



COVIDIEN

Service Manual

# Valleylab™ FT10

**FT Series Energy Platform**



Service Manual

# Valleylab™ FT10

**FT Series Energy Platform**

**For use with software version 2.0x**

**Part Number:** PT00047922

## Preface

This manual and the equipment it describes are for use only by qualified medical professionals trained in the particular technique and surgical procedure to be performed. It is intended as a guide for servicing the Covidien Valleylab FT10 FT Series Energy Platform only. Additional user information is available in the *Valleylab FT10 FT Energy Platform User's Guide*.

### **Equipment covered in this manual**

Valleylab FT10 FT Series Energy Platform (VLFT10GEN) with software version 2.0x

The latest version of the VLFT10GEN user's guide and service manual is available at <http://www.medtronic.com/covidien/support/biomed-connect/electrosurgery>.

Call these numbers to request a hardcopy of the service manual

- USA and Canada: 1 800 255 8522 Option 2
- International: 1 303 476 7996

Additional technical information may be available from Covidien Technical Service (see page 10-6).

For a complete list of service centers world wide, please refer to the Covidien web site: <http://www.medtronic.com/covidien/support/service-centers>.

## Limited Warranty

Covidien warrants the covered product listed below to be free from defects in material and workmanship for normal use and service for the period(s) set forth below. Covidien'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 authorized distributor) within the applicable time period shown below after delivery of the product to the original purchaser, and which examination discloses, to Covidien's satisfaction, that the product is defective. This limited warranty does not apply to any product, or part thereof, which has been repaired or altered in a way so as, in Covidien's judgment, to affect its stability or reliability, or which has been subjected to misuse, neglect, or accident.

The warranty period for this Covidien product is as follows:

### **Valleylab™ FT10 FT Series Energy Platform    One year from date of shipping**

Notwithstanding any other provision herein or in any other document or communication, Covidien's liability with respect to this limited warranty and the products sold hereunder shall be limited to the aggregate purchase price for the products sold to the customer. This limited warranty is non-transferable and runs only to the original purchaser of the covered product(s). There are no warranties which extend beyond the terms hereof. Covidien disclaims any liability hereunder or elsewhere in connection with the sale of products and for any form of indirect, tort, or consequential damages.

This limited warranty and the rights and obligations hereunder shall be construed under and governed by the laws of the State of Colorado, USA. The sole forum for resolving disputes arising under or relating in any way to this limited warranty is the District Court of the County of Boulder, State of Colorado, USA.

Covidien reserves the right to make changes in covered products built or sold by it at any time without incurring any obligation to make the same or similar changes to equipment previously built or sold by it.

**THE OBLIGATION TO REPAIR OR REPLACE A DEFECTIVE OR NONPERFORMING PRODUCT IS THE SOLE REMEDY OF THE CUSTOMER UNDER THIS LIMITED WARRANTY. EXCEPT AS EXPRESSLY PROVIDED HEREIN, COVIDIEN DISCLAIMS ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, ORAL OR WRITTEN, WITH RESPECT TO PRODUCTS, INCLUDING WITHOUT LIMITATION ALL IMPLIED WARRANTIES, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

## Software License

Customer hereby acknowledges that Covidien LP and or its affiliates (collectively called "COVIDIEN" herein) owns the entire right, title, and interest in and to the Software, as may be installed in the Products or Equipment addressed herein or provided separately ("Software") (including all of the computer code, source and object, comprising the Software and all components and elements thereof), and all associated manuals, drawings, technical information and Documentation (collectively, the "Documentation"), including, without limitation, all patent, copyright, trademark, trade secret and other intellectual property or proprietary rights ("Intellectual Property Rights") in and to the Software and all components and elements thereof all of which shall remain the sole and exclusive property of Covidien. The amount paid by the Customer for the Products and/or Equipment incorporating the Software includes as a portion of that amount, a license fee granting Customer only the rights set forth in this Software License. This Software License will be superseded by any express Software agreement between Covidien and Customer. The use of term "Product" herein includes Products and/or Equipment as applicable.

**1. Single User License Grant:** COVIDIEN grants to Customer a limited, nonexclusive, non-sublicensable, nontransferable and revocable license to use the Software, exclusively at location identified by Customer on the order form as the ship-to location of the Products, solely in machine-readable object code form, and only on a single central processing unit embedded in the Products as provided by COVIDIEN under this agreement, and solely for the Customer's internal business purpose in the operation of the Products provided by COVIDIEN under this agreement. Notwithstanding anything to the contrary contained in this Agreement, the Software is licensed to be used on only one computing device or Product, and a valid license must be obtained under this Agreement for each computing device or Product with which the Software is used or in which the Software is embedded.

**2. Restrictions on Use:** Except to the extent expressly authorized in these Software License Terms or by law, Customer shall not and shall not cause any third part to; (i) decompile, disassemble, or reverse engineer the Software; (ii) modify or create any derivative works (including, without limitation, translations, transformations, adaptations or other recast or altered versions) of or based on the Software, or alter the Software in any way; (iii) merge the Software with any other software or product not supplied by Covidien; (iv) use, copy, sell, sublicense, lease, rent, loan, assign, convey or otherwise transfer the Software except as expressly authorized by this Agreement; (v) distribute, disclose or allow use of the Software, in any format, through any timesharing service, service bureau, network or by any other means, to or by third parties; (vi) remove or modify any copyright, confidential or proprietary markings, legends or restrictions that are in the Software originally supplied to Customer; or (vii) violate any obligations with regard to Covidien's Confidential Information (as defined below). To the extent that Customer is expressly permitted by applicable mandatory law to undertake any of the activities listed in the preceding sentence, Customer will not exercise those rights unless and until Customer has given Covidien not less than 30 days' prior written notice of Customer's intent to exercise any such rights unless an order of a government agency of competent jurisdiction will not so allow. This License will terminate immediately upon notice from Covidien if Customer fails to comply with any provision of this License or any agreement.

**3. Reservation of Rights:** Notwithstanding anything to the contrary contained in this Agreement, or any order form, purchase order or agreement between the parties, all rights not expressly granted by Covidien to Customer are reserved to and retained by Covidien and Covidien expressly is not selling, assigning or otherwise transferring to Customer, and Customer is not purchasing or otherwise acquiring or obtaining, any of Covidien's Intellectual Property Rights or other rights in or to the Software or Documentation.

**4. Confidentiality:** Customer agrees that the Software and the Documentation, and all components and elements of the Software and Documentation, including, without limitation, the specific design and structure of individual programs, constitutes confidential information and trade secrets of Covidien (the "Confidential Information"). Customer agrees not to disclose, provide, or otherwise make available such Confidential Information, including, without limitation, any trade secrets or copyrighted material, in any form to any third party. Customer agrees that it will make the Software available only to those employees, contractors, or consultants of Customer with a specific need to know, who are obligated to comply with the restrictions contained in these Software License Terms and to maintain secrecy of the Software and all other Confidential Information and are properly trained in its use. Customer is responsible for the compliance of all users of the Software and Products with these obligations and shall cause all users of the Software and Products to comply with these obligations. Customer acknowledges that the Software embodies proprietary trade secrets of Covidien including, without limitation, technical and non-technical information regarding the Software and the development and manufacture of the same. Customer hereby agrees to maintain the confidentiality of such trade secrets using at least as great a degree of care as Customer uses to maintain the confidentiality of its own most confidential information. Customer shall communicate these obligations to those employees and agents of Customer who come into contact with the Software, and shall use its best efforts to ensure their compliance with all confidentiality obligations applicable to Customer.

**5. Change Orders:** Covidien shall have the right, at any time during the Term, by written request to Customer (an "Update Notice"), to require that Customer return the Products and Software to Covidien for such periods of time as are required by Covidien ("Update Periods") or to allow Covidien to access the Software at the Customer's location for the purpose of enabling Covidien to incorporate Software revisions, updates or modifications from time to time. Upon receipt of an Update Notice, Customer shall return the requested Products and Software to Covidien at Covidien's cost and expense, or work with Covidien to find a suitable time for Covidien to access the Software at the Customer's location. Customer acknowledges and agrees that during Update Periods, if the Software must be returned to Covidien, the Products and Software will be unavailable to Customer and in Covidien's possession. Covidien will use reasonable commercial efforts to perform the revisions, updates or modifications and to return the revised, updated or modified Products and Software to Customer as soon as is reasonably practicable.

**6. Software License Term:** The term of the Software license granted under this Software License shall be for the commercial life of the associated Product or Equipment.

**7. Limited Warranty:** Covidien represents and warrants to Customer that the Software will perform substantially as described in Covidien's then current Documentation for such

Software and the remaining warranty, or extended warranty, if any, applicable to the Product or Equipment with which such Software was delivered. If Customer notifies Covidien of defects during the applicable warranty period, and those defects are verified by Covidien, as Customer's sole and exclusive remedy, Covidien will replace the defective Software or, at its option, terminate this Software License and refund to Customer the amount paid by Customer to Covidien for the Software (if provided separately from a Product) or for the Product in which the defective Software is installed (if embedded within a Product). Customer's remedy for breach of this limited warranty shall be limited to the foregoing replacement or refund and shall not encompass any other damages. No dealer, distributor, agent or employee of Covidien is authorized to make any modification or addition to the warranty and remedies stated herein.

Notwithstanding these limited warranty provisions, all of Covidien's obligations with respect to such warranties shall be contingent on Customer's use of the Software in accordance with this Agreement and in accordance with Covidien's instructions as provided by Covidien in the Documentation provided by Covidien, as such instructions may be amended, supplemented, or modified by Covidien, in its sole discretion, from time to time. Covidien shall have no warranty obligations with respect to any failures of the Software that are the result of accident, abuse, misapplication, extreme power surge or extreme electromagnetic field, or any other cause outside of Covidien's control.

This limited warranty does not apply to any damages, malfunctions, or non-conformities caused to or by; (i) Customer's use of Software in violation of these Software License Terms or in a manner inconsistent with any Documentation or instructions provided by Covidien; (ii) use of non-Covidien furnished equipment, software, or facilities with its equipment or Products; (iii) Customer's failure to follow Covidien's installation, operation, repair or maintenance instructions; (iv) Customer's failure to permit Covidien timely access, remote or otherwise, to Products; (v) failure to implement all features, revisions, modifications, updates, patches, "bug fixes", or new versions of or to the Software provided by Covidien under this Agreement or otherwise; (vi) Products with their original manufacturer's serial numbers altered, defaced or deleted; (vii) Products that have been altered, serviced or modified by a party other than Covidien; or (viii) Software that has been subjected to abnormal physical or electrical stress, misuse, negligence or accident by Customer or a third party.

**8. Export Laws:** THESE SOFTWARE TERMS ARE EXPRESSLY MADE SUBJECT TO ANY AND ALL LAWS, REGULATIONS, ORDERS, OR OTHER RESTRICTIONS WITH RESPECT TO THE EXPORT FROM THE UNITED STATES OF AMERICA OF THE SOFTWARE. BUYER SHALL NOT EXPORT OR RE-EXPORT THE SOFTWARE (I) WITHOUT FULL COMPLIANCE WITH SUCH LAWS, REGULATIONS, ORDERS AND OTHER RESTRICTIONS, INCLUDING, WITHOUT LIMITATION, OBTAINING ALL NECESSARY APPROVAL FROM ALL REQUIRED GOVERNMENTAL AGENCIES AND (II) WITHOUT THE PRIOR WRITTEN CONSENT OF COVIDIEN.

**9. U.S. Government Rights.** The Software is a "commercial item" developed exclusively at private expense, consisting of "commercial computer software" and "commercial computer software Documentation" as such terms are defined or used in the applicable U.S. acquisition regulations. The Software is licensed hereunder (i) only as a commercial item and (ii) with only those rights as are granted to all other customers pursuant to the terms and conditions of this License. Customer shall not use, duplicate, or disclose the Software in any way not specifically permitted by this License. Nothing in this License requires Covidien to produce or furnish technical data for or to Customer.

**10. Survival.** Sections 2, 3, 4, 8, 9 and this Section 10 shall survive the termination or expiration of these Software License Terms.



# Table of Contents

|                        |     |
|------------------------|-----|
| Preface .....          | ii  |
| Limited Warranty ..... | iii |
| Software License ..... | iv  |

## Chapter 1. Overview and General Features

|                                          |      |
|------------------------------------------|------|
| The Valleylab FT10 Energy Platform ..... | 1-2  |
| Introduction .....                       | 1-2  |
| Front Panel .....                        | 1-3  |
| Rear Panel .....                         | 1-4  |
| Modes & Settings .....                   | 1-5  |
| Bipolar Resection .....                  | 1-10 |
| LigaSure .....                           | 1-11 |
| System Conventions .....                 | 1-14 |
| The Touchscreen .....                    | 1-14 |
| System Buttons .....                     | 1-16 |
| Interface Conventions .....              | 1-17 |

## Chapter 2. Warnings and Precautions for

### Patient and Operating Room Safety

|                                                         |      |
|---------------------------------------------------------|------|
| Conventions Used in this Guide .....                    | 2-1  |
| General Warnings and Precautions .....                  | 2-2  |
| Fire/Explosion Hazards .....                            | 2-2  |
| System Setup Warnings and Precautions .....             | 2-3  |
| Warnings and Precautions for the Energy Platform .....  | 2-6  |
| Warnings and Precautions for Active Instruments .....   | 2-7  |
| Warnings for Implanted Electronic Devices (IEDs) .....  | 2-8  |
| Post Surgery Safety Issues .....                        | 2-9  |
| Warnings and Precautions for Monopolar Procedures ..... | 2-9  |
| Warnings and Precautions for                            |      |
| Patient Return Electrodes .....                         | 2-10 |
| Inadvertent Radio Frequency (RF) Burns .....            | 2-11 |
| Warnings and Cautions for Laparoscopic Procedures ..... | 2-13 |
| Warnings and Precautions for Bipolar Procedures .....   | 2-14 |
| Warnings and Precautions for LigaSure Procedures .....  | 2-14 |
| Warnings and Precautions for Bipolar Resection .....    | 2-15 |
| Servicing .....                                         | 2-15 |
| Shunt Cords .....                                       | 2-16 |
| Conductive Fluid In the Surgical Site .....             | 2-16 |

## **Chapter 3. Principles of Operation**

|                                                                       |     |
|-----------------------------------------------------------------------|-----|
| Block Diagram .....                                                   | 3-2 |
| Electronic Assemblies Principles of Operation .....                   | 3-4 |
| High-Voltage/Low-Voltage Power Supply Principles of<br>Operation..... | 3-4 |
| Controller PCBA.....                                                  | 3-4 |
| RF PCBA .....                                                         | 3-4 |
| Steering Relay PCBA .....                                             | 3-4 |
| Display PCBA .....                                                    | 3-4 |
| Mechanical Assemblies Principles of Operation.....                    | 3-5 |
| IT Network Connectivity Principles of Operation.....                  | 3-5 |

## **Chapter 4. Technical Specifications**

|                                                                                                              |      |
|--------------------------------------------------------------------------------------------------------------|------|
| VLFT10GEN Specifications .....                                                                               | 4-2  |
| General.....                                                                                                 | 4-2  |
| Dimensions and Weight .....                                                                                  | 4-2  |
| Environmental Parameters .....                                                                               | 4-3  |
| Input Power .....                                                                                            | 4-3  |
| Power Cord Specifications.....                                                                               | 4-4  |
| Backup Power .....                                                                                           | 4-4  |
| Equipotential Ground Connection.....                                                                         | 4-4  |
| EKG Blanking and Smoke Evacuation .....                                                                      | 4-4  |
| Internal Memory .....                                                                                        | 4-5  |
| Duty Cycle .....                                                                                             | 4-5  |
| Leakage .....                                                                                                | 4-5  |
| Radio Frequency Identification (RFID) .....                                                                  | 4-6  |
| Wireless Fidelity (WiFi) .....                                                                               | 4-6  |
| Ethernet.....                                                                                                | 4-7  |
| Symbols Used .....                                                                                           | 4-8  |
| Standards and IEC Classifications .....                                                                      | 4-10 |
| Class I Equipment (IEC 60601-1) .....                                                                        | 4-10 |
| Type CF Equipment/Defibrillator Proof<br>(IEC 60601-1, IEC 60601-2-2, and ANSI/AAMI HF18) ....               | 4-10 |
| IP21 Liquid Ingress/Spillage<br>(IEC 60601-1 and IEC 60601-2-2).....                                         | 4-11 |
| Voltage Transients – Energy Platform Mains Transfer<br>(IEC 60601-1, IEC 60601-2-2, and ANSI/AAMI HF18) .... | 4-11 |
| CISPR 11 Class A.....                                                                                        | 4-11 |
| Electromagnetic Compatibility<br>(IEC 60601-1-2 and IEC 60601-2-2) .....                                     | 4-11 |
| Cables Used for EMC Compliance Testing .....                                                                 | 4-16 |
| Return Electrode Monitor (REM) .....                                                                         | 4-18 |

|                                          |      |
|------------------------------------------|------|
| Auto Bipolar .....                       | 4-18 |
| Audio Tones .....                        | 4-19 |
| Energy Output Characteristics .....      | 4-21 |
| Output Waveforms .....                   | 4-23 |
| Output Power vs. Resistance Graphs ..... | 4-25 |
| Monopolar Graphs .....                   | 4-25 |
| Bipolar Graphs .....                     | 4-40 |
| Discontinuous Power Curves .....         | 4-49 |

## Chapter 5. System Setup

|                                  |      |
|----------------------------------|------|
| Setup .....                      | 5-2  |
| Unpacking the System .....       | 5-2  |
| Before Starting the System ..... | 5-2  |
| Turning On the VLFT10GEN .....   | 5-3  |
| Turning Off the VLFT10GEN .....  | 5-3  |
| System Functions .....           | 5-4  |
| On/Off .....                     | 5-4  |
| Restore Settings .....           | 5-4  |
| Audio Volume .....               | 5-5  |
| Service and Settings .....       | 5-6  |
| Logs .....                       | 5-7  |
| DEMO Mode .....                  | 5-7  |
| System Menu .....                | 5-8  |
| Service Menu .....               | 5-10 |
| Language Selection Menu .....    | 5-11 |
| Feature Enabling Menu .....      | 5-11 |

## Chapter 6. Testing Setup and Functional Tests

|                                                                        |      |
|------------------------------------------------------------------------|------|
| Periodic Safety Check (Routine Maintenance) .....                      | 6-2  |
| Inspecting the System and Accessories .....                            | 6-3  |
| Inspecting Internal Components (when required) .....                   | 6-5  |
| Power Up Check .....                                                   | 6-6  |
| Verifying Power Output .....                                           | 6-7  |
| RF Output Test Screen .....                                            | 6-7  |
| Testing Monopolar 1 COAG Output - 500 $\Omega$ Load .....              | 6-8  |
| Testing Monopolar 2 COAG Output - 500 $\Omega$ Load .....              | 6-9  |
| Testing Monopolar 2 COAG Output - 100 $\Omega$ Load .....              | 6-10 |
| Testing Monopolar 2 CUT Output - 300 $\Omega$ Load .....               | 6-11 |
| Testing Monopolar 2 VALLEYLAB Mode<br>Output - 300 $\Omega$ Load ..... | 6-12 |
| Testing Bipolar Energy Channel Output - 100 $\Omega$ Load ..           | 6-13 |
| Testing LigaSure/Bipolar Output .....                                  | 6-14 |

|                                                                       |      |
|-----------------------------------------------------------------------|------|
| Verifying REM Function . . . . .                                      | 6-15 |
| Verifying Cross Coupling. . . . .                                     | 6-16 |
| Checking High-Frequency Leakage Current. . . . .                      | 6-19 |
| Checking Monopolar High-Frequency<br>Leakage Current . . . . .        | 6-19 |
| Checking Patient Return High-Frequency<br>Leakage Current . . . . .   | 6-20 |
| Checking Bipolar High-Frequency Leakage Current . . . .               | 6-21 |
| Checking LigaSure/Bipolar High-Frequency<br>Leakage Current . . . . . | 6-22 |
| Safety Testing in Accordance with IEC 60601-1 . . . . .               | 6-23 |
| Checking Low-Frequency Leakage Current. . . . .                       | 6-23 |
| Chassis or Earth Leakage. . . . .                                     | 6-24 |
| Total Patient Leakage Source Current . . . . .                        | 6-24 |
| Total Patient Leakage Sink Current . . . . .                          | 6-24 |
| Ground Continuity Testing . . . . .                                   | 6-25 |
| Preventive Maintenance Check Sheet. . . . .                           | 6-25 |

## **Chapter 7. Calibrations**

|                                                        |      |
|--------------------------------------------------------|------|
| Touchscreen Calibration . . . . .                      | 7-2  |
| Energy Calibration . . . . .                           | 7-4  |
| Periodic Safety Check (Routine Maintenance). . . . .   | 7-7  |
| Inspecting the System and Accessories. . . . .         | 7-8  |
| Inspecting Internal Components (when required) . . . . | 7-10 |
| Power Up Check. . . . .                                | 7-11 |

## **Chapter 8. Troubleshooting**

|                                              |     |
|----------------------------------------------|-----|
| General Troubleshooting Guidelines . . . . . | 8-2 |
| REM Alarms . . . . .                         | 8-2 |
| Correcting a REM-Alarm Condition . . . . .   | 8-2 |
| Correcting Malfunctions . . . . .            | 8-3 |
| System Errors . . . . .                      | 8-8 |

## **Chapter 9. Replacement Procedures**

|                                                    |      |
|----------------------------------------------------|------|
| Tools Required for Component Replacement . . . . . | 9-2  |
| Touch-up Paint Instructions. . . . .               | 9-2  |
| Top-Level Assemblies. . . . .                      | 9-4  |
| Base Chassis Replacement. . . . .                  | 9-4  |
| Controller Fan Replacement. . . . .                | 9-8  |
| Controller PCBA Replacement . . . . .              | 9-10 |
| PCBA Battery Replacement. . . . .                  | 9-14 |
| Display PCBA Replacement . . . . .                 | 9-17 |

|                                                          |      |
|----------------------------------------------------------|------|
| E-PAC Foam Replacement . . . . .                         | 9-20 |
| Power-Supply Fan Replacement . . . . .                   | 9-23 |
| Power-Supply Module Replacement . . . . .                | 9-26 |
| Speaker Replacement . . . . .                            | 9-28 |
| RF Fan Replacement . . . . .                             | 9-30 |
| RF PCBA Replacement . . . . .                            | 9-32 |
| Steering Relay PCBA Replacement . . . . .                | 9-34 |
| Top Cover Replacement . . . . .                          | 9-37 |
| Front-Panel Assemblies . . . . .                         | 9-39 |
| Front Bezel Replacement . . . . .                        | 9-39 |
| Bipolar Receptacle Replacement . . . . .                 | 9-43 |
| LigaSure/Bipolar Receptacle Replacement . . . . .        | 9-45 |
| Monopolar 1 Receptacle Replacement . . . . .             | 9-47 |
| Monopolar 2 Receptacle Replacement . . . . .             | 9-49 |
| VIBE Replacement . . . . .                               | 9-51 |
| REM Assembly Replacement . . . . .                       | 9-53 |
| LCD Module Replacement . . . . .                         | 9-56 |
| Touchscreen Assembly Replacement . . . . .               | 9-59 |
| Rear-Panel Assemblies . . . . .                          | 9-63 |
| EMI Filter Replacement . . . . .                         | 9-63 |
| Equipotential Ground Connection Replacement . . . . .    | 9-66 |
| FTSW PCBA Replacement . . . . .                          | 9-68 |
| Fuse Replacement . . . . .                               | 9-70 |
| WiFi Replacement . . . . .                               | 9-71 |
| Back Panel Disassembly and Re-assembly . . . . .         | 9-72 |
| <b>Chapter 10. Maintenance and Repair</b>                |      |
| Responsibility of the Manufacturer . . . . .             | 10-2 |
| Routine Maintenance and Periodic Safety Checks . . . . . | 10-2 |
| Cleaning . . . . .                                       | 10-3 |
| Product Service . . . . .                                | 10-3 |
| Returning the Energy Platform for Service . . . . .      | 10-4 |
| Software Updates . . . . .                               | 10-5 |
| Updating Energy Platform Software . . . . .              | 10-5 |
| Service Manual Copies and Updates . . . . .              | 10-6 |
| Covidien Technical Service . . . . .                     | 10-6 |
| Training/Education . . . . .                             | 10-7 |



# Chapter 1

## Overview and General Features

This chapter provides an overview of the features and functions of the Valleylab FT10 FT Series Energy Platform.

### Precaution

Read the instructions, warnings, and precautions provided with this energy platform and associated accessories before using. Specific instructions for electrosurgical instruments are not included in this manual.

# **The Valleylab FT10 Energy Platform**

## **Introduction**

The Valleylab FT10 FT Series Energy Platform (VLFT10GEN) provides RF energy for monopolar and bipolar surgical applications, and tissue-fusion and vessel-sealing applications. It features a touchscreen divided into four quadrants for viewing and user input of settings and options available for any application. The energy platform automatically detects coded handsets and configures the energy platform accordingly. Safety and diagnostic functionality include automatic fail-safe functions.

The VLFT10GEN, applied parts (patient return electrodes and active instruments) are designed to work as a system. Covidien offers a selection of patient return electrodes and active instruments that are fully compatible with this energy platform.

- Refer to each instrument's instructions for use (IFU) for indications, warnings, and specific contraindications.
- When considering other manufacturers' patient return electrodes and/or active instruments, customers should seek detailed user instructions and warning information from the manufacturer.

The generator is intended for use in general surgery and such surgical specialties as urologic, vascular, thoracic, plastic, gynecologic, reconstructive, and colorectal surgery.

## **Indications for Use**

The VLFT10GEN is a high frequency electrosurgical generator intended for use with monopolar and bipolar accessories for cutting and coagulating tissue. When used with compatible sealing devices, it is indicated for sealing vessels up to and including 7mm, tissue bundles, and lymphatics.

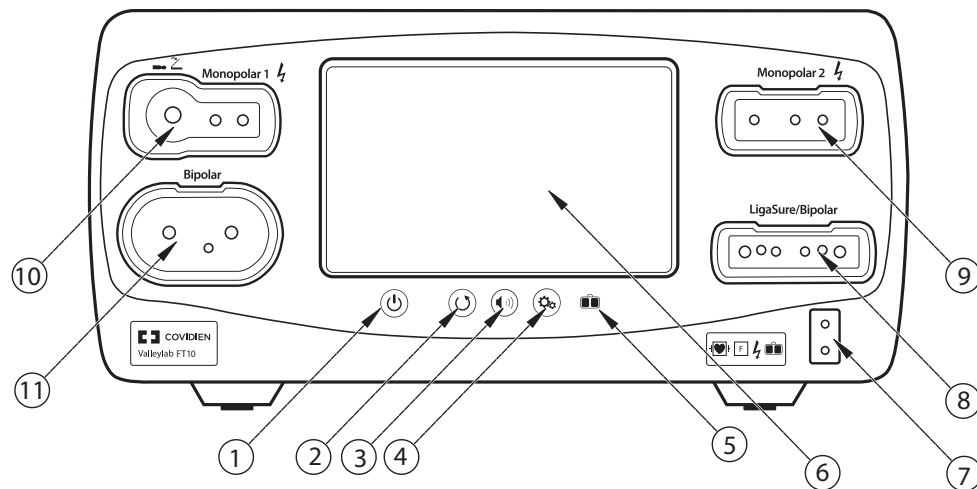
The generator can also be used with compatible resectoscopes for endoscopically controlled removal or coagulation of tissue using 0.9% NaCl solution as the irrigation medium.

The tissue fusion function has not been shown to be effective for tubal sterilization or tubal coagulation for sterilization procedures. Do not use this function for these procedures.

## **Contraindications**

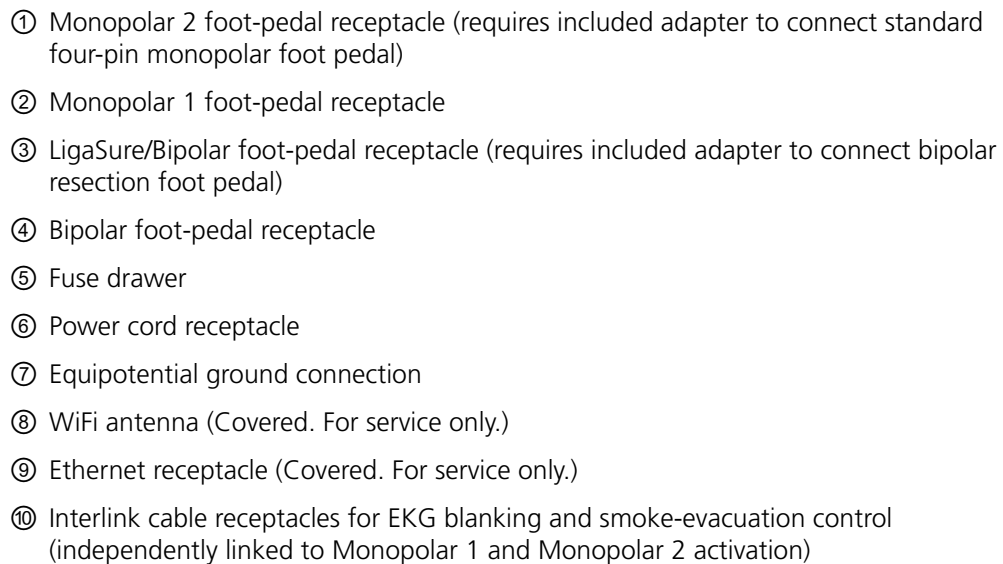
None known.

## Front Panel



- ① On/Off button
- ② Restore Settings button
- ③ Audio Volume control button
- ④ Service/Settings button
- ⑤ REM™ (Return Electrode Monitoring) indicator
- ⑥ Interface touchscreen
- ⑦ REM patient return electrode receptacle
- ⑧ LigaSure™/Bipolar receptacle
- ⑨ Monopolar 2 instrument receptacle
- ⑩ Monopolar 1 Universal Foot-Pedal Port (UFP) receptacle
- ⑪ Bipolar instrument receptacle

## Valleylab FT10 Energy Platform Service Manual



## Modes & Settings

The VLFT10GEN provides the following modes and settings for a variety of surgical procedures:

| Monopolar modes                 | Power-Setting Ranges | Peak Voltage |
|---------------------------------|----------------------|--------------|
| · CUT                           |                      |              |
| - PURE                          | Off, 1–300 W         | 1287 V       |
| - BLEND                         | Off, 1–200 W         | 2178 V       |
| · VALLEYLAB                     | 5–60 W               | 2783 V       |
| · COAG                          |                      |              |
| - SOFT                          | Off, 1–120 W         | 264 V        |
| - FULGURATE                     | Off, 1–120 W         | 3448 V       |
| - SHARED FULGURATE              | Off, 1–120 W         | 3448 V       |
| - SPRAY                         | Off, 1–120 W         | 3932 V       |
| - SHARED SPRAY                  | Off, 1–120 W         | 3932 V       |
| <b>Bipolar effects</b>          |                      |              |
| · LOW                           | Off, 1–15 W          | 133 V        |
| · MEDIUM                        | 16–40 W              | 214 V        |
| · HIGH                          | 45–95 W              | 462 V        |
| <b>LigaSure (tissue fusion)</b> | No power settings    | 244 V        |
| <b>Bipolar Resection effect</b> |                      |              |
| · CUT                           | 1–6                  | 742 V        |
| · COAG                          | 1–6                  | 318 V        |

## Monopolar Modes

The system produces six modes of monopolar power output.

### Precaution

To provide expected functionality from a hand piece, proper insertion is required. Refer to the alignments dots below the receptacles for proper insertion orientation.

### CUT Modes

**PURE** CUT provides a clean, precise cut in any tissue with little or no hemostasis.

**BLEND** CUT is a conventional blended waveform that provides slower cutting with simultaneous hemostasis.

### VALLEYLAB Mode

**VALLEYLAB** mode is a unique combination of hemostasis and dissection that allows the user to slow down for more hemostasis and speed up for faster dissection.

### COAG Modes

**SOFT** desiccates tissue at a relatively slower rate with deeper thermal penetration. It is typically performed with a ball electrode.

**FULGURATE** coagulates tissue by sparking from the active electrode, through air, to the patient tissue.

**SPRAY** delivers wider fulguration; penetration is shallower and the affected tissue area is larger than with the FULGURATE mode.

**SHARED** allows two monopolar instruments to activate simultaneously in either FULGURATE or SPRAY modes. A single power setting is provided and power is shared between the two instruments.

**Note:** SOFT and SHARED COAG modes are features that are not available on the clinical screen until they have been enabled. These features can be enabled through the Feature Enabling menu of the service screen. See *Feature Enabling Menu* on page 3-10.

### Compatible Monopolar Instruments & Devices

The following Covidien catalog numbers for monopolar surgical instruments, return electrodes, foot pedals, and adapters are fully compatible with the VLFT10GEN.

### Monopolar UFP Instruments (connect only to Monopolar 1)

|                           |
|---------------------------|
| E05021 Monopolar Adapter  |
| E050212 Monopolar Adapter |

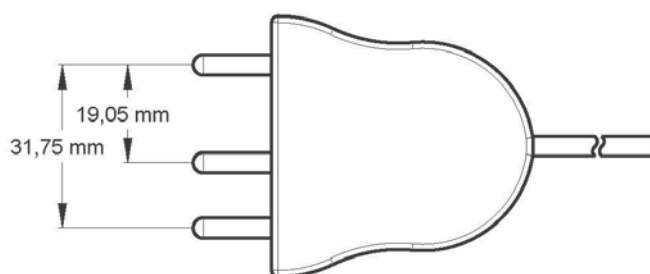
The Monopolar 1 UFP-receptacle, identified by a blue ring, accepts UFP connectors with diameters of 4 mm to 8 mm, and lengths of 15.2 mm to 41.7 mm. UFP connectors with a diameter of less than 4 mm require an adapter to connect to the Monopolar 1 UFP receptacle.

**Monopolar Instruments (connect only to Monopolar 2 receptacle)**

|                                                 |
|-------------------------------------------------|
| FT3000DB Force TriVerse™ Electrosurgical Device |
| FT3000 Force TriVerse Electrosurgical Device    |

**Monopolar Instruments (connect to either Monopolar 1 or Monopolar 2)**

This generator is designed for use with Covidien monopolar instruments. However, other monopolar instruments are compatible with the VLFT10GEN if they have a connector that matches the following figure and are rated for peak voltages of at least 3932 V.

**Monopolar**

Utilizes 4 mm banana pins

**Return Electrodes (Monitoring)**

|                                                               |
|---------------------------------------------------------------|
| E0560 Valleylab REM Patient Return Electrode Cord             |
| E7507 REM Polyhesive™ Adult Patient Return Electrode          |
| E7507DB REM Polyhesive Adult Patient Return Electrode         |
| E7508 REM Polyhesive Adult Cordless Patient Return Electrode  |
| E7509 REM Polyhesive Adult Cordless Patient Return Electrode  |
| E7509B REM Polyhesive Adult Cordless Patient Return Electrode |
| E7510-25 REM Polyhesive Infant Patient Return Electrode       |
| E7510-25DB REM Polyhesive Infant Patient Return Electrode     |
| E7512 REM Polyhesive Neonatal Patient Return Electrode        |

**Return Electrodes (Non-Monitoring, for use in DEMO mode only. Not for clinical use.)**

|                                                   |
|---------------------------------------------------|
| E7506 Non-REM Polyhesive Patient Return Electrode |
|---------------------------------------------------|

**REM Connector**

|                                                 |
|-------------------------------------------------|
| E0507B Valleylab Multiple Return/S Cord Adapter |
|-------------------------------------------------|

**Foot Pedals**

|                                                                               |
|-------------------------------------------------------------------------------|
| FT6003 ForceTriad Three-Pedal Footswitch (Monopolar 2 only)                   |
| E6008 Valleylab Monopolar Footswitch (Monopolar 1, Monopolar 2 with adapter)  |
| E6008B Valleylab Monopolar Footswitch (Monopolar 1, Monopolar 2 with adapter) |
| 1017577 6-Pin to 4-Pin Monopolar Footswitch Adapter (Monopolar 2 only)        |

**Bipolar Effects**

Selection of bipolar effects and power settings is dependent on surgeon preferences, tissue characteristics, accessories selection, and the intended clinical application.

**LOW effect** is for power selections of 1–15 watts. It delivers low-voltage output for precision and fine control of the amount of desiccation typically used with small-surface area instruments.

**MEDIUM effect** is for power selections of 16–40 watts. It is a conventional bipolar output typically used with medium-surface area electrodes.

**HIGH effect** is for power selections of 45–95 watts. Power remains constant over a wide range of tissue types and may be used for large electrodes.

| Effect Setting | Power Setting Range                | Optimized Instrumentation                                                                                                                                                             |
|----------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>LOW</b>     | 1—15 watts                         | <ul style="list-style-type: none"> <li>Small-surface area instruments</li> <li>Micro-tip forceps (0.4—2.2 mm)</li> </ul>                                                              |
| <b>MEDIUM</b>  | 16—40 watts                        | <ul style="list-style-type: none"> <li>Medium-surface area instruments</li> <li>Micro-tip forceps (1.0—2.2 mm)</li> <li>Small paddle lap forceps</li> <li>Bipolar scissors</li> </ul> |
| <b>HIGH</b>    | 45—95 watts<br>(5 watt increments) | <ul style="list-style-type: none"> <li>Large-surface area instruments</li> <li>Large paddle lap forceps</li> </ul>                                                                    |

## Auto Bipolar

The Auto Bipolar feature senses tissue impedance between the two bipolar electrodes, then uses the impedance information to automatically start or stop bipolar RF energy delivery. Optionally, the user may select a timed activation delay for auto start of RF activation.

**Note:** When using Auto Bipolar, the tissue in the grasp of the bipolar device must have an impedance less than 2200  $\Omega$ . The activation impedance safety feature will not deliver RF power to the tissue if it is not within the specified range. This is a factory-set value that cannot be reset by the user.

**Note:** Auto Bipolar is a feature that is not available on the clinical screen until it is enabled. This feature can be enabled through the Feature Enabling Menu of the service screen. See *Feature Enabling Menu* on page 3-10.

### Important

If the VLFT10ADP1 Bipolar Adapter is used, only one bipolar instrument can set the Auto Bipolar feature to ON.

### Precaution

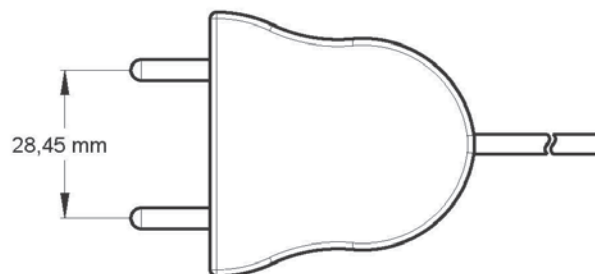
Do not use instruments with flying leads with the VLFT10GEN.

Do not use the FT0501 ForceTriad™ Bipolar Adapter with the VLFT10GEN.

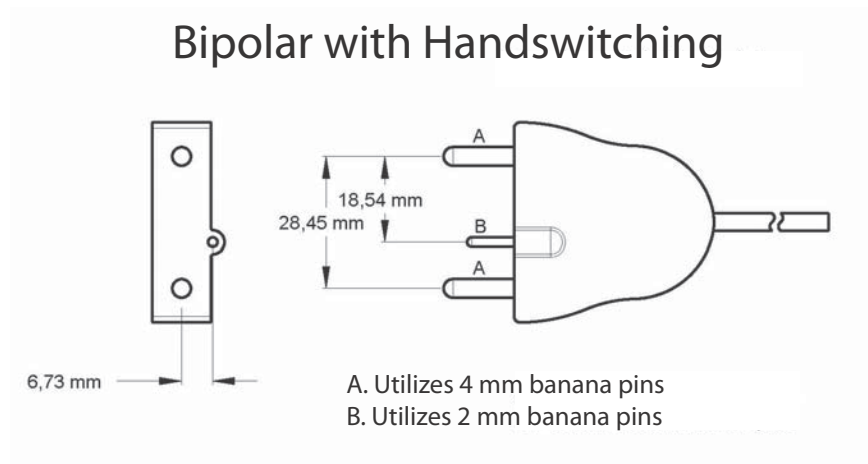
## Compatible Bipolar Instruments & Devices

The VLFT10GEN is designed for use with Covidien bipolar instruments. However, other bipolar instruments are compatible with the VLFT10GEN if their connectors match the following illustration and are rated for peak voltages of at least 531 V.

### Bipolar



Utilizes 4 mm banana pins



The following Covidien catalog numbers for bipolar foot pedals are fully compatible with the VLFT10GEN.

#### Foot Pedals

|                                              |
|----------------------------------------------|
| E6009 Valleylab Bipolar Standard Footswitch  |
| E6009B Valleylab Bipolar Standard Footswitch |
| E6019 Valleylab Bipolar Dome Footswitch      |

#### Bipolar Adapter

The VLFT10ADP1 Bipolar Adapter allows bipolar instruments to connect to the Ligasure/ Bipolar receptacle, thereby enabling the use of a second bipolar instrument.

#### Bipolar Resection

Bipolar Resection configures the LigaSure/Bipolar receptacle to use bipolar-resection resectoscopes.

## Accessories

|                                                                         |
|-------------------------------------------------------------------------|
| FT0021S ForceTriad Bipolar Resection Cord                               |
| FT0022W ForceTriad Bipolar Resection Cord                               |
| FT6009 ForceTriad FT Series Bipolar Resection Footswitch (with adapter) |
| 1060355 Valleylab FT10 Bipolar Resection Footswitch Adapter             |

## Effect-Settings Reference Chart

| Effect Setting | CUT Initiation Current (amps) | CUT (watts) | COAG (max RMS volts) |
|----------------|-------------------------------|-------------|----------------------|
| 1              | 1.8                           | 80          | 25                   |
| 2              | 1.8                           | 120         | 50                   |
| 3              | 2.1                           | 120         | 75                   |
| 4              | 2.4                           | 120         | 100                  |
| 5              | 2.4                           | 160         | 125                  |
| 6              | 2.4                           | 200         | 150                  |

## LigaSure

LigaSure tissue fusion can be used on arteries, veins, pulmonary vasculature, and lymphatics—up to and including 7 mm in diameter—and tissue bundles. When used with compatible instruments, the system provides precise energy delivery and electrode pressure to vessels for a controlled time period to achieve a complete and permanent fusion of the vessel lumen. The system has been designed to produce minimal sticking, charring, and thermal spread to adjacent tissue.

