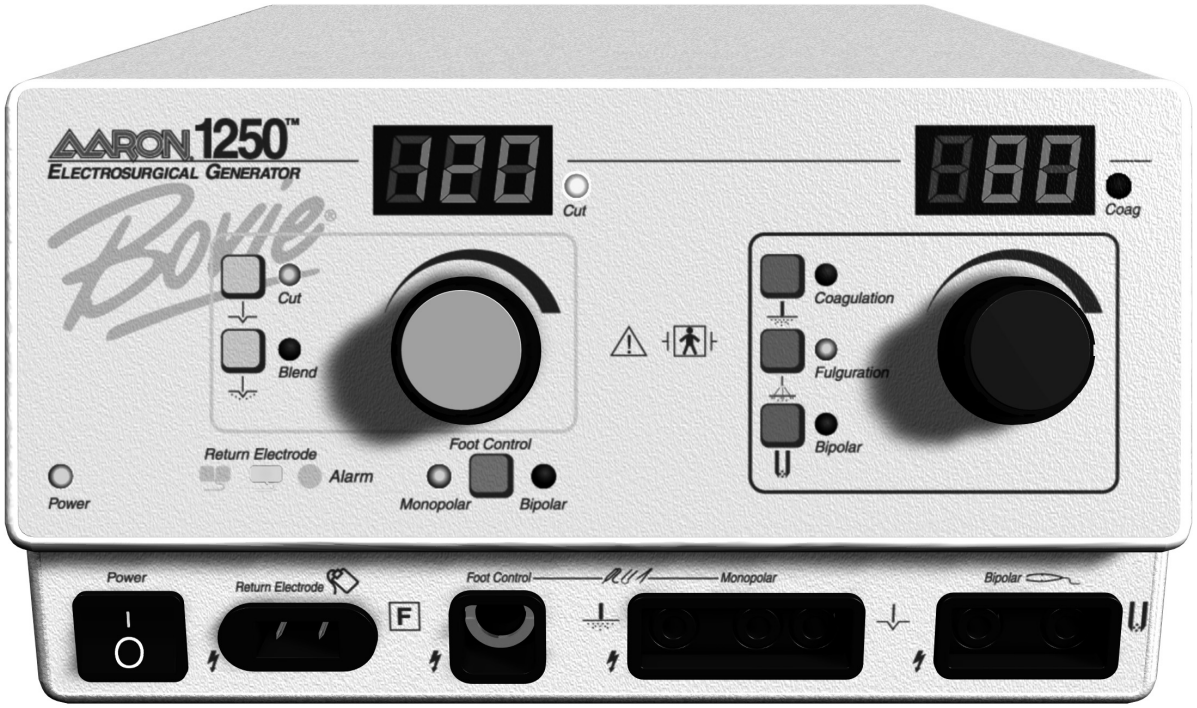
AARON® 1250™
ELECTROSURGICAL GENERATOR



SERVICE GUIDE

PREFACE

This Service Guide and the equipment it describes are for qualified technicians who maintain and repair the Aaron 1250 Electrosurgical Generator. Additional User information is available in the *Aaron 1250 Electrosurgical Generator User's Guide*.

This document covers technical descriptions of the Aaron 1250 including its physical appearance, all operator controls and indications, operational specifications, component functional descriptions (module level), diagrams of the electronic circuits used, and troubleshooting guidelines (with chart comparisons).

The Aaron 1250 was constructed with the highest quality components, and was built in a registered environment. In the unlikely event that your generator fails within 1 year of purchase date, Bovie / Aaron Medical will warranty the product and effect factory repairs. Please refer to Appendix A Warranty for what is covered, how long, and "How to Receive a Return Authorization Number".

Equipment covered in this manual

Aaron 1250 Electrosurgical Generator (110 VAC Model) A1250

Aaron 1250 Electrosurgical Generator (220 VAC Model) A1250-220

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SAFETY PRECAUTIONS WHEN OPERATING THE GENERATOR

The safe and effective use of electrosurgery depends to a large degree on factors solely under the control of the operator. There is no substitute for a properly trained and vigilant medical staff. It is important that they read, understand, and follow the operating instructions supplied with this electrosurgical equipment.

To promote the safe use of the Aaron 1250 Electrosurgical Generator, please refer to the User's Guide for standard operating precautions.

APPLICABLE SAFETY STANDARDS

CSA C22.2, NO. 601.1 – M90
UL 2601 – 1 – UL
IEC 60601 – 2 – 2 (1998 – 90) CLASS 1 EQUIPMENT, TYPE BF
CENELEC EN 60601 – 1 – 2
FCC PART 15, CLASS A
IEC 60601-1 2nd Edition (1988)

CONVENTIONS USED IN THIS GUIDE

WARNING
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE
Indicates an operating tip, a maintenance suggestion, or a hazard that may result in product damage.

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Board Drawings and Schematics

SECTION 1

THE AARON 1250 ELECTROSURGICAL GENERATOR

This section includes the following information:

- *Functional Description*
- *Unit Description*
- *Safety precautions when Repairing the Generator*
- *General Warnings, Cautions, and Notices*
- *Active Accessories*
- *Fire/Explosion Hazards*
- *Generator Electric Shock Hazards*
- *Servicing*
- *Cleaning*

CAUTION
Read all warnings, cautions, and instructions provided with this generator before using.

Read the instructions, warnings, and cautions provided with electrosurgical accessories before using. Specific instructions are not included in this manual.

FUNCTIONAL DESCRIPTION

The Aaron 1250 is a multipurpose electrosurgical generator for use in physician's offices and surgi-centers. It provides unsurpassed performance, flexibility, reliability, and user convenience in one compact package.

The Aaron 1250 Electrosurgical Generator includes digital technology. This new technology is evident in the self-checking circuitry and error code readouts. The unit offers monopolar and bipolar electrosurgical operations.

The following are Aaron 1250 key advantages and benefits.

Power Capabilities	Up to 120 watts of Pure Cut @ 500 **Ω**. Up to 90 watts of Blend @ 800 **Ω**. Up to 80 watts of Coagulation @ 1000 **Ω**. Up to 40 watts of Fulguration @ 1000 **Ω**. Up to 30 watts of Bipolar @ 200 **Ω**.
Two Levels of Coagulation: Pinpoint Coagulation and Fulguration	Pinpoint coagulation provides precise control of bleeding in localized areas. Fulguration provides greater control of bleeding in highly vascular tissue over broader tissue surface areas.
Return Electrode Monitoring System	The unit incorporates a return electrode contact quality monitoring system (RECQMS). This system determines the type of patient return electrode attached (single plate or split plate). It also continuously monitors the contact impedance between the patient and the split plate patient return electrode. Contact impedance is only monitored when approved split plate patient return electrodes are used.
Memory	The generator automatically powers up to the last modes selected, and previously set power settings.
Floating RF Output	This minimizes the potential of alternate site burns.
Standard Front Panel Connectors	These connectors accept the latest monopolar and bipolar instruments.
Self Diagnostics	These diagnostics continually monitor the unit to ensure proper performance. Whenever they detect a problem, medical personnel receive audible and visual alarm responses, and the output is suspended until the alarm condition is cleared.

UNIT DESCRIPTION

The Aaron 1250 electrosurgical generator is a self-contained unit, consisting of the main enclosure and power cord. The main components incorporated in the generator include:

- **FRONT PANEL COMPONENTS** Power switch; two dials for controlling power output; membrane switches for selecting modes; receptacles for connecting electrosurgical accessories; and indicators that show the current settings and patient return electrode status.
- **REAR PANEL COMPONENTS** Volume control; footswitch receptacle; power cable receptacle and fuse holder; equipotential grounding lug; and remote accessory receptacle.
- **INTERNAL COMPONENTS** Display board; main board; pad sensing module; speaker board; and relay board.

SAFETY PRECAUTIONS WHEN REPAIRING THE GENERATOR

Before servicing the Aaron 1250 Generator it is important that you read, understand, and follow the instructions supplied with it. Also, be familiar with any other equipment used to install, test, adjust, or repair this generator.

General Warnings, Cautions, and Notices

WARNINGS

Use the generator only if the self-test has been completed as described. Otherwise, inaccurate power outputs may result.

The instrument receptacles on this generator are designed to accept only one instrument at a time. Do not attempt to connect more than one instrument at a time into a given receptacle. Doing so will cause simultaneous activation of the instruments.

CAUTIONS

Do not stack equipment on top of the generator or place the generator on top of electrical equipment. These configurations are unstable and / or do not allow adequate cooling.

Provide as much distance as possible between the electrosurgical generator and other electronic equipment (such as monitors). An activated electrosurgical generator may cause electrical interference with them.

Do not turn the activation tone down to an inaudible level. The activation tone alerts the surgical team when an accessory is active.

NOTICES

If required by local codes, connect the generator to the hospital equalization (grounding) connector with an equipotential cable.

Connect the power cord to a wall receptacle having the correct voltage. Otherwise, product damage may result.

Active Accessories

WARNINGS

Shock Hazard – Do not connect wet accessories to the generator.

Shock Hazard – Ensure that all accessories and adapters are correctly connected and that no metal is exposed.

CAUTIONS
Accessories must be connected to the proper receptacle type. In particular, bipolar accessories must be connected to the Bipolar Instrument receptacle only. Improper connection may result in inadvertent generator activation or a Contact Quality Monitor alarm.

Set power levels to the lowest setting before testing an accessory.

NOTICE
During Bipolar Electrosurgery, do not activate the generator until the forceps have made contact with the patient. Product damage may occur.

Fire / Explosion Hazards

WARNINGS

Explosion Hazard – Do not install the generator in the presence of flammable anesthetics, gases, liquids, or objects.

Fire Hazard – Do not place active accessories near or in contact with flammable materials (such as gauze or surgical drapes). Electrosurgical accessories that are activated or hot from use can cause a fire. Use a holster to hold electrosurgical accessories safely away from personnel and flammable materials.

Fire Hazard – Do not use extension cords.

Fire Hazard – For continued protection against fire hazard, replace fuses only with fuses of the same type and rating as the original fuse.

Generator Electric Shock Hazards

WARNINGS

Connect the generator power cord to a properly grounded receptacle. Do not use power plug adapters.

Do not connect a wet power cord to the generator or to the wall receptacle.

To allow stored energy to dissipate after power is disconnected (caps discharge) wait at least five minutes before replacing parts.

Always turn off and unplug the generator before cleaning.

Do not touch any exposed wiring or conductive surfaces while the generator is disassembled and energized. Never wear a grounding strap when working on an energized generator.

When taking troubleshooting measurements use appropriate precautions such as using isolated tools and equipment, using the “one hand rule,” etc.

Potentially lethal AC and DC voltages are present in the AC line circuitry, high voltage DC circuitry, and associated mounting and heat sink hardware described in this manual. These potentials are not isolated from the AC line. Take appropriate precautions when testing and troubleshooting this area of the generator.

High frequency, high voltage signals that can cause severe burns are present in the RF output stage and in the associated mounting and heat sink hardware. Take appropriate precautions when testing and troubleshooting this area of the generator.

Servicing

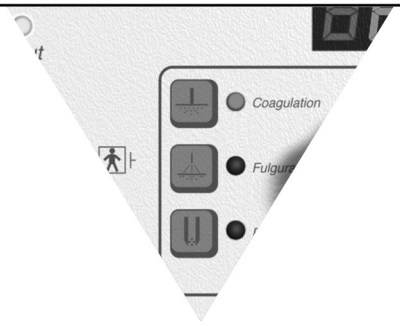
CAUTION
Read all warnings, cautions, and instructions provided with this generator before servicing.

The generator contains electrostatic-sensitive components. When repairing the generator, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized generator. Handle circuit boards by their nonconductive edges. Use an anti-static container for transport of electrostatic-sensitive components and circuit boards.

NOTICE
After installing a new low voltage power supply, verify that the voltages are correct.

Cleaning

NOTICE
Do not clean the generator with abrasive cleaning or disinfectant compounds, solvents, or other materials that could scratch the panels or damage the generator.



