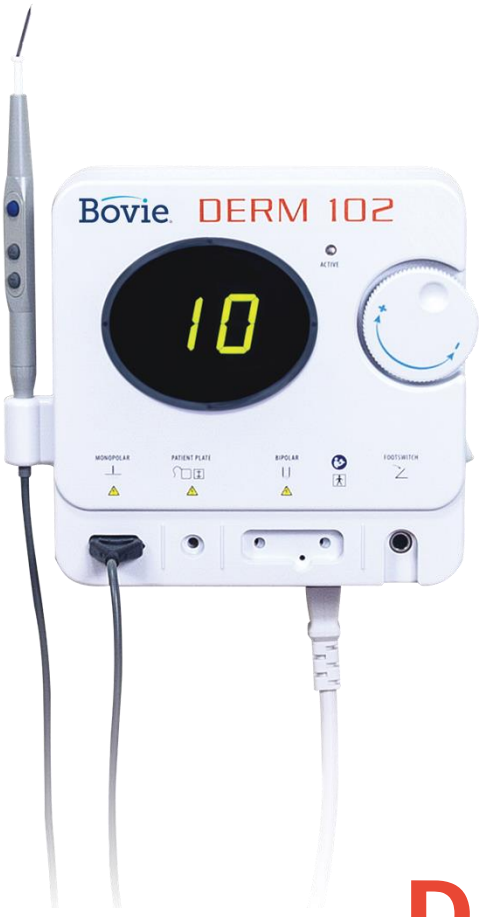
Bovie®



DERM 102

Electrosurgical Generator and High-Frequency Desiccator

Service Guide

SERVICE GUIDE

This Service Guide and the equipment it describes are for qualified technicians who maintain and repair the Bovie® DERM 102 High Frequency Desiccator. Additional User information is available in the Bovie® DERM 102 User's Guide.

This document covers technical descriptions of the Bovie® DERM 102 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 Bovie DERM 102 was constructed with the highest quality components. In the unlikely event that your generator fails within two years of purchase date, Aspen Surgical Products will warranty the product and effect factory repairs. Please refer to Appendix A, Warranty for what is covered, length of coverage, and "How to Receive a Return Authorization Number."

Equipment Covered in this Manual

Bovie DERM 102™:
Reference No.: DERM102

For Information Contact

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Bovie Part Number MC-55-229-002 Rev. 3

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 Bovie® DERM 102, please refer to the User's Guide for standard operating precautions.

APPLICABLE SAFETY STANDARDS

Conforms To
ANSI/AAMI STD ES60601-1
IEC STD 60601-1-6 & 60101-2-2

Certified To
CAN/CSA STD C22.2 No. 60601-1

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.

LIST OF FIGURES

THE BOVIE® DERM 102 HIGH FREQUENCY DESICCATOR

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

CAUTIONS:

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.

Any serious incident that has occurred in relation to the device should be reported to Aspen Surgical Products, the governing body, and the Competent authority of the member state in which the incident occurred

FUNCTIONAL DESCRIPTION

The Bovie® DERM 102 is a multipurpose High Frequency Desiccator for use in physician's offices and surgi-centers. It provides unsurpassed performance, flexibility, reliability, and user convenience in one compact package.

The Bovie® DERM 102 High Frequency Desiccator includes digital technology. This new technology is evident in the self-checking circuitry and error code readouts. The DERM 102™ unit offers monopolar and bipolar electrosurgical operations.

The following are key advantages and benefits.

Power Capabilities	Up to 10 watts of Coagulation @ 1000 Ω. Up to 10 watts of Bipolar @ 150 Ω.
Memory	The generator automatically powers up to the last power setting.
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

TheBovie® DERM 102 High Frequency Desiccator is a self-contained unit, consisting of the main enclosure and power cord. The main components incorporated in the generator include:

- FRONT PANEL COMPONENTS Dial for controlling power output; receptacles for connecting electrosurgical accessories; footswitch receptacle; and 7-segment display.
- REAR PANEL COMPONENTS Volume control.
- OTHER COMPONENTS Power switch (located on side of unit); power cable receptacle (located on bottom of unit); connector to A902 pencil.
- INTERNAL COMPONENTS Main PCB

SAFETY PRECAUTIONS WHEN REPAIRING THE GENERATOR

Before servicing the Bovie® DERM 102 High Frequency Desiccator 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

WARNING:

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.

To avoid risk of electric shock, this equipment must only be connected to a supply mains with protective earth.

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 adequate cooling. Unit is designed to be wall mounted or mounted on a mobile stand.

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.

No modification of this equipment is allowed.

NOTICE:

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

Electrosurgical equipment and accessories are intended to be used by health professional educated in their use.

Active Accessories

WARNING:

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.

Associated equipment and active accessories should be selected that have a rated accessory voltage equal to or greater than the maximum output voltage.

Accessories must be connected to the proper receptacle type. In particular, bipolar accessories must be connected to the Bipolar Instrument output jack only. Improper connection may result in inadvertent generator activation.

CAUTION:

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.

Examine all accessories and connections to the electrosurgical generator before use. Ensure that the accessories function as intended. Improper connection may result in arcs, sparks, accessory malfunction, or unintended surgical effects. Refer to the accessories instructions for use for more detailed instructions.

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

Reusable devices are provided non-sterile and must be processed prior to use to include first use. Processing is defined on specific Instructions provided with each device.
Single Use Devices Only: Reusing or reprocessing single use devices may cause damage to the device which in turn may cause unnecessary harm to the user and/or patient. Reuse or reprocessing is not recommended.
After Use or upon determining product can no longer be used due to wear or damage, safely discard in accordance with established procedures for biohazardous waste.
Notice: For applicable IFU/additional information: Visit https://www.aspensurgical.com/Resources/Documents/IFUs
Please refer to the manufacturer of the generator for warnings, precautions, contra-indications, undesirable side-effect, measures to be taken, and limitations of use for the electrosurgical system and accessories.

NOTICE:

To avoid incompatibility and unsafe operation, we recommend using only Bovie®/Aaron® accessories.

During bipolar electrosurgery, do not activate the generator until the forceps have made contact with the patient. Product damage may occur.

Fire / Explosion Hazards

WARNING:
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.
Residual Risks and Adverse Reactions/Adverse effects associated with the use of this device may include thermal damage, shock, or electrocution, burns, fire, biohazard (from smoke). Additionally, accessories include risks associated with patient contact including unintended cut, allergic reaction, and infection.
Due to concerns about the carcinogenic and infectious potential of electrosurgical byproducts (such as tissue smoke plume and aerosols which may include toxic gasses and vapors, live and dead cellular material, and viruses), protective eyewear, filtration masks, and effective smoke evacuation equipment should be used in both open and laparoscopic procedures. Contact Aspen Surgical Products at customerservice@aspensurgical.com for additional information or to inquire about our smoke evacuation solutions.

Generator Electric Shock Hazards

WARNING:
Connect the generator power cord to a properly grounded receptacle. Do not use power plug adapters.
To avoid risk of electric shock, this equipment must only be connected to a supply mains with protective earth.
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. Disconnect power cord from power source to isolate the internal circuits from the supply mains.
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.

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.

CONTROLS, INDICATORS, AND RECEPTACLES

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

CONTROLS AND INDICATORS OVERVIEW

Users may control most Bovie® DERM 102 functions from the front panel. Each Control is plainly marked on the front panel for quick reference. The volume control is located on the rear panel.

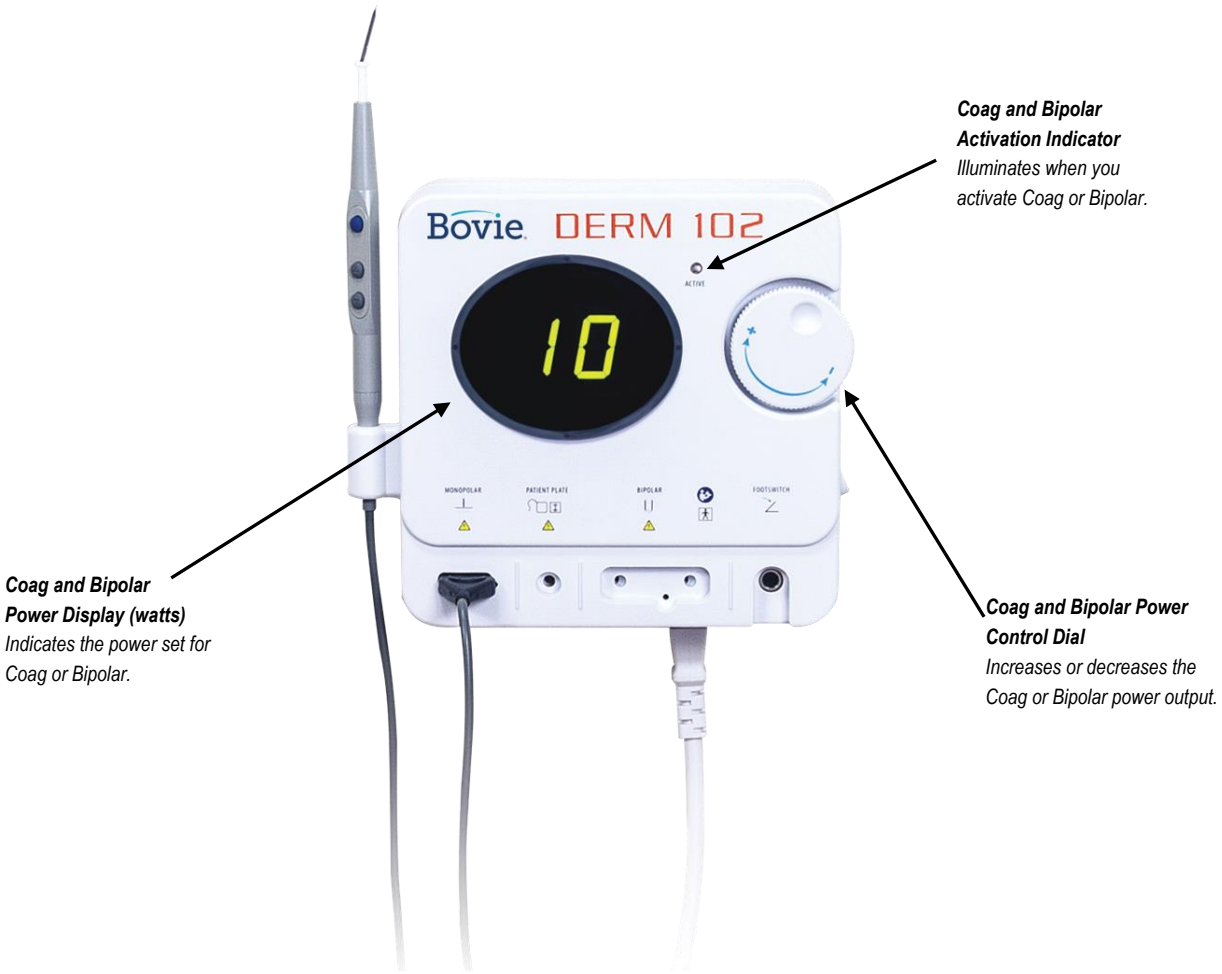
Normal operations involve activating the generator with either a front connected handswitch or footswitch. The following components are the User Interface for the Bovie® DERM 102 High Frequency
Desiccator:

Power Switch	The rocker ON/OFF switch on the lower right corner. The switch turns power on and off to the unit.
Power Control Knob	This rotary knob allows you to select the desired RF power level for all modes of operation. The Power Control Knob moves at a graduated .1 watt per notch (incrementally) up to 10 watts.
Watts Display	The large power output display reports the generator's output power setting from .1 to 10 watts.
Visual LED Indictors	The blue activation indicator reports when the unit is activated.
Audible Indicators	An activation tone sounds whenever the Bovie® DERM 102 High Frequency Desiccator is activated. The volume may be adjusted to a high or low setting. The volume adjust ment is located on the rear of the unit. An alarm siren sounds during all alarm conditions. The volume of this alarm cannot be adjusted.

