the transducer is docked. Failure to ensure this may cause corrosion, poor contact and may invalidate the warranty.*

B - Charge Bay LEDs

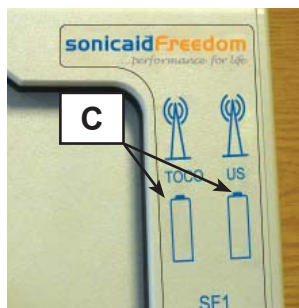
The battery state during charging is indicated as follows:

- **LED off:** No transducer detected
- **LED on:** Transducer is being charged. The battery capacity is displayed in the corresponding battery Indicator (C)
- **LED flashing:** Transducer not paired but charging. This allows transducers to be charged on any receiver unit. Note, however, that no battery charge indicator is displayed in this mode.

If the LED flashes with a transducer which is correctly paired, remove the transducer and re-dock it using a rapid snap-in action. Hesitation when docking may result in the transducer not being recognised.

Note: Flashing LED - If the problem persists, rotating the transducer in the docked position may clear the problem. A flashing LED may also occur if the docking contacts, or the contact rings on the transducer, are contaminated with fluids, gel, etc. Refer to the cleaning instructions for cleaning these contacts.

C - Battery Indicators



Once a transducer has been identified by the receiver, the corresponding battery indicator (C), shows the battery level during operation and the recharge level during charging. Each LED represents about a quarter of the capacity. When the battery is fully charged, all 4 LEDs are continuously on. An operating time of about 16 hours is available on a full charge. A complete charging process takes approximately 2.5 hours.

If the transducer has fully discharged, a charging time of about 15 minutes allows for an operation of more than 1 hour.

LED assignment: **US** - Ultrasound-transducer
TOCO - TOCO-transducer

It is recommended to leave the transducers docked on the receiver when not in use.

D - Transmission Indicators



The transmission indicators are located on the upper right corner of the receiver (D). These indicators show the status of TOCO and US transducer transmission:

LED flickering amber:

US Transducer off or out of range

LED amber:

Transducer docked or TOCO Transducer out of range

LED green:

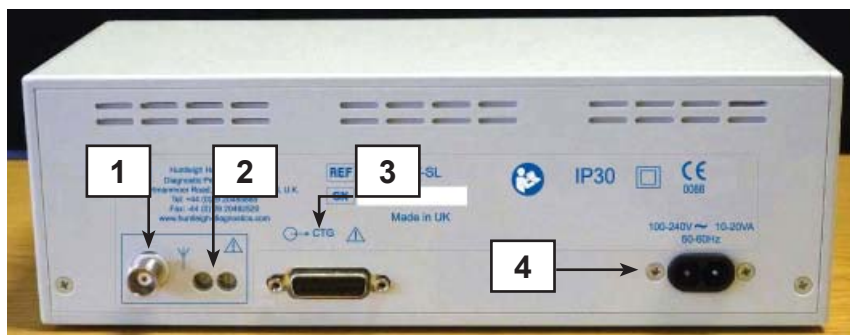
Transducer in range and good signal quality

LED flickering green/amber:

Transducer near range limit, or disturbance by another RF-transmitter.

If known to be in range, refer to Section 8.3 to change the channel of the Freedom unit.

3.2.3 Rear Panel controls and Indicators



1	Connector for the Receiving Antenna 
2	RF-Channel selector : ISM : 00 - 25 (26 channels) WMTS : 00-99 (100 channels)
3	Interface to Fetal Monitor  CTG
4	Mains Input, 100...240V, 50...60Hz, 10VA.

3.3 The Transducers



Indicator

- ① On the top of each transducer is a green indicator LED.

Once the transducer is undocked, the LED is switched ON and flashes to indicate normal operation.

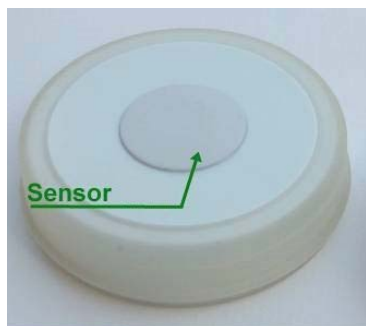
Note that unpaired transducers will switch off when undocked. If the LED on a paired transducer stays off, refer to the troubleshooting guide (section 8).

Connections



On the top surface of the transducer is a contact plate. The two connecting rings connect to the charging pins on the receiver when the transducer is docked for charging. All rings are internally disconnected during operation.

SF1 TOCO - Sensor



In the centre on the bottom of the TOCO-transducer is the sensor area, which measures uterine activity.

Avoid applying excess pressure to the sensor.

Mechanical Protection



The transducers are protected against damage by a silicone sheath. Never operate the transducer without this protective sheath. It can be removed for cleaning if required. Refer to Section 6.2 for instructions.

Transducer Application



The transducers are applied using the belt clips supplied, together with the same belts as for the FM800Encore transducers.

Replacement belts & clips are available.

Refer to section 9.7 for Recommended Consumables and Accessories.

The belt clips should be clipped over the top face of the transducer, over the gold contact plate, as shown.