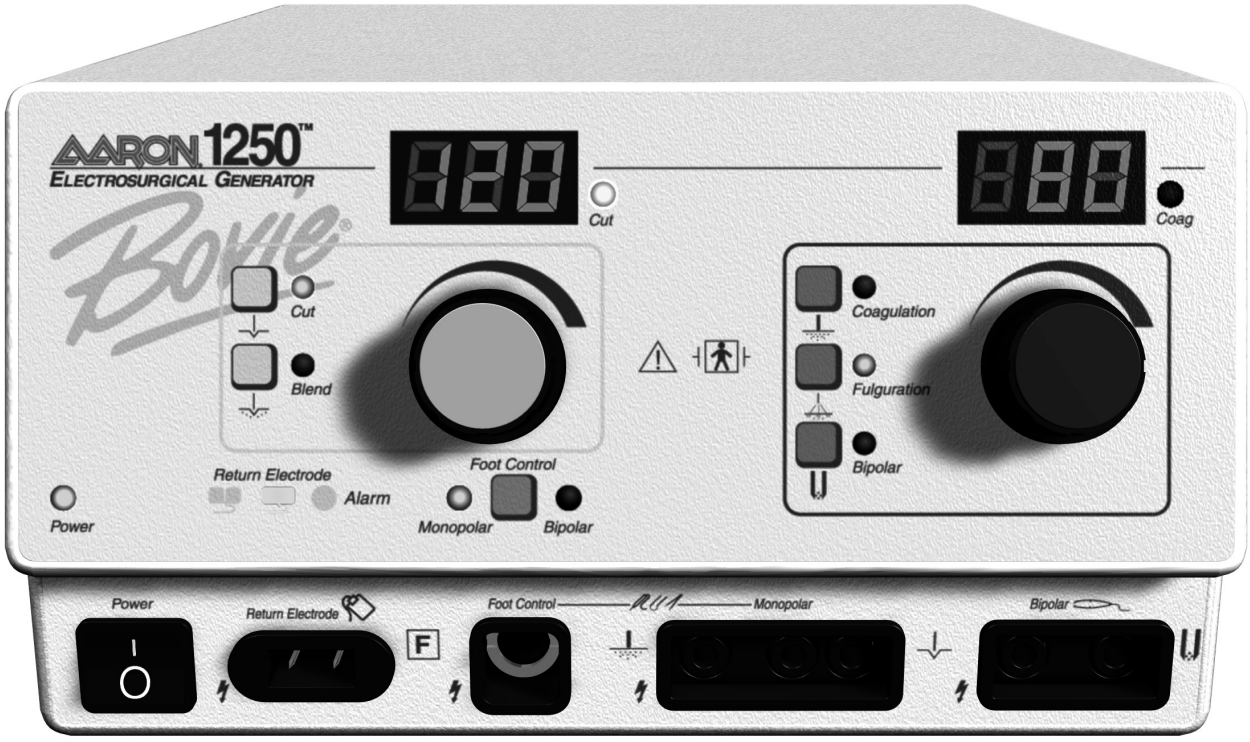
SECTION 2

CONTROLS, INDICATORS, AND RECEPTACLES

This section describes the front and rear panels, including all controls, indicators, receptacles, the fuse drawer, and ports.

FRONT PANEL

Figure 2-1 Layout of controls, indicators, and receptacles on the front panel



CONTROLS AND INDICATORS OVERVIEW

Users may control most Aaron 1250 functions from the front panel. Each Control is plainly marked and colored on the front panel for quick reference. Volume control and a footswitch connector are located on the rear panel.

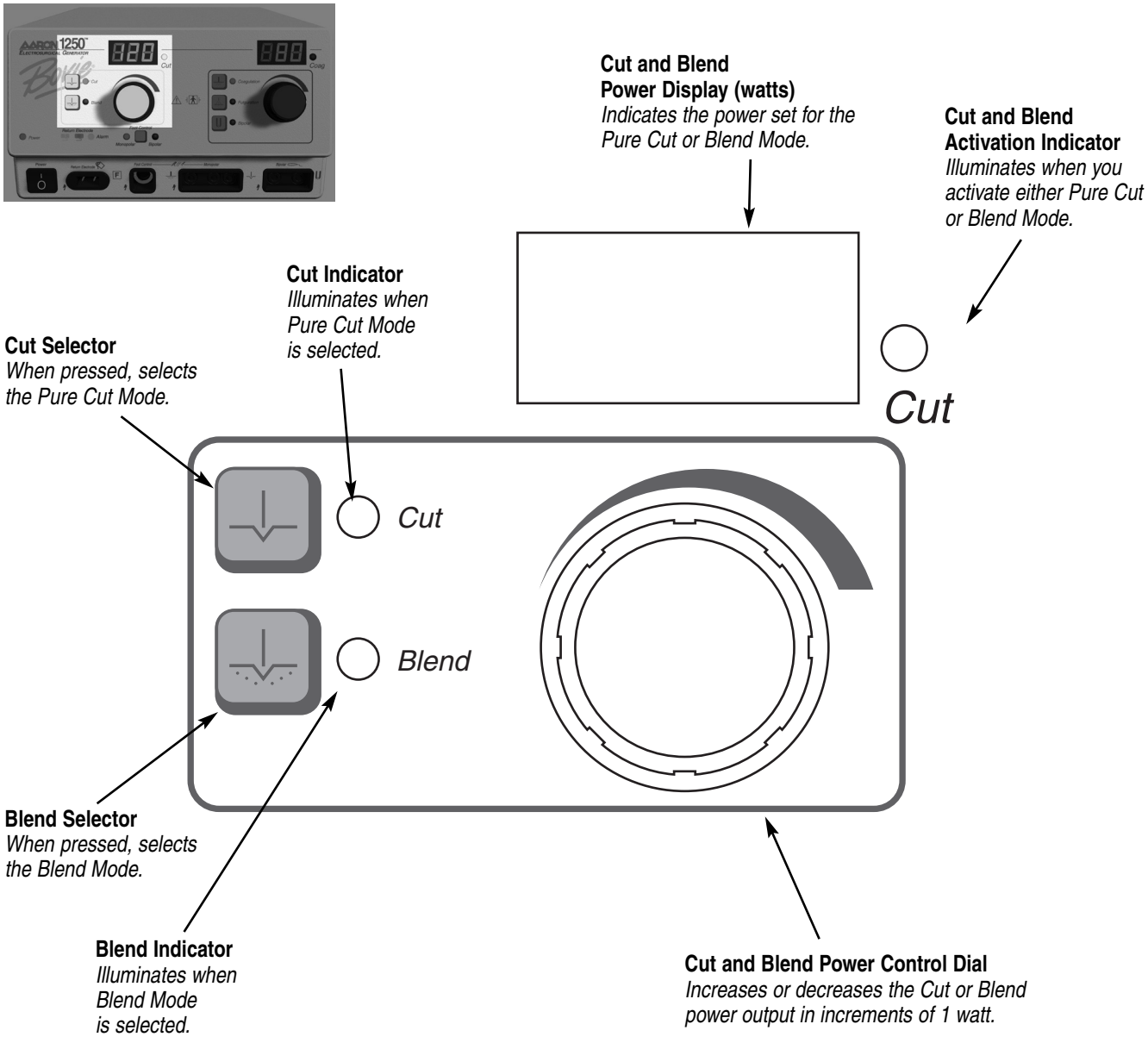
Normal operations involve activating the generator with either a front connected handswitch OR a rear-connected footswitch. The following components are the User Interface for the Aaron 1250 Electrosurgical Generator.

Power Switch	The rocker ON / OFF switch on the lower left corner allows the Aaron 1250 to be shut off when the unit is not in use.
Membrane Function Switches	The front panel overlay contains 6 membrane function switches (sometimes called matrix switches). There is a membrane switch dedicated for each operational mode. These switches toggle the unit between mode settings.
Power Control Knob	These rotary knobs allow you to select the desired RF power level for all modes of operation. The Power Control Knobs move at a graduated 1 watt per notch (incrementally).
Watts Display A & B (Cut and Coag)	These large Power Output Displays report the generator's output power setting from 1 to 120 watts in 1 watt increments (at the rated load). During operation, the numeral output of the display gives the surgeon an indication of available generator power.
Visual LED Indictors	Mode LEDs indicate the mode setting. The YELLOW indicators and controls indicate cutting and blending operations. A yellow field LED indicates that either a Cut or Blend mode is activated. The BLUE indicators and controls indicate Coagulation, Fulguration, and Bipolar operation. The blue field LED indicates either Coagulation, Fulguration or Bipolar mode is activated. The Footswitch Control LED Indicator indicates which mode the footswitch is presently in. Monopolar footswitch control allows the user to activate the monopolar mode when using footswitch controlled accessories. Bipolar footswitch control allows the user to activate the bipolar mode.

Visual LED Indictors	A Return Electrode Indicator displays which type of patient Return Electrode is attached to the patient. It also has an associated audio alarm that sounds when a patient return electrode is not detected during activation.
Audible Indicators	An activation tone sounds whenever the Aaron 1250 Electrosurgical Generator is activated. The volume may be adjusted up or down on the rear of the unit. An Alarm Siren sounds during all alarm conditions. The volume of this alarm cannot be adjusted.

CUT AND BLEND CONTROLS

Figure 2-2 Controls for the Cut and Blend modes



COAG AND BIPOLAR CONTROLS

Figure 2-3 Controls for the Coagulation, Fulguration, and Bipolar modes

Coag and Bipolar Power Display (watts)
Indicates the power set for any Coag or Bipolar Mode.

Coag and Bipolar Activation Indicator
Illuminates when you activate Coagulation, Fulguration, or Bipolar Mode.

Coagulation Indicator
Illuminates when Coagulation Mode is selected.

Coagulation Selector
When pressed, selects the Coagulation Mode.

Fulguration Indicator
Illuminates when Fulguration Mode is selected.

Fulguration Selector
When pressed, selects the Fulguration Mode.

Bipolar Selector
When pressed, selects the Bipolar Mode.

Bipolar Indicator
Illuminates when Bipolar Mode is selected.

Coag and Bipolar Power Control Dial
Increases or decreases the Coag or Bipolar power output in increments of 1 watt.

INDICATORS

Figure 2-4 Indicators for power, return electrodes, and footswitch control

Power Indicator
Illuminates when the unit is on.

Monopolar Footswitch Control Indicator
Illuminates when monopolar footswitch control is selected.

Bipolar Footswitch Control Indicator
Illuminates when bipolar footswitch control is selected.

Foot Control

Return Electrode

Alarm

Power

Monopolar

Bipolar

Split-Plate Patient Return Electrode Indicator
Illuminates when the system detects a split plate.

Single Plate Patient Return Electrode Indicator
Illuminates when the system detects a single plate.

Patient Return Electrode Alarm Indicator
Illuminates when the system detects a patient return electrode alarm condition.

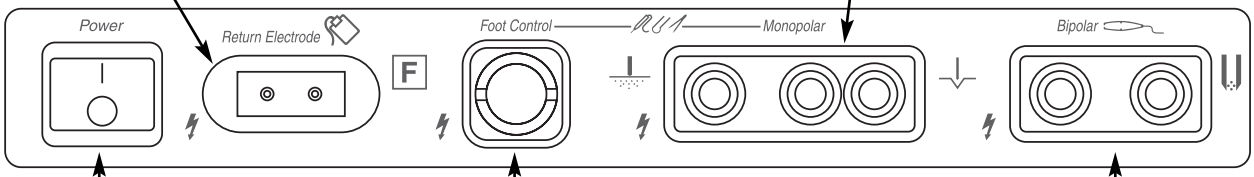
Footswitch Control Selector
When pressed, toggles between monopolar and bipolar foot control.

POWER SWITCH AND RECEPTACLES

Figure 2-5 Location of the unit power switch and front panel receptacles

Patient Return Electrode Receptacle
Accepts a standard patient return electrode plug.

Monopolar Handswitching Receptacle
Accepts standard three-pin handpieces. Connect handswitching accessories.



Power On/Off Switch
Turns the unit on or off.

Monopolar Footswitching Receptacle
Accepts cables or adapters equipped with standard (Bovie #12) active plugs. Connect footswitching accessories.