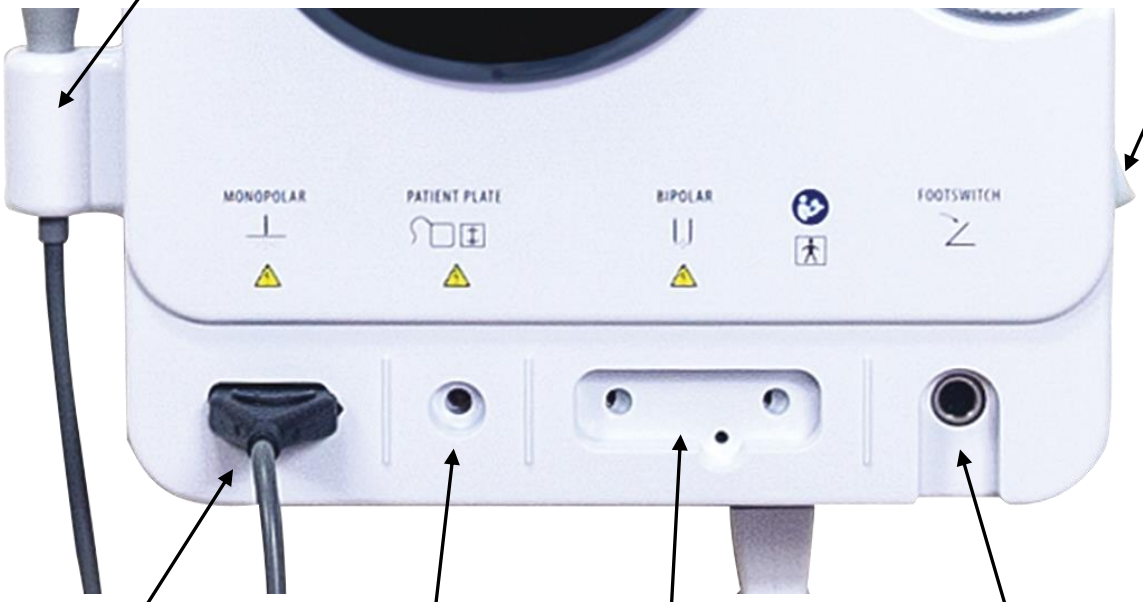
Figure 2 – 2 Layout of controls, indicators, and receptacles on the front panel- DERM 102™

COAGULATION AND BIPOLAR CONTROLS

Figure 2 – 3 Controls for the coag and bipolar modes



MONOPOLAR POWER OUTPUT MODES



Handpiece Holder
Securely holds Bovie® handpiece when not in use.

Power Switch
Powers the unit on or off.

*Monop**olar Handswitching Receptacle***
Accepts only Bovie handpieces.

Patient Return Electrode Receptacle
Accepts only Bovie return electrode plugs designed for the DERM 102.

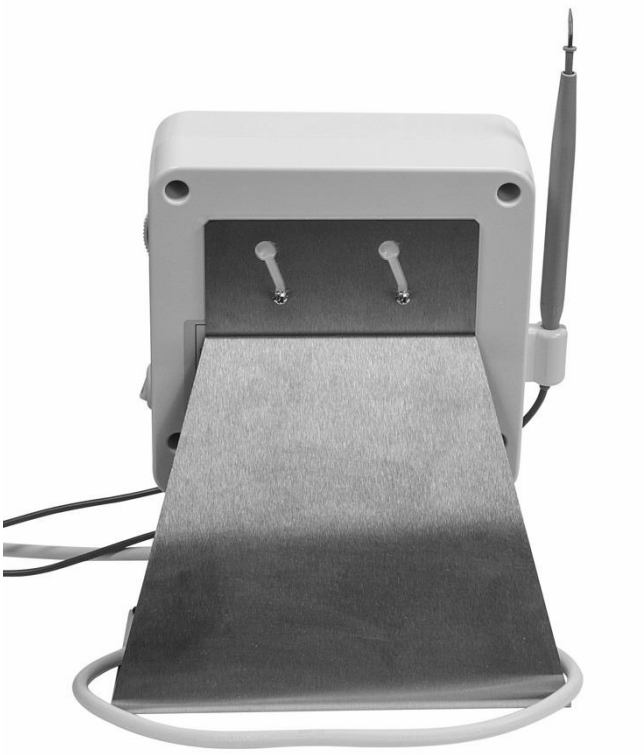
Bipolar Receptacle
Accepts only Bovie cables for bipolar handpieces.

Footswitching Receptacle
Accepts only Bovie footswitch.

REAR PANEL VIEW

Figure 2 – 5 Layout of controls and labeling on the rear panel

Figure 2 – 6 Rear view mounted on stand



FRONT VIEW ON WALL MOUNT AND STAND

Figure 2 – 7 Front view on wall mount

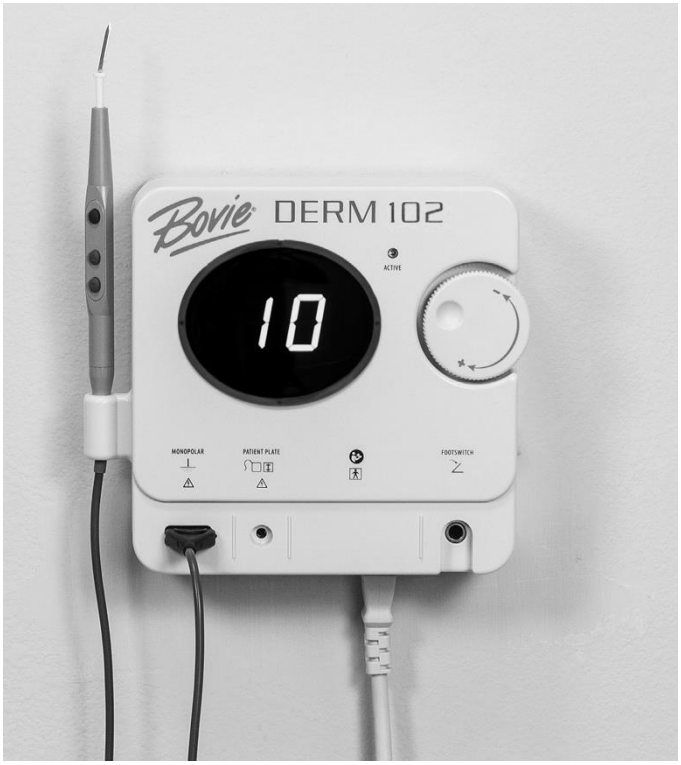
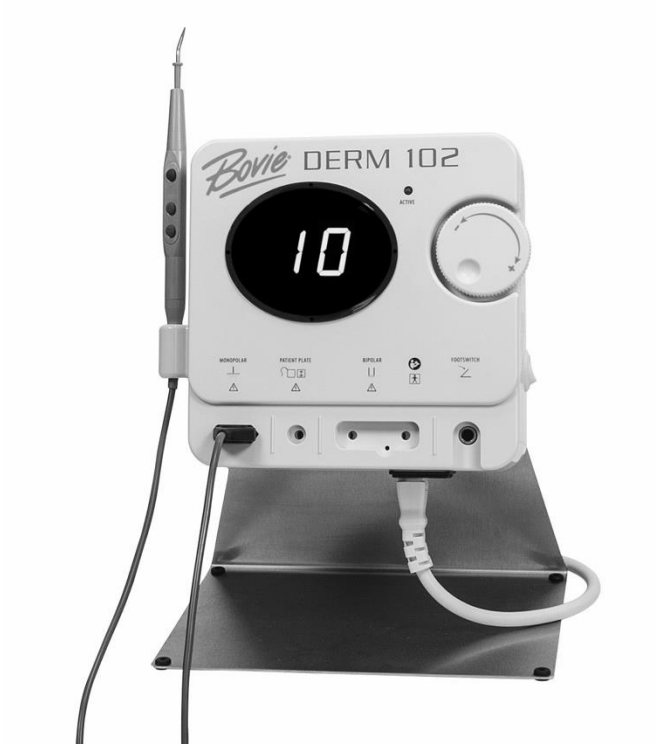


Figure 2 – 8 Front view on stand



SIDE VIEW LEFT AND RIGHT

Figure 2 – 9 Side view right (On/Off switch and power control knob)

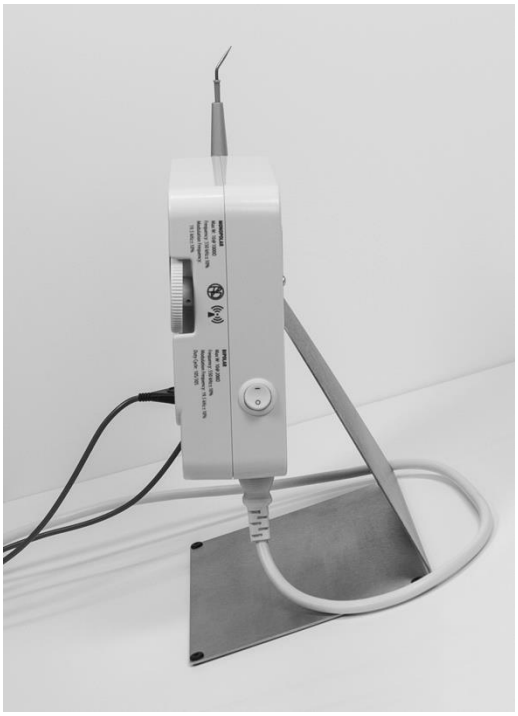


Figure 2 – 10 Side view left (pencil holster)

SYMBOLS ON THE FRONT AND REAR PANELS

The following table lists descriptions for symbols found on the DERM units.

SYMBOLS	DESCRIPTION
	Warning: Dangerous voltage.
	Medical Device
	Unique Device Identifier
	Serial Number
	Reference Number
	On (power: connection to the mains).
	Off (power: disconnection from the mains).
	* Do not dispose of this device in the unsorted municipal waste stream.
	Monopolar output jack (hand control pencil jack).
	Bipolar output jack.
	Patient Plate, for use with Monopolar modes.
	Footswitch jack, for foot controlled activation of monopolar (optional) and bipolar devices.
	Type BF Equipment.
	Non-ionizing radiation.
	Neutral Electrode referenced to earth.
	Volume control.
	Explosion Risk if used with flammable anesthetics.
	Manufacturer
	Mandatory: Refer to instruction manual / guide
	Compliant RoHS Directive (2011/65/EU)
	Fuse type and rating. Slow blow (T), high capacity (H)

NOTICE:

**Please note that infected medical devices must be disposed of as medical/biohazard waste and cannot be included in used electronic equipment disposal/recycling programs. In addition, certain electronic products must be returned directly to Aspen Surgical Products. Contact your Bovie® sales representative for return instructions.*

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

Input Voltage	100-240 VAC ~ ± 10%
Mains line frequency range (nominal):	50 – 60 Hz
Power consumption:	28 VA
Fuses (two):	T 400mAH, 250V

Duty Cycle

Under maximum power settings and rated load conditions (Coagulation 10 W @ 1000 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 75°C an alarm sounds, the system displays an error code, and the system disables output power.

Dimensions and Weight

Width	20.8 cm (8.2 in.)	**Depth**	6.9 cm (2.7 in.)
Height	18.4 cm (7.2 in.)	**Weight**	< 1.4 kg (< 3 lbs.)

Operating Parameters

Ambient temperature range	10° to 40° C
Relative humidity	30% to 75%, non-condensing
Atmospheric pressure	70kPa to 106kPa
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

Ambient temperature range	-40° to +70° C
Relative humidity	10% to 100%, including condensation
Atmospheric pressure	50kPa to 106kPa

Storage

Ambient temperature range	10° to 30° C
Relative humidity	10% to 75%, non-condensing
Atmospheric pressure	70kPa to 106kPa

Audio Volume

The audio levels stated below are for the activation tone (bipolar and monopolar) and the alarm tone at a distance of one meter. Audio levels meet the requirements for IEC 60601-2-2.

Activation Tone

Volume (adjustable)	40 to 65 dB
Frequency	All Modes: 833Hz +/- 25Hz
Duration	Continuous while the generator is activated

Low Frequency (50-60 Hz) Leakage Current

Enclosure source current, ground open	< 500 µA
Source current, patient leads, all outputs	Normal polarity, intact ground: < 10 µA Normal polarity, ground open: < 10 µA Reverse polarity, ground open: < 10 µA
Sink current at high line, all inputs	< 10 µA

High Frequency (RF) Leakage Current

Bipolar RF leakage current	< 22 mA rms at 10 watts
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)

The Bovie® DERM 102 High Frequency Desiccator provides a high degree of protection against electric shock, particularly regarding allowable leakage currents. It is type BF equipment.

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 Bovie® equipment is placed on or beneath an activated Bovie® Medical High Frequency Desiccator, the Bovie® DERM 102 High Frequency Desiccator 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 Bovie® DERM 102 High Frequency Desiccator complies with the appropriate IEC 60601-1-2 and IEC 60601-2-2 specifications regarding electromagnetic compatibility.

EMC COMPLIANCE

Special precautions should be taken regarding the Bovie® DERM 102. Medical Electrical Equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in this manual.

Understand that only the Accessories supplied with or ordered from Aspen Surgical Products should be used with your device. The use of Accessories, transducers, and cables other than those specified, may result in increased Emissions or decreased Immunity of the Bovie® DERM 102. The Bovie® DERM 102 and its accessories are not suitable for interconnection with other equipment.

Portable and mobile RF communications equipment can affect Medical Electrical Equipment. The Bovie® DERM 102 should not be used adjacent to or stacked with other equipment and that if adjacent or stacked use is necessary, the Bovie® DERM 102 should be observed to verify normal operation in the configuration in which it will be used.

