

Intelect® SWD100

Intelect® SHORTWAVE100



**SENIOR™
SOLUTIONS**
SWD100



Service Manual

Service & Calibration
Instructions for:

Intelect® Shortwave 100 - REF 1602

Intelect® SWD 100 - REF 1600

Intelect® Shortwave 100 (Canada) - REF 1604

Senior Solutions™ SWD 100 - REF 1601



Chattanooga Group is an ISO 13485 Certified Company

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FOREWORD

Read, understand and follow all safety precautions and information contained in the manual. This information is intended to be used by trained and certified Chattanooga Group technicians.

The specifications put forth in this manual were in effect at the time of the publication. However, owing to Chattanooga Group's policy of continuous improvement, changes to these specifications may be made at any time without obligation on the part of Chattanooga Group.

Chattanooga Group requires that all Field Technicians stay informed and trained on all changes pertaining to the Intelect® Shortwave 100, Intelect® SWD 100, and Senior Solutions™ SWD 100.

Technicians repairing the Intelect Shortwave 100, Intelect SWD 100, and Senior Solutions SWD 100 agree to assume all risk and liability associated with this process.

The Intelect Shortwave 100, Intelect SWD 100, and Senior Solutions SWD 100 are to be used only under the prescription and supervision of a licensed practitioner.

DANGER

- Service Personnel, Technicians, and non-service personnel who have any metallic implants, any implanted system containing leads, or who have had an implant in the past should not service this unit.
- Since the effects of high-frequency fields on unborn life have not yet been sufficiently researched, we recommend that Service Personnel, Technicians, and non-service personnel who are pregnant are not within 15 meters of the applicator when the unit is activated.



SAFETY INSTRUCTIONS

PRECAUTIONARY DEFINITIONS

The precautionary instructions found in this section and throughout this manual are indicated by specific symbols. Understand these symbols and their definitions before operating this equipment. The definitions of these symbols are as follows:

CAUTION

Text with a "CAUTION" indicator will explain possible safety infractions that could have the potential to cause minor to moderate injury or damage to equipment.

WARNING

Text with a "WARNING" indicator will explain possible safety infractions that will potentially cause serious injury and equipment damage.

DANGER

Text with a "DANGER" indicator will explain possible safety infractions that are imminently hazardous situations that would result in death or serious injury.



Explosion Hazard

Text with an "Explosion Hazard" indicator will explain possible safety infractions if this equipment is used in the presence of flammable anesthetics.



Dangerous Voltage

Text with a "Dangerous Voltage" indicator serves to inform the user of possible hazards resulting in the electrical charge delivered to the patient or operator in certain treatment configurations.



Non-ionizing Electromagnetic Radiation

Text with a "Non-ionizing Electromagnetic Radiation" indicator informs the user of possible hazards resulting from elevated, potentially dangerous, levels of non-ionizing radiation.



Refer to Instruction Manual/Booklet

NOTE: Throughout this manual, "NOTE" may be found. These Notes are helpful information to aid in the particular area or function being described.

CAUTION

- Read, understand, and practice the precautionary operating instructions. Know the limitations and hazards associated with using any shortwave diathermy device. Observe the precautionary and operational decals placed on the unit.
- DO NOT operate the unit in conjunction with any other devices.
- DO NOT operate this unit in an environment where other devices are being used that intentionally radiate electromagnetic energy in an unshielded manner. Portable and mobile RF communications equipment can affect medical electrical equipment.
- The unit should be routinely checked before each use to determine that all controls function normally, especially that the output control does properly adjust the intensity of the shortwave diathermy power output in a stable manner. Also, determine that the treatment time control does actually terminate shortwave diathermy power output when the timer reaches zero.
- DO NOT use sharp objects such as a pencil point or ballpoint pen to operate the buttons on the control panel as damage may result.
- This unit should be transported and stored in temperatures between -40 °C and 70 °C (-40 °F and 158 °F) to prevent damage to the unit or its components.
- Handle shortwave diathermy accessories with care. Inappropriate handling of the accessories may adversely affect their characteristics.
- Inspect cables, electrodes, associated connectors, and accessories before each use. To test the Patient Interrupt Cord, follow the procedures listed in "Testing the Patient Interrupt Cord" on [page 15](#).
- External conductive material should be removed from the immediate treatment area.
- Do not use accessories other than those supplied with the unit, or recommended by Chattanooga Group. The safety of other products has not been established, and their use could result in injury to the patient and degrade minimum safety.
- Disconnect the Power Supply Cord before removing covers on this equipment.
- This equipment has an output that is capable of producing a physiological effect.
- Grounding reliability can only be achieved when the equipment is connected to an equivalent receptacle marked "Hospital Only," "Hospital Grade," or a receptacle otherwise properly grounded.
- Medical electrical equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in the User Manual.
- This unit generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to other devices in the vicinity. However, there is no guarantee that interference will not occur in a particular installation. Harmful interference to other devices can be determined by turning this equipment on and increasing the output. Try to correct the interference using one or more of the following: reorient or relocate the receiving device, increase the separation between the equipment, connect the equipment to an outlet on a different circuit from that to which the other device(s) are connected.
- Medical devices that are to be used within 12 meters of the unit should have an electromagnetic site survey completed. See NOTE 2 of Table 2: Guidance and Manufacturer's Declaration—Electromagnetic Immunity in Appendix A of the User Manual for more information.



CAUTION

- To determine the distance of separation for all equipment operating near the unit, consult the EMC tables (listed in Appendix A of the User Manual) applicable to the other equipment. If the distance cannot be determined, make certain that the other equipment is operated from a distance of no less than 12 meters.
- This equipment is to be used by, and sold to, a trained clinician only under the prescription and supervision of a licensed practitioner.

WARNING

- Since relatively high powers are used, there is the possibility of producing shock, localized burns, and cataracts if the patient is unaware of the heat due to reduced thermal sensation, or if the patient does not know what to expect during treatment.
- Improper installation, operation, or maintenance of the shortwave diathermy system may result in malfunctions of this unit or other devices.
- In case of Display Assembly failure or other obvious defects, switch the unit off immediately by means of the power switch and disconnect the power cord from the power outlet.
- Be aware that some synthetics and plastics, though assumed to be non-conductive, may be heated by shortwave diathermy.
- Adjustments or replacement of components may result in the equipment failing to meet the requirements for interference suppression.
- If the unit cannot be installed immediately after delivery, the unit and its external components or accessory elements must be stored in their original packaging in a dry place.
- Do not store or operate the unit in a dusty environment.
- Keep all electrodes, accessories, and their cords separated during treatment by using the cable clips located on the side of the arm extenders. Electrodes or their cords in contact with each other during treatment could result in improper stimulation, skin burns, or damage to the cord or electrode.
- Do not lean on or hold the cables during operation.
- Keep all line cords away from the diathermy unit cables. Do not store or coil line cords where they can come close to the cables on an operating shortwave diathermy unit.
- This equipment is not designed to prevent the ingress of water or liquids. Ingress of water or liquids could cause malfunction of internal components of the system and therefore create a risk of injury to the patient.
- Care must be taken when operating this unit adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, the unit should be observed to verify normal operation in the configuration in which it will be used. Potential electromagnetic or other interference could occur to this or other equipment. Try to minimize this interference by not using other equipment in conjunction with it.

WARNING

- Use only accessories that are specially designed for this unit. Do not use accessories manufactured by other companies on this unit. Chattanooga Group is not responsible for any consequence resulting from using products manufactured by other companies. The use of other accessories or cables (other than those specified) may result in increased emissions or decreased immunity of this unit.
- Metal in treatment area will provide low impedance paths to the induced radio frequency current, producing local heating and the possibility of burning. In particular, treatment should never be given in the area of metal implants. Also, metal jewelry, buckles, cell phones, etc must be removed.
- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous exposure to shortwave diathermy energy.
- This device should be kept out of the reach of children.
- Make certain that the unit is electrically earthed by connecting only to a earthed electrical service receptacle, conforming to the applicable national and local electrical codes.
- Make certain that the electrode arms and arm extenders are locked firmly into place during operation using the front and rear handwheels to prevent unintentional movement. See [pages 10 and 11](#) for the nomenclature of the unit.
- Do not leave patient unattended during shortwave diathermy therapy.
- Remove the electrode by pulling the cable connector only. DO NOT remove by pulling the cable.
- To remove the cable from the applicator, make certain the power is off. While the applicator is being supported by the electrode arm, hold the applicator while removing the cable to prevent the applicator from dropping to the floor.
- Observe the patient and the position of the arms at all times during therapy.
- Inform the patient that the arms are not supposed to move during therapy.
- In the event that an Error message or Warning appears beginning with a 2 or 3, immediately stop all use of the unit and contact the dealer or Chattanooga Group for service. Errors and Warnings in these categories indicate an internal problem with the unit that must be tested by Chattanooga Group or a Field Service Technician certified by Chattanooga Group before any further operation or use of the system. Use of a unit that indicates an Error or Warning in these categories may pose a risk of injury to the patient, user, or extensive internal damage to the system.
- Failure to press the tabs into place could result in the Display Assembly falling off the unit and becoming damaged.
- Be certain to note the locations of the cables when disconnecting PCB or parts from this unit in order to reconnect safely.
- Failure to use saline solution with the proper ratio of salt (with no additives) to distilled water will affect the operation of the unit and the output results. Be certain to accurately follow the directions for making the saline solution: add 1 tsp salt (with no additives) per every quart of distilled water, or 9 g per liter. The solution should be 0.9% weight per volume NaCl dissolved in H₂O.
- When using the 80 mm capacitive electrodes, do not exceed 80 W in continuous mode.



DANGER



- Do not administer shortwave diathermy to a patient who has had an implant in the past unless you are absolutely certain that the implant and all leads in their entirety have been removed. Note that the leads are often left implanted after the implant is removed.
- This unit generates non-ionizing radiation. Patients with implanted electronic devices, such as cardiac pacemakers and defibrillators, cochlear implants, bone growth stimulators, deep brain stimulators, spinal cord stimulators, and other nerve stimulators, must not be treated, even if the device has been turned off.
- The function of certain implanted devices (e.g., pacemakers) may be adversely affected during treatment with shortwave diathermy. In case of doubt, the advice of a licensed practitioner in charge of the patient should be sought.
- Service Personnel, Technicians, and non-service personnel who have any metallic implants, any implanted system containing leads, or who have had an implant in the past should not service this unit.
- Technicians without the proper equipment and/or training should not test the power output of this unit using a power meter.
- Pins 3 and 4 (P100) on the RF Generator Assembly (see [page 8](#)) or Variable Power Supply can carry electrical charge. Before attempting to service the unit, discharge pins 3 and 4 to ground through an 100 Ohm 5 W resistor.
- The mode of operation poses the risk of tissue destruction and/or death.
- Shortwave diathermy should not be used on patients who have any implanted metallic lead or any implanted system that may contain a lead. Both the heating and non-heating modes of operation pose a risk of tissue destruction. If you are a licensed practitioner who implants or monitors patients with leads or implanted systems with leads, explain to the patient what diathermy is and stress that they should not receive shortwave diathermy treatment. If you are a licensed practitioner who uses diathermy in your practice, be sure to ask patients about possible implants before deciding to administer shortwave diathermy.
- Other equipment, including patient connected devices, may be adversely affected when in close proximity to shortwave diathermy equipment.
- Patients should not be treated with shortwave diathermy when they have reduced thermal sensitivity over the proposed area of treatment, unless the physician in charge of the patient is notified.
- Treatment should not be given through clothing, although it is permissible to administer treatment through a dressing or plaster in pulsed modes.

DANGER



- Remove hearing aids prior to treatment.
- At average power levels above 5 W, patients should not be allowed to come into contact with conductive parts which are earthed or which have an appreciable capacitance to earth and which may provide unwanted pathways for the radio frequency current. In particular, treatment must never be given with the patient on metal framed couches, chairs, or beds. Do not use conductive mattresses or mattress covers.
- Before increasing the output in response to a report of inadequate patient heating, verify that the cables are properly routed, spaced correctly, and away from metal or grounded objects. The heating effect may be misdirected and heating may be occurring in an unwanted area.
- Before each use, check the condition of the housing and the insulation of the electrodes, electrode connection cable, and the Power Supply cable. Also make sure that the cables have been routed correctly.
- If the unit is not safe for operation, then it must be repaired by certified service personnel and the operators must be informed of the dangers posed by the unit.
- In order to prevent electrical shock, unplug the power plug from the socket before cleaning or disinfecting the unit.
- Under no circumstances may liquid penetrate the openings on the unit, e.g. the connecting sockets of the electrode cables. Therefore, do not use cleaning or disinfectant sprays.
- The unit, electrodes, and cables may not be sterilized using steam or gas.
- Never clean the unit with abrasives, disinfectants or solvents that could scratch the housing or damage the unit.
- Internal burns can occur with the incorrect application of shortwave diathermy due to excessive intensity.
- Internal burns can occur with the incorrect application of shortwave diathermy due to excessive exposure time.
- Do not perform unauthorized repairs under any circumstances.
- The unit and the electrodes must be positioned so that there is no danger of personal injury. Therefore, you must read and observe the safety instructions and the list of contraindications before putting the unit into operation.
- The Electrode-Skin Distance (ESD) must be small for surface warming and large for depth warming. A larger Electrode-Skin Distance (ESD) is necessary for patients with a thick layer of subcutaneous fat in order to achieve the necessary warming of deep-lying tissue.



DANGER



- Explosion hazard if the unit is used in the presence of flammable anesthetics mixture with air, oxygen, or nitrous oxide.
- The operator should not use diathermy over the heart in order to prevent theoretical cardiac signal interference.
- Never, under any circumstances, attempt to hold any of the electrodes in your hands during therapy.
- The unit must be installed so that there is no danger to the patient, the operator, or other persons. Therefore, you must read the safety instructions and contraindications.
- Keep all unnecessary persons out of the treatment location. No other person should be located within 3 meters of the unit.
- The unit may contain Di (2-ethylhexyl) phthalate (DEHP) which is the plasticizer for most PVC medical devices. Everyone is exposed to small levels of DEHP in everyday life. However, some individuals can be exposed to high levels of DEHP through certain medical procedures. DEHP can leach out of plastic medical devices into solutions that come into contact with the plastic. The amount of DEHP that will leach out depends on the temperature, the lipid content of the liquid, and the duration of contact with the plastic. As a preventative measure, use PVC devices that do not contain DEHP, or devices made of other materials such as ethylene (EVA), silicone, polyethylene, or polyurethane for all clinical procedures. Avoid using DEHP-leaching PVC when performing all clinical procedures on male neonates, pregnant women who are carrying male fetuses, or peripubertal males.