Bipolar Receptacle
Accepts standard cables for bipolar handpieces.

SYMBOLS ON THE FRONT PANEL

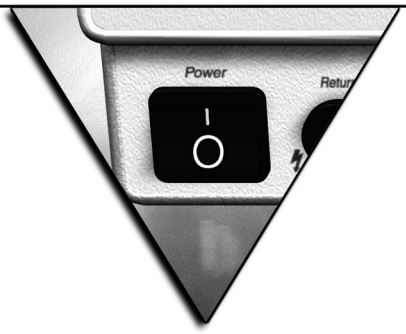
SYMBOLS	DESCRIPTION
Cut Controls	
	Cut Mode
	Blend Mode
Coag Controls	
	Coagulation Mode
	Fulguration Mode
	Bipolar Mode
Indicators	
	Split Plate Return Electrode
	Single Plate Return Electrode
Power Switch and Handpiece Connectors	
	Read instructions before use.
	Type BF (Defibrillator – Proof) Equipment
	Patient Return Electrode
	RF isolated – patient connections are isolated from earth at high frequency.
	Caution High Voltage
	Monopolar Output
	Bipolar Output

REAR PANEL

Figure 2-6 Layout of connectors and controls on the rear panel

SYMBOLS ON THE REAR PANEL

SYMBOLS	DESCRIPTION
	Equipotential Ground Stud
	Non-ionizing Radiation
	Volume Control
	Danger - Explosion Risk If Used With Flammable Anesthetics.
	Fuse Enclosed
	Relay Connector
	Footswitch Input Jack
	Read Instructions Before Use
	Do not dispose of this device in the unsorted municipal waste stream.



SECTION 3

TECHNICAL SPECIFICATIONS

All specifications are nominal and subject to change without notice. A specification referred to as "typical" is within ± 20% of a stated value at room temperature (25° C / 77° F) and a nominal input power voltage.

PERFORMANCE CHARACTERISTICS

Input Power

110-120 Volt	**220-240 Volt**
Mains line frequency range (nominal): 60 Hz	Mains line frequency range (nominal): 50 Hz
Power consumption: 540 VA	Power consumption: 540 VA
Fuses (2): 5A (Slow Blow)	Fuses (2): 3.15A (Slow Blow)

Duty Cycle

Under maximum power settings and rated load conditions (Pure cut, 120 watt @ 500 Ω load), the generator is suitable for activation times of 10 seconds on, 30 seconds off for one hour.

NOTICE

The internal temperature of the unit is constantly being monitored. If the temperature rises above 85° an alarm sounds, the system displays an error code, and the system disables output power.

Dimensions and Weight

Width.....26 cm (10.25 in.)	**Depth**.....30.5 cm (12 in.)
Height .....15.2 cm (6 in.)	**Weight**.....< 6.5 kg (< 14 lbs)

Operating Parameters

Ambient temperature range	10° to 40° C (50° to 104° F)
Relative humidity	30% to 75%, noncondensing
Atmospheric pressure	700 to 1060 millibars
Warm-up time	If transported or stored at temperatures outside the operating temperature range, allow one hour for the generator to reach room temperature before use.

Transport and Storage

Ambient temperature range	-34° to 65° C (-29° to 149° F)
Relative humidity	10% to 100%, condensing
Atmospheric pressure	500 to 1060 millibars

Audio Volume

The audio levels stated below are for activation tones (bipolar, cut, and coag) and alarm tones (return electrode and system alarms) at a distance of one meter. Alarm tones meet the requirements for IEC 60601-2-2.

Activation Tone

Volume (adjustable)	45 to 65 dBa
Frequency	Cut: 1 kHz Blend: 1 kHz Coagulation: 2 kHz Fulguration: 2 kHz Bipolar: 2 kHz
Duration	Continuous while the generator is activated

Alarm Tone

Volume (not adjustable)	70 dB ± 5dBa
Frequency	2 kHz for 1/2 second, then1 kHz for 1/2 second
Duration	2 seconds

Patient Return Electrode Sensing

Single Plate	Trip resistance: 0 Ω to 5 Ω ± 3 Ω Continuous measurement: Once the system establishes the single-plate electrode resistance, a change of 20 Ω ± 5 Ω in resistance will cause an alarm. When the alarm condition exists, the system deactivates output power.
Split Plate	Trip resistance: 10 Ω ± 5 Ω to 135 Ω ± 10 Ω Continuous measurement: Once the system establishes the split-plate electrode resistance, a change of 40% in resistance will cause an alarm. When the alarm condition exists, the system deactivates output power.

The system presents audible and visible alarms when it senses no patient return electrode:

- When a fault condition occurs, the alarm indicator flashes red, an alarm tone sounds, and the system disables out put power.
- The red LED alarm indicator remains illuminated until you correct the condition that caused the alarm condition.
- Activation attempts during an alarm condition result in an audio alarm.
- When the alarm condition is resolved, the green single or split-plate indicator will illuminate.
- The system measures the return electrode sensing current according to IEC 60601-1.

Low Frequency (50–60 Hz) Leakage Current

Enclosure source current, ground open	< 500 μA
Source current, patient leads, all outputs	Normal polarity, intact ground: < 50 μA Normal polarity, ground open: < 50 μA Reverse polarity, ground open: < 50 μA
Sink current at high line, all inputs	< 50 μA

High Frequency (RF) Leakage Current

Bipolar RF leakage current	< 39 mA_{rms}
Monopolar RF leakage current (additional tolerance)	< 150 mA_{rms}

STANDARDS AND IEC CLASSIFICATIONS

Class I Equipment (IEC 60601-1)

Accessible conductive parts cannot become live in the event of a basic insulation failure because of the way in which they are connected to the protective earth conductor.

Type BF Equipment (IEC 60601-1) / Defibrillator Proof

The Aaron 1250 Electrosurgical Generator provides a high degree of protection against electric shock, particularly regarding allowable leakage currents. It is type BF equipment. Patient connections are isolated from earth and resist the effects of defibrillator discharge.

Drip Proof (IEC 60601-2-2)

The generator enclosure is constructed so that liquid spillage in normal use does not wet electrical insulation or other components which, when wet, are likely to affect adversely the safety of the generator.

Electromagnetic Interference

When other equipment is placed on or beneath an activated Bovie Aaron Medical electrosurgical generator, the Aaron 1250 Electrosurgical Generator operates without interference. The generator minimizes electromagnetic interference to video equipment used in the operating room.

Electromagnetic Compatibility (IEC 60601-1-2 and IEC 60601-2-2)

The Aaron 1250 Electrosurgical Generator complies with the appropriate IEC 60601-1-2 and IEC 60601-2-2 specifications regarding electromagnetic compatibility.

Voltage Transients (Emergency Generator Mains Transfer)

The Aaron 1250 Electrosurgical Generator operates in a safe manner when the transfer is made between line AC and an emergency generator voltage source.

OUTPUT POWER CHARACTERISTICS

Maximum Output for Bipolar and Monopolar Modes

Power readouts agree with actual power into rated load to within 20% or 5 watts, whichever is greater.

Mode	Output Power	Output Frequency	Repetition Rate	Vp-p max	Crest Factor* (Rated Load)
Cut	120 W @ 500 Ω	357 kHz ± 50 kHz	N / A	2.5 KV	2.9 ± 20%
Blend	90 W @ 800 Ω	357 kHz ± 50 kHz	30 kHz ± 5 kHz	3.5 KV	3.3 ± 20%
Coagulation	80 W @ 1000 Ω	425 kHz – 494 kHz	57 kHz ± 5 kHz	4.5 KV	5.5 ± 20%
Fulguration	40 W @ 1000 Ω	410 kHz ± 50 kHz	25 kHz ± 5 kHz	6.5 KV	7.7 ± 20%
Bipolar	30 W @ 200 Ω	506 kHz – 570 kHz	32 kHz ± 5 kHz	2.0 KV	6.9 ± 20%

* an indication of a waveform's ability to coagulate bleeders without a cutting effect

OUTPUT POWER CURVES

The curves that follow depict the changes for each mode at specific power settings.

Monopolar Cut Curves

These measurements were taken using short (< 0.5 meter) leads. For each output power vs. impedance curve, the upper curve represents readings taken at full power; the lower curve, readings taken at half power.

Figure 3 – 1 Output power versus impedance for Cut mode

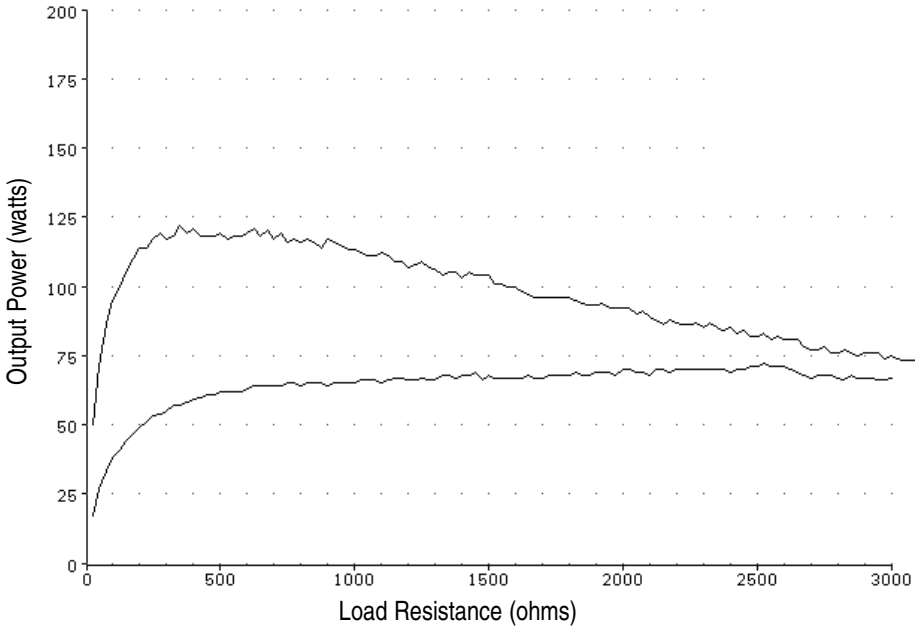


Figure 3 – 2 Peak voltage vs. power setting for Cut mode

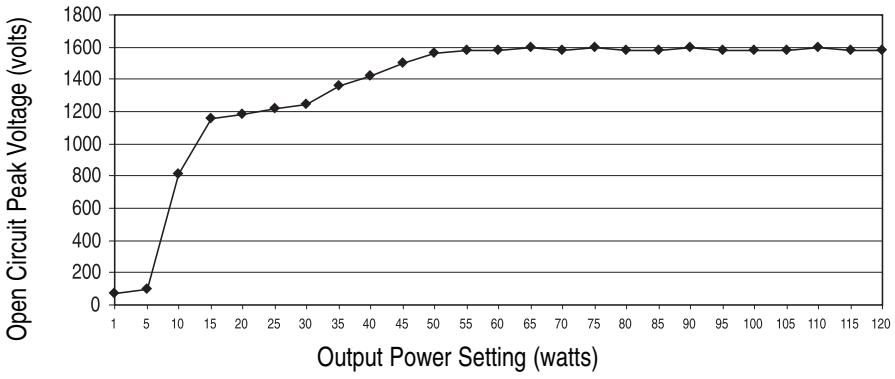
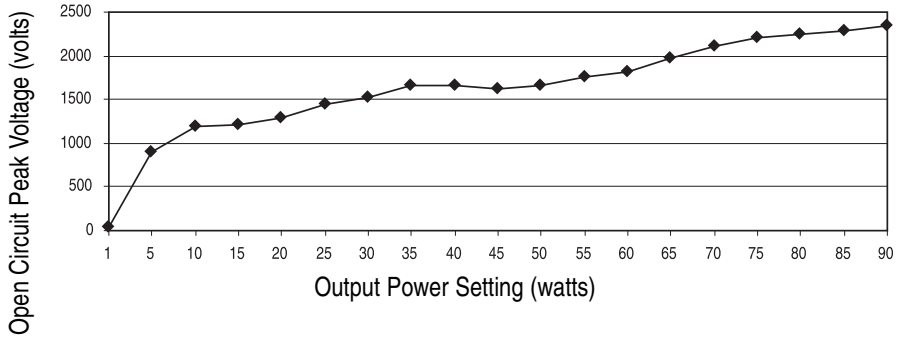


Figure 3 – 3 Output power versus impedance for Blend mode

Figure 3 – 4 Peak voltage vs. power setting for Blend mode



Monopolar Coag Curves

These measurements were taken using short (< 0.5 meter) leads.