### Warning

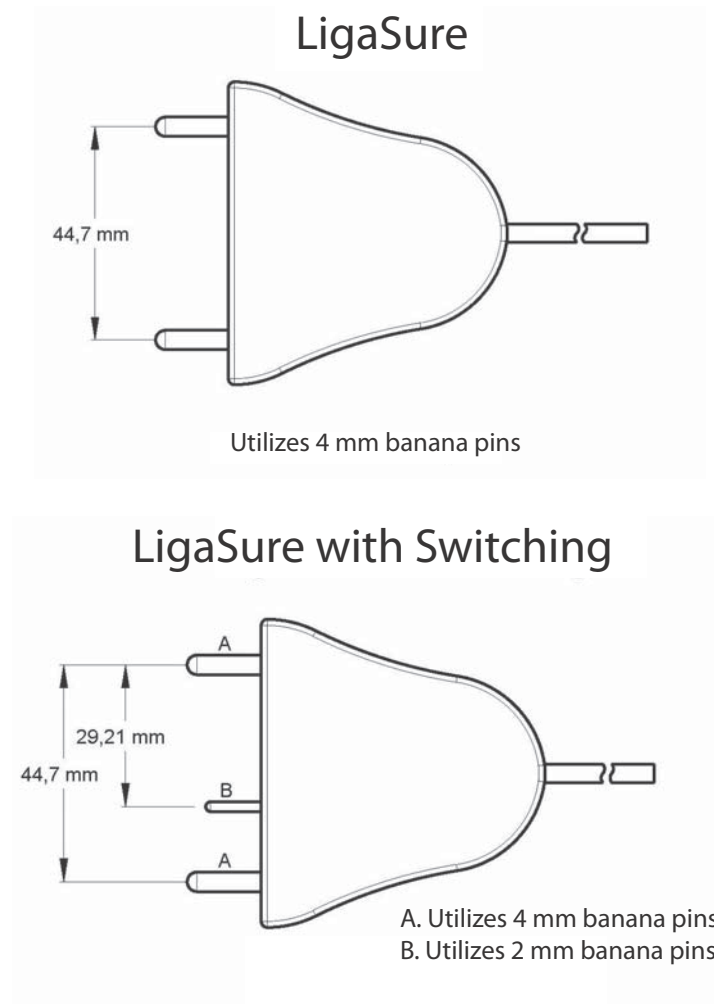
The tissue fusion function has not been shown to be effective for tubal sterilization or tubal coagulation for sterilization procedures. Do not use this function for these procedures.

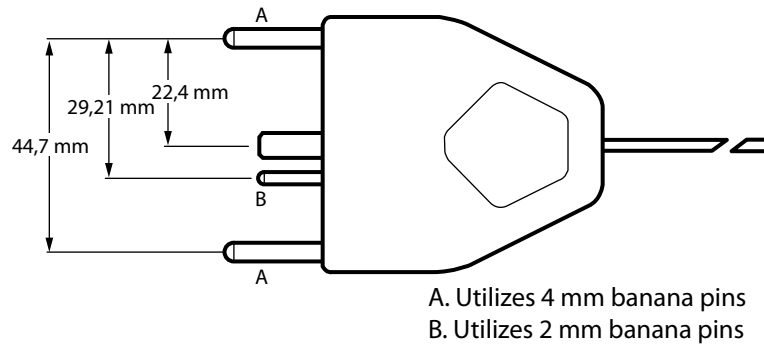
## LigaSure Instruments

The LigaSure instruments that complete the VLFT10GEN tissue-fusion system include reusable and single-use instruments for open and laparoscopic procedures. Each reusable instrument requires a corresponding single-use electrode. The LigaSure function is only available when using compatible instruments.

### Compatible LigaSure Instruments & Devices

This generator is designed for use with Covidien LigaSure instruments that have a connector that matches the following figures and are rated for peak voltages of at least 244 V. However, it does not recognize all LigaSure instruments. Please refer to the cover of the instructions for use to confirm if a specific LigaSure catalog number is compatible with the VLFT10GEN.





The following LigaSure foot pedal is fully compatible with the VLFT10GEN.

#### Foot Pedal

LS0300 Tissue Fusion Footswitch, Purple

#### Connection to External Systems

The VLFT10GEN can be connected to an external system. For example, connections can be made to enable smoke evacuation or EKG blanking during monopolar activation, or provide argon-enhanced coagulation. There are two external system receptacles on the back of the VLFT10GEN that can signal RF activation. The receptacles are labeled Monopolar 1 and Monopolar 2. They both signal RF activation whenever RF energy from any of the RF receptacles is initiated. Refer to the external system user's guide for detailed instructions regarding how to connect it to the generator.

#### External Systems Compatible with the VLFT10GEN

|                                                   |
|---------------------------------------------------|
| SEA3730 RapidVac™ Smoke Evacuator Interlink Cable |
| SE3690 RapidVac Smoke Evacuator                   |
| Force™ Argon II-20 Argon Gas Delivery Unit II     |

#### Warning

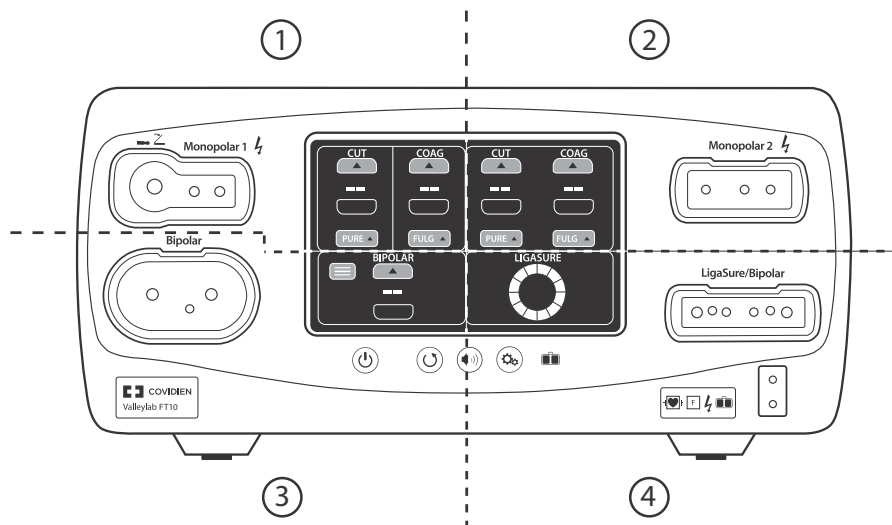
Only medical devices compliant with IEC 60601-1 may be connected to the external system receptacles. The use of any external system connected to the VLFT10GEN should be evaluated by qualified personnel.

## System Conventions

### The Touchscreen

The VLFT10GEN features a user-friendly touchscreen interface to control system functions. The touchscreen is divided into quadrants; each of the four sections is associated with an adjacent instrument receptacle.

- **Quadrant 1**—Settings entered in the touchscreen control an instrument attached to the Monopolar 1 receptacle.
- **Quadrant 2**—Settings entered in the touchscreen control an instrument attached to the Monopolar 2 receptacle.
- **Quadrant 3**—Settings entered in the touchscreen control an instrument attached to the Bipolar receptacle.
- **Quadrant 4**—The touchscreen displays instrument-specific options and activation of LigaSure and Bipolar Resection devices.



## Generator States

The appearance of touchscreen components indicates one of the three states of the system.

### Edit

When the system is powered on and no instrument is attached, the instrument controls in the monopolar and bipolar sections can be preset. The following illustration shows monopolar controls edited prior to inserting an instrument.



### Inserted

The controls change from the edit stage's flat gray to a brightly illuminated color when an instrument is inserted into the associated receptacle. The following illustration shows the monopolar controls when a two-button pencil is inserted.



### Activation

The black background illuminates brightly when the instrument is activated. The following illustration shows the two-button pencil is currently delivering energy for PURE CUT. The mode controls are locked during activation preventing any change in the mode. Power settings can be changed during activation.



### System Buttons

There are four buttons on the energy platform's front panel:



#### On/Off

Turns system power on and off. To turn power on, hold the button for 0.25 seconds. To turn off, hold the button for 1 second. To reset a non-responsive system, hold for 10 seconds.



#### Restore Settings

Restores settings from the last time the system was powered down using the On/Off button.



#### Audio Volume

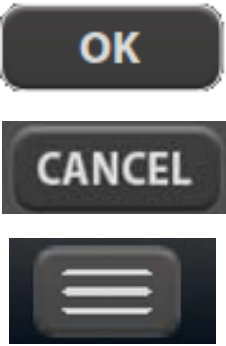
Displays the volume pop-up menu to adjust sound levels.



#### Service/Settings

Displays the service/settings menu.

## Interface Conventions

| Interface Element                                                                   | Name                           | Description                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <b>Pop-up window/<br/>menu</b> | Pop-up windows and menus appear on screen when user input is needed or requested. Pop-ups close if the user touches anywhere outside of the pop-up window.                                                                                                                                                          |
|   | <b>Up/Down arrows</b>          | Up and down arrows indicate additional values or selections are available for the current setting.<br><br>For numeric values, press the up or down arrow to increase or decrease the displayed value. When the value is at its maximum or minimum available setting, the appropriate arrow button becomes inactive. |
|  | <b>Software Buttons</b>        | Options and confirmations are represented by virtual buttons on the touchscreen. Touch on-screen buttons to select preference.                                                                                                                                                                                      |
|  | <b>Toggle Switches</b>         | Touch the virtual toggle switches to enable (ON) or disable (OFF) options or functions.                                                                                                                                                                                                                             |



# Chapter 2

## Warnings and Precautions for Patient and Operating Room Safety

The safe and effective use of electrosurgery depends to a large degree upon factors solely under the control of the operator. There is no substitute for a properly trained and vigilant surgical team. It is important that the operating instructions supplied with this or any electrosurgical equipment be read, understood, and followed.

Electrosurgery has been used safely in millions of procedures. Before starting any surgical procedure, the surgeon should be trained in the particular technique and surgical procedure to be performed, should be familiar with the medical literature related to the procedure and potential complications, and should be familiar with the risks versus the benefits of utilizing electrosurgery in the procedure.

### Conventions Used in this Guide

|                                                                                                 |
|-------------------------------------------------------------------------------------------------|
| <b>Warning</b>                                                                                  |
| Indicates a hazardous situation which, if not avoided, could result in death or serious injury. |
| <b>Precaution</b>                                                                               |
| Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.  |
| <b>Notice</b>                                                                                   |
| Indicates a hazard which may result in product damage.                                          |
| <b>Important</b>                                                                                |
| Indicates an operating tip or maintenance suggestion.                                           |

## General Warnings and Precautions

### Fire/Explosion Hazards

#### Warning

**Danger - Explosion Hazard** Do not use electrosurgery in the presence of flammable anesthetics or oxidizing gases (such as nitrous oxide (N<sub>2</sub>O) and oxygen) or in close proximity of to volatile solvents (such as ether or alcohol).

**Fire Hazard** Do not place active instruments near or in contact with flammable materials (such as gauze or surgical drapes). Electrosurgical instruments that are activated or hot from use can cause a fire. When not in use, place electrosurgical instruments in a safety holster or safely away from patients, the surgical team, and flammable materials.

Sparkling and heating associated with electrosurgery can be an ignition source. Keep gauze and sponges wet. Keep electrosurgical electrodes away from flammable materials and oxygen (O<sub>2</sub>) enriched environments.

Use of electrosurgery in O<sub>2</sub> rich environments increases the risk of fire. Therefore, take measures to reduce the O<sub>2</sub> concentration at the surgical site.

If possible, stop supplemental oxygen at least one minute before and during use of electrosurgery.

The use of non-flammable agents is recommended for cleaning and disinfecting wherever possible. If flammable agents are used, do not activate the energy platform until flammable vapors from skin-preparation solutions and tinctures have dissipated.

There is a risk of pooling of flammable solutions under the patient or in body depressions, such as the umbilicus, and in body cavities, such as the vagina. Any fluid pooled in these areas should be removed before activating the energy platform.

Avoid the accumulation of naturally occurring flammable gases that may accumulate in body cavities such as the bowel.

Prevent the accumulation of flammable or oxidizing gases or vapors under surgical drapes or near the surgical site.

Tissue buildup (eschar) on the tip of an active electrode may create embers that pose a fire hazard, especially in oxygen-enriched environments. Keep the electrode clean and free of all debris.

Facial and other body hair is flammable. Water soluble surgical lubricating jelly may be used to cover hair close to the surgical site to decrease flammability.

Verify that all anesthesia circuit connections are leak free before and during use of electrosurgery.

#### Fire Hazard During Oropharyngeal Surgery

Verify endotracheal tubes are leak free and that the cuff seals properly to prevent oxygen leaks.

If an uncuffed tube is in use, pack the throat with wet sponges around the uncuffed tube, and be sure to keep sponges wet throughout the procedure.

Question the need for 100% O<sub>2</sub> during oropharyngeal or head and neck surgery.

If necessary, scavenge excess O<sub>2</sub> with separate suction.

Do not attempt to recharge the generator's lithium battery. This can cause the battery to explode.

## System Setup Warnings and Precautions

### Warning

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

**Electric Shock Hazard** When taking measurements or troubleshooting the system, take appropriate precautions, such as using isolated tools and equipment, using the “one hand rule,” etc.

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

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least 5 minutes before replacing parts.

Position the generator where it can be easily unplugged in an emergency.

**Fire Hazard** Do not plug into a power strip or extension cord.

**Patient Safety** Use the energy platform only if the power-on self-test has been completed as described in this manual, otherwise inaccurate power outputs may result.

**Hazardous Electrical Output** This equipment is for use only by trained, licensed physicians. Do not use electrosurgical equipment unless properly trained to use it in the specific procedure being undertaken. Use of this equipment without such training can result in serious, unintended patient injury, including bowel perforation and unintended, irreversible tissue necrosis.

Do not touch the patient while touching a connector or fuse contact at the same time. Simultaneous contact can cause electric shock or burns.

Do not wrap the instrument cords or patient-return-electrode cords around metal objects. This may induce currents (capacitive coupling) that could lead to shocks, fires, or injury to the patient or surgical team.

**Electric Shock Hazard** Do not connect wet instruments to the energy platform. Ensure that all instruments and adapters are correctly connected and that no metal is exposed at any connection points.

Confirm proper power settings before proceeding with surgery. If the proper power settings are not known, set the power to a low setting and cautiously increase the power until the desired effect is achieved. If increased power settings are requested, check the patient return electrode and all instrument connections before major power-setting adjustments.

Contact between the active electrode and any metal will greatly increase current flow and can result in unintended surgical effect.

### Warning

While using electrosurgery, the user and patient should not be allowed to come into direct contact with grounded metal objects (e.g., surgical-table frame, instrument table, etc.). If this is not possible during certain procedures (e.g., those in which noninsulated head frames are used), use extreme caution to maximize patient safety:

- Use the lowest power setting that achieves the desired effect.
- Place the patient return electrode as close to the surgical site as possible.
- Place dry gauze between the patient and the grounded object if possible.
- Continually monitor the contact point(s).
- Do not use metal needle monitoring electrodes.

### Warning

Ensure the UFP connector is fully inserted in the generator prior to use. A partially inserted connector may result in injury to the surgical team if the exposed connector is touched during use.

### Precaution

Read the instructions, warnings, and precautions provided with this energy platform and associated accessories before using. Specific instructions for electrosurgical instruments are not included in this manual.

Read the instructions, warnings, and precautions provided with electrosurgical instruments before using. Specific instructions for electrosurgical instruments are not included in this manual.

Always use the lowest power setting that achieves the desired surgical effect. The active electrode should be utilized only for the minimum time necessary in order to lessen the possibility of unintended burn injury. Accidental and unintended burn injury has occurred during procedures in small surgical fields and on small appendages. Pediatric applications and/or procedures performed on small anatomic structures may require reduced power settings. The higher the current flow and the longer the current is applied, the greater the possibility of unintended thermal damage to tissue, especially during use on small structures.

Certain devices or accessories may present an unacceptable risk at low power settings. For example, with argon beam coagulation, the risk of gas embolism increases if there is insufficient high frequency (HF) power to produce a rapid, impermeable eschar on the target tissue.

For surgical procedures where the current could flow through delicate parts of the body, the use of bipolar techniques may be desirable in order to avoid unwanted coagulation.

Connect only Covidien-approved devices. Using devices from other manufacturers may cause equipment malfunction or patient injury.

Examine all instruments and connections to the system before using. Improper connection may result in arcs, sparks, instrument malfunction, or unintended surgical effects.

Do not operate the generator for clinical use while cables are connected to the utility WiFi receptacle or Ethernet receptacles on the back of the generator. This may cause a system error that would halt the procedure and require restarting the generator.

**Precaution**

Do not turn the activation tone down to an inaudible level. The activation tone alerts the surgical team when the energy platform is delivering RF energy.

When using a smoke evacuator in conjunction with the VLFT10GEN, set the system volume control at a level that ensures the activation tones can be heard.

A non-functioning VLFT10GEN may cause an interruption of surgery. A backup system should be available for use.

Inadvertent activation may occur while installing, removing, or bending electrodes. Ensure that the instrument cord is not connected to the VLFT10GEN or that the system is off.

Leads connected to the patient should be positioned in such a way that contact with the patient or other leads is avoided because the capacitance between the electrode cable and the patient may result in some local high current densities. When not in use, place electrosurgical instruments in a safety holster or safely away from patients, the surgical team, and flammable materials.

Studies have shown that smoke generated during electrosurgical procedures can be potentially harmful to patients and the surgical team. These studies recommend adequately ventilating the smoke by using a surgical-smoke evacuator or other means.<sup>1</sup>

1. U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health (NIOSH). Control of Smoke from Laser/Electric Surgical Procedures. HAZARD CONTROLS, Publication No. 96-128, September, 1996

**Notice**

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

The VLFT10GEN requires special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in Chapter 4, *Technical Specifications*.

Portable and mobile RF communications equipment can affect the VLFT10GEN. Refer to the EMC information provided in Chapter 4, *Technical Specifications*.

The system should not be used adjacent to or stacked with equipment other than specified in the *Valleylab FT10 Energy Platform User Guide and Service Manual*. If adjacent or stacked use is necessary, the system should be observed to verify normal operation in the configuration in which it will be used.

The system intentionally applies RF energy for diagnosis or treatment during activation. Observe other electronic medical equipment in the vicinity during the system activation for any possible adverse electromagnetic effects. Ensure adequate separation of electronic medical equipment based on observed reactions.

The use of accessories, other than specified in the *Valleylab FT10 Energy Platform User Guide and Service Manual*, may result in increased emissions or decreased immunity of the system.

Before plugging the generator into a power receptacle, verify that the installed fuses are appropriate for the local input line voltage. See *Input Power* on page 4-3.

#### Notice

Calibration must be performed on a non-conductive surface. Do not use antistatic bench-top mats. When performed on a conductive surface, calibration values may not be accurate.

After completing calibration, the system will reboot to the clinical screen to save the values or abort the calibration.

#### Important

The VLFT10GEN is intended for use in a hospital or medical center environment.

If required by local codes, connect the energy platform to the hospital potential equalization system with an equipotential cable.

The operator of the generator may be as far away from the generator as 2 feet (direct product interaction), 5 feet (inside the sterile field), and 13 feet (across the room working with other equipment).

RFID and WiFi function may be interfered with by other equipment even if that other equipment complies with CISPR emission requirements.

Log files are maintained when the system is powered down. The time when the system was powered down or experiences a total loss of power is also logged.

When log files reach capacity, the earliest log is deleted to make room for the newest log.

Generator log files can be uploaded for viewing on a computer using Valleylab Exchange. Refer to the *Valleylab Exchange Remote Software System User's Guide* available at <http://www.medtronic.com/covidien/support/valleylab-exchange>.

The VLFT10GEN contains substances of very high concern as defined in Article 57 and Annex XIV of Regulation (EC) No 1907/2006 (Registration, Evaluation, Authorization, and Restriction of Chemicals [REACH]). Specifically, it contains di-(2-ethylhexyl)phthalate (DEHP) (CAS number 117-81-7; EC number EN 204-211-0) and 1,2 dimethoxyethane, ethylene glycol dimethyl ether (EGDME) (CAS number 110-71-4; EC number EN 203-794-9) in concentrations above 0.1% by weight.

## Warnings and Precautions for the Energy Platform

#### Warning

Each instrument receptacle on this energy platform is designed to accept only one instrument at a time. Follow the instructions provided with electrosurgical instruments for proper connection and use.

Failure of the generator could result in an unintended increase of output power or activation.

Only medical devices compliant with IEC 60601-1 may be connected to the external system receptacles. The use of any external system connected to the VLFT10GEN should be evaluated by qualified personnel.

**Precaution**

Do not stack equipment on top of the energy platform or place the energy platform on top of electrical equipment. This is an unstable configuration and does not allow for adequate cooling.

Provide at least 4" to 6" (10 to 15 cm) of unobstructed space round the top and sides of the generator to ensure proper cooling.

Provide as much distance as possible between the energy platform and other electronic equipment (such as monitors). Do not cross or bundle cords from electronic devices. This energy platform may cause interference with other electronic equipment.

The use of monitoring systems that incorporate high-frequency current-limiting devices is recommended to reduce interference with the monitoring device.

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle Printed Circuit Board Assemblies (PCBA) by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

**Notice**

Make no modifications to the electrosurgical generator. Any modifications to the system will void the warranty.

When testing RF equipment, follow these test procedures. Keep test leads to the minimum length usable; lead inductance and stray capacitance can adversely affect readings. Carefully select suitable ground points to avoid ground loop error in measurements.

The accuracy of most RF instruments is approximately 1%–5% of full scale. Using uncompensated scope probes causes large errors when measuring high-voltage RF waveforms.

**Warnings and Precautions for Active Instruments****Warning**

Energy applied to an electrosurgical instrument can convert liquids to steam. The thermal energy of steam may cause unintended injury in close proximity to the tip of the instrument. Care should be taken in surgical procedures occurring in confined spaces in anticipation of this possibility.

Do not activate the energy platform in an open-circuit condition. To reduce the chances of unintended burns, activate the energy platform only when the active electrode is near or touching the target tissue.

Use the lowest power setting that achieves the desired surgical effect and use a low-voltage waveform (PURE CUT, BLEND, or VALLEYLAB mode) to lessen the potential for the creation of capacitive currents.

If energy delivery from the generator cannot be stopped, remove the handpiece from the patient and disconnect the handpiece or power cord.

### Warning

Do not activate the instrument when not in contact with target tissue as this may cause injuries due to capacitive coupling.

The surface of the active electrode may remain hot enough to cause burns after the RF current is deactivated.

Keep the active electrodes clear. Build-up of eschar may reduce the instrument's effectiveness. Do not activate the instrument while cleaning. Injury to operating room personnel may result.

### Precaution

Read the instructions, warnings, and precautions provided with electrosurgical instruments before using. Specific instructions for electrosurgical instruments are not included in this manual.

Inspect instruments and cords—especially for laparoscopic/endoscopic instruments—for breaks, cracks, nicks, and other damage before every use. If damaged, do not use. Damaged instruments or cords may result in injury or electrical shock to the patient or surgical team.

Use only instruments that can withstand the maximum output (peak) voltage for each output mode as listed in Chapter 4, *Technical Specifications*. Using an instrument with a voltage rating that is lower than the maximum output voltage may result in injury to the patient or the operator, or damage to the instrument.

Information on voltage ratings for non-Covidien instruments should be obtained from the instrument's manufacturer.

### Notice

All Covidien instruments have voltage ratings that are greater than the maximum output voltages in the VLFT10GEN.

Inspect instrument plugs for wear before every use. Worn plugs may result in a loose or stuck connection to the generator.

## Warnings for Implanted Electronic Devices (IEDs)

IEDs include, but are not limited to, pacemakers, neurostimulators, implantable cardioverter defibrillators (ICDs), ventricular assist devices (VAD), spinal cord stimulators, cochlear implants, infusion pumps, and bone growth stimulators.

### Warning

Use the system with caution in the presence of internal or external pacemakers or other implanted devices. Interference produced by electrosurgical equipment can cause a pacemaker or other device to enter an unsafe mode or permanently damage the device. Consult the device manufacturer or responsible hospital department for further information when use is planned in patients with implanted medical devices.

## Post Surgery Safety Issues

### Warning

**Shock Hazard** Before cleaning or servicing the unit, disconnect the power plug from the power outlet in order to completely isolate the generator from mains power.

### Notice

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

## Warnings and Precautions for Monopolar Procedures

### Warning

Simultaneously activating suction/irrigation and electrosurgical current may result in increased arcing at the electrode tip, burns to unintended tissues, or shocks and burns to the surgical team.

Power output of a two- or three-button pencil (COAG selection) can change during use when another monopolar instrument is activated.

Some surgeons may elect to “buzz the hemostat” during surgical procedures. It is not recommended, and the hazards of such a practice probably cannot be eliminated. Burns to the surgeon’s hands are possible. To minimize the risk take these precautions:

- Do not buzz the hemostat with a needle electrode.
- Do not lean on the patient, the table, or the retractors while buzzing the hemostat.
- Activate CUT rather than COAG. CUT has a lower voltage than COAG.
- Firmly grasp as much of the hemostat as possible before activating the energy platform. This disperses the current over a larger area and minimizes the current concentration at the finger tips.
- Buzz the hemostat below hand level (as close as possible to the patient) to reduce the opportunity for current to follow alternate paths through the surgeon’s hands.
- Use the lowest power setting possible for the minimum time necessary to achieve hemostasis.
- Activate the energy platform after the instrument makes contact with the hemostat. Do not arc to the hemostat.
- When using a coated- or nonstick-blade electrode, place the edge of the electrode against the hemostat or other metal instrument.

DEMO mode delivers monopolar energy without the use of a patient return electrode, and is intended for demonstration purposes only. Chance of burns to the patient significantly increase when DEMO mode is used for clinical procedures.

#### Precaution

To provide expected functionality from a hand piece, proper insertion is required. Refer to the alignment dots below the receptacles for proper insertion orientation.

The use of modes that produce electrical arcs between the active electrode and tissue may result in neuromuscular stimulation.

## Warnings and Precautions for Patient Return Electrodes

#### Warning

It is not possible to foresee what combination of current and duty cycle may be safely used in every situation—for example, when higher currents and/or longer duty cycles are used on procedures such as tissue lesioning, tissue ablation, tissue vaporization; and procedures where conductive fluid is introduced into the surgical site. Under these conditions a greater risk may exist that the heating under a fully applied return electrode may be high enough to injure the patient.

When using a Covidien energy platform or a patient return electrode during these types of surgical procedures, the user should seek written guidance in the form of detailed user instructions from the manufacturer of the active accessory regarding the currents and duty cycles that can be expected. In some instances, the application of additional patient return electrodes may help mitigate the increased risk.

Do not attempt to use patient return electrodes that disable the Return Electrode Monitoring (REM) system. The VLFT10GEN REM system will function correctly only with contact quality monitoring (CQM) split-style patient return electrodes. Other patient-return-electrode products may not identify loss of safe contact between the return electrode and the patient, thereby failing to provide an auditory alarm and causing patient injury or product damage.

The safe use of monopolar electrosurgery requires proper placement of the patient return electrode. To avoid electrosurgical burns beneath the patient return electrode, follow all directions provided with the product.

Do not cut a patient return electrode to reduce its size. Patient burns due to high current density may result.

To avoid patient burns, ensure that the patient return electrode makes firm and complete contact with the skin. Always check the patient return electrode periodically, after the patient is repositioned, and during procedures involving long periods of activation.

Use of duty cycles greater than 25% (10 seconds active followed by 30 seconds inactive) will increase the risk that heat build-up under a return electrode may be high enough to injure the patient. Do not continuously activate for longer than one minute.

Apparent low-power output at the normal operating settings may indicate faulty application of the return electrode. Verify the return electrode is correctly placed and attached to the patient as described in the electrode's instructions for use. Verify the connection between the electrode and the generator before selecting a higher output power.

**Warning**

DEMO mode does not monitor the quality of pad contact with the patient. No warning will be issued from the generator when a non-REM return electrode's pad-to-patient contact degrades when in DEMO mode.

**Precaution**

Covidien REM Polyhesive patient return electrodes are recommended for use with the VLFT10GEN. Return electrodes from other manufacturers may not provide proper impedance to work correctly with the energy platform.

**Important**

A statement of compatibility from the CQM patient return electrode manufacturer should be obtained prior to the use of a non-Covidien CQM patient return electrode.

A patient return electrode is not necessary in bipolar or LigaSure procedures.

**Inadvertent Radio Frequency (RF) Burns****Warning**

Electrodes and probes used with monitoring, stimulation, and imaging devices (or similar equipment) can provide a path for high frequency current even if the electrodes or probes are isolated at 50 –60 Hz, insulated, and/or battery operated.

Do not use needles as monitoring electrodes during electrosurgical procedures. Inadvertent electrosurgical burns may result.

To reduce the risk of an inadvertent electrosurgical burn at the monitoring electrode or probe site, place the electrode and/or probe as far away as possible from the electrosurgical site and/or patient return electrode. Protective impedances (resistors or RF inductors) installed in the monitoring leads may reduce the risk of such burns. Consult the hospital biomedical engineer for further information.

**Warning**

In some circumstances, the potential exists for alternate site burns at points of skin contact (e.g., between the arm and the side of the body). This occurs when electrosurgical current seeks a path to the patient return electrode that includes the skin-to-skin contact point. Current passing through small skin-to-skin contact points is concentrated and may cause a burn. This is true for ground referenced and isolated output electrosurgical energy systems.

To reduce the potential for alternate site burns, do one or more of the following:

- Avoid skin-to-skin contact points, such as fingers touching leg or knee touching knee when positioning the patient.
- Place insulation, such as dry gauze or towel, between contact points to ensure that contact does not occur.
- Position the patient return electrode to provide a direct current route between the surgical site and the return electrode which avoids skin-to-skin contact areas.
- In addition, place patient return electrodes according to the manufacturer's instructions.

## Warnings and Cautions for Laparoscopic Procedures

### Warning

For laparoscopic procedures, be alert to these potential hazards:

- Laparoscopic surgery may result in gas embolism due to insufflation of gas in the abdomen.
- The electrode tip or LigaSure jaws may remain hot enough to cause burns after the electrosurgical current is deactivated.
- Inadvertent activation or movement of the activated instrument electrode or jaws outside of the field of vision may result in injury to the patient.
- Localized burns to the patient or physician may result from electrical currents carried through conductive objects (such as other instrument, cannulas, or scopes). Electrical current may be generated in conductive objects through direct contact with the active electrode or jaws, capacitive coupling, or by the active instrument (electrode or cable) being in close proximity to the conductive object.
- Do not use hybrid trocars that have a non-conductive locking anchor placed over a conductive sleeve. For the operative channel, use all-metal or all-plastic systems. At no time should electrical energy pass through hybrid systems. Capacitive coupling of RF current may cause unintended burns.
- When using laparoscopic instrumentation with metal cannulas, the potential exists for burns to the abdominal wall due to direct electrode contact or capacitive coupling of RF current. This is most likely to occur in instances where the energy platform is activated for extended periods at high power levels inducing high current levels in the cannula.
- Carefully insert and withdraw LigaSure instruments from cannulas to avoid possible damage to the devices and/or injury to the patient.
- Ensure that the insulation of single-use and reusable laparoscopic instrumentation is intact and uncompromised. Compromised insulation may lead to inadvertent metal-to-metal sparking and neuromuscular stimulation and/or inadvertent sparking to adjacent tissue.
- Do not activate the LigaSure function in an open-circuit condition. Activate the energy platform only when the instrument is near or in direct contact with the target tissue to reduce the possibility of unintended burns.

Covidien recommends against the use of laparoscopic surgery on pregnant patients.

## Warnings and Precautions for Bipolar Procedures

### Warning

Use of different Covidien cord models or cords from other manufacturers may not achieve proper electrical output for this device, thereby failing to produce the desired clinical effect. For example, Auto Bipolar activation/deactivation settings may not work properly using cords other than those specified by Covidien.

In the Auto Bipolar setting, activation may occur with contact of any material. When not in use, place electrosurgical instruments in a safety holster or safely away from patients, the surgical team, and flammable materials.

### Precaution

Bipolar instruments must be connected to the Bipolar instrument receptacle only. Improper connection may result in inadvertent system activation.

Do not use instruments with flying leads with the VLFT10GEN.

Do not use the FT0501 ForceTriad Bipolar Adapter with the VLFT10GEN.

Bipolar forceps should not be set down while Auto Bipolar is active. Contact with any material may cause activation. Turn off Auto Bipolar before setting down an instrument.

## Warnings and Precautions for LigaSure Procedures

### Warning

LigaSure instruments are intended for use only with compatible Covidien generators and energy platforms. See the front cover of the instrument's instructions for a list of compatible generators. Use of these instruments with other generators may not result in electrical output that they were designed for, and may not result in the desired clinical effect.

The tissue fusion function has not been shown to be effective for tubal sterilization or tubal coagulation for sterilization procedures. Do not use this function for these procedures.

Tissue fusion requires the application of RF energy and pressure from the instrument. Ensure grasping pressure is maintained until the seal cycle is complete. Tissue to be sealed must be firmly grasped between the instrument jaw electrodes. Tissue in the jaw hinge or outside the instrument jaw may not be sealed even if thermal blanching occurs.

If the seal-cycle-complete tone has not sounded, an optimal seal may not have been achieved. Reactivate the RF energy until a seal-cycle-complete tone is heard.

Do not activate the energy platform until the tissue-fusion or LigaSure instrument has been applied with the proper pressure. Do not release the pressure on the tissue until the end tone has sounded. Activating the energy platform with improper grasping pressure applied may result in an improper seal and may increase thermal spread to tissue outside the surgical site.

**Warning**

Fluid in the body cavity should be kept to a minimum during treatment. Conductive fluids (e.g., blood or saline) in direct contact with, or in close proximity to, the instrument may carry electrical current or heat, which may cause unintended burns to the patient. Aspirate fluid from around the instrument jaws before activating the instrument.

Do not attempt to seal or cut over clips or staples as incomplete seals may be formed.

**Precaution**

Energy-based devices, such as electrosurgical pencils or ultrasonic scalpels, that are associated with thermal spread should not be used to transect seals.

## Warnings and Precautions for Bipolar Resection

**Warning**

Bipolar Resection mode is intended to be used only with compatible resectoscopes for endoscopically controlled removal (resection) or coagulation of tissue using 0.9% NaCl solution (saline) as the irrigation medium

**Precaution**

Bipolar Resection mode is supported only if a Covidien-specified bipolar resection instrument is connected to the LigaSure/Bipolar receptacle with a Covidien bipolar resection cord. In addition, Bipolar Resection mode can be activated only with the Covidien Bipolar Resection foot pedal connected to the LigaSure/Bipolar foot-pedal receptacle. See the cords IFU listed in *Accessories* on page 1-11 for the list of supported bipolar resection instruments and cords.

## Servicing

**Warning**

**Electric Shock Hazard** Do not remove the energy platform cover. Contact qualified personnel for service.



Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

#### Notice

Refer to this service manual for maintenance recommendations, and function and output-power verification procedures.

Do not spray cleaning fluids directly on the generator as damage to the generator may occur.

The latest version of the *Valleylab FT10 Energy Platform Service Manual* is available at <http://www.medtronic.com/covidien/support/biomed-connect/electrosurgery>. Call these numbers to request a hardcopy of the service manual

- USA and Canada: 1 800 255 8522 Option 2
- International: 1 303 476 7996

## Shunt Cords

#### Warning

Some surgical instruments (e.g., colonoscopes) may allow substantial leakage current that could burn the surgeon. If the instrument manufacturer recommends the use of a shunt cord (s-cord) to direct the current back to the energy platform, an E0507-B adaptor must also be used. To avoid a REM alarm, a REM Polyhesive patient return electrode with the E0507-B adaptor must be used.

## Conductive Fluid In the Surgical Site

#### Warning

When this energy platform is used in monopolar procedures where conductive fluid (including, but not limited to saline or lactated Ringer's) is introduced into the surgical site for distention or to conduct RF current, higher than normal currents (greater than one amp) may be produced. In this situation, use one or more adult-size return electrode. Do not use return electrodes labeled for children, infants, babies, neonatal use, or pediatric use.

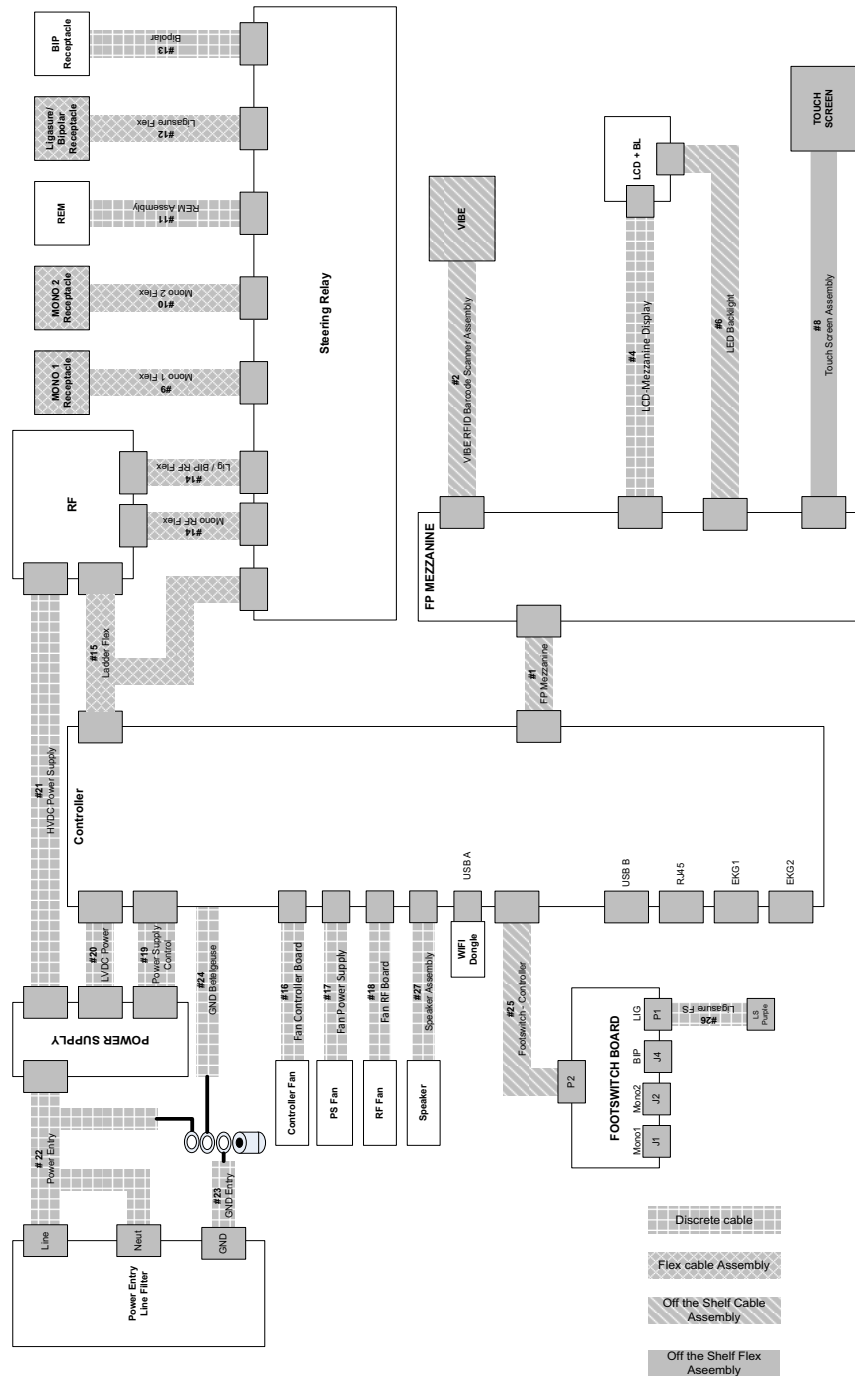
Use of duty cycles greater than 25% (10 seconds active followed by 30 seconds inactive) will increase the risk that heat build-up under a return electrode may be high enough to injure the patient. Do not continuously activate for longer than one minute.

# Chapter 3

## Principles of Operation

This chapter provides information about how the VLFT10GEN functions and how the internal components interact.

## Block Diagram



**Cable Part Numbers**

| <b>Cable Number</b> | <b>Cable Name</b>        |
|---------------------|--------------------------|
| #1                  | FP Mezzanine             |
| #2                  | VIBE RFID Scanner Assy   |
| #4                  | LCD-Mezzanine Display    |
| #6                  | LED Backlight            |
| #8                  | Touch Screen Assembly    |
| #9                  | Mono 1 Flex              |
| #10                 | Mono 2 Flex              |
| #11                 | REM Assembly             |
| #12                 | LigaSure Flex            |
| #13                 | Bipolar                  |
| #14                 | Mono RF Flex             |
| #14                 | Lig/BIP RF Flex          |
| #15                 | Ladder Flex              |
| #16                 | Fan Controller Board     |
| #17                 | Fan Power Supply         |
| #18                 | Fan RF Board             |
| #19                 | Power Supply Control     |
| #20                 | LVDC Power               |
| #21                 | HVDC Power Supply        |
| #22                 | Power Entry              |
| #23                 | GND Entry                |
| #24                 | GND Controller           |
| #25                 | Foot-switch - Controller |
| #26                 | LigaSure FS              |
| #27                 | Speaker Assembly         |

## Electronic Assemblies Principles of Operation

### High-Voltage/Low-Voltage Power Supply Principles of Operation

The High-Voltage/Low-Voltage power-supply module provides a complete main power supply solution. It is contained within its own chassis and is cooled by a dedicated system fan.

### Controller PCBA

The Controller Printed Circuit Board Assembly (PCBA) serves as the main digital control of the system. It comprises the following features:

- Control of the user interface (touchscreen, push-button, foot pedal, and handpiece activation inputs, LCD, and LEDs)
- Closed-loop control of RF power delivery
- External communications (WiFi and Ethernet)
- Control of smoke-evacuation devices or blanking functionality of an EKG device
- Audio control
- Power-supply control

### RF PCBA

The RF PCBA serves primarily to convert a DC voltage sourced from the High Voltage Power supply output to a 434 kHz AC source with an output impedance that is tailored to match the energy modality being sourced. The RF PCBA also houses the RF energy current and voltage sensors which are used to provide closed loop control of the energy delivered to the patient.

### Steering Relay PCBA

The Steering Relay PCBA accepts energy from the RF PCBA and directs it toward the intended energy-output receptacle based on energy modality. Non-activated energy receptacles are disconnected from the energy source by way of high-voltage relays. The Steering Relay PCBA houses the REM module, the ISOfirm modules, and the isolated power supply for the REM and ISOfirm modules.

### Display PCBA

The Display PCBA houses the touchscreen controller, the LCD backlight driver, and provides an interface for the LCD, VIBE module, and User Interface buttons.

## Mechanical Assemblies Principles of Operation

The Chassis assembly consists of 4 major metal mechanical subassemblies (front bezel, chassis base, chassis top, and rear bezel), 3 cooling fans, and a molded foam PCBA mounting structure (Electronic Packaging Assembly Concept—E-PAC™\*).

## IT Network Connectivity Principles of Operation

The generator connects to an IT network, usually through Valleylab Exchange, for the purpose of registering the generator and its components, updating software, setting the country code, and transmitting error and event logs. The generator cannot connect to an IT network while in clinical mode. Because the generator cannot connect to an IT network while in clinical mode, there are no OR-related hazardous situations. The generator has to be in the service screens for IT network connectivity. The generator can be 1) connected to another computer (point to point connection), 2) connected remotely to a router or to a DHCP server via a WiFi access point broadcasting a non-hidden SSID, or 3) connected via Ethernet cable to a router or directly to the DHCP server. The generator allows wired connections to be either static (assigned by the user) or assigned by the DHCP server. The MAC address is unique to each generator.