DANGER

- The unit may contain bisphenol-A (BPA) which is a building block of polycarbonate plastic used to make numerous consumer products (baby bottles, 5 gallon water bottles, etc). This chemical is considered an Unclassifiable Carcinogen and a suspected Endocrine disruptor which may interfere with or block hormones. BPA is highly toxic if swallowed, absorbed through the skin, or inhaled.
- In case of damage from transport that could endanger personal safety, the unit must not be connected to the Mains Power Supply before inspection is complete.
- Adhere to rules, regulations, and ordinances that may vary from location to location concerning the appropriate use of high powered radio frequency fields.
- Since the effects of high-frequency fields on unborn life have not yet been sufficiently researched, we recommend that Service Personnel, Technicians, and non-service personnel who are pregnant are not within 15 meters of the applicator when the unit is activated.
- Any persons with pacemakers or implants must remain outside of the treatment area during shortwave diathermy. No one wearing a cardiac pacemaker should be within 15 meters of an operating unit.
- After the removal or replacement of any part, verify the output power. Refer to [page 16](#) for instructions on using the Indicator Discharge Tube to test for output power.



SAFETY INSTRUCTIONS

PROTECTION OF THE UNIT

WARNING

Improper installation, operation or maintenance of the shortwave diathermy unit may result in malfunctions of this unit or other devices.

Observe the following instructions in order to prevent malfunctions:

- In order to prevent electromagnetic disturbances, place the unit at least 12 meters (see the Caution on [page 2](#) for more information) from any other devices. Also make sure that there is sufficient distance between the unit and Mains Power Supply or data cables in walls, ceilings and floors, since the electromagnetic radiation from the unit can pass these essentially without hindrance.
- In selecting the location for the unit, make sure that the patient has contact during the treatment to the non-earthed application element and, due to equalizing currents in case of differing potentials, that the patient is never in contact with metal elements (especially if they are earthed), such as heating radiators, metal beds or other earthed devices.

Before connecting the unit, make sure that:

- the voltage rating on the safety label corresponds to the available system voltage.
- the frequency rating on the rating plate corresponds to the system frequency.
- an earthed socket outlet with earthing contact is available for connecting the unit.
- the routing of the power cable from the unit to the socket outlet with earthing contact does not pose a danger for personnel or the patient.
- the Mains Power Supply is designed for the comparatively high (possibly additional) power input of the unit (~500 VA) and the line is sufficiently protected in accordance with regulations.

WARNING

Make certain that the unit is electrically earthed by connecting only to a earthed electrical service receptacle, conforming to the applicable national and local electrical codes.

Do not connect the unit to the Mains Power Supply until the following requirements have been met:

- Before putting the unit into operation, check to make sure that the electrode connection cable and the electrodes are undamaged and have been connected correctly to the unit.
- Never operate the unit with open outputs, (i.e. without electrodes).
- Do not operate the unit for an extended period with no load (without a patient), especially in coil (induction field) mode.
- Pay attention to the routing of the electrode connection cables. These must always be in the air and must never lie on surfaces.
- Other than Chattanooga Group equipment, keep chip cards, magnetic cards, audio and video cassettes, and other data media susceptible to interference away from the unit.
- Clean and disinfect the unit only when the Mains Power Supply is deactivated (power switch off, power plug disconnected).
- Clean and disinfect the unit only by means of disinfection by wiping. Disinfecting by spraying can damage the unit due to penetrating moisture.
- Never clean the unit with abrasives, disinfectants, or solvents that could scratch the housing or damage the unit.
- Never perform unauthorized service work. All service work must be performed only by service technicians who have been authorized by the manufacturer.



OVERVIEW

Shortwave diathermy is the application of electromagnetic energy to the body at shortwave frequencies. At these frequencies, the electromagnetic energy is converted to thermal energy by the induction of circulating currents in the tissue and dielectric absorption in insulating tissue. Shortwave diathermy units may produce varying output power levels providing significant heat to the area of the body being treated. To avoid equipment such as shortwave diathermy units interfering with radio communications, certain frequency ranges are designated by international agreement as ISM (Industrial, Scientific, and Medical) bands.

Shortwave diathermy equipment normally uses the band centered on 27.12 MHz. This corresponds to a wavelength, in a vacuum, of approximately 11 meters.

Shortwave diathermy is normally applied at a level which produces detectable heating and the benefits are those associated with the heating effect (encouragement of healing, pain relief, reduction of muscle spasm, increase in mobility, etc.).

The difference between shortwave diathermy and other methods of heating is that it provides "deep heat." Other heating techniques such as infrared therapy, hot packs, etc., provide the heat externally whereas shortwave diathermy generates heat within the tissue.

Pulsed Shortwave Diathermy - Introduction

Pulsed shortwave diathermy equipment delivers the energy in pulses or bursts of shortwave energy. The pulses are typically 20 to 400 μ sec in duration (pulse width) and are repeated with a frequency of 10 to 800 Hz (pulse frequency). As with other modalities such as ultrasound, it is found that delivering the energy in pulses is often therapeutically more beneficial than providing the same amount of energy in continuous waveform. Pulsed shortwave diathermy appears to be effective for many conditions especially in the early stages of recovery.

Because the output is pulsed, the average output power levels can be very low (less than 1 W) and still produce the effective treatment. The unit in pulsed mode provides a peak power of 200 W and average powers from a few mW to 64 W.

As the power levels are lower than with conventional shortwave diathermy equipment, some of the potential dangers associated with the modality no longer apply. The unit is of modular design. All individual parts can be installed and removed easily. Electrical and electronic modules are connected via plug-in connectors, eliminating the requirement for any solder.

The unit's electronics are located inside the chassis and underneath the LCD and on the PCB's for the Power Supply, amplifier, and RF Generator Assembly. The Power Supply, amplifier, and the RF Generator Assembly are located within the chassis behind the Rear Extrusion. The PCB's and other electrical modules are connected to each other by plug-in connectors and ribbon cables.

The unit and the accompanying components and individual elements fulfill, as a unit, the currently valid safety standards and comply with the stipulations of IEC 60601-1 and the medical products regulations.

The unit and its external components (accessory elements) are safe if used properly and in compliance with the explanations and instructions provided in this documentation. Nevertheless, the unit or its external components can pose dangers. Therefore, we strongly recommend that anyone operating the shortwave diathermy unit become aware of the potential dangers of the unit and its external components before beginning work.

Please read and observe all safety instructions in this service manual.

EFFECTIVE POWER - PULSED MODE

The effective power is the energy output which has a thermal or heating effect in the tissue of the patient. In continuous mode, therefore, the output power is identical with the effective power. Hence, the effective power shows the equivalent heating effect of the output in continuous mode.

The pulsed mode, in contrast, is known as athermal therapy, since the effective power is so minimal that the perceptible heating effect is not the point of the therapy. The main effect is pulses with high maximum energy outputs, and therefore, the deep-reaching effects are the widening of the vessels for improved blood circulation, trophic improvement, and prevention of inflammation. To achieve these effects, the effective power should not exceed 25W, otherwise the opposite can occur (i.e. a narrowing of the vessels).

The effective depth will depend on the maximum output. This means that therapy can reach considerable depths of tissue, even if the thermal load involved is considerably lower.

By changing the pulse frequency, the effective power can be adjusted to the desired level, even with high maximum pulse outputs (i.e. greater deep-reaching effects). The set effective power is shown on the graphic display. This makes the relationship between pulse frequency and thermal/heating effect (effective power) immediately clear.

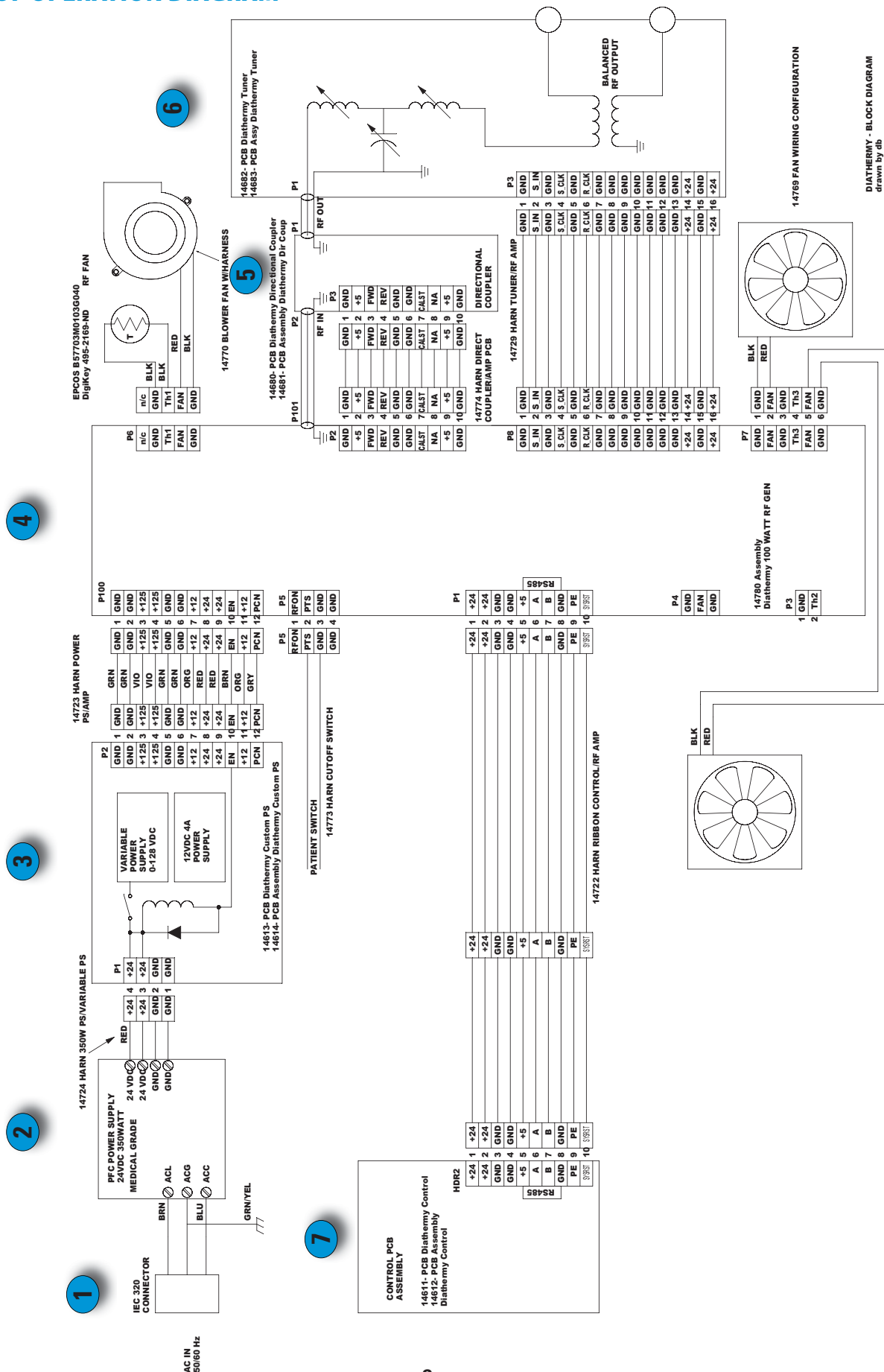
The higher the pulse frequency, the greater the thermal effect.



THEORY OF OPERATION

Shortwave Diathermy

THEORY OF OPERATION DIAGRAM





THEORY OF OPERATION DIAGRAM (CONTINUED)

1 First block: IEC Connector

Power is supplied through the appropriate line cord via the IEC connector.

2 Second Block: 24 V Power Supply

System power is provided by the 24 V DC/350 W Power Supply.

3 Third Block: Variable Power Supply/Buck Power Supply

This block in the power flow serves the following four basic functions:

1. Generates 12 V from the 24 V to power some circuits in the rest of the system.
2. Distributes 24 V to rest of system.
3. Generates variable power from 0 to 128 V DC that is used to power the final amplifier in the RF Generator Assembly.
4. Provides an additional relay (operated by the patient switch and watchdog) to shut down power to the RF Generator Assembly.

4 Fourth Block: Micro Controller and RF Generator Assembly

This block is the RF Generator Assembly. It consists of two parts: a Micro Controller and an RF Generator Assembly.

Micro Controller

The Micro Controller monitors and controls the RF Generator Assembly. It also communicates with the Control PCB (7th block) that serves as the user interface (Touch Screen LCD). Communication between the Micro Controller and the Control PCB is via RS 485. Power for the 7th block also comes from 4th block.

Auxiliary Functions of Micro Controller

The Micro Controller also functions to:

- measure the temp of the heat sink
- control the fan and blower speed
- monitor the state of Patient Interrupt Switch
- control the relays on the tuner board
- communicates with the Directional Coupler PCB (5th block).

RF Generator Assembly

The RF Generator Assembly produces the RF power used for treating the patient. There is a 27.12 MHz clock on the PC board. The output of the clock is gated by control line from the Micro Controller to control the duty cycle of the RF Generator Assembly. Power output of the RF Generator Assembly is controlled by varying the voltage of the Variable Power Supply (2nd block). The output voltage of the Variable Power Supply is controlled by the Micro Controller via analog voltage from a D/A converter.

5 Fifth Block: Directional Coupler PCB

The RF output of the RF Generator Assembly is transferred through the Directional Coupler PCB. The Directional Coupler PCB measures the forward and reverse power and provides feedback to the Micro Controller on the RF Generator Assembly (4th block). It also has a memory device that stores calibration information. DC power (+5 V) for this block is provided by the 4th block.

6 Sixth Block: Tuner Box

The Tuner matches the output of the unit to the patient load. It does this by using relays to switch coils and capacitors. Efficacy of tuning process is measured by the Directional Coupler PCB (5th block). DC power (+24 V) for this block is provided by the 4th block.

7 Seventh Block: Control PCB

The 7th block is also known as the Control PCB, GUI (Graphical User Interface) and the Touch Screen LCD. This block accepts commands from the user. and provides feedback to the user during operation. DC power (+24 V) for this block is provided by the 4th block.