Figure 3 – 5 Output power versus impedance for Coagulation mode

Figure 3 – 6 Peak voltage vs. power setting for Coagulation mode

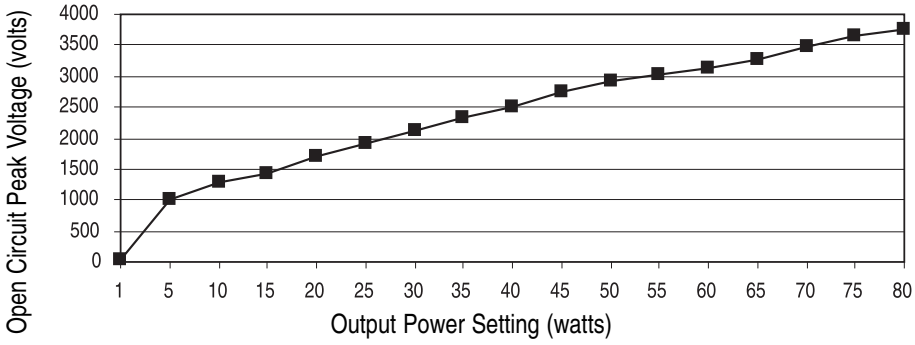


Figure 3 – 7 Output power versus impedance for Fulguration mode

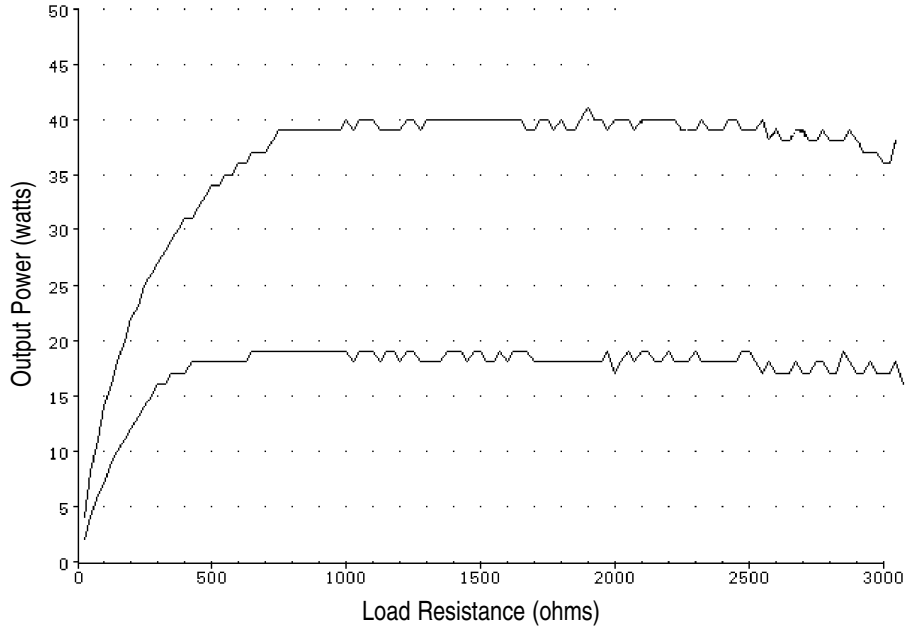
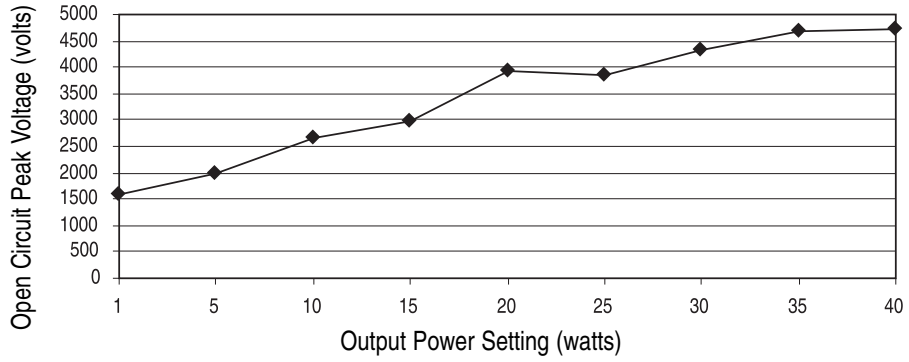


Figure 3 – 8 Peak voltage vs. power setting for Fulguration mode



Bipolar Curves

Figure 3 – 9 Output power versus impedance for Bipolar mode

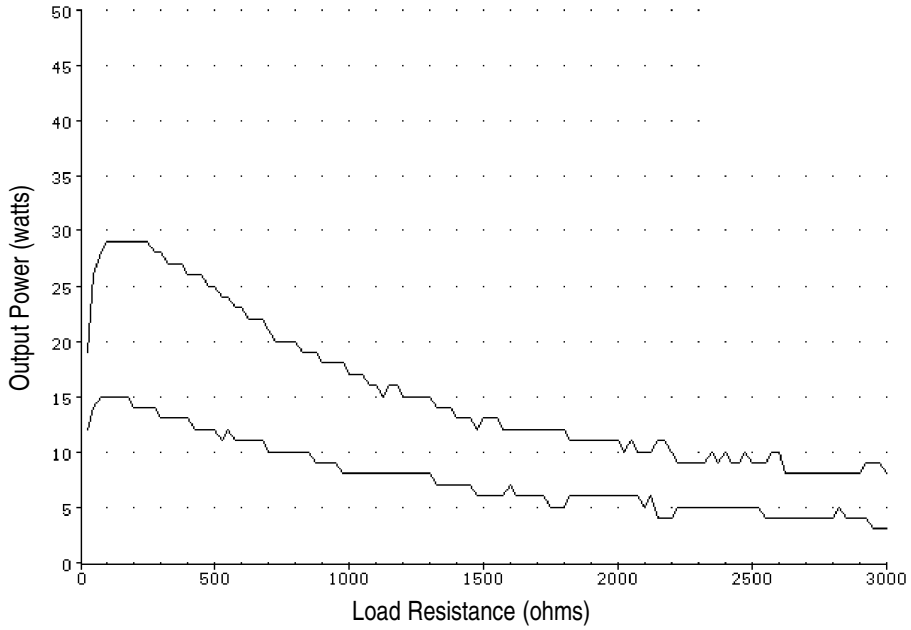
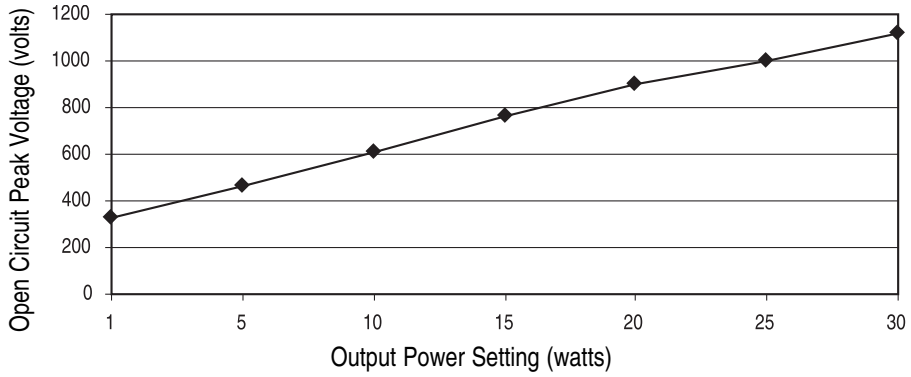


Figure 3 – 10 Peak voltage vs. power setting for Bipolar mode



Reference Output Waveforms

The following figures are the output waveforms as viewed on an oscilloscope.