Connection of the generator to an IT network that includes other equipment could result in previously unidentified risks. The user should identify, analyze, evaluate, and control these risks. Subsequent changes to the IT network could introduce new risks and require additional analysis. Changes to the IT network include:

- changes to the IT network configuration
- connection of additional items to the IT network
- disconnecting items from the IT network
- update of equipment connected to the IT network
- upgrade of equipment connected to the IT network



# Chapter 4

## Technical Specifications

### Precaution

Read the instructions, warnings, and precautions provided with this energy platform and associated accessories before using. Specific instructions for electrosurgical instruments are not included in this manual.

## VLFT10GEN Specifications

### General

|                              |                                                                                                                                                                                                  |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Output configuration</b>  | Isolated output                                                                                                                                                                                  |
| <b>Cooling</b>               | Natural convection and fan                                                                                                                                                                       |
| <b>Display</b>               | 7.0 in. (17.8 cm.) LCD touchscreen                                                                                                                                                               |
| <b>Connector receptacles</b> | LED illuminated connector readers on the LigaSure/Bipolar receptacle                                                                                                                             |
| <b>Enclosure</b>             | Magnesium                                                                                                                                                                                        |
| <b>Mounting</b>              | <ul style="list-style-type: none"> <li>Valleylab Universal Generator Cart (VLFCRT)</li> <li>Operating-room boom systems</li> <li>Any stable, flat surface such as a table or cart top</li> </ul> |
| <b>Operating System</b>      | Linux™*                                                                                                                                                                                          |

#### Important

The VLFT10GEN contains substances of very high concern as defined in Article 57 and Annex XIV of Regulation (EC) No 1907/2006 (Registration, Evaluation, Authorization, and Restriction of Chemicals [REACH]). Specifically, it contains di-(2-ethylhexyl)phthalate (DEHP) (CAS number 117-81-7; EC number EN 204-211-0) and 1,2 dimethoxyethane, ethylene glycol dimethyl ether (EGDME) (CAS number 110-71-4; EC number EN 203-794-9) in concentrations above 0.1% by weight.

### Dimensions and Weight

|               |                    |
|---------------|--------------------|
| <b>Height</b> | 7.0 in. (17.8 cm)  |
| <b>Width</b>  | 14.5 in. (36.8 cm) |
| <b>Length</b> | 18.2 in. (46.2 cm) |
| <b>Weight</b> | 22.3 lb. (10.1 kg) |

## Environmental Parameters

|                                  | Operation                  | Transport and Storage <sup>1,2</sup> |
|----------------------------------|----------------------------|--------------------------------------|
| <b>Ambient temperature range</b> | 50 to 104 °F (10 to 40 °C) | 14 to 140 °F (-10 to +60 °C)         |
| <b>Relative humidity</b>         | 15% to 85% non-condensing  | 15% to 90% non-condensing            |
| <b>Atmospheric pressure</b>      | 700 to 1060 millibars      | 500 to 1060 millibars                |

1. The system can be stored for up to one year without performance degradation upon use.

2. If the generator is stored at a temperature outside the normal operating range of 10 to 40 °C, the system is ready for use after at least one hour at ambient temperature 20 °C ± 5 °C.

## Input Power

| Nominal Line Voltage                                      |                                                |                                                 |                  |
|-----------------------------------------------------------|------------------------------------------------|-------------------------------------------------|------------------|
|                                                           | 100–127 VAC                                    | 220–240 VAC                                     | Units            |
| Line Ranges                                               |                                                |                                                 |                  |
| Line Voltage Full Regulation Range                        | 90–140                                         | 198–264                                         | VAC              |
| Line Frequency                                            | 47–63                                          | 47–63                                           | Hz               |
| Max VA nominal line Voltage <sup>1</sup>                  | 950                                            | 950                                             | VA               |
| Max Mains Current <sup>1</sup>                            | 9.5                                            | 4.8                                             | A <sub>RMS</sub> |
| Max Heat Dissipation                                      | 180                                            | 180                                             | W                |
| Fuses                                                     | 10                                             | 6.3                                             | A                |
|                                                           | Fuses (2) – 5 mm x 20 mm 10 A, 250 V fast blow | Fuses (2) – 5 mm x 20 mm 6.3 A, 250 V fast blow |                  |
| Power Cord                                                | NEMA 3-prong hospital-grade connector          |                                                 |                  |
| 1. Max VA and current are based on nominal line voltages. |                                                |                                                 |                  |

## Power Cord Specifications

This system is factory equipped with a 110 VAC hospital grade NEMA 5-15 power cord. Should the AC power cord need to be replaced to match another plug configuration, the replacement plug/cable/receptacle configuration must meet or exceed the following specifications:

- **100-127 VAC**

Cable - SJT16/3, IEC color code, maximum length 15 ft. (5 m)

Plug - minimum 10 A - 125 VAC

Unit receptacle - IEC female, minimum 10 A - 125 VAC

- **220-240 VAC**

Cable - H05VVF3G1.0 VDE, maximum length 15 ft. (5 m)

Plug - minimum 6 A - 250 VAC

Unit receptacle - IEC female, minimum 6 A - 250 VAC

### Important

Contact your local Covidien representative for alternative internationally approved power-cord options.

## Backup Power

The VLFT10GEN retains all user programmed features, calibration, and statistical data when switched off and unplugged. The VLFT10GEN operates within specification when switched over to a supplied-line power by hospital backup systems.

### Real time clock battery

Battery type – Lithium CR1620 or CR1632

Battery life – 75 mAh minimum

## Equipotential Ground Connection

An equipotential ground connection is provided to allow connection of the VLFT10GEN to a common ground by way of a potential equalization connector. This connection meets IEC 60601-1 requirements.

## EKG Blanking and Smoke Evacuation

Interlink cable receptacles are provided to signal other devices, such as an EKG or smoke evacuator, that the VLFT10GEN is active. The receptacle is a 2.5 mm mono jack. It is electrically isolated from the internal ground referenced electronics. The shell is electrically isolated from chassis ground.

## Internal Memory

|                         |      |
|-------------------------|------|
| <b>Storage capacity</b> | 8 GB |
|-------------------------|------|

## Duty Cycle

The VLFT10GEN is capable of operating a duty cycle of 25%, defined as 10 seconds active and 30 seconds inactive, in any mode for a period of four hours.

### Precaution

Use of duty cycles greater than 25% (10 seconds active followed by 30 seconds inactive) will increase the risk that heat build-up under a return electrode may be high enough to injure the patient. Do not continuously activate for longer than one minute.

## Leakage

| <b>Leakage Currents and Patient Auxiliary Currents (IEC 60601-1:2012)</b>                                        |                                                                             |
|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Touch Current                                                                                                    | < 100 $\mu$ A NC, < 500 $\mu$ A SFC                                         |
| Earth Leakage Current                                                                                            | < 500 $\mu$ A NC, < 1000 $\mu$ A SFC                                        |
| Patient Auxiliary Current (< 1kHz)                                                                               | < 10 $\mu$ A NC, < 50 $\mu$ A SFC                                           |
| Patient Auxiliary Current (> 1kHz)                                                                               | Scaled with frequency per IEC 60601-1:2012, but does not exceed 10mA NC/SFC |
| Patient Leakage Current                                                                                          | < 10 $\mu$ A NC, < 50 $\mu$ A SFC                                           |
| Total Patient Leakage Current                                                                                    | < 50 $\mu$ A NC, < 100 $\mu$ A SFC                                          |
| NC—Normal Condition                                                                                              |                                                                             |
| SFC—Single Fault Condition (as defined in IEC 60601-1:2012)                                                      |                                                                             |
| Total Patient Leakage Current—Measurement of patient leakage current with all patient outputs connected together |                                                                             |
| <b>High Frequency Leakage (IEC 60601-2-2)</b>                                                                    |                                                                             |
| Bipolar (short leads)                                                                                            | < 68.9 mARMS                                                                |
| Monopolar measured directly at the ESU terminals                                                                 | < 100 mARMS                                                                 |
| LigaSure/BPR measured directly at the ESU terminals                                                              | < 100 mARMS                                                                 |

## Radio Frequency Identification (RFID)

The RFID module is located above the LigaSure/Bipolar receptacle. The intended use of the RFID module is to identify the inserted LigaSure instrument and configure the generator with the data included in the RFID tag.

|                                             |                              |
|---------------------------------------------|------------------------------|
| <b>Transmit/Receive Frequency Range</b>     | 13.56MHz                     |
| <b>RF Output Power</b>                      | 68.17 dBu V/m @3 meter       |
| <b>Type of Antenna</b>                      | Integral Loop Antenna        |
| <b>Modulation</b>                           | Amplitude-shift keying (ASK) |
| <b>Mode of Operation (Simplex / Duplex)</b> | Duplex                       |
| <b>Contains Module FCC ID</b>               | 2AAVI-JDK1901                |
| <b>Contains IC ID</b>                       | 11355A-JDK1901               |

## Wireless Fidelity (WiFi)

The WiFi module is located on the back of the generator. The intended use of the WiFi module is to perform service operations on the generator.

|                                         |                                                                                                                                         |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Transmit/Receive Frequency Range</b> | 2.4000 ~ 2.4835 GHz<br>(Industrial Scientific Medical Band)                                                                             |
| <b>Standards</b>                        | IEEE 802.11b, 802.11g, 802.11n                                                                                                          |
| <b>RF Output Power</b>                  | 11b: 17 ± 1.5 dBm<br>11g: 15 ± 1.5 dBm<br>11n: 14 ± 1.5 dBm                                                                             |
| <b>Data Rate</b>                        | 11b: 1/2/5.5/11 Mbps<br>11g: 6/9/12/24/36/48/54 Mbps<br>11n: (20 MHz): MCS0-7 (Up to 72 Mbps)<br>11n: (40 MHz): MCS0-7 (Up to 150 Mbps) |
| <b>Securities</b>                       | WPA2                                                                                                                                    |
| <b>Type of Antenna</b>                  | Internal Antenna (1T1R)                                                                                                                 |
| <b>Contains Module FCC ID</b>           | NDD9578111008                                                                                                                           |
| <b>Contains IC ID</b>                   | 4701A-78111306                                                                                                                          |

## IFETEL Radio Standards Warning Statement

The operation of radios within this equipment is subject to the following two conditions:

- 1) They shall not cause harmful interference, and
- 2) They must accept any interference received, including interference that may cause undesired operation.

## Industry Canada Statement

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following conditions:

- 1) This device may not cause interference; and
- 2) This device must accept any interference, including interference that may cause undesired operation of the device.

## RF Exposure Statement

This device meets the requirements for RF exposure when operated at a minimum distance of 20 cm from the user or nearby persons.

## EU Short Form Declaration

Hereby, Covidien llc, declares that this wireless LAN and RFID is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

## WiFi Device Installation Guide

The translated Quick Installation Guide (QIG) for the WiFi device (EW-7811Un) is available on the Edimax™\* website in many languages. It is at the following location:  
[http://www.edimax.com/edimax/download/download/data/edimax/global/download/for\\_home/wireless\\_adapters/wireless\\_adapters\\_n150/ew-7811un](http://www.edimax.com/edimax/download/download/data/edimax/global/download/for_home/wireless_adapters/wireless_adapters_n150/ew-7811un).

## Ethernet

The Ethernet connection is located on the back of the generator. The intended use of the Ethernet connection is to perform service operations on the generator.

|                        |                                                                           |
|------------------------|---------------------------------------------------------------------------|
| <b>Connected Speed</b> | 10/100/1000Base-T                                                         |
| <b>Standards</b>       | IEEE 802.3, IPv4                                                          |
| <b>Protocols</b>       | SFTP (for file transfer through port 22), UDP (non-file transfer), TCP/IP |

## Symbols Used



For prescription use only



Consult instructions for use



Follow instructions for use (blue)



Caution: Consult accompanying documents



The energy platform output is floating (isolated) with respect to ground.



Defibrillation proof



**DANGER**

Explosion risk if used with flammable anesthetics



To reduce the risk of electric shock, do not remove the cover. Refer servicing to qualified service personnel.



- 1) Unit produces non-ionizing radiation
- 2) Unit includes RFID



Unit includes WiFi

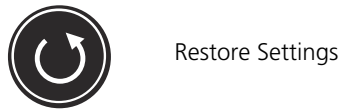


Classified with respect to electrical shock, fire, and mechanical hazards only in accordance with AAMI ES standard 60601-1; certified to CSA standard C22.2 60601-1:2008.

**IP21** Liquid Ingress/Spillage Classification



On/Off



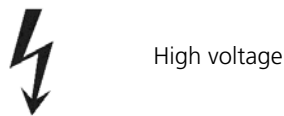
Restore Settings



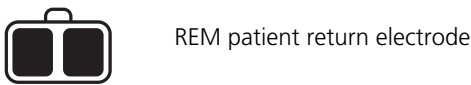
Audio Volume



Service/Settings



High voltage



REM patient return electrode



Monopolar 1 Universal Foot-Pedal Port (UFP)



Ethernet



Fuse



Foot pedal



Volume adjustment for activation tones



Bipolar Menu button



Equipotential grounding point



Equipment should not be disposed in trash



Do not reuse (Single use only)

## Standards and IEC Classifications

The VLFT10GEN meets all pertinent clauses of the IEC 60601-1 editions 2.0 and 3.1, IEC 60601-2-2 editions 4.0 and 5.0, IEC 60601-1-2 editions 2.1 and 3.0 and 4.0, and IEC 60601-1-8 edition 2.1.

### 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 CF Equipment/Defibrillator Proof (IEC 60601-1, IEC 60601-2-2, and ANSI/AAMI HF18)



This VLFT10GEN provides a high degree of protection against electric shock, particularly regarding allowable leakage currents. It is type CF isolated (floating) output and may be used for procedures involving the heart.

## IP21 Liquid Ingress/Spillage (IEC 60601-1 and IEC 60601-2-2)

The VLFT10GEN is constructed so that liquid spillage in normal use does not wet electrical insulation or other components which when wetted are likely to adversely affect the safety of the equipment.

## Voltage Transients – Energy Platform Mains Transfer (IEC 60601-1, IEC 60601-2-2, and ANSI/AAMI HF18)

The VLFT10GEN continues to operate normally with no errors or system failures when transfer is made between line AC and an emergency system-voltage source. The system may momentarily shut down in a safe mode depending on the switchover time.

## CISPR 11 Class A

The emissions characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required), this equipment may not offer adequate protection to radio-frequency communication services. The user may need to take mitigation measures, such as relocating or re-orienting the equipment.

### Important

RFID and WiFi function may be interfered with by other equipment even if that other equipment complies with CISPR emission requirements.

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

The VLFT10GEN complies with the appropriate IEC 60601-1-2 and 60601-2-2 specifications regarding electromagnetic compatibility.

### Notice

The VLFT10GEN requires special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in Chapter 4, *Technical Specifications*.

Portable and mobile RF communications equipment can affect the VLFT10GEN. Refer to the EMC information provided in Chapter 4, *Technical Specifications*.

The system should not be used adjacent to or stacked with equipment other than specified in the *Valleylab FT10 Energy Platform User Guide and Service Manual*. If adjacent or stacked use is necessary, the system should be observed to verify normal operation in the configuration in which it will be used.

**Notice**

The system intentionally applies RF energy for diagnosis or treatment during activation. Observe other electronic medical equipment in the vicinity during the system activation for any possible adverse electromagnetic effects. Ensure adequate separation of electronic medical equipment based on observed reactions.

The use of accessories, other than specified in the *Valleylab FT10 Energy Platform User Guide and Service Manual*, may result in increased emissions or decreased immunity of the system.

| <b>Guidance and manufacturer's declaration - electromagnetic emissions</b>                                                                                                                                                                          |                   |                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The Valleylab FT10 FT Series Energy Platform is intended for use in the electromagnetic environment specified below. The customer or the user of the Valleylab FT10 FT Series Energy Platform should assure that it is used in such an environment. |                   |                                                                                                                                                                       |
| <b>Emissions test</b>                                                                                                                                                                                                                               | <b>Compliance</b> | <b>Electromagnetic environment - guidance</b>                                                                                                                         |
| RF emissions<br>CISPR 11                                                                                                                                                                                                                            | Group 2           | The Valleylab FT10 FT Series Energy Platform must emit electromagnetic energy in order to perform its intended function. Nearby electronic equipment may be affected. |
| RF emissions<br>CISPR 11                                                                                                                                                                                                                            | Class A           |                                                                                                                                                                       |
| Harmonic emissions<br>IEC 61000-3-2                                                                                                                                                                                                                 | Class A           |                                                                                                                                                                       |
| Voltage fluctuations/flicker emissions<br>IEC 61000-3-3                                                                                                                                                                                             | Complies          |                                                                                                                                                                       |

The essential performance requirement per IEC60601-1 does not apply to VLFT10GEN. Basic safety is the performance requirement used during immunity testing.

| Guidance and manufacturer's declaration - electromagnetic immunity                                                                                                                                                                                  |                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                |                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| The Valleylab FT10 FT Series Energy Platform is intended for use in the electromagnetic environment specified below. The customer or the user of the Valleylab FT10 FT Series Energy Platform should assure that it is used in such an environment. |                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                |                                                                                                                                               |
| Immunity test                                                                                                                                                                                                                                       | IEC 60601 test level                                                                                                                                                                                                                                        | Compliance level                                                                                                                                                                                                                               | Electromagnetic environment - guidance                                                                                                        |
| Electrostatic discharge (ESD)<br>IEC 61000-4-2                                                                                                                                                                                                      | $\pm 8$ kV contact<br>$\pm 15$ kV air                                                                                                                                                                                                                       | $\pm 8$ kV contact<br>$\pm 15$ 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<br>IEC 61000-4-4                                                                                                                                                                                                    | $\pm 2$ kV for power supply lines<br>$\pm 1$ kV for input/output lines                                                                                                                                                                                      | $\pm 2$ kV for power supply lines<br>$\pm 1$ kV for input/output lines                                                                                                                                                                         | Mains power quality should be that of a typical commercial or hospital environment.                                                           |
| Surge IEC<br>IEC 61000-4-5                                                                                                                                                                                                                          | $\pm 1$ kV differential mode<br>$\pm 2$ kV common mode                                                                                                                                                                                                      | $\pm 1$ kV differential mode<br>$\pm 2$ kV common mode                                                                                                                                                                                         | 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<br>IEC 61000-4-11                                                                                                                                              | $< 5\% U_T$ ( $> 95\%$ dip in $U_T$ ) for 0.5 cycle <sup>a</sup><br>$< 40\% U_T$ ( $> 60\%$ dip in $U_T$ ) for 5 cycles<br>$< 70\% U_T$ ( $> 30\%$ dip in $U_T$ ) for 25 cycles<br>$< 5\% U_T$ ( $> 95\%$ dip in $U_T$ ) for 5 sec<br>$0\% U_T$ for 1 cycle | $< 5\% U_T$ ( $> 95\%$ dip in $U_T$ ) for 0.5 cycle<br>$< 40\% U_T$ ( $> 60\%$ dip in $U_T$ ) for 5 cycles<br>$< 70\% U_T$ ( $> 30\%$ dip in $U_T$ ) for 25 cycles<br>$< 5\% U_T$ ( $> 95\%$ dip in $U_T$ ) for 5 sec<br>$0\% U_T$ for 1 cycle | Mains power quality should be that of a typical commercial or hospital environment.                                                           |
| Power frequency (50/60 Hz) magnetic field<br>IEC 61000-4-8                                                                                                                                                                                          | 30 A/m                                                                                                                                                                                                                                                      | 30 A/m                                                                                                                                                                                                                                         | Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.     |
| <p><b>a.</b> 1 cycle is at 50 Hz or 20 ms</p> <p><b>NOTE:</b> <math>U_T</math> is the a.c. mains voltage prior to the application of the test level.</p>                                                                                            |                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                |                                                                                                                                               |

| Guidance and manufacturer's declaration - electromagnetic immunity                                                                                                                                                                                  |                                         |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The Valleylab FT10 FT Series Energy Platform is intended for use in the electromagnetic environment specified below. The customer or the user of the Valleylab FT10 FT Series Energy Platform should assure that it is used in such an environment. |                                         |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Immunity test                                                                                                                                                                                                                                       | IEC 60601 test level                    | Compliance level   | Electromagnetic environment - guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Conducted RF<br>IEC 61000-4-6                                                                                                                                                                                                                       | 3 V <sub>rms</sub><br>150 kHz to 80 MHz | 3 V <sub>rms</sub> | <p>Portable and mobile RF communications equipment should be used no closer to any part of the Valleylab FT10 FT Series Energy Platform, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.</p> <p><b>Recommended separation distance:</b><br/>d=1.2ÖP</p>                                                                                                                                                                                                                                                                                          |
| Radiated RF<br>IEC 61000-4-3                                                                                                                                                                                                                        | 3 V/m<br>80 MHz to 2.7 GHz              | 3 V/m              | <p>d=1.2ÖP 80 MHz to 800 MHz<br/>d=2.3ÖP 800 MHz to 2.7 GHz</p> <p>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 meters (m).</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey<sup>a</sup>, should be less than the compliance level in each frequency range.<sup>b</sup></p> <p>Interference may occur in the vicinity of equipment marked with the following symbol.</p>  |
| Continued                                                                                                                                                                                                                                           |                                         |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

| Guidance and manufacturer's declaration - electromagnetic immunity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>NOTE 1</b> At 80 MHz and 800 MHz, the higher frequency range applies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| <b>NOTE 2</b> These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| <p><b>a.</b> 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 predicted 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 in which the Valleylab FT10 FT Series Energy Platform is used exceeds the applicable RF compliance level above, the Valleylab FT10 FT Series Energy Platform should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Valleylab FT10 FT Series Energy Platform.</p> <p><b>b.</b> Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.</p> |  |

| Recommended separation distances between portable and mobile RF communication equipment and the Valleylab FT10 FT Series Energy Platform                                                                                                                                                                                                                                                                                         |                                                               |                                              |                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|----------------------------------------------|-----------------------------------------------|
| The VLFT10GEN is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the system can help prevent electromagnetic interferences by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the system 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 (m) |                                              |                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                  | 150 kHz to 80 MHz<br>$d=1.2 \times \sqrt{P}$                  | 80 MHz to 800 MHz<br>$d=1.2 \times \sqrt{P}$ | 800 MHz to 2.5 GHz<br>$d=2.7 \times \sqrt{P}$ |
| 0.01                                                                                                                                                                                                                                                                                                                                                                                                                             | 0.12                                                          | 0.12 <sup>a</sup>                            | 0.23 <sup>a</sup>                             |
| 0.1                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.37                                                          | 0.37                                         | 0.74                                          |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                | 1.2                                                           | 1.2                                          | 2.3                                           |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                               | 3.7                                                           | 3.7                                          | 7.4                                           |
| 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.                                                                                                 |                                                               |                                              |                                               |
| <b>a.</b> For frequencies listed in the following table, use a separation distance of 0.3 m.                                                                                                                                                                                                                                                                                                                                     |                                                               |                                              |                                               |
| Continued                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                               |                                              |                                               |

| Recommended separation distances between portable and mobile RF communication equipment and the Valleylab FT10 FT Series Energy Platform                                                                                                                                                                                                                                                                                         |                        |                                                           |                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------------------------------------------|------------------------------|
| Frequency ranges and test condition on transmitter bands                                                                                                                                                                                                                                                                                                                                                                         |                        |                                                           |                              |
| Bands (MHz)                                                                                                                                                                                                                                                                                                                                                                                                                      | Test Frequencies (MHz) | Modulation                                                | Claimed Compliance Level V/m |
| 380 – 390                                                                                                                                                                                                                                                                                                                                                                                                                        | 385                    | Pulse <sup>a</sup> – 18 Hz                                | 27                           |
| 430 – 470                                                                                                                                                                                                                                                                                                                                                                                                                        | 450                    | FM $\pm$ 5 kHz Deviation<br>or Pulse <sup>a</sup> – 18 Hz | 28                           |
| 704 – 787                                                                                                                                                                                                                                                                                                                                                                                                                        | 710, 745, 780          | Pulse <sup>a</sup> – 217 Hz                               | 9                            |
| 800 – 960                                                                                                                                                                                                                                                                                                                                                                                                                        | 810, 870, 930          | Pulse <sup>a</sup> – 18 Hz                                | 28                           |
| 1700 – 1990                                                                                                                                                                                                                                                                                                                                                                                                                      | 1720, 1845, 1970       | Pulse <sup>a</sup> – 217 Hz                               | 28                           |
| 2400 – 2570                                                                                                                                                                                                                                                                                                                                                                                                                      | 2450                   | Pulse <sup>a</sup> – 217 Hz                               | 28                           |
| 5100 – 5800                                                                                                                                                                                                                                                                                                                                                                                                                      | 5240, 5500, 5785       | Pulse <sup>a</sup> – 217 Hz                               | 9                            |
| <p><b>a.</b> Pulse Modulation is defined as a square wave input with a 50% duty cycle at the listed frequency.</p> <p><b>NOTE 1</b> The minimum dwell time during test is 7 s.</p> <p><b>NOTE 2</b> A minimum separation distance of 0.3 meters should be maintained between any device transmitting in this band and the VLFT10GEN. This includes devices such as mobile phones, PDAs, Wireless LANs, RFID and Bluetooth™*.</p> |                        |                                                           |                              |

## Cables Used for EMC Compliance Testing

The following cables, lengths, and instruments were used to determine compliance levels.

| Model No. | Description           | Shielded | Length            | Location              | Classification | Tests Included         |
|-----------|-----------------------|----------|-------------------|-----------------------|----------------|------------------------|
| 207002060 | A/C cable             | No       | 15 ft.<br>(4.6 m) | Rear panel            | AC             | Emissions/<br>Immunity |
| 1017178   | Equipotential cable   | No       | 15 ft.<br>(4.6 m) | Rear panel            | EQ             | Emissions/<br>Immunity |
| E2450HDB  | 2-button pencil       | No       | 15 ft.<br>(4.6 m) | Front panel<br>Mono 1 | Patient        | Emissions/<br>Immunity |
| FT3000DB  | Force TriVerse pencil | No       | 15 ft.<br>(4.6 m) | Front panel<br>Mono 2 | Patient        | Emissions/<br>Immunity |
| Continued |                       |          |                   |                       |                |                        |

| Model No.             | Description                                           | Shielded | Length                    | Location                      | Classification | Tests Included         |
|-----------------------|-------------------------------------------------------|----------|---------------------------|-------------------------------|----------------|------------------------|
| E7507DB               | Adult REM pad                                         | No       | 15 ft.<br>(4.6 m)         | Front panel<br>REM            | Patient        | Emissions/<br>Immunity |
| E0020V/<br>E4073CT    | Foot switching<br>bipolar cord/<br>bayonet<br>forceps | No       | 15 ft.<br>(4.6 m)         | Front panel<br>bipolar        | Patient        | Emissions/<br>Immunity |
| LF1644                | LigaSure                                              | No       | 10 ft.<br>(3 m)           | Front panel<br>LigaSure       | Patient        | Immunity               |
| FT0021S/<br>FT27050SL | Cord Storz/<br>Storz<br>Resectoscope                  | No       | 15 ft.<br>(4.6 m)/<br>NA  | Front panel<br>Adv.<br>Energy | Patient        | Emissions              |
| E6008B                | Monopolar footswitch                                  | No       | 15 ft.<br>(4.6 m)         | Rear panel<br>Mono 1          | SIP/SOP        | Emissions/<br>Immunity |
| E6019                 | DomeBipolar footswitch                                | No       | 15 ft.<br>(4.6 m)         | Rear panel<br>bipolar         | SIP/SOP        | Emissions/<br>Immunity |
| LS0300                | LigaSure footswitch                                   | No       | 15 ft.<br>(4.6 m)         | Rear panel<br>LigaSure        | SIP/SOP        | Emissions/<br>Immunity |
| Any                   | Ethernet                                              | No       | 15 ft.<br>(4.6 m)<br>min. | Rear panel                    | SIP/SOP        | Emissions/<br>Immunity |
| SEA3730               | Coax                                                  | No       | 10 ft.<br>(3 m)           | Rear panel<br>smoke<br>evac.  | SIP/SOP        | Emissions/<br>Immunity |
| SEA3730               | Coax                                                  | No       | 10 ft.<br>(3 m)           | Rear panel<br>ECG<br>blank    | SIP/SOP        | Emissions/<br>Immunity |

## Return Electrode Monitor (REM)

| REM Specification                              |                                     |
|------------------------------------------------|-------------------------------------|
| Interrogation Frequency                        | 64–76 kHz                           |
| Interrogation Current                          | < 100 $\mu$ A                       |
| Contact Resistance Sense Range                 | 5 $\Omega$ to 135 $\Omega$          |
| Contact Resistance Accuracy (RF not activated) | $\pm$ 7 $\Omega$                    |
| Contact Resistance Accuracy (RF Activated)     | Greater of $\pm$ 14 $\Omega$ or 20% |

### REM Alarm Activation

REM patient return electrode: When the measured resistance exceeds the standard range of safe resistance (below 5 ohms or above 135 ohms) or when the measured contact resistance increases by 40% over the baseline, the REM alarm is activated and RF output is disabled.

## Auto Bipolar

The VLFT10GEN is equipped with an Auto Bipolar feature that allows for automatic activation of bipolar energy.

### Warning

Use of different Covidien cord models or cords from other manufacturers may not achieve proper electrical output for this device, thereby failing to produce the desired clinical effect. For example, Auto Bipolar activation/deactivation settings may not work properly using cords other than those specified by Covidien.

In the Auto Bipolar setting, activation may occur with contact of any material. When not in use, place electrosurgical instruments in a safety holster or safely away from patients, the surgical team, and flammable materials

| Auto Bipolar Specifications |                                                                  |
|-----------------------------|------------------------------------------------------------------|
| Interrogation Frequency     | 434 kHz $\pm$ 10%                                                |
| Interrogation Current       | < 10 $\mu$ A <sub>RMS</sub> averaged over 1 second               |
| Activation Impedance        | $\leq$ 2200 $\Omega$ $\pm$ 20%                                   |
| Deactivation Impedance      | > 4000 $\Omega$ $\pm$ 20%                                        |
| Keying Delay                | User selectable in 0.5 second increments from 0 sec. to 2.5 sec. |
| Minimum Power               | 1 W                                                              |

## Audio Tones

### Activation Tones

| Activation Tones | Tone            | Duration                   | Volume                                                  |
|------------------|-----------------|----------------------------|---------------------------------------------------------|
| CUT              | 660 Hz $\pm$ 5% | Entire Activation Duration | User adjustable from 45 dBA to 65 dBA (-0/+6 dBA @ 1 m) |
| COAG             | 940 Hz $\pm$ 5% | Entire Activation Duration |                                                         |
| SHARED COAG      | 988 Hz $\pm$ 5% | Entire Activation Duration |                                                         |
| VALLEYLAB        | 800 Hz $\pm$ 5% | Entire Activation Duration |                                                         |
| BIPOLAR          | 940 Hz $\pm$ 5% | Entire Activation Duration |                                                         |
| LIGASURE         | 440 Hz $\pm$ 5% | Entire Activation Duration |                                                         |

**Alarm Tones**

| <b>Alarm Tones</b>                         | <b>Tone(s)</b>                                                                                                         | <b>Duration</b>                                                                             | <b>Volume</b>            |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|--------------------------|
| REM                                        | 660 Hz $\pm$ 5%                                                                                                        | Two 500 msec. tones separated by 500 msec. of silence                                       | 65 dBA (-0/+6 dBA @ 1 m) |
| Incomplete Seal Cycle (Regrasp/Reactivate) | High 784 Hz $\pm$ 5%<br>Low 587 Hz $\pm$ 5%                                                                            | Four 175 msec. tones (high, low, high, low)                                                 |                          |
| Seal Cycle Complete                        | 988 Hz $\pm$ 5%                                                                                                        | Two 175 msec. tones separated by 175 msec. of silence                                       |                          |
| High System Alarm                          | Simultaneously play the following tones:<br>784 Hz $\pm$ 5%<br>1568Hz $\pm$ 5%<br>2352 Hz $\pm$ 5%<br>3136 Hz $\pm$ 5% | Ten 138 msec. tones separated by 88, 88, 312, 88, 825, 88, 88, 312, and 88 msec. of silence |                          |
| Medium System Alarm                        | Simultaneously play the following tones:<br>784 Hz $\pm$ 5%<br>1568Hz $\pm$ 5%<br>2352 Hz $\pm$ 5%<br>3136 Hz $\pm$ 5% | Three 188 msec. tones separated 188 msec. of silence                                        |                          |
| Low System Alarm                           | Simultaneously play the following tones:<br>784 Hz $\pm$ 5%<br>1568Hz $\pm$ 5%<br>2352 Hz $\pm$ 5%<br>3136 Hz $\pm$ 5% | One 188 msec. tone                                                                          |                          |

| Alarm Tones         | Tone(s)                                                                                                                                | Duration           | Volume                                                  |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------|
| Informational Alarm | Simultaneously play the following tones:<br><br>784 Hz $\pm$ 5%<br><br>1568Hz $\pm$ 5%<br><br>2352 Hz $\pm$ 5%<br><br>3136 Hz $\pm$ 5% | One 188 msec. tone | User adjustable from 45 dBA to 65 dBA (-0/+6 dBA @ 1 m) |

**Notice**

Alarm characteristics cannot be changed.

Alarm response time is less than one second.

## Energy Output Characteristics

The VLFT10GEN automatically senses the tissue resistance and adjusts the output voltage to maintain a consistent effect across different tissue density. The adjustment is based on the selected mode or effect, power setting, and the level of tissue resistance. The maximum output voltage is controlled to reduce capacitive coupling and video interference and to minimize undesired sparking. The following table outlines the rated power, peak voltages, and maximum output current for a given modality. The peak voltage includes tolerance and identifies the maximum value across all loading conditions. Output power can vary  $\pm$  15%. Current nominal maximum does not include tolerance.

|                          | Rated Load (Ω)   | Rated Output Power (W) | Peak Voltage (V) <sup>1</sup> | Current Nominal Max (A) | Typical Crest Factor <sup>2</sup> | Duty Cycle |
|--------------------------|------------------|------------------------|-------------------------------|-------------------------|-----------------------------------|------------|
| <b>Monopolar CUT</b>     |                  |                        |                               |                         |                                   |            |
| PURE                     | 300              | 300                    | 1287                          | 1.25                    | 1.6                               | 100%       |
| BLEND                    | 300              | 200                    | 2178                          | 1.0                     | 2.2                               | 50%        |
| <b>Valleylab</b>         |                  |                        |                               |                         |                                   |            |
| VALLEYLAB                | 300              | 200                    | 2783                          | 1.0                     | 3.2                               | 25%        |
| <b>Monopolar COAG</b>    |                  |                        |                               |                         |                                   |            |
| SOFT                     | 100              | 120                    | 264                           | 1.55                    | 1.5                               | 100%       |
| FULGURATE                | 500              | 120                    | 3448                          | 1.0                     | 5.4                               | 6.25%      |
| SHARED FULGURATE         | 500 <sup>4</sup> | 120                    | 3448                          | 1.0                     | 5.4                               | 6.25%      |
| SPRAY                    | 500              | 120                    | 3932                          | 1.0                     | 6.2                               | 4.76%      |
| SHARED SPRAY             | 500 <sup>4</sup> | 120                    | 3932                          | 1.0                     | 6.2                               | 4.76%      |
| <b>Bipolar</b>           |                  |                        |                               |                         |                                   |            |
| LOW (1–15 W)             | 100              | 15                     | 133                           | 1.0                     | 1.8                               | 100%       |
| MEDIUM (16–40 W)         | 100              | 40                     | 214                           | 2.0                     | 1.8                               | 100%       |
| HIGH (45–95 W)           | 100              | 95                     | 462                           | 2.0                     | 1.7                               | 100%       |
| <b>LigaSure</b>          |                  |                        |                               |                         |                                   |            |
| LIGASURE                 | 20               | 350                    | 244                           | 5.5                     | 1.9                               | 100%       |
| <b>Bipolar Resection</b> |                  |                        |                               |                         |                                   |            |
| • CUT                    | 500              | 200 <sup>3</sup>       | 742                           | 2.4                     | 1.4                               | 100%       |
| • COAG                   | 100              | 175                    | 318                           | 3.2                     | 1.6                               | 100%       |

1. Per IEC 60601-2-2: 2009 clause 201.7.9.2.2.101(c)(2), whenever the peak voltage is greater than 1600 V, the calculated variable y is less than the actual crest factor. The peak voltage at rated load can be calculated using the equation:

$$V_{\text{peak}}(U_{\text{max}}) = \text{TypicalCrestFactor} \sqrt{\text{Power} \cdot \text{RatedLoad}}$$

2. At rated load.

3. Bipolar Resection CUT maximum power is 432 W, including tolerance.

4. Rated load in SHARED COAG modes is the total energy channel load. For SHARED dual activation using two activating instruments, it is the parallel combination of the two loads. For SHARED single activation using one activating instrument, it is the load connected to the activating electrode only.

## Output Waveforms

TissueFect Tissue Sensing Technology, an automatic adjustment, controls all modes and effects. As tissue resistance increases from zero, the energy platform outputs constant current, followed by constant power, followed by constant voltage. The maximum output voltage is controlled to reduce capacitive coupling and video interference and to minimize sparking.

### Bipolar

|               |                                       |
|---------------|---------------------------------------|
| <b>LOW</b>    | 434 kHz $\pm$ 10% continuous sinusoid |
| <b>MEDIUM</b> | 434 kHz $\pm$ 10% continuous sinusoid |
| <b>HIGH</b>   | 434 kHz $\pm$ 10% continuous sinusoid |

### Monopolar CUT

|              |                                                                                                    |
|--------------|----------------------------------------------------------------------------------------------------|
| <b>CUT</b>   | 434 kHz $\pm$ 10% continuous sinusoid                                                              |
| <b>BLEND</b> | 434 kHz $\pm$ 10% bursts of sinusoid, recurring at 27.13 kHz $\pm$ 10% intervals<br>50% duty cycle |

### VALLEYLAB

|                  |                                                                                                    |
|------------------|----------------------------------------------------------------------------------------------------|
| <b>VALLEYLAB</b> | 434 kHz $\pm$ 10% bursts of sinusoid, recurring at 27.13 kHz $\pm$ 10% intervals<br>25% duty cycle |
|------------------|----------------------------------------------------------------------------------------------------|

## Monopolar COAG

|                         |                                                                                                                   |
|-------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>SOFT</b>             | 434 kHz $\pm$ 10% continuous sinusoid                                                                             |
| <b>FULGURATE</b>        | 434 kHz $\pm$ 10% damped sinusoidal bursts with a repetition frequency of 27.13 kHz $\pm$ 10%<br>6.25% duty cycle |
| <b>SHARED FULGURATE</b> | 434 kHz $\pm$ 10% damped sinusoidal bursts with a repetition frequency of 27.13 kHz $\pm$ 10%<br>6.25% duty cycle |
| <b>SPRAY</b>            | 434 kHz $\pm$ 10% damped sinusoidal bursts with a repetition frequency of 20.67 kHz $\pm$ 10%<br>4.76% duty cycle |
| <b>SHARED SPRAY</b>     | 434 kHz $\pm$ 10% damped sinusoidal bursts with a repetition frequency of 20.67 kHz $\pm$ 10%<br>4.76% duty cycle |

## LigaSure

|                 |                                       |
|-----------------|---------------------------------------|
| <b>LIGASURE</b> | 434 kHz $\pm$ 10% continuous sinusoid |
|-----------------|---------------------------------------|

## Bipolar Resection

|                          |                                       |
|--------------------------|---------------------------------------|
| <b>BIPOLAR RESECTION</b> | 434 kHz $\pm$ 10% continuous sinusoid |
|--------------------------|---------------------------------------|

## Output Power vs. Resistance Graphs

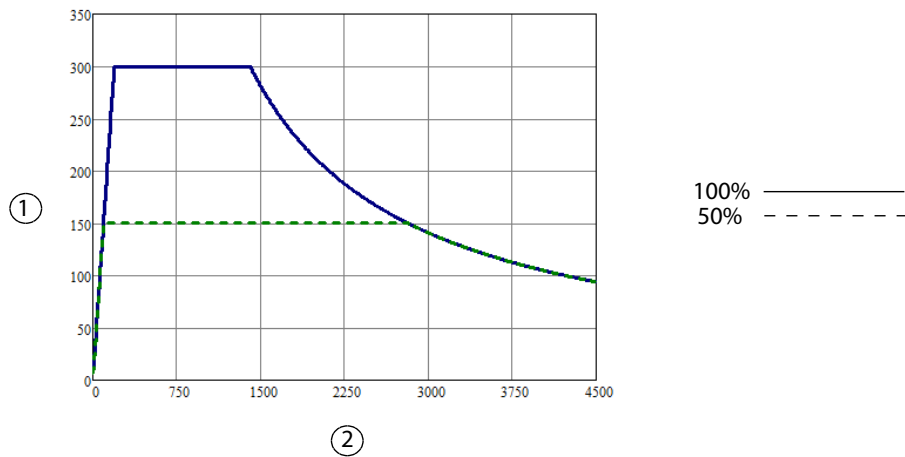
For the values stated in the graphs provided in this section:

- Output power at rated load is within the greater of 15% or 8 W.
- Peak voltage includes tolerances.
- The generator measures resistance within the greater of 15% or 5  $\Omega$ .
- Output power is measured using compatible instruments, not test leads.