3.4 Product Labelling

	Attention, consult accompanying documents / Instructions for Use		
	Sonicaid Freedom is Class II, double insulated according to the definitions in EN 60601-1:2006		
IP30	Receiving Unit rating for protection against ingress of fluids and particulate.		
IPX8	Transducer rating for protection against ingress of fluids and particulate: The transducers are designed for operation under water. (1M for 16 hours)		
	General Warning or Caution.		
	Applied parts type CF		Alternating current (AC)
SN:	Serial Number	PN:	Product Number / Model Number
	Refer to Instructions for Use		FM800E fetal monitor (CTG) connection point
	Antenna or Aerial connection point		Battery Indicator
	Transducer Indicator (On / Off Symbol)	REF	Product Code
	Transmission Symbol	TOCO	Contractions Transducer
US	Ultrasound Transducer		Manufacturer

4. Setup



WARNING: *These requirements must be met when Sonicaid™ Freedom is connected to any other electrical equipment.*

- 1 Medical equipment must comply with IEC60601-1, or equivalent.
- 2 The configured system must comply with the requirements of IEC60601-1:2005; clause 16.

4.1 Receiver Connection



The receiver unit should be plugged into the same mains supply circuit as other equipment in use on the same patient. Do not make any modifications to the power supply of the receiver and transducer units.

- Connect the interface cable which is clearly identified, from output of the receiver unit to the interface input of the fetal monitor.
- Connect the receiving antenna and select RF channel (See Section 8.3)
- Dock the transducers with the receiver powered off.
- Connect the mains supply lead from the receiver unit to mains supply. This will pair the receiver and transducers.
- Charge the transducer batteries
- Switch on the FM800E monitor (refer to its Instructions for Use)



There is no end user tuning required other than changing the channel. The user selects a channel on the receiver rotary switches. The user docks an ultrasound transducer to the receiver within 20 seconds of a receiver power up to pair it to the same channel as the receiver.

The system is ready for monitoring.

4.2 Testing the Basic Functions

A functional test should be performed after initial installation, following each step below:

1. Remove TOCO-transducer, while the US-transducer is charging:

- charge bay LED and battery indicator LEDs turn off
- LED in TOCO-transducer starts flashing
- no further action (no signal transmission, because the US-transducer is not running)

2. Dock TOCO-transducer for charging again:

- charge bay LED and battery indicator LEDs turn on

3. Remove US-transducer (US):

- charge bay LED turns off
- LED in US-transducer starts flashing
- US-transmission indicator LED turns green
- US battery indicator LEDs indicate charge status
- US channel becomes active: US is indicated on fetal monitor

4. Simulate audio signal:

- Stroke bottom face of transducer at approximately 2 strokes per second to simulate a fetal heart signal.
- fetal monitor shows heart rate, after a short delay.

5. Remove the TOCO-transducer:

- charge bay LED turns off
- LED in TOCO-transducer starts flashing
- TOCO-transmission indicator LED turns green
- TOCO battery indicator LED's indicate charge status
- TOCO channel becomes active: TOCO is indicated on fetal monitor

Note : *The TOCO transducer must be in operating range of the US transducer (Maximum range 30cm).*

6. Press gently on the sensor area of the transducer:

- fetal monitor shows adequate TOCO values

7. Dock US-transducer for charging

- US and TOCO-transmission indicator LEDs turn Amber
- charge bay LED turns on
- US battery bay LEDs indicate charge status
- Fetal monitor returns to normal operating mode with wired transducers.

8. Dock TOCO transducer for charging

- charge bay LED turns on
- TOCO battery indicator LEDs indicate charge status

9. Wait until both Battery Indicators show all 4 LEDs on (battery fully charged). A complete charge cycle takes approximately 2.5 hours.

Note : *It is recommended that the serial numbers from installed and matched receiver and transducer units are recorded for future use if required. This may be important if several telemetry systems are used within a ward or confined area.*

5. Operation

5.1 Getting Started

- Charge the transducer batteries
- Switch on the FM800E monitor (refer to its Instructions for Use)
- Apply transducers to the patient (Refer to Section 5.2).

When the US-transducer is undocked from the charging bay, the unit is automatically switched on and is ready to use.

The system is ready for monitoring if the transmission indicator LED and battery indicator LEDs are illuminated green.

5.2 Application of the Transducers

Ultrasound transducer

Fix the transducer to the belt clip. Apply ultrasound gel to the surface of the transducer.

Note: Use recommended gel only. Do not use oil based gels.

Use the minimum amount of gel required, to prevent it from sliding too easily on the skin.

- When the transducer is to be used in water, use only a little gel, or no gel if possible.
- Position the transducer. Adjust for best, clear, fetal heart sounds. Refer to the FM800E instructions for use for further information.
- Secure firmly with the belt. For optimum performance during periods of mobility, ensure that the belt is tight enough to prevent the transducer slipping. Avoid patient discomfort through excessive tightening.

TOCO transducer

- Position the TOCO transducer over the fundus of the uterus (refer to the FM800E instructions for use for further application information), and fasten it securely.
- Allow the system to stabilise for 20-30 seconds while communication is fully established with the fetal monitor.
- Adjust the TOCO baseline using the toco zero button on the FM800E monitor, once the system has stabilised.
- After any drop-out in the wireless link, it will be necessary to re-zero the toco channel when communication is re-established. Allow the system to stabilise as above before re-zeroing.

Note: The TOCO-transducer transmits its signals to the US-transducer. The distance between them should not exceed 30cm. If this range is exceeded, toco data will be lost. When it comes back in range, the stabilisation period & re-zeroing as detailed above will need to be repeated.