Figure 3-11 Cut mode waveform

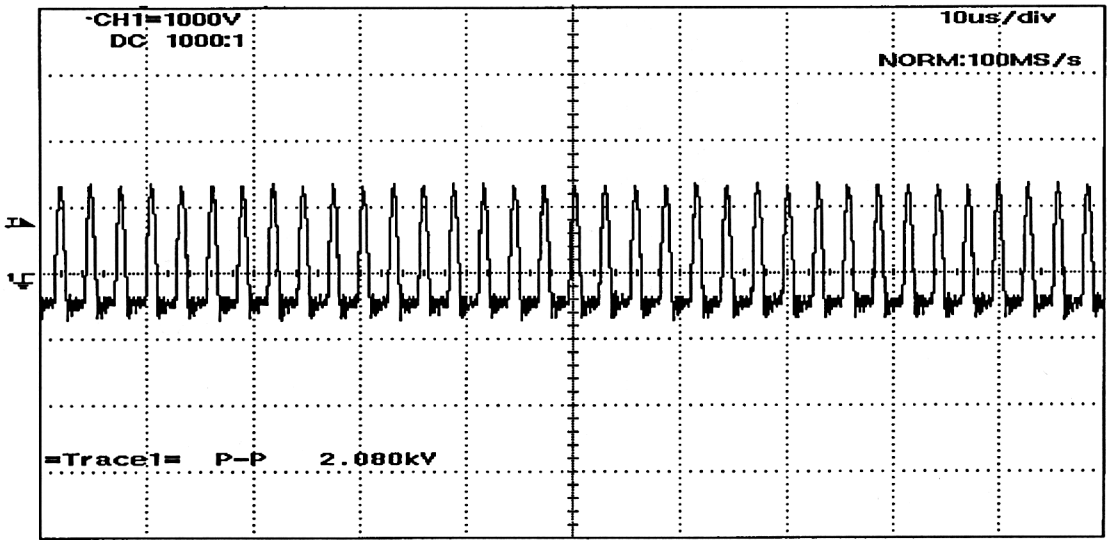


Figure 3-12 Blend mode waveform

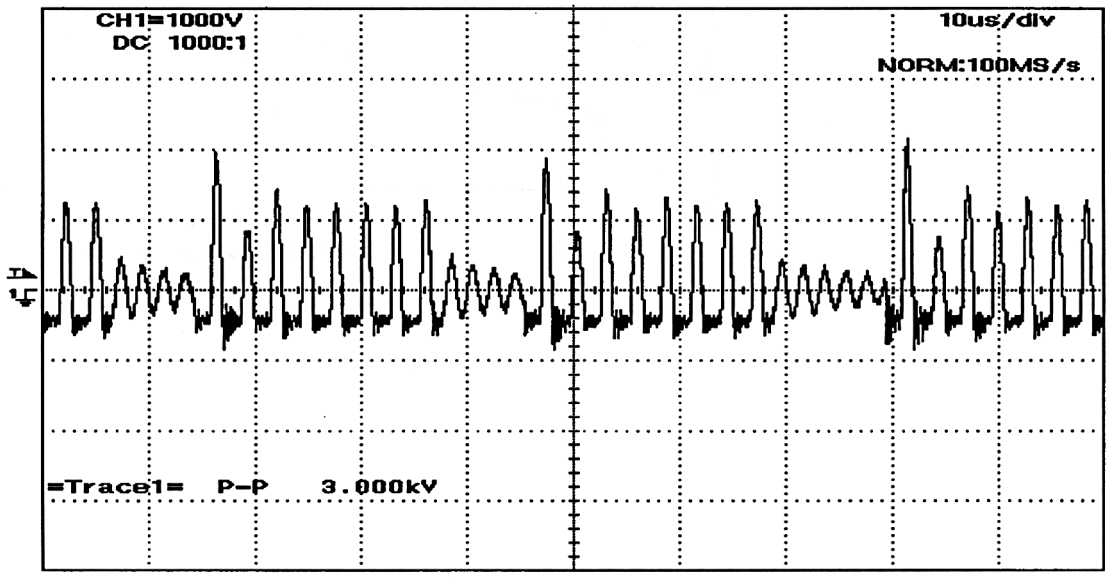


Figure 3-13 Coagulation mode waveform

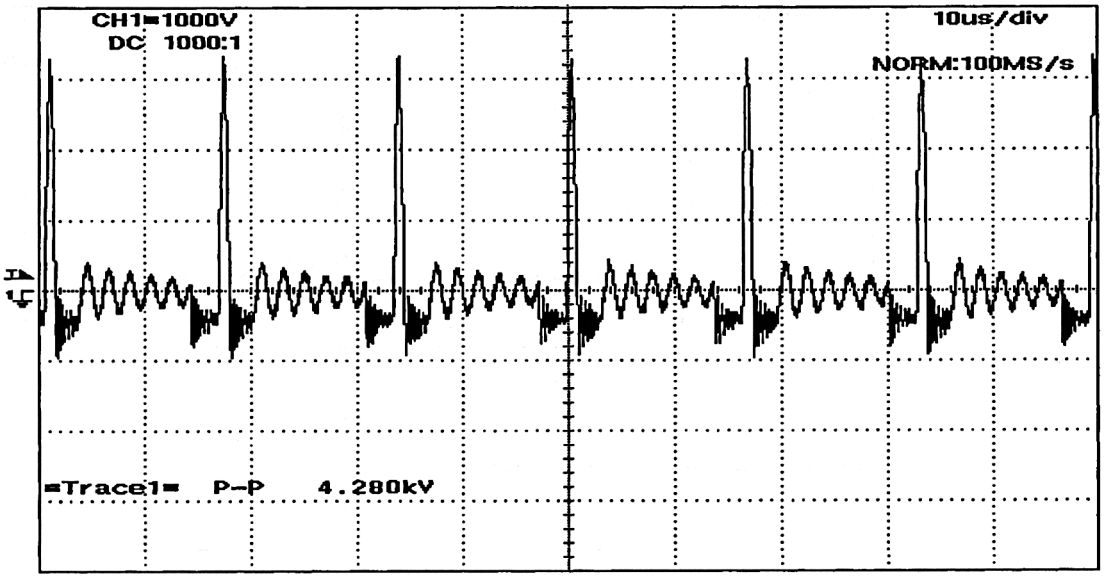


Figure 3-14 Fulguration mode waveform

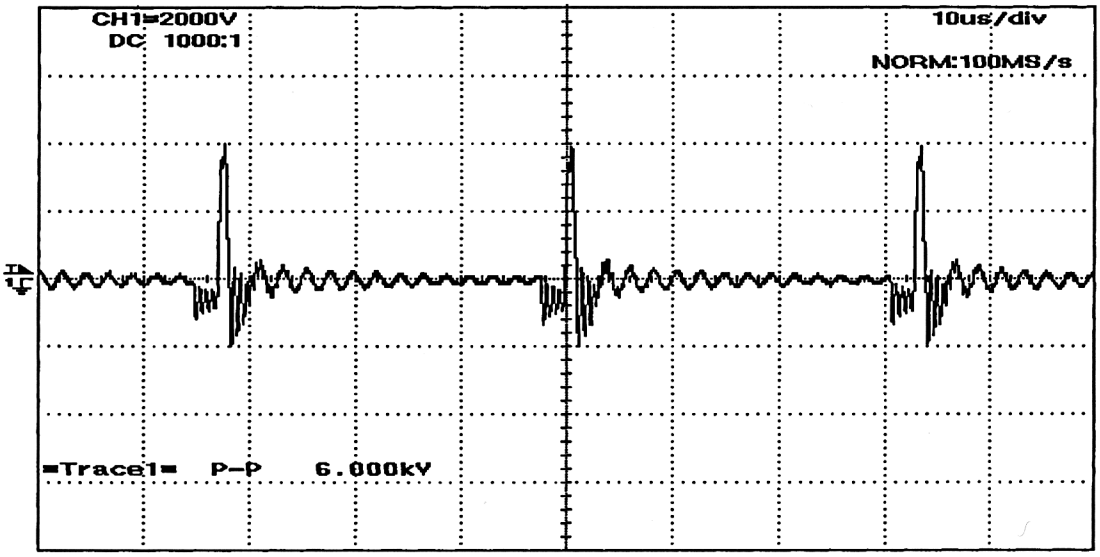
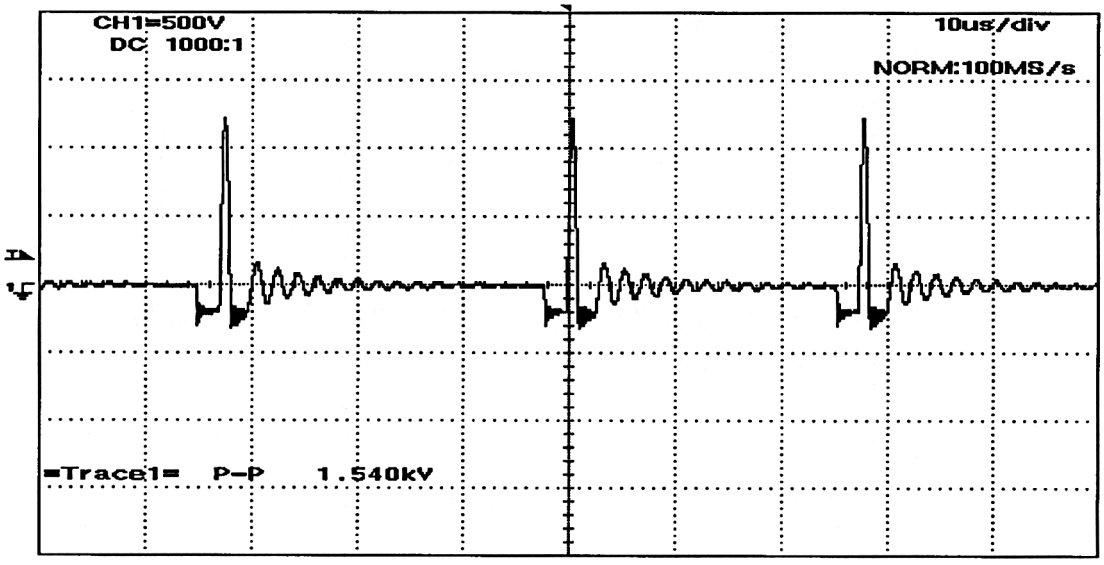


Figure 3-15 Bipolar mode waveform



SECTION 4

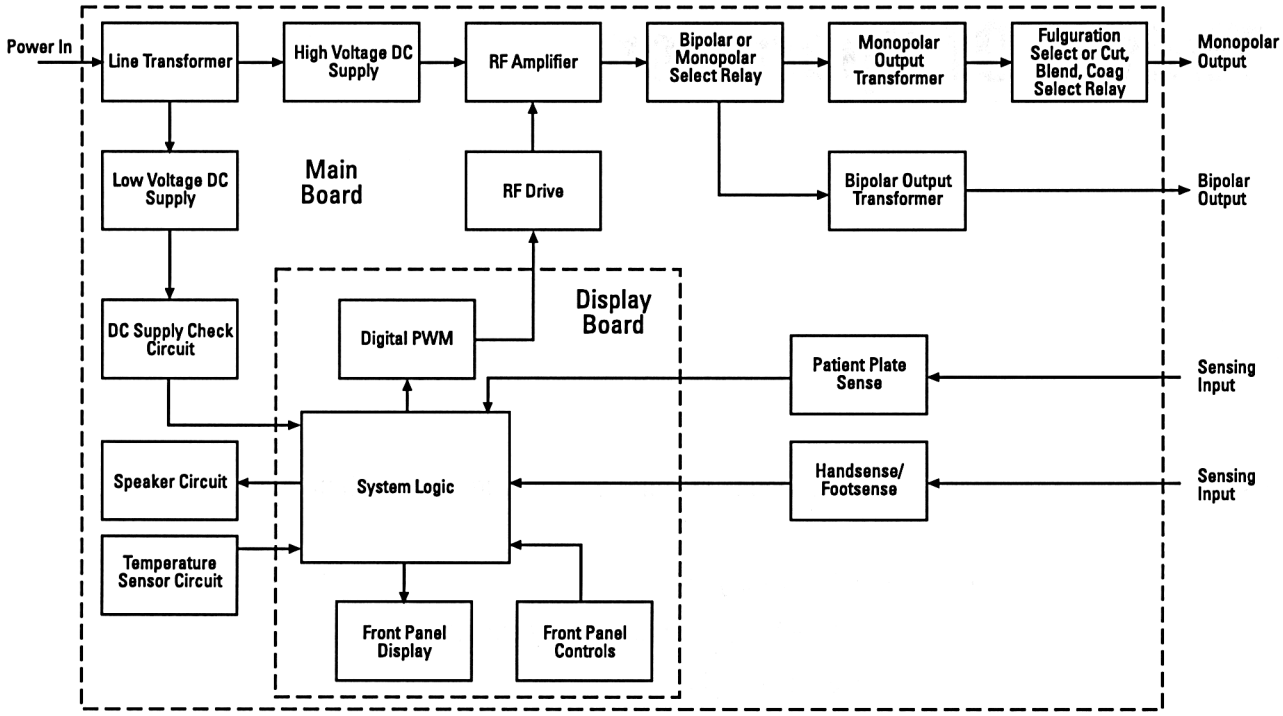
THEORY OF OPERATION

This section includes the following information:

- *Block diagram*
- *Functional overview of key circuits*
- *System logic*
- *Aaron 1250 control signal inputs and outputs.*

BLOCK DIAGRAM

Figure 4-1 Functional block diagram of the Aaron 1250 system



FUNCTIONAL OVERVIEW OF KEY CIRCUITS

The following descriptions highlight the main circuits in the Aaron 1250 Electrosurgical Generator.

High Voltage DC Supply

The unit incorporates a high voltage power supply to generate the RF output power. The high voltage power supply delivers an unregulated DC output for the RF output. The nominal DC voltage from the high voltage power supply is 87 VDC ± 5V.

Low Voltage DC Supplies

The unit incorporates four regulated low voltage levels to control generator operations. They are: 15 VDC, 12 VDC, 8 VDC, and 5 VDC.

- The 15 VDC circuit supplies power for all of the request sense circuits, the switching of the mode relays and the audio circuit.
- The 12 VDC circuit supplies power for the patient electrode sense module.
- The 8 VDC circuit supplies power for the RF drive circuit. This circuit turns on and off the power MOSFETS for the RF output power.
- The 5 VDC circuit supplies power for the logic system, and all of the displays and indicators.

DC Supply Check Circuit

The DC Supply Check Circuit is used by system logic to monitor the high voltage DC supply. If the voltage increases by 30%, the system displays error code E4 and disables the RF output.

For isolation purposes, the High Voltage Sense Voltage is measured from the 15-volt DC power supply.

Temperature Sensing Circuit

The temperature sensing circuit is used by the system logic to monitor the internal temperature of the unit. If the temperature rises above 85° C, the system displays error code E7 and disables the RF output.

Four Request Activation Sensing Circuits

The Activation Request Sensing Circuit is used by the system logic to detect both hand controlled activation and foot-controlled activation requests. This circuit is made up of a Colpitts Oscillator (operating at approximately 50 kHz) and a level detection circuit.

In a non-activation status, the Colpitts Oscillator operates at its set operating frequency, and presents a sine wave to the level detection circuit. The level detection circuit converts the sine wave into a square wave. Activation will not occur as long as a square wave is present.

When a resistance (approximately 200 W or less) is presented to the transformer's secondary winding by a hand-control or foot-control, the sense transformer is essentially shorted. The "short" is felt on the transformer's primary winding causing the Colpitts Oscillator to temporarily shut down.

When the oscillator shuts down, the sense signal becomes +5 VDC (logic "1"). This informs the system logic that a handswitch or footswitch activation request has been made.

If the square wave (from any of the request sense circuits) is not present at the system logic when the unit is initially turned on, an error code is displayed, an alarm sounds, and the RF output is disabled.