Recommended separation distances between portable and mobile RF communications equipment and the Bovie® DERM 102.			
The Bovie® DERM 102 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Bovie® DERM 102 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Bovie® DERM 102 as recommended below, according to the maximum output power of the communications equipment.			
Rated maximum output power of transmitter. W	Separation distance according to frequency of transmitter in metres (m)		
	150 kHz to 80 MHz $d = 1.2\ P$	80 MHz to 800 MHz $d = 1.2\ P$	800 MHz to 2.5 GHz $d = 2.3\ P$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer. NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies. NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

Guidance and manufacturer's declaration – electromagnetic emissions		
The Bovie® DERM 102 is intended for use in the electromagnetic environment listed below. The customer or the user of the Bovie® DERM 102 should assure that is used in such an environment.		
Emissions test	**Compliance**	**Electromagnetic environment - guidance**
RF Emissions CISPR 11	Group 2	The Bovie® DERM 102 must Emit electromagnetic energy in order to perform its intended function. Nearby electronic equipment may be affected.
RF Emissions CISPR 11	Class A	The Bovie® DERM 102 is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used in domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/flicker emissions IEC 61000-3-3	Complies	

Guidance and manufacturer's declaration – electromagnetic immunity			
The Bovie® DERM 102 is intended for use in the electromagnetic environment listed below. The customer or the user of the Bovie® DERM 102 should assure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines Not Applicable	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5 % U_t (>95 % dip in U_t) for 0.5 cycle 40 % U_t (60 % dip in U_t) for 5 cycles 70 % U_t (30 % dip in U_t) for 25 cycles <5 % U_t (>95 % dip in U_t) for 5 sec	<5 % U_t (>95 % dip in U_t) for 0.5 cycle 40 % U_t (60 % dip in U_t) for 5 cycles 70 % U_t (30 % dip in U_t) for 25 cycles <5 % U_t (>95 % dip in U_t) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment. If the user of the Bovie® DERM 102 requires continued operation during power mains interruptions, it is recommended that the Bovie® DERM 102 be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE U_t is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration – electromagnetic immunity continued...			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms (V_1)	Portable and mobile RF communications equipment should be used no closer to any part of the Bovie® DERM 102, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = [\frac{3.5}{3}]\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m (E1)	$d = [\frac{3.5}{3}]\sqrt{P}$ 80 MHz to 800 MHz $d = [\frac{7}{3}]\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m) Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol. 

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicated theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location which the Bovie® DERM 102 is used exceeds the applicable RF compliance level above, the Bovie® DERM 102 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Bovie® DERM 102.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than [3] V/m.

OUTPUT POWER CHARACTERISTICS

Maximum Output for Bipolar and Monopolar

Power readouts agree with actual power into rated load:

- for Coagulation Mode - to within 20% or 0.1 watts, whichever is greater;
- for Bipolar Mode - to within 20% for power settings >=1W; and to within 0.3 watts for power settings <1W

Mode	Output Power	Output Frequency	Repetition Rate	Crest Factor @ Rated Load	Vp-p max
Coagulation	10 W @ 1000 Ω	550 kHz ± 44.9 kHz	19.5 kHz ± 10%	10.0 ± 20%	3.3 kV
Bipolar	10 W @ 200 Ω	550 kHz ± 44.9 kHz	19.5 kHz ± 10%	10.0 ± 20%	1.0 kV

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

Figure 3–1 illustrates output power delivered to rated load for all available modes. Figure 3–2 illustrates power setting versus voltage for all modes. Figures 3–3 and 3–5 illustrates the maximum peak voltage available at a given power setting and output mode.
Figures 3–4 and 3–6 are the output waveforms as viewed on an oscilloscope.

Figure 3 – 1 Power setting versus maximum voltage (Vpeak) CUT

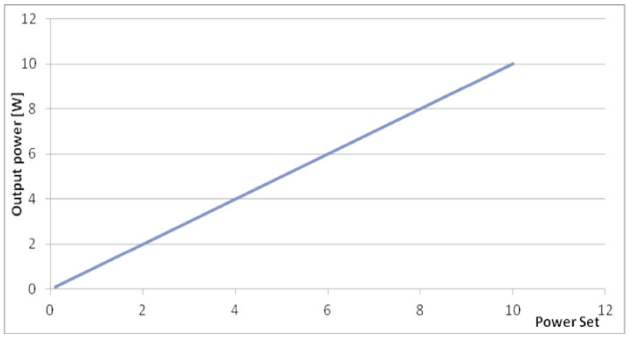


Figure 3 – 2 Power setting versus maximum voltage (Vpeak) COAG

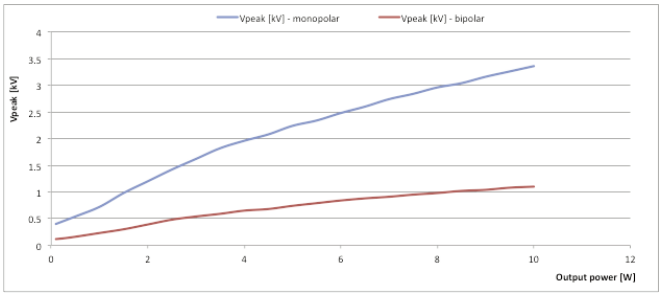


Figure 3–3 Output Power versus Load • Bipolar 100% / 50%

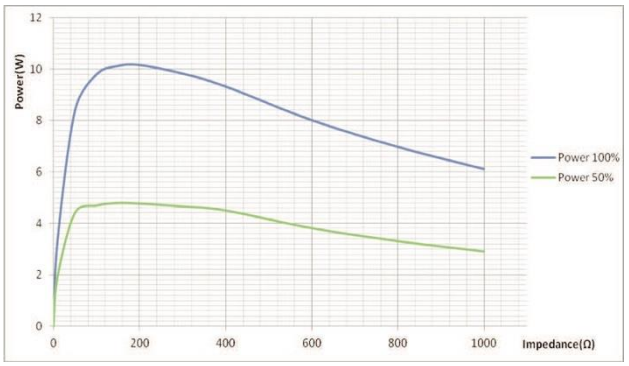
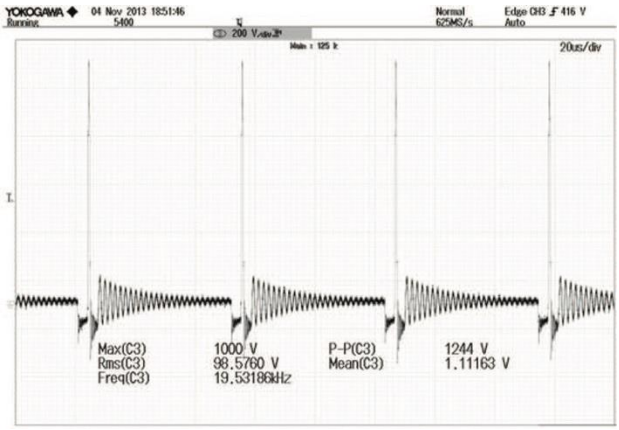
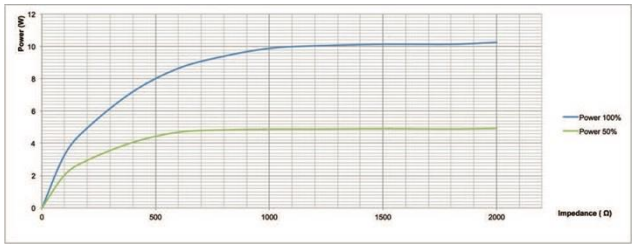
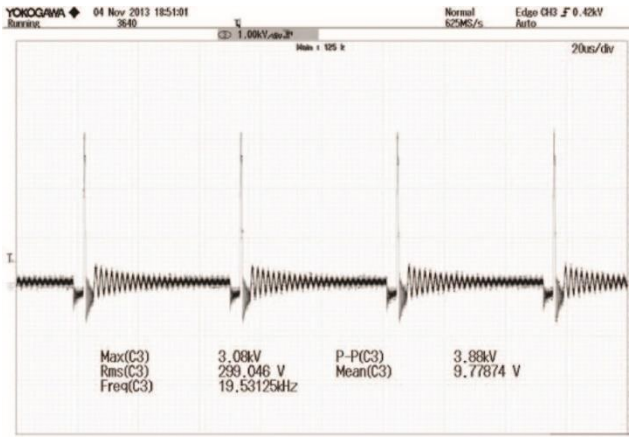


Figure 3–4 Bipolar Mode Waveform




Power (W)
12
10
8
6
4
2
0
0
500
1000
1500
2000
Impedance (Ω)
Power 100%
Power 50%


YOKOGAWA
04 Nov 2013 18:51:01
Running
3640
Normal
625MS/s
Edge Ch3 0.42kV
Auto
20us/div
Max(C3) 3.08kV
Rms(C3) 299.046 V
Freq(C3) 19.53125kHz
P-P(C3) 3.88kV
Mean(C3) 9.77874 V

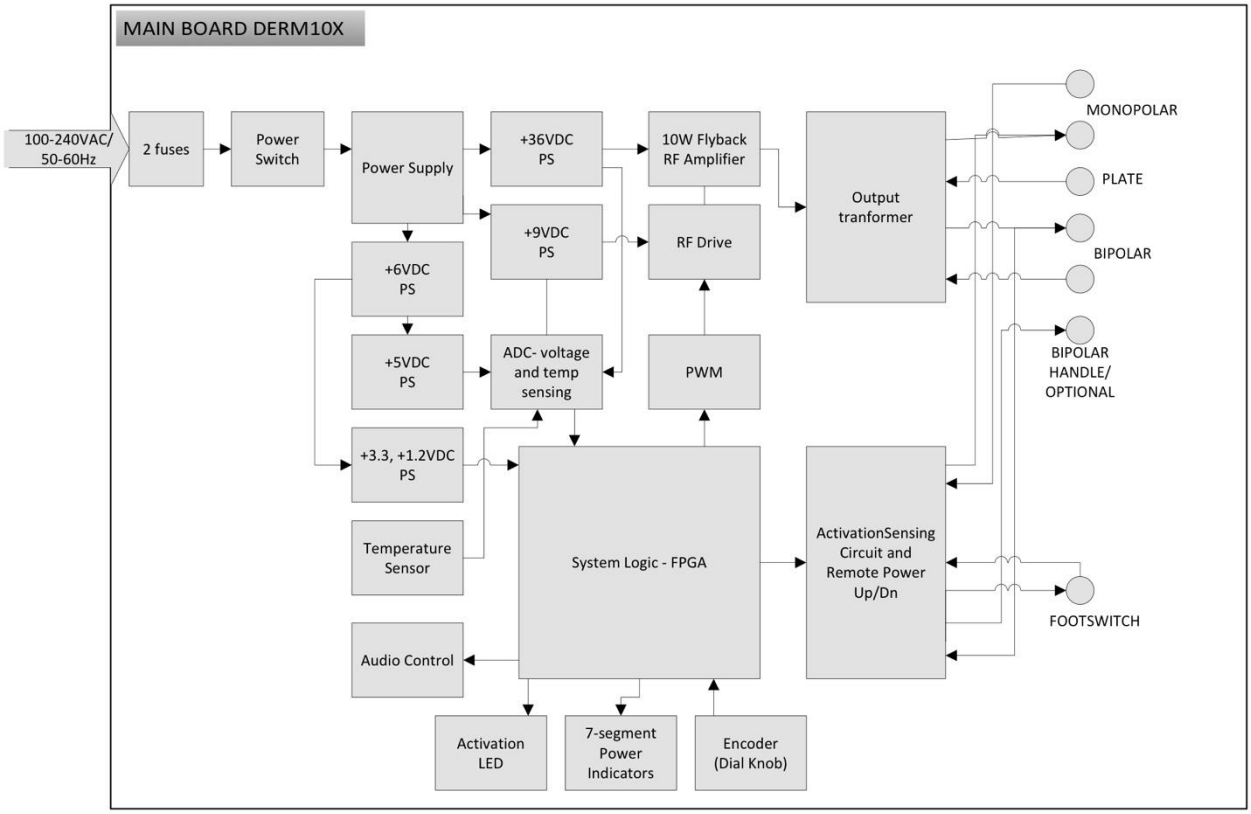
THEORY OF OPERATION

This section contains the following information:

- Block diagram
- Functional overview of key circuits
- System logic
- Bovie® DERM 102 control signal inputs and outputs.

BLOCK DIAGRAM

Figure 4 – 1 Functional Block Diagram of the Bovie® DERM 102.



FUNCTIONAL OVERVIEW OF KEY CIRCUITS

The following descriptions highlight the main circuits in the Bovie® DERM 102 High Frequency Desiccator.

High-voltage Power Supply +36VDC

The unit incorporates a non-regulated high voltage power supply for the RF output power. The nominal DC voltage from the high voltage power supply is +36 VDC with tolerance between +33VDC and +37.5 VDC.

Low Voltage DC Supplies

The unit incorporates two regulated low voltage levels to control generator operations. They are: +9 VDC, +5 VDC, +3.3 VDC, and +1.2VDC.

- The +9 VDC circuit supplies power for the activation circuit, the audio circuit, the 7-segment display and Activation LED, and the RF drive circuit. This circuit turns on and off the power MOSFETS for the RF output power.
- The +3.3 VDC and +1.2 VDC circuit supplies power for the logic system, and all temperature sensors.