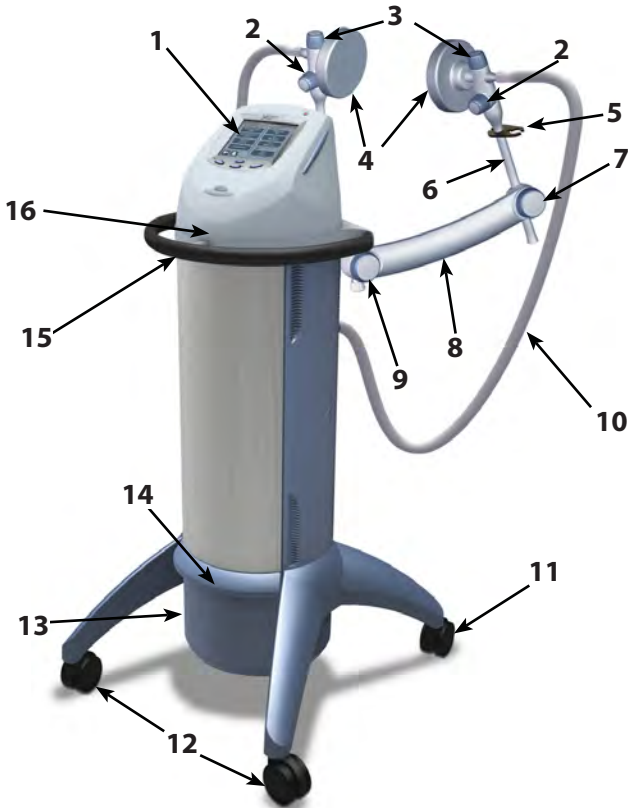


NOMENCLATURE

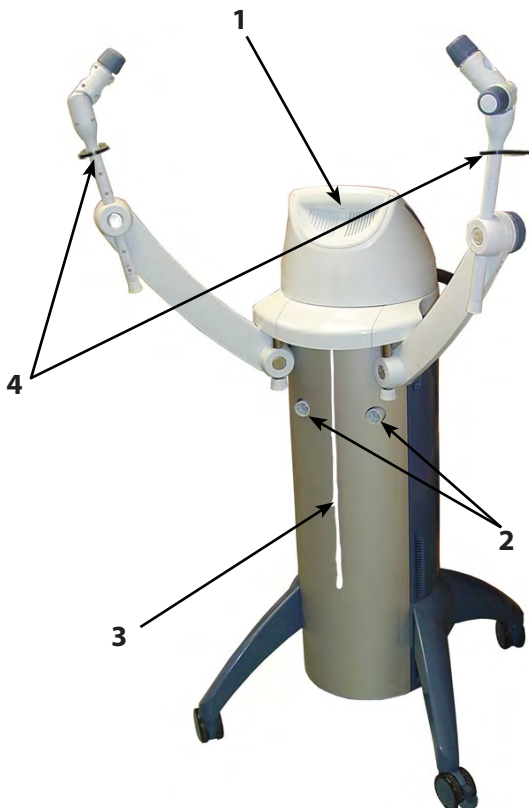
EXTERNAL COMPONENTS

The nomenclature graphics below indicate the general locations of the major components of the unit.

Know the components and their functions before performing any operation of or service to the unit.

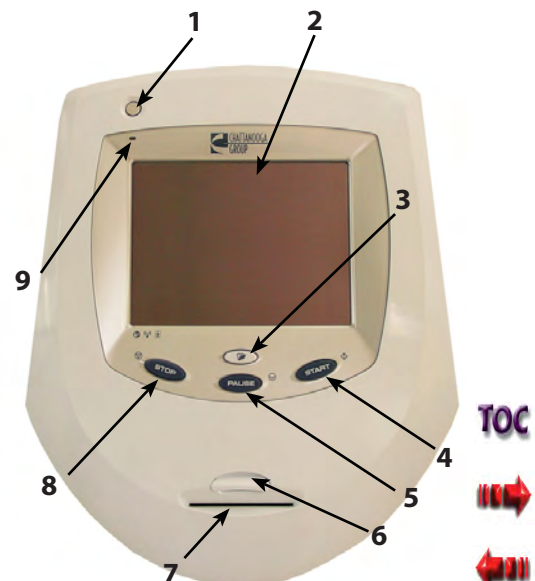


1. User Interface (see below)
2. Arm Extender Lock Knobs
3. Electrode Lock Knobs
4. Capacitive Electrodes 120 mm
5. Cable Clip
6. Arm Extenders
7. Front Handwheel
8. Electrode Arm
9. Rear Handwheel
10. Electrode Connection Cable
11. Locking Castor
12. Non Locking Castors
13. IEC Connector for Power Cord
14. Storage Bin
15. Grab Bar
16. Swivel Console



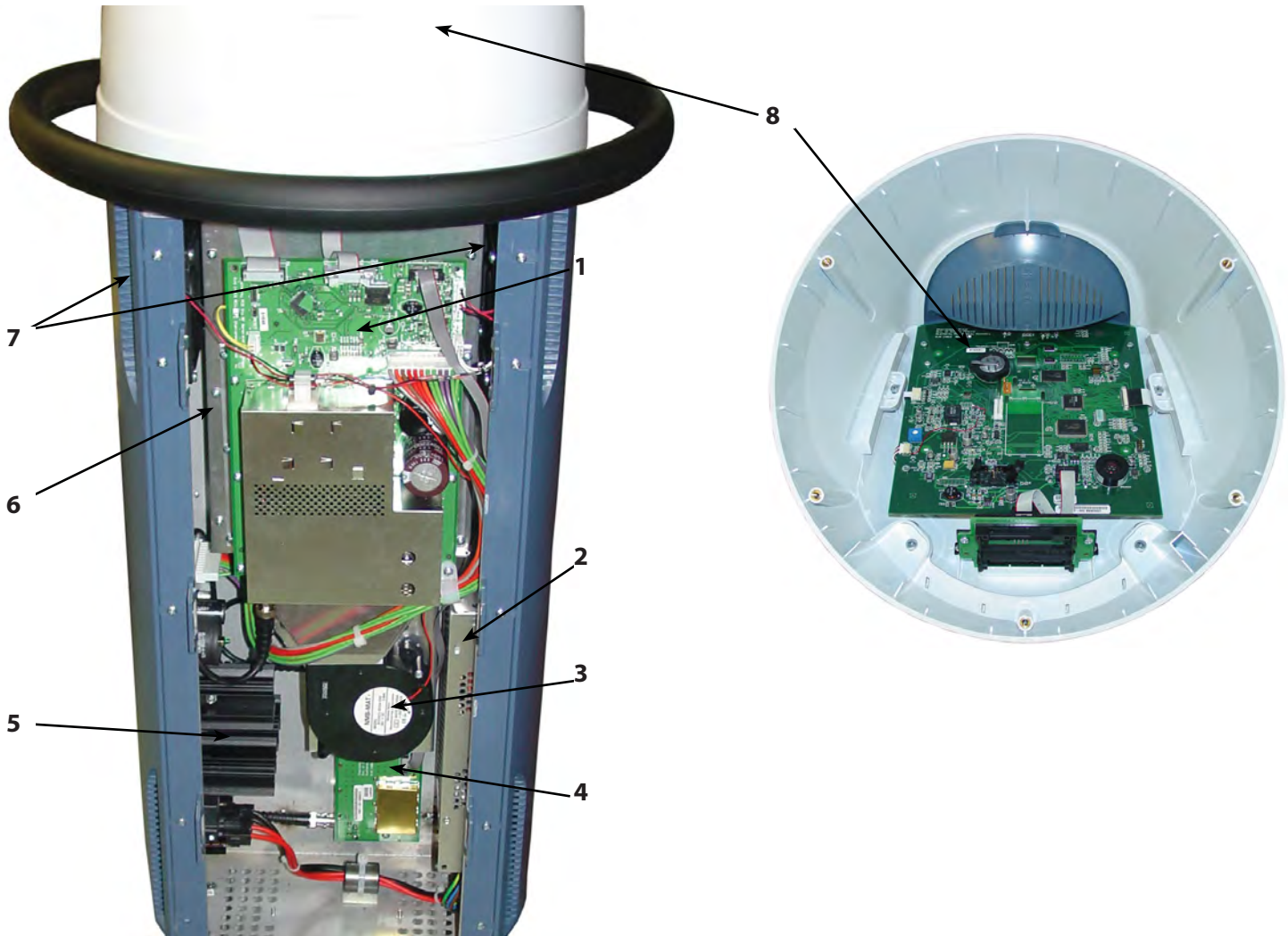
1. Expansion Port
(for factory diagnostic
purposes only)
2. Output Sockets
3. Patient Interrupt Cord
4. Cable Clips

1. Power On/Off Button
2. Liquid Crystal Display (LCD) and Touch Screen
3. Clinical Resources Button
4. START Button
5. PAUSE Button
6. Multimedia Card (MMC Port)
7. Patient Data Card Port
8. STOP Button
9. Power LED



INTERNAL COMPONENTS

The unit is housed in a sheet metal housing comprised of a number of separate parts. The individual parts making up the unit are as follows:



1. RF Generator Assembly
2. 24 V Power Supply
3. Blower
4. Directional Coupler PCB

5. Variable Power Supply
6. Tuner Box Assembly PCB
7. Fans
8. Control PCB



SPECIFICATIONS

UNIT SPECIFICATIONS



Software

The software is developed and provided by Chattanooga Group.
©2009 Encore Medical, L.P. and its affiliates, Austin, Texas, USA.

To view the version of the software, press the Unit Settings button on the Clinical Resources screen. The version number of the software appears at the top of the screen.

Transport and Storage Conditions

Ambient temperature -40 °C to 70 °C (-40 °F to 158 °F)
Relative Humidity 30% to 75%
Air Pressure 50 kPa to 1060 kPa

Safety

The unit conforms to the requirements of IEC/EN 60601-1, 60601-2-3, 60601-1-2, and 60601-1-4.



In order to prevent excessive warming of tissue, the maximum and average output power must not be exceeded.

Operating Data and Ratings

Width* 420 mm (16.5")
Depth* 410 mm (16.14")
Height* 970 mm (38.2")
Standard Weight (with diode electrode) 27.22 kg (60 lbs)
Ambient temperature +10 °C to 40 °C (50 °F to 104 °F)
Relative Humidity 30% to 75%
Air Pressure 700 kPa to 1060 kPa
Power Consumption 500 VA
Input
..... Model 1602 - 120-240 V ~, 50/60 Hz
..... Models 1600, 1601, and 1604 - 120 V ~, 50/60 Hz
Output Frequency 27.12 MHz ± 0.6%
Mode Pulsed or Continuous
Output Power 0 - 100 W in continuous mode at 50 ohms
..... 0 - 200 W in pulsed modes at 50 ohms
..... 0 - 80 W if 80 mm capacitive electrodes
..... are selected at 50 ohms
Power Increment Settings 5 W
Power Indication maximum and average power
Pulse Width 20 - 400 µsec in 20 µsec increments
Pulse Frequencies 10 - 800 Hz in 10 Hz increments
Treatment Duration
..... Model 1602 - 1-60 minutes in 1 minute increments
Models 1600, 1601, and 1604 - 1-30 minutes in 1 minute increments
Electrical Class CLASS I
Electrical Type (Degree of Protection) TYPE BF
Regulatory Risk Class IIb according to MDD 93/42/EEC

* without electrodes, electrode arm, and electrode cables



SPECIFICATIONS

DESCRIPTION OF DEVICE MARKINGS

Meets Directive 93 /42 /EEC, Complies with 21CFR 1040.10 &1040.11 IEC/UL/EN: IEC/EN 60601-1, 60601-2-3, 60601-1-2, and 60601-1-4

Electromedical equipment, Canadian Electrical Code. Part II: Safety standards for Electrical Equipment Risk Class I. Listed by Intertek Group, PLC with respect to electric shock, fire and mechanical hazards only in accordance with UL 60601-1, and CAN/CSA C22.2 No. 601.1-M90 w/Amd 2.

Refer to Instruction Manual/Booklet

Type BF Equipment

Council Directive 2002/96/EC concerning Waste Electrical and Electronic Equipment (WEEE). Indicates a requirement not to dispose of WEEE as municipal waste. Contact your local distributor for information regarding disposal of the unit and accessories.



Adjustments or replacement of components may result in the equipment failing to meet the requirements for interference suppression.

Non-ionizing Electromagnetic Radiation. Text with a "Non-ionizing Electromagnetic Radiation" indicator informs the user of possible hazards resulting from elevated, potentially dangerous, levels of non-ionizing radiation.



PREPARING TO TROUBLESHOOT THE UNIT

Introduction

Keep in mind the following:

- Information in this section, with respect to electronic components, is intended to help with troubleshooting the unit.
- Procedures are provided to determine whether electrical components need to be replaced.
- Once it has been determined that a particular part requires replacement, use only parts obtained from Chattanooga Group.

Replacement Components

Critical component replacement parts for the unit are available as subassemblies only. Individual components of these subassemblies will not be made available by Chattanooga Group.

General Tests and Repair Procedures

1. Certain tests and repair procedures may require use of special tools and fixtures. These will be listed at the particular test where they are required. Testing with any other special tool or fixture other than those stated could give erroneous readings or test results. Always perform the tests exactly as stated to ensure accurate results.
2. Test equipment settings will be listed for each test performed prior to the respective test. This will ensure the test is performed to Chattanooga Group standards and enable proper readings.

Operating Procedures

Refer to the User Manual for information regarding the operation of the unit (i.e. setting parameters and administering shortwave diathermy therapy), use of accessories, menu descriptions, and descriptions of indicator and operational elements.

Tools, Fixtures, and Equipment Required

- RF Watt Meter capable of reading 0 to 10 W and 0 to 100 W at 27.12 MHz
- Multimeter
- RF Sensor
- 50 Ohm 100 W RF Load
- Load: plastic container (at least 4 liters or 1 gallon) with saline solution

NOTE: The saline solution should be made by adding 1 tsp salt (with no additives) per every quart of distilled water, or 9 g per liter. The solution should be 0.9% weight per volume NaCl dissolved in H₂O.