## Monopolar Graphs

### PURE CUT

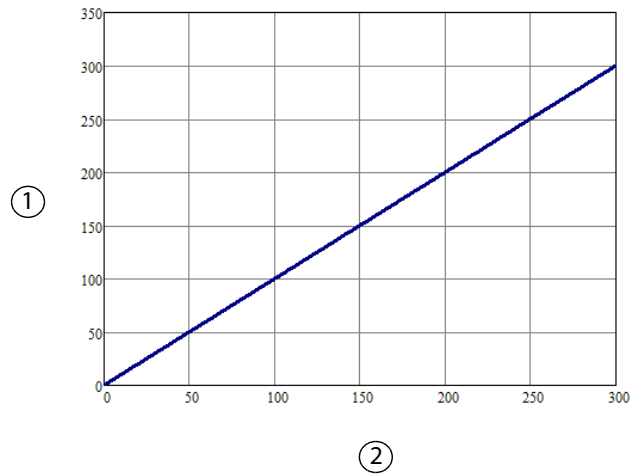
*Output power versus resistance for Pure CUT power*



① Output power (watts)

② Load resistance (ohms)

**Output power versus power setting for Pure CUT power**

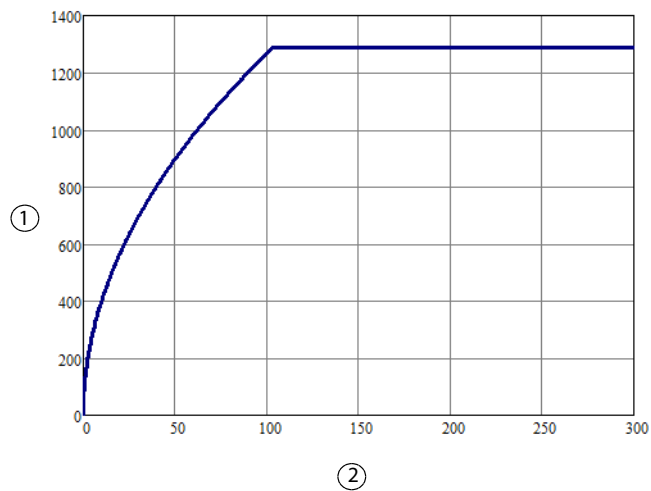


① Output power (watts)

② Power setting

**Note:** Rated load

**Peak voltage versus power setting for Pure CUT power**



① Peak voltage (volts)

② Power setting

**Note:** Open circuit

## BLEND

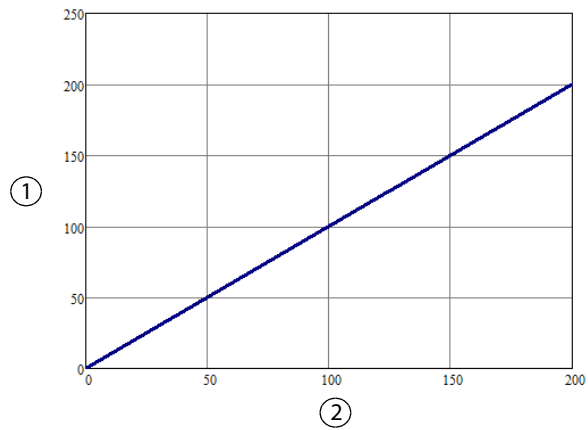
**Output power versus resistance for BLEND power**



① Output power (watts)

② Load resistance (ohms)

**Output power versus power setting for BLEND power**

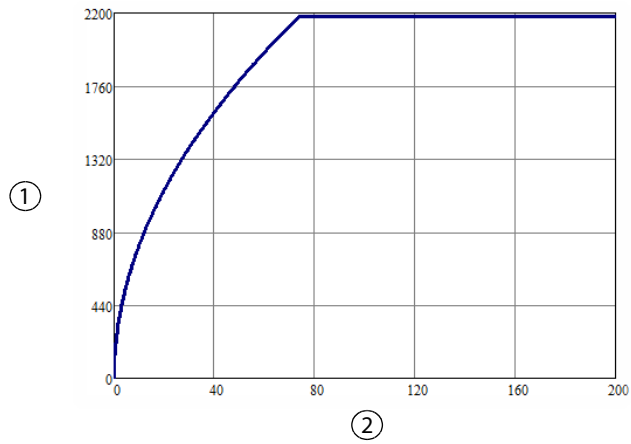


① Output power (watts)

② Power setting

**Note:** Rated load

**Peak voltage versus power setting for BLEND power**



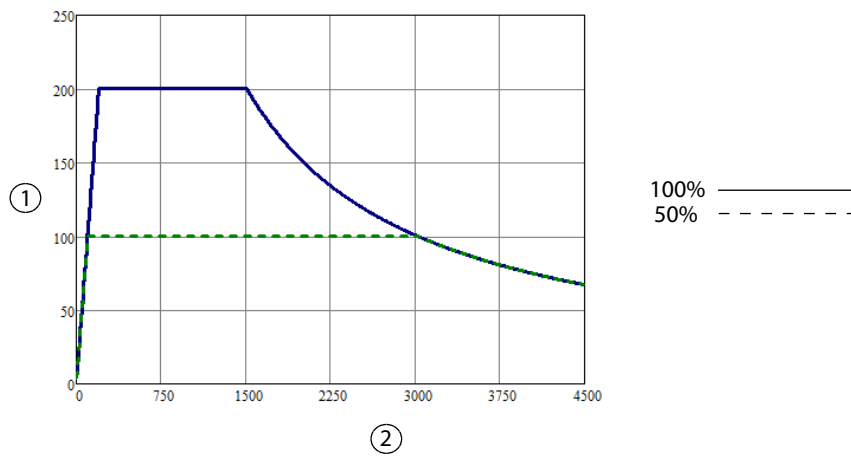
① Peak voltage (volts)

② Power setting

**Note:** Open circuit

## VALLEYLAB

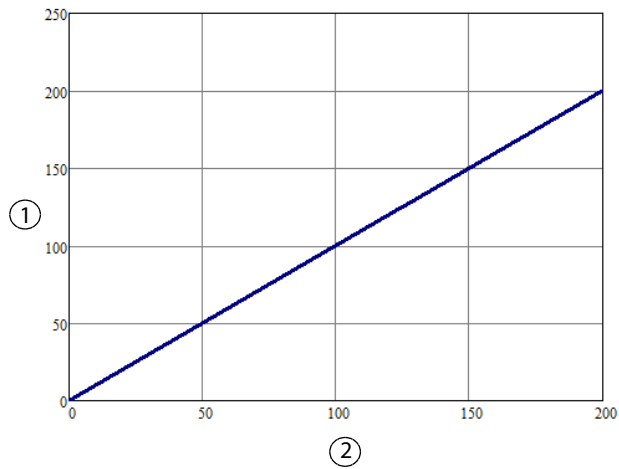
**Output power versus resistance for VALLEYLAB power**



① Output power (watts)

② Load resistance (ohms)

**Output power versus power setting for VALLEYLAB power**

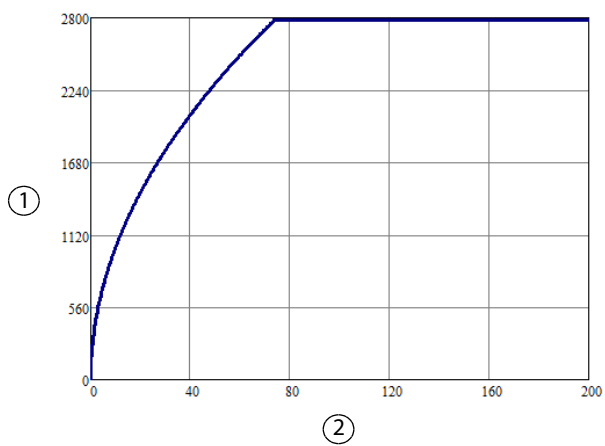


① Output power (watts)

② Power setting

**Note:** Rated load

**Peak voltage versus power setting for VALLEYLAB power**



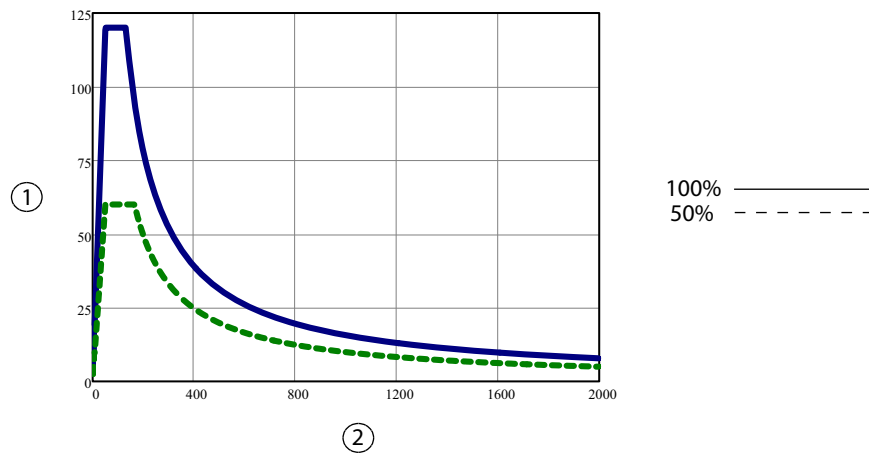
① Peak voltage (volts)

② Power setting

**Note:** Open circuit

## SOFT COAG

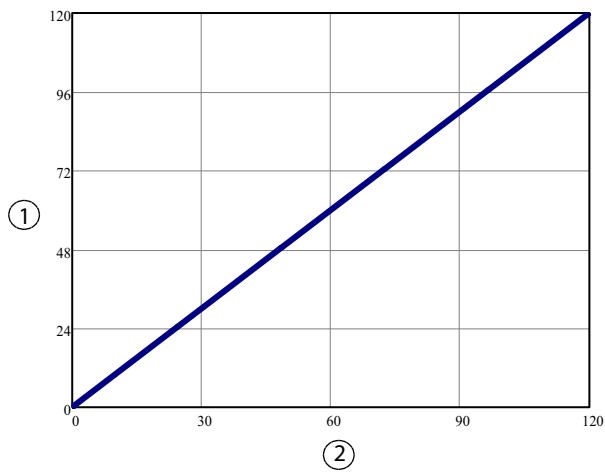
*Output power versus resistance for SOFT COAG power*



① Output power (watts)

② Load resistance (ohms)

*Output power versus power setting for SOFT COAG power*

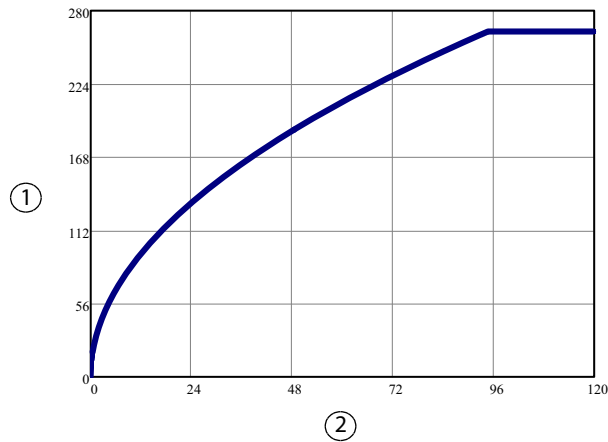


① Output power (watts)

② Power setting

**Note:** Rated load

**Peak voltage versus power setting for SOFT COAG power**



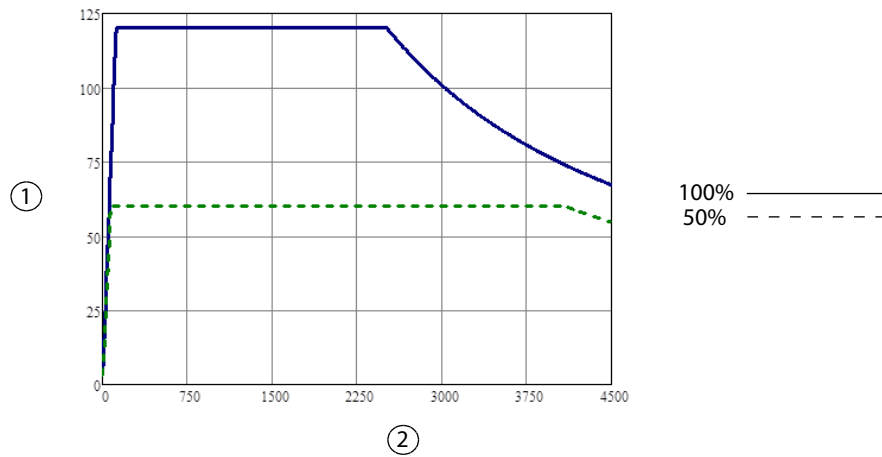
① Peak voltage (volts)

② Power setting

**Note:** Open circuit

## FULGURATE

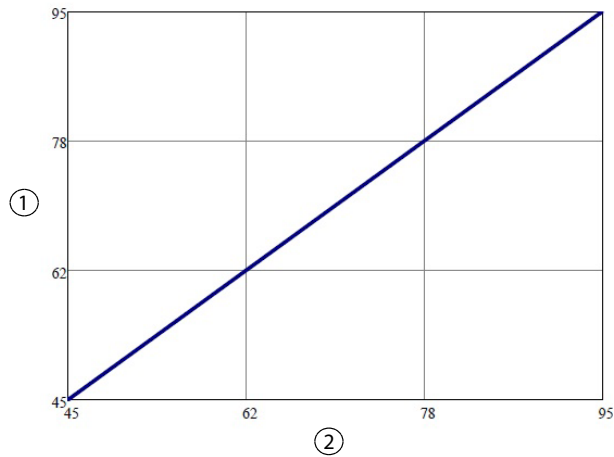
**Output power versus resistance for FULGURATE power**



① Output power (watts)

② Load resistance (ohms)

**Output power versus power setting for FULGURATE power**

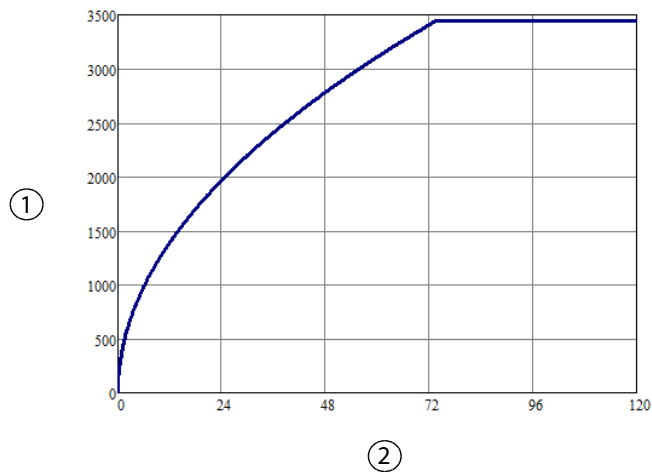


① Output power (watts)

② Power setting

**Note:** Rated load

**Peak voltage versus power setting for FULGURATE power**



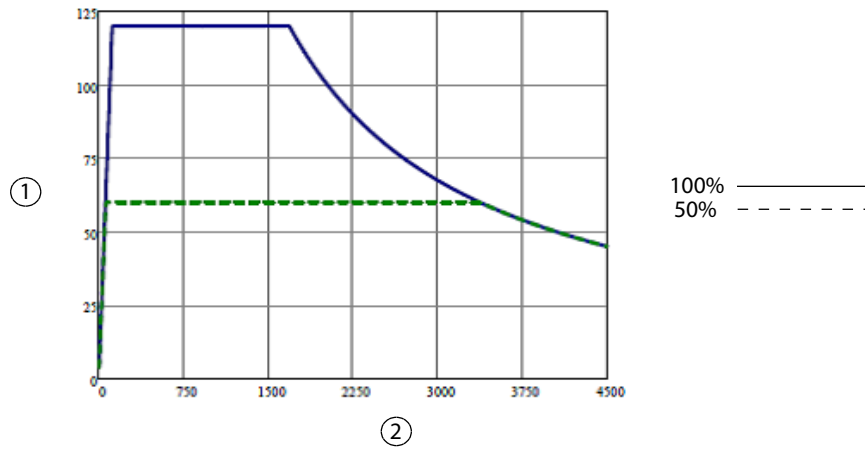
① Peak voltage (volts)

② Power setting

**Note:** Open circuit

## SHARED FULGURATE - Single Activation (One Instrument Activated)

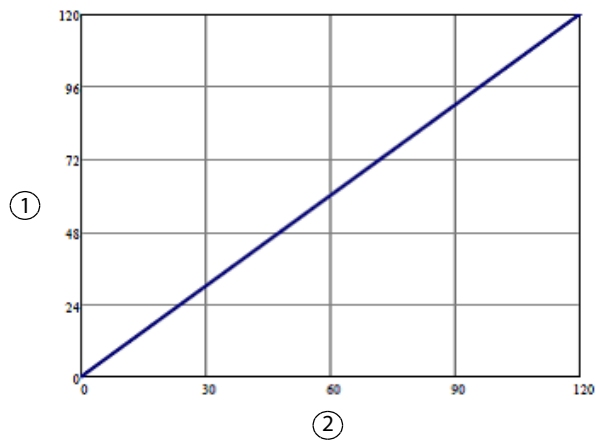
*Output power versus resistance for SHARED FULGURATE (single activation) power*



① Output power (watts)

② Load resistance (ohms)

*Output power versus power setting for SHARED FULGURATE (single activation) power*

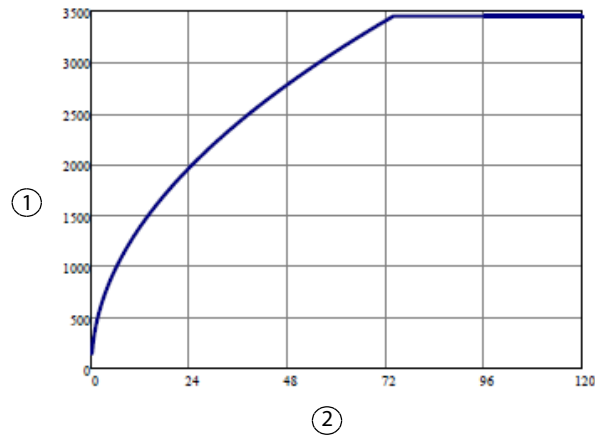


① Output power (watts)

② Power setting

**Note:** Rated load

**Peak voltage versus power setting for SHARED FULGRUATE (single activation) power**



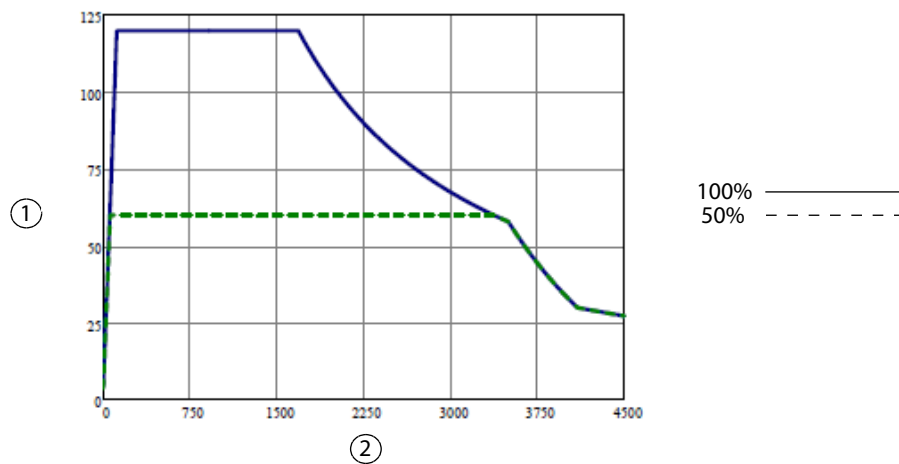
① Peak voltage (volts)

② Power setting

**Note:** Open circuit

**SHARED FULGURATE - Dual Activation (Two Instruments Activated)**

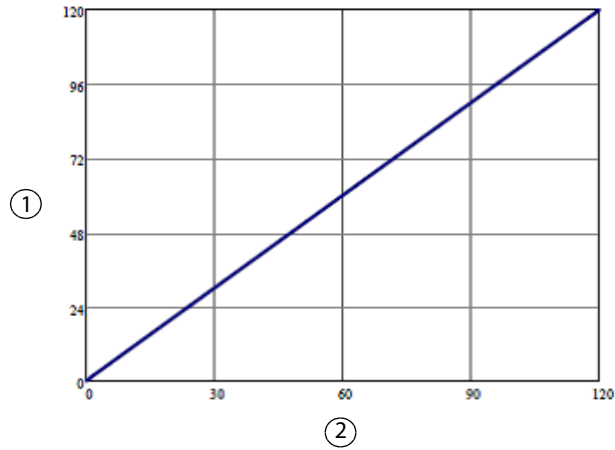
**Output power versus resistance for SHARED FULFURATE (dual activation) power**



① Output power (watts)

② Load resistance (ohms)

**Output power versus power setting for SHARED FULGURATE (dual activation) power**

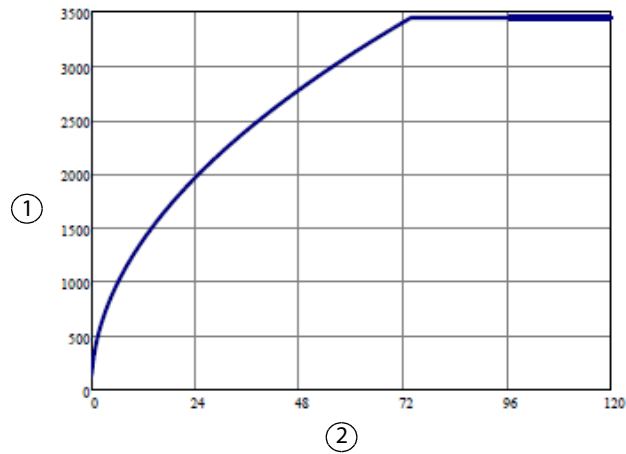


① Output power (watts)

② Power setting

**Note:** Rated load

**Peak voltage versus power setting for SHARED FULGURATE (dual activation) power**



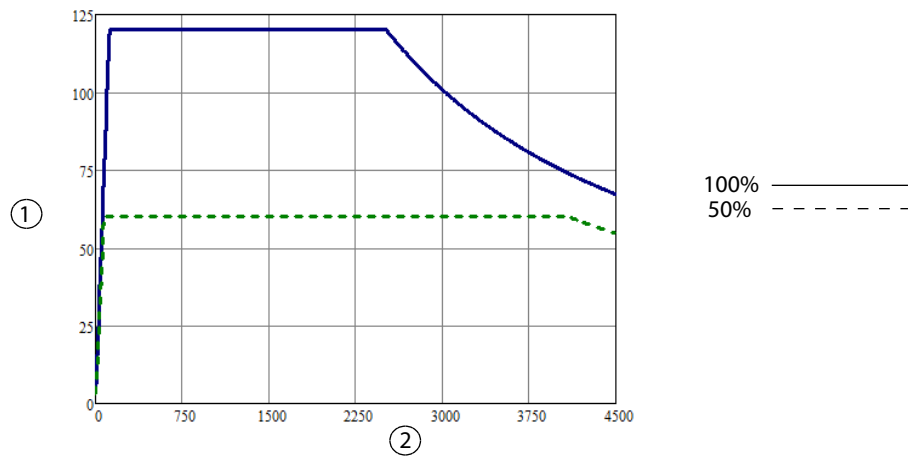
① Peak voltage (volts)

② Power setting

**Note:** Open circuit

## SPRAY

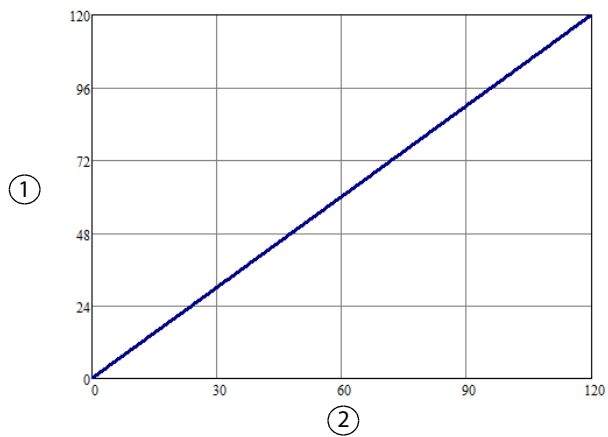
**Output power versus resistance for SPRAY power**



① Output power (watts)

② Load resistance (ohms)

**Output power versus power setting for SPRAY power**

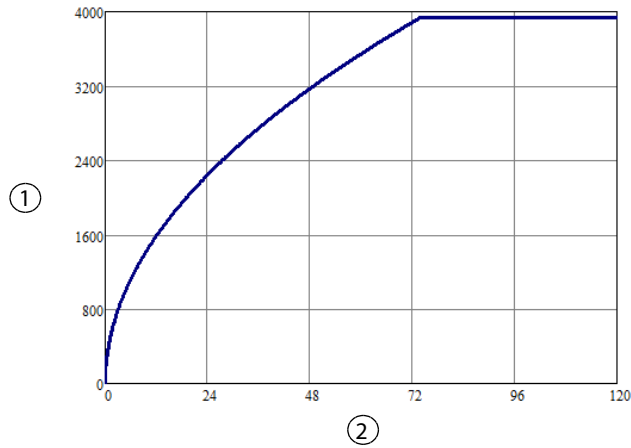


① Output power (watts)

② Power setting

**Note:** Rated load

**Peak voltage versus power setting for SPRAY power**



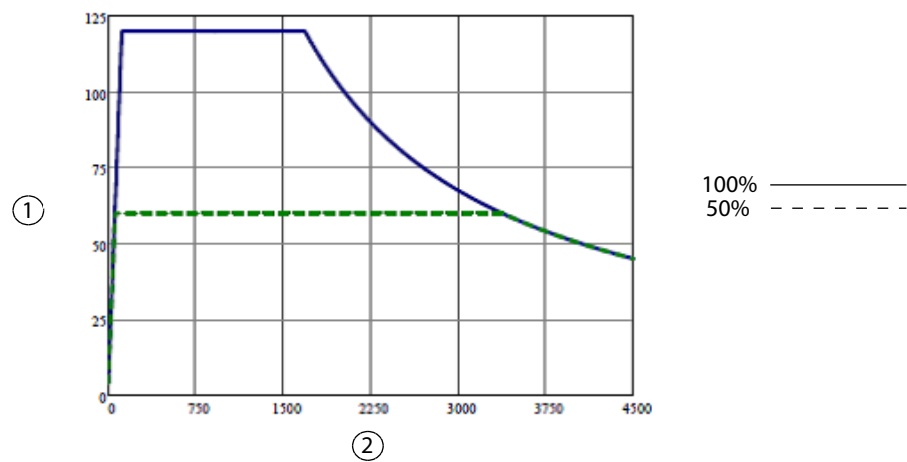
① Peak voltage (volts)

② Power setting

**Note:** Open circuit

**SHARED SPRAY - Single Activation (One Instrument Activated)**

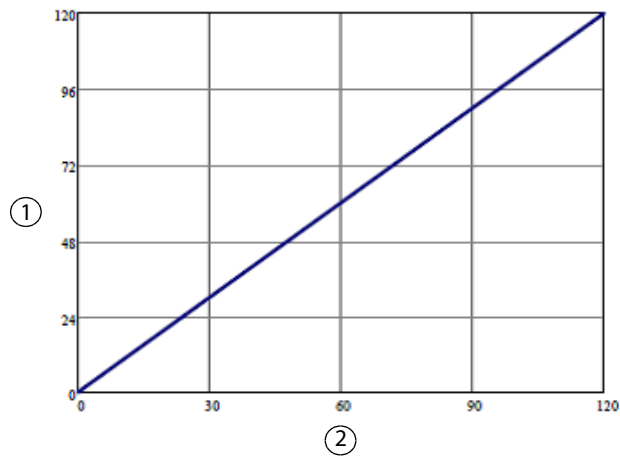
**Output power versus resistance for SHARED SPRAY (single activation) power**



① Output power (watts)

② Load resistance (ohms)

**Output power versus power setting for SHARED SPRAY (single activation) power**

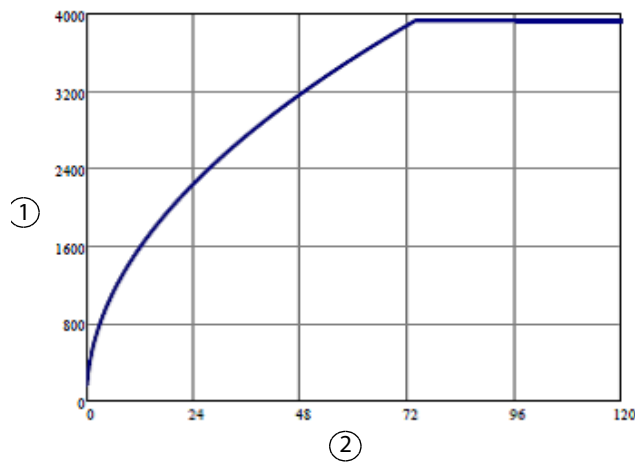


① Output power (watts)

② Power setting

**Note:** Rated load

**Peak voltage versus power setting for SHARED SPRAY (single activation) power**



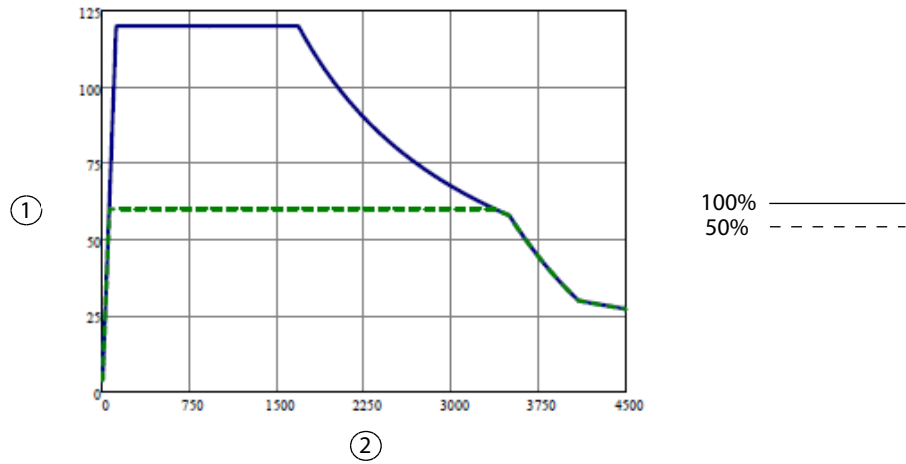
① Peak voltage (volts)

② Power setting

**Note:** Open circuit

## SHARED SPRAY - Dual Activation (Two Instruments Activated)

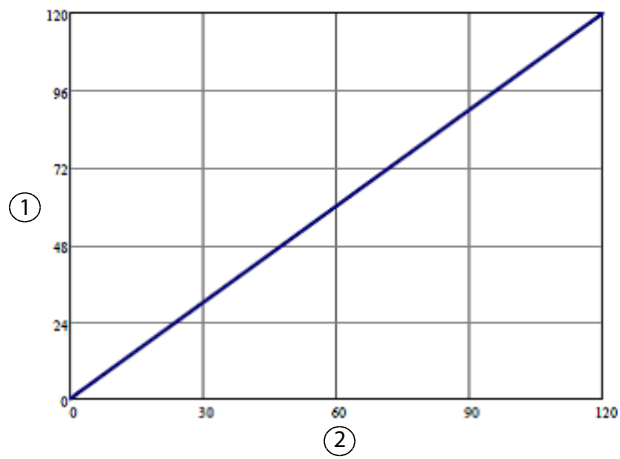
*Output power versus resistance for SHARED SPRAY (dual activation) power*



① Output power (watts)

② Load resistance (ohms)

*Output power versus power setting for SHARED SPRAY (dual activation) power*

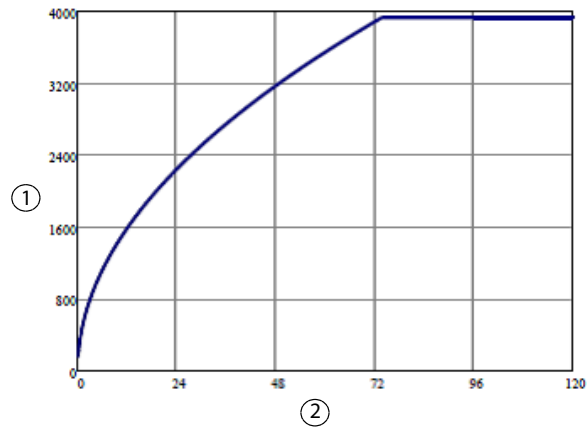


① Output power (watts)

② Power setting

**Note:** Rated load

**Peak voltage versus power setting for SHARED SPRAY (dual activation) power**



① Peak voltage (volts)

② Power setting

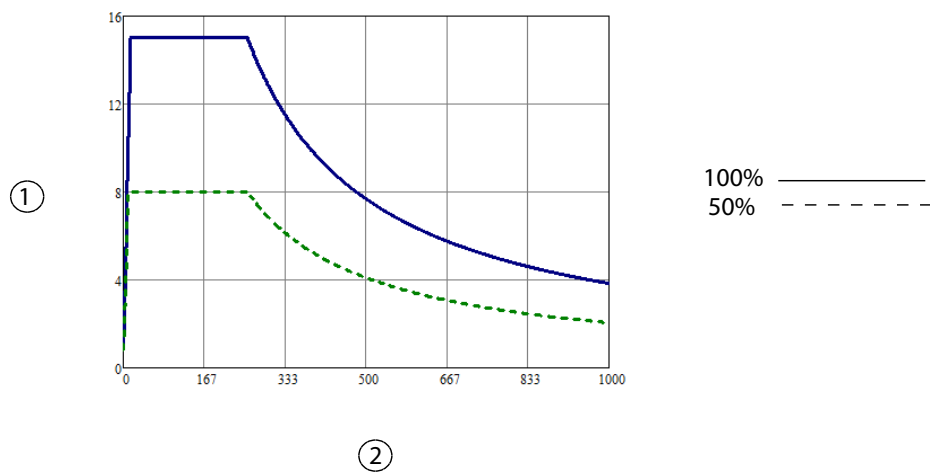
**Note:** Open circuit

## Bipolar Graphs

### Bipolar LOW Effect

**Note:** Bipolar LOW effect is utilized for power settings of OFF, 1-15 W inclusive within Bipolar mode (1-95 W).

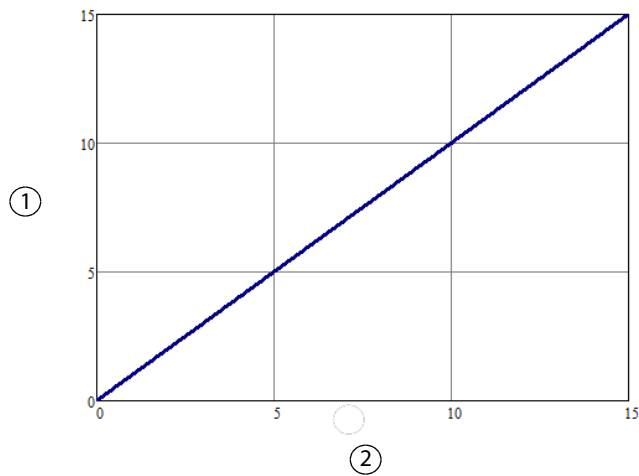
**Output power versus resistance for Bipolar LOW power**



① Output power (watts)

② Load resistance (ohms)

**Output power versus power setting for Bipolar LOW power**

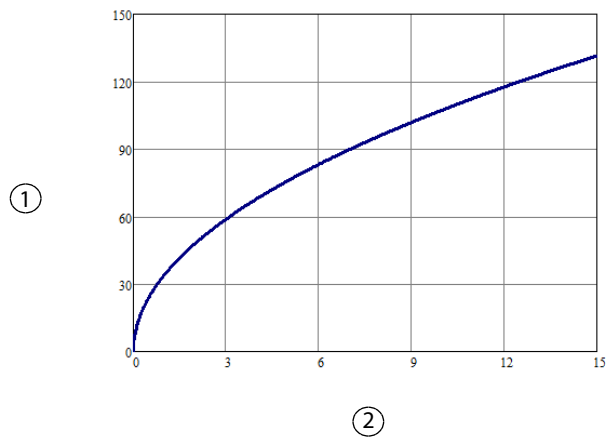


① Output power (watts)

② Power setting

**Note:** Rated load

**Peak voltage versus power setting for Bipolar LOW power**



① Peak voltage (volts)

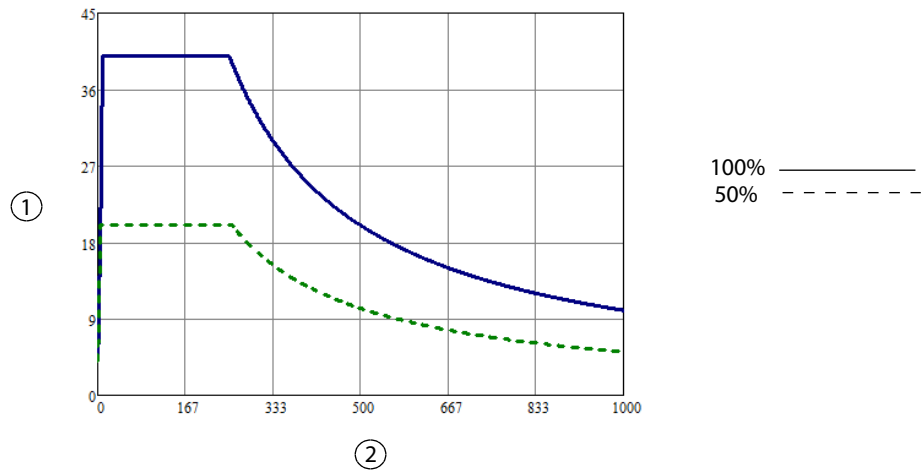
② Power setting

**Note:** Open circuit

## Bipolar MEDIUM Effect

**Note:** Bipolar MEDIUM effect is utilized for power settings of 16–40 W inclusive within Bipolar mode (1–95 W).

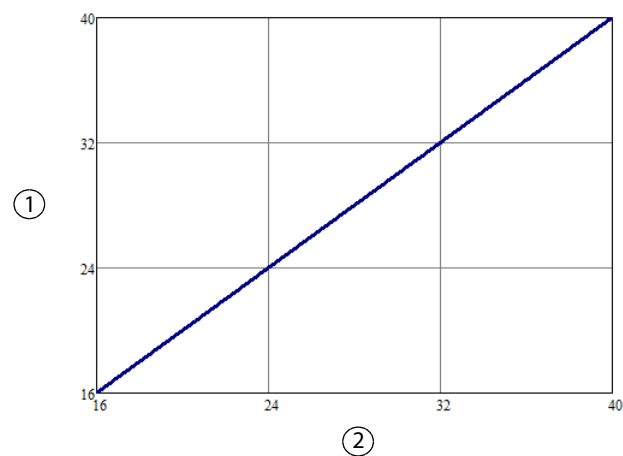
**Output power versus resistance for Bipolar MEDIUM power**



① Output power (watts)

② Load resistance (ohms)

**Output power versus power setting for Bipolar MEDIUM power**

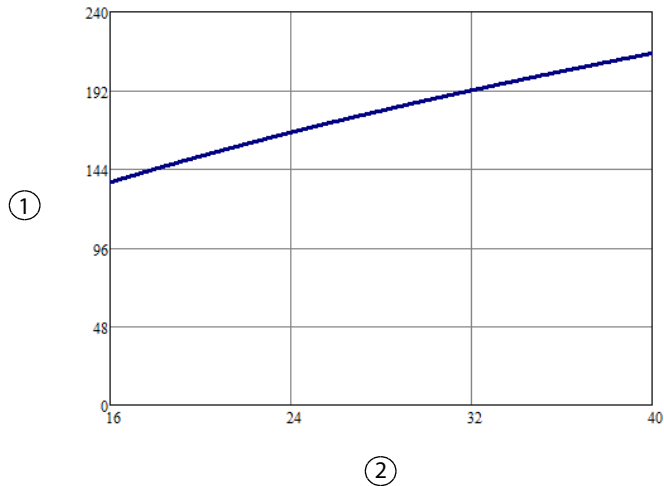


① Output power (watts)

② Power setting

**Note:** Rated load

### Peak voltage versus power setting for Bipolar MEDIUM power



① Peak voltage (volts)

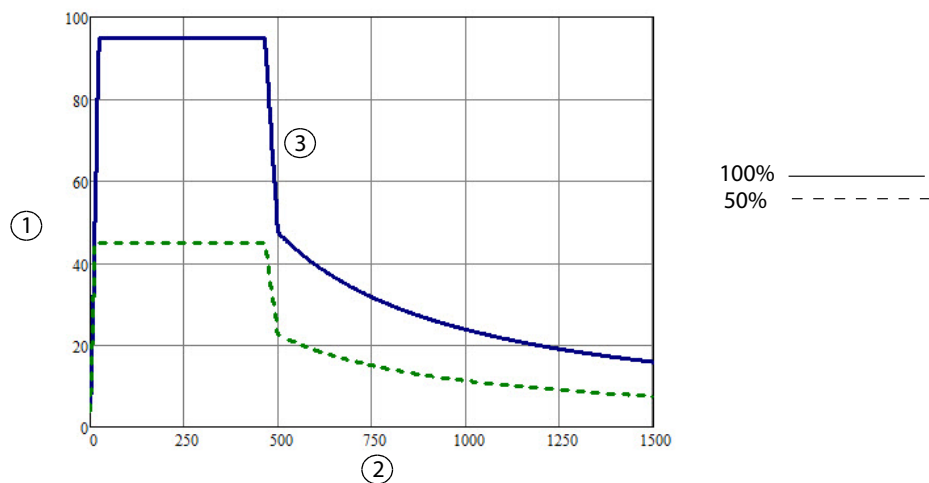
② Power setting

**Note:** Open circuit

### Bipolar HIGH Effect

**Note:** Bipolar HIGH Effect is utilized for power settings of 45–95 W inclusive within Bipolar mode (1–95 W).

### Output power versus resistance for Bipolar HIGH power

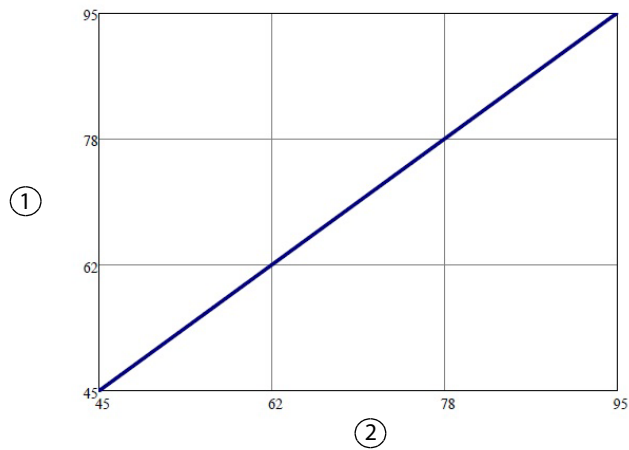


① Output power (watts)

② Load resistance (ohms)

③ See *Discontinuous Power Curves* on page 4-49 for additional details of this region of the power curve.