FU ADC Voltage & Temperature Sensing

The unit incorporates an analog-to digital converter (ADC) to continually monitor the power supply voltages for +9 VDC and +36 VDC . If this voltage is not within limits, the system displays Error Code E2 (36V) or Error Code E6 (9V) and disables the RF output. The ADC is also used by the system logic to monitor the internal temperature of the unit. If the temperature rises above 75° C, the system displays an error code and disables the RF output.

Activation Sensing Circuit and Remote Power Up/Down

The Activation Sensing Circuit is used by the system logic to detect both hand controlled activation and foot- controlled activation and up/down requests. This circuit is made up of a colpitts oscillator (operating at approximately 80 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 up/down level detection circuit. The level detection circuit converts the sine wave into a square wave. Any Activation, or UP/DN command, will not occur as long as a square wave with certain duty cycle is present.

When a resistance (approximately 45 Ω 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 +3.3 VDC (logic "1"). This informs the system logic that a handswitch or footswitch activation request has been made.

When a resistance (80Ω< 90 Ω <110Ω) is presented to the transformer's secondary winding by the hand-control, the colpitts oscillator is not shut down, but changes it's amplitude and reducing it's duty cycle. The system logic can measure the duty cycle and recognizes this condition as a request for "Power UP".

When a resistance (150Ω< 200 Ω < 330Ω) is presented to the transformer's secondary winding by the hand-control, the system logic recognizes this condition as a request for "Power DOWN".

NOTICE

The activation circuit works with Bovie® handpiece A902.

If the square wave (from any of the request sense circuits) is having a duty cycle, higher than the maximum predefined value that is measured 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.

Audio Control 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.

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 two power MOSFETs, and a step-up transformer.

The initial RF drive pulse is generated by the Digital PWM circuit and the system logic control block. When the RF drive pulse turns the power MOSFET "ON," current flows from the high voltage supply through the output transformers, through the clamping diodes, and then through the MOSFET to high voltage ground.

The energy developed by the "ON" time is stored in an LC tank circuit. When the MOSFET 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.

Controls and Indicators

The Bovie® DERM 102™ controls and indicators are listed below:

- DISPLAYS Seven segment displays indicate the output power in watts.
- ACTIVATION INDICATOR Blue LED indicates that the generator is activated.
- POWER CONTROL KNOB These mechanical encoders adjust the output power for each mode.
- POWER SWITCH A double pole single throw switch that snaps into the housing. 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 resolution is 12.5ns.

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 Bovie® DERM 102 High Frequency Desiccator. 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 20 MHz.

The Reset Circuit provides a single pulse at the time the Bovie® DERM 102 High Frequency Desiccator is turned on. This pulse resets Field Programmable Gate Array to ensure proper operation.

BOVIE® DERM 102 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**
VOL_CNTRL	This is the input signal to the control logic to change the audio volume.
BLUE_DIODE	These are signals from the system logic that illuminates the activation blue LED indicator.
ENCDR1_REQ ENCDR2_REQ	These are output signals from the encoder to control the power setting of the system.
CAL_MODE	Reserved for Calibration of the Activation Circuit.
CAL_BIT3- CAL_BIT0	Signals used to control the handle calibration fixture.
CAL_ENTER	Signal used to start the handle calibration fixture.
PC_SPI(CLK-CS-DIN-DOUT	RESERVED for DEBUG pupose
SPKR_DRV1 SPKR_DRV2	These are signals from the system logic that generates the activation tone and alarm tones. These signals are used by the audio circuit.
RF_DRV	This is an output signal from the digital PWM circuit that controls the pulse width duration for the RF drive.
TEMP_SEN	This is an input signal from the Temperature Sense Circuit TS1 that informs the system logic if the internal temperature of the unit is above 75° C. The signal is measured by Analog-to Digital converter.
VDDP	This is an input signal from the high voltage +36 VDC circuit that informs the system logic if a high voltage error has occurred. The power supply signals are measured by Analog-to Digital converter
9V	This is an input signal from the high voltage + 9 VDC circuit that informs the system logic if a voltage error has occurred. The power supply signals are measured by a Digital converter.
RQST_RECG	This is an input signal from the activation sense circuit. This signal is generated by a colpitts oscillator. When an activation request is made, this oscillator become a logic 1 (5 VDC) signal. This is also an input signal for the UP or DOWN request command and is generated by a colpitts oscillator. The system measures the signal duty cycle and determines the type of the command request

OPERATING THE BOVIE® DERM 102

This section covers the following topics:

- Inspecting the generator and accessories
- Service personnel safety
- Installation and placement
- Functional (operational) checks
- Unit Operation.

INSPECTING THE GENERATOR AND ACCESSORIES

Before each use of the Bovie® DERM 102, inspect the unit and all accessories to verify good working order:

- Inspect for physical damage to the High Frequency Desiccator 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

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

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 adequate cooling. Unit is designed to be wall mounted or mounted on a mobile stand.
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.
No modification of this equipment is allowed.

NOTICE

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

INSTALLATION AND PLACEMENT

Mount the Bovie® DERM 102 on the wall or optional mobile stand using the standard mounting kit (see figure 5-1). Do not operate the unit in the horizontal position, as liquids may spill into unit.

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

WARNING:

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

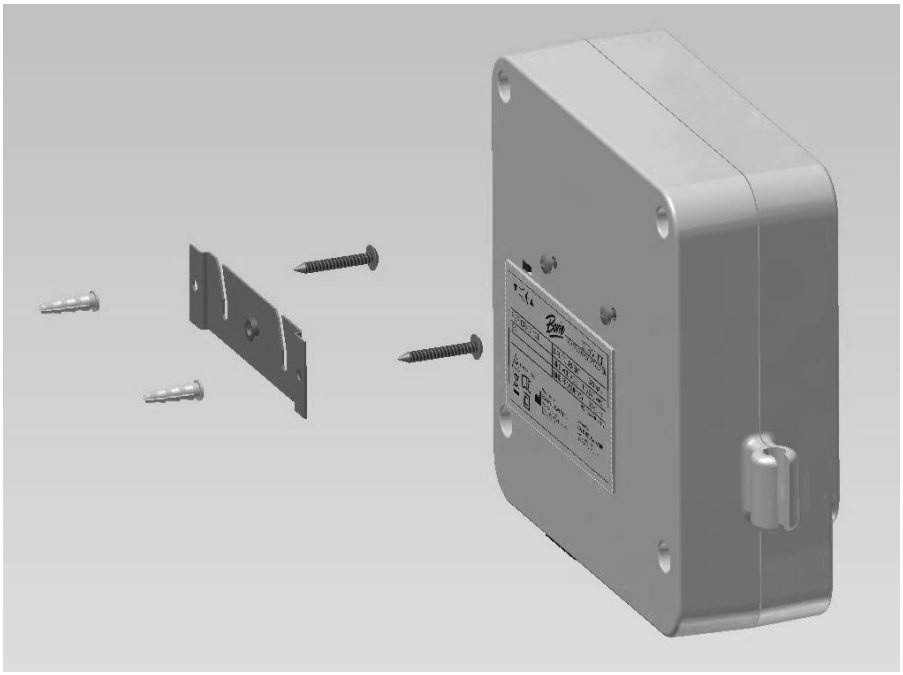


Figure 5-1 Installation and placement

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 Bovie® DERM 102 Unit

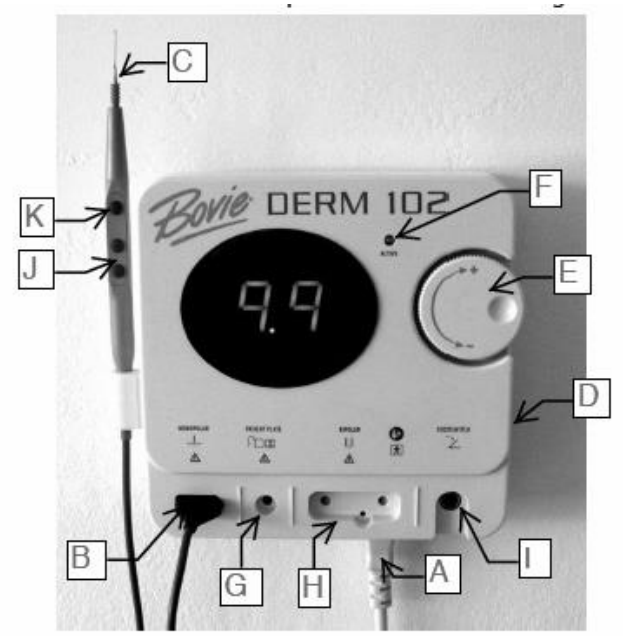


Figure 5-2

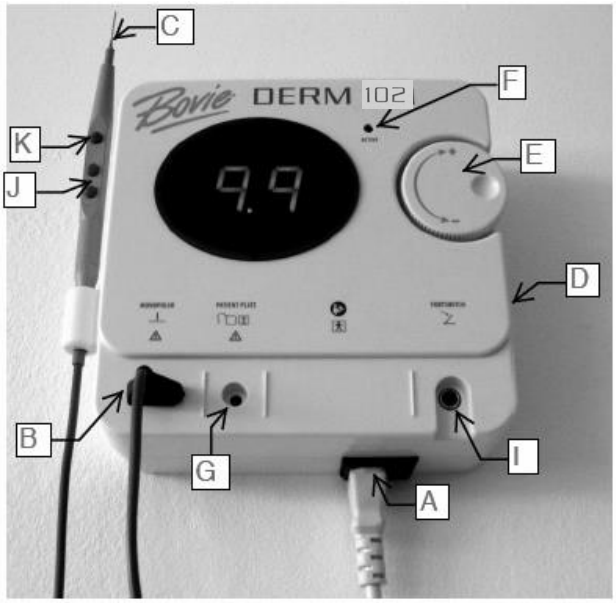
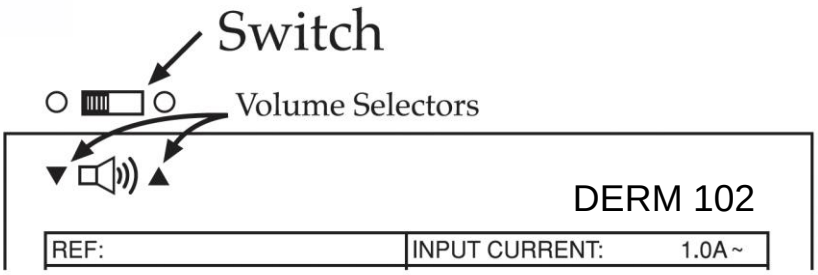


Figure 5-3

Figure 5-4



1. Mount the Bovie® DERM 102 on the wall or optional mobile stand using the standard mounting kit (see figure 5-1). Do not operate the unit in the horizontal position, as liquids may spill into unit.
2. Plug the female end of the power cord into the base of the unit (see figures 5-2 and 5-3, letter A).
3. Plug the male end of the power cord into a grounded wall receptacle.
4. The monopolar output for the handpiece is on the lower left front of the unit (see figures 2 and 3, letter B). The handpiece plug is designed to fit in only one direction. Plug the connector from the handpiece into the receptacle on the bottom of the unit (see figures 5-2 and 5-3, letter B). The three button handpiece is designed to give the doctor complete fingertip control of the power output settings.
5. Slide the standard electrode into the handpiece until it is firmly seated (see figures 5-2 and 5-3, letter C). The handpiece will accept most standard 3/32" electrodes.
6. Slide the handpiece into the holder on the left side of the unit before powering on the unit.
7. Turn the unit power on utilizing the switch on the right side panel of the unit (see figures 5-2 and 5-3, letter D).
8. Set the power output either by using the dial on the front of the unit (see figures 5-2 and 5-3, letter E) or on Bovie® DERM 102 unit only by the up and down buttons on the handpiece (see figures 5-2 and 5-3, letter J). When power level adjustment is being made by the handpiece an audible tone will sound to indicate that the power level has been changed. Depressing and holding the up or down buttons will cause the power settings to change more rapidly for quick adjustment of the output settings. Power output is displayed in ".1" watt increments from 0.1 to 10 watts.

NOTICE:

The output settings can not be adjusted when the unit is being activated.

9. To activate the unit, remove the handpiece from the holder. Place the handpiece in the desired position and depress the activation button (see figures 5-2 and 5-3, letter K). When the unit is activated, an audible tone is sounded and the blue active light will illuminate (see figures 5-2 and 5-3, letter F).
10. To use the optional grounding plate with cord (A802EU), insert the plug of the cord into the grounding plate output (see figures 5-2 and 5-3, letter G) and connect the other end into the grounding plate. The plate should be placed underneath the patient at a point where the entire plate is covered by bare skin. The use of conductive gel is recommended.
11. To use the optional bipolar cord (A827V), insert the plugs into the bipolar outputs (see figures 5-2 and 5-3, letter H). The cord is then plugged into the forceps. A sliding gate behind the monopolar and bipolar outputs prevents the user from using both simultaneously.
12. The optional footswitch (A803) is plugged into the footswitch output and placed on the floor (see figures 5-2 and 5-3, letter I). The footswitch can be used with monopolar procedures and must be used with bipolar procedures.
13. When the procedure is completed, turn the unit off utilizing the switch on the right side panel of the unit.
14. Return the handpiece to the holder on the right side of the unit and remove the electrode. The electrode should be disposed of after each procedure. If contamination has occurred to the handpiece, the handpiece should also be sterilized.
15. Adjustment of the audible tone is achieved by a switch located on the rear of the unit (see figure 5-4). Two tone choices are available, high and low. A small screwdriver will be necessary to make the adjustment.