- Safety tester that will perform tests in accordance with IEC/BS/60601-1
- Cordless Drill
- #1 Phillips Bit
- #2 Phillips Bit
- Indicator Discharge Tube (supplied with unit)
- 5/16 Nut Driver



VISUAL INSPECTION

Preparation for Use

Prior to each use, the following checks should be performed:

1. Check that the voltage specified on the type plate is the same as the Mains voltage at the premises.
2. Insert the electrodes in the recesses at the end of the electrode arms and fasten the electrodes in place with the locking screws.
3. Plug the electrode connector cables into the connector sockets at the back of the unit. Fasten the cables, if necessary, to the cable clips on the electrode arms.
4. Plug the inlet connector on the Mains cable into the corresponding socket on the side of the unit.

General Visual Inspection

1. Check the unit and accessories visually for any mechanical damage, which may impair their proper function.
2. Check all safety related labels for legibility.
3. Ensure all BNC cables are in the locked position.
4. Verify that the connectors are firmly in place.

ELECTRICAL SAFETY

The inside of the unit contains parts which are in direct electrical contact with the Mains Power Supply. Some service tasks require that the unit is operated while open and measurements to be taken and settings adjusted on the unit. In such cases, it is important that standard regulations on Safety Instructions against electric shock are complied with. When in operation, high voltages are generated in the electric circuit and high frequency Generator.

It is imperative that the User Manual and Service Manual are read before servicing this unit.

The unit conforms to the requirements of IEC/EN 60601-1, 60601-2-3, 60601-1-2, and 60601-1-4.

NOTE: This device complies with current leakage, ground continuity, and dielectric withstand (Hi-Pot) limits as prescribed by IEC/EN/UL 60601-1 and CSA/CAN 601.1 Medical Electrical, Part 1: General Requirements for Safety.

Facility, local, and national limits and test methods may vary.

TESTING THE PATIENT INTERRUPT CORD



WARNING

Failure to use saline solution with the proper ratio of salt (with no additives) to distilled water will affect the operation of the unit and the output results. Be certain to accurately follow the directions for making the saline solution.

Equipment Required

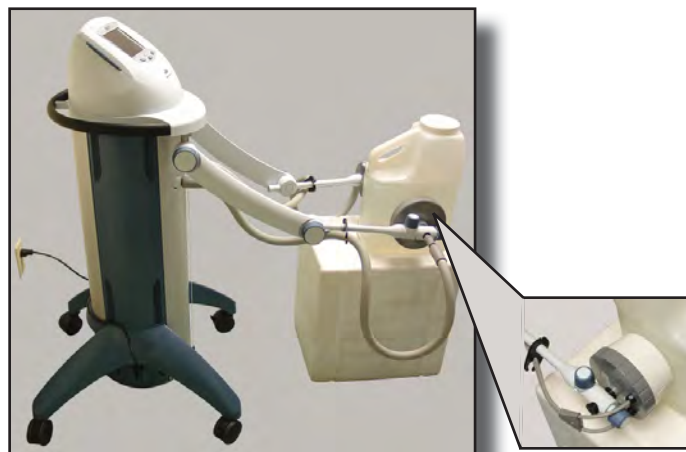
- Load: Plastic container with saline solution

NOTE: The saline solution should be made by adding 1 tsp salt (with no additives) per every quart of distilled water, or 9 g per liter. The solution should be 0.9% weight per volume NaCl dissolved in H₂O.

Testing the Patient Interrupt Cord

1. Place a plastic container filled with a saline solution between the two Capacitive Electrodes. If you are using the monode, place it against one side.

NOTE: The plastic container should be elevated off the floor at least 18 in (45.7 cm), via a non-conductive rest, to maintain separation between the plastic container and the potentially steel-reinforced concrete floor.



2. Connect to mains power.
3. Press the power on/off button or touch the screen to power up the unit.
4. Increase the output power (refer to the User Manual if necessary).
5. Press the START button.
6. Allow the unit to tune.
7. Pull the Patient Interrupt Cord.

If the Patient Interrupt Cord is working properly:

- the applicator stops emitting shortwave diathermy energy
- The (pause) symbol displays and blinks
- the message "*Treatment has been stopped by the patient. Press any button to continue.*"

8. Press any button on the unit to acknowledge the message.

ELECTRICAL SAFETY TEST

Conduct all necessary leakage tests at twelve month intervals or as directed by your facility, local, and national regulations.



The unit conforms to the requirements of IEC/EN 60601-1, 60601-2-3, 60601-1-2, and 60601-1-4.

0413



DANGER



High Voltage

GENERAL TROUBLESHOOTING

If the unit is malfunctioning, you should first verify that all harnesses are correctly plugged in and fully seated.

When troubleshooting, it is not always necessary to perform all the possible steps listed. If the first step solves the problem, it is not necessary to perform the next one in the list.

Unit is not Tuning

If the unit does not tune, do the following:

1. Try different electrode positions.
2. Try different electrodes.
3. Replace Directional Coupler PCB.
4. Replace the Tuner Box Assembly PCB.
5. Replace the RF Generator Assembly.

No Heat is Being Emitted

If unit does not provide heat, do the following:

1. Verify the output power using the Indicator Discharge Tube. Refer to the next section for instructions necessary to use the Indicator Discharge Tube.

If the Indicator Discharge Tube does not illuminate, continue with the next step.

If the Indicator Discharge Tube illuminates, continue with the steps listed in "Testing the Directional Coupler PCB" on [page 18](#).

2. Verify that electrodes and lead wires are correctly placed.
3. Check lead wires for continuity.
4. Replace the RF Generator Assembly.
5. Replace the Variable Power Supply.
6. Replace Tuner Assembly PCB

Unit is not Powering Up

If unit does not power up, do the following:

1. Check the power cord to make sure that it is fully plugged into IEC connector on the side of the unit.
2. Check the 24 V Power Supply.
3. If the 24 volt Power Supply is providing 24 volts to the unit and the system still does not power up, replace the Control PCB.

Using the Indicator Discharge Tube to Test for Output Power

To verify that shortwave diathermy energy is actually being transmitted, this small, fluorescent tube illuminates when it's held between the capacitive or flexible rubber electrodes, or near the monode and diode (assuming a therapy session is in progress).

NOTE: The Indicator Discharge Tube will not illuminate if the output power is at a low setting.



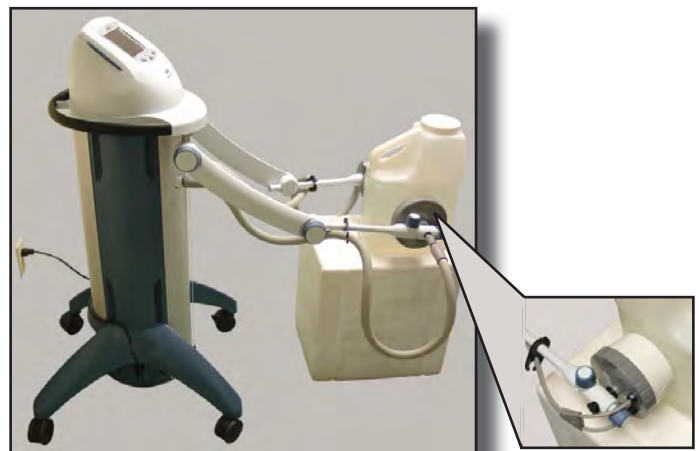
Equipment Required

- Load: Plastic container with saline solution
- Indicator Discharge Tube

Using the Indicator Discharge Tube

1. Place a plastic container filled with a saline solution between the two Capacitive Electrodes. If you are using the monode, place it against one side.

NOTE: The plastic container should be elevated off the floor at least 18 in (45.7 cm), via a non-conductive rest, to maintain separation between the plastic container and the potentially steel-reinforced concrete floor.



GENERAL TROUBLESHOOTING (CONTINUED)

Using the Indicator Discharge Tube to Test for Output Power (continued)

2. Increase the output power to 50 W (refer to the User Manual if necessary).
3. Ensure the output mode is set to Continuous.
4. Press the START button.
5. Hold the Indicator Discharge Tube close to the applicators.

NOTE: If the applicators are emitting energy, the Indicator Discharge Tube illuminates. If the unit is in constant mode, the Indicator Discharge Tube stays illuminated. If the unit is in pulse mode, the Indicator Discharge Tube blinks. The Indicator Discharge Tube will not illuminate if the output power is at a low setting.





TESTING THE DIRECTIONAL COUPLER PCB

Tools and Equipment Required

- Directional Coupler PCB
- Shortwave Unit
- RF Sensor
- Wattmeter
- 50 Ohm Test Load
- 2 Coaxial Cables

Testing the Directional Coupler PCB

1. Unplug the unit.
2. Remove the end of the coaxial cable that connects the Tuner Box Assembly PCB to the P1 connection on the Directional Coupler PCB and allow it to hang.

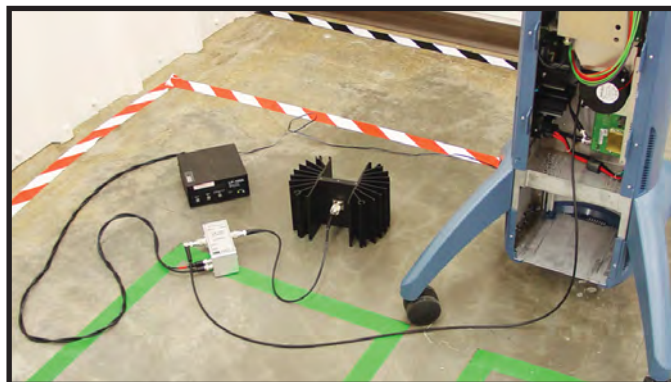


3. Connect a new coaxial cable from P1 on the Directional Coupler PCB to the input port on the RF sensor.



4. Make certain that the 50 Ohm test load is connected to the output port on the RF sensor.

The configuration should appear similar to the following:



5. Plug in the unit.
6. Press the power on/off button or touch the screen to power up the unit. The Home screen displays.
7. Begin a treatment according to procedures listed in the user manual and increase the output power to 80 W Continuous.
8. Verify that the output power level is between 80.00w and 100.00w on the wattmeter.



The testing procedure is now complete.

9. If the output level **is not** within the 80.00 to 100.00w range, you must re-calibrate the Directional Coupler PCB. Refer to [pages 19-22](#) for instructions necessary for calibrating the Directional Coupler PCB.

If the output level **is** within the 80.00 to 100.00w range, reconnect the unit by continuing with steps 10-12.

10. Unplug the unit.
11. Disconnect the coaxial cable from the P2 connection on the Directional Coupler PCB.
12. Re-connect the coaxial cable from the Tuner Box Assembly PCB to the P2 connection on the Directional Coupler PCB.





CALIBRATING THE DIRECTIONAL COUPLER PCB

The Directional Coupler PCB must be recalibrated if it is not operating within specifications after testing has been performed (see [page 18](#)) for instructions on testing the Directional Coupler PCB.

The screens may vary slightly from unit to unit (e.g., Intellect Shortwave 100, Intellect SWD 100, and Senior Solutions SWD 100), but the procedures for calibrating the Directional Coupler PCBs are identical. For instruction, the Senior Solutions SWD 100 will be used.

Equipment Required

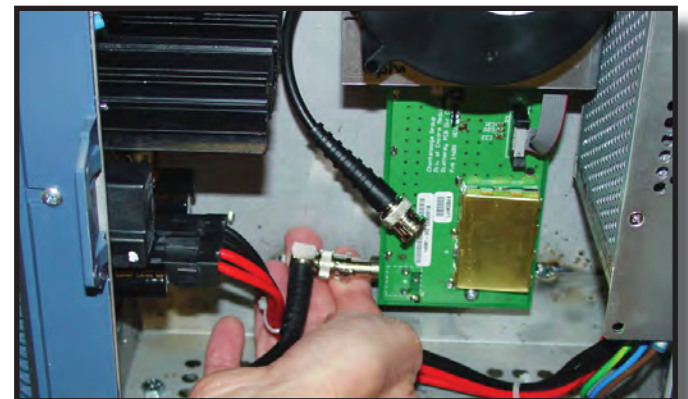
- Directional Coupler PCB
- Shortwave Unit
- RF Sensor
- Wattmeter
- 50 Ohms Test Load
- 2 Coaxial Cables

Calibrating the Directional Coupler PCB

1. Perform all procedures listed in "Testing the Directional Coupler PCB" on [page 18](#).

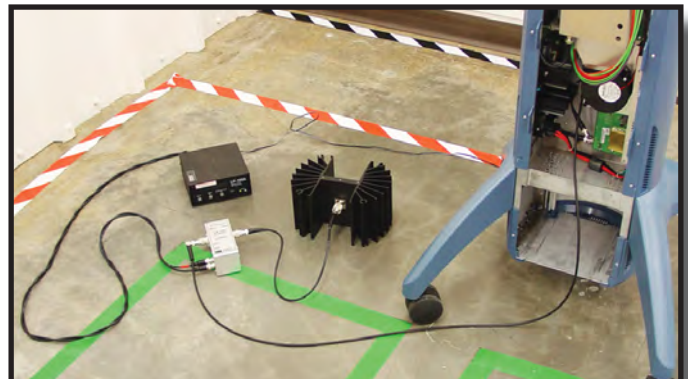
NOTE: Perform the steps in this section **ONLY** if the output level is not within the 80.00 to 100.00w range (step 9 on [page 18](#)). Therefore, the unit must be configured as if step 9 on page 18 has just been completed.

2. Unplug unit.
3. Switch the coaxial cables connected to the Directional Coupler PCB so that the coaxial cable from the RF Generator Assembly is connected to P1 on the Directional Coupler PCB and the coaxial cable from the input port RF sensor is connected to P2 on the Directional Coupler PCB.



NOTE: Make certain that the 50 Ohm test load is connected to the RF sensor.

The configuration should appear similar to the following:



4. Plug in the unit.
5. Press the power on/off button or touch the screen to power up the unit. The Home screen displays.





CALIBRATING THE DIRECTIONAL COUPLER PCB (CONTINUED)

Calibrating the Directional Coupler PCB (continued)

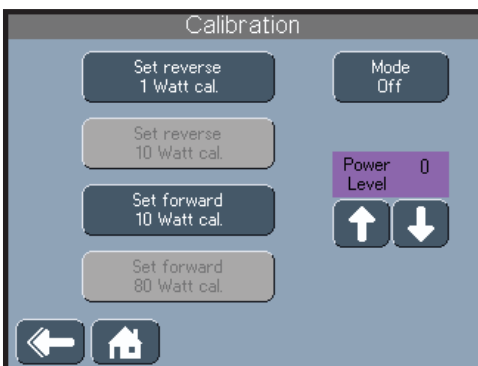
- Press the Clinical Resources button. The Clinical Resources screen displays.