**Output power versus power setting for Bipolar HIGH power**

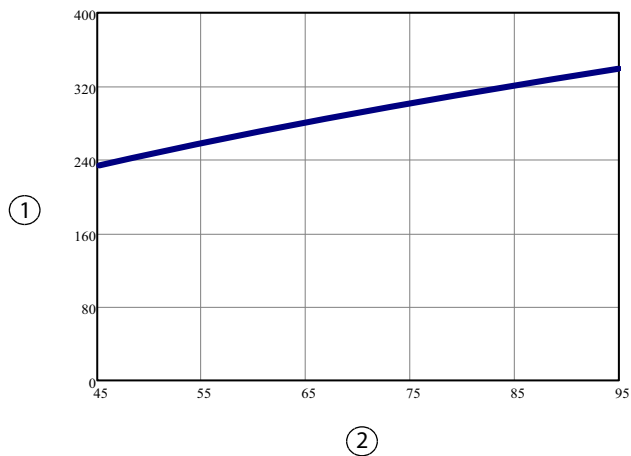


① Output power (watts)

② Power setting

**Note:** Rated load

**Peak voltage versus power setting for Bipolar HIGH power**



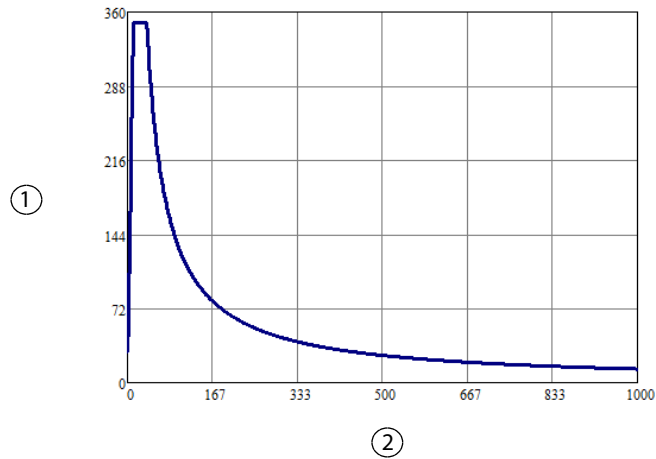
① Peak voltage (volts)

② Power setting

**Note:** Open circuit

## LigaSure

### Output power versus resistance for LigaSure power

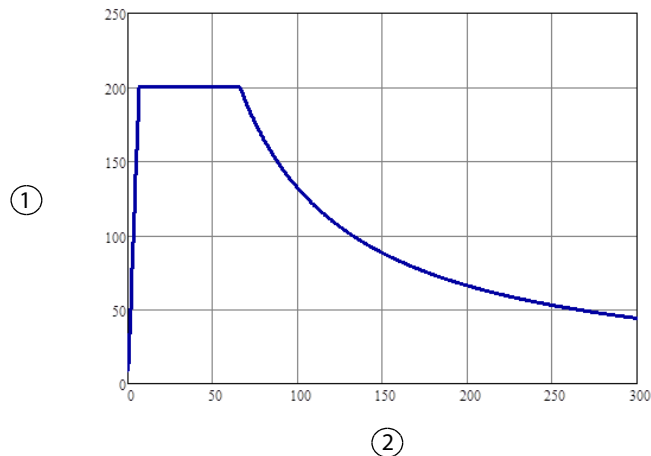


① Output power (watts)

② Load resistance (ohms)

**Note:** The LigaSure Vessel Sealing algorithm is a vessel adaptive algorithm. The LigaSure Vessel Sealing algorithm only requests the power it needs to optimally seal vessels; the power requested will be within the confines of the output power capability curve. Presentation of the "half output control setting" per IEC 60601-2-2 is not required.

### Output power versus resistance for representative LigaSure instruments

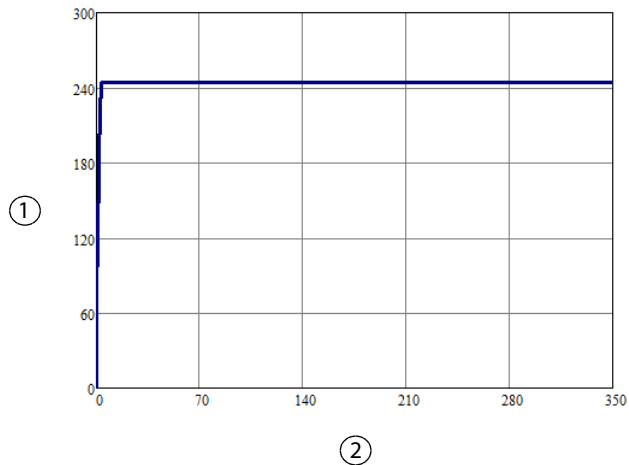


① Output power (watts)

② Load resistance (ohms)

**Note:** The LigaSure algorithm limits the power to 200 watts for the representative LigaSure instruments including LF1537, LF1544, LF5544, LF1212, LF1212A, LF4200, LF4200T, LF1520, LF1723, LF1737, LF1744, LF1637, LF1623, LF1644, LF3225, LS1020, LS1037, LF4318, LF5637, and LF5644.

**Peak voltage versus output power for LigaSure power**



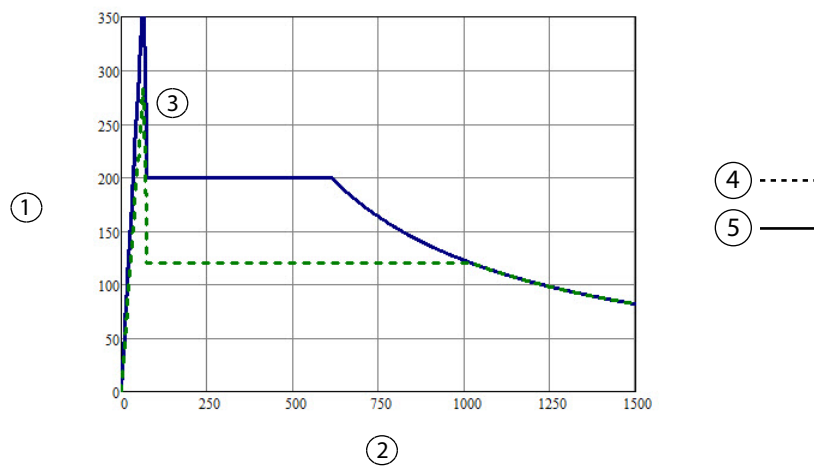
① Peak voltage (volts)

② Output power (watts)

**Note:** Open circuit

## Bipolar Resection CUT

**Output power versus resistance for Bipolar Resection CUT effect setting**



① Output power (watts)

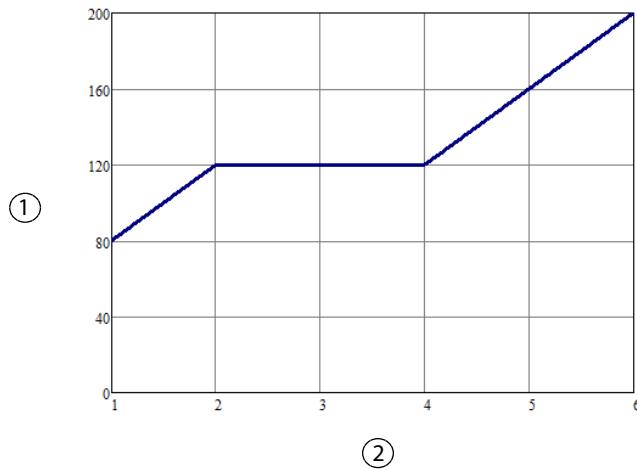
② Load resistance (ohms)

③ See *Discontinuous Power Curves* on page 4-49 for additional details of this region of the power curve.

④ CUT Effect 3

⑤ CUT Effect 6

**Output power versus effect setting for Bipolar Resection CUT**

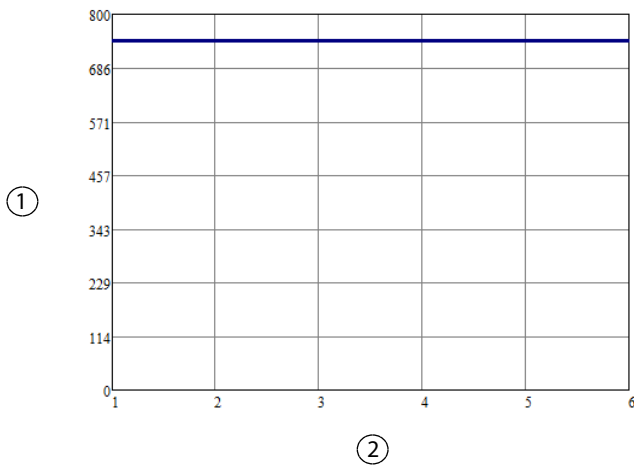


① Output power (watts)

② Effect setting

**Note:** Rated load

**Peak voltage versus effect setting for Bipolar Resection CUT**



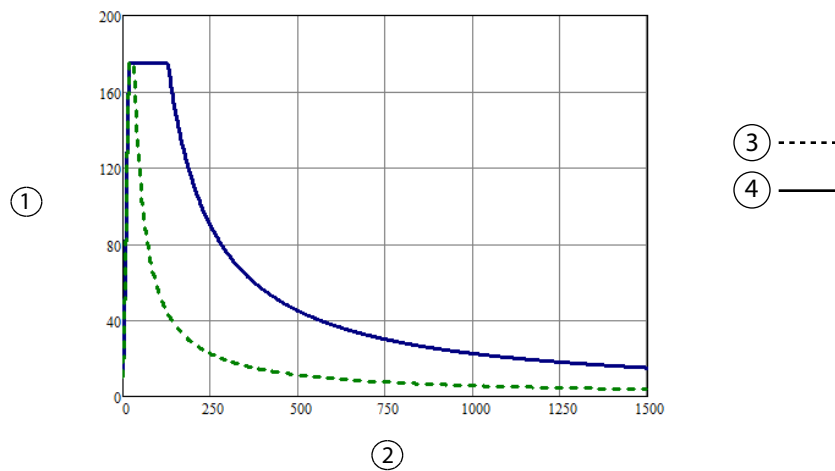
① Peak voltage (volts)

② Effect setting

**Note:** Open circuit

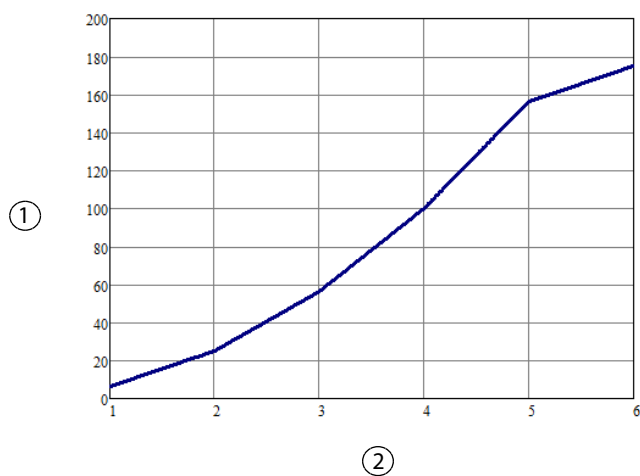
## Bipolar Resection COAG

**Output power versus resistance for Bipolar Resection COAG effect setting**



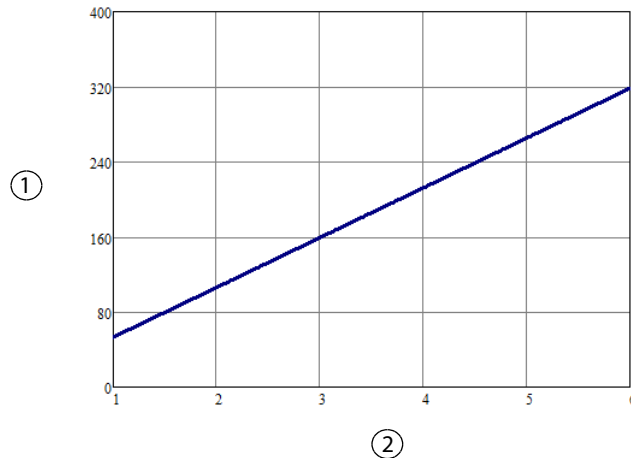
- ① Output power (watts)
- ② Load resistance (ohms)
- ③ COAG Effect 3
- ④ COAG Effect 6

**Output power versus effect setting for Bipolar Resection COAG**



- ① Output power (watts)
- ② Effect setting

**Note:** Rated load

**Peak voltage versus effect setting for Bipolar Resection COAG**

① Peak voltage (volts)

② Effect setting

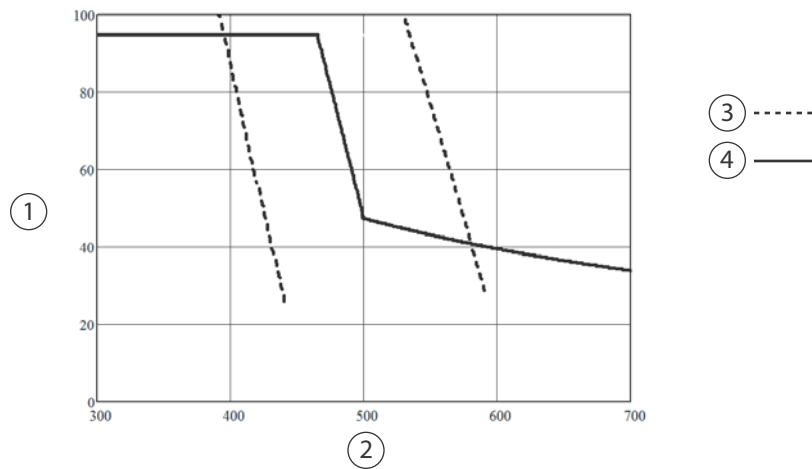
**Note:** Open circuit**Discontinuous Power Curves**

The power curves depicted earlier in this section show a nominal situation – one where there is no sensor variance. As stated earlier in this section, there is an allowed tolerance in both the output power as well as the measured resistance, so any measurements that fall within the allowed tolerance, or "area of uncertainty," are considered to meet requirements.

For most regions of the power curve, considering only the tolerance in power is an acceptable engineering approximation; however, in some modes there are regions in the power curves with sharp changes in output power with respect to measured resistance. In these power curve regions, the area of uncertainty in resistance should be considered when performing power output tests.

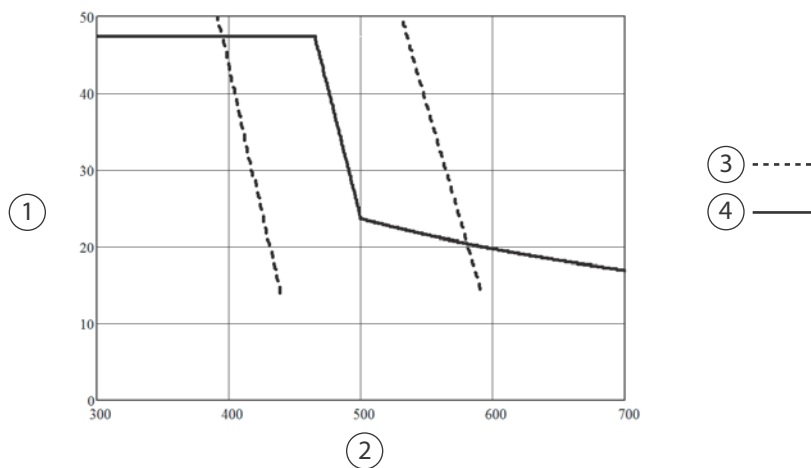
The following charts zoom in on the sharp changes in the power curves and provide an illustrative description of the area of uncertainty in resistance along just that portion of the power curve.

**Bipolar HIGH Effect: Output Power vs. Resistance (Full Power) with Area of Uncertainty in Resistance (does not include power tolerance)**



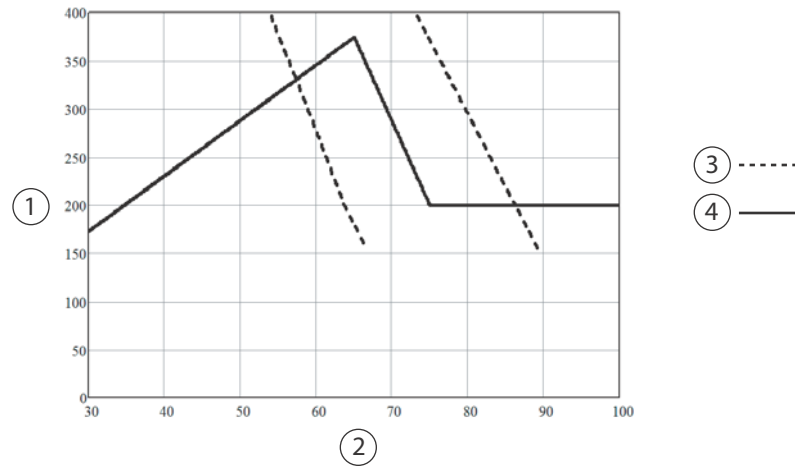
- ① Output power (watts)
- ② Load resistance (ohms)
- ③ Area of uncertainty in resistance
- ④ Nominal power curve

**Bipolar HIGH Effect: Output Power vs. Resistance (Half Power) with Area of Uncertainty in Resistance (does not include power tolerance)**



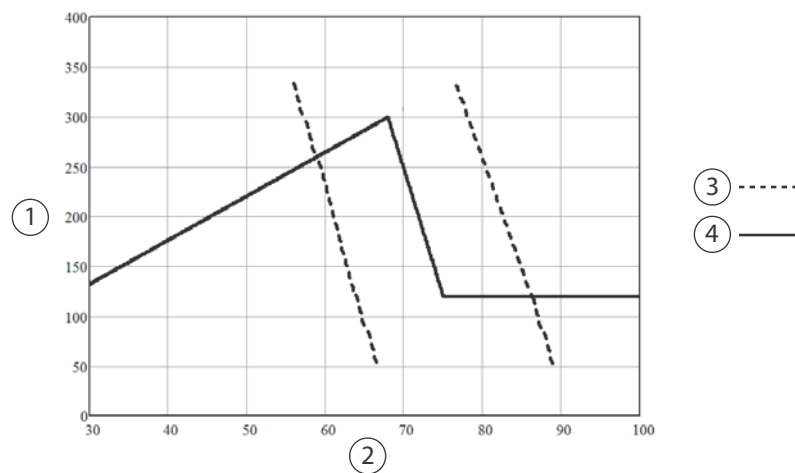
- ① Output power (watts)
- ② Load resistance (ohms)
- ③ Area of uncertainty in resistance
- ④ Nominal power curve

**Bipolar Resection CUT: Output Power vs. Resistance (Effect 6) with Area of Uncertainty in Resistance (does not include power tolerance)**



- ① Output power (watts)
- ② Load resistance (ohms)
- ③ Area of uncertainty in resistance
- ④ Nominal power curve

**Bipolar Resection CUT: Output Power vs. Resistance (Effect 3) with Area of Uncertainty in Resistance (does not include power tolerance)**



- ① Output power (watts)
- ② Load resistance (ohms)
- ③ Area of uncertainty in resistance
- ④ Nominal power curve



# Chapter 5

## System Setup

This chapter describes how to set up the energy platform, turn it on, and configure system settings.

### Precaution

Read the instructions, warnings, and precautions provided with this energy platform and associated accessories before using. Specific instructions for electrosurgical instruments are not included in this manual.

## Setup

### Unpacking the System

Carefully unpack the contents of the shipping container. The container contains the following items:

- Valleylab FT10 FT Series Energy Platform
- Power cord
- First-time setup guide
- Quick reference card
- User's guide
- DVD with user's guide translations and service manual
- Ethernet cable
- Monopolar foot-pedal adapter
- Bipolar Resection foot-pedal adapter
- Fuses for 220-240 VAC

### Before Starting the System

**Important**

The VLFT10GEN is intended for use in a hospital environment.

The operator of the generator may be as far away from the generator as 2 ft. (60 cm) [direct product interaction], 5 ft. (1.5 m) [inside the sterile field], and 13 ft. (4 m) [across the room working with other equipment].

**Notice**

Before plugging the generator into a power receptacle, verify that the installed fuses are appropriate for the local input line voltage. See *Input Power* on page 4-3.

1. Verify the system is off and the power cord is unplugged.
2. Place the energy platform outside the sterile field on a flat, stable surface such as a table, platform, boom system, or Valleylab Universal Generator Cart (VLFTCRT). Refer to local codes or the procedures for the local institution.
3. If necessary, connect the equipotential ground connection to a ground source.
4. Plug the system power cord into the rear panel receptacle.
5. Plug the system power cord into a grounded power receptacle. The On/Off button illuminates yellow.

**Precaution**

Do not plug the system power cord into a power strip or extension cord.

## Turning On the VLFT10GEN

1. Turn on the system by depressing the On/Off button on the front panel. Observe the following during the power-on self-test (POST):
  - The Covidien logo appears on screen.
  - A status bar indicates authentication activity.
  - The system revision code appears.
  - A tone sounds upon completion of the power-on self-test (POST).
  - The REM (Return Electrode Monitoring) indicator appears below the touchscreen: red if an REM-alarm condition exists; green if no REM-alarm condition exists.
  - If an REM-alarm condition exists, refer to *Correcting a REM-Alarm Condition* on page 8-2.
2. If the self-test is not successful, an alarm tone sounds. An error screen appears on the touchscreen. Note the information on the display and refer to Chapter 8, *Troubleshooting*.

**Warning**

**Patient Safety** Use the energy platform only if the power-on self-test has been completed as described in this manual, otherwise inaccurate power outputs may result.

3. **Required for initial start up**—The generator must be set up using the Valleylab Exchange Remote Software System. For instructions, refer to the *First-Time Setup Guide* and the *Valleylab Exchange Remote Software System User's Guide*.

These documents are available online at  
<http://www.medtronic.com/covidien/support/valleylab-exchange>.

## Turning Off the VLFT10GEN

1. **Normal Power-off:** Turn off the system by depressing the On/Off button (illuminated green) on the front panel for at least 1 second. Observe the following during the power-off:
  - The system exits the screen.
  - The screen displays the power-down sequence.
  - Once the power-down sequence is complete, the screen turns off and the On/Off button illuminates yellow.
  - Power-down is complete.

2. **Force Quit option:** If the system was powered up but non-responsive, press and hold the On/Off button for at least 10 seconds and observe the following:
  - The screen turns off and the On/Off button illuminates yellow.
  - Power-down is complete.

## System Functions

The VLFT10GEN system functions are accessed from buttons on the front panel: On/Off, Restore Settings, Audio Volume, and Service and Settings.

### On/Off



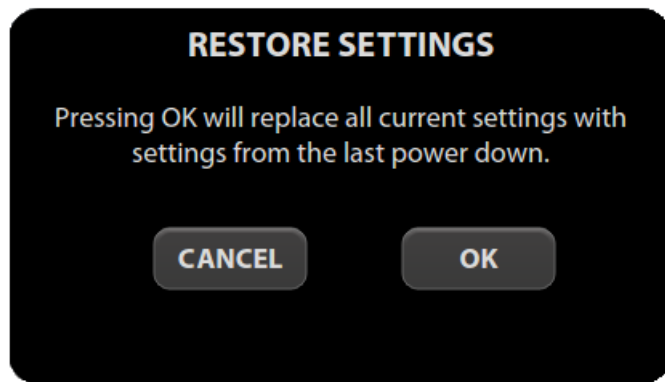
When the system is plugged into a power source, the On/Off button appears yellow. Turn on power to the energy platform by pressing and holding the On/Off button for 0.25 seconds. After a successful power-on self-test, the On/Off button illuminates green. A tone sounds to signal a successful system power up.

Press and hold the button for 1 second to turn power off. The button illuminates yellow when the system is powered down. If a system is non-responsive, holding the button for 10 seconds will power down the system.

### Restore Settings



Select the Restore Settings button on the front panel to reset the system to the settings in use when the system was last powered down using the On/Off button. Accepting the prompt in the dialog box will reset all quadrants to their last setting. All modes and values are reset with the exception of audio volume and Auto Bipolar setting.

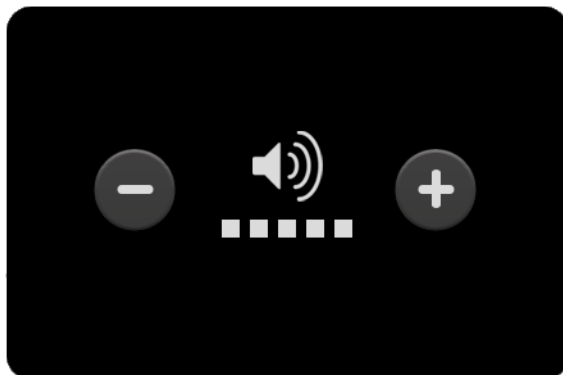


Touch **OK** and the touchscreen will display the last settings entered into each of the quadrants prior to shutting off the system.

## Audio Volume



The VLFT10GEN has five levels of audio volume. Press the Audio Volume button on the front panel to view the volume-select menu.

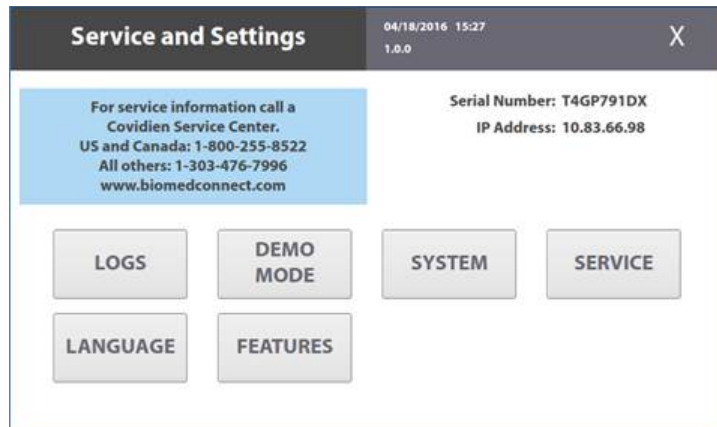


The factory setting is as shown with the volume set at it's highest level. Adjust the volume using the + or - buttons. Dismiss the dialog box by touching the screen outside of the volume menu.

## Service and Settings



The *Service and Settings* menu is accessed by pressing the gears button on the front panel.



The *Service and Settings* menu displays the generator serial number, IP address (if connected to the network), software version number, and contact information for the Covidien Service Center.

It provides available options for

- Viewing logs
  - Events Log
  - Error Log
  - Error Histogram
- Enabling DEMO Mode
- Selecting system settings
  - System Config
  - Diagnostics
  - Network
  - Time Zone
  - Calibration Info
- Accessing system service functions
  - Qualified service personnel can access service functions from a password-protected menu.
- Selecting a language
- Enabling Features

- SOFT COAG Mode
- SHARED COAG Mode
- Auto Bipolar
- Bipolar Ammeter

## Logs

The LOGS button displays the LOGS menu with three options.

1. Touch the **LOGS** button to view the Logs menu:
  - EVENTS—A detailed display of all user actions and generator events on the VLFT10GEN
  - ERROR—A display of all recorded system errors with details
  - ERROR HISTOGRAM—A summary of how often an error has occurred
2. Touch entries to view available details:
  - EVENTS—Touch an event entry to view details. Touch **BACK** to return to the Event Log screen.
  - ERROR LOG—Touch an error to view its details in the *Error Details* dialog box. Touch the **SHOW EVENTS** button to view related events in the Events log entries. Touch **BACK** to return to the *Error Log* screen.
  - ERROR HISTOGRAM—Entries in the *Error Histogram* dialog box are not linked to other logs.

### Important

Log files are maintained when the system is powered down. The time when the system was powered down or experiences a total loss of power is also logged.

When log files reach capacity, the earliest log is deleted to make room for the newest log.

Generator log files can be downloaded using Valleylab Exchange Remote Software System and viewed on a computer. For more information go to:  
<http://www.medtronic.com/covidien/support/valleylab-exchange>.

The Valleylab Exchange user's guide available from the site provides instructions for downloading log files.

## DEMO Mode

DEMO mode is used for demonstration of the generator and accessories only. DEMO mode enables monopolar activation through an attached instrument without the use of a REM patient return electrode. When the monopolar surgery is performed clinically, the required return electrode provides a safe path for the current introduced to the patient's body.

### Warning

DEMO mode delivers monopolar energy without the use of a patient return electrode, and is intended for demonstration purposes only. Chance of burns to the patient significantly increase when DEMO mode is used for clinical procedures.

## Enable DEMO Mode

1. Touch **DEMO MODE** in the *Service and Settings* screen.
2. Touch the **Enable DEMO MODE** button to place the quadrants in DEMO mode. A reminder is posted: "NOT FOR CLINICAL USE."



3. Touch the screen anywhere outside the EXIT DEMO MODE button to temporarily remove the message, allowing full access to the controls.
4. Proceed with any practice or demonstration scenarios. While in DEMO mode, the REM alarm is deactivated, but RF power is still delivered.

### Warning

DEMO mode does not monitor the quality of pad contact with the patient. Therefore, no warning will be issued from the generator when pad-to-patient contact degrades.

5. Touch **EXIT DEMO MODE** to close DEMO mode and return to the functional screen. This will enable REM.

## System Menu

The System button accesses settings for

- System Config
- Diagnostics

- Network
- Time Zone
- Calibration Info

## System Configuration

System Configuration displays the hardware, software, and firmware components of the VLFT10GEN. This information is for reference only. No changes to the configuration can be performed from this screen.

## Diagnostics

- **Instrument Bar Code Reader**—Insert a Covidien device with a scannable bar code. When the SCAN button is touched, the bar-code reader displays the current view from the reader's camera to verify it is working properly.
- **Self Test**—Runs the same system test as the power-on self-test when the system is turned on. Current power and mode settings in each quadrant will be lost as the system is reset to run the power-on self-test. These settings can be retrieved by pressing the Restore Settings button on the front panel. If the self-test is successful, a tone sounds.

## Network

The Network button allows the technician to select a network connection to the Valleylab Exchange server for service operations. There are 4 ways to connect to the IT network:

- Wired Point-to-Point
- Wired Automatic
- Wired Manual
- Wireless (presently not available)

### Wired Point-to-Point

This selection allows the generator to communicate directly with another computer through an Ethernet cable that is connected from the generator to the computer.

### Wired Automatic

This selection allows the generator to communicate on the IT network through an Ethernet cable that is connected from the generator to a router or the facility's DHCP server. The generator is automatically assigned an IP address by the facility's DHCP server.

### Wired Manual

This selection allows the generator to communicate on the IT network through an Ethernet cable that is connected from the generator to a router or the facility's DHCP server. The technician must manually set a static IP address, network mask, and default gateway address.

### **Wireless (presently not available)**

This selection allows a wireless connection from the generator to a router or to a DHCP server via a WiFi access point broadcasting a non-hidden SSID. The technician selects which SSID to connect to and enters a WPA2 password to enable the connection. The generator is automatically assigned an IP address by the facility's DHCP server.

### **Time Zone**

Select a region from the drop-down menu to set the time zone used by the system clock. The time and date are originally set during the initial connection to Valleylab Exchange (see page 5-3).

### **Calibration Info**

Calibration Info displays all of the energy calibration values stored in the VLFT10GEN. This information is for reference only. No changes to the calibration values can be performed from this screen.

### **Service Menu**

Items in the Covidien Service menu are specifically for qualified service personnel and are password protected. The password is 423213. The Service Menu button accesses settings for

- RF Output Test
- Touchscreen Verification
- Energy Calibration
- Country Code
- RF Logging

### **RF Output Test**

The *RF Output Test Screen* is used to test the RF output of the generator. It allows a technician to output RF in a specified mode, to a specified energy channel, at a specified power level. While RF is output, the *RF Output Test Screen* displays the internal sensor readings of average power, RMS voltage, RMS current, impedance magnitude, impedance phase angle, REM impedance magnitude, and REM impedance phase angle.

### **Touchscreen Verification**

The Touchscreen Verification screen allows the technician to calibrate the touchscreen and verify proper calibration. See *Touchscreen Calibration* on page 7-2 for instructions on how to perform touchscreen calibration.

## Energy Calibration

The Energy Calibration screen allows the technician to calibrate the RF output. See *Energy Calibration* on page 7-4 for instructions on how to perform energy calibration.

## Country Code

The Country Code screen allows the technician to identify in which country the generator is set up to operate. If this is the first time using the generator, the country code needs to be selected before the LigaSure/Bipolar energy channel will function. See the *First Time Setup Guide* for instructions on how to set the country code.

After the initial setting of the country code, the code can only be changed using the remote software-update site Valleylab Exchange. For more information go to <http://www.covidien.com/surgical/services/valleylab-exchange>.

The Valleylab Exchange user's guide available from the site provides instructions for changing country codes.

## RF Logging

By default, the generator will log RF activation data for Ligasure instruments. To log RF activation data for all instruments, touch the Enable All Modes RF Logging button. The button changes to Set Ligasure Only RF Logging. To log only Ligasure instrument RF data, touch this button again or cycle power on the generator.

## Language Selection Menu

The Language Selection Menu presents 25 buttons; each labeled with a language available for all software screens and options in the software interface. To change the language, select the button labeled with the desired language. The software interface changes the non-service windows to the selected language after the language button is selected. Some service screens are not translated.

## Feature Enabling Menu

The Feature Enabling menu presents a list of all of the extra features available with the installed software. Some features are available for free while other features need to be purchased separately to be used on the generator. The unavailable features are grayed out in the menu. The available features have a toggle for enabling their use on the clinical screen. If a feature is enabled, or on, the feature's settings can be accessed on the clinical screen. If a feature is disabled, or off, the feature's settings are not available on the clinical screen. The default setting for each feature is disabled, or off. All changes to the feature settings are retained through the removal of AC power.



# Chapter 6

## Testing Setup and Functional Tests

This chapter describes how to set up and test the VLFT10GEN.

After unpacking or servicing the system, set up the system, perform any required calibration (see Chapter 7, *Calibrations*), and verify correct functionality.

If the system does not satisfactorily complete the power-on self-test, then cycle the system power. If the VLFT10GEN continues to fail the self-test, contact Covidien Technical Service.

This chapter contains tests that are specific for field testing. There are some tests that are performed in the manufacturing environment that are not field requirements. Those tests are not described in this manual.

## Periodic Safety Check (Routine Maintenance)

Perform the following safety check once a year, or as directed in Chapter 8, to verify that the system is functioning properly. Record the test results for reference in future tests. Copy the check sheet at the end of this chapter for use in recording the results. Keep the completed check sheet for future reference. If the system fails to meet any of the checks, refer to Chapter 8, *Troubleshooting*.

### Warning

**Electric Shock Hazard** When taking measurements or troubleshooting the system, take appropriate precautions, such as using isolated tools and equipment, using the “one hand rule”, etc.

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

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

When testing RF equipment, follow these test procedures. Keep test leads to the minimum length usable; lead inductance and stray capacitance can adversely affect readings. Carefully select suitable ground points to avoid ground loop error in measurements.

The accuracy of most RF instruments is approximately 1%–5% of full scale. Using uncompensated scope probes causes large errors when measuring high-voltage RF waveforms.

Full definitions of the periodic safety checks are found throughout the remainder of this section. A summary of the periodic safety check is:

- Inspect the system and accessories
- Inspect the internal components (when required)
- System self-test
- Verify the audio
- Verify the power output
- Verify REM function
- Verify cross coupling
- Check leakage current and ground resistance

## Inspecting the System and Accessories

### Equipment list

- Monopolar foot pedal
- Bipolar foot pedal
- Ligasure foot pedal
- Monopolar instrument (preferred) or test leads
- Bipolar instrument cord (preferred) or test leads
- LigaSure instrument (preferred) or test leads

For a rear-panel inspection, turn off the system, and disconnect the power cord from the wall receptacle.

### Rear Panel

1. Check the rear-panel foot pedal receptacles for obstructions or damage. Check for a secure fit by inserting the foot pedal connector into the Bipolar, Monopolar 1, Monopolar 2, and LigaSure/Bipolar foot pedal connectors.
2. If any foot pedal connector is damaged or unusable, return the system to Covidien Technical Service. For more information, see *Covidien Technical Service* on page 10-6.
3. Remove the fuse and verify correct voltage and current rating for usage environment. Refer to *Input Power* on page 4-3.

### Front Panel

1. Turn on the generator and navigate to Demo Mode. See *DEMO Mode* on page 5-7.
2. Check the Monopolar 1 and Monopolar 2 instrument receptacles for obstructions or damage:
  - Insert a standard two-button pencil into the Monopolar 1 and Monopolar 2 receptacles to verify a secure fit
  - Insert a Force TriVerse electrosurgical pencil into the Monopolar 2 receptacle to verify a secure fit.
  - Verify the appropriate Monopolar quadrant on the display becomes active, indicating the instrument has been detected:
    - For the standard two-button electrosurgical pencil, the Standard Monopolar controls become active in the adjacent Monopolar quadrant.
    - For the Force TriVerse electrosurgical pencil, the Valleylab mode is available in the Monopolar 2 quadrant.
3. If either of the monopolar receptacles is damaged, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
4. Check the Patient Return Electrode (REM) receptacle for a broken pin or an obstruction.

5. If the REM receptacle is damaged or obstructed, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
6. Check the Bipolar instrument receptacle for obstructions or damage:
  - Insert the bipolar instrument or cable into the receptacle to verify a secure fit.
  - Verify the Bipolar quadrant on the touchscreen becomes active, indicating the instrument has been detected.
7. If the bipolar receptacle is damaged, return the system to Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
8. Check the LigaSure/Bipolar receptacle for obstructions or damage:
  - Insert a compatible LigaSure instrument into receptacle to ensure a secure fit.
  - Verify the LigaSure quadrant of the touchscreen becomes active, indicating the instrument has been detected:
9. If the LigaSure/Bipolar receptacle is damaged or the “Invalid Instrument” message appears, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).

#### **Foot Pedals**

1. Remove the foot pedal from the system.
2. Inspect the connector and receptacle for damage or corrosion.
3. Inspect the foot pedal for damage.
4. Reconnect the foot pedal to the system.

#### **Power Cord**

1. Verify the cord is unplugged from the wall receptacle and remove the power cord from the system.
2. Inspect the power connector and receptacle for damage.
3. Inspect the power cord for damage.
4. Reconnect the power cord to the system.
5. Turn on the generator to test functionality.

## Inspecting Internal Components (when required)

This section is only required when the system is open for troubleshooting, repair, or spare replacement.

### Equipment list

- Torx T30 screwdriver

#### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

1. Turn off power to the system and remove the power cord from the wall outlet and the generator power cord receptacle.
2. Remove the four bolts that secure the cover to the chassis.

#### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Slide the front and back bezels away from the main chassis to release the locking/alignment features.
4. Lift the cover off the chassis. Set the cover aside for reinstallation.
5. Remove the top E-PAC foam layer. Set aside the foam for reinstallation.
6. Verify that all connectors are firmly seated.
7. If further investigation is required, remove subsequent E-PAC foam layers and housed PCBAs.
8. Inspect each PCBA for damaged components or wires, cracks, and corrosion.
9. If there is evidence of damage on the Controller PCBA, Steering Relay PCBA, Front Panel, Footswitch PCBA, or the RF PCBA, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
10. Inspect the entire device for loose debris. If any debris exists, carefully remove the debris before proceeding.
11. Replace the cover using the four mounting bolts to secure.

## Power Up Check

### System Self Test

Turning on the system initiates an internal power-on self-test to verify the calibration. The self-test also checks the operation of the speaker, all indicators, and the display.

#### Warning

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

1. There are two ways to run a system self-test:
  - If the System is OFF, turn on the system by pressing the **On/Off** button on the front panel.
  - If the system is ON, navigate to the system self-test screen by pressing the gears button on the front panel, touching the **System** button on the touchscreen, touching the **Diagnostics** button on the touchscreen, and then touching the **Self-Test** button on the touchscreen.
2. Verify the following:
  - All visual indicators and display on the front panel illuminate.
  - Test tones sound to verify that the speaker is working properly.
3. If the power-on self-test is successful, the following occurs:
  - The display illuminates and shows all 4 quadrants.
  - The REM alarm indicator illuminates.or
4. If the self-test is not successful, an alarm tone sounds. An error screen appears on the display. Note the information on this display and refer to Chapter 8, *Troubleshooting*.
5. Activate the monopolar instruments by pressing the handswitches to test functionality.
6. Set Auto Bipolar.
7. Activate the bipolar instrument by closing the tines to test functionality.
8. Activate the foot pedal with a corresponding instrument inserted to test functionality and confirm the audio tone.

### Verifying the Audio

1. Press the **Audio** button on the front panel.
2. Press the **+** and **-** buttons on the display. Verify that the audio is active after each +/- button press and is distortion free.

## Verifying Power Output

### Equipment list

- Test cable leads
- True RMS meter or oscilloscope
- Current transformer—Volt per Amp equal to 0.10 with 10 MHz bandwidth

For each power output test:

- Enter *RF Output Test Screen* as described in the previous section.
- Test power output with the Energy Mode, Load, and Power specified in the following tables.
- Activate and deactivate power output as described in the RF Output Test Screen section.
- 50  $\Omega$ , 100  $\Omega$ , 300  $\Omega$ , 500  $\Omega$ , all 250 W, 1 % tolerance, non-inductive resistive loads

## RF Output Test Screen

### Navigation

1. To enter *RF Output Test Screen*, touch the Service/Settings button on the front panel.
2. Touch the **Service** button, enter the password (423213), and touch **OK**.
3. Select the **RF Output Test** button on the screen.

### Setup

1. *RF Mode Selection* - Select test-specific RF mode from RF-Mode pull-down menu.

**Note:** Not all modes listed in the *RF Mode Selection* window are for clinical or biomedical use. These options are for exclusive use of Covidien service centers.

2. *Energy Channel Selection* - Select Energy Channel by pressing test-specific Energy Channel button. A default setting is provided based on the RF mode selected.
3. *Power Setting* - Set the power to test-specific power setting by touching the up or down arrow. A default setting is provided based on the RF mode selected.

### RF Output Activation

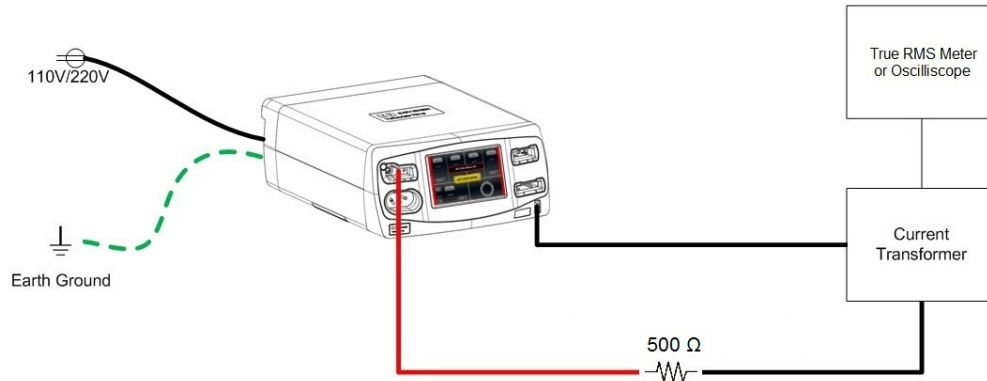
Touch the **Activate** button to activate RF output with the selected Energy Channel/RF Mode/Power Setting.

### RF Output Deactivation

Touch **Deactivate** to end RF output. To deactivate RF output and clear the displayed values, touch **Deactivate No Hold**. To deactivate RF output and retain the displayed values, touch **Deactivate Hold Values**.

## Testing Monopolar 1 COAG Output - 500 $\Omega$ Load

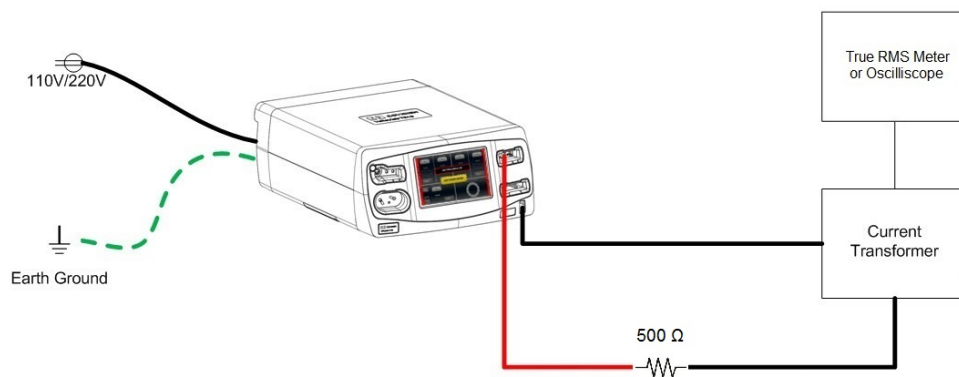
| Power Setting | Energy Mode | Specifications |
|---------------|-------------|----------------|
| 120 W         | SPRAY       | 424 – 570 mA   |



1. The *RF Output Test Screen* should be set up with the following settings specific to the table above. See *RF Output Test Screen* on page 6-7 for setup instructions.
  - RF Mode
  - Energy Channel
  - Power
2. Connect a test cable from the left tine of the Monopolar 1 channel receptacle to one side of the 500  $\Omega$  load.
3. Short the REM receptacle pins and connect a test cable from the shorted REM jack through the current transformer, to the other side of the 500  $\Omega$  load.
4. Activate RF energy by pressing the **Activate** button on the touchscreen.
5. Verify the power output is within the specification range.
6. Deactivate RF energy by pressing one of the **Deactivate** buttons on the touchscreen.