False recording of FHR



When monitoring FHR using Doppler ultrasound, the heart rate may be falsely reported. This can be caused by a number of effects including double-rating or half rating, and is characteristic of ultrasound fetal monitoring. Another cause may be detection of maternal signals, (particularly in the absence of fetal signals). Doubling of the maternal rate can result in a trace looking very like a normal fetal trace. For further information on this, refer to the FM800E instructions for use.

If the fetal heart signal has large variations in rate, is weak, or is in the presence of large maternal signals, noise or artefact, it is possible for the system to double count or half rate for short periods of time. This is characteristic of monitoring fetal heart rates with ultrasound.



To minimise the chances of double rating, half rating or other types of artefact occurring, always palpate the abdomen and listen to the fetal heart with a hand-held Doppler unit before applying the ultrasound transducers. This helps to verify the fetal heart and to locate the area where best signal quality can be expected. For further information on this refer to the FM800E instructions for use.

5.3 Ambulatory Monitoring

IMPORTANT: *Apply the transducers while the patient is standing for ambulatory monitoring.*

For ambulatory monitoring of a patient, undock the transducers from the receiver and apply them to the patient as described in Section 5.2.

During monitoring take care that:

- The transducers do not become displaced.
- A good fetal heart sound is recorded.
- The patient stays within operating range of the receiver.

Note

Monitoring while the patient is moving or walking may result in increased artefact or drop-out on the trace. To minimise this, ensure the transducers are securely strapped on using good quality belts. It may be necessary to tighten these more than usual to keep the transducers in position.

If the patient moves outside the wireless range, the signal will be lost. This is indicated by the transmission indicators on the receiver flickering or turning amber. Note also that within the wireless range, there may be “dead spots” where there is no signal due to building construction or interference from other sources.

Other wireless systems working on the same frequency can also interrupt ambulatory monitoring. In this case, the system should be set to a different frequency. To change the frequency, please refer to Section 8.3.

5.4 Water Birth Monitoring

IMPORTANT: *Apply the transducers when the patient is in the water for monitoring under water.
Use little, or no gel if possible on the US-transducer.*

When the transducers are under water, this reduces the range. Positioning the receiver in line of sight of the transducers may improve reception. If you are in doubt, please contact Huntleigh or your distributor for assistance.

5.5 Ending Monitoring / Switching Off

Once monitoring is complete and the transducers and receiver have been cleaned (see Section 6.2), dock the transducers on the receiver, so they are easily located when you want to use the system again, and so the transducer batteries can be charged.

For charging the transducer batteries, the system must be connected to the mains supply (see Section 3.2).



***To disconnect from the mains, the plug must be removed.
Always ensure that the plug is easily accessible.***

6. Care and Cleaning

6.1 General Care

Although the Freedom is robust and has been designed to withstand normal clinical use, the unit contains delicate components, which should be handled and treated with care.

Periodically, and whenever the integrity of the system is in doubt, carry out a check of all functions as described in Section 4.2. If there are any defects to the housing of a transducer do not use it in water. Contact Huntleigh or your distributor to get it repaired or to order a replacement.

If a transducer is dropped, check that the seal and the housing are not damaged. If you are in doubt please contact Huntleigh or your distributor for further instructions.



Please ensure that you check with your facility's local infection control policy and medical equipment cleaning procedures.



Observe warnings and guidance on cleaning fluid labelling regarding use and personal protective equipment (PPE).



Do not use abrasive cloths or cleaners on the transducer, receiver or accessories.



Do not use automatic washers or autoclaves to clean the transducers.



Phenolic detergent based disinfectants, solutions containing cationic surfactants, ammonia based compounds or perfumes and antiseptic solutions such as Steriscol or Hibiscrub should never be used on any part of the Freedom system.



If detergent or disinfectant wipes are used to clean the transducers or the receiver ensure that excess solution is squeezed from the wipe prior to use.



Always switch off the Receiver by disconnecting the unit from the AC supply before cleaning and disinfecting, do not allow any fluid to enter the Receiver and do not immerse the receiver in any solution.

6.2 Cleaning and Disinfecting

6.2.1 Transducers

Clean the two transducers before examining a patient using cleaning Method 1 below.

Following patient examination clean and/or disinfect the transducers by the appropriate method based upon the risk of transferring an infection from one patient to another. Risk definitions are defined in the table below:

Risk Level Definitions	
Low Risk	Normal use or low risk situations include patients having intact skin and no known infection and the transducers have not been contaminated with blood.
Medium Risk:	The patient has a known infection, skin is not intact, the transducer is heavily soiled or the patient has given birth in a water bath.
High Risk:	This procedure should only be used when the transducer has been contaminated by blood.

Cleaning & Disinfecting Methods

Ensure the coupling gel used with the ultrasound transducer is removed before cleaning, in all three methods.

Method 1 (Low Risk):

Do not remove the protective silicone sleeves ('sleeve').

1. Wipe the sleeves and the transducers using a mild detergent and then rinse in water.
2. Dry the sleeves and the transducers with a clean lint free cloth.

Method 2 (Medium Risk)

Remove the sleeves before cleaning.

1. Remove soiling and clean the transducers and the internal and external surfaces of sleeves with a mild detergent and then rinse in water.
2. Completely dry the transducers and the inside and external surfaces of the sleeve.
3. Wipe transducers and sleeves with a cloth dampened in Sodium Hypochlorite (1000ppm).
4. After two minutes rinse with water and then dry with a clean lint free cloth.
5. Re-attach the sleeve ensuring that they are assembled correctly (see pictures below).