- Press and hold the STOP, START, and Clinical Resource buttons simultaneously. The CG Technician Utilities screen displays.



- Press the Calibration button. The Calibration screen displays.





- Press the  button on the screen so that the Power Level reads 1.



- Press the Mode Off button so that Mode Continuous displays.



- Press the  button on the screen until 1.00 W (or as close as you can get it) displays on the wattmeter.

NOTE: When holding down the  button, be sure to release it as the power level approaches 1.00 W so that the equipment is not damaged by excessive power levels.




- Press the Set reverse 1 Watt cal. button on the screen.






CALIBRATING THE DIRECTIONAL COUPLER PCB (CONTINUED)

Calibrating the Directional Coupler PCB (continued)

13. Press the  button on the screen until 10.00 W (or as close as you can get it) displays on the wattmeter.

NOTE: When holding down the  button, be sure to release it as the power level approaches 10.00 W so that the equipment is not damaged by excessive power levels.





14. Press the Set reverse 10 Watt cal. button on the screen.

15. Unplug the unit.

16. Switch the coaxial cables connected to the Directional Coupler PCB so that the coaxial cable from the RF Generator Assembly is connected to P2 on the Directional Coupler PCB and the coaxial cable from the input port RF sensor is connected to P1 on the Directional Coupler PCB.


17. Repeat steps 6-12.


18. Press the  button on the screen until 10.00 W (or as close as you can get it) displays on the wattmeter.

NOTE: When holding down the  button, be sure to release it as the power level approaches 10.00 W so that the equipment is not damaged by excessive power levels.



19. Press the Set forward 10 Watt cal. button on the screen.

20. Press the  button on the screen until 80.00 W (or as close as you can get it) displays on the wattmeter.

NOTE: When holding down the  button, be sure to release it as the power level approaches 80.00 W so that the equipment is not damaged by excessive power levels.

21. Press the Set forward 80 Watt cal. button on the screen.

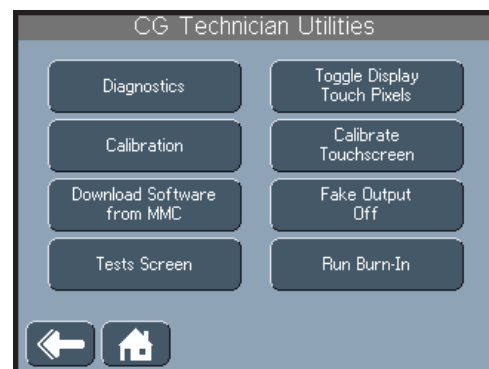
22. Press the on/off button to power off the unit.

23. Press the power on/off button or touch the screen to power up the unit. The Home screen displays.

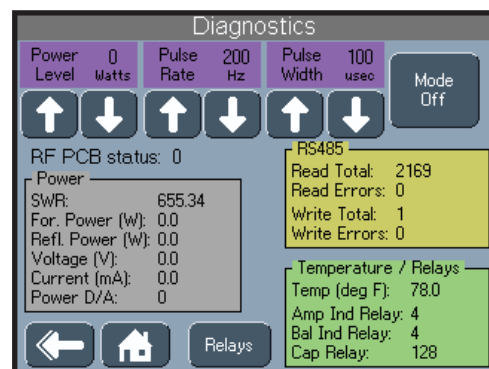
24. Press the Clinical Resources button. The Clinical Resources screen displays.




25. Press and hold the STOP, START, and Clinical Resource buttons simultaneously. The CG Technician Utilities screen displays.



26. Press the Diagnostics button. The Diagnostics screen displays.



27. In the Power Level section, press the  button on the screen until 7 Watts displays.

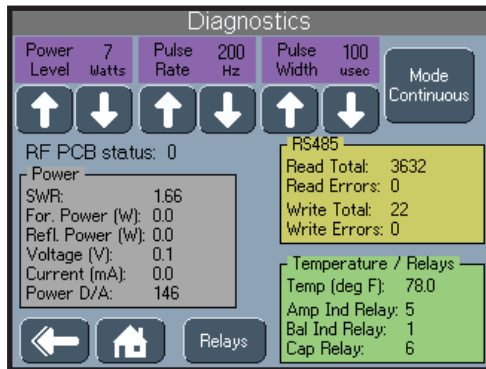





CALIBRATING THE DIRECTIONAL COUPLER PCB (CONTINUED)

Calibrating the Directional Coupler PCB (continued)


28. Press the Mode Off button on the screen so that Mode Continuous displays.



NOTE: Allow the unit to tune. The unit should tune within 60 seconds.

29. In the Power Level section, press the  button on the screen until 10 Watts displays.
30. Allow the power level of the unit sufficient time to stabilize. Verify that the level is between 9.00w and 14.00w on the wattmeter.

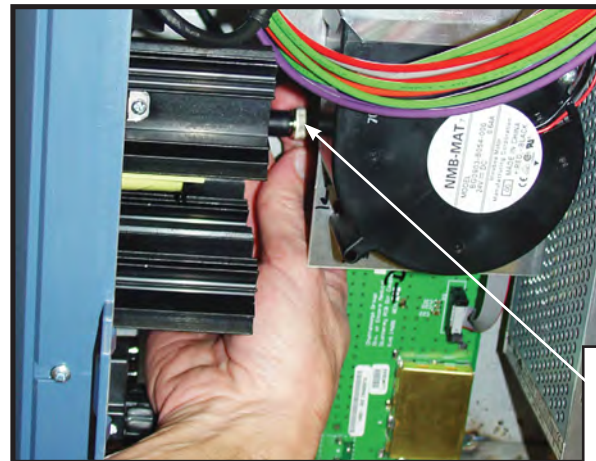


31. In the Power Level section, press the  button on the screen until 80 Watts displays.
32. Allow the power level of the unit sufficient time to stabilize. Verify that the level is between 80.00w and 100.00w on the wattmeter.



33. Unplug the unit.

34. Disconnect the coaxial cable from the P1 connection on the Directional Coupler PCB.



Coax on P1 Connection on Directional Coupler PCB

35. Re-connect the coaxial cable from the Tuner Box Assembly PCB to the P1 connection on the Directional Coupler PCB. The Directional Coupler PCB calibration process is complete.
36. After completing the calibration process, verify the output power. Refer to [page 16](#) for instructions on using the Indicator Discharge Tube to test for output power.



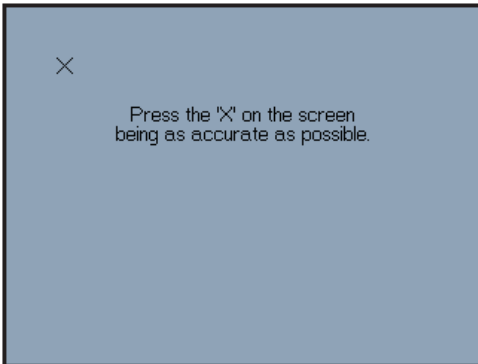
CALIBRATING THE TOUCH SCREEN

Equipment Required

- None

Calibrating the Touch Screen

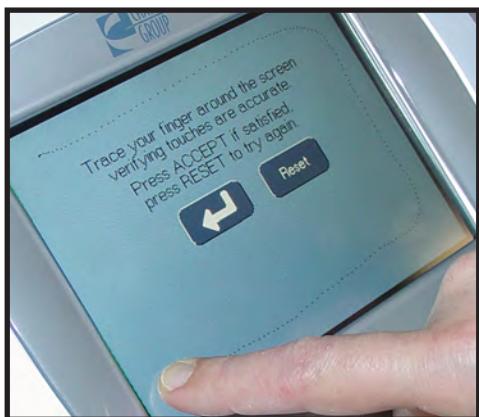
1. With the unit turned off, press and hold the STOP and PAUSE buttons simultaneously until the Calibrate Touch Screen window displays.




2. Follow the directions on the screen by touching the window directly on the X. Repeat this step four times for each corner of the window. After the fourth attempt, the tracing window displays.



3. Press and slide your finger across the screen. Verify that your finger leaves a trail of dots on the screen where you have touched.



4. Press the  button to accept the calibration.
5. If necessary, press Reset to restart the Touch Screen recalibration process and repeat steps 1 - 4.



When addressing error codes, it is not always necessary to perform all the possible remedies listed. If the first possible remedy solves the problem, it is not necessary to perform the next one in the list.

Code	Definition	Possible Remedy
100	Patient Interrupt Cord was pulled.	<ol style="list-style-type: none"> 1. Release cord. 2. Check Patient Interrupt Cord harness to make sure it is secure (pages 32 and 33). 3. Replace Patient Interrupt Cord Assembly (pages 32 and 33).
102	Save to Patient Card button was pressed, but there is no patient card inserted.	<ol style="list-style-type: none"> 1. Insert a known good patient card. 2. Check harness that connects patient card to Control PCB (pages 32 and 33). 3. Replace the MMC PCB (page 34). 4. Replace Control PCB (page 34).
103	Save to Patient Card button was pressed, but the card that is currently inserted in the Patient Data Card Port is not a valid Patient Data Card.	<ol style="list-style-type: none"> 1. Insert a known good Patient Data Card. 2. Check harness that connects Patient Data Card to Control PCB (page 34). 3. Replace the MMC PCB (page 34). 4. Replace Control PCB (page 34).
104	Save to Patient Card button was pressed, but the card that is currently inserted in the Patient Data Card Port is full.	<ol style="list-style-type: none"> 1. Insert a new good Patient Data Card. 2. Erase the current Patient Data Card and retry. 3. Check harness that connects Patient Data Card to Control PCB (page 34). 4. Replace the MMC PCB (page 34). 5. Replace Control PCB (page 34).
106	No patient name was entered when the Save to Patient Card button was pressed.	There is nothing wrong with the unit. Refer to User Manual for more information about saving treatments to the Patient Data Card.
107	No protocol name was entered when attempting to save a protocol.	There is nothing wrong with the unit. Refer to User Manual for more information about saving protocols.
108	Retrieve Protocol button was pressed, but no user protocols have been set up in the unit.	There is nothing wrong with the unit. Refer to the User Manual for more information about saving user protocols.

Code	Definition	Possible Remedy
109	Protocol cannot be saved because the unit has maximum number of protocols already saved.	Delete the necessary number of protocols. There are 200 available.
110	MMC is being accessed, but there is no MMC inserted into the MMC port.	There is nothing wrong with the unit. Refer to User Manual for more information about using MMC cards.
114	Treatment being accessed on the Patient Data Card is a traction type of treatment.	There is nothing wrong with the unit. Refer to User Manual for more information about accessing treatments from the Patient Data Card.
115	Treatment being accessed on the Patient Data Card is an electrotherapy type of treatment.	There is nothing wrong with the unit. Refer to User Manual for more information about accessing treatments from the Patient Data Card.
117	Treatment being accessed on the Patient Data Card is an unknown type of treatment.	There is nothing wrong with the unit. Refer to User Manual for more information about accessing treatments from the Patient Data Card.
119	Unit failed to tune properly.	<ol style="list-style-type: none"> 1. Tell the patient to be still. 2. Check all connections and that electrodes are positioned properly. 3. Replace the Directional Coupler PCB (page 32). 4. Replace the Tuner Box Assembly PCB (page 32). 5. Replace the RF Generator Assembly (page 35).
200	A real time clock error occurred.	Replace Control PCB (page 34).
201	An error erasing Patient Data Card occurred.	<ol style="list-style-type: none"> 1. Check harness that connects the patient card to the Control PCB (page 34). 2. Replace the MMC PCB (page 34). 3. Replace Control PCB (page 34).
202	Bad checksum when unit is reading Patient Data Card.	Erase Patient Data Card and retry.
203	Protocol memory is corrupt.	<ol style="list-style-type: none"> 1. Reset default protocols 2. Replace Control PCB (page 34).





Code	Definition	Possible Remedy
204 205	Problem accessing MMC.	<ol style="list-style-type: none"> 1. Check harness that connects the patient card to Control PCB (page 34). 2. Replace the MMC PCB (page 34). 3. Replace Control PCB (page 34).
206 207	Problem upgrading Control PCB software.	<ol style="list-style-type: none"> 1. Try another MMC. 2. Replace Control PCB (page 34).
208 209	Problem upgrading RF Generator Assembly software.	<ol style="list-style-type: none"> 1. Try another MMC 2. Replace RF Generator Assembly (page 35).
211	RF Generator Assembly detected an over-current fault.	<ol style="list-style-type: none"> 1. Ensure all coax cables are not pinched or frayed and are properly connected. 2. Replace Directional Coupler PCB (page 32). 3. Replace Tuner Box Assembly PCB (page 35). 4. Replace RF Generator Assembly (page 35).
212	RF Generator Assembly detected a mismatched voltage fault.	<ol style="list-style-type: none"> 1. Replace Variable Power Supply (page 32). 2. Replace RF Generator Assembly (page 35).
213	RF Generator Assembly detected an excessive forward power fault.	<ol style="list-style-type: none"> 1. Ensure all coax cables are not pinched or frayed and are properly connected. 2. Replace Directional Coupler PCB (page 32). 3. Replace Tuner Box Assembly PCB (page 35). 4. Replace RF Generator Assembly (page 35).
214	RF Generator Assembly detected an excessive reflected power fault.	<ol style="list-style-type: none"> 1. Ensure all coax cables are not pinched or frayed and are properly connected. 2. Replace Directional Coupler PCB (page 32). 3. Replace Tuner Box Assembly PCB (page 35).
215	RF Generator Assembly detected a communications watchdog fault.	<ol style="list-style-type: none"> 1. Check harness from RF Generator Assembly (page 35) to Control PCB (page 34). 2. Replace RF Generator Assembly (page 35). 3. Replace Control PCB (page 34).
216	RF Generator Assembly reset abnormally.	Replace RF Generator Assembly (page 35).