How to check the unit operation with a Footswitch

1. Connect a footswitch to the footswitch jack on the front of the unit.
2. Set the power setting to 0.1 watts.
3. Verify that the Activation LED illuminates blue, and that the system generates the Activation tone when you press the pedal on the footswitch.
4. Confirm that releasing the footswitch pedal returns the unit to an idle state.

How to Check the Monopolar Mode

1. Connect the monopolar handpiece A902 to the Monopolar receptacle.
2. Set the power setting to 0.1 watts.
3. 3.Verify that the generator activates when the activation (blue) button on the handpiece is depressed.

UNIT OPERATION

The Bovie® DERM 102 High Frequency Desiccator produces radio frequency current which is useful for the removal and destruction of superficial cutaneous and mucosal lesions. This is done by performing desiccation and fulguration procedures. Electrosurgical desiccation occurs when the electrode is placed directly onto the surface of the lesion. Fulguration occurs when the electrode is held slightly above the lesion and an arc is delivered to the lesion. The unit also provides fast and efficient bleeding control by coagulation of capillaries and small blood vessels.

For the majority of desiccation, fulguration, and coagulation procedures utilizing the standard handpiece in the monopolar output, the patient plate is optional. When used, the patient plate will intensify the coagulation properties of the unit and also lessen the opportunity for an electrosurgical burn. The optional footswitch adds versatility when using the standard handpiece in the monopolar output, as the footswitch allows you to activate the unit by either the handpiece or the footswitch. Bipolar outputs are available only in DERM 102™ for those physicians who prefer to utilize bipolar forceps to perform coagulation procedures. A footswitch is required when using the bipolar output. Procedures that are performed in sensitive areas may require an anesthetic. Flammable anesthetics should not be used.

If you are unfamiliar with the operation of a low powered electrosurgery unit, it is advisable to practice on chicken or lean flank steak to visualize the effects at various output and power levels.

MAINTENANCE

This section covers the following topics:

- Cleaning the unit
- Performing periodic inspection

Aspen Surgical Products recommends that you complete periodic inspection and performance testing. Perform inspections and performance testing every six months. A qualified biomedical technician should conduct this testing to ensure that the unit is operating effectively and safely.

CLEANING

After each use, clean the unit.

WARNINGS:

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

NOTICES:

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.

PERIODIC INSPECTION

Every six months, visually inspect the Bovie® DERM 102 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.

FUSE REPLACEMENT

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 T0.4AH250V Slow Blow fuses.
5. Insert the fuse holder into the Power Cable Receptacle.

NOTICE:

If the unit does not display an error and does not power on, check fuses.

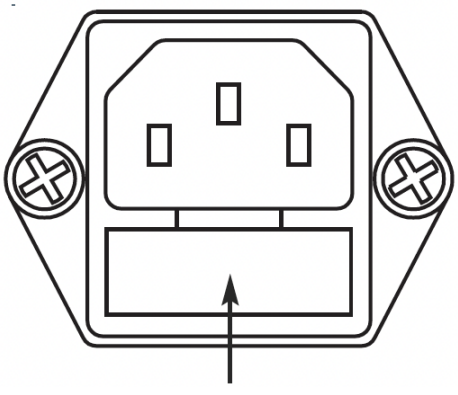


Figure 6-1 Fuse

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 Bovie® DERM 102.

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

TROUBLESHOOTING THE BOVIE® DERM 102

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 Bovie® DERM 102 malfunctions, check for obvious conditions that may have caused the problem.

1. Check the generator for visible signs of physical damage.
1. Verify that all accessory cords are properly connected.
2. Check the power cord. Replace the power cord if you find exposed wires, cracks, frayed insulation, or a damaged connector.
3. Remove the back panel and inspect all internal connections.
4. Verify that the fuses are firmly seated and are not blown.
5. You may need to replace the fuses if the generator fails to start up. Refer to Fuse Replacement in Section 6.

Inspecting the Receptacles

Equipment required:

- Footswitch
- Bipolar cable (only for DERM 102™)
- Monopolar instrument
- 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 front 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.
5. Check the Bipolar receptacle on the front of the unit for obstruction or damage (only for DERM 102™).
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 jacks.

7. Check the Monopolar handpiece receptacle on the front of the unit for obstruction or damage.
8. Insert a Monopolar handpiece 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 jacks.

Inspecting Internal Components

CAUTIONS:
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 back panel to the unit.
2. Lift the back off the chassis.
3. Visually inspect and verify that all connectors are firmly seated.
4. Inspect the board for damaged components, wires, cracks and corrosion.
5. Reinstall the back panel by positioning the panel over the enclosure, and securing the four screws.

UNDERSTANDING ERROR CODES AND AUDIO TONES

The Bovie® DERM 102 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
E1	Internal Calibration Error	• Switch unit off and on again.
E2	DC Supply Over Voltage Detection +36V	• Switch unit off and on again. • Make sure unit is connected to correct power source for the unit.
E3	Pulse Width	• Switch unit off and on again.
E5	Temperature Error	• Switch unit off. Allow unit to cool. Switch unit on.
E6	DC Supply Over Voltage Detection +9V	• Switch unit off and on again. • Make sure unit is connected to correct power source for the unit.
E7	Multiple Errors	• Switch unit off and on again.

The following table lists Bovie® DERM 102 fault codes, their meaning and recommended actions to be taken to resolve the faults. The faults are resettable, i.e it is not necessary to switch unit off and on again to reset the fault condition.

Fault Code	Description	Recommended Action
F1	Activation upon power up	• Check handpiece for activation. • Check footswitch for activation; once the activation is halted unit will resolve the error. If the error persists the handpiece could be malfunctioning and may need to be replaced.
F2	Handpiece "Power-UP" upon power up	• Check handpiece for "Power-Up" command. Once the command is halted the unit will resolve the error. If the error persists the handpiece could be malfunctioning and may need to be replaced.
F3	Handpiece "Power-Down" upon power up	• Check handpiece for "Power-Down" command. Once the command is halted the unit will resolve the error. If the error persists the handpiece could be malfunctioning and may need to be replaced.
F4	Power UP and Power Down are simultaneously depressed	• Check handpiece for "Power-Up-Down" command. Once the commandis halted the unit will resolve the error. If the error persists the handpiece could be malfunctioning and may need to be replaced.
F5	Duty Cycle Fault- unit is activated more than 30sec	• Do not exceed 30 second activation time for one activation request.

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.
	PFC board malfunction	Replace the PFC board.
	Fuses blown	1. Check fuses. If necessary, replace fuse(s). 2. If a problem persists, us a backup generator.
	Loose or disconnected internal cables	Check all internal connections.
	Faulty power switch	Replace the power switch.
Generator is on, but will not activate.	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.
Activation and / or alarm tones do not sound; speaker is malfunctioning.	Loose or disconnected cable between main board and back panel	Check / connect all connections from the speaker board to the main board.
	Main board malfunction	Check / connect cable from the main board to the back panel. Replace the main board.

Situation	Possible Cause	Recommended Action
Blank or confusing LED display	Loose or disconnected internal cables	Check and correct all internal connections.
	Main board malfunction	Replace the main board.
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.
	Power set too low	Increase the power setting.
	An error condition exists	1. Check the display 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.
	PFC board malfunctio	Replace the PFC 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).
	Loose or disconnected internal cables	Check and correct all internal connections.
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
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 Coag.
	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.

TEST POINTS

Test Point	Description
TP1	RESERVED
TP2	RESERVED
TP3	RESERVED
TP4 (+36 VDC)	36 VOLT DC POWER SUPPLY
TP5 (+5 VDC)	5 VOLT DC POWER SUPPLY
TP6 (+3.3 VDC)	3.3 VOLT DC POWER SUPPLY
TP7 (+1.2 VDC)	1.2 VOLT DC POWER SUPPLY
TP8 (+9 VDC)	9 VOLT DC POWER SUPPLY
QS9T	DRAIN U15 (AC/DC Converter)
TP10	SECONDARY SMPS AC VOLTAGE
TP11	PRIMARY (MAINS) GROUND
TP12 (REQST_RECG)	ACTIVATION CIRCUIT OUTPUT
TP13	LOW VOLTAGE GROUND
TP14	DRAIN POWER MOSFETS (POWER GENERATOR)
TP15	HIGH VOLTAGE GROUND

REPAIR POLICY AND PROCEDURES

Refer to this section for information on:

- Responsibility of the Manufacturer
- Returning the Generator for Service

RESPONSIBILITY OF THE MANUFACTURER

Aspen Surgical Products 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 User's Guide.
- Persons authorized by Aspen Surgical Products 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 Aspen Surgical Products instructions for use.
- Equipment to be disposed/recycled.

Please note that infected medical devices must be disposed of as medical/biohazard waste and cannot be included in used electronic equipment disposal/recycling programs. In addition, certain electronic products must be returned directly to Aspen Surgical Products. Contact your Aspen Surgical Products representative for return instructions.

For warranty information, refer to Appendix A - Warranty.

RETURNING THE GENERATOR FOR SERVICE

Before you return the unit, call your Aspen Surgical Products representative for assistance. If instructed to send the unit to Aspen Surgical Products, first

obtain a Returned Goods Authorization Number. Then, clean the Unit and package securely to ensure proper protection of the unit. So as to aid in the processing of the unit, please be sure to include a reference to the Bovie Return Goods Authorization Number on the outside of the box and ship directly to Aspen Surgical Products.

Step 1 – Obtain a Returned Goods Authorization Number

Call the Aspen Surgical Products Customer Service Center 888-364-7004 to obtain a Returned Goods Authorization Number. Have the following information ready when you call:

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

Step 2 – 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.