Method 3 (High Risk)



Warning: Sodium Hypochlorite @ 10000 ppm for disinfecting should only be used in situations described in the High Risk definition. Unnecessary use of this concentrated solution for Low and Medium risk situations may result in damage to the transducer over time.

Remove the sleeves before cleaning.

1. Remove soiling and clean the transducers and the internal and external surfaces of the sleeves with a mild detergent and then rinse in water.
2. Completely dry the transducers and the inside and external surfaces of the sleeves.
3. Wipe transducers and sleeves with a cloth dampened in Sodium Hypochlorite (10000ppm).
4. After two minutes rinse with water and then dry with a clean lint free cloth.
5. Re-attach the sleeve ensuring that they are assembled correctly (see pictures below).



Warning: Before docking the transducers onto the Receiver, ensure that the transducers are dry and that the receiver has been cleaned following the procedure below. If this is not followed, damage to transducer will result.

6.2.2 Receiver Unit

General Comments

- Always keep the external surfaces clean and free of dirt and fluids using a clean dry cloth to remove.
- Clean the charging contacts regularly with a dry cloth.
- Ensure that the charging contacts are completely dry following the cleaning and disinfecting procedure.

Cleaning & Disinfecting Procedure

Following patient examination, clean and disinfect the receiver's exterior surface as described below:

1. Wipe any fluids from the surface of the unit using a clean dry cloth.
2. Wipe the receiver with a cloth dampened in 70% Isopropyl Alcohol avoiding connector sockets and charging pins.
3. Completely dry the receiver with a clean, dry lint free cloth.
4. If the receiver has been contaminated with blood disinfect the contaminated area using a cloth dampened in Sodium Hypochlorite solution @ 10000ppm.
5. After two minutes wipe this area with a cloth dampened in water to remove residue and then dry with a lint free cloth.

7. Maintenance

7.1 Mechanical Inspection

Inspect the AC supply cable, FM800E connection cable, receiver, transducer protective sleeves and transducers for loose or broken parts or any other damage. Pay particular attention to the AC supply socket.

Look carefully for cracks which may allow the ingress of liquids or gels.

Contact Huntleigh or your distributor for service or replacement of any broken or damaged cables, transducers or transducer protective sleeves.

If there is damage to the receiver, do not use and contact Huntleigh or your distributor.

7.2 Corrective Maintenance

All corrective maintenance must be performed by qualified engineers, approved by Huntleigh.

The Sonicaid Freedom Service manual (PN 778345) is designed as an aid to engineers in maintenance and service of repairable parts.

7.3 Charging Transducer Batteries

Refer to Section 3.2

7.4 Transducer Battery Replacement

The lifetime of the battery is estimated to be 2 to 3 years, depending on use patterns. You will notice a significantly reduced working time of a charged battery when the battery is due for replacement.

Do not attempt to change the battery yourself.

Contact Huntleigh or your distributor for battery replacement. Battery replacement must be done by a Huntleigh trained and qualified service technician.

7.5 Servicing

Servicing should be performed by Huntleigh or their appointed service agent.

8. Trouble Shooting

This section gives some of the more common problems encountered during use together with possible causes. If the problem cannot be located after consulting the table below, the receiver should be disconnected from the mains power source and a qualified technician should be consulted.

Before attempting trouble-shooting, verify that all cables are properly connected to both the receiver, FM800E and the main power source.

Transmission Indicator LED always amber, even though the US-transducer is removed.

POSSIBLE CAUSE	SOLUTION
Transducer battery discharged.	Charge transducer
Receiver and transducer are working on different RF-channels.	Select the correct transducer
	Re-pair the transducers to receiver. (See section 4).

Transmission Indicators flicker sporadically amber/green when patient is walking.

POSSIBLE CAUSE	SOLUTION
Patient out of range.	Ensure the patient understands the range limits and any local "dead spots" to avoid.

No signal on Fetal Monitor even though the indicators on receiver are green.

POSSIBLE CAUSE	SOLUTION
Interface cable to Fetal Monitor is disconnected or broken.	Connect cable or repair.

Interrupted recording of fetal heart rate or uterine activity.

POSSIBLE CAUSE	SOLUTION
Transducer position.	Check position of transducers for best signal.
Transducer is sliding on the skin.	Reposition and fasten securely. Use less gel on the US transducer.
Excessive movement	Ask the patient to restrict movement.
RF-interference or patient at the end of range.	Instruct patient to stay inside the area where reception is good. If necessary change RF channel. Refer to 8.3.

Charging indicator is off even though the transducer is docked for charging.

POSSIBLE CAUSE	SOLUTION
Transducer not docked properly.	Re-position the transducer.
Receiver not connected to the mains power supply.	Connect the receiver.

No TOCO signal on fetal monitor from telemetry.	
POSSIBLE CAUSE	SOLUTION
US-transducer not receiving signal from TOCO.	Bring the transducers closer together until US receives signal from TOCO.
TOCO not running (LED not flashing).	Charge TOCO-transducer and try again.
TOCO baseline zeroed before wireless system has stabilised	Wait for 20-30s after activating the wireless system before using the fetal monitor contractions zero function. Note that it may be necessary to repeat the contractions zero function after any drop-out in the wireless link, allowing the system to re-stabilise on each occasion.