Code	Definition	Possible Remedy
217	RF Generator Assembly detected the internal temperature is too high.	<ol style="list-style-type: none"> 1. Ensure fans are functional (they should always be running). If fans are not running, check fan harness, or replace fans. 2. Check air flow inlets and outlets for obstructions (dust, etc.). 3. Turn unit on and allow the fans to cool the unit for approximately 20 minutes. 4. Replace RF Generator Assembly (page 35).
218	RF Generator Assembly detected a Variable Power Supply watch dog fault.	<ol style="list-style-type: none"> 1. Ensure all coax cables are not pinched or frayed and are properly connected. 2. Replace Directional Coupler PCB (page 32). 3. Replace Tuner Box Assembly PCB (page 35). 4. Replace RF Generator Assembly (page 35).
219	RF Generator Assembly detected a configuration test fault.	<ol style="list-style-type: none"> 1. Ensure all coax cables are not pinched or frayed and are properly connected. 2. Replace Directional Coupler PCB (page 32). 3. Replace Tuner Box Assembly PCB (page 35). 4. Replace RF Generator Assembly (page 35).
220	RF Generator Assembly detected a serial port 1 test fault.	<ol style="list-style-type: none"> 1. Replace Control PCB (page 34). 2. Replace RF Generator Assembly (page 35).
221	RF Generator Assembly detected a serial port 2 test fault.	Replace RF Generator Assembly (page 35).
222	RF Generator Assembly detected a Patient Interrupt Cord reset error.	<ol style="list-style-type: none"> 1. Make sure the Patient Interrupt Cord harness (pages 32 and 33) is connected to the RF Generator Assembly (page 35). 2. Verify continuity of Patient Interrupt Cord (pages 32 and 33) with multimeter. 3. Replace RF Generator Assembly (page 35).
223	RF Generator Assembly detected an EEPROM fault.	<ol style="list-style-type: none"> 1. Replace Directional Coupler PCB (page 32). 2. Replace RF Generator Assembly (page 35).





ERROR CODES

Code	Definition	Possible Remedy
224	RF Generator Assembly detected D/A voltage at rail.	<ol style="list-style-type: none"> 1. Verify continuity between Variable Power Supply (page 32) and RF Generator Assembly (page 35). 2. Replace Directional Coupler PCB (page 32). 3. Replace Variable Power Supply (page 32). 4. Replace RF Generator Assembly (page 35).
300	Cannot initiate communications with RF Generator Assembly.	<ol style="list-style-type: none"> 1. Check harness from RF Generator Assembly (page 35) to Control PCB (page 34). 2. Replace RF Generator Assembly (page 35). 3. Replace Control PCB (page 34).
302	Time out occurred while waiting for the RF Generator Assembly to complete power up self test.	Replace RF Generator Assembly (page 35).
303	RF Generator Assembly failed power up self test.	<ol style="list-style-type: none"> 1. Ensure Patient Interrupt Cord is not pulled. 2. Check the Patient Interrupt Cord harness (pages 32 and 33). 3. Ensure the cable between the Directional Coupler PCB (page 32) and the RF Generator Assembly (page 35) is connected. 4. Replace Directional Coupler PCB (page 32). 5. Replace RF Generator Assembly (page 35).

Code	Definition	Possible Remedy
304	Unit needs to be calibrated.	<ol style="list-style-type: none"> 1. Check the harness between the Directional Coupler PCB (page 32) and the RF Generator Assembly (page 35). 2. Calibrate Directional Coupler PCB (page 32). 3. Replace Directional Coupler PCB (page 32). 4. Replace RF Generator Assembly (page 35).
305 306 307 308 309 310 311	Control PCB to RF Generator Assembly communication error.	<ol style="list-style-type: none"> 1. Check harness from RF Generator Assembly (page 35) to Control PCB (page 34). 2. Replace RF Generator Assembly (page 35). 3. Replace Control PCB (page 34).
312	Error reading EEPROM.	<ol style="list-style-type: none"> 1. Check harness connecting the MMC PCB to the Control PCB (page 34). 2. Replace the MMC PCB (page 34). 3. Replace Control PCB (page 34).
320	RF Generator Assembly general fault.	Replace RF Generator Assembly (page 35).
321	RF Generator Assembly program memory checksum error.	Replace RF Generator Assembly (page 35).
322	RF Generator Assembly voltage reference power up test failed.	Replace RF Generator Assembly (page 35).



REMOVAL AND REPLACEMENT

ACCESSING THE CHASSIS

In order to access the chassis and the inner electrical components of the unit, you must perform the instructions in the order they appear in this section.

DANGER

- Under no circumstances should the components be replaced without switching off the power and disconnecting the power plug to prevent injury or damage.
- Pins 3 and 4 (P100) on the RF Generator Assembly (see [page 8](#)) or Variable Power Supply can carry electrical charge. Before attempting to service the unit, discharge pins 3 and 4 to ground through an 100 Ohm 5 W resistor.
- Adjustments or replacement of components may result in the equipment failing to meet the requirements for interference suppression.

Tools and Equipment Required

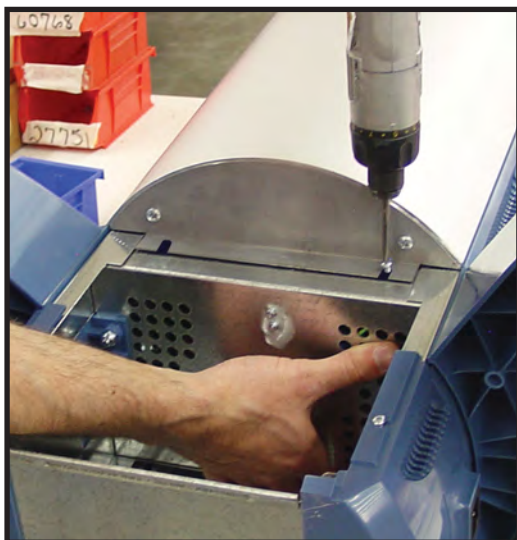
- Cordless Drill
- #1 Phillips Bit
- #2 Phillips Bit

Removing the Front Extrusion

1. Unplug the unit from the Mains Power.
2. Remove the drawer.



3. Remove the two mounting screws using the cordless screw driver and the #1 Phillips bit.



4. Slide the Front Extrusion down and out of the shoulder molding.



5. Pull the Front Extrusion straight off the chassis.



REMOVAL AND REPLACEMENT

ACCESSING THE CHASSIS (CONTINUED)

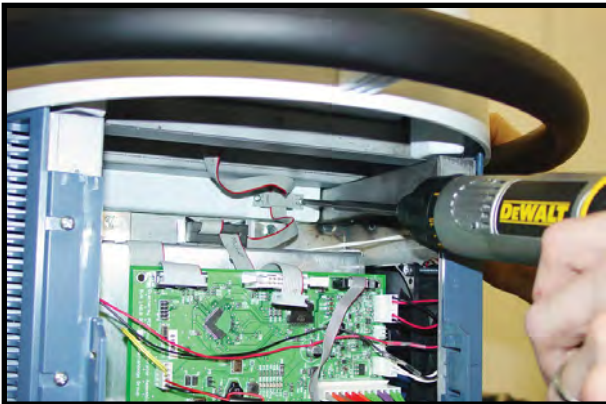
Removing the Display Assembly

1. Complete the steps listed in the previous section entitled "Removing the Front Extrusion" on [page 27](#).
2. Remove the module cavity cover.

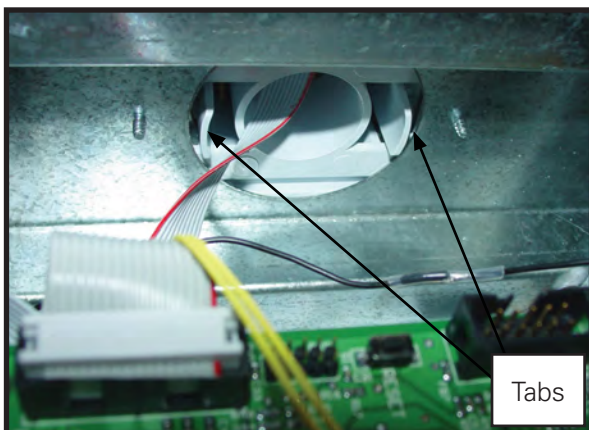


3. Using the cordless drill and #1 Phillips bit, remove the control ribbon cable from the shoulder molding by removing two screws.

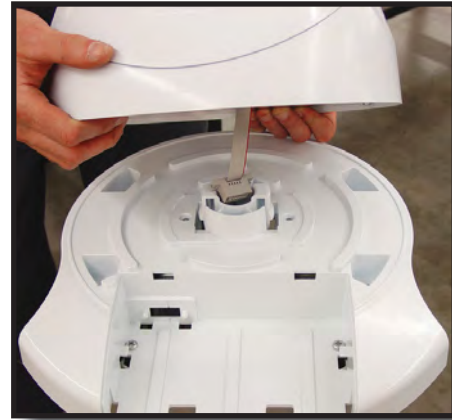
NOTE: Keep in mind that the red stripe on the control ribbon cable is on the left.



4. Pinch the locking tabs together.



5. While pinching the tabs, lift the Display Assembly off the unit, being careful to feed the ribbon cable bracket through the pivot plate.



NOTE: When replacing the Display Assembly, make certain to hold the Display Assembly with one hand and press the tabs firmly up and against the pivot plate until they click into place.

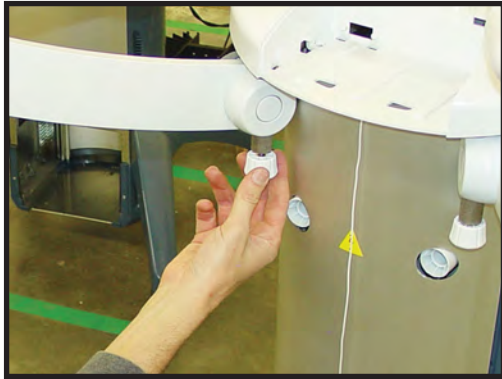


REMOVAL AND REPLACEMENT

ACCESSING THE CHASSIS (CONTINUED)

Removing the Rear Extrusion

1. Complete the steps listed in the previous sections entitled "Removing the Front Extrusion" on [page 27](#) and "Removing the Display Assembly" on [page 28](#).
2. Remove the pivot arm knob by turning counter clockwise.



3. Remove the two small screws holding the rear end cap to the chassis using the cordless drill and the #2 Phillips bit.



4. Remove the two screws holding the shoulder molding to the Rear Extrusion using the cordless drill and the #2 Phillips bit.

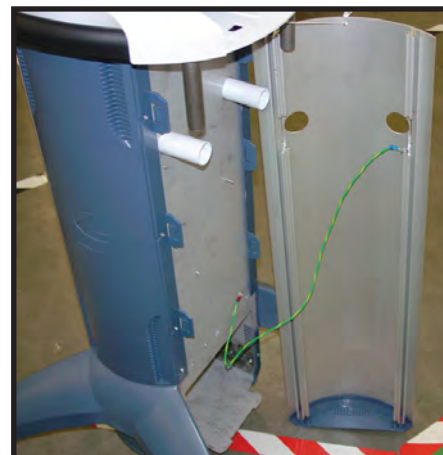


5. Loosen the Rear Hand Wheel by turning it counter clockwise and slide the arm off the arm rod.



6. Pull the Rear Extrusion straight off the chassis and carefully maneuver it off the output sockets.

NOTE: Because of the attached ground wire harness, do not pull the Rear Extrusion too forcefully.



REMOVAL AND REPLACEMENT

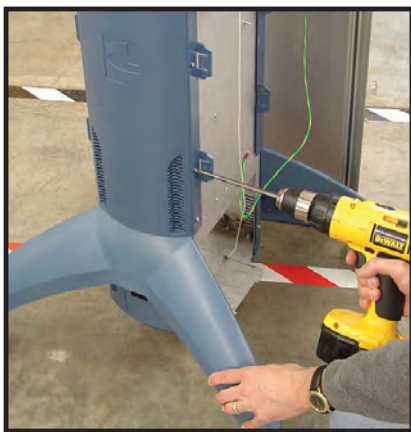
Removing the Rear Extrusion (continued)

NOTE: When replacing the Rear Extrusion, make sure the metal tabs fit inside the rear end cap.



Removing the Side Covers

1. Complete the steps listed in the previous sections entitled "Removing the Front Extrusion" on [page 27](#), "Removing the Display Assembly" on [page 28](#), and "Removing the Rear Extrusion" on [page 29](#).
2. Using the cordless drill and #1 Phillips bit, remove all ten screws from each of the Side Covers.



DIRECTIONAL COUPLER PCB

Tools and Equipment Required

- Cordless Drill
- #1 Phillips Bit

Refer to [pages 32](#) and [33](#) for detailed diagrams necessary for the removal and installation of the Directional Coupler PCB.

NOTE: Before removing the Directional Coupler PCB, remove the six screws (part 10) that hold the Blower Assembly to the Tuner Box Assembly PCB and slide the Blower Assembly out of the way.

Refer to [pages 19-22](#) for instructions necessary for calibrating the Directional Coupler PCB.

TUNER BOX ASSEMBLY PCB

Tools and Equipment Required

- 5/16 Nut Driver
- Cordless Drill
- #1 Phillips Bit

Refer to [pages 32](#) and [35](#) for detailed diagrams necessary for the removal and installation of the Tuner Box Assembly PCB.

BLOWER ASSEMBLY

Tools and Equipment Required

- Cordless Drill
- #1 Phillips Bit

Refer to [page 35](#) for detailed diagrams necessary for the removal and installation of the Blower Assembly.

FAN ASSEMBLY

Tools and Equipment Required

- Cordless Drill
- #1 Phillips Bit

Refer to [page 32](#) for detailed diagrams necessary for the removal and installation of the Fan Assembly.

DISPLAY ASSEMBLY

Tools and Equipment Required

- Cordless Drill
- #1 Phillips Bit

Refer to [pages 33](#) and [34](#) for detailed diagrams necessary for the removal and installation of the Display Assembly.



WARNING

Failure to press the tabs into place could result in the Display Assembly falling off the unit and becoming damaged.

REMOVAL AND REPLACEMENT

ACCESSING THE CHASSIS (CONTINUED)

24 V POWER SUPPLY

Tools and Equipment Required

- Cordless Drill
- #1 Phillips Bit

Refer to [pages 32 and 33](#) for detailed diagrams necessary for the removal and installation of the 24 V Power Supply.

Tips for Removing the 24 V Power Supply

1. Remove the Side Covers before attempting to remove the 24 V Power Supply. For more information, see "Removing the Side Covers" on [page 30](#).



WARNING

Be certain to note the locations of the cables when disconnecting PCB or parts from this unit in order to reconnect safely.

DANGER

After the removal or replacement of any part, verify the output power. Refer to [page 16](#) for instructions on using the Indicator Discharge Tube to test for output power.