Speaker Circuit

The audio circuit is used by the system logic to generate activation tones and alarm tones. Volume for the activation tones may be adjusted from the back panel of the unit.

NOTICE
Alarm volume cannot be adjusted up or down.

Patient Return Electrode Sensing Circuit

The Patient Return Electrode Sensing Module senses and sends signals to the system logic that displays which type of patient return electrode is attached to the patient.

When you connect a single plate patient return electrode to the unit, the Pad Sensing Module will detect if the resistance is below 5 Ω. If it is, the Aaron 1250 will display the green single plate LED on the front of the unit.

When you connect a split plate patient return electrode to a patient, and the Pad Sensing Module detects a resistance between 10 and 135 Ω, then the Aaron 1250 will display the green split plate LED on the front of the unit.

The Pad Sensing Module constantly monitors the patient contact quality. If the impedance changes by a specific amount, then the unit will display an alarm, and immediately de-activate the RF output power.

WARNING
Patient Return Electrode contact quality is only monitored when a split plate patient return electrode is attached to the patient.

RF Amplifier Circuit

The RF Amplifier Circuit generates the RF output energy that is delivered to the patient. It is a single-ended power amplifier incorporating three power MOSFETs, and two step-up transformers.

The initial RF drive pulse is generated by the Digital PWM circuit and the system logic unit. When the RF drive pulse turns the power MOSFETs "ON," current flows from the high voltage supply through one of the output transformers, depending on which mode the unit is in, through the clamping diodes, and then through the MOSFETs to high voltage ground.

The energy developed by the "ON" time is stored in an LC tank circuit. When the MOSFETs are OFF the energy is delivered to the patient through the output capacitors. A longer "ON" time develops more energy in the LC tank circuit; therefore, more energy is delivered to the patient.

Monopolar Select Circuit

The monopolar select circuit is used to switch the Aaron 1250 between each of the four-monopolar modes. Selection of the modes is accomplished through the matrix switches on the front panel. High voltage relays are used to switch and isolate the four-monopolar configurations one from the other.

Monopolar / Bipolar Select Relays

The monopolar / bipolar select relays changes which output transformer is used to deliver the RF output to the patient.

Controls and Indicators

The Aaron 1250 controls and indicators are listed below:

- MEMBRANE SWITCHES Toggle between modes.
- DISPLAYS Seven segment displays indicate the output power in watts.
- MODE INDICATORS Green LEDs indicate the present mode of the unit.
- POWER CONTROL KNOBS These mechanical encoders adjust the output power for each mode.
- POWER SWITCH A double pole single throw switch that snaps into the front bezel. This switch supplies the AC mains current to the generator.

Digital PWM Circuit

The Digital Pulse Width Modulation (PWM) Circuit controls the output power of the unit. This digitally controlled signal is used by the system logic to provide a precise signal to the RF drive.

The pulse width is determined by power setting (generated by the user) on the front of the unit.

When a power is selected, the system logic determines what the pulse width needs to be to deliver the requested output.

SYSTEM LOGIC

The control logic uses a Field Programmable Gate Array as the “brain” of the Aaron 1250 Electrosurgical Generator. This system interprets all of the inputs and delivers the correct corresponding outputs.

Every operation of the unit is controlled from this system.

A System Clock Circuit, composed of an oscillator, provides the basic operating frequency of 5 MHz.

The Reset Circuit provides a single pulse at the time the Aaron 1250 Electrosurgical Generator is turned on. This pulse resets Field Programmable Gate Array to ensure proper operation.

AARON 1250 CONTROL SIGNAL INPUTS AND OUTPUTS

The following table lists the important input and output signals. From a troubleshooting standpoint, the absence (and presence) of these signals will help you isolate problems.

Signal Name	Description
PAD_SNS_ERROR	This is the input signal from the Pad Sense Module that informs the system logic that a pad sensing error has occurred. When a pad sense error occurs, a logic 1 (5 VDC) is sent to the system logic section.
PAD_NSED	This is an input signal from Pad Sense Module that informs system logic that a single plate Patient Return Electrode is attached to the front jack strip. When the Pad Sense Module senses the presence of a single plate patient return electrode, a logic 0 (0 VDC) is sent to the system logic.
PAD_SED	This is an input signal from Pad Sense Module that informs the system logic that a split plate Patient Return Electrode is attached to the patient. When the Pad Sense Module senses the presence of a split patient return electrode, a logic 0 (0 VDC) is sent to the system logic.
AUD_DRV	This is an output signal from the system logic that generates the activation tones for all modes of operation. A 1 kHz square wave is generated whenever cut or blend mode is activated. A 2 kHz square wave is generated when the coagulation, fulguration, or bipolar mode is activated. This signal is used by the audio circuit.
ALM_DRV	This is an output signal from the system logic that generates a 2 kHz / 1 kHz square wave for activating the alarm siren. This signal is used by the audio circuit.
AUX_RLY_DRV	This is an output signal from the system logic that controls the accessory relay on the back panel.

Signal Name	Description
TAP_SEL	This is an output signal from the system logic that controls relays on the main board. The relays select which secondary windings will be used from the monopolar output transformer.
OUT_SEL	This is an output signal from the system logic that controls relays on the main board. They control which output transformer provides the RF output circuit delivered to the patient.
HAND/FOOT_SEL	This is an output signal from the system logic that controls relays on the main board. These relays direct which output jack receives the output RF power. The output power for monopolar modes is switchable from foot-controlled hand piece activation, to a hand-controlled (switching pencil) activation.
RF_DRV	This is an output signal from the digital PWM circuit that controls the pulse width duration for the RF drive.
CON_SENS	This is an input signal that informs the system logic if the 24 pin ribbon cable (between the main board and the display board) is connected. When the cable is connected, a logic 0 (0 VDC) is sent to system logic section. When the cable is damaged, not secure, or not connected, a logic 1 (5 VDC) is sent to the system logic.
TEMP_SEN	This is an input signal from the Temperature Sense Circuit that informs the system logic if the internal temperature of the unit is above 85° C. If the internal temperature of the unit is below 85° C a logic 1 (5 VDC) is sent to the system logic. If the internal temperature of the unit rises above 85° C a logic 0 (0 VDC) is sent to the system logic.
HV_SENS	This is an input signal from the high voltage sense circuit that informs the system logic if a high voltage error has occurred. If the line voltage is within normal operating parameters a logic 1 (5 VDC) is sent to the system logic. If the line voltage increase by more than 30% a logic 0 (0 VDC) is sent to the system logic.

Signal Name	Description
ACT_REQ_HAND_A	This is an input signal from the Hand A request sense circuit. Hand A refers to the Cut button on the handpiece. This signal is generated by a colpitts oscillator located on the main board. When an activation request is made, this oscillator become a logic 1 (5 VDC) signal.
ACT_REQ_HAND_B	This is an input signal from the Hand B request sense circuit. Hand B refers to the Coag button on the handpiece. This signal is generated by a colpitts oscillator located on the main board. When an activation request is made, this oscillator becomes a logic 1 (5 VDC) signal.
ACT_REQ_FOOT_A	This is an input signal from the Foot A request sense circuit. Foot A refers to the Cut pedal on the footswitch. This signal is generated by a colpitts oscillator located on the main board. When an activation request is made, this oscillator becomes a logic 1 (5 VDC) signal.
ACT_REQ_FOOT_B	This is an input signal from the Foot B request sense circuit. Foot B refers to the Coag pedal on the footswitch. This signal is generated by a colpitts oscillator located on the main board. When an activation request is made, this oscillator becomes a logic 1 (5 VDC) signal.

SECTION 5

OPERATING THE AARON 1250

This section covers the following topics:

- *Inspecting the generator and accessories*
- *Service personnel safety*
- *Installation and placement*
- *Functional (operational) checks*
- *Operating the unit.*

INSPECTING THE GENERATOR AND ACCESSORIES

Before each use of the Aaron 1250 Electrosurgical Generator, inspect the unit and all accessories to verify good working order:

- Inspect for physical damage to the Electrosurgical Generator and its connections.
- Verify that the appropriate accessories and adapters are present.
- Inspect all cords and connectors for signs of wear, damage, and abrasion.
- Verify that no error messages are displayed when the unit is turned on.

SERVICE PERSONNEL SAFETY

WARNINGS

Hazardous Electrical Output This equipment is for operational use only by a trained, licensed, physician. Bio-Med Technicians must also exercise caution when testing or repairing a unit.

Electric Shock Hazard Connect the generator power cord to a properly grounded receptacle. Do not use power plug adapters.

Connect the power cord to a properly polarized and grounded power source with the frequency and voltage characteristics that match those listed on the back of the unit.

Fire Hazard Do not use extension cords.

CAUTION

Do not stack equipment on top of the generator or place the generator on top of electrical equipment. These configurations are unstable and / or do not allow for adequate cooling.

Provide as much distance as possible between the electrosurgical generator and other electronic equipment (such as monitors). An activated electrosurgical generator may cause interference with them.

Nonfunction of the generator may cause interruption of surgery. A backup electrosurgical generator should be available for use.

Do not turn the activation tone down to an inaudible level. This activation tone alerts the surgical team when an accessory (and the generator) is active.

When using a smoke evacuator in conjunction with the electrosurgical generator, place the smoke evacuator a distance away from the generator. Set the generator's volume control (on the rear panel) at a level that ensures all activation tones may be heard.

NOTICE

If required by local codes, connect the generator to the hospital equalization connector with an equipotential cable. There is a equipotential connector on the rear of the unit.

Connect the power cord to a wall outlet having the correct voltage. Otherwise product damage may result.

INSTALLATION AND PLACEMENT

Place the Aaron 1250 Electrosurgical Generator on any flat surface with a tilt angle of not more than 10 degrees. The unit relies on natural convection cooling. Do not block the rear vents.

Ensure that air flows freely on all sides of the unit.

WARNING

Connect the power cord to a properly polarized and grounded power source with the frequency and voltage characteristics that match those listed on the back of the unit.

FUNCTIONAL (OPERATIONAL) CHECKS

Upon initial installation of the unit, perform the following checks. Refer to the figures in Controls and Indicators for the location of connectors and generator controls.

WARNING

At no time should you touch the active electrode or bipolar forceps. A serious burn could result.

How to Set Up and Start the Aaron 1250 Unit

1. Verify that the Power Switch is in the OFF position and that no accessories are connected to the unit.

2. Connect a hospital-grade power cable to the AC power cable receptacle on the back of the unit, then to a properly grounded wall outlet.

3. Connect a two-pedal footswitch to the matching footswitch receptacle on the back of the unit. Use only Aaron footswitches. Although other types of footswitches may fit, they may not be compatible with this Electrosurgical Generator.

4. Do not connect a Patient Return Electrode to the front of the unit at this time.

5. Turn the unit on by switching the power switch to the (ON) position.

6. The correct startup for the unit is a quick flash of all indicators and a series of beeps. The unit will return to the last mode and power setting used.

How to Check the Patient Return Electrode Alarm Function

1. Adjust the power settings for each mode (Cut, Blend, Coagulation, Fulguration, and Bipolar) to one watt.

2. Press the Cut Pedal of the footswitch.

3. Verify that an alarm sounds for three seconds, and then the Patient Return Electrode Sensing Alarm Indicator Light illuminates. This indicates NO patient return electrode connected to the unit.

4. Verify that adjusting the volume control on the back of the unit (while the alarm is sounding) cannot change the alarm's sound level.

How to Check the Bipolar Mode (with Footswitch)

1. Select the Bipolar mode by pressing the Bipolar Mode switch on the front panel.

   Note: The unit automatically changes to Bipolar footswitching when you select the Bipolar mode.

2. Verify that the Bipolar Mode LED illuminates green, and that the system generates the Coag tone when you press the Coag pedal (Blue) on the footswitch.

3. While activating the Bipolar mode, rotate the volume control over the full range to verify that the sound is audible throughout the range.

4. Confirm that releasing the Coag pedal returns the unit to an idle state.

How to Check the Monopolar Mode (with Footswitch)

1. Select monopolar foot control by pressing the Footswitch Control Selector until the Monopolar Footswitch Control Indicator illuminates.