Charging panel or contacts show corrosion.	
POSSIBLE CAUSE	SOLUTION
Transducer was wet or contaminated with gel when docked on the receiver.	Always clean and dry the transducer before docking and charging. If necessary have the contact panel replaced.

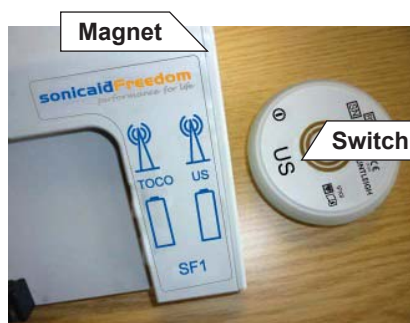
Receiver or Transducer does not respond	
POSSIBLE CAUSE	SOLUTION
The discharge of static electricity may have disabled the receiver.	Disconnect the power cord for about 5 seconds. Re-connect the cable.
The discharge of static electricity may have disabled the transducer.	Refer to section 8 for re-setting transducers.

Green LED of undocked Transducer does not have normal operational pattern.	
POSSIBLE CAUSE	SOLUTION
No LED (Not paired- Normal operation)	Pair transducers (See Section 4)
No LED Unusual green LED pattern Solid green LED	Redock transducer, wait for identification. Undock and recheck. Try 3 times.
Transducers may be locked	Manually Switch off Transducers (Refer to 8.1 and 8.2) If problem persists, transducer is faulty.

No battery indicator LEDs illuminated	
POSSIBLE CAUSE	SOLUTION
RF Interference	Occasionally, the battery indicator LEDs may show absence of charge. As long as the transducers have been properly docked, with the charge bay LEDs showing that charging is in progress for a minimum of 15 minutes, the transducers should operate normally.(Refer to Section 3.2)

8.1 Manually Switching off the Transducers

If the green LED of the ultrasound or Toco transducer remain illuminated or the transducers lock up, the following procedure must be adhered to:



Position of Magnet and Switch

Inside the housing by the upper right edge of the receiver unit there is a magnet. This is used to manually switch off the transducer. The transducers have an internal magnetic switch, which is mounted within the transducer and positioned under the C of "TOCO" and the S of "US" respectively

Switching Off

Hold the transducer at the right hand side of the receiver as shown on the pictures below.
Position the letters so that the “TOCO” or “US” are as shown.

By moving the transducers along the right hand side of the receiver wall the transducers will switch off and reset accordingly
The process will take approximately 2-3 seconds.



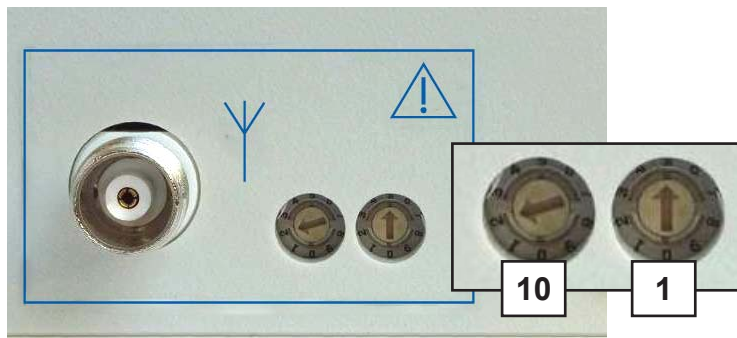
8.2 Re-enabling Transducers

After manually switching off the transducers, it is essential that they are docked for recharging and enabling. After a short delay, the operating status will be indicated (refer to section 3.2).

8.3 Changing the RF-channel

Wireless transmission can be disturbed by other transmitters running on the same frequency. If there are several Freedom units in one ward, all receivers must be set to different channel numbers. The operating channel is set using the controls located on the rear panel of the Freedom receiver. This is performed as follows:

1. Disconnect the receiver from the mains and wait until all LEDs are off.



2. Use the code-switches on the rear panel of the receiver to select the new channel number.
 WMTS (USA) : 00 - 99 (100 channels - see Appendix 1)
 ISM : 00 - 25 (26 channels - see Appendix 2)
3. Re-connect the receiver unit to mains and wait until the LED test is finished.
4. Insert the US-transducer unit into a charging bay and wait until charging is indicated.

Now the new channel is installed for receiver and transducer. This procedure takes about 20 seconds; please do not interrupt this process. In case of unusual behaviour of this process please retry this procedure.

Note: *Transducer frequency is set by the receiver and cannot be adjusted.*

Note : *The serial numbers from installed and matched receiver and transducer units should be recorded for future use if required. This may be important if several telemetry systems are used within a ward or confined area.*

9. Specifications

9.1 Equipment Classification

Type of protection against electric shock.	The receiver unit is connected to the AC line without a protective earth (class 2).
Degree of protection against electric shock 	Transducer - SF1-US : Class CF applied parts Transducer - SF1-TOCO : Class CF applied parts
Mode of operation.	Continuous
Degree of protection against harmful ingress of particles and/or water.	Receiver - SF1-SL : IP30 Transducer - SF1-US : IPX8 (1m for 16Hours) Transducer - SF1-TOCO : IPX8 (1m for 16Hours)
Degree of safety of application in the presence of a flammable anaesthetic	Equipment not suitable for use in the presence of a FLAMMABLE ANAESTHETIC MIXTURE WITH AIR, OXYGEN OR NITROUS OXIDE