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

B. Thoroughly wipe all surfaces of the unit 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 unit.

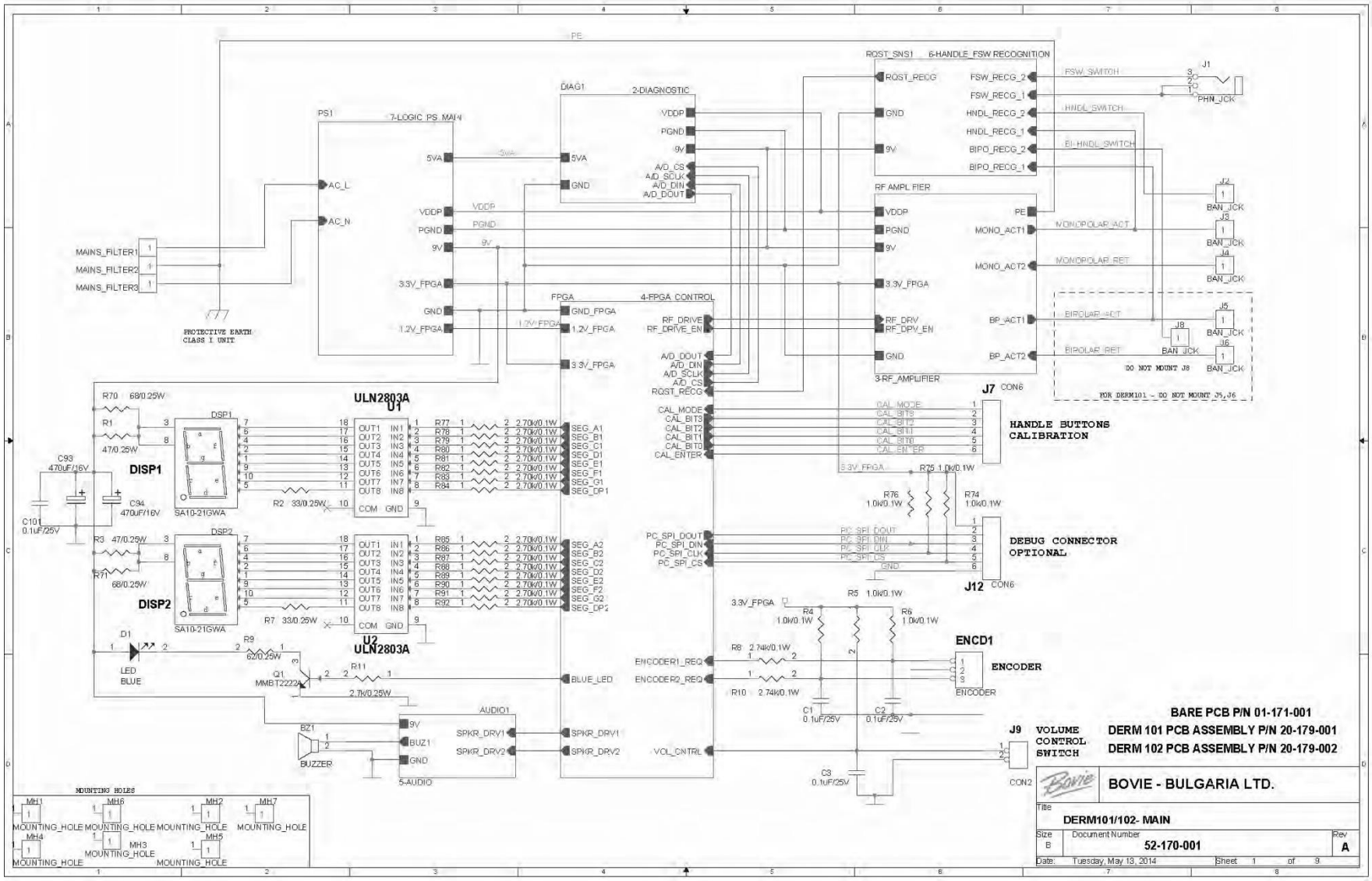
Step 3 – Ship the Unit

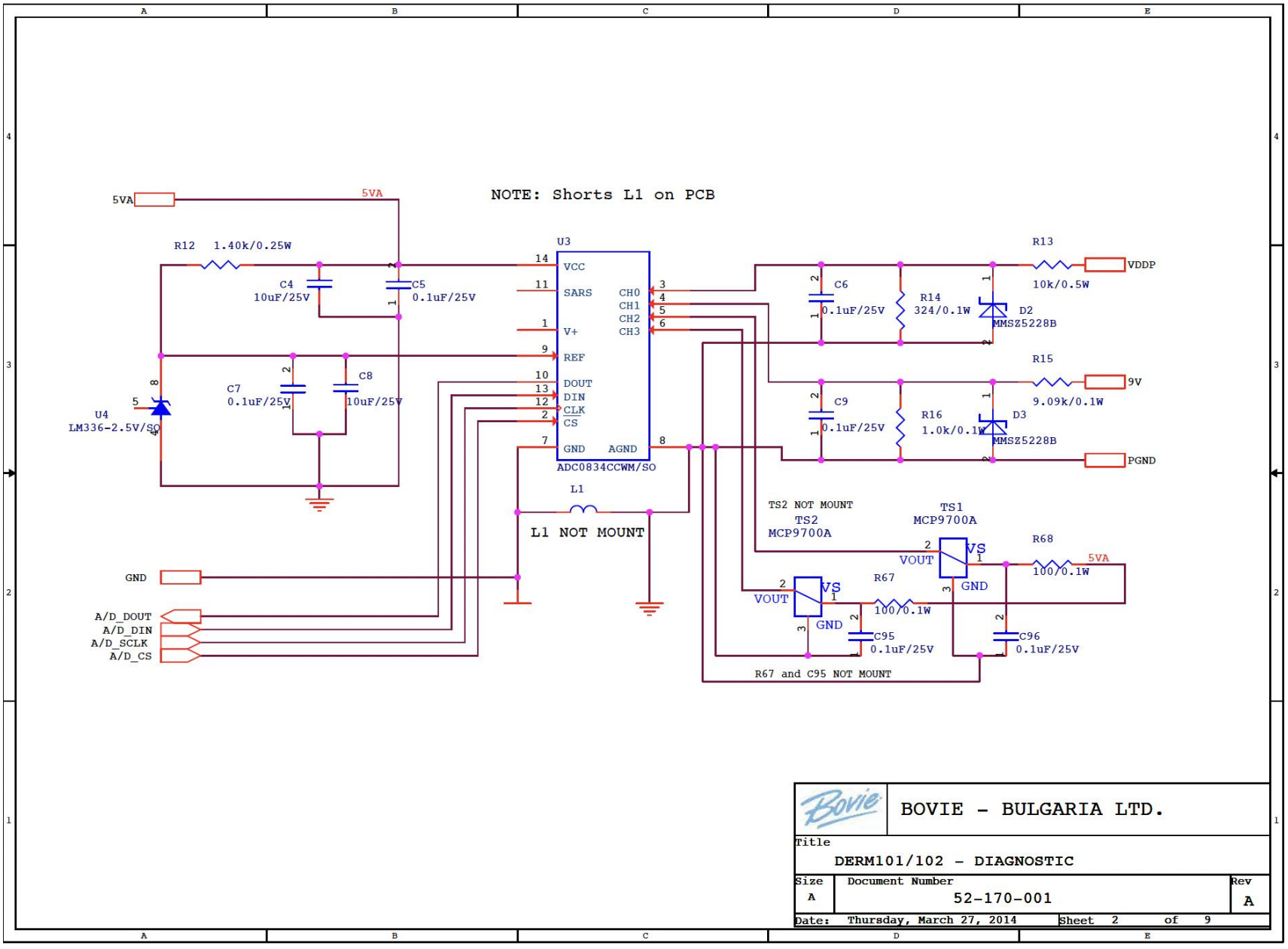
A. Attach a tag to the unit that includes the Returned Goods Authorization Number and the information (hospital, phone number, etc.) listed in Step 1 – Obtain a Returned Goods Authorization Number.

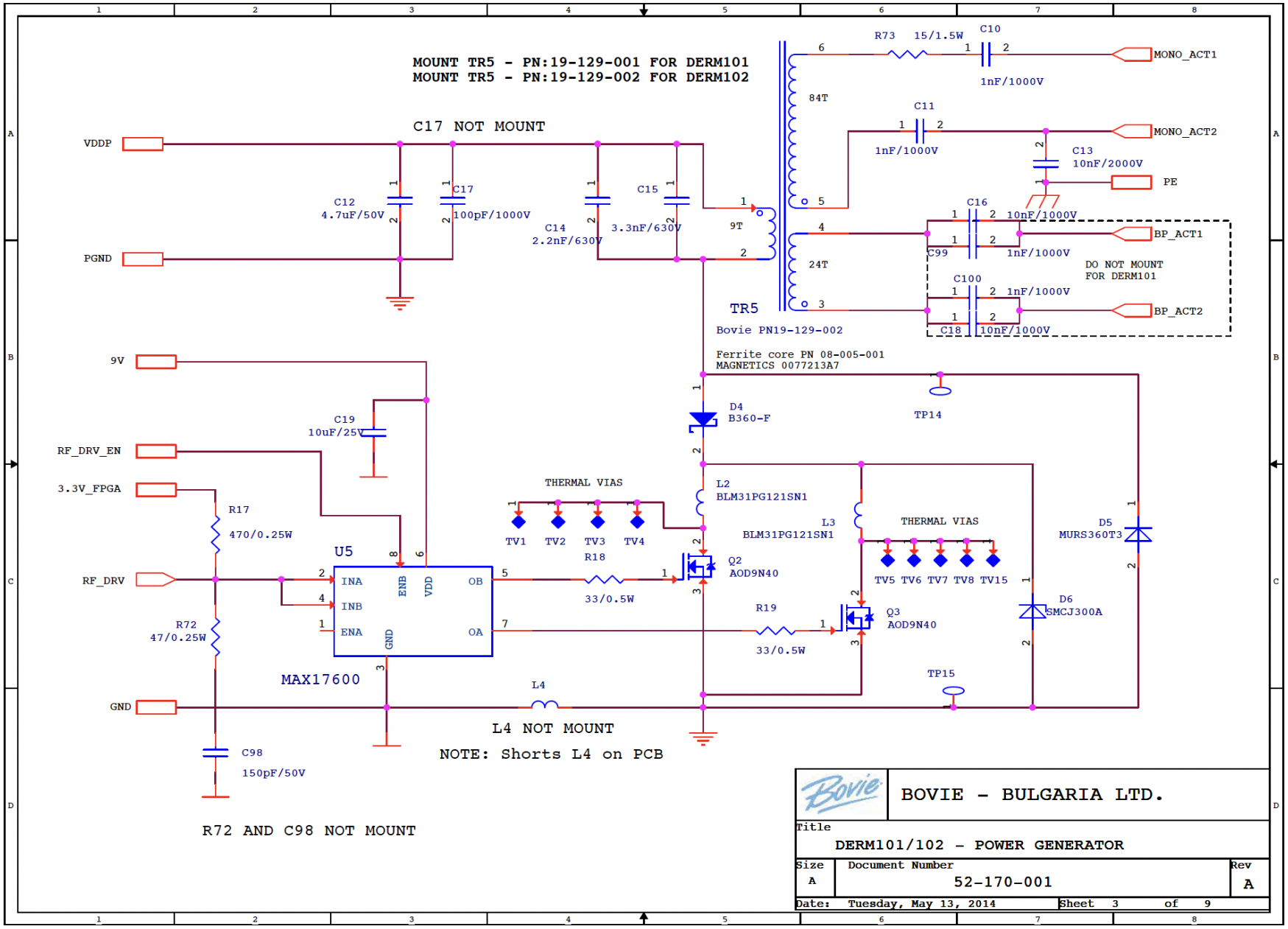
B. Be sure the unit is completely dry before you pack it for shipment. Although the preference is to have the unit repackaged using its original packaging, Bovie® understands that this may not always be possible. If necessary, contact Customer Service for the proper packaging to ship the unit. Please be sure to include a reference of the Bovie Return Goods Authorization Number on the outside of the box/container.

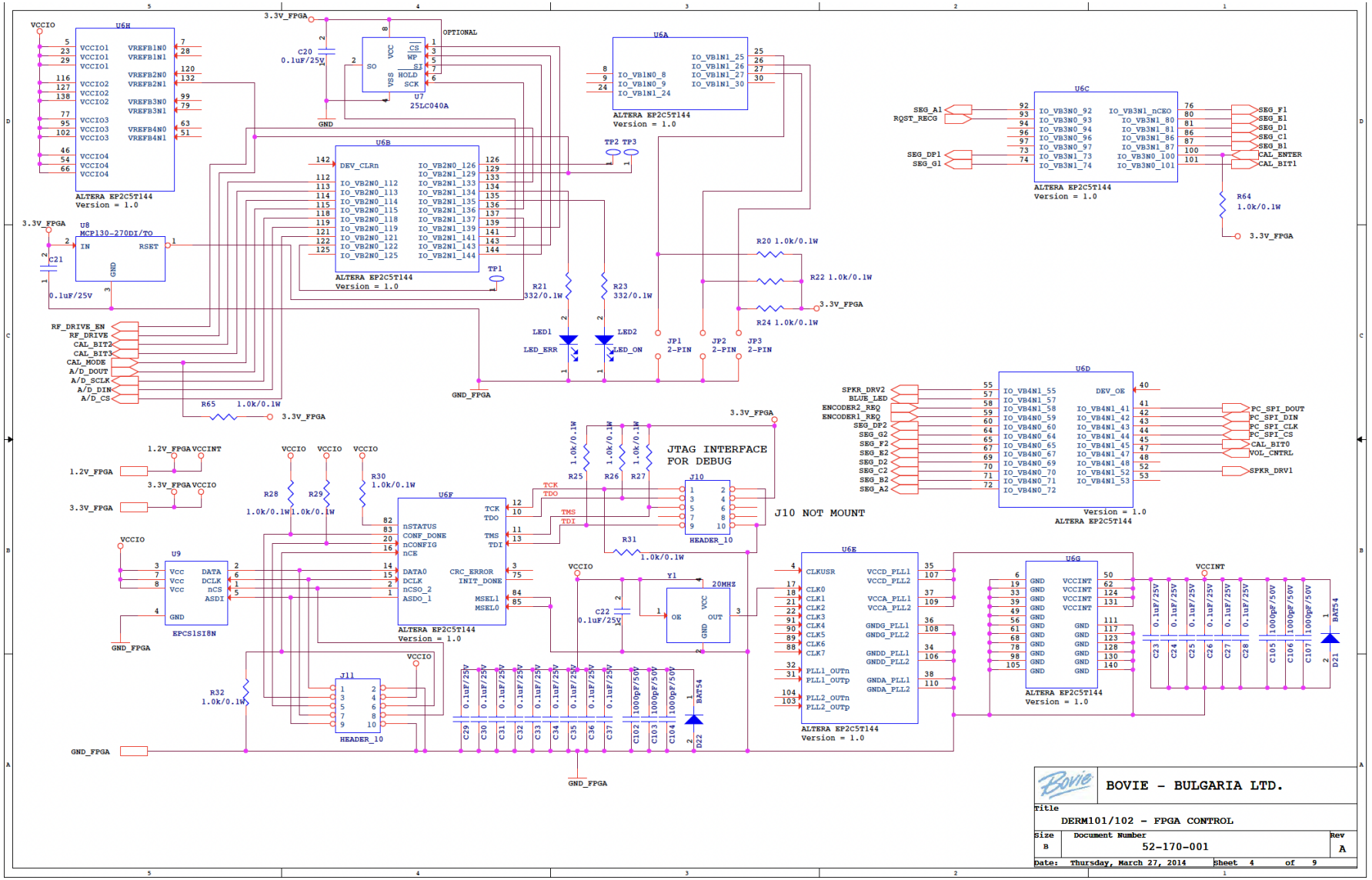
C. Ship the unit, prepaid, to the address given to you by the Aspen Surgical Products Service Center.