2. Connect a single-plate patient return electrode to the Return Electrode receptacle of the unit. Verify that the green single-plate patient return electrode indicator illuminates.

3. Press the Cut pedal on the footswitch. Verify that the Cut and Blend Activation Indicator illuminates and that the system generates the Cut activation tone.

4. While activating the Cut mode, rotate the volume control over the full range to verify that the sound is audible throughout the range.

5. Press the Coag pedal on the footswitch. Verify that the Coagulation, Fulguration, and Bipolar Activation Indicator illuminates and that the system generates the Coagulation activation tone.

6. While activating the Coag mode, rotate the volume control over the full range to verify that the sound is audible throughout the range.

How to Check the Monopolar Mode (with Handswitch)

1. Connect a handswitching handpiece to the Monopolar Handswitching receptacle.

2. Activate, one at a time, the Cut and Coag handswitching controls. Verify that each control causes the correct indicator and tone to sound.

OPERATING THE UNIT

Monopolar Cut Select the desired mode of operation (Pure Cut or Blend), then select the power settings by rotating the Cut and Blend Power Control Dial.

Monopolar Coag Select the coag mode of operation (Coagulation or Fulguration), then select the power setting by rotating the Coag and Bipolar Power Control Dial.

Bipolar Select the mode of operation for Bipolar (coagulation or fulguration), then select the Bipolar power settings by rotating the Coag and Bipolar Power Control Dial.

Activate the generator by pressing the appropriate button on the handswitch or footswitch.

NOTICE
One footswitch can activate either monopolar or bipolar operation.

To Activate…	Press This…	On This Device…
Monopolar		
Cut or Blend Modes	Yellow Button Yellow Pedal	Handswitching Pencil Footswitch
Coagulation or Fulguration Modes	Blue Button Blue Pedal	Handswitching Pencil Footswitch
Bipolar		
Any Bipolar	Yellow (Cut) or Blue (Coag) Pedal	Footswitch

SECTION 6

MAINTENANCE

This section includes the following information:

- *Cleaning the unit*
- *Performing periodic inspection*
- *Replacing fuses.*

CLEANING THE UNIT

After each use, clean the unit.

WARNING

Electric Shock Hazard Always turn off and unplug the generator before cleaning.

NOTICE

Do not clean the generator with abrasive cleaning or disinfectant compounds, solvents, or other materials that could scratch the panels or damage the generator.

1. Turn off the generator, and unplug the power cord from the wall outlet.
2. Thoroughly wipe all surfaces of the generator and power cord with a mild cleaning solution or disinfectant and a damp cloth. Follow the procedures approved by your institution or use a validated infection control procedure. Do not allow fluids to enter the chassis. Do not sterilize the generator.

PERFORMING PERIODIC INSPECTION

Every six months, visually inspect the Aaron 1250 for signs of wear or damage. In particular, look for any of the following problems:

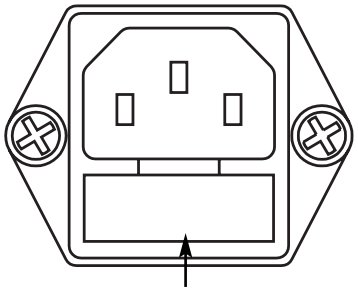
- Damage to the power cord
- Damage to the power cable receptacle
- Obvious damage to the unit
- Damage to any receptacle
- Accumulation of lint or debris in or around the unit.

REPLACING FUSES

Fuses for the unit reside directly below the Power Cable Receptacle on the rear of the unit.

To replace the fuses, follow this procedure:

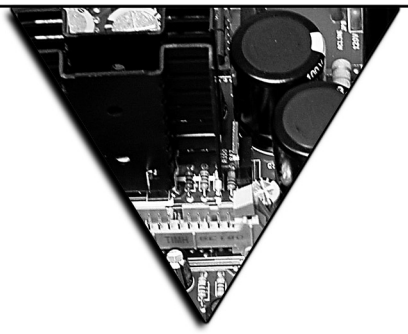
1. Unplug the power cord from the wall outlet.
2. Remove the power cord from the Power Cable Receptacle on the rear panel.
3. To release the fuse drawer, insert a small flathead screwdriver into the slot on the drawer below the power cord receptacle. Then, slide the drawer out.
4. Remove the two fuses and replace them with new fuses with the same values.
5. Insert the fuse holder into the Power Cable Receptacle.



Fuse Holder

Use the following fuses:

	110 - 120 V	220 - 240 V
VAC	250	250
AMPS	5.0 A	3.15 A
Type	Slow Blow	Slow Blow
Size	5 x 20 mm	5 x 20 mm



SECTION 7

TROUBLESHOOTING

This section includes error code descriptions and actions to take to resolve them.

RECOMMENDED EQUIPMENT FOR TROUBLESHOOTING

The following equipment enables you to troubleshoot and repair the Aaron 1250 Electrosurgical Generator.

- Digital multimeter with leads
- Electrosurgical analyzer or a true RMS voltmeter such as a Fluke 8920A
- Wideband current transformer such as a Pearson 4100
- Noninductive RF load resistors 200 W, 500 W, 800 W, 1000 W
- Oscilloscope (dual channel) at 100 MHz
- Oscilloscope probes, (2) 10X and 1000X
- Bovie/Aaron footswitch
- Bovie/Aaron handswitching pencil (single use or reusable)
- Standard technician's tool kit
- Miscellaneous test leads and cables.

TROUBLESHOOTING THE AARON 1250

If the generator is not functioning properly, use the information in this section to perform the following activities:

- Identify and correct the malfunction.
- If an error code was displayed, take the appropriate action(s) to correct the error condition.

Inspecting the Generator

If the Aaron 1250 malfunctions, check for obvious conditions that may have caused the problem.

1. Check the generator for visible signs of physical damage.
2. Verify that all accessory cords are properly connected.
3. Check the power cord. Replace the power cord if you find exposed wires, cracks, frayed insulation, or a damaged connector.
4. Open the fuse drawer and inspect the fuse housing and fuses for damage and corrosion.
5. Verify that the fuses are firmly seated. An internal component malfunction in the generator can damage the fuses.
6. You may need to replace the fuses if the generator fails the self-test or stops functioning. Refer to Fuse Replacement in Section 6.

Inspecting the Receptacles

Equipment required:

- Footswitch
- Bipolar cable
- Monopolar instruments (handswitch and footswitch)
- Return electrode cable.

Procedure:

1. Turn off the generator.
2. Disconnect the power cord from the wall receptacle.
3. Check the footswitch receptacle on the rear of the unit for obvious signs of obstruction and damage.
4. Check for a secure fit by inserting the footswitch connector into footswitch receptacle. If the footswitch receptacle is damaged, replace the footswitch connector assembly.

5. Check the Bipolar receptacle on the front of the unit for obstruction or damage.
6. Insert a bipolar cable into the bipolar receptacle on the front of the unit. Verify a secure fit.

   If the Bipolar receptacle is damaged, replace the bipolar connector assembly.
7. Check the monopolar handpiece receptacle on the front of the unit for obstruction or damage.
8. Insert a handswitching pencil into the monopolar handpiece receptacle on the front of the unit. Verify a secure fit.

   If the monopolar handpiece receptacle is damaged, replace the monopolar handpiece assembly.
9. Check the monopolar foot controlled receptacle on the front of the unit for obstruction or damage.
10. Insert a monopolar foot controlled handpiece into the monopolar foot control receptacle on the front of the unit. Verify a secure fit.
    If the monopolar foot controlled receptacle is damaged, replace the connector assembly.
11. Check the Patient Return Electrode receptacle on the front of the unit for a broken pin or an obstruction.
12. Insert a return electrode cable into the return electrode receptacle. Verify a secure fit.

    If the return electrode receptacle on the front of the unit is damaged, replace the return electrode cable assembly.

Inspecting Internal Components

CAUTION
The generator contains electrostatic-sensitive (ESS) components. When repairing the generator, work at a static-control workstation.

Wear a grounding strap when handling electrostatic-sensitive components.

Handle circuit boards by their nonconductive edges.

Use an anti-static container for transport of electrostatic-sensitive components and circuit boards.

To inspect the internal components, follow this procedure:

1. Remove the four screws that secure the cover to the chassis.
2. Lift the cover off the chassis. Save the cover and screws for later reinstallation.
3. Visually inspect and verify that all connectors are firmly seated.
4. Inspect each board for damaged components, wires, cracks and corrosion.
5. Reinstall the cover by positioning the cover over the chassis, and securing the four screws.

UNDERSTANDING ERROR CODES AND AUDIO TONES

The Aaron 1250 Electrosurgical Generator includes automatic, perpetual, self-diagnostics. If the diagnostics detect an error, the system displays an error code, sounds an audible tone, and deactivates the output power.

Any errors detected will shut down the RF output power.

NOTICE
Internal firmware self-diagnostics continually monitor the unit's operation to ensure proper and safe performance.

Most error codes result from faults in accessories attached to the unit. The following table lists the error codes, describes the error, and recommends actions to take to resolve the error.

ERROR CODE	DESCRIPTION	RECOMMENDED ACTION
F1 (on the Cut / Blend display) **F1** (on the Coagulation / Fulguration / Bipolar display)	Handswitch or monopolar footswitch cut pedal may be stuck Handswitch or monopolar footswitch coag pedal may be stuck	1. Turn off, then turn on the generator. Do not press buttons or accessory activation devices during the self-test. 2. If the alarm number reappears, disconnect all accessories. Turn off, then turn on the generator again. 3. If the problem persists, replace the handpiece or footswitch and repeat the restart. 4. If the alarm number reappears, record the number and call the Aaron Medical Service Center.
F2	Cut and Coag buttons activated simultaneously (pencil or footswitch)	The unit does not allow simultaneous activation of the cut and coagulation modes. Release either the cut or coag button on the handpiece, or the cut or coag pedal on the footswitch.
F3	Footswitch Cut or Coag Pedal pressed while in Bipolar Foot Control and the unit is not in Bipolar Mode	The unit will not allow the Footswitch to activate the unit if Bipolar Footcontrol is selected, but the Bipolar Mode is not selected.
E4	Line voltage error (Line voltage too high)	1. Turn the unit off. 2. Verify that the unit is connected to the correct line voltage.
E7	Internal temperature of the unit exceeded limit	1. Turn unit off. 2. Allow unit to cool for 20 minutes.

CORRECTING COMMON PROBLEMS

If a solution is not readily apparent, use the table below to help identify and correct specific malfunctions. After you correct the malfunction, verify that the generator successfully completes the self-test.

Situation	Possible cause	Recommended action
Generator does not respond when turned on	Disconnected power cord, faulty wall receptacle, or faulty power cord	1. Check power cord connections (generator and wall receptacle). 2. Connect the power cord to a functional wall receptacle. If necessary, replace the power cord.
	Fuse drawer is open or fuses blown	1. Close the fuse drawer. If necessary, replace the fuse(s). 2. If a problem persists, use a backup generator.
	Loose or disconnected internal cables	Check all internal connections.
	Faulty power entry module or connections	Check the power entry module and its cable connections.
	Faulty power switch	Replace the power switch.
Generator is on, but did not complete the self-test.	An alarm condition exists.	Check the display for an error code. Note the number and refer to Error Code list.
	Loose or disconnected internal cables	Check and correct all internal connections.
	Faulty power switch	Replace the power switch.
	Main board malfunction	Replace the main board.
	Display board malfunction	Replace the display board.
Activation and / or alarm tones do not sound; speaker is malfunctioning.	Loose or damaged connection between speaker board and main board	Check / connect all connections from the speaker board to the main board.
	Loose or disconnected cable between main board and display board	Check / connect ribbon cable from the main board to the display board.
	Main board malfunction	Replace the main board.
	Display board malfunction	Replace the display board.