VARIABLE POWER SUPPLY

Tools and Equipment Required

- 5/16 Nut Driver
- Cordless Drill
- #1 Phillips Bit

Refer to [pages 32 and 33](#) for detailed diagrams necessary for the removal and installation of the Variable Power Supply.

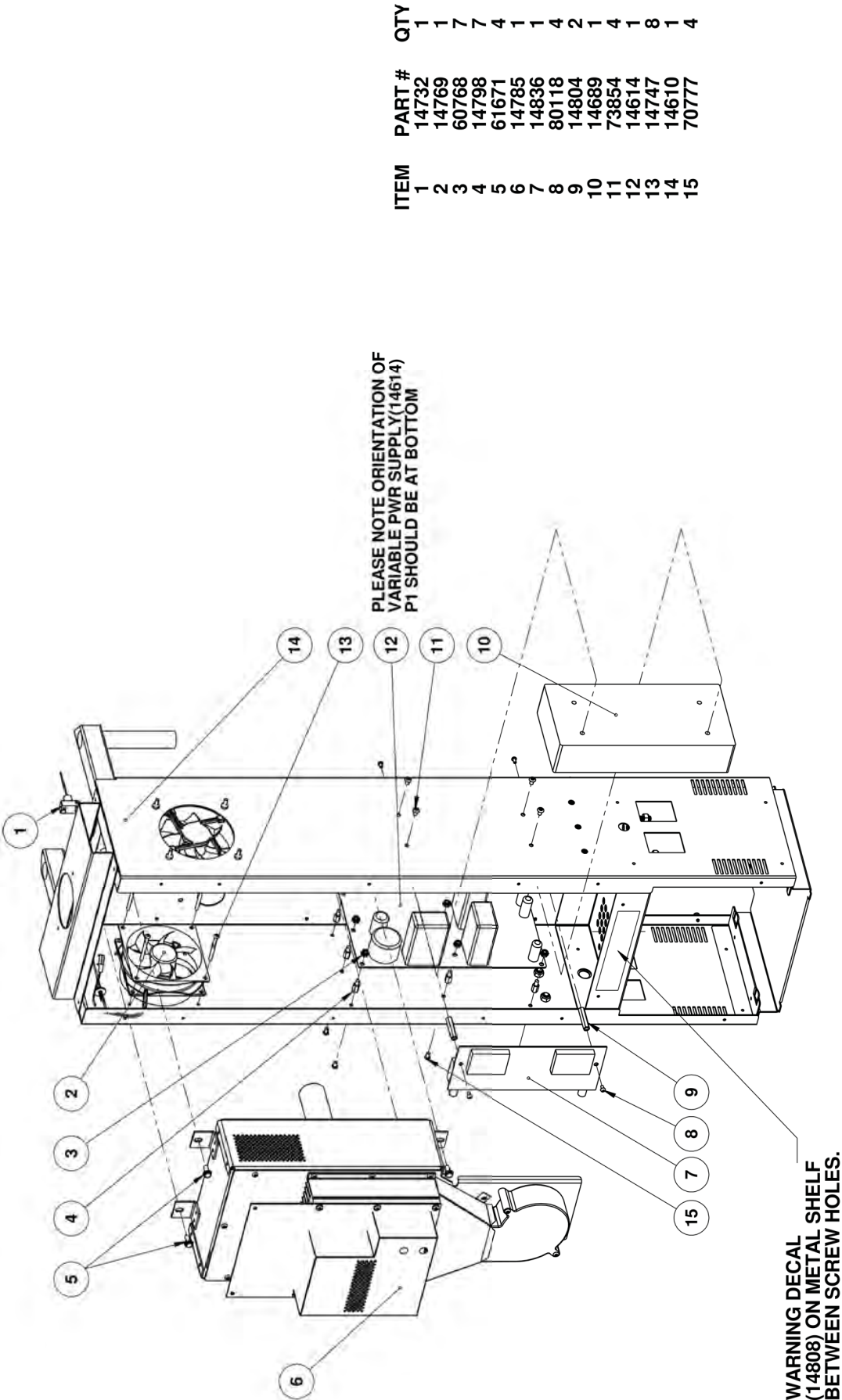
Tips for Removing the Variable Power Supply

1. Remove the Side Covers before attempting to remove the Variable Power Supply. For more information, see "Removing the Side Covers" on [page 30](#).





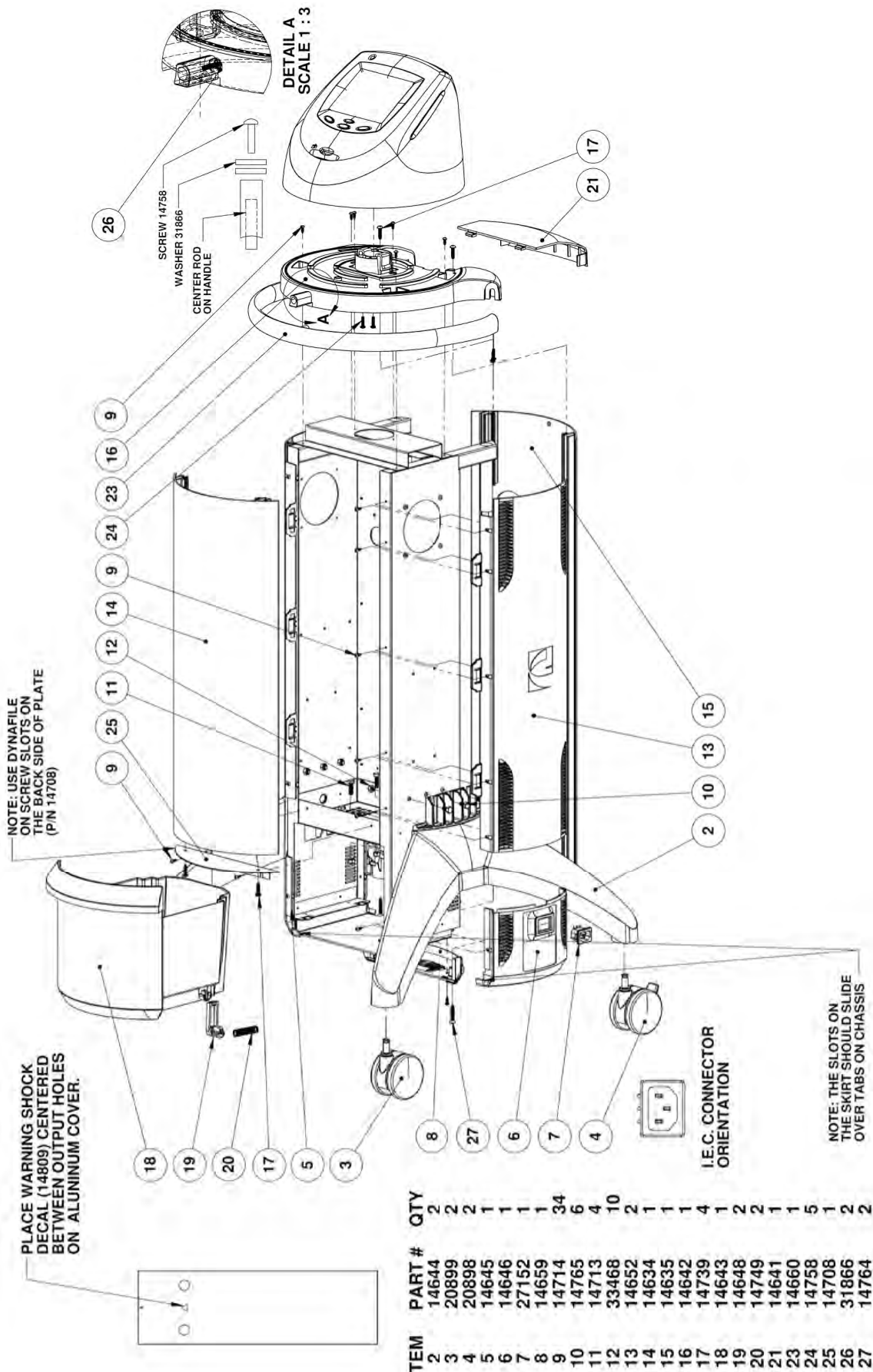
CHASSIS ASSEMBLY 1



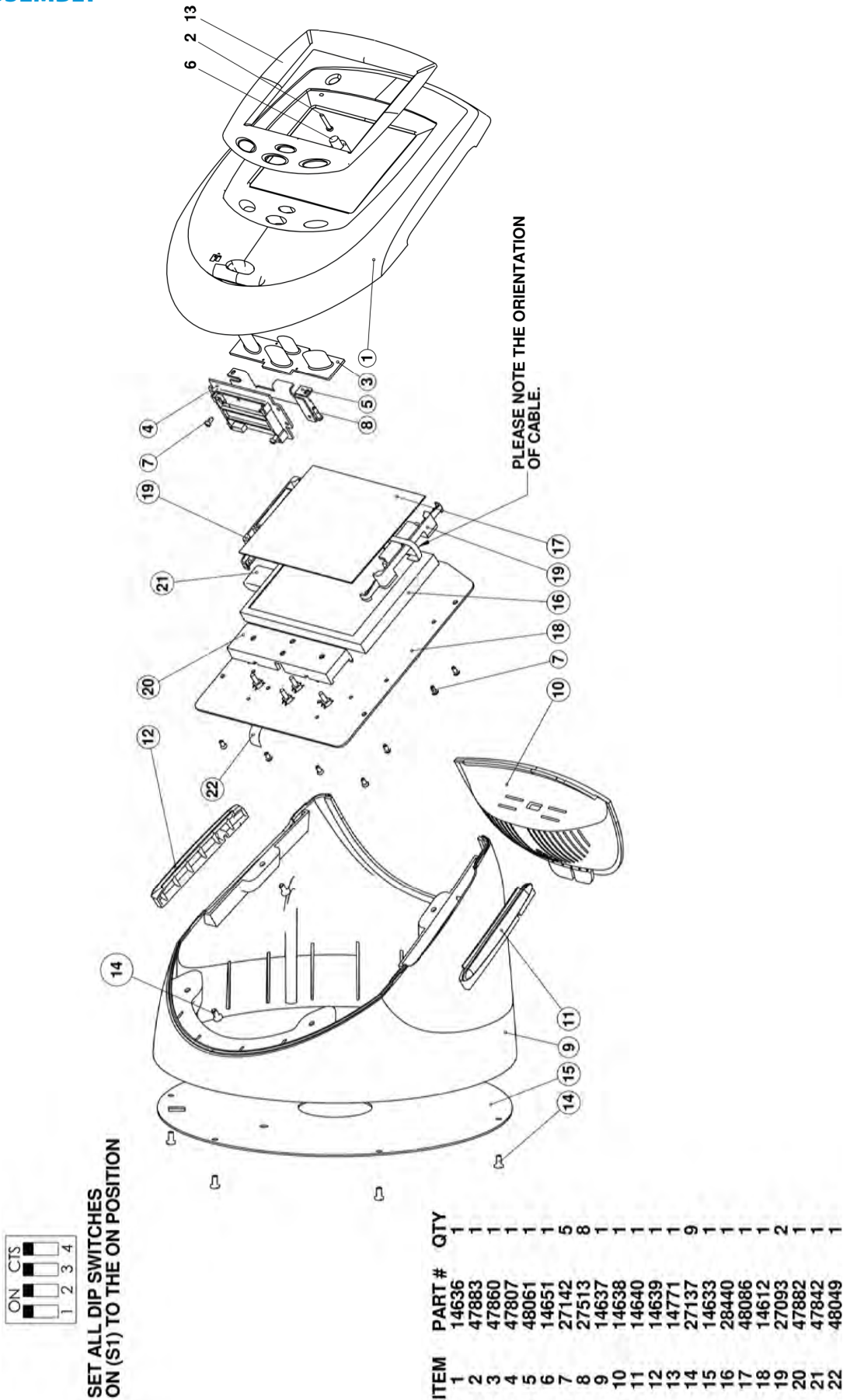
ITEM	PART #	QTY
1	14732	1
2	14769	1
3	60768	7
4	14798	7
5	61671	4
6	14785	1
7	14836	1
8	80118	4
9	14804	2
10	14689	1
11	73854	4
12	14614	1
13	14747	8
14	14610	1
15	70777	4



CHASSIS ASSEMBLY 2



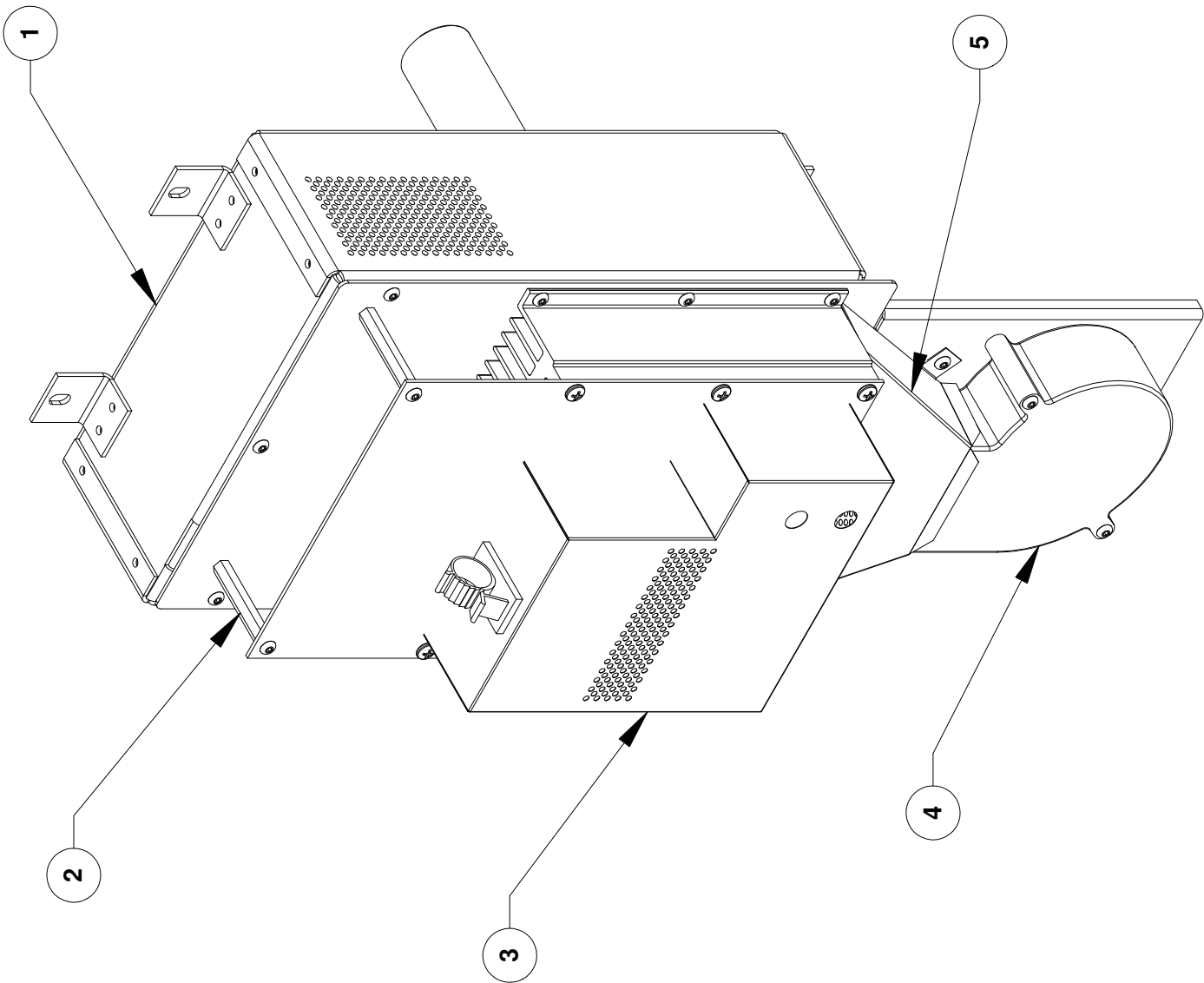
DISPLAY ASSEMBLY





TUNER BOX ASSEMBLY PCB

ITEM	PART#	QTY.
1	14854	1
2	14855	2
3	14780	1
4	14770	1
5	14754	1





CLEANING

Routine Maintenance

Keep in mind the following when maintaining the unit:

- As the manufacturer, Chattanooga Group is responsible for the safety and reliability of the unit only if it is used in accordance with the User Manual.
- Repairs and modifications may be performed only by a certified service center or field technician certified by Chattanooga Group.