## Testing Monopolar 2 COAG Output - 500 $\Omega$ Load

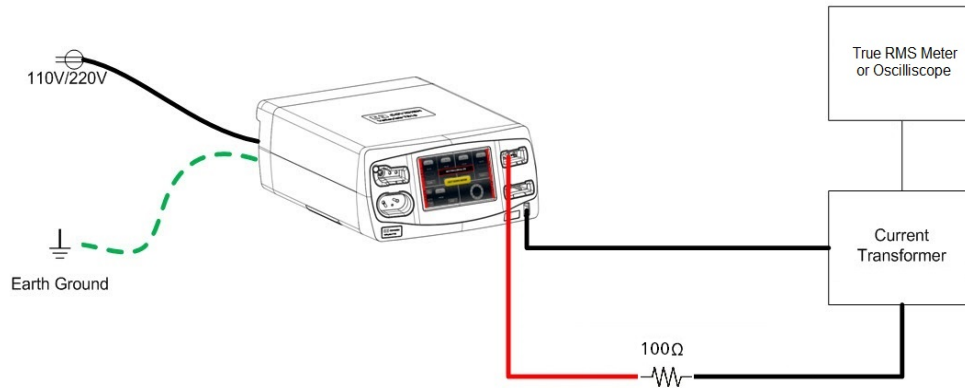
| Power Setting | Energy Mode | Specifications |
|---------------|-------------|----------------|
| 120 W         | SPRAY       | 424 – 570 mA   |
| 10 W          | SPRAY       | 101 – 181 mA   |
| 30 W          | FULGURATE   | 205 – 285 mA   |



1. The *RF Output Test Screen* should be set up with the following settings specific to the table above. See *RF Output Test Screen* on page 6-7 for setup instructions.
  - RF Mode
  - Energy Channel
  - Power
2. Connect a test cable from the left tine of the Monopolar 2 channel receptacle to one side of the 500  $\Omega$  load.
3. Short the REM receptacle pins and connect a test cable from the shorted REM jack through the current transformer, to the other side of the 500  $\Omega$  load.
4. Activate RF energy by pressing the **Activate** button on the touchscreen.
5. Verify the power output is within the specification range.
6. Deactivate RF energy by pressing one of the **Deactivate** buttons on the touchscreen.
7. Repeat steps 1 – 6 for each row of the table above for the Monopolar 2 channel receptacle.

## Testing Monopolar 2 COAG Output - 100 $\Omega$ Load

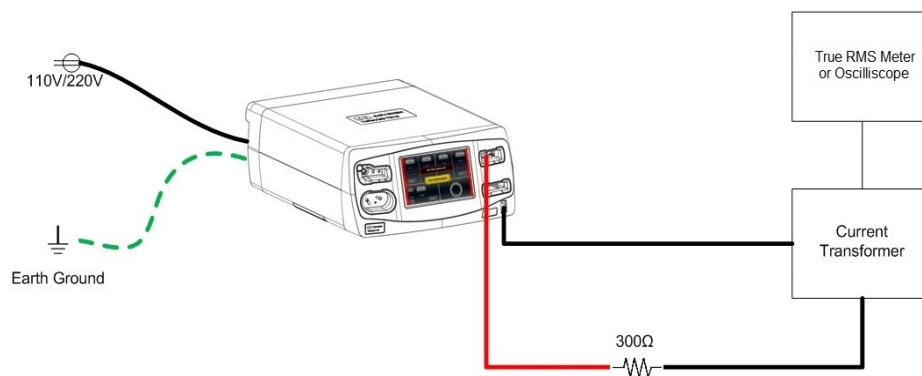
| Power Setting | Energy Mode | Specifications |
|---------------|-------------|----------------|
| 120 W         | SOFT        | 948 – 1274 mA  |



1. The *RF Output Test Screen* should be set up with the following settings specific to the table above. See *RF Output Test Screen* on page 6-7 for setup instructions.
  - RF Mode
  - Energy Channel
  - Power
2. Connect a test cable from the left line of the Monopolar 2 channel receptacle to one side of the 100  $\Omega$  load.
3. Short the REM receptacle pins and connect a test cable from the shorted REM jack through the current transformer, to the other side of the 100  $\Omega$  load.
4. Activate RF energy by pressing the **Activate** button on the touchscreen.
5. Verify the power output is within the specification range.
6. Deactivate RF energy by pressing one of the **Deactivate** buttons on the touchscreen.

## Testing Monopolar 2 CUT Output - 300 $\Omega$ Load

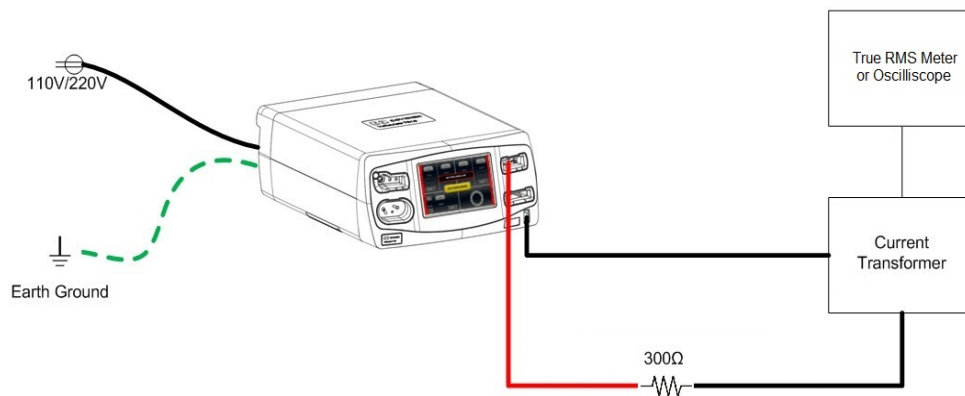
| Energy Mode | Power Setting | Specifications |
|-------------|---------------|----------------|
| PURE        | 10 W          | 143 – 223 mA   |
| PURE        | 300 W         | 865 – 1163 mA  |
| BLEND       | 200 W         | 707 – 949 mA   |



1. The *RF Output Test Screen* should be set up with the following settings specific to the table above. See *RF Output Test Screen* on page 6-7 for setup instructions.
  - RF Mode
  - Energy Channel
  - Power
2. Connect a test cable from the left tine of the Monopolar 2 channel receptacle to one side of the 300  $\Omega$  load.
3. Short the REM receptacle pins and connect a test cable from the shorted REM jack through the current transformer, to the other side of the 300  $\Omega$  load.
4. Activate RF energy by pressing the **Activate** button on the touchscreen.
5. Verify the power output is within the specification range.
6. Deactivate RF energy by pressing one of the **Deactivate** buttons on the touchscreen.
7. Repeat steps 1 – 6 for each row of the table above for the Monopolar 2 channel receptacle.

## Testing Monopolar 2 VALLEYLAB Mode Output - 300 $\Omega$ Load

| Power Setting | Energy Mode | Specifications |
|---------------|-------------|----------------|
| 75 W          | VALLEYLAB   | 433 – 581 mA   |

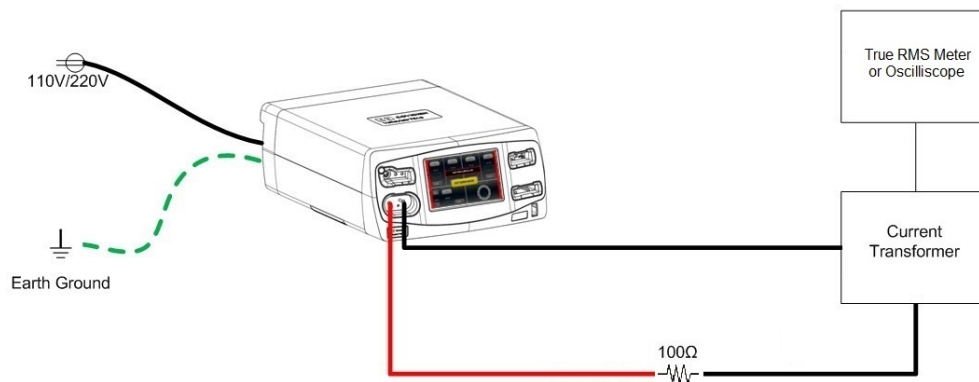


1. The *RF Output Test Screen* should be set up with the following settings specific to the table above. See *RF Output Test Screen* on page 6-7 for setup instructions.
  - RF Mode
  - Energy Channel
  - Power
2. Connect a test cable from the left tine of the Monopolar 2 channel receptacle to one side of the 300  $\Omega$  load.
 

**Note:** This test is not to be performed on the Monopolar 1 receptacle.
3. Short the REM receptacle pins and connect a test cable from the shorted REM jack through the current transformer, to the other side of the 300  $\Omega$  load.
4. Activate RF energy by pressing the **Activate** button on the touchscreen.
5. Verify the power output is within the specification range.
6. Deactivate RF energy by pressing one of the **Deactivate** buttons on the touchscreen.

## Testing Bipolar Energy Channel Output - 100 $\Omega$ Load

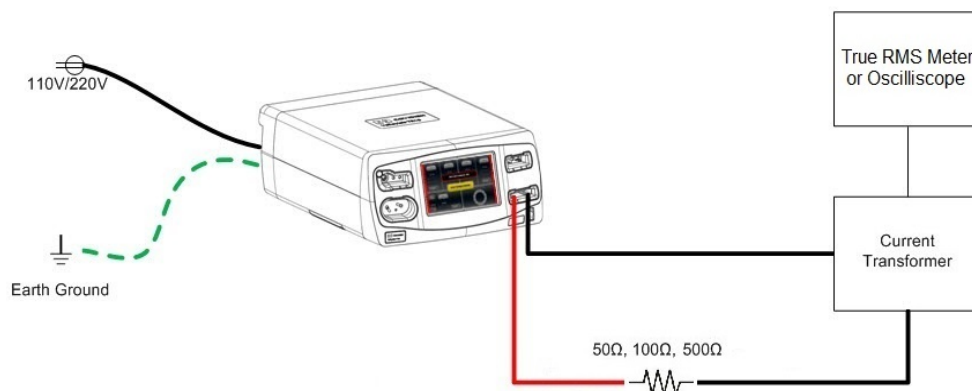
| Power Setting | Energy Effect  | Load         | Specification |
|---------------|----------------|--------------|---------------|
| 95 W          | Bipolar HIGH   | 100 $\Omega$ | 843 – 1133 mA |
| 40 W          | Bipolar MEDIUM | 100 $\Omega$ | 547 – 735 mA  |
| 15 W          | Bipolar LOW    | 100 $\Omega$ | 335 – 450 mA  |



1. The *RF Output Test Screen* should be set up with the following settings specific to the table above. See *RF Output Test Screen* on page 6-7 for setup instructions.
  - RF Mode
  - Energy Channel
  - Power
2. Connect a test cable from the right tine of the bipolar channel receptacle through the current transformer to the 100  $\Omega$  load.
3. Connect a test cable from the left tine of the bipolar channel receptacle to the other side of the 100  $\Omega$  load.
4. Activate RF energy by pressing the **Activate** button on the touchscreen.
5. Verify the power output is within the specification range.
6. Deactivate RF energy by pressing one of the **Deactivate** buttons on the touchscreen.
7. Repeat steps 1 – 6 for each row of the table above.

## Testing LigaSure/Bipolar Output

| Power Setting | Energy Effect            | Load         | Specifications |
|---------------|--------------------------|--------------|----------------|
| Effect 6      | Bipolar Resection - COAG | 100 $\Omega$ | 1145 – 1538 mA |
| Effect 6      | Bipolar Resection - CUT  | 500 $\Omega$ | 547 – 735 mA   |
| 5 W           | LigaSure                 | 50 $\Omega$  | 276 – 357 mA   |
| 350 W         | LigaSure                 | 50 $\Omega$  | 1940 – 2740 mA |



1. The *RF Output Test Screen* should be set up with the following settings specific to the table above. See *RF Output Test Screen* on page 6-7 for setup instructions.
  - RF Mode
  - Energy Channel
  - Power
2. Connect a test cable from the right tine of the LigaSure/Bipolar channel receptacle through the current transformer to the load identified in the table above.
3. Connect a test cable from the left tine of the LigaSure/Bipolar channel receptacle to the other side of the load identified in the table above.
4. Activate RF energy by pressing the **Activate** button on the touchscreen.
5. Verify the power output is within the specification range.
6. Deactivate RF energy by pressing the **Deactivate No Hold** button on the touchscreen.
7. Repeat steps 1 – 6 for each row of the table above.

## Verifying REM Function

### Equipment list

- REM plug
  - Resistance decade box, 1  $\Omega$  resolution, 1% tolerance, 1/8 W or greater, or 50  $\Omega$  and 100  $\Omega$  1% tolerance, non-inductive resistance loads
1. Enter *RF Output Test Screen*. Set the resistance decade box to 100  $\Omega$  or select a 100  $\Omega$  load. Connect the resistance box to the REM receptacle, and confirm that the REM ZMag measurement on the display is within the specification 93  $\Omega$  to 107  $\Omega$ . Confirm the REM LED indicator light illuminates green.

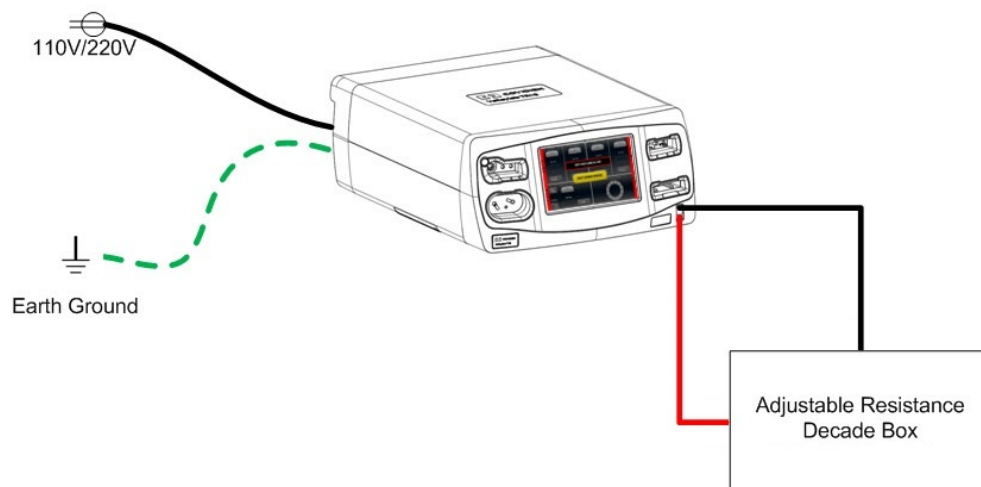
### Important

If the REM ZMag measurement on the display does not refresh, set the output power to 1 W, touch the **Activate** button, then touch **Deactivate no hold** button.

2. Decrease the resistance to 50  $\Omega$  or select a 50  $\Omega$  load and verify that the REM ZMag measurement on the display is within the specification 43  $\Omega$  to 57  $\Omega$ .
3. Decrease the resistance to 0  $\Omega$  or short the REM pins together and verify that the REM ZMag measurement on the display is within the specification 0  $\Omega$  to 4  $\Omega$ . Confirm the REM LED indicator light illuminates red.
4. Remove any connector that may be in the REM port.
5. Verify that the REM ZMag measurement on the display is less than 2000 Ohms.

### Precaution

If the REM ZMag reading is greater than 2000 Ohms, the Steering Relay PCBA will need to be replaced to ensure the proper performance of REM.



## Verifying Cross Coupling

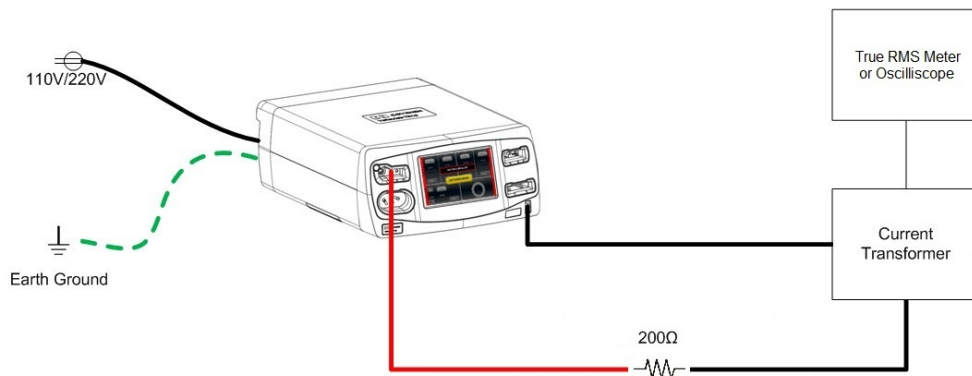
### Equipment list

- Banana cables, 18 inches or shorter
- True RMS meter
- Current transformer—Volt per Amp equal to 0.10 with 10 MHz bandwidth
- 200  $\Omega$ , 250 W, 1% tolerance, non-inductive resistive load

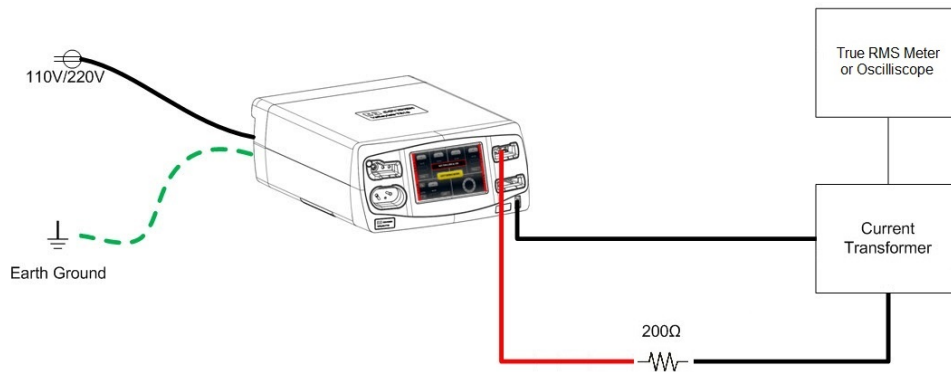
1. Navigate to the *RF Output Test Screen*.

For each test:

- Set all modes to their maximum power settings as specified herein.
  - Activate each mode by touching the **Activate** button on the *RF Output Test Screen*.
2. **Mono 1 current** - Connect a 200  $\Omega$  load to the Mono 1 left tine output. Short the REM receptacle pins and connect a test cable from the shorted REM jack through the current transformer to the other side of the 200  $\Omega$  load. Activate the following modes one at a time as specified in the following list. Ensure that the current is within the specification measured by the current transformer: 0 mA to 150 mA
    - Bipolar Resection CUT - Effect 6 setting
    - Bipolar HIGH – 95 W setting
    - Mono 2 COAG SPRAY – 120 W setting
    - Mono 2 CUT PURE – 300 W setting

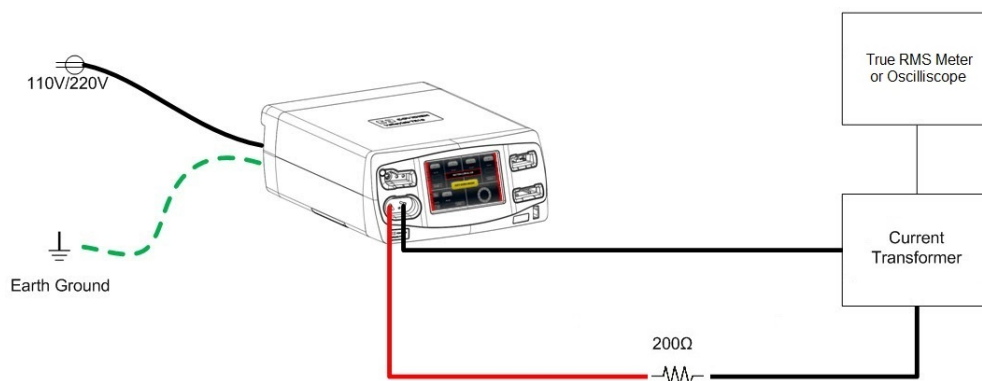


3. **Mono 2 current** - Connect a  $200\ \Omega$  load to the Mono 2 left tine output. Short the REM receptacle pins and connect a test cable from the shorted REM jack through the current transformer, to the other side of the  $200\ \Omega$  load. Activate the following modes one at a time as specified in the following list. Ensure that the current is within the specification measured by the current transformer: 0 mA to 150 mA.
- Mono 1 CUT PURE – 300 W setting
  - Mono 1 COAG SPRAY – 120 W setting
  - Bipolar HIGH – 95 W setting
  - Bipolar Resection CUT – Effect 6 setting



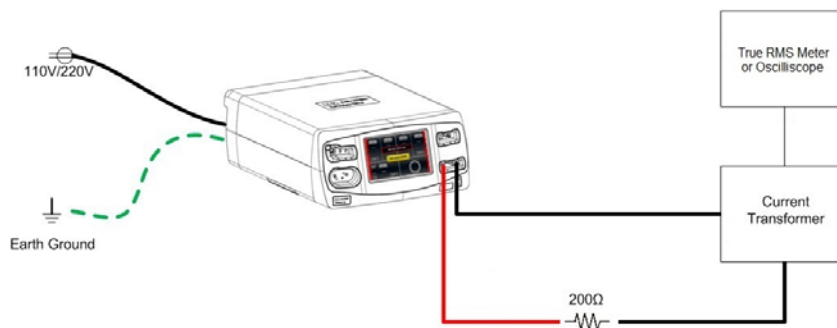
4. **Bipolar current** - Connect a  $200\ \Omega$  load to the left bipolar tine output. Connect the right tine output through the current transformer, to the other side of the  $200\ \Omega$  load. Activate the following modes on at a time as specified in the following list. Ensure that the current is within the specification measured by the current transformer: 0 mA to 50 mA.

- Bipolar Resection CUT – Effect 6 setting
- Mono 2 COAG SPRAY – 120 W setting
- Mono 1 CUT PURE – 300 W setting



5. **LigaSure/Bipolar current** - Connect a  $200\ \Omega$  load from the left LigaSure/Bipolar output. Connect the right tine through the current transformer, to the other side of the  $200\ \Omega$  load. Activate the following modes on at a time as specified in the following list. Ensure that the current is within the specification measured by the current transformer: 0 mA to 50 mA.

- Mono 1 CUT PURE – 300 W setting
- Bipolar HIGH – 95 W setting
- Mono 2 COAG SPRAY – 120 W setting



## Checking High-Frequency Leakage Current

Check the high-frequency leakage current and ground resistance before returning the generator to clinical use. Check the leakage current:

- After calibrating the system
- Annually

### Equipment list

- 200  $\Omega$ , 250 W, 1% tolerance, non-inductive resistive load
- Current transformer
- True RMS meter
- Bipolar and monopolar foot pedals
- Leakage table - in accordance with IEC 60601-2-2, Figure 201.104.
- Test leads, 18 inches or shorter
- Banana cables, 18" or shorter

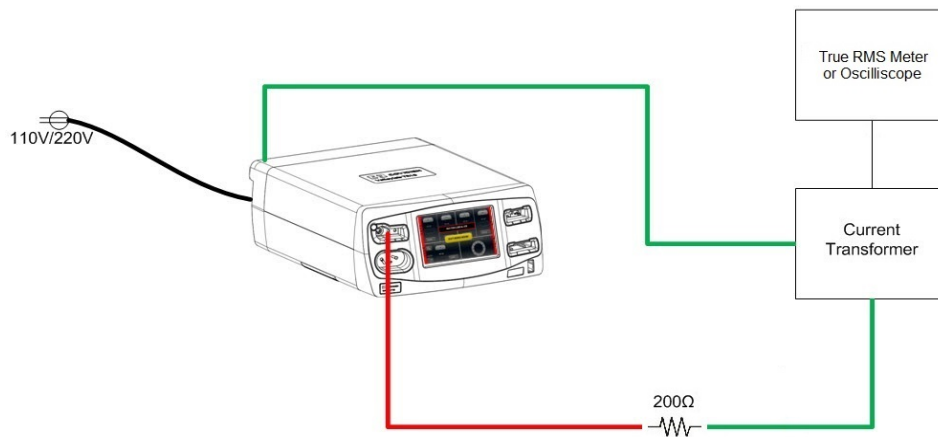
**Note:** The following leakage tests are a short-lead configuration where leakage is measured directly at the "high frequency surgical equipment terminals" per IEC 60601-2-2: 2009 clause 201.8.7.3.101 b.

## Checking Monopolar High-Frequency Leakage Current

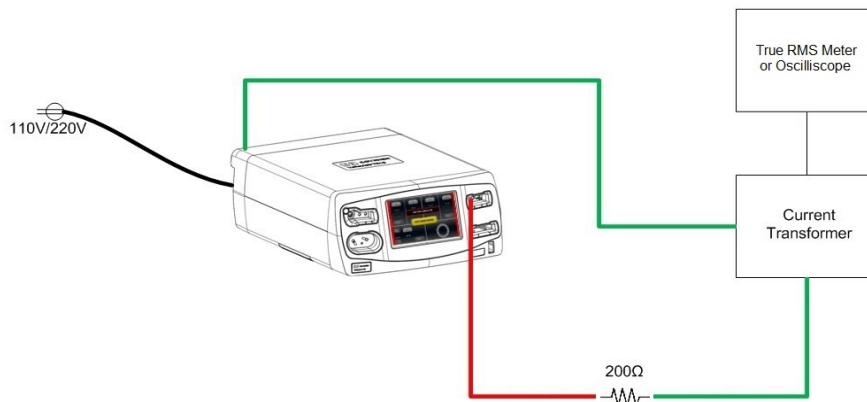
### Notice

The system must be in *RF Output Test Screen* mode to activate the receptacle. See *RF Output Test Screen* on page 6-7 for proper screen setup.

1. Connect a 200  $\Omega$  load to the Monopolar 1 left tine. Connect the equipotential ground lug on the rear of the system through the current transformer to the other side of the 200  $\Omega$  load.
2. Manually activate Monopolar SPRAY mode on Monopolar 1 using the *RF Output Test Screen* at 120 W. Record the leakage current.



3. Press the **DEACTIVATE HOLD VALUES** button to deactivate RF energy.
4. Repeat steps 1 through 3 for Monopolar 2.



5. If using the leakage table, leakage current directly at the generator terminals should not exceed 100 mA for any mode. If the measurements still exceed 100 mA, contact Covidien Technical Service (see page 10-6) for further instructions.

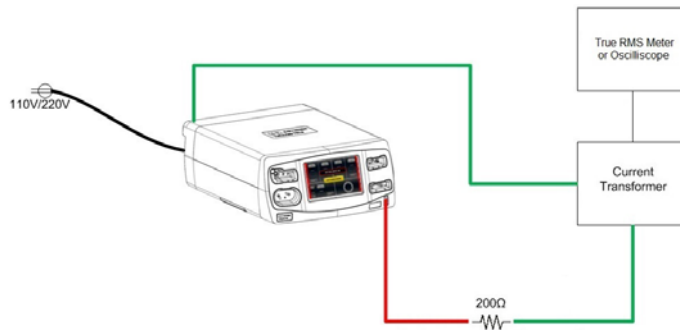
## Checking Patient Return High-Frequency Leakage Current

### Notice

The system must be in *RF Output Test Screen* mode to activate the receptacle. See *RF Output Test Screen* on page 6-7 for proper screen setup.

1. Short the REM receptacle pins and connect to one side of the 200 Ω load. Connect the equipotential ground lug on the rear of the system through the current transformer, to the other side of the 200 Ω load.

2. In *RF Output Test Screen*, set the energy channel to Monopolar 2, the mode to SPRAY, and power to 120 W. Touch the **Activate** button. Record the leakage current. The leakage current should not exceed 100 mA for any mode.
3. Press the **Deactivate Hold Values** button to deactivate RF energy.
4. Repeat steps 1-3 for the following setups:
  - PURE (300 W)
  - BLEND (200 W)
  - FULGURATE (120 W)
  - SOFT (120 W)
  - VALLEYLAB (200 W)
  - SHARED SPRAY Dual (120 W)
5. If using the leakage table, leakage current directly at the generator terminals should not exceed 100 mA for any mode. If the measurements still exceed 100 mA, contact Covidien Technical Service (see page 10-6) for further instructions.



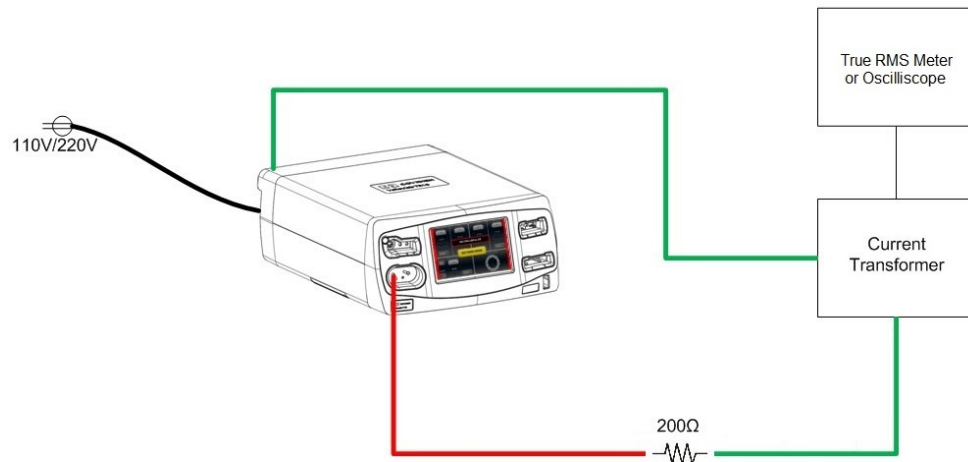
## Checking Bipolar High-Frequency Leakage Current

### Notice

The system must be in *RF Output Test Screen* mode to activate the receptacle. See *RF Output Test Screen* on page 6-7 for proper screen setup.

1. Remove the monopolar accessories and connect the left output tine of the bipolar receptacle to one side of the 200 Ω load. Connect the equipotential ground lug on the rear of the system through the current transformer, to the other side of the 200 Ω load.
2. Manually activate the Bipolar HIGH effect using the *RF Output Test Screen* at 95 W. Record the leakage current. It should not exceed 69 mA for any Bipolar mode.
3. Press the **DEACTIVATE HOLD VALUES** button to deactivate RF energy.
4. Repeat steps 1 – 3 for the right tine.

5. If the high-frequency leakage exceeds 69 mA, contact Covidien Technical Service (see page 10-6) for further instructions.

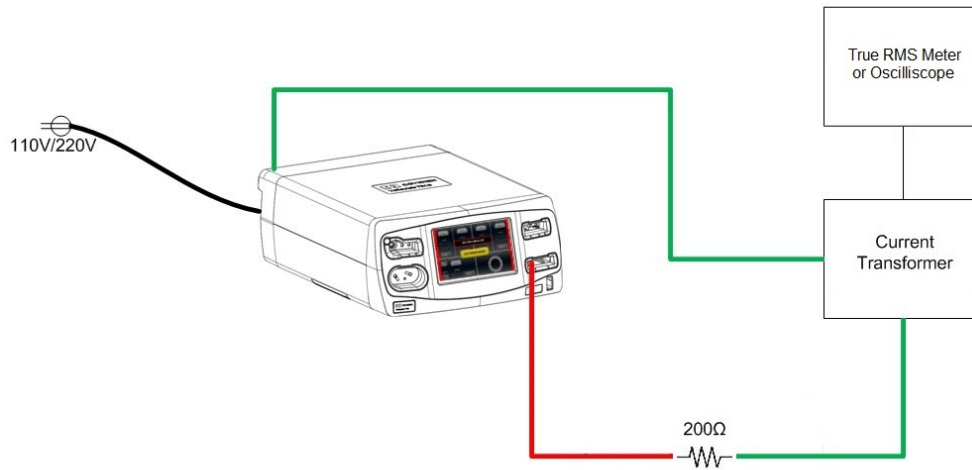


## Checking LigaSure/Bipolar High-Frequency Leakage Current

### Notice

The system must be in *RF Output Test Screen* mode to activate the receptacle. See *RF Output Test Screen* on page 6-7 for proper screen setup.

1. Connect the left output tine of the LigaSure/Bipolar receptacle to one side of the 200  $\Omega$  load. Connect the equipotential ground lug on the rear of the system through the current transformer to the other side of the 200  $\Omega$  load.
2. In *RF Output Test Screen*, set the mode to LigaSure, the power to 350 W, and touch the **ACTIVATE** button. Record the leakage current. The leakage current should not exceed 100 mA for any mode.
3. Press the **DEACTIVATE HOLD VALUES** button to deactivate RF energy.
4. Repeat steps 1 – 3 for the following setups:
  - Connect to the right output tine with Ligasure power set to 350 W.
  - Connect to the right output tine with Bipolar Resection CUT set to effect 6.
  - Connect to the left output tine with Bipolar Resection CUT set to effect 6.
  - Connect to the left output tine with Bipolar Resection COAG set to effect 6.
  - Connect to the right output tine with Bipolar Resection COAG set to effect 6.
5. If the high-frequency leakage exceeds 100 mA, contact Covidien Technical Service (see page 10-6).



## Safety Testing in Accordance with IEC 60601-1

Check the low-frequency leakage current before returning the VLFT10GEN to clinical use.

### Equipment list

- Safety tester

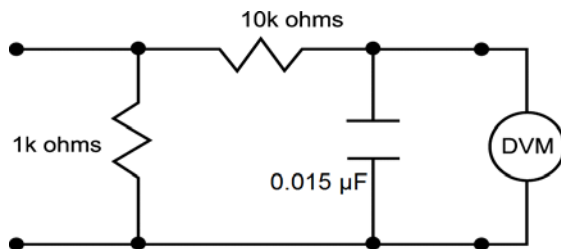
**Note:** Low-frequency tests are conducted at 10% above line voltage.

## Checking Low-Frequency Leakage Current

Check the low-frequency leakage current before returning the VLFT10GEN to clinical use.

### Equipment list

- Digital Voltage Meter (DVM)
- Leakage current measuring device (pictured below)



1 millivolt = 1 microamp

## **Chassis or Earth Leakage**

1. Set the DVM to AC volts (200 mV) and connect the leakage current measuring device.
2. Turn on the system.
3. Measure between the chassis and earth ground.
4. Determine the leakage current using the conventional 1  $\mu$ A for each 1 mV.
5. Verify under normal conditions (ground closed, normal polarity) the leakage current is less than 300  $\mu$ A. If the leakage current is greater than 300  $\mu$ A, contact Covidien Technical Service (see page 10-6).
6. Verify that in single fault conditions (open neutral) the leakage current is less than or equal to 1000  $\mu$ A. If the leakage current is greater than 1000  $\mu$ A, contact Covidien Technical Service (see page 10-6).

## **Total Patient Leakage Source Current**

1. Set the DVM to AC volts (200 mV) and connect the leakage current test circuit.
2. Turn on the system.
3. Measure between all the output receptacles (including the Patient Return Electrode receptacle) and earth ground. Record the largest reading.
4. Determine the leakage current using the conventional 1  $\mu$ A for each 1 mV.
5. Verify that under normal conditions (ground closed, normal polarity) the leakage current is less than 10  $\mu$ A. If the leakage current is greater than 10  $\mu$ A, contact Covidien Technical Service (see page 10-6).
6. Verify that in single fault conditions (ground open) the leakage current is less than or equal to 50  $\mu$ A. If the leakage current is greater than 50  $\mu$ A, contact Covidien Technical Service (see page 10-6).

## **Total Patient Leakage Sink Current**

1. Set the DVM to AC volts (200 mV) and connect the leakage current test circuit.
2. Turn on the system and connect the end of the leakage current test circuit to mains voltage through a 120  $\Omega$ ,  $\frac{3}{4}$  W resistor.
3. Connect the other side of the IEC leakage load to all of the output receptacles (including the Patient Return Electrode receptacle)
4. Determine the leakage current using the conventional 1  $\mu$ A for each 1 mV.
5. Verify that the leakage current is less than or equal to 50  $\mu$ A. If the leakage current is greater than 50  $\mu$ A, contact Covidien Technical Service (see page 10-6).

## Ground Continuity Testing

1. Connect the system to a ground continuity tester or a digital multimeter (DMM).
2. Test between the equipotential ground lug on the rear of the system and the supplied Covidien power cord, or directly to the middle ground pin of the inlet receptacle.
3. Initiate the test according to IEC standards.
4. Maximum permissible values are 0.3 ohms using a Covidien-supplied power cord or 0.2 ohm connected directly to the middle pin of the inlet receptacle. If the specifications are not met, contact Covidien Technical Service (see page 10-6).

## Preventive Maintenance Check Sheet

Unit Serial Number

Date of Maintenance

### Initial Inspection

|                                               |               |
|-----------------------------------------------|---------------|
| Rear-panel inspection                         | Accept Y or N |
| Front-panel inspection                        | Accept Y or N |
| Foot-pedal inspection                         | Accept Y or N |
| Power-cord inspection                         | Accept Y or N |
| Internal-component inspection (if applicable) | Accept Y or N |

### Power Up Check

|                                     |               |
|-------------------------------------|---------------|
| System self-check                   | Accept Y or N |
| Handswitch activation               | Accept Y or N |
| Foot-pedal activation               | Accept Y or N |
| Auto Bipolar activation             | Accept Y or N |
| Tone audible at high and low ranges | Accept Y or N |

**Power Output**Testing COAG output Monopolar 1 – 500  $\Omega$ 

| Power Setting | Energy Mode | Specifications | Reading | Pass/Fail |
|---------------|-------------|----------------|---------|-----------|
| 120 W         | SPRAY       | 424 to 570 mA  |         | P / F     |

Testing COAG output Monopolar 2 – 500  $\Omega$ 

| Power Setting | Energy Mode | Specifications | Reading | Pass/Fail |
|---------------|-------------|----------------|---------|-----------|
| 120 W         | SPRAY       | 424 to 570 mA  |         | P / F     |
| 10 W          | SPRAY       | 101 to 181 mA  |         | P / F     |
| 30 W          | FULGURATE   | 205 to 285 mA  |         | P / F     |

Testing COAG output Monopolar 2 – 100  $\Omega$ 

| Power Setting | Energy Mode | Specifications | Reading | Pass/Fail |
|---------------|-------------|----------------|---------|-----------|
| 120 W         | SOFT        | 948 to 1274 mA |         | P / F     |

Testing CUT output Monopolar 2 – 300  $\Omega$ 

| Power Setting | Energy Mode | Specifications | Reading | Pass/Fail |
|---------------|-------------|----------------|---------|-----------|
| 10 W          | PURE        | 143 to 223 mA  |         | P / F     |
| 300 W         | PURE        | 865 to 1163 mA |         | P / F     |
| 200 W         | BLEND       | 707 to 949 mA  |         | P / F     |

Testing VALLEYLAB mode output Monopolar 2 – 300  $\Omega$ 

| Power Setting | Energy Mode | Specifications | Reading | Pass/Fail |
|---------------|-------------|----------------|---------|-----------|
| 75 W          | VALLEYLAB   | 433 to 581 mA  |         | P / F     |

Bipolar output – 100  $\Omega$

| Power Setting | Energy Effect  | Specifications | Reading | Pass/Fail |
|---------------|----------------|----------------|---------|-----------|
| 95 W          | Bipolar HIGH   | 843 to 1133 mA |         | P / F     |
| 40 W          | Bipolar MEDIUM | 547 to 735 mA  |         | P / F     |
| 15 W          | Bipolar LOW    | 335 to 450 mA  |         | P / F     |

Testing LigaSure/Bipolar output

| Power Setting | Energy Effect            | Specifications  | Reading | Pass/Fail |
|---------------|--------------------------|-----------------|---------|-----------|
| Effect 6      | Bipolar Resection - COAG | 1145 to 1538 mA |         | P / F     |
| Effect 6      | Bipolar Resection - CUT  | 547 to 735 mA   |         | P / F     |
| 5 W           | LigaSure                 | 276 to 357 mA   |         | P / F     |
| 350 W         | LigaSure                 | 1940 to 2740 mA |         | P / F     |

**REM Function**

|                                                       |               |
|-------------------------------------------------------|---------------|
| Receive a green indicator at 100 $\Omega$             | Accept Y or N |
| Measured impedance within 93 $\Omega$ to 107 $\Omega$ | Accept Y or N |
| Measured impedance within 43 $\Omega$ to 57 $\Omega$  | Accept Y or N |
| Receive a red indicator at 0 $\Omega$                 | Accept Y or N |
| Measured impedance within 0 $\Omega$ to 4 $\Omega$    | Accept Y or N |
| Open Circuit REM Measurement less than 2000 $\Omega$  | Accept Y or N |

**Cross Coupling**

| Energy Channel Tested | Energy Mode/ Effect   | Specifications | Reading | Pass/Fail |
|-----------------------|-----------------------|----------------|---------|-----------|
| Monopolar 1           | Bipolar Resection CUT | 0 to 150 mA    |         | P / F     |
|                       | Bipolar HIGH          | 0 to 150 mA    |         | P / F     |
|                       | Mono 2 SPRAY          | 0 to 150 mA    |         | P / F     |
|                       | Mono 2 Pure           | 0 to 150 mA    |         | P / F     |
| Monopolar 2           | Mono 1 Pure           | 0 to 150 mA    |         | P / F     |
|                       | Mono 1 SPRAY          | 0 to 150 mA    |         | P / F     |
|                       | Bipolar HIGH          | 0 to 150 mA    |         | P / F     |
|                       | Bipolar Resection CUT | 0 to 150 mA    |         | P / F     |
| Bipolar               | Bipolar Resection CUT | 0 to 50 mA     |         | P / F     |
|                       | Mono 2 SPRAY          | 0 to 50 mA     |         | P / F     |
|                       | Mono 1 Pure           | 0 to 50 mA     |         | P / F     |
| LigaSure/Bipolar      | Mono 1 Pure           | 0 to 50 mA     |         | P / F     |
|                       | Bipolar HIGH          | 0 to 50 mA     |         | P / F     |
|                       | Mono 2 SPRAY          | 0 to 50 mA     |         | P / F     |

**High-Frequency Leakage**

| <b>Power</b>                | <b>Energy Mode/<br/>Effect</b>           | <b>Specifications</b> | <b>Reading</b> | <b>Pass/Fail</b> |
|-----------------------------|------------------------------------------|-----------------------|----------------|------------------|
| Monopolar 1<br>Leakage      | SPRAY                                    | 0 to 100 mA           |                | P / F            |
|                             | SPRAY                                    | 0 to 100 mA           |                | P / F            |
| Patient Return<br>Leakage   | PURE                                     | 0 to 100 mA           |                | P / F            |
|                             | BLEND                                    | 0 to 100 mA           |                | P / F            |
|                             | FULGURATE                                | 0 to 100 mA           |                | P / F            |
|                             | SOFT                                     | 0 to 100 mA           |                | P / F            |
|                             | VALLEYLAB                                | 0 to 100 mA           |                | P / F            |
|                             | SHARED SPRAY Dual                        | 0 to 100 mA           |                | P / F            |
|                             |                                          |                       |                |                  |
| Bipolar<br>Leakage          | HIGH (left tine)                         | 0 to 69 mA            |                | P / F            |
|                             | HIGH (right tine)                        | 0 to 69 mA            |                | P / F            |
| LigaSure/Bipolar<br>Leakage | LigaSure (left tine)                     | 0 to 100 mA           |                | P / F            |
|                             | LigaSure (right tine)                    | 0 to 100 mA           |                | P / F            |
|                             | Bipolar Resection -<br>CUT (right tine)  | 0 to 100 mA           |                | P / F            |
|                             | Bipolar Resection -<br>CUT (left tine)   | 0 to 100 mA           |                | P / F            |
|                             | Bipolar Resection -<br>COAG (left tine)  | 0 to 100 mA           |                | P / F            |
|                             | Bipolar Resection -<br>COAG (right tine) | 0 to 100 mA           |                | P / F            |
|                             |                                          |                       |                |                  |

**Safety Test in Accordance with IEC 60601-1**

| <b>Power</b>                                                            | <b>Energy Mode/<br/>Effect</b> | <b>Specifications</b>                                                            | <b>Reading</b> | <b>Pass/Fail</b> |
|-------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------|----------------|------------------|
| Earth Leakage                                                           | Normal Conditions              | 0 to 300 $\mu$ A                                                                 |                | P / F            |
|                                                                         | Open Neutral                   | 0 to 1000 $\mu$ A                                                                |                | P / F            |
| Total Patient<br>Leakage Source<br>Current                              | Normal Conditions              | 0 to 50 $\mu$ A                                                                  |                | P / F            |
|                                                                         | Open Ground                    | 0 to 100 $\mu$ A                                                                 |                | P / F            |
| Total Patient<br>Leakage Sink<br>Current<br>(Mains to<br>applied parts) | Normal Conditions              | 0 to 100 $\mu$ A                                                                 |                | P / F            |
| Ground Bond<br>Test                                                     |                                | 0 to 0.3 ohms<br>with power<br>cord or<br>0 to 0.2 ohms<br>without power<br>cord |                | P / F            |

# Chapter 7

## Calibrations

This chapter describes how to calibrate the VLFT10GEN.