9.2 Receiver Unit (SF1-EUR / SF1-SL)

RF-Receiver	ISM : 434.05 - 434.7 MHz Band, 26 channels WMTS : 608.0375 - 612.9875 MHz Band, 100 channels
Channel selection	Rotary switch
Supply voltage	100V...240V, 50...60Hz, 10VA
Stand by power consumption	<0.8W
Antenna	Gainflex
Transducer Charging	Two docking and charging bays for SF1-US and SF1-TOCO
Charging time	Maximum: 3 hours, regulated
Operation	Automatic, no controls
Indicators	- Transmission US transducer - Transmission TOCO transducer - Battery capacity during operation - Battery capacity during charging - Battery charging established
Size	250 x 200 x 85mm
Weight	1Kg

9.3 US-Transducer (SF1-US)

Measurement	External Fetal Heart Rate by Pulsed Doppler Ultrasound
Ultrasound parameter	Complies with IEC60601-2-37
Transmission	Cordless to receiver (SF1-EUR/ SF1-SL)
Range	Up to 30m, from under-water up to 8m (subject to local environment)
Modulation	Digital, FSK
Antenna	Helix
RF-Transmitter	According to receiver: SF1-EUR (ISM), SF1-SL (WMTS)
Power supply	Lithium Polymer Battery
Operating time	Approximately 16 hours with fully charged battery
Size	Ø75x20mm
Weight	105g

9.4 TOCO-Transducer (SF1-TOCO)

Measurement	External pressure measurement of uterine activity
Transmission	Cordless to Ultrasound-transducer SF1-US
Range	30cm (TOCO to US Transducer)
Modulation	Digital, FSK
Antenna	Ferrite
Transmitter	10kHz
Power supply	Li-Polymer-Battery
Operating time	Approximately 16 hours with fully charged battery
Size	Ø75x20mm
Weight	92g

9.5 Environmental

Operating		Storage
10°C to 40°C	Temperature range	-10°C to 50°C
10% to 75% (non condensing)	Relative Humidity	10% to 93% (non condensing)

9.6 Directives and Standards Compliance*

European Directives:

The Sonicaid™ Freedom complies with the essential requirements of the Medical Devices Directive (93/42/EEC) with amendments by 2007/42/EC and the Radio and Telecommunications Terminal Equipment Directive (1999/5EU).

Standards:

Safety	IEC/UL/CSA/EN 60601-1 (Second Edition) IEC/ANSI/AAMI/CSA/EN60601-1 (Third Edition) EN60601-1-6:2010, IEC60601-2-37:2007
Electromagnetic Compatibility	EN60601-1-2:2007 FCC 47 Part 15 Subpart B
Radio	ETSI EN 300 220-2: V2.3.1 (2009-12) ETSI EN 301 489-1 V1.9.2 (2011-09) ETSI EN 301 489-3 V1.6.1 (2013-06) FCC 47 CFR Part 15 Subpart C and Part 95; Subpart H (WMTS), RSS-210
Labelling	BS EN15223-1:2012

9.7 Recommended Consumables & Accessories*



WARNING: Use only recommended accessories/consumables listed in this manual.

Item	PN
Aquasonic Gel 5ltr container (each)	ACC-1300-0154
Aquasonic Gel (box of 12 x 250ml)	ACC3
Ultrasonic Gel (box 12 x 60ml tubes)	ACC24
Latex free Reusable transducer belts (pair)	ACC-MI1136
Transducer Clips	ACC-OBS-051
Ultrasound Transducer	ACC-OBS-052
TOCO Transducer	ACC- OBS-053
Transducer Sleeve	ACC-OBS-054
Mounting Bracket (To mount the Receiver to an FM800E Monitor)	ACC-OBS-050
Service Manual	778345

*This list is not fully comprehensive

10. Electromagnetic Compatibility

Make sure the environment in which the Sonicaid™ Freedom is installed is not subject to strong sources of electromagnetic interference (e.g. radio transmitters, mobile phones).

This equipment generates and uses radio frequency energy. If not installed and used properly, in strict accordance with the manufacturer's instructions, it may cause or be subject to interference. Type-tested in a fully configured system, it complies with EN60601-1-2, the standard intended to provide reasonable protection against such interference. Whether the equipment causes interference may be determined by turning the equipment off and on. If it does cause or is affected by interference, one or more of the following measures may correct the interference:

- Re-orienting the equipment
- Relocating the equipment with respect to the source of interference
- Moving the equipment away from the device with which it is interfering



Adding accessories or components to a system, or modifying a medical device or system, may degrade the immunity performance. Consult qualified personnel before making changes to the system configuration.



Modifications not expressly approved by Huntleigh Healthcare could void the user's authority to operate the equipment.



***This device complies with part 15 of the FCC/IC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference,
and (2) this device must accept any interference received, including interference that may cause undesired operation.***



Operation of this equipment requires the prior coordination with a frequency coordinator designated by the FCC for the Wireless Medical Telemetry Service.

11. Ultrasound Safety Considerations

General

Diagnostic ultrasound has been in use for over 35 years with no confirmed adverse effects on patients or instrument operators at the intensities typical of present diagnostic instruments. However, available data are not wholly conclusive, and the possibility remains that biological effects may be identified in the future.