Main Board

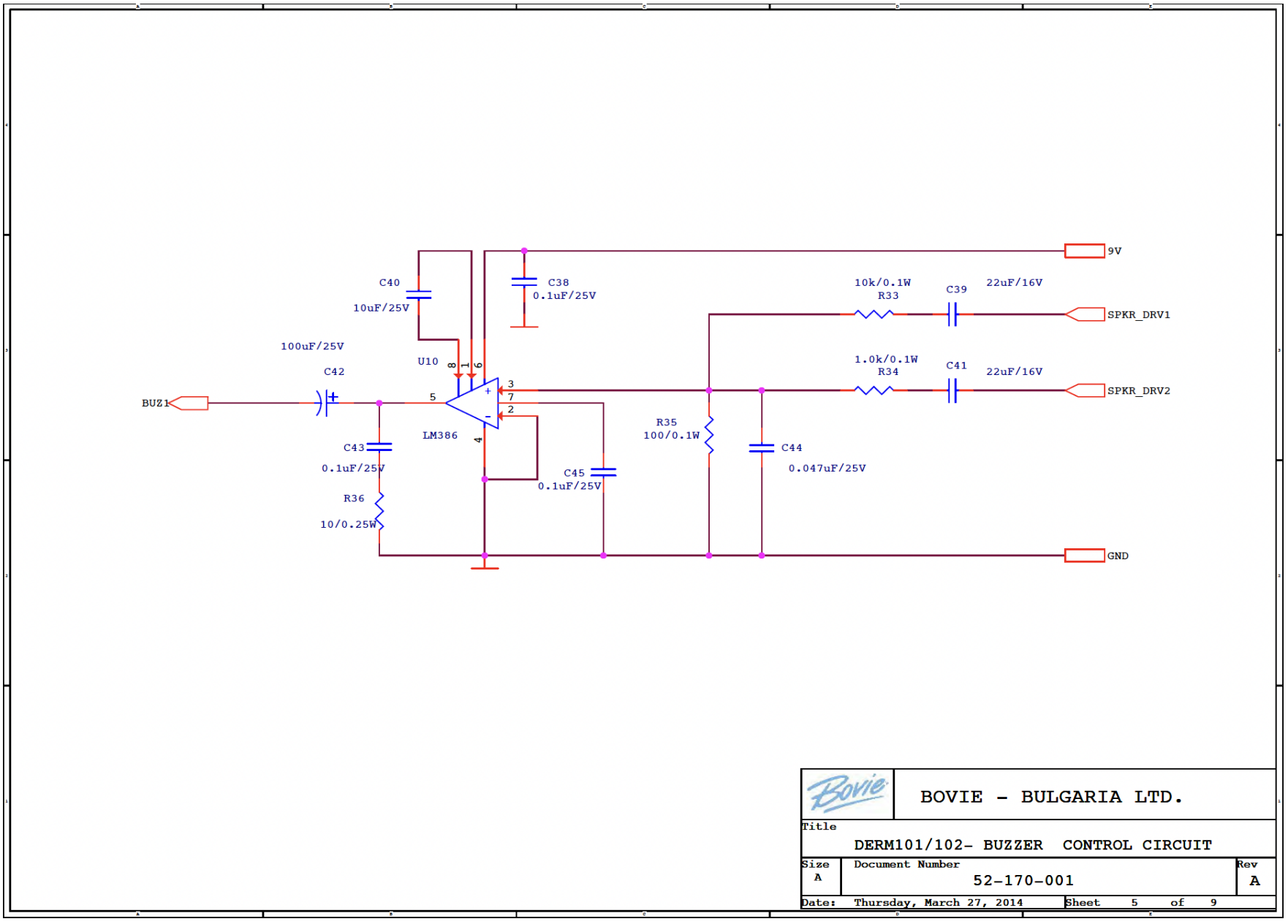

PE
PS1
7-LOGIC PS MAIN
AC_L
AC_N
MAINS_FILTER1
MAINS_FILTER2
MAINS_FILTER3
PROTECTIVE EARTH
CLASS I UNIT
5VA
VDDP
PGND
9V
3.3V_FPGA
GND
1.2V_FPGA
DIAG1
2-DIAGNOSTIC
A/D_CS
A/D_SCLK
A/D_DIN
A/D_DOUT
FPGA
4-FPGA CONTROL
GND_FPGA
RF_DRIVE
RF_DRIVE_EN
RQST_SNS1
6-HANDLE_FSW RECOGNITION
RQST_RECG
FSW_RECG_2
FSW_RECG_1
HNDL_RECG_2
HNDL_RECG_1
BIPO_RECG_2
BIPO_RECG_1
FSW_SWITCH
HNDL_SWITCH
BI-HNDL_SWITCH
J1
PHN_JCK
RF AMPLIFIER
MONO_ACT1
MONO_ACT2
BP_ACT1
BP_ACT2
MONOPOLAR_ACT
MONOPOLAR_RET
BIPOLAR_ACT
BIPOLAR_RET
J2
J3
J4
J5
J6
J8
BAN_JCK
DO NOT MOUNT J8
FOR DERM101 - DO NOT MOUNT J5,J6
3-RF_AMPLIFIER
J7 CON6
HANDLE BUTTONS
CALIBRATION
CAL_MODE
CAL_BIT3
CAL_BIT2
CAL_BIT1
CAL_BIT0
CAL_ENTER
ULN2803A
U1
U2
DISP1
DISP2
SA10-21GWA
SEG_A1
SEG_B1
SEG_C1
SEG_D1
SEG_E1
SEG_F1
SEG_G1
SEG_DP1
SEG_A2
SEG_B2
SEG_C2
SEG_D2
SEG_E2
SEG_F2
SEG_G2
SEG_DP2
COM
GND
DEBUG CONNECTOR
OPTIONAL
J12 CON6
PC_SPI_DOUT
PC_SPI_DIN
PC_SPI_CLK
PC_SPI_CS
ENCD1
ENCODER
ENCODER1_REQ
ENCODER2_REQ
LED
BLUE
BLUE_LED
MMBT2222A
BUZZER
AUDIO1
5-AUDIO
SPKR_DRV1
SPKR_DRV2
BUZ1
VOL_CNTRL
J9
VOLUME
CONTROL
SWITCH
CON2
MOUNTING HOLES
MH1
MH2
MH3
MH4
MH5
MH6
MH7
MOUNTING_HOLE
BARE PCB P/N 01-171-001
DERM 101 PCB ASSEMBLY P/N 20-179-001
DERM 102 PCB ASSEMBLY P/N 20-179-002
BOVIE - BULGARIA LTD.
DERM101/102- MAIN
Document Number
52-170-001
Rev
A
Tuesday, May 13, 2014
Sheet 1 of 9


NOTE: Shorts L1 on PCB
5VA
R12 1.40k/0.25W
C4 10uF/25V
C5 0.1uF/25V
U3
VCC
SARS
V+
REF
DOUT
DIN
CLK
CS
GND
AGND
CH0
CH1
CH2
CH3
ADC0834CCWM/SO
C6 0.1uF/25V
R14 324/0.1W
D2 MMSZ5228B
R13 10k/0.5W
VDDP
C9 0.1uF/25V
R16 1.0k/0.1W
D3 MMSZ5228B
R15 9.09k/0.1W
9V
PGND
C7 0.1uF/25V
C8 10uF/25V
U4 LM336-2.5V/SO
L1
L1 NOT MOUNT
TS2 NOT MOUNT
TS2 MCP9700A
TS1 MCP9700A
VOUT
GND
VS
R67 100/0.1W
R68 100/0.1W
C95 0.1uF/25V
C96 0.1uF/25V
R67 and C95 NOT MOUNT
GND
A/D_DOUT
A/D_DIN
A/D_SCLK
A/D_CS
BOVIE - BULGARIA LTD.
Title
DERM101/102 - DIAGNOSTIC
Size A
Document Number 52-170-001
Rev A
Date: Thursday, March 27, 2014
Sheet 2 of 9

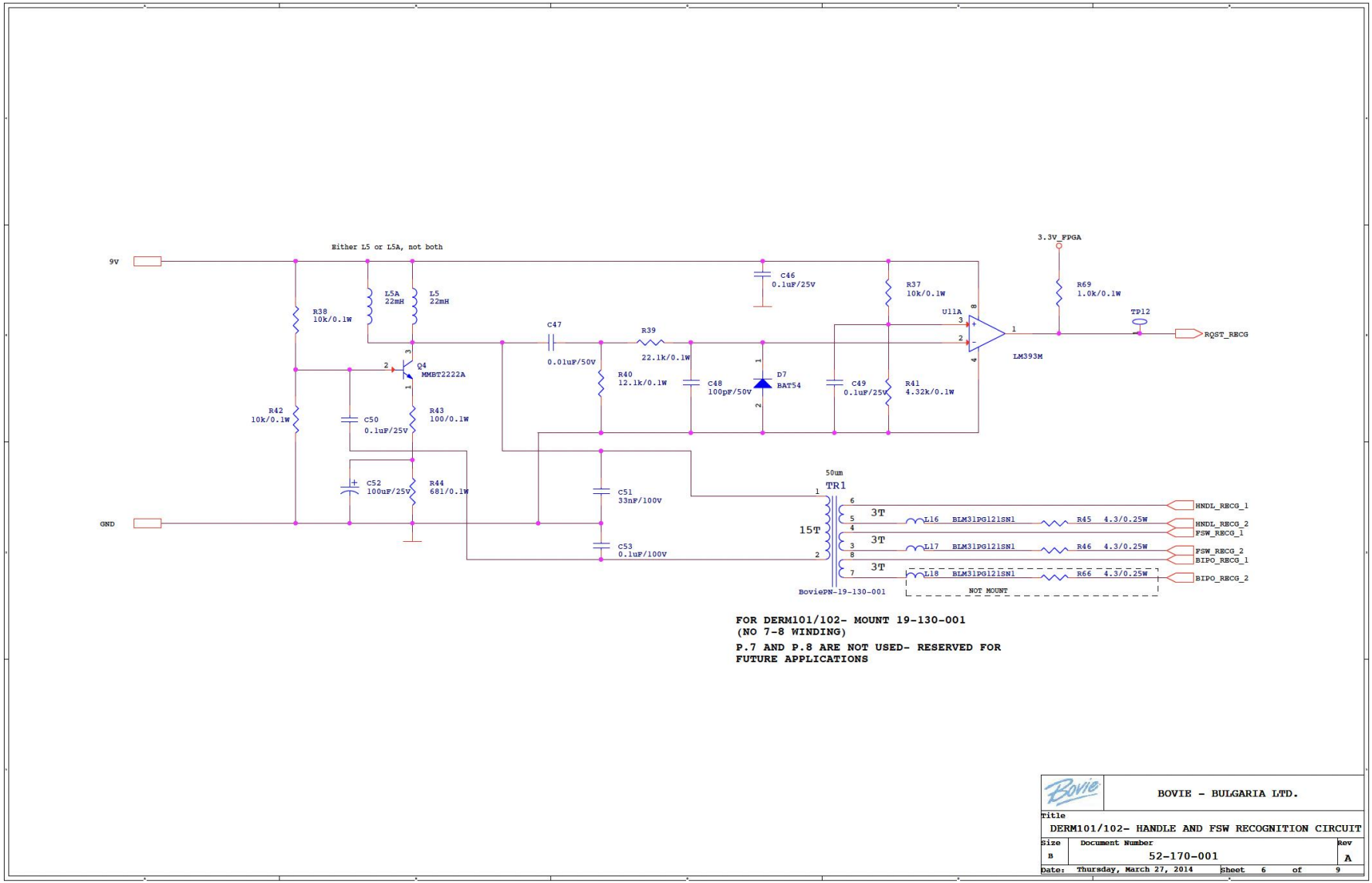

MOUNT TR5 - PN:19-129-001 FOR DERM101
MOUNT TR5 - PN:19-129-002 FOR DERM102
C17 NOT MOUNT
VDDP
PGND
C12
4.7uF/50V
C17
100pF/1000V
C14
2.2nF/630V
C15
3.3nF/630V
9T
24T
84T
TR5
Bovie PN19-129-002
Ferrite core PN 08-005-001
MAGNETICS 0077213A7
R73 15/1.5W
C10
1nF/1000V
MONO_ACT1
C11
1nF/1000V
MONO_ACT2
C13
10nF/2000V
PE
C16
10nF/1000V
C99
1nF/1000V
BP_ACT1
DO NOT MOUNT
FOR DERM101
C100
1nF/1000V
C18
10nF/1000V
BP_ACT2
9V
C19
10uF/25V
RF_DRV_EN
3.3V_FPGA
R17
470/0.25W
RF_DRV
R72
47/0.25W
GND
U5
INA
INB
ENA
ENB
VDD
GND
OB
OA
MAX17600
C98
150pF/50V
R72 AND C98 NOT MOUNT
D4
B360-F
TP14
THERMAL VIAS
TV1
TV2
TV3
TV4
R18
33/0.5W
L2
BLM31PG121SN1
L3
BLM31PG121SN1
Q2
AOD9N40
THERMAL VIAS
TV5 TV6 TV7 TV8 TV15
D5
MURS360T3
R19
33/0.5W
Q3
AOD9N40
D6
SMCJ300A
TP15
L4
L4 NOT MOUNT
NOTE: Shorts L4 on PCB
BOVIE - BULGARIA LTD.
Title
DERM101/102 - POWER GENERATOR
Size
A
Document Number
52-170-001
Rev
A
Date: Tuesday, May 13, 2014
Sheet 3 of 9