After unpacking or servicing the system, set up the system, perform any required calibration, and verify correct functionality (see Chapter 6, *Testing Setup and Functional Tests*).

If the system does not satisfactorily complete the power-on self-test, then cycle the system power. If the VLFT10GEN continues to fail the self-test, contact Covidien Technical Service.

## Touchscreen Calibration

Covidien recommends that only qualified personnel calibrate the VLFT10GEN. Covidien defines qualified personnel as someone with experience in electrosurgical equipment repair, such as biomedical personnel, or individuals who have taken official Covidien training courses.

During calibration, the user verifies system-specific information and adjusts the information if necessary.

Calibration may be required when components are replaced. Refer to Chapter 9, *Replacement Procedures* to determine the level of required calibration.

### Notice

Calibration must be performed on a non-conductive surface. Do not use antistatic bench-top mats. When performed on a conductive surface, calibration values may not be accurate.

After completing any calibration section, the system will reboot to the clinical screen to save the values.

### Recommended test equipment:

- Stylus pencil (or equivalent)
1. Touch the Service/Settings button on the front panel.
  2. Touch the **Service** button on the display.

### Important

If the touchscreen is inoperable, the touchscreen calibration can be accessed by holding down the service button for 5–10 seconds, and following the on-screen instructions.

3. Enter password (423213) and select the **OK** button.
4. Touch the **Touchscreen Calibration Verification** button on the display.
5. Press **Start Calibration** in the display to calibrate the touchscreen. The generator will restart.
6. Using a stylus (or equivalent) gently tap the center of the cross-hair targets. Touch all targets.

### Important

Touch and release the targets quickly. Holding the target down will interfere with accurate screen calibration.

7. Upon completion of the touchscreen calibration, the generator will restart.
8. After the generator has restarted, press **Start Verification** in the display to determine if the touchscreen has been properly calibrated.
9. Press **Next** to begin verification of the touchscreen calibration.
10. Using a stylus (or equivalent) gently tap the center of the highlighted targets as they appear on the display panel. The display will identify which targets were touched

correctly (indicated with a check mark), and which were touched incorrectly (indicated with an X).

11. When the touchscreen verification is complete, a new screen will summarize how many targets, if any, were missed.
12. If no targets were missed, there is no need to calibrate the touchscreen. You may exit the touchscreen verification/calibration screen by touching **OK**.
13. If any targets were missed, the screen provides the option to restart touchscreen verification, start touchscreen calibration, or exit the touchscreen verification/calibration screen.
  - To exit the touchscreen verification/calibration screen, touch the **OK** button.
  - To restart the touchscreen verification, touch the **Restart Verification** button and repeat steps 10 through 13 in this section.
  - To start touchscreen calibration, touch the **Start Calibration** button and perform the following steps.

## Energy Calibration

Covidien recommends that only qualified personnel calibrate the VLFT10GEN. Covidien defines qualified personnel as someone with experience in electrosurgical equipment repair, such as biomedical personnel, or individuals who have taken official Covidien training courses.

During calibration, the user verifies system-specific information and adjusts the information if necessary.

Calibration may be required when components are replaced. Refer to Chapter 9, *Replacement Procedures* to determine the level of required calibration.

### Warning

**Electric Shock Hazard** When taking measurements or troubleshooting the system, take appropriate precautions, such as using isolated tools and equipment, using the “one hand rule”, etc.

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

### Notice

When testing RF equipment, follow these test procedures. Keep test leads to the minimum length usable; lead inductance and stray capacitance can adversely affect readings. Carefully select suitable ground points to avoid ground loop error in measurements.

The accuracy of most RF instruments is approximately 1%–5% of full scale. Using uncompensated scope probes causes large errors when measuring high-voltage RF waveforms.

Calibration must be performed on a non-conductive surface. Do not use antistatic bench-top mats. When performed on a conductive surface, calibration values may not be accurate.

After completing any calibration section, the system will reboot to the clinical screen to save the values.

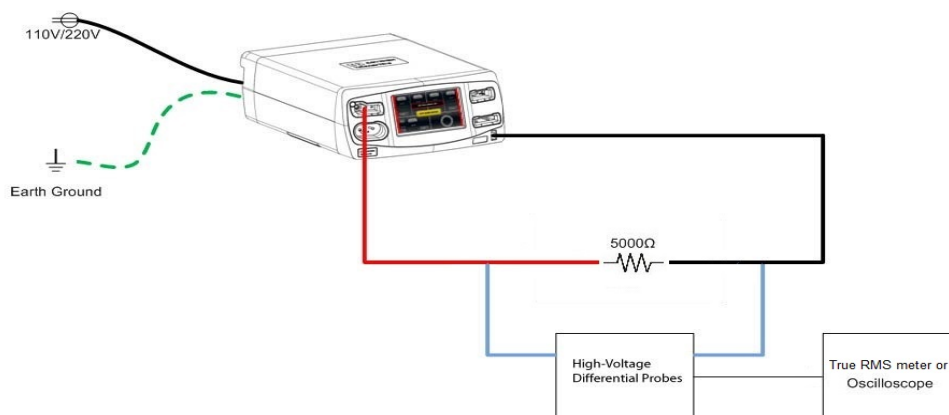
### Required test equipment:

- 5  $\Omega$ , and 5000  $\Omega$ , all 250 W, 1% tolerance, non-inductive resistive loads
- Current transformer - 10 MHz bandwidth or greater
- True RMS meter or oscilloscope
- High-voltage differential probe -  $\pm$  5000 V or greater - 10 MHz bandwidth or greater
- REM plug
- Banana-plug style cables

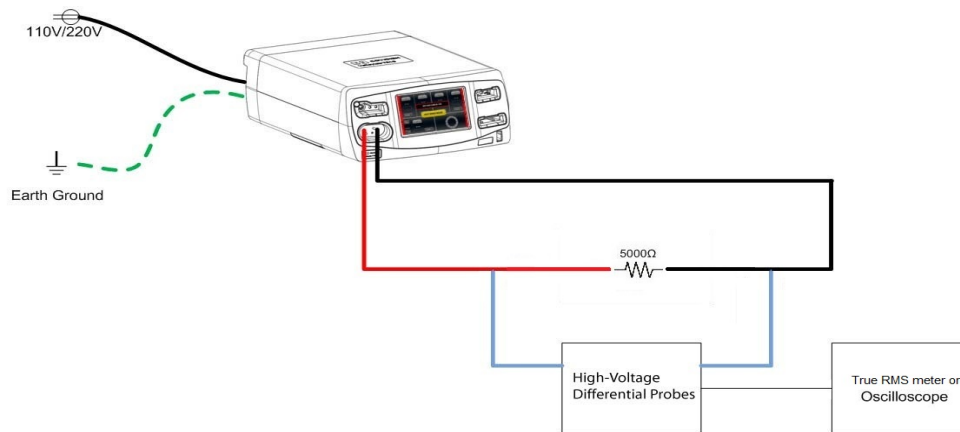
1. Select Service/Settings button on the front panel.
2. Touch the **Service** button on the display.
3. Enter password (423213) and select the **OK** button.
4. Touch **Energy Calibration** on the display.
5. Connect a cable from the left tine of the Monopolar 1 receptacle to one side of the 5000  $\Omega$  resistor.
6. Connect a cable from the shorted REM receptacle to the other side of the 5000  $\Omega$  resistor.
7. Connect the high-voltage differential probes to each side of the 5000  $\Omega$  resistor.

#### Important

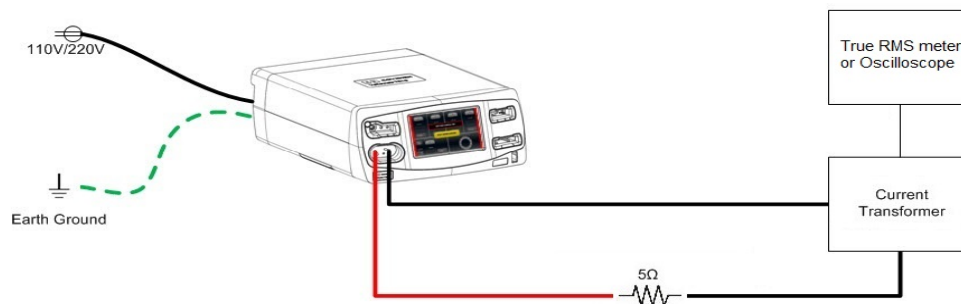
Configure the probe and oscilloscope scaling appropriately otherwise an incorrect calibration will result.



8. Press the **Start** button and adjust the output on the generator screen to move the RMS output measurement on the oscilloscope as close to the target as possible.
9. Once the target voltage is met, select the **Accept** button. The device will take measurements, then deactivate RF.
10. Select the **Next Step** button.
11. Repeat steps 8, 9, and 10 until all levels of calibration for Monopolar 1 are completed.
12. After completion of Monopolar 1, connect a cable from the left tine of the Bipolar receptacle to one side of the 5000  $\Omega$  resistor.
13. Connect a cable from the right tine of the Bipolar receptacle to the other side of the 5000  $\Omega$  resistor.
14. Connect the high-voltage differential probes to each side of the 5000  $\Omega$  resistor.



15. Repeat steps 8, 9, and 10 until all prompted steps of voltage calibration for Bipolar are completed.
16. After completion of Bipolar, connect a single cable from the left tine of the Bipolar receptacle to one side of the 5  $\Omega$  resistor.



17. Connect a cable from the right tine of the Bipolar receptacle, through the current transformer, to the other side of the 5  $\Omega$  resistor.
  18. Press the **Start** button and adjust the output on the generator screen to move the RMS output measurement on the RMS voltage meter as close to the target as possible.
  19. Once the target amperage is met, select the **Accept** button. The device will take measurements, then deactivate RF.
  20. Select **Next Step** button.
  21. Repeat steps 18, 19, and 20 until all levels of calibration for Bipolar are completed.
  22. Accept the calibration values by selecting the **Save New Calibration** button.
- The system will automatically restart.

#### Important

If Energy Calibration is stopped before completion, the device will revert to the previous calibration settings.

## Periodic Safety Check (Routine Maintenance)

Perform the following safety check once a year, or as directed in Chapter 8, to verify that the system is functioning properly. Record the test results for reference in future tests. Copy the check sheet at the end of this chapter for use in recording the results. Keep the completed check sheet for future reference. If the system fails to meet any of the checks, refer to Chapter 8, *Troubleshooting*.

### Warning

**Electric Shock Hazard** When taking measurements or troubleshooting the system, take appropriate precautions, such as using isolated tools and equipment, using the “one hand rule”, etc.

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

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

When testing RF equipment, follow these test procedures. Keep test leads to the minimum length usable; lead inductance and stray capacitance can adversely affect readings. Carefully select suitable ground points to avoid ground loop error in measurements.

The accuracy of most RF instruments is approximately 1%–5% of full scale. Using uncompensated scope probes causes large errors when measuring high-voltage RF waveforms.

Full definitions of the periodic safety checks are found throughout the remainder of this section. A summary of the periodic safety check is:

- Inspect the system and accessories
- Inspect the internal components (when required)
- System self-test
- Verify the audio
- Verify the power output
- Verify REM function
- Verify cross coupling
- Check leakage current and ground resistance

## Inspecting the System and Accessories

### Equipment list

- Monopolar foot pedal
- Bipolar foot pedal
- Ligasure foot pedal
- Monopolar instrument (preferred) or test leads
- Bipolar instrument cord (preferred) or test leads
- LigaSure instrument (preferred) or test leads

For a rear-panel inspection, turn off the system, and disconnect the power cord from the wall receptacle.

### Rear Panel

1. Check the rear-panel foot pedal receptacles for obstructions or damage. Check for a secure fit by inserting the foot pedal connector into the Bipolar, Monopolar 1, Monopolar 2, and LigaSure/Bipolar foot pedal connectors.
2. If any foot pedal connector is damaged or unusable, return the system to Covidien Technical Service. For more information, see *Covidien Technical Service* on page 10-6.
3. Remove the fuse and verify correct voltage and current rating for usage environment. Refer to *Input Power* on page 4-3.

### Front Panel

1. Turn on the generator and navigate to Demo Mode. See *DEMO Mode* on page 5-7.
2. Check the Monopolar 1 and Monopolar 2 instrument receptacles for obstructions or damage:
  - Insert a standard two-button pencil into the Monopolar 1 and Monopolar 2 receptacles to verify a secure fit
  - Insert a Force TriVerse electrosurgical pencil into the Monopolar 2 receptacle to verify a secure fit.
  - Verify the appropriate Monopolar quadrant on the display becomes active, indicating the instrument has been detected:
    - For the standard two-button electrosurgical pencil, the Standard Monopolar controls become active in the adjacent Monopolar quadrant.
    - For the Force TriVerse electrosurgical pencil, the Valleylab mode is available in the Monopolar 2 quadrant.
3. If either of the monopolar receptacles is damaged, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
4. Check the Patient Return Electrode (REM) receptacle for a broken pin or an obstruction.

5. If the REM receptacle is damaged or obstructed, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
6. Check the Bipolar instrument receptacle for obstructions or damage:
  - Insert the bipolar instrument or cable into the receptacle to verify a secure fit.
  - Verify the Bipolar quadrant on the touchscreen becomes active, indicating the instrument has been detected.
7. If the bipolar receptacle is damaged, return the system to Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
8. Check the LigaSure/Bipolar receptacle for obstructions or damage:
  - Insert a compatible LigaSure instrument into receptacle to ensure a secure fit.
  - Verify the LigaSure quadrant of the touchscreen becomes active, indicating the instrument has been detected:
9. If the LigaSure/Bipolar receptacle is damaged or the “Invalid Instrument” message appears, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).

#### **Foot Pedals**

1. Remove the foot pedal from the system.
2. Inspect the connector and receptacle for damage or corrosion.
3. Inspect the foot pedal for damage.
4. Reconnect the foot pedal to the system.

#### **Power Cord**

1. Verify the cord is unplugged from the wall receptacle and remove the power cord from the system.
2. Inspect the power connector and receptacle for damage.
3. Inspect the power cord for damage.
4. Reconnect the power cord to the system.
5. Turn on the generator to test functionality.

## Inspecting Internal Components (when required)

This section is only required when the system is open for troubleshooting, repair, or spare replacement.

### Equipment list

- Torx T30 screwdriver

#### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

1. Turn off power to the system and remove the power cord from the wall outlet and the generator power cord receptacle.
2. Remove the four bolts that secure the cover to the chassis.

#### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Slide the front and back bezels away from the main chassis to release the locking/alignment features.
4. Lift the cover off the chassis. Set the cover aside for reinstallation.
5. Remove the top E-PAC foam layer. Set aside the foam for reinstallation.
6. Verify that all connectors are firmly seated.
7. If further investigation is required, remove subsequent E-PAC foam layers and housed PCBAs.
8. Inspect each PCBA for damaged components or wires, cracks, and corrosion.
9. If there is evidence of damage on the Controller PCBA, Steering Relay PCBA, Front Panel, Footswitch PCBA, or the RF PCBA, contact Covidien Technical Service (see *Covidien Technical Service* on page 10-6).
10. Inspect the entire device for loose debris. If any debris exists, carefully remove the debris before proceeding.
11. Replace the cover using the four mounting bolts to secure.

## Power Up Check

### System Self Test

Turning on the system initiates an internal power-on self-test to verify the calibration. The self-test also checks the operation of the speaker, all indicators, and the display.

#### Warning

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

1. There are two ways to run a system self-test:
  - If the System is OFF, turn on the system by pressing the **On/Off** button on the front panel.
  - If the system is ON, navigate to the system self-test screen by pressing the gears button on the front panel, touching the **System** button on the touchscreen, touching the **Diagnostics** button on the touchscreen, and then touching the **Self-Test** button on the touchscreen.
2. Verify the following:
  - All visual indicators and display on the front panel illuminate.
  - Test tones sound to verify that the speaker is working properly.
3. If the power-on self-test is successful, the following occurs:
  - The display illuminates and shows all 4 quadrants.
  - The REM alarm indicator illuminates.

or
4. If the self-test is not successful, an alarm tone sounds. An error screen appears on the display. Note the information on this display and refer to Chapter 8, *Troubleshooting*.
5. Activate the monopolar instruments by pressing the handswitches to test functionality.
6. Set Auto Bipolar.
7. Activate the bipolar instrument by closing the tines to test functionality.
8. Activate the foot pedal with a corresponding instrument inserted to test functionality and confirm the audio tone.

### Verifying the Audio

1. Press the **Audio** button on the front panel.
2. Press the **+** and **-** buttons on the display. Verify that the audio is active after each +/- button press and is distortion free.



# Chapter 8

## Troubleshooting

### Precaution

Read the instructions, warnings, and precautions provided with this energy platform and associated accessories before using. Specific instructions for electrosurgical instruments are not included in this manual.

## General Troubleshooting Guidelines

If the VLFT10GEN malfunctions, check for obvious conditions that may have caused the problem:

- Check the system for visible signs of physical damage.
- Make sure the fuse drawer is tightly closed.
- Verify that all cords are connected and attached properly.
- If an error code is displayed on the touchscreen, note the code along with all information in the error log (See *Logs* on page 5-7) and use the information in this chapter to proceed.
- If the problem is still unclear, turn the VLFT10GEN off, wait 10 seconds before turning on again.

If the malfunction persists, the system may require service. Contact your institution's biomedical engineering department. Covidien Technical Service contact information is listed on page 10-6.

## REM Alarms

If the VLFT10GEN does not sense the correct impedance for the connected REM Polyhesive patient return electrode, monopolar energy is disabled, the REM indicator on the front panel illuminates red, the REM message appears on the touchscreen, and an alarm tone sounds twice. After some time, the REM message disappears, the REM symbol appears and remains red, and RF energy remains disabled until the REM alarm is corrected.

When you correct a REM-alarm condition, the system is enabled and the REM-alarm indicator on the front panel illuminates green.

### Precaution

Covidien REM Polyhesive patient return electrodes are recommended for use with the VLFT10GEN. Return electrodes from other manufacturers may not provide proper impedance to work correctly with the energy platform.

### Notice

Alarm characteristics cannot be changed.

## Correcting a REM-Alarm Condition

To correct a REM-alarm condition, follow these steps:

1. Inspect the return-electrode plug and cord. If there is evidence of cracks, breaks, or other visible damage, replace the return electrode and/or the cord.
2. Verify that the patient-return-electrode cord is correctly connected to the energy platform.

3. Verify that there is full contact between the patient and return electrode. Follow the instructions for use provided with the REM Polyheseive patient return electrode to ensure proper attachment.
4. If the REM alarm persists, it may be necessary to use more than one patient return electrode. Refer to the troubleshooting flow chart in the REM Polyheseive patient return electrode instructions for use for more detail.

## Correcting Malfunctions

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 system completes the self-test as described in Chapter 5, *System Setup*.

| Situation                                                               | Possible Cause                                        | Solution                                                                                                                                    |
|-------------------------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Abnormal neuromuscular stimulation ( <i>stop surgery immediately</i> ). | Metal-to-metal sparking.                              | Check all connections to the energy platform, patient return electrode, and active electrodes.                                              |
|                                                                         | High settings used for the FULGURATE and SPRAY modes. | Use a lower power setting for the FULGURATE and the SPRAY modes.                                                                            |
|                                                                         | Abnormal 50–60 Hz leakage currents.                   | Contact your biomedical engineering department or a Covidien technical service representative for assistance.                               |
| Energy platform does not respond when turned on.                        | Disconnected power cord or faulty wall outlet.        | Check power cord connections (energy platform and wall outlet). Connect the power cord to a functional outlet.                              |
|                                                                         | Faulty power cord.                                    | Replace the power cord.                                                                                                                     |
|                                                                         | Fuse drawer is open or fuses are blown.               | Replace the blown fuse(s). Close the fuse drawer. See Chapter 4, <i>Technical Specifications</i> .                                          |
|                                                                         | Internal component malfunction.                       | Use a backup energy platform. Contact your biomedical engineering department or a Covidien technical service representative for assistance. |

| Situation                                                                              | Possible Cause                                         | Solution                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System is on, but did not complete the self-test.                                      | Software malfunction.                                  | Turn off the energy platform, then turn on.                                                                                                                                                                                                                                     |
|                                                                                        | Internal component malfunction.                        | Note the code along with all information on the error screen. Note the number and refer to <i>System Errors</i> on page 8-8.<br><br>Use a backup energy platform. Contact your biomedical engineering department or a Covidien technical service representative for assistance. |
| Energy platform is on and instrument is activated, but system does not deliver output. | Malfunctioning foot pedal or handswitching instrument. | Turn off the energy platform. Check and correct all instrument connections.<br><br>Turn on the energy platform. Replace the instrument if it continues to malfunction.                                                                                                          |
|                                                                                        | Power is set too low or turned off.                    | Increase the power setting.                                                                                                                                                                                                                                                     |
|                                                                                        | An alarm condition exists.                             | Note the code along with all information on the error screen. Refer to <i>System Errors</i> on page 8-8.<br><br>In case of a REM alarm, refer to <i>Correcting a REM-Alarm Condition</i> on page 8-2.                                                                           |
|                                                                                        | Internal component malfunction.                        | Contact your biomedical engineering department or a Covidien technical service representative for assistance.                                                                                                                                                                   |
|                                                                                        | System does not detect tissue-fusion instrument.       | Firmly insert the LigaSmart connector into the appropriate receptacle on the energy platform front panel. Ensure the LigaSure quadrant indicates that it has detected the instrument.                                                                                           |

| Situation                        | Possible Cause                                                                                                                                                                    | Solution                                                                                                                                                                                          |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  | System does not detect monopolar instrument.                                                                                                                                      | Firmly insert the monopolar connector into the appropriate receptacle on the energy platform front panel. Ensure the associated Monopolar quadrant indicates that it has detected the instrument. |
|                                  | System does not detect bipolar instrument.                                                                                                                                        | Firmly insert the bipolar connector into the appropriate receptacle on the energy platform front panel. Ensure the Bipolar quadrant indicates that it has detected the instrument.                |
| Continuous monitor interference. | Malfunctioning monitor.                                                                                                                                                           | Replace the monitor.                                                                                                                                                                              |
|                                  | Faulty chassis-to-ground connections.                                                                                                                                             | Check and correct the chassis ground connections for the monitor and for the energy platform.<br><br>Check other electrical equipment in the room for defective grounds.                          |
|                                  | Electrical equipment is grounded to different objects rather than a common ground. The energy platform may respond to the resulting voltage differences between grounded objects. | Plug all electrical equipment into line power at the same location. Contact your biomedical engineering department or a Covidien technical service representative for assistance.                 |

| Situation                                                                   | Possible Cause                                                                                                      | Solution                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interference with other devices only when the energy platform is activated. | Metal-to-metal sparking.                                                                                            | Check all connections to the energy platform, patient return electrode, and instruments.                                                                                                                                                                                                                                                       |
|                                                                             | High settings used for the FULGURATE and SPRAY modes                                                                | Use lower power settings for the FULGURATE and SPRAY modes.                                                                                                                                                                                                                                                                                    |
|                                                                             | 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 energy platform is activated, the monitor is responding to radiated frequencies. | <p>Ask your biomedical engineering department to check with the manufacturer of the monitor.</p> <p>Some manufacturers offer RF choke filters for use in monitor leads. The filters reduce interference when the energy platform is activated and minimize the potential for an electrosurgical burn at the site of the monitor electrode.</p> |

| Situation                                        | Possible Cause                                                                                                       | Solution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pacemaker interference.                          | Intermittent connections or metal-to-metal sparking.                                                                 | Check the active and patient return electrode cord connections.<br><br>It may be necessary to reprogram the pacemaker.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                  | Current traveling from active to return electrode during monopolar electrosurgery is passing too close to pacemaker. | Consult the pacemaker manufacturer or hospital cardiology department for further information when use of electrosurgical appliances is planned in patients with cardiac pacemakers.<br><br>Use bipolar instruments, if possible.<br><br>If you must use a monopolar instrument, place the patient return electrode as close as possible to the surgical site. 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.<br><br>Always monitor patients with pacemakers during surgery and keep a defibrillator available. |
| Internal Cardiac Defibrillator (ICD) activation. | ICD is activated by energy platform.                                                                                 | Stop the procedure and contact the ICD manufacturer for instructions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Touchscreen button does not respond to touch.    | Touchscreen is out of calibration.                                                                                   | Request biomedical department to perform touchscreen calibration as described in the service manual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                  | Touchscreen is broken.                                                                                               | Request biomedical department to replace the touchscreen as described in the service manual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## System Errors

Most system errors require some action on the user's part to correct the condition; however, some are corrected automatically. Use the following list to determine how to correct an error condition.

After correcting the error condition, verify that the system completes the self-test as described in Chapter 5, *System Setup*.

All errors are classified as Technical Alarm Conditions in IEC 60601-1-8, with the exception of E402, E403, E404, E405, E419, E422, and E426 (classified as Other Alarm Conditions).

**Note:** Alarm priorities marked with \* signify a high priority if the error is discovered during POST, and medium priority if the error occurs at any time outside of POST.

### Error Codes

| Error Code | Title        | Description          | Troubleshooting | Possible Source(s) | Alarm Priority |
|------------|--------------|----------------------|-----------------|--------------------|----------------|
| E101       | System Error | FPGA Failure         | Contact Biomed  | Controller PCBA    | High Priority  |
| E102       | System Error | CPLD Failure         | Contact Biomed  | Controller PCBA    | High Priority  |
| E103       | System Error | FPGA Failure         | Contact Biomed  | Controller PCBA    | High Priority  |
| E104       | System Error | Boot Sector Failure  | Contact Biomed  | Controller PCBA    | High Priority  |
| E105       | System Error | RAM Test Failure     | Contact Biomed  | Controller PCBA    | High Priority  |
| E106       | System Error | Processor Exception  | Contact Biomed  | Controller PCBA    | High Priority  |
| E107       | System Error | Unexpected Interrupt | Contact Biomed  | Controller PCBA    | High Priority  |
| E201       | System Error | Storage Failure      | Contact Biomed  | Controller PCBA    | High Priority  |
| E202       | System Error | RTOS Failure         | Contact Biomed  | Controller PCBA    | High Priority  |
| E203       | System Error | OS Failure           | Contact Biomed  | Controller PCBA    | High Priority  |
| E204       | System Error | Assert Error         | Contact Biomed  | Controller PCBA    | High Priority  |
| E205       | System Error | Null Pointer Error   | Contact Biomed  | Controller PCBA    | High Priority  |

| Error Code | Title        | Description               | Troubleshooting | Possible Source(s)            | Alarm Priority |
|------------|--------------|---------------------------|-----------------|-------------------------------|----------------|
| E206       | System Error | Database Error            | Contact Biomed  | Controller PCBA               | High Priority  |
| E207       | System Error | Mem Allocate Error        | Contact Biomed  | Controller PCBA               | High Priority  |
| E208       | System Error | Stack Overflow            | Contact Biomed  | Controller PCBA               | High Priority  |
| E209       | System Error | DMA Failure               | Contact Biomed  | Controller PCBA               | High Priority  |
| E210       | System Error | Thread Limit Error        | Contact Biomed  | Controller PCBA               | High Priority  |
| E211       | System Error | Internal Messaging Error  | Contact Biomed  | Controller PCBA               | High Priority  |
| E212       | System Error | PCBA Failure              | Contact Biomed  | Controller PCBA               | High Priority  |
| E213       | System Error | SR PCBA Failure           | Contact Biomed  | Steering Relay PCBA           | High Priority  |
| E214       | System Error | RF PCBA Failure           | Contact Biomed  | RF PCBA                       | High Priority  |
| E215       | System Error | Software State Error      | Contact Biomed  | Controller PCBA               | High Priority  |
| E216       | System Error | Low Voltage Rail Failure  | Contact Biomed  | Controller PCBA, Power Supply | High Priority  |
| E217       | System Error | High Voltage Rail Failure | Contact Biomed  | Controller PCBA, Power Supply | High Priority  |
| E218       | System Error | Display Driver Error      | Contact Biomed  | Controller PCBA               | High Priority  |
| E219       | System Error | Audio Circuit Failure     | Contact Biomed  | Controller PCBA               | High Priority  |
| E220       | System Error | Multi-tasking Error       | Contact Biomed  | Controller PCBA               | High Priority  |
| E221       | System Error | Processor Timebase Error  | Contact Biomed  | Controller PCBA               | High Priority  |

| Error Code | Title                  | Description                    | Troubleshooting            | Possible Source(s)                      | Alarm Priority |
|------------|------------------------|--------------------------------|----------------------------|-----------------------------------------|----------------|
| E222       | System Error           | Processor Timebase Error       | Contact Biomed             | Controller PCBA                         | High Priority  |
| E223       | System Error           | FPGA Timebase Error            | Contact Biomed             | Controller PCBA                         | High Priority  |
| E224       | System Error           | System Timebase Error          | Contact Biomed             | Controller PCBA                         | High Priority  |
| E225       | System Error           | Processor Watchdog Error       | Contact Biomed             | Controller PCBA                         | High Priority  |
| E226       | System Error           | FPGA Comm Error                | Contact Biomed             | Controller PCBA,<br>Steering Relay PCBA | High Priority  |
| E227       | System Error           | REM Circuit Failure            | Contact Biomed             | Steering Relay PCBA                     | High Priority  |
| E228       | System Error           | Relay Feedback Failure         | Contact Biomed             | Steering Relay PCBA                     | High Priority  |
| E229       | System Error           | Connector Diagnostic Failure   | Contact Biomed             | Cable Connection                        | High Priority  |
| E230       | System Error           | Critical Data Failure          | Contact Biomed             | Controller PCBA                         | High Priority  |
| E231       | System Error           | Security Access Error          | Contact Biomed             | Controller PCBA                         | High Priority  |
| E232       | Configuration Mismatch | Invalid System Configuration   | Dock to Valleylab Exchange | Any                                     | High Priority  |
| E233       | Configuration Mismatch | Field Replaceable Unit Updated | Dock to Valleylab Exchange | Any                                     | High Priority  |
| E234       | System Error           | Processor Comm Failure         | Contact Biomed             | Controller PCBA                         | High Priority  |

| Error Code | Title                   | Description                 | Troubleshooting                                                                                                                                    | Possible Source(s) | Alarm Priority                    |
|------------|-------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
| E235       | REM Pad Contact Quality | None                        | <ul style="list-style-type: none"> <li>Connect REM pad</li> <li>Check connection at patient site</li> <li>Replace REM pad</li> </ul>               | N/A                | Medium Priority                   |
| E236       | System Error            | Processor Watchdog Error    | Contact Biomed                                                                                                                                     | Controller PCBA    | High Priority                     |
| E238       | System Error            | Software Failure            | Contact Biomed                                                                                                                                     | Controller PCBA    | High Priority                     |
| E239       | System Error            | Software Failure            | Contact Biomed                                                                                                                                     | Controller PCBA    | High Priority                     |
| E240       | System Error            | Thread Check Failure        | Contact Biomed                                                                                                                                     | Controller PCBA    | High Priority                     |
| E241       | System Error            | RF Data Error               | Contact Biomed                                                                                                                                     | Controller PCBA    | High Priority                     |
| E242       | System Error            | RF Data Timing Error        | Contact Biomed                                                                                                                                     | Controller PCBA    | High Priority                     |
| E243       | System Error            | RF Data Delay Error         | Contact Biomed                                                                                                                                     | Controller PCBA    | High Priority                     |
| E244       | System Error            | RF Interrupt Error          | Contact Biomed                                                                                                                                     | Controller PCBA    | High Priority                     |
| E246       | System Error            | HWC Control Selection Error | Contact Biomed                                                                                                                                     | Controller PCBA    | High Priority                     |
| E247       | System Error            | PS PCBA Failure             | Contact Biomed                                                                                                                                     | Controller PCBA    | High Priority                     |
| E248       | System Error            | FP PCBA Failure             | Contact Biomed                                                                                                                                     | Controller PCBA    | High Priority                     |
| E301       | Internal Check          | Network Diagnostic Issue    | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA    | High Priority<br>Medium Priority* |

| Error Code | Title          | Description              | Troubleshooting                                                                                                                                    | Possible Source(s)               | Alarm Priority                    |
|------------|----------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------|
| E302       | Internal Check | Mono 1 Port Comm Issue   | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Steering Relay PCBA              | High Priority<br>Medium Priority* |
| E303       | Internal Check | Mono 2 Port Comm Issue   | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Steering Relay PCBA              | High Priority<br>Medium Priority* |
| E304       | Internal Check | Bipolar Port Comm Issue  | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Steering Relay PCBA              | High Priority<br>Medium Priority* |
| E305       | Internal Check | LigaSure Port Comm Issue | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Steering Relay PCBA              | High Priority<br>Medium Priority* |
| E306       | Internal Check | Instrument Scanner Issue | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA,<br>Display PCBA | Medium Priority                   |
| E307       | Internal Check | Unsupported Command      | Press to dismiss                                                                                                                                   | Controller PCBA                  | Medium Priority                   |

| Error Code | Title             | Description                  | Troubleshooting                                                                                                                                    | Possible Source(s)                                                        | Alarm Priority                    |
|------------|-------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------|
| E308       | Internal Check    | Software Timeout Issue       | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA                                                           | Medium Priority                   |
| E309       | Internal Check    | Activation Timing Issue      | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA                                                           | Medium Priority                   |
| E310       | Touchscreen Error | Unintentional Screen Input   | <ul style="list-style-type: none"> <li>Inspect Touchscreen</li> <li>If message reappears, contact Biomed</li> </ul>                                | Display PCBA, Chassis                                                     | Medium Priority                   |
| E312       | Internal Check    | Absolute Integrated Error    | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None | High Priority<br>Medium Priority* |
| E313       | Internal Check    | Voltage Sensor Compare Error | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None | High Priority<br>Medium Priority* |
| E314       | Internal Check    | Current Sensor Compare Error | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None | High Priority<br>Medium Priority* |

| Error Code | Title          | Description                | Troubleshooting                                                                                                                                    | Possible Source(s)                                                        | Alarm Priority                    |
|------------|----------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------|
| E315       | Internal Check | Power Sensor Compare Error | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None | High Priority<br>Medium Priority* |
| E316       | Internal Check | Power Compare Error        | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None | High Priority<br>Medium Priority* |
| E317       | Internal Check | PVI Curve Compare Error    | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None | High Priority<br>Medium Priority* |
| E318       | Internal Check | Voltage Sensor Clip Error  | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None | High Priority<br>Medium Priority* |
| E319       | Internal Check | Current Sensor Clip Error  | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA, Steering Relay PCBA, RF PCBA, Software Calibration, None | High Priority<br>Medium Priority* |

| Error Code | Title            | Description | Troubleshooting                                                                                                                                           | Possible Source(s)                                                | Alarm Priority  |
|------------|------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------|
| E320       | Check Instrument | N/A         | <ul style="list-style-type: none"> <li>• Mono 1 handswitch pressed</li> <li>• Release switch</li> <li>• Replace instrument</li> </ul>                     | Controller PCBA, Instrument                                       | Medium Priority |
| E321       | Check Foot Pedal | N/A         | <ul style="list-style-type: none"> <li>• Mono 1 foot pedal pressed</li> <li>• Release pedal</li> <li>• If issue persists, replace foot pedal</li> </ul>   | Controller PCBA, Steering Relay PCBA, Foot Pedal PCBA, Foot Pedal | Medium Priority |
| E322       | Check Instrument | N/A         | <ul style="list-style-type: none"> <li>• Mono 2 handswitch pressed</li> <li>• Release switch</li> <li>• If issue persists, replace instrument</li> </ul>  | Controller PCBA, Steering Relay PCBA, Instrument                  | Medium Priority |
| E323       | Check Foot Pedal | N/A         | <ul style="list-style-type: none"> <li>• Mono 2 foot pedal pressed</li> <li>• Release pedal</li> <li>• If issue persists, replace foot pedal</li> </ul>   | Controller PCBA, Steering Relay PCBA, Foot Pedal PCBA, Foot Pedal | Medium Priority |
| E324       | Check Instrument | N/A         | <ul style="list-style-type: none"> <li>• Bipolar handswitch pressed</li> <li>• Release switch</li> <li>• If issue persists, replace instrument</li> </ul> | Controller PCBA, Steering Relay PCBA, Instrument                  | Medium Priority |

| Error Code | Title                | Description              | Troubleshooting                                                                                                                                                  | Possible Source(s)                                                | Alarm Priority  |
|------------|----------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------|
| E325       | Check Foot Pedal     | N/A                      | <ul style="list-style-type: none"> <li>Bipolar foot pedal pressed</li> <li>Release pedal</li> <li>If issue persists, replace foot pedal</li> </ul>               | Controller PCBA, Steering Relay PCBA, Foot Pedal PCBA, Foot Pedal | Medium Priority |
| E326       | Check Instrument     | N/A                      | <ul style="list-style-type: none"> <li>LigaSure handswitch pressed</li> <li>Release switch</li> <li>If issue persists, replace instrument</li> </ul>             | Controller PCBA, Instrument                                       | Medium Priority |
| E327       | Check Foot Pedal     | N/A                      | <ul style="list-style-type: none"> <li>LigaSure foot pedal pressed</li> <li>Release pedal</li> <li>If issue persists, replace foot pedal</li> </ul>              | Controller PCBA, Steering Relay PCBA, Foot Pedal PCBA, Foot Pedal | Medium Priority |
| E328       | Unintentional Input  | Panel Button Error       | <ul style="list-style-type: none"> <li>Release front panel button</li> <li>If message reappears, contact Biomed</li> </ul>                                       | Controller PCBA, Display, Chassis                                 | Medium Priority |
| E329       | Check Foot Pedal     | Invalid Foot Pedal Input | <ul style="list-style-type: none"> <li>Release pedal</li> <li>If issue persists, replace foot pedal</li> </ul>                                                   | Steering Relay PCBA, Foot Pedal PCBA, Foot Pedal                  | Medium Priority |
| E330       | Prolonged Activation | Prolonged Activation     | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss or reactivate</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA                                                   | Medium Priority |
| E331       | Invalid Instrument   | Invalid Instrument       | Replace Instrument                                                                                                                                               | Controller PCBA                                                   | Medium Priority |

| Error Code | Title           | Description                  | Troubleshooting                                                                                                                                                              | Possible Source(s)                | Alarm Priority                    |
|------------|-----------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------|
| E332       | System Issue    | Chassis Over Temp Detected   | Contact Biomed                                                                                                                                                               | Any                               | High Priority<br>Medium Priority* |
| E333       | System Issue    | Cooling Fan Failure          | Contact Biomed                                                                                                                                                               | Any                               | High Priority<br>Medium Priority* |
| E334       | REM Check Issue | REM Automated Check Error    | <ul style="list-style-type: none"> <li>• REM check completed</li> <li>• Press to dismiss or reactivate</li> </ul>                                                            | Steering Relay PCBA               | High Priority<br>Medium Priority* |
| E335       | System Issue    | Driver Comm Issue            | Contact Biomed                                                                                                                                                               | Controller PCBA                   | Medium Priority                   |
| E336       | Internal Check  | ADC Sync Issue               | <ul style="list-style-type: none"> <li>• Internal check completed</li> <li>• Press to dismiss or reactivate</li> <li>• If message reappears, contact Biomed</li> </ul>       | Controller PCBA, RF PCBA, Chassis | High Priority<br>Medium Priority* |
| E337       | Internal Check  | Real Time Clock Issue        | <ul style="list-style-type: none"> <li>• Internal check completed</li> <li>• Press to dismiss or reactivate</li> <li>• If message reappears, contact Biomed</li> </ul>       | Controller PCBA                   | High Priority<br>Medium Priority* |
| E339       | Internal Check  | RF Control Limit Check Issue | <ul style="list-style-type: none"> <li>• RF Limit Error check completed</li> <li>• Press to dismiss or reactivate</li> <li>• If message reappears, contact Biomed</li> </ul> | RF PCBA                           | Medium Priority                   |

| Error Code | Title                  | Description           | Troubleshooting                                                                                                                                          | Possible Source(s)                   | Alarm Priority                    |
|------------|------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------------------------|
| E340       | Configuration Mismatch | Invalid Country Code  | <ul style="list-style-type: none"> <li>• LigaSure temporarily disabled</li> <li>• Contact Biomed</li> <li>• Dock to Valleylab Exchange</li> </ul>        | Controller PCBA                      | Medium Priority                   |
| E341       | Internal Check         | Panel Comm Issue      | <ul style="list-style-type: none"> <li>• Internal check completed</li> <li>• Press to dismiss</li> <li>• If message reappears, contact Biomed</li> </ul> | Display PCBA, Chassis                | High Priority<br>Medium Priority* |
| E342       | Internal Check         | Foot Pedal Comm Issue | <ul style="list-style-type: none"> <li>• Internal check completed</li> <li>• Press to dismiss</li> <li>• If message reappears, contact Biomed</li> </ul> | Controller PCBA, Foot Pedal PCBA     | High Priority<br>Medium Priority* |
| E343       | Internal Check         | REM Comm Issue        | <ul style="list-style-type: none"> <li>• Internal check completed</li> <li>• Press to dismiss</li> <li>• If message reappears, contact Biomed</li> </ul> | Controller PCBA, Steering Relay PCBA | High Priority<br>Medium Priority* |
| E344       | Internal Check         | REM Comm Issue        | <ul style="list-style-type: none"> <li>• Internal check completed</li> <li>• Press to dismiss</li> <li>• If message reappears, contact Biomed</li> </ul> | Controller PCBA, Steering Relay PCBA | High Priority<br>Medium Priority* |