Because fetal tissue could be more sensitive to biological effects by reason of rapid cell division, it is particularly desirable that ultrasound exposure of pregnant subjects be kept to a minimum.

Medical and scientific authorities therefore recommend that ultrasound procedures be performed in accordance with the “ALARA” principle, which states that the energy delivered to the patient should always be kept As Low As Reasonably Achievable.

The transmitted acoustic power of the Sonicaid Freedom Ultrasound transducer is fixed and cannot be adjusted by the operator. Therefore, the user can best observe the ALARA principle by ensuring that each examination is medically indicated and by limiting the duration of the study to the extent appropriate for the clinical objectives.

Acoustic output data for the transducers is summarized in the following tables.

Acoustic Output

The Sonicaid Freedom's ultrasound transducer, which is used with Sonicaid FM800 Encore series fetal monitors, has a single mode of operation, with fixed acoustic output parameters that are not user adjustable. Refer to Table 1 for the Acoustic Output Reporting Table used for ultrasound devices following FDA Track 1.

Table 1 Acoustic Output Reporting Table for Track 1 – Non-Auto-scanning Mode Sonicaid Freedom Wireless Fetal Monitoring System Operating Mode: PWD Application(s): Fetal Monitoring				
Acoustic Output		MI	$I_{SPTA,3}$ (mW/cm ²)	$I_{SPPA,3}$ (mW/cm ²)
Global Maximum Value*		0.0261	4.64	17.5
Associated Acoustic Parameters	$Pr_{.3}$ (MPa)*	0.0258		
	W_o total (mW)*		27.5	27.5
	f_c (MHz)	1.024	1.024	1.024
	Z_{sp} (cm)	4.50	4.50	4.50
	Beam Dimensions	x_g (cm)	4.64	4.64
		y_g (cm)	4.95	4.95
	PD (μS)		91.5	91.5
	PRF (Hz)		2900	2900
	Overall EBD (cm)	Az. (cm)	5.0	
		Elev. (cm)	5.0	

* Note: The Global Maximum Values of MI and intensity, and also pressure and power, are statistical maxima calculated using a one-sided tolerance analysis for normal distributions using test data from three samples taken from a production batch.

Table 2: Acoustic Output Parameters for Unfocused Fetal Heart Rate Monitors	
Parameter	Value
I_{SATA} @ Transducer Face (Note 1)	3.92 mW/cm ²
I_{SATA} @ Transducer Face / DF (Note 1)	14.8 mW/cm ²
Area of Entrance Beam Dimensions (A_{EBD}) (Note 2)	7.02 cm ²

Note1: The values I_{SATA} are statistical maxima calculated using a one-sided tolerance analysis for normal distributions using test data from three samples taken from a production batch. See table 3 below.

Note 2: This is the area of the radiating elements, which is used in the calculation of I_{SATA} @ Transducer Face.

The derated pressure and intensity values were calculated in accordance with NEMA UD 2-2004 (R2009), *Acoustic Output Measurement Standard for Diagnostic Ultrasound Equipment, Revision 3*, from pressures measured in water using a derating factor of 0.3dB cm⁻¹ MHz⁻¹. Searches for the global maximum acoustic output were performed using derated values, because the derated maxima usually occur at a shorter axial range than the in-water maxima. The derating factor for pressure is $\exp(-0.115 * 0.3 * f_c * z)$ and for intensity the factor is $\exp(-0.23 * 0.3 * f_c * z)$ where f_c is center frequency in MHz and z is axial distance in cm.

Definition of Terms

$I_{SPTA.3}$	The derated spatial peak temporal average intensity
$I_{SPPA.3}$	The derated spatial peak pulse average intensity
I_{SATA}	The spatial average temporal average intensity
MI	The mechanical index
$Pr_{.3}$	The derated peak rarefactional pressure
W_o	The ultrasonic power
f_c	The acoustic center frequency
z_{sp}	The axial distance at which the reported parameter is measured
$x_{-6} \ y_{-6}$	respectively the in-plane (azimuthal) and out-of-plane (elevational) -6dB dimensions in the x-y plane where z_{sp} is found
PD	Pulse duration
PRF	Pulse repetition frequency
EBD	Entrance beam dimensions for the azimuthal and elevational planes

Statistical Analysis of Measurement Data

Table 3 contains the results from a statistical analysis performed on the acoustic output data to examine the upper output limit, based on a one sided tolerance limit approach. The mean and standard deviation of the Spatial-Peak, Time-Average Intensity and Mechanical Index were found, and the upper output limits were calculated from the following formula:

$$X = \bar{x} + K S_x$$

Where **X** is the upper output parameter limit, $\bar{x}$, is the average of the measured output parameter, S_x is the standard deviation of the measured output parameter, and K is a factor from the following reference ; M. G. Natrella, Experimental Statistics, NBS Handbook 91, 1963. K is chosen such that there is 90% confidence that the output levels of 90% of all units will not exceed the limit X.

Table 3: Example of Statistical Measurement Data			
Probe: SF1-US	Acoustic Output	Pulsed Doppler*	
Parameter	I_{SATA} @ Transducer Face / DF [mW/cm²]	MI	$I_{SPTA.3}$ [mW/cm²]
Sample Size	3	3	3
K	4.258	4.258	4.258
Mean	13.1	0.0182	2.53
Standard Deviation	0.406	1.88E-3	0.496
Limit (X)	14.8	0.0261	4.64

12. End of Life Disposal

This product, including its accessories and consumables, should be disposed of responsibly according to facility and / or local procedures. When disposing of used electronic waste and batteries, customers should review local programs and recycling opportunities and regulations.