Cleaning and Disinfection

When cleaning the unit, keep in mind the following:

- Press the Power On/Off button so that the unit is off.
- Unplug the power plug from the power outlet before cleaning or disinfecting the unit.
- After each patient use, clean the accessories using a soft, clean cloth dampened with water and a mild antibacterial detergent. Avoid the use of abrasive materials and cleaning solvents.
- Wait until the unit is completely dry before operating it again.

DANGER

- Under no circumstances may liquid penetrate the openings on the unit (e.g. the connecting sockets of the electrode cables). Therefore, do not use cleaning or disinfectant sprays.
- The unit, electrodes, and cables may not be sterilized using steam or gas.
- Never clean the unit with abrasives, disinfectants, or solvents that could scratch the housing or LCD or otherwise damage the unit.
- In order to prevent electrical shock, unplug the power plug from the power outlet before cleaning or disinfecting the unit.

SAFETY INSPECTIONS

The following safety inspections must be performed on this unit. This must be done by persons who, based on training, knowledge or practical experience, are capable of conducting the inspections correctly and independently.

DANGER

If the unit is not safe for operation, it must be repaired by a certified service technician and the operators must be informed of the dangers posed by the unit.

ANNUAL SAFETY INSPECTION

The following safety inspections must be performed on this unit by an authorized service technician at twelve month intervals or as directed by your facility, local, and national regulations. Service Technicians should be trained and certified Chattanooga Group technicians.

SERVICE

DANGER

Do not perform unauthorized repairs under any circumstances.

All units returned to the factory for service must include the following:

Warranty Repair/Out of Warranty Repair

1. Written statement containing the following information:
 - Return Authorization (PCR) number- obtain from factory
 - Unit model number
 - Unit serial number
 - Contact person with phone and fax numbers
 - Billing address (for out of warranty repair)
 - Shipping address (where to ship unit after repair)
 - Detailed description of problem or symptoms
2. Copy of original invoice issued at purchase of the unit.
3. Ship the unit to address specified by a certified service technician.

Service to these units should be performed only by Service Technicians certified by Chattanooga Group.

NOTE: The unit was calibrated during the manufacturing process and is ready to be placed into service upon delivery.

Council Directive 2002/96/EC concerning Waste Electrical and Electronic Equipment (WEEE). Indicates a requirement not to dispose of WEEE as municipal waste. Contact your local distributor for information regarding disposal of the unit and accessories.





REPLACEMENT PARTS

Shortwave Diathermy

ACCESSORIES

REF	Description	Qty
14762	Indicator Discharge Tube	1
14668	Intellect Shortwave 100 CD User Manual	1
14715	Intellect SWD 100 CD User Manual	1
14663	Senior Solutions SWD CD User Manual	1
14670	Intellect Shortwave 100 Quick Start Guide	1
14719	Intellect SWD 100/Senior Solutions SWD 100 Quick Start Guide	1
020453216	Capacitive Electrode 80 mm diameter	1
020453217	Capacitive Electrode 120mm diameter	1
	One of the following power cords:	
14679	U.S. [18 AWG, 118 in (300 cm), Shielded]	1
14814	Switzerland [18 AWG, 118 in (300 cm), Shielded]	1
14815	UK [18 AWG, 118 in (300 cm), Shielded]	1
14816	India [18 AWG, 118 in (300 cm), Shielded]	1
14817	Israel [18 AWG, 118 in (300 cm), Shielded]	1
14818	Denmark [18 AWG, 118 in (300 cm), Shielded]	1
14819	Australia [18 AWG, 118 in (300 cm), Shielded]	1
14820	EU [18 AWG, 118 in (300 cm), Shielded]	1
14821	Japan [18 AWG, 118 in (300 cm), Shielded]	1
020453218	Capacitive Electrode 165 mm diameter	1
02200002	Monode (Drum) Electrode	1
020969553	Diplode (Coil Field Electrode 18 x 39 cm) with cable	1
020453266	Flexible Rubber Electrode 180 x 120 inclusive one Linenpocket and one intermediate felt layer	1
020453267	Flexible Rubber Electrode 250 x 145 inclusive one Linenpocket and one intermediate felt layer	1
14712	Connection cable for Capacitive Electrodes	1
14779	Cable clips	1
4538963EH725	Rubber strap 1 row of holes 135 cm long 2,7 cm wide	1

CHASSIS ASSEMBLY 1 (PAGE 32)

REF	Description	Qty
14732	Patient Interrupt Cord (Assembly)	1
14769	Fan (Assembly)	1
60768	Nut 6-32 ESNA#22NM-62 Plated	7
14798	Standoff 6-32X.375 #7210K-ND	7
61671	Screw #10X5/8 HX W/HD S/M Plated	4
14785	Tuner Enclosure	1
14836	Directional Coupler PCB	1
80118	Screw 6-32X5/16 Pan Head Phillips Plated	4
14804	Standoff 6-32X1-1/4 #1818K-ND	2
14689	24 V Power Supply	1
73854	Screw M4X6	4
14614	Variable Power Supply	1
14747	Screw M4X30MM Long Phillips Plated	8
14610	Unit Chassis	1
70777	Screw 6-32X1/4 Round Head Phillips Plated	4
14808	Warning Decal	1

CHASSIS ASSEMBLY 2 (PAGE 33)

REF	Description	Qty
14644	Chassis Legs	2
20898	Locking Caster	2
20899	Non-Locking Caster	2
14645	Side Skirt IEC Connector Molding	1
14646	IEC Side Skirt	1
27152	IEC Connector	1
14659	Rear End Cap	1
14714	Screw Tap 6-20x3/8 Pan Head Phillips Plated	34
14765	Screw M6x12mm Hex Plated	6
14713	Screw Hex M6x20mm Long	4
33468	Nut Hex M6 ESNA Zinc Plated	10
14652	Side Cover	2
14634	Front Extrusion	1
14635	Rear Extrusion	1
14642	Shoulder Molding	1
14739	Screw #12X1 Type B	4
14643	Drawer	1
14648	Drawer Spring Guide	2
14749	Drawer Spring	2
14641	Module Cavity Cover	1
14660	Handle	1
14758	Screw M4X16MM Long Phillips Plated	5
14708	Front End Cap	1
31866	Washer 1/16X3/16IDX1/2OD	2
14764	Screw #12X1-1/4 Oval Head Phillips	2

DISPLAY ASSEMBLY (PAGE 34)

REF	Description	Qty
14636	Face Plate	1
47883	Light Pipe	1
47860	Key Mat	1
47807	MMC Reader	1
48061	MMC Bracket	1
14651	Power Button	1
27142	Screw M3X6MM Pan Head Phillips Plated	5
27513	Screw M3X10MM Phillips Pan Head THRDfrm	8
14637	Screen Housing	1
14638	Control Interface	1
14640	Right Handle Grip	1
14639	Left Handle Grip	1
14771	Display Bezel	1
27137	Screw M4X8MM Pan Head Phillips Plated	9
14633	Pivot Plate	1
28440	LCD	1
48086	LCD Touch Screen	1
14612	Control PCB	1
27093	LCD Holding Bracket	2
47882	Key Mat Spacer	1
47842	LCD Flex Cable	1
48049	MMC Ribbon Cable	1





REPLACEMENT PARTS

Shortwave Diathermy

TUNER BOX ASSEMBLY PCB (PAGE 35)

REF	Description	Qty
14854	Tuner Box Assembly PCB	1
14855	Standoff	2
14780	RF Generator Assembly	1
14770	Blower Assembly	1
14754	Blower Duct	1

TOC





REPLACEMENT PARTS

Shortwave Diathermy

WIRE HARNESS PIN CONNECTOR INFORMATION

REF	Harness	Pin Number	Pin Name and Description	Pin Voltage
14724	Variable Power Supply Wire Harness	1	Ground	0
		2	Ground	0
		3	+24	24
		4	+24	24
14723	Variable Power Supply/Amp Wire Harness	1	Ground	0
		2	Ground	0
		3	+125	0 - 128
		4	+125	0 - 128
		5	Ground	0
		6	Ground	0
		7	+12	12
		8	+24	24
		9	+24	24
		10	EN Enable line for Variable Power Supply	Active Low Logic Levels
		11	+12	12
		12	PCN Output Control for Variable Power Supply	0 - 4.096
14774	Directional Coupler PCB Ribbon Cable	1	Ground	0
		2	+5	5
		3	FWD Forward Power Analog Signal	0.6 - 4.0
		4	REV Reverse Power Analog Signal	0.6 - 4.0
		5	Ground	0
		6	Ground	0
		7	CALST Serial Communication between Micro Controller on RF Generator Assembly and Memory on Directional Coupler PCB	Logic Levels
		8	N/A	N/A
		9	+5	5
		10	Ground	0

REF	Harness	Pin Number	Pin Name and Description	Pin Voltage
14729	Tuner PCB Ribbon Cable	1	Ground	0
		2	S_IN Digital Control Line Serial Input to Power Shift Register on Tuner PCB	Logic Levels
		3	Ground	0
		4	S_CLK Digital Control Line Clock Input to Power Shift Register on Tuner PCB	Logic Levels
		5	Ground	0
		6	R_CLK Digital Control Line Register Input to Power Shift Register on Tuner PCB	Logic Levels
		7	Ground	0
		8	Ground	0
		9	Ground	0
		10	Ground	0
		11	Ground	0
		12	Ground	0
		13	Ground	0
		14	+24	24
		15	Ground	0
		16	+24	24
14722	Control Ribbon Cable Harness	1	+24	24
		2	+24	24
		3	Ground	0
		4	Ground	0
		5	RS-485 +5	
		6	RS-485 A RS-485	
		7	RS-485 B Communications	
		8	RS-485 Ground	0
		9	PE Spare	N/A
		10	SYSRST Reset Line for Micro Controller on RF Generator Assembly	Low to Reset Logic Levels

TOC





WARRANTY

Chattanooga Group, a division of Encore Medical, L.P., ("Company") warrants that the Intellect Shortwave 100, Intellect SWD 100, and Senior Solutions SWD 100 ("Product") are free of defects in material and workmanship. This warranty shall remain in effect for two years (24 months) from the date of original consumer purchase. If this Product fails to function during the two year warranty period due to a defect in material or workmanship, at the Company's option, Company or the selling dealer will repair or replace this Product without charge.

All repairs to the Product must be performed by a service center certified by the Company. Any modifications or repairs performed by unauthorized centers or groups will void this warranty.

The warranty period for accessories is 180 days for the Intellect Shortwave 100 and Intellect SWD 100 (Canada). The warranty period for accessories is 90 days for the Intellect SWD 100, and Senior Solutions SWD 100.

This Warranty Does Not Cover:

- Replacement parts or labor furnished by anyone other than the Company, the selling dealer or a certified Company service technician.
- Defects or damage caused by labor furnished by someone other than Company, the selling dealer or a certified Company service technician.
- Any malfunction or failure in the Product caused by product misuse, including, but not limited to, the failure to provide reasonable and necessary maintenance or any use that is inconsistent with the Product User Manual.

COMPANY SHALL NOT BE LIABLE IN ANY EVENT FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Some areas do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

To obtain service from Company or the selling dealer under this warranty:

1. A written claim must be made within the warranty period to the Company or the selling dealer. Written claims made to the Company should be sent to:

Chattanooga Group

4717 Adams Road

Hixson, TN 37343

Telephone: (800) 592-7329 U.S.A.
+1 (423) 870-7200 Outside U.S.A.

FAX: (423) 875-5497 U.S.A.
+1 (423) 870-2046 Outside U.S.A.

chattgroup.com

and

2. The Product must be returned to the Company or the selling dealer by the owner.

This warranty gives you specific legal rights and you may also have other rights which vary from region to region.

The Company does not authorize any person or representative to create for it any other obligation or liability in connection with the sale of the Product. Any representation or agreement not contained in the warranty shall be void and of no effect.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.





0413

14673B



Medical Device Safety Service (MDSS)
GmbH
Schiffgraben 41
30175 Hannover, Germany
Telephone: + 49 -511-6262-8630
Fax: + 49-511-6262-8633

Chattanooga Group

4717 Adams Road
P.O. Box 489
Hixson, TN 37343 U.S.A.

(800) 592-7329 U.S.A.
+1-423-870-7200 OUTSIDE U.S.A.
(423) 875-5497 U.S.A. FAX
+1 423-870-2046 OUTSIDE U.S.A. FAX
chattgroup.com

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