JTAG INTERFACE
FOR DEBUG
J10 NOT MOUNT
BOVIE - BULGARIA LTD.
DERM101/102 - FPGA CONTROL
52-170-001
Thursday, March 27, 2014

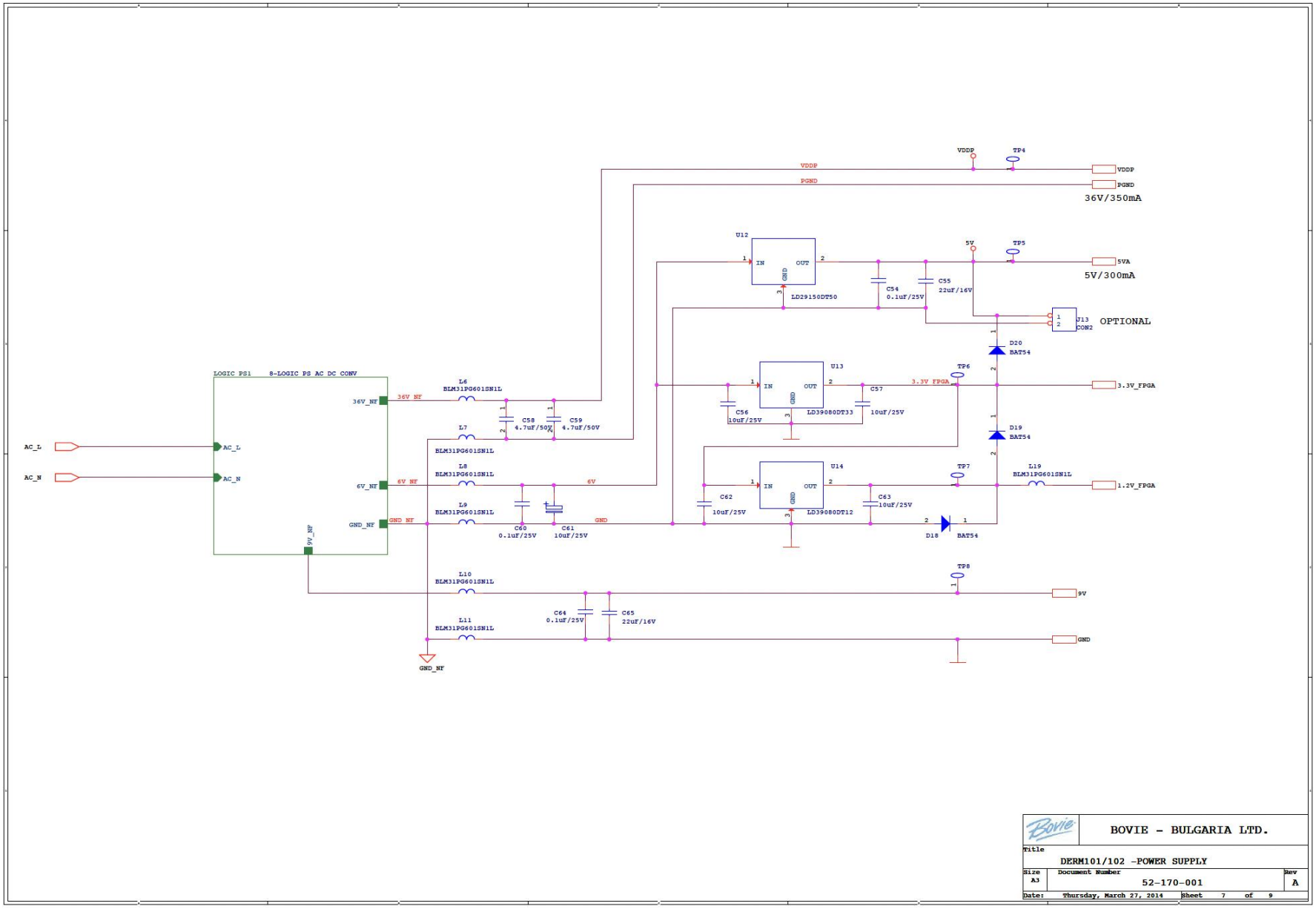
Buzzer Control Circuit

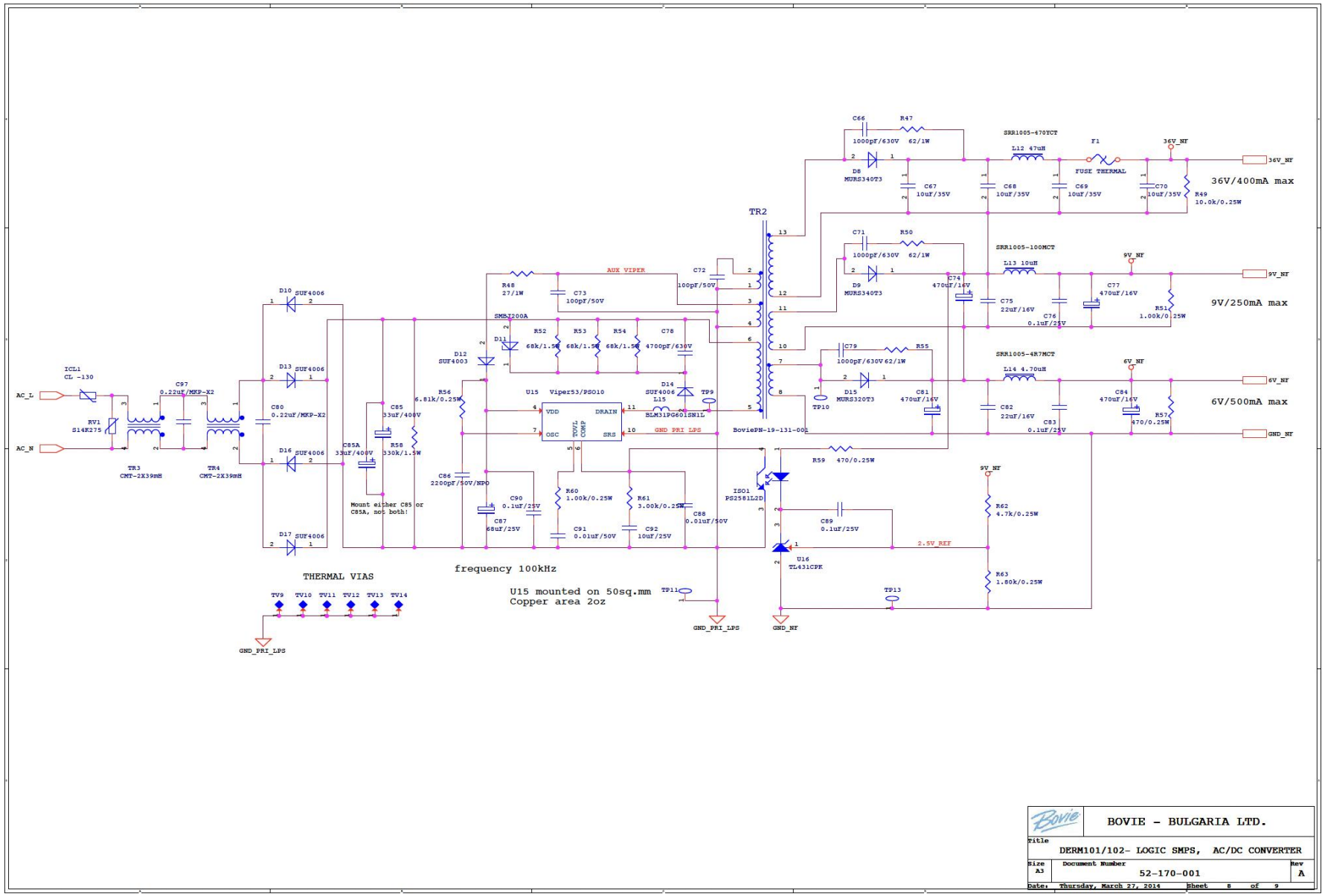


Handle and FSW Recognition Circuit

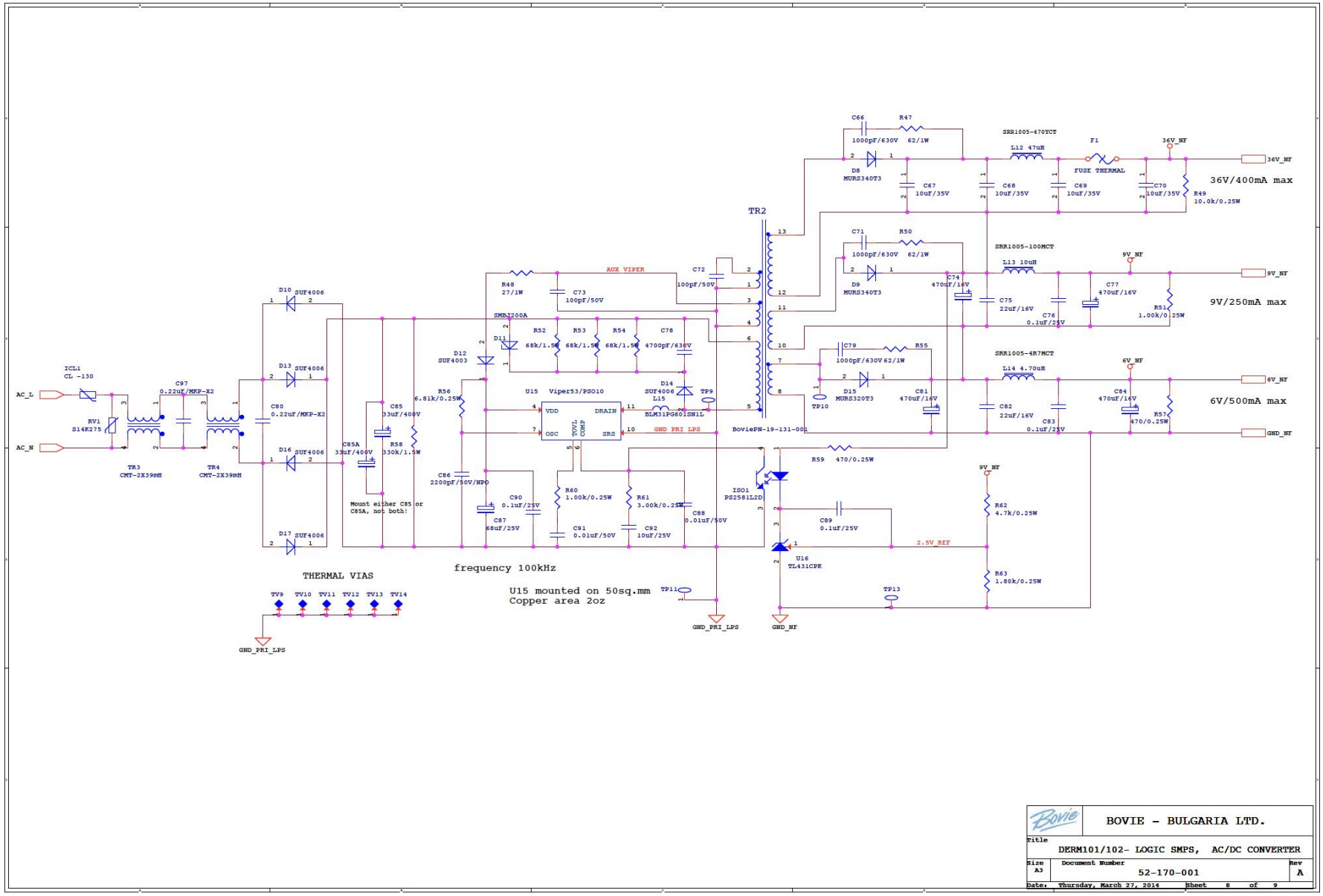


Power Supply




36V/400mA max
9V/250mA max
6V/500mA max
TR2
BoviePN-19-131-00L
THERMAL VIAS
frequency 100kHz
U15 mounted on 50sq.mm
Copper area 2oz
Mount either C85 or C85A, not both!
BOVIE - BULGARIA LTD.
DERM101/102- LOGIC SMPS, AC/DC CONVERTER
52-170-001
Thursday, March 27, 2014

Assembly, Final, DERM



CH REP

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MC-55-229-002 REV 3
2025-02-28

EC REP

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