| Error Code | Title          | Description               | Troubleshooting                                                                                                                                    | Possible Source(s)                   | Alarm Priority                    |
|------------|----------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------------------------|
| E345       | Internal Check | REM Comm Issue            | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA, Steering Relay PCBA | High Priority<br>Medium Priority* |
| E346       | Internal Check | REM Comm Issue            | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA, Steering Relay PCBA | High Priority<br>Medium Priority* |
| E347       | Internal Check | REM Data Issue            | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA, Steering Relay PCBA | High Priority<br>Medium Priority* |
| E348       | Internal Check | Software Assert Issue     | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA                      | Medium Priority                   |
| E349       | Internal Check | Thread Check Issue        | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA                      | Medium Priority                   |
| E350       | Internal Check | Return Electrode Overtemp | <ul style="list-style-type: none"> <li>Allow cooling time</li> <li>Reactivate instrument</li> </ul>                                                | N/A                                  | Medium Priority                   |

| Error Code | Title                 | Description                    | Troubleshooting                                                                                                                                    | Possible Source(s)               | Alarm Priority                    |
|------------|-----------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------|
| E351       | System Issue          | Processor Watchdog Error       | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Steering Relay PCBA              | Medium Priority                   |
| E352       | Internal Check        | Software Update Issue          | Contact Biomed                                                                                                                                     | Controller PCBA                  | Medium Priority                   |
| E353       | System Issue          | Touchscreen Calibration Reset  | Contact Biomed                                                                                                                                     | Controller PCBA, Display PCBA    | Medium Priority                   |
| E354       | Internal Check        | SWC Target Variance            | <ul style="list-style-type: none"> <li>Internal check completed</li> <li>Press to dismiss</li> <li>If message reappears, contact Biomed</li> </ul> | Controller PCBA                  | High Priority<br>Medium Priority* |
| E355       | Invalid Activation    | Foot Pedal Not Supported       | <ul style="list-style-type: none"> <li>Press to dismiss</li> <li>Reactivate instrument</li> <li>Activation from instrument only</li> </ul>         | Controller PCBA, Foot Pedal PCBA | Medium Priority                   |
| E356       | System Error          | Invalid RF Calibration         | Perform Energy Calibration                                                                                                                         | N/A                              | Medium Priority                   |
| E401       | Authorization Issue   | Invalid Pairing Code           | Press to dismiss                                                                                                                                   | Controller PCBA                  | Low Priority                      |
| E402       | Incomplete Seal Cycle | Hold until complete seal cycle | <ul style="list-style-type: none"> <li>Inspect seal</li> <li>Press activation button</li> </ul>                                                    | N/A                              | Information Signal                |
| E403       | Incomplete Seal Cycle | Reactivate instrument          | <ul style="list-style-type: none"> <li>Inspect seal</li> <li>Check for metal clips/staples</li> <li>Remove excess fluids</li> </ul>                | N/A                              | Information Signal                |

| Error Code | Title                      | Description           | Troubleshooting                                                                                                                                              | Possible Source(s) | Alarm Priority     |
|------------|----------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|
| E404       | Incomplete Seal Cycle      | Reactivate instrument | <ul style="list-style-type: none"> <li>Inspect seal</li> <li>Grasp thicker tissue</li> <li>Fully close instrument handle</li> </ul>                          | N/A                | Information Signal |
| E405       | Incomplete Seal Cycle      | Reactivate instrument | <ul style="list-style-type: none"> <li>Inspect seal</li> <li>Remove excess fluids</li> <li>Clean and dry jaws</li> </ul>                                     | N/A                | Information Signal |
| E407       | Instrument Not Ready       | N/A                   | <ul style="list-style-type: none"> <li>Dual modality instrument.</li> <li>Insert other plug into Mono 2 receptacle.</li> </ul>                               | N/A                | Medium Priority    |
| E408       | Instrument Not Ready       | N/A                   | <ul style="list-style-type: none"> <li>Dual modality instrument.</li> <li>Insert other plug into LigaSure receptacle.</li> </ul>                             | N/A                | Medium Priority    |
| E411       | Invalid Activation Attempt | N/A                   | <ul style="list-style-type: none"> <li>Dual modality instrument.</li> <li>Both plugs are required. Insert other plug into LigaSure receptacle.</li> </ul>    | N/A                | Medium Priority    |
| E412       | Invalid Activation Attempt | N/A                   | <ul style="list-style-type: none"> <li>Dual modality instrument.</li> <li>Both plugs are required. Insert other plug into Monopolar 2 receptacle.</li> </ul> | N/A                | Medium Priority    |

| Error Code | Title               | Description | Troubleshooting                                                                                                                                     | Possible Source(s) | Alarm Priority     |
|------------|---------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|
| E413       | Invalid Combination | N/A         | <ul style="list-style-type: none"> <li>Instrument combination not allowed.</li> <li>Remove current instrument in LigaSure receptacle.</li> </ul>    | N/A                | Medium Priority    |
| E414       | Invalid Combination | N/A         | <ul style="list-style-type: none"> <li>Instrument combination not allowed.</li> <li>Remove current instrument in Monopolar 2 receptacle.</li> </ul> | N/A                | Medium Priority    |
| E415       | Feature Not Enabled | N/A         | <ul style="list-style-type: none"> <li>The Bipolar Resection feature is not enabled.</li> <li>Contact Covidien to enable this feature.</li> </ul>   | N/A                | Medium Priority    |
| E416       | Unknown Instrument  | N/A         | <ul style="list-style-type: none"> <li>Instrument not recognized.</li> <li>Replace instrument.</li> </ul>                                           | N/A                | Medium Priority    |
| E419       | Incomplete Setup    | N/A         | <ul style="list-style-type: none"> <li>Separate forceps tips</li> <li>Remove from tissue</li> <li>Remove from fluids</li> </ul>                     | N/A                | Information Signal |
| E420       | Usage Limit         | N/A         | The inserted device has already been used. It has not been recertified by the original manufacturer.                                                | N/A                | Medium Priority    |

| Error Code | Title                    | Description | Troubleshooting                                                                                                                          | Possible Source(s) | Alarm Priority     |
|------------|--------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|
| E421       | Usage Limit              | N/A         | The inserted device has already been used. It has not been recertified by the original manufacturer.                                     | N/A                | Medium Priority    |
| E422       | Incomplete Setup         | N/A         | <ul style="list-style-type: none"> <li>• Check cable insertion</li> <li>• Separate forceps tips</li> <li>• Remove from tissue</li> </ul> | N/A                | Information Signal |
| E424       | Activation Time Exceeded | N/A         | <ul style="list-style-type: none"> <li>• Remove from tissue</li> <li>• Separate forceps tips</li> <li>• Remove from fluids</li> </ul>    | N/A                | Information Signal |
| E425       | Contact Time Exceeded    | N/A         | <ul style="list-style-type: none"> <li>• Remove from tissue</li> <li>• Separate forceps tips</li> <li>• Remove from fluids</li> </ul>    | N/A                | Information Signal |
| E426       | Incomplete Setup         | N/A         | Check cable insertion.                                                                                                                   | N/A                | Information Signal |



# Chapter 9

## Replacement Procedures

This chapter presents information on the replacement of components for the energy platform's top-level assemblies, front-panel assemblies, and rear-panel assemblies.

## Tools Required for Component Replacement

The following are the tools needed to complete the replacement of VLFT10GEN components described in this chapter.

- Torx T-10 driver
- Torx T-30 driver
- #1 Phillips screwdriver
- 10 mm wrench
- #1 flathead screwdriver
- Valleylab Exchange

### Notice

Upgrade to the latest version of Valleylab Exchange. If using v3.1.5, the following restrictions apply when replacing the Controller PCBA, Display PCBA, Power Supply, RF PCBA, Steering Relay PCBA, VIBE, or FTSW PCBA:

1. Replace only one component at a time.
2. Set the generator country code through Valleylab Exchange upon completion of the component replacement.

## Touch-up Paint Instructions

The following instructions are to provide guidance on how to apply touch-up paint to the VLFT10GEN. The instructions are a guideline for the pre-cleaning requirements, safety concerns, and drying/environmental requirements. The material safety data sheet (MSDS) contains additional valuable information about the application of this product and should be read and followed before applying the touch-up paint.

### Notice

Only use touch-up paint on fully assembled devices.

### Pre-cleaning Requirements

Warm water should always be used for primary cleaning. If something stronger is needed, use a mild cleaning agent as recommended in *Cleaning* on page 10-3. Air-quality regulations in your area may limit the allowable emissions from cleaning operations.

### Cleaning the Substrate

All surfaces to be coated must be free of dirt, grease, oil, oxidation, mill scale, and all other contaminants. The surface must be thoroughly dry before painting.

**Touch-up Paint Safety**

The touch-up paint contains organic solvents. Use adequate ventilation. Do not breath vapors or spray mists. Keep away from heat, sparks, and open flames. Avoid contact with eyes, skin, and clothing. Wash hands and equipment thoroughly after handling.

**First Aid**

- Eye contact – Flush immediately with plenty of water for at least 15 minutes. Seek medical attention.
- Skin contact – Wash thoroughly with soap and water for 5 minutes.
- If swallowed – Do not induce vomiting. Seek medical attention immediately.
- If inhaled – Remove to fresh air.

**Drying Time**

For air drying of the touched up area, the following drying time is suggested:

- Tack Free – 15 minutes
- Dry to handle – 2 Hours
- Full Cure – 7-10 days

## Top-Level Assemblies

### Base Chassis Replacement

#### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

#### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

#### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

#### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Remove the RF fan connector from the Controller PCBA.
6. Leaving the RF PCBA and RF fan in the second level of E-PAC foam, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
7. Locate the power-supply fan directly behind the power supply. Remove the wire harness from the P8 connector on the Controller PCBA. Locate the Ladder flex cable connector opposite the power supply and remove the connector from J7 on the Steering PCBA.
8. Locate the 5 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, and P1 on the Steering Relay PCBA. Remove the front-panel assembly and set aside for reinstallation.

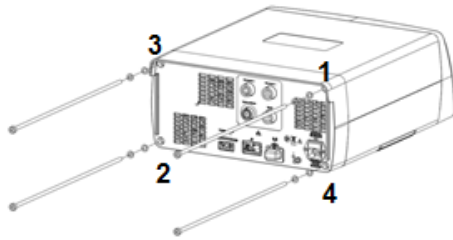
9. Remove the power-supply fan connector from the Controller PCBA.
10. Leaving the power-supply fan and Steering Relay PCBA in the third layer of E-PAC, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
11. Locate and remove the four wire harnesses from P9, P7, J9, and P4 from the Controller PCBA near to the power supply. Locate and remove the fan connector from the side of the Controller PCBA furthest from the power supply on connector P1.
12. Locate and remove the Ladder flex cable from the J2 connector on the side of the Controller PCBA furthest from the power supply. Set aside for reinstallation.
13. Using a T-10, remove the fastener holding the braided ground wire to the Controller PCBA. Set aside for reinstallation.

#### Notice

Before removing the Controller PCBA, ensure that the braided ground wire is removed from the Controller PCBA. Failure to remove the braided cable can lead to irreparable damage to the PCBA, ground connection, and/or the power supply.

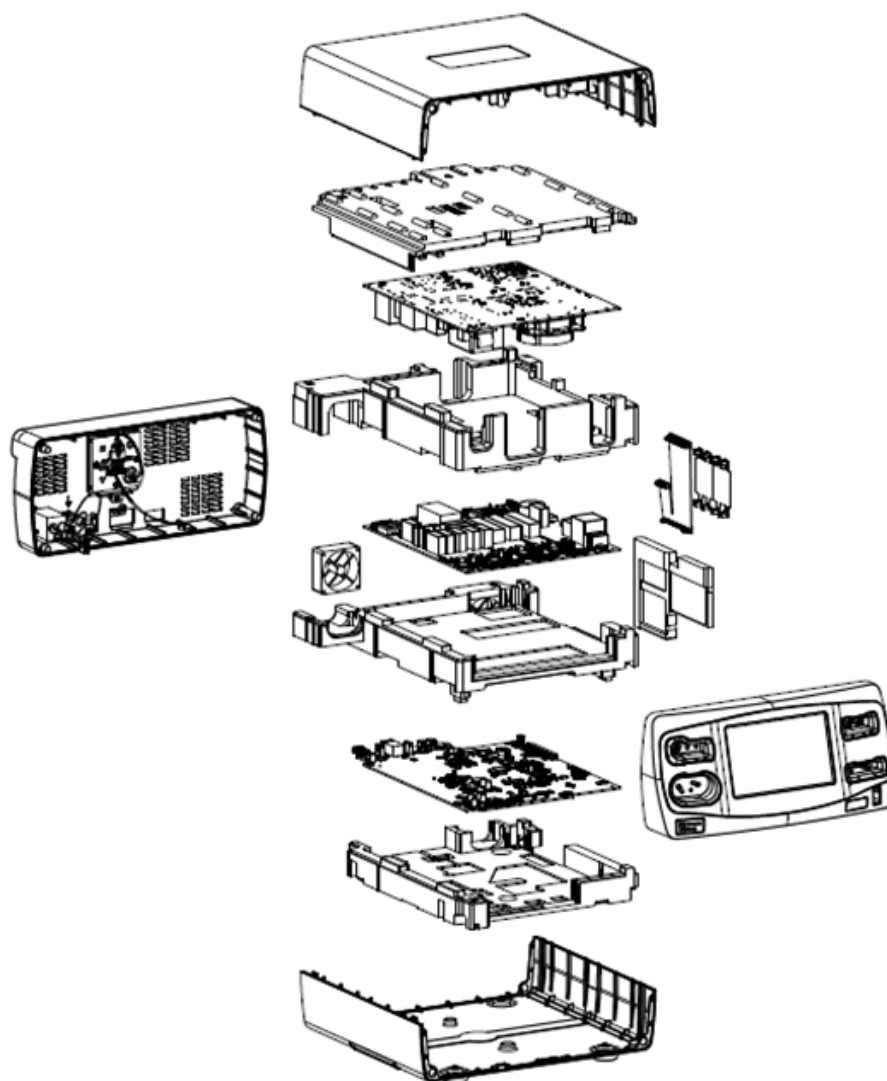
14. Leaving the controller fan and Controller PCBA in the third layer of E-PAC, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
15. Locate and remove the blue/brown/green connector from the rear of the device connected to the J1 connector on the rear of the power supply. Set aside for reinstallation.
16. Locate and remove the power supply from the chassis. Set aside for reinstallation.
17. Using a T-10, remove the grounding wires from behind where the power supply was mounted. Set all aside for reinstallation.
18. Using a T-10, remove all four feet on the chassis. Set aside fasteners and feet for reinstallation.
19. Locate and remove the replacement chassis from its packaging and set it on a smooth, level surface.
20. Using a T-10, replace the four feet onto the bottom of the chassis and torque to 5.0 in./lb.
21. Using a T-10, replace the ground wires to the grounding point behind where the power supply is to be installed ensuring that the green/yellow wire is installed first followed by the braided wire. Torque to 5.0 in./lb.
22. Install the power supply by orienting the supply so that the tab on the metal enclosure faces away from where the PCBA stack will be reinstalled. The three connectors J2, J3, and J4 should be facing the front of the device. Slide the power supply down until the standoffs come through the tab on the power supply.
23. Reconnect the blue/brown/green connector to the rear of the power supply and the 3 cables to the J2, J3, and J4 connectors.
24. Replace the 4th layer of E-PAC foam with the Controller PCBA and controller fan onto the chassis base ensuring that the fan is facing the rear of the device.

25. Using a T-10, replace the braided ground wire and screw. Torque the screw to 5.0 in./lb. of force.
26. Reconnect the Ladder cable to J2 as well as the P9, P7, J9, and P4 wire harnesses to their respective connection points. Reconnect the Controller PCBA fan to P1 as well.
27. Replace the 3rd layer of E-PAC foam with the Steering Relay PCBA and power-supply fan onto the Controller PCBA ensuring that the Controller PCBA fan slides into the E-PAC foam cutout on the 3rd level of foam. Reconnect the Ladder flex cable to J7 on the Steering PCBA, the power-supply fan to J8, and all five connections for the front panel P510, P511, P508, P509, and P1 on the Steering Relay PCBA.
28. Replace the 2nd layer of E-PAC foam with the RF PCBA and RF fan onto the Steering Relay PCBA foam ensuring that the power-supply fan slides into the E-PAC foam cutout on the 2nd level of foam. Reconnect the red/black power connector, 5 flex cable connectors, and RF fan connector.
29. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
30. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
  - Bottom left
  - Top left
  - Bottom right
31. Tighten the bolts to 15 in./lb. of force.
  32. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



## Controller Fan Replacement

### Equipment needed

- Torx T-10 driver
- Torx T-30 driver

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Leaving the RF PCBA and RF fan in the second level of E-PAC foam, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
6. Locate the power-supply fan directly behind the power supply. Remove the wire harness from the P8 connector on the controller PCBA. Locate the Ladder flex cable connector opposite the power supply and remove the connector from J7 on the Steering PCBA.
7. Locate the 5 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, and P1 on the Steering Relay PCBA. Remove the front-panel assembly and set aside for reinstallation.

8. Leaving the power-supply fan and Steering Relay PCBA in the third layer of E-PAC, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
9. Locate and remove the fan connector from the side of the Controller PCBA furthest from the power supply on connector P1.
10. Lift and remove the fan from the E-PAC.

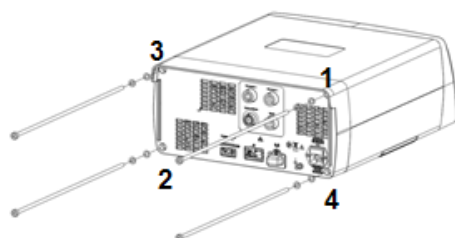
**Warning**

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

11. Locate and remove the replacement fan from the packaging. Orient the fan so that the power cable so that it is facing up and the fan is blowing out or towards the rear of the device.
12. Reconnect the Controller PCBA fan to P1.
13. Replace the 3rd layer of E-PAC foam with the Steering Relay PCBA and power-supply fan onto the Controller PCBA ensuring that the Controller PCBA fan slides into the E-PAC foam cutout on the 3rd level of foam. Reconnect the Ladder flex cable to J7 on the Steering PCBA, the power-supply fan to J8, and all five connections for the front panel P510, P511, P508, P509, and P1 on the Steering PCBA.
14. Replace the 2nd layer of E-PAC foam with the RF PCBA and RF fan onto the Steering Relay PCBA foam ensuring that the power-supply fan slides into the E-PAC foam cutout on the 2nd level of foam. Reconnect the red/black power connector, 5 flex cable connectors, and RF fan connector.
15. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
16. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:

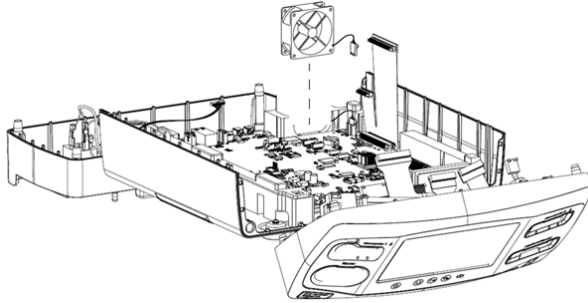


Bolt-tightening descriptions from the rear view:

- Top right

- Bottom left
- Top left
- Bottom right

17. Tighten the bolts to 15 in./lb. of force.



18. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## Controller PCBA Replacement

### Equipment needed

- Torx T-10 driver
- Torx T-30 driver
- Valleylab exchange

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.

2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

**Notice**

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Leaving the RF PCBA and RF fan in the second level of E-PAC foam, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
6. Locate the power-supply fan directly behind the power supply. Remove the wire harness from the P8 connector on the Controller PCBA. Locate the Ladder flex cable connector opposite the power supply and remove the connector from J7 on the Steering PCBA.
7. Locate the 5 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, and P1 on the Steering Relay PCBA. Remove the front-panel assembly and set aside for reinstallation.
8. Leaving the power-supply fan and Steering Relay PCBA in the third layer of E-PAC, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
9. Locate and remove the four wire harnesses from P9, P7, J9, and P4 from the Controller PCBA near to the power supply. Locate and remove the fan connector from the side of the Controller PCBA furthest from the power supply on connector P1.
10. Locate and remove the Ladder flex cable from the J2 connector on the side of the Controller PCBA furthest from the power supply. Set aside for reinstallation.
11. Using a T-10, remove the fastener holding the braided ground wire to the Controller PCBA. Set aside for reinstallation.

**Notice**

Before removing the Controller PCBA, ensure that the braided ground wire is removed from the Controller PCBA. Failure to remove the braided cable can lead to irreparable damage to the PCBA, ground connection, and/or the power supply.

12. Remove the Controller PCBA by holding the edges of the PCBA from the E-PAC foam.

### Warning

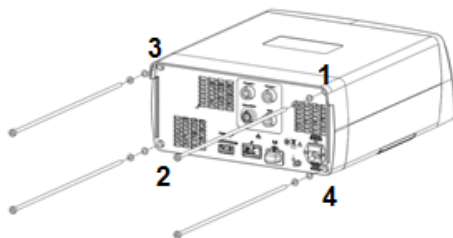


Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

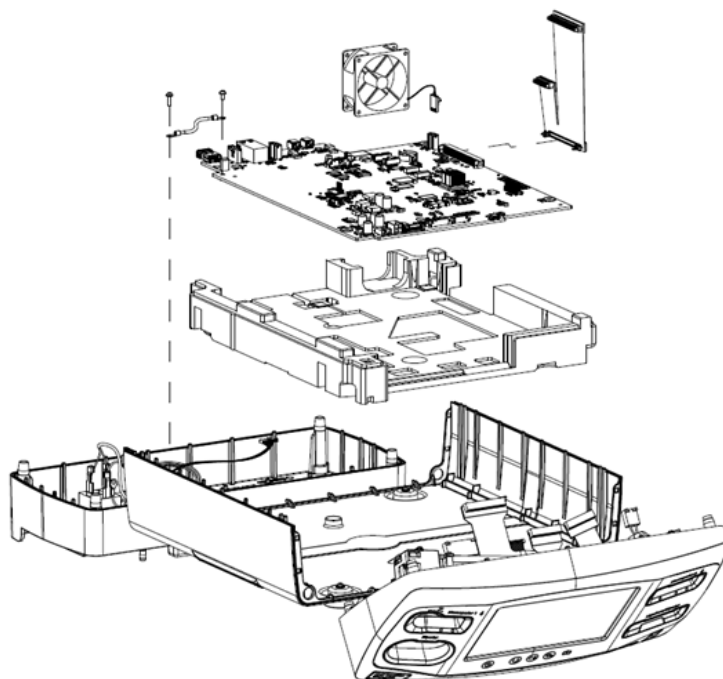
13. Locate and remove the replacement Controller PCBA from the protective ESD bag handling the PCBA only by the edges of the board. Orient the Controller PCBA so that the PCBA will slide down into the E-PAC foam.
14. Using a T-10, replace the braided ground wire and screw. Torque the screw to 5.0 in/ lb. of force.
15. Reconnect the Ladder cable to J2 as well as the P9, P7, J9, and P4 wire harnesses to their respective connection points. Reconnect the Controller PCBA fan to P1 as well.
16. Replace the 3rd layer of E-PAC foam with the Steering Relay PCBA and power-supply fan onto the Controller PCBA ensuring that the Controller PCBA fan slides into the E-PAC foam cutout on the 3rd level of foam. Reconnect the Ladder flex cable to J7 on the Steering PCBA, the power-supply fan to J8, and all five connections for the front panel P510, P511, P508, P509, and P1 on the Steering Relay PCBA.
17. Replace the 2nd layer of E-PAC foam with the RF PCBA and RF fan onto the Steering Relay PCBA foam ensuring that the power-supply fan slides into the E-PAC foam cutout on the 2nd level of foam. Reconnect the red/black power connector, 5 flex cable connectors, and RF fan connector.
18. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
19. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

20. Tighten the bolts to 15 in./lb. of force.
21. Upon completion of the component replacement, follow the touchscreen calibration procedure outlined in this manual. See *Touchscreen Calibration* on page 7-2.
22. Upon completion of the touchscreen calibration, the system will issue an E337 error upon startup of the device and will persist until the generator is docked to the Valleylab Exchange to re-sync the clock.
23. Configure a computer with Valleylab Exchange installed to connect simultaneously to the generator and the Internet. Examples of this setup are:
  - Connecting the generator and computer to the Ethernet ports of a router.
  - Connecting a Wi-Fi adapter to your computer for Internet access and connecting the computer and generator with an Ethernet cable.
  - Configuring your computer's BIOS to allow simultaneous use of Wi-Fi and Ethernet connections.
24. Set up the generator and log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5. The generator clock will automatically re-sync as part of the docking workflow.
25. Select the **Set Serial Number** button on Valleylab Exchange.
26. When prompted, enter the generator serial number from the label on the back of the generator and click **Continue**.
27. After successful completion of the component setup and registration, the generator will automatically restart.
28. Verify that the E339 error does not appear when the generator has finished powering on. Press the service button on the front panel of the generator and verify that the clock is set to the correct time.
29. Follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



## PCBA Battery Replacement

### Equipment needed

- Torx T-10 driver
- Torx T-30 driver
- #1 flathead screwdriver

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

**Notice**

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Leaving the RF PCBA and RF fan in the second level of E-PAC foam, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
6. Locate the power-supply fan directly behind the power supply. Remove the wire harness from the P8 connector. Locate the Ladder ribbon cable connector opposite the power supply and remove the connector from J7.
7. Locate the 5 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, and P1. Remove the front-panel assembly and set aside for reinstallation.
8. Leaving the power-supply fan and Steering Relay PCBA in the third layer of E-PAC, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
9. Locate the battery on the Controller PCBA and remove the battery. A small flathead screwdriver may be required.
10. Replace the battery with a new battery.

**Warning**

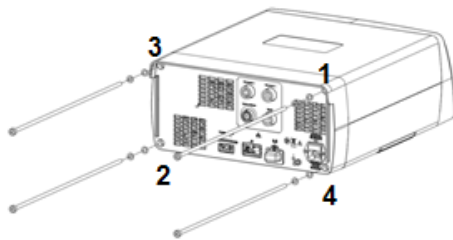
Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

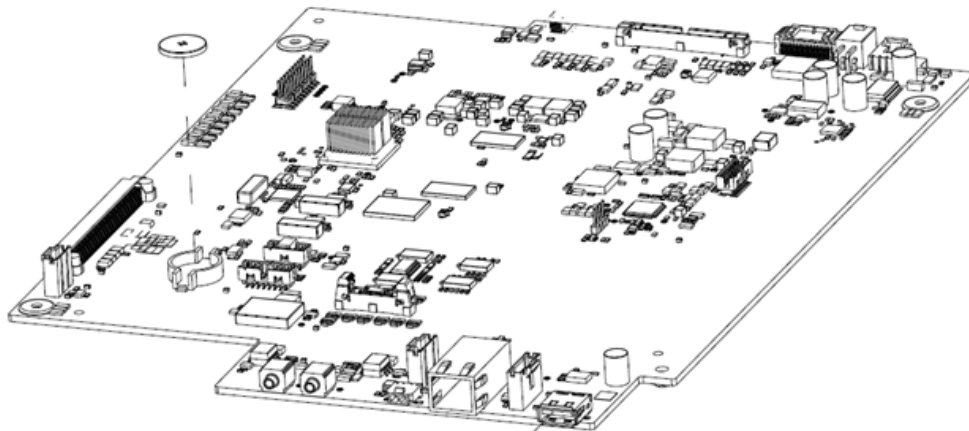
11. Replace the third layer of E-PAC foam with the Steering Relay PCBA and power-supply fan on the Controller PCBA ensuring the Controller PCBA fan slides into the E-PAC foam cutout on the third level of foam. Reconnect the Ladder ribbon cable to J7, the power-supply fan to J8, and all five connections for the front panel P510, P511, P508, and P1.

12. Replace the 2nd layer of E-PAC foam with the RF PCBA and RF fan onto the Steering Relay PCBA foam ensuring that the power-supply fan slides into the E-PAC foam cutout on the 2nd level of foam. Reconnect the red/black power connector, 5 ribbon-cable connectors, and RF fan connector.
13. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
14. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
  - Bottom left
  - Top left
  - Bottom right
15. Tighten the bolts to 15 in./lb. of force.



16. Upon completion of the battery replacement, the system will issue an E337 error upon startup of the device and will persist until the generator is docked to Valleylab Exchange to re-sync the clock.
17. Configure your computer with Valleylab Exchange installed to connect simultaneously to the generator and to the Internet. Examples of this setup are:

- Connecting the generator and computer to the Ethernet ports of a router.
  - Connecting a Wi-Fi adapter to your computer for Internet access and connecting the computer and generator with an Ethernet cable.
  - Configuring your computer's BIOS to allow simultaneous use of Wi-Fi and Ethernet connections.
18. Log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5. the generator clock will automatically re-sync as part of the docking workflow.
  19. Turn the generator off, disconnect the Ethernet cable, and disconnect the power cord for at least 10 seconds.
  20. Plug the power cord into the generator and turn on the power. Verify that the E339 error does not appear when the generator has finished powering on.
  21. Press the service button on the front panel of the generator and verify that the clock is set to the correct time.
  22. Upon completion of the clock re-sync, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## Display PCBA Replacement

### Equipment needed

- Torx T-10 driver
- Torx T-30 driver
- Valleylab Exchange

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.

2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

**Notice**

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1 on the Steering Relay PCBA. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Locate and remove the connectors from P4, P5, J2, P1, and P6 on the Display PCBA.
5. Using a T-10, remove the 2 screws holding the speaker bracket. Set them aside for reinstallation.
6. Using a T-10, remove the 3 screws holding the display PCBA to the LCD mount. Set them aside for reinstallation.
7. Remove the Display PCBA by holding the edges of the PCBA from the assembly.

**Warning**

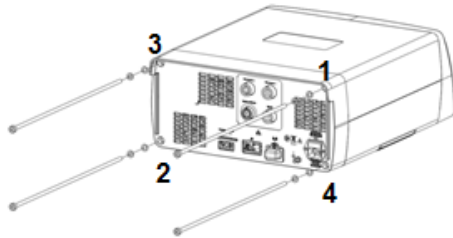


Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

8. Locate and remove the replacement Display PCBA from the protective ESD bag handling the PCBA only by the edges of the board. Orient the Display PCBA so that the large P5 connector is facing the bottom of the assembly.
9. Using a T-10, replace the 3 screws to attach the Display PCBA to the LCD housing torquing the screw to 5.0 in./lb. of force.
10. Using a T-10, replace the two screws and speaker bracket.
11. Reconnect the connectors to P4, P5, J2, P1, P2, and P6 on the Display PCBA.
12. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all five connections for the front panel P510, P511, P508, P509, P1, and P4.
13. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

14. Tighten bolts to 15 in./lb. of force.

15. Upon completion of the component replacement, follow the Touchscreen Calibration procedure outlined in this manual. See *Touchscreen Calibration* on page 7-2.

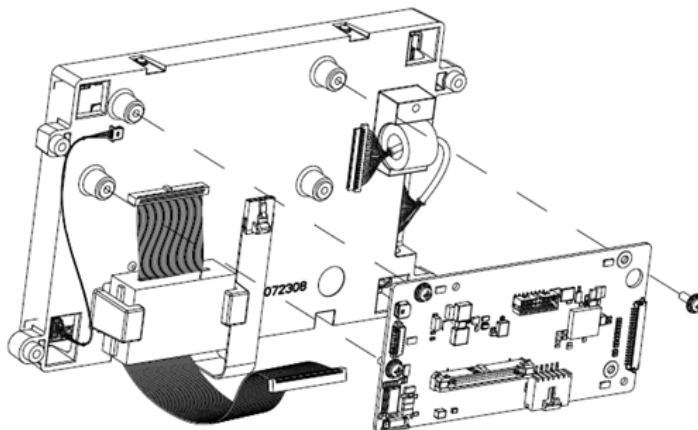
16. Set up the generator and log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5.

**Note:** The system will issue an E233 error upon startup of the generator.

17. Valleylab Exchange automatically configures and registers the component.

18. After successful completion of the component setup and registration, the generator will automatically restart.

19. Follow the Periodic Safety Check (Routine Maintenance) procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



## E-PAC Foam Replacement

### Equipment needed

- Torx T-10 driver
- Torx T-30 driver

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

For replacement of the E-PAC foam, various levels of E-PAC can be replaced. Each section of this replacement procedure is divided into 4 levels of E-PAC. Each level can be replaced individually or can encompass all levels of E-PAC foam depending on replacement needs.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.

**For 1st level E-PAC replacement only, acquire the replacement E-PAC foam and move to step 19.**

4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Leaving the RF PCBA and RF fan in the second level of E-PAC foam, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.

**For 2nd level E-PAC replacement only, acquire the replacement E-PAC foam and move to step 18.**

6. Locate the power-supply fan directly behind the power supply. Remove the wire harness from the P8 connector on the Controller PCBA. Locate the Ladder flex cable connector opposite the power supply and remove the connector from J7 on the Steering PCBA.
7. Locate the 5 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, and P1 on the Steering Relay PCBA. Remove the front-panel assembly and set aside for reinstallation.
8. Leaving the power-supply fan and Steering Relay PCBA in the third layer of E-PAC, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.

**For 3rd level E-PAC replacement only, acquire the replacement E-PAC foam and move to step 17.**

9. Locate and remove the four wire harnesses from P9, P7, J9, and P4 from the Controller PCBA near to the power supply. Locate and remove the fan connector from the side of the Controller PCBA furthest from the power supply on connector P1.
10. Locate and remove the Ladder flex cable from the J2 connector on the side of the Controller PCBA furthest from the power supply. Set aside for reinstallation.
11. Using a T-10, remove the fastener holding the braided ground wire to the Controller PCBA. Set aside for reinstallation.

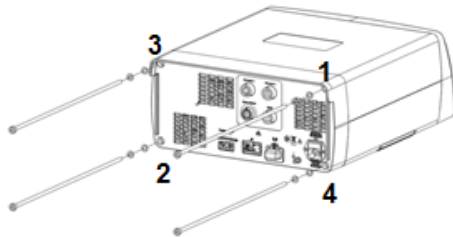
#### Notice

Before removing the Controller PCBA, ensure that the braided ground wire is removed from the Controller PCBA. Failure to remove the braided cable can lead to irreparable damage to the PCBA, ground connection, and/or the power supply.

12. Leaving the controller fan and Controller PCBA in the third layer of E-PAC, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.  
For complete E-PAC replacement, acquire the replacement E-PAC foam and move to step 13.
13. Replace the 4th layer of E-PAC foam into the chassis base ensuring that the foam cutout for the fan is facing the rear of the device.
14. Orient and place the Controller PCBA into the base piece of E-PAC foam along with the controller fan.
15. Using a T-10, replace the braided ground wire and screw. Torque the screw to 5.0 in./lb. of force.
16. Reconnect the Ladder cable to J2 as well as the P9, P7, J9, and P4 wire harnesses to their respective connection points. Reconnect the Controller PCBA fan to P1 as well.
17. Remove the Steering Relay PCBA and power-supply fan from the E-PAC foam and place the Steering Relay PCBA and power-supply fan into the replacement piece of E-PAC foam. Place the 3rd layer of E-PAC foam with the Steering Relay PCBA and power-supply fan onto the Controller PCBA ensuring that the Controller PCBA fan slides into the E-PAC foam cutout on the 3rd level of foam. Reconnect the Ladder flex cable to J7

on the Steering PCBA, the power-supply fan to J8, and all five connections for the front panel P510, P511, P508, P509, and P1 on the Steering Relay PCBA.

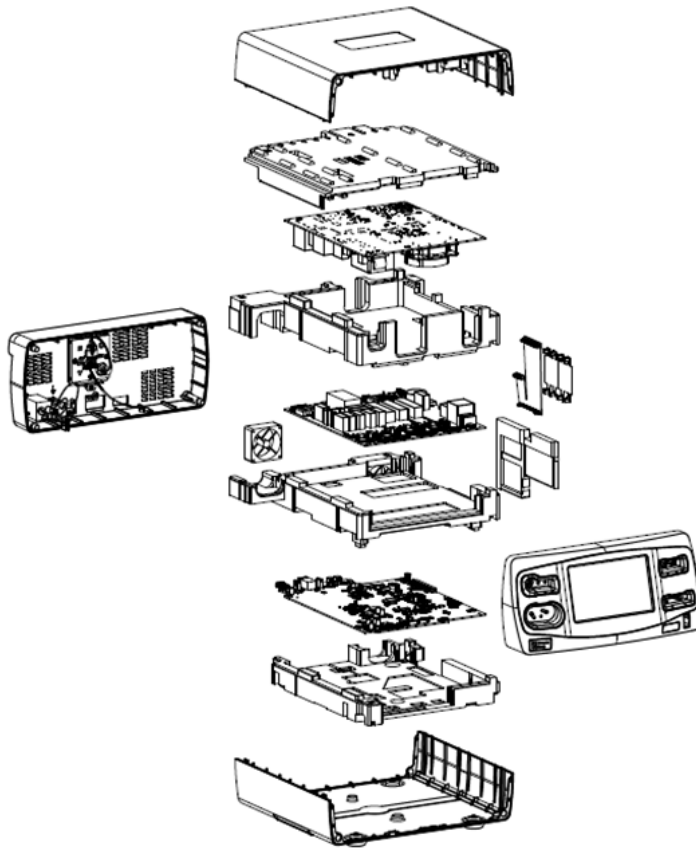
18. Remove the RF PCBA and RF fan from the E-PAC foam and place the RF PCBA and RF fan into the replacement piece of E-PAC foam. Place the 2nd layer of E-PAC foam with the RF PCBA and RF fan onto the Steering Relay PCBA foam ensuring that the power-supply fan slides into the E-PAC foam cutout on the 2nd level of foam. Reconnect the red/black power connector, 5 flex cable connectors, and RF fan connector.
19. Replace the top level of E-PAC foam with the new E-PAC foam and orient it onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
20. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

21. Tighten the bolts to 15 in./lb. of force.
22. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



## Power-Supply Fan Replacement

### Equipment needed

- Torx T-30 driver

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

**Notice**

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

**Notice**

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Leaving the RF PCBA and RF fan in the second level of E-PAC foam, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
6. Locate the power-supply fan directly behind the power supply. Remove the wire harness from the P8 connector on the Controller PCBA.
7. Lift and remove the fan from the E-PAC.

**Warning**

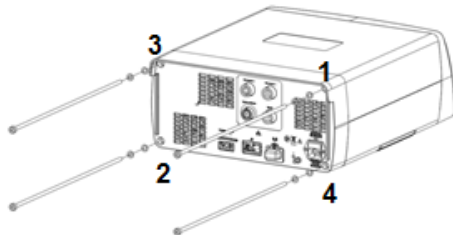
Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

8. Locate and remove the replacement fan from the packaging. Orient the fan so that the power cable so that it is facing down and the fan is blowing out or towards the rear of the device.
9. Reconnect the power cable to P6 on the Display PCBA.
10. Replace the 2nd layer of E-PAC foam with the RF PCBA and RF fan onto the Steering Relay PCBA foam ensuring that the power-supply fan slides into the E-PAC foam cutout on the 2nd level of foam. Reconnect the red/black power connector, 5 flex cable connectors, and RF fan connector.
11. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.

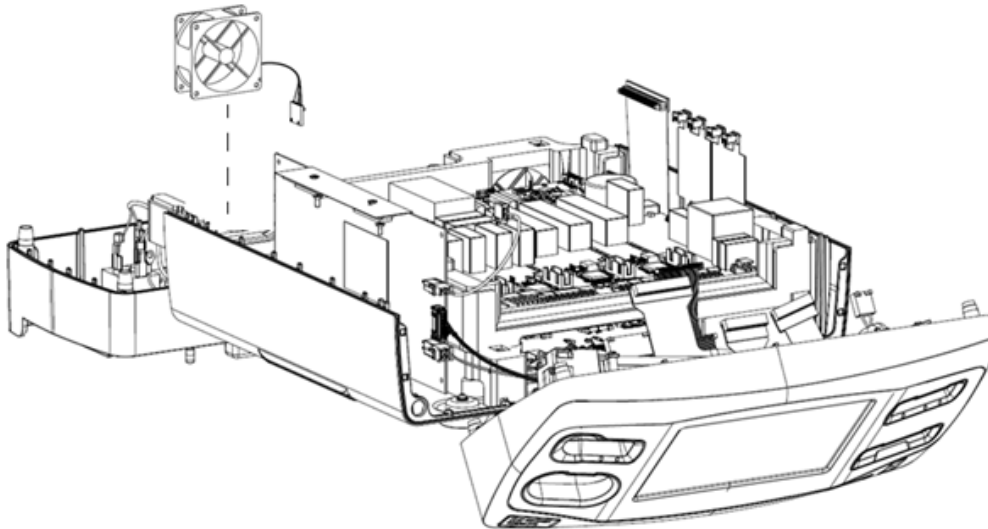
12. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

13. Tighten the bolts to 15 in./lb. of force.



14. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## Power-Supply Module Replacement

### Equipment needed

- Torx T-30 driver
- Valleylab Exchange

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Locate and remove the blue/brown/green connector from the rear of the device connected to the J1 connector on the rear of the power supply. Set aside for reinstallation.

**Note:** If the J1 connector cannot be reached, reference the Controller PCBA work instruction remove all of the PCBAs to gain access to the rear of the power supply. Use the same work instruction for reassembly instructions.

5. Locate and remove the three connectors on the front of the power supply at J2, J3, and J4. Set aside for reinstallation.
6. Grabbing the power supply with both hands by the metal enclosure of the power supply, pull vertically to remove the power supply.

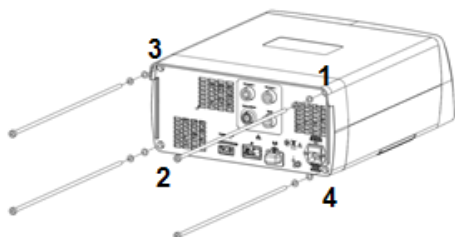
**Warning**

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

7. Locate and remove the replacement power from the protective ESD bag. Orient the power supply so that the tab on the metal enclosure faces away from the PCBA stack. The three connectors J2, J3, and J4 should be facing the front of the device. Slide the power supply down until the standoffs come through the tab on the power supply.
8. Reconnect the blue/brown/green connector to the rear of the power supply and the 3 cables to the J2, J3, and