Situation	Possible cause	Recommended action
Blank or confusing LED display	Faulty ribbon cable between Main board and Display board	Check / connect ribbon cable that connects the display board to the main board.
	Display board malfunction	Replace the display board.
Mode buttons do not operate correctly when pressed	Loose or disconnected cable between main board and display board	Check / connect ribbon cable from the main board to the display board
	Loose or disconnected cable between front panel overlay and display board	Check / connect cable from front panel overlay to the display board
	Damaged front panel overlay	Replace front panel overlay
Generator is on and the accessory is activated, but generator does not deliver output.	Malfunctioning footswitch or handswitching instrument	1. Turn off the generator. Check and correct all accessory connections. 2. Turn on the generator. 3. Replace the accessory if it continues to malfunction.
	Display board malfunction	Replace the display board.
	Power set too low	Increase the power setting.
	An error condition exists	1. Check the Cut and Coag displays for an error code number. 2. Note the number and refer to the error codes descriptions in this section.
	Main board malfunction	Replace the main board.
	RF output stage malfunction	1. Troubleshoot the RF output stage as described below: 2. On the main board, verify output pulses (TP1) during activation. 3. If pulses are not present replace the Main board. Check the power MOSFETs for failure (typically fail as shorted). Check all output relays to verify that they are toggling during operation. If they are not, check the relay drivers.
Footswitch will not activate output.	Malfunctioning or damaged footswitch receptacle	Replace the Footswitch connector assembly.
	Footswitch activation signal lost on main board	Replace the main board.

Situation	Possible cause	Recommended action
Continuous monitor interference	Faulty chassis-to-ground connections	1. Check and correct the chassis ground connections for the monitor and, if applicable, for the generator. 2. Check other electrical equipment in the room for defective grounds.
	Electrical equipment is grounded to different objects rather than a common ground. The generator may respond to the resulting voltage differences between grounded objects.	Plug all electrical equipment into line power at the same location.
	Malfunctioning monitor	Replace the monitor.
Interference with other devices only when generator is activated	Metal-to-metal sparking	Check all connections to the generator, patient return electrode, and accessories.
	High settings used for fulguration	Use lower power settings for fulguration or select the Coagulation mode.
	Electrically inconsistent ground wires in the operating room	Verify that all ground wires are as short as possible and go to the same grounded metal.
	If interference continues when the generator is activated, the monitor is responding to radiated frequencies.	Check with the manufacturer of the monitor. Some manufacturers offer RF choke filters for use in monitor leads. The filters reduce interference when the generator is activated and minimize the potential for an electrosurgical burn at the site of the monitor electrode.

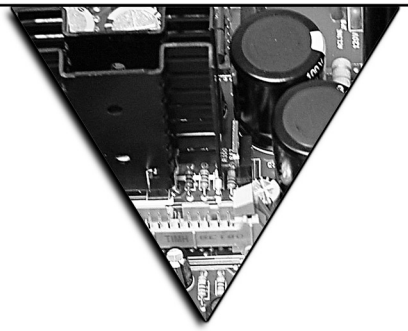
Situation	Possible cause	Recommended action
Pacemaker interference	Intermittent connections or metal-to-metal sparking	1. Check all connections to the generator. 2. It may be necessary to re-program the pacemaker.
	Current traveling from active to return electrode during monopolar Electrosurgery is passing too close to pacemaker.	1. Use bipolar instruments, if possible. If you must use a monopolar instrument, place the patient return electrode as close as possible to the surgical site. 2. Make sure the current path from the surgical site to the patient return electrode does not pass through the vicinity of the heart or the site where the pacemaker is implanted. 3. Always monitor patients with pacemakers during surgery and keep a defibrillator available. 4. Consult the pacemaker manufacturer or hospital. 5. Contact the Cardiology Department for further information when use of electrosurgical appliances is planned on patients with cardiac pacemakers.
Abnormal neuromuscular stimulation (stop surgery immediately)	Metal-to-metal sparking	Check all connections to the generator, patient return electrode, and active electrodes.
	Can occur during coag	Use a lower power setting for the Fulgurate mode or select the Coagulation mode.
	Abnormal 50 Hz - 60 Hz leakage currents	Inside the generator, carefully inspect for damage that may cause shorting between the AC line voltage and connected patient components.

MAIN BOARD TEST POINTS

Test Point	Description
TP1 (RFDRIVE)	RF DRIVE SIGNAL
TP2 (+HV)	HIGH VOLTAGE POWER SUPPLY
TP3 (HVGND)	HIGH VOLTAGE GROUND
TP4 (+15 VDC)	15 VOLT DC POWER SUPPLY
TP5 (+12 VDC)	12 VOLT DC POWER SUPPLY
TP6 (+8 VDC)	8 VOLT DC POWER SUPPLY
TP7 (LVGND)	LOW VOLTAGE GROUND
TP8 (+5 VDC)	5 VOLT DC POWER SUPPLY

DISPLAY BOARD TEST POINTS

Test Point	Description
TP1	DIGITAL GROUND
TP2	NOT USED
TP3	NOT USED



SECTION 8

REPAIR POLICY AND PROCEDURES

Refer to this section for information on

- *Responsibility of the manufacturer*
- *Returning the generator for service*

RESPONSIBILITY OF THE MANUFACTURER

Bovie Aaron Medical is responsible for the safety, reliability, and performance of the generator only under the following circumstances:

- The user has followed the Installation and Setup Procedures in this Service Guide.
- Persons authorized by Bovie Aaron Medical performed assembly operation, readjustments, modifications, or repairs.
- The electrical installation of the relevant room complies with local codes and regulatory requirements, such as IEC and BSI.
- Equipment use is in accordance with the Bovie Aaron Medical instructions for use.

For warranty information, refer to *APPENDIX A - WARRANTY*.

RETURNING THE GENERATOR FOR SERVICE

Before you return the generator, call your Bovie Aaron Medical representative for assistance. If instructed to send the generator to Bovie Aaron Medical, first obtain a Returned Goods Authorization Number. Then clean the Generator and ship it to Bovie Aaron Medical for service.

Step 1 – Obtain a Returned Goods Authorization Number

Call the Bovie Aaron Medical Customer Service Center to obtain a Returned Goods Authorization Number. Have the following information ready when you call:

- Hospital / clinic name / customer number
- Telephone number
- Department / address, city, state, and zip code
- Model number
- Serial number
- Description of the problem
- Type of repair to be done

Step 2 – Clean the Generator

WARNING

Electric Shock Hazard - Always turn off and unplug the generator before cleaning.

NOTICE

Do not clean the generator with abrasive cleaning or disinfectant compounds, solvents, or other materials that could scratch the panels or damage the generator.

A. Turn off the generator, and unplug the power cord from the wall outlet.

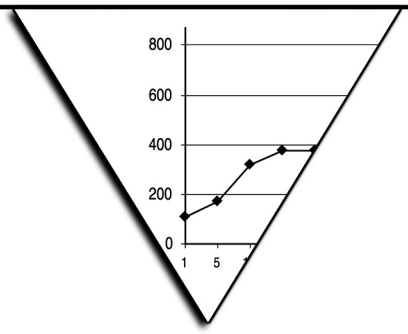
B. Thoroughly wipe all surfaces of the generator and power cord with a mild cleaning solution or disinfectant and a damp cloth. Follow the procedures approved by your institution or use a validated infection control procedure. Do not allow fluids to enter the chassis. You cannot sterilize the generator.

Step 3 – Ship the Generator

A. Attach a tag to the generator that includes the Returned Goods Authorization Number and the information (hospital, phone number, etc.) listed in *Step 1 – Obtain a Returned Goods Authorization Number*.

B. Be sure the generator is completely dry before you pack it for shipment. Package it in its original shipping container, if available.

C. Ship the generator, prepaid, to the address given to you by the Bovie Aaron Medical Service Center.



APPENDIX A

WARRANTY

Bovie Aaron Medical warrants each product manufactured by it to be free from defects in material and workmanship under normal use and service for the period(s) set forth below.

Aaron Medical's obligation under this warranty is limited to the repair or replacement, at its sole option, of any product, or part thereof, which has been returned to it or its Distributor within the applicable time period shown below after delivery of the product to the original purchaser, and which examination discloses, to Aaron Medical's satisfaction, that the product is indeed, defective.

This warranty does not apply to any product, or part thereof, which has been repaired or altered outside Aaron Medical's factory in a way so as, in Aaron Medical's judgment, to affect its stability or reliability, or which has been subjected to misuse, neglect, or accident.

The warranty periods for Aaron Medical products are as follows:

- Electrosurgical Generators: Two years from date of shipment
- Mounting Fixtures (all models): Two years from date of shipment
- Footswitches (all models): Ninety days from date of shipment
- Patient Return Electrodes: Shelf life only as stated on packaging
- Sterile Single Use Accessories: Only as stated on packaging

This warranty is in lieu of all other warranties, express or implied, including without limitation, the warranties of merchantability and fitness for a particular purpose, and of all other obligations or liabilities on the part of Aaron Medical.

Aaron Medical neither assumes nor authorizes any other person to assume for it any other liability in connection with the sale or use of any of Aaron Medical's products.

Notwithstanding any other provision herein or in any other document or communication, Aaron Medical's liability with respect to this agreement and products sold hereunder shall be limited to the aggregate purchase price for the goods sold by Aaron Medical to the customer.

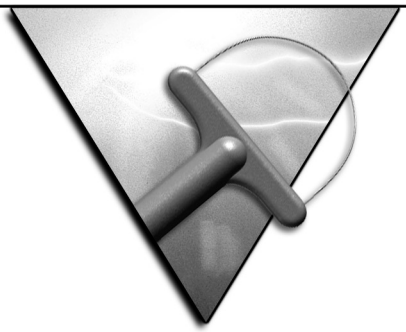
There are no warranties which extend beyond the terms hereof.

Aaron Medical disclaims any liability hereunder or elsewhere in connection with the sale of this product, for indirect or consequential damages.

This warranty and the rights and obligations hereunder shall be construed under and governed by the laws of the State of Florida, USA.

The sole forum for resolving disputes arising under or relating in any way to this warranty is the District Court of the County of Pinellas, State of Florida, USA.

Aaron Medical, its dealers, and representatives reserve the right to make changes in equipment built and/or sold by them at any time without incurring any obligation to make the same or similar changes on equipment previously built and/or sold by them.



APPENDIX B

BOARD DRAWINGS AND SCHEMATICS

This supplement contains the assembly drawings and schematics for the following printed circuit boards:

- *Control board*
- *Display board*
- *Footswitch board*
- *Power Supply/RF board.*

HOW TO ORDER PARTS FROM AARON MEDICAL

Once you have determined what parts you need from the drawings and Bill of Materials, call our Technical Service Department.

Our trained staff will verify the part numbers and arrange immediate delivery. The Technical Service Department can relay cost information, determine parts availability, and suggest any assembly updates available.

AARON 1250 DESIGN BREAKDOWN & DRAWING REFERENCE

PCB BOARD ASSEMBLIES	
P/N	**Description**
20-037-001	Main PCB Assembly
20-033-001	Display PCB Assembly
20-045-001	Speaker PCB Assembly
20-009-001	Relay PCB Assembly
ENCLOSURE	
P/N	**Description**
10-040-001	Back Panel, White
10-041-001	Bottom Panel, White
10-042-001	Top Panel, White
06-053-001	Front Panel, White
CONNECTORS	
P/N	**Description**
21-073-001	Bipolar Receptacle Assembly
21-074-001	Mopolar Receptacle Assembly
21-075-001	Monopolar Foot-Control Receptacle Assembly
21-076-001	Return Electrode Receptacle Assembly
21-090-001	Footswitch Receptacle Assembly
21-086-001	Accessory Relay Receptacle Assembly
FUSES	
P/N	**Description**
02-033-500	Fuse 250 VAC 5.0 Amp, Slow Blow 5x20 mm (F1 & F2 and Power Entry Module for 120 VAC Model Only)
02-033-001	Fuse 250 VAC 3.15 Amp, Slow Blow 5x20 mm (F1 & F2 and Power Entry Module for 220 VAC Model Only)
MISCELLANEOUS	
P/N	**Description**
19-034-001	Line Transformer
05-023-001	Power Entry Module and Filter
15-079-001	Front Panel Overlay with Membrane Switches
07-044-001	Switch DPST Snap Mount On/Off
21-078-001	24 Pin Ribbon Cable

AARON DRAWING & SCHEMATIC PACKAGE

Following tri-folds