The following websites may also be consulted for further information:

- USA: United States Environmental Protection Agency website (www.epa.gov/epawaste)
- Canada: Environment Canada website (www.ec.gc.ca)

13. Warranty & Service

Huntleigh Healthcare Diagnostic Products Division standard terms and conditions apply to all sales. A copy is available on request. These contain full details of warranty terms and do not limit the statutory rights of the consumer.

Service Returns

If for any reason the Sonicaid™ Freedom has to be returned, please:

- Clean the product following the instructions in this manual.
- Pack it in suitable packaging materials.
- Attach a decontamination certificate (or other statement declaring that the product has been cleaned) to the outside of the package.
- Mark the package 'Service Department '

Huntleigh Healthcare Ltd reserve the right to return product that does not contain a decontamination certificate.

Customer Care Department.

Huntleigh Healthcare Ltd, Diagnostic Products Division,
35, Portmanmoor Rd.,
Cardiff. CF24 5HN
United Kingdom.

Tel: +44 (0)29 20496793 - Service (24hr answer machine)

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Fax: +44 (0)29 20492520

Email: sales@huntleigh-diagnostics.co.uk
service@huntleigh-diagnostics.co.uk
www.huntleigh-diagnostics.com

Appendix 1 - WMTS Channel Allocation

FS1-SL Channel Number	Freq. MHz	WMTS Channel (for reference)	FS1-SL Channel Number	Freq. MHz	WMTS Channel (for reference)
00	608.0375	2242	50	610.5375	2342
01	608.0875	2244	51	610.5875	2344
02	608.1375	2246	52	610.6375	2346
03	608.1875	2248	53	610.6875	2348
04	608.2375	2250	54	610.7375	2350
05	608.2875	2252	55	610.7875	2352
06	608.3375	2254	56	610.8375	2354
07	608.3875	2256	57	610.8875	2356
08	608.4375	2258	58	610.9375	2358
09	608.4875	2260	59	610.9875	2360
10	608.5375	2262	60	611.0375	2362
11	608.5875	2264	61	611.0875	2364
12	608.6375	2266	62	611.1375	2366
13	608.6875	2268	63	611.1875	2368
14	608.7375	2270	64	611.2375	2370
15	608.7875	2272	65	611.2875	2372
16	608.8375	2274	66	611.3375	2374
17	608.8875	2276	67	611.3875	2376
18	608.9375	2278	68	611.4375	2378
19	608.9875	2280	69	611.4875	2380
20	609.0375	2282	70	611.5375	2382
21*	609.0875	2284	71	611.5875	2384
22	609.1375	2286	72	611.6375	2386
23	609.1875	2288	73	611.6875	2388
24	609.2375	2290	74	611.7375	2390
25*	609.2875	2292	75	611.7875	2392
26	609.3375	2294	76	611.8375	2394
27	609.3875	2296	77	611.8875	2396
28	609.4375	2298	78	611.9375	2398
29	609.4875	2300	79	611.9875	2400
30	609.5375	2302	80	612.0375	2402
31	609.5875	2304	81	612.0875	2404

FS1-SL Channel Number	Freq. MHz	WMTS Channel (for reference)	FS1-SL Channel Number	Freq. MHz	WMTS Channel (for reference)
32	609.6375	2306	82	612.1375	2406
33	609.6875	2308	83	612.1875	2408
34	609.7375	2310	84	612.2375	2410
35	609.7875	2312	85	612.2875	2412
36	609.8375	2314	86	612.3375	2414
37	609.8875	2316	87	612.3875	2416
38	609.9375	2318	88	612.4375	2418
39	609.9875	2320	89	612.4875	2420
40	610.0375	2322	90	612.5375	2422
41	610.0875	2324	91	612.5875	2424
42	610.1375	2326	92	612.6375	2426
43	610.1875	2328	93	612.6875	2428
44	610.2375	2330	94	612.7375	2430
45	610.2875	2332	95	612.7875	2432
46	610.3375	2334	96	612.8375	2434
47	610.3875	2336	97	612.8875	2436
48	610.4375	2338	98	612.9375	2438
49	610.4875	2340	99	612.9875	2440

*Note - Channels 21 & 25 are also used for test purpose

Appendix 2 - ISM Channel Allocation

Appendix 2 - ISM Channel Allocation

SF1-EUR Channel Number	Frequency MHz	ISM Allocated Channel Number
00	434.050	39
01	434.075	40
02	434.100	41
03	434.125	42
04	434.150	43
05	434.175	44
06	434.200	45
07	434.225	46
08	434.250	47
09	434.275	48
10	434.300	49
11	434.325	50
12	434.350	51
13	434.375	52
14	434.400	53
15	434.425	54
16	434.450	55
17	434.475	56
18	434.500	57
19	434.525	58
20	434.550	59
21	434.575	60
22	434.600	61
23	434.625	62
24	434.650	63
25	434.675	64

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The Sonicaid Freedom™ is in conformity with the Medical Devices Directive 93/42/EEC as amended by 2007/47/EC and has been subject to the conformity assurance procedures laid down by the Council Directive

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...with people in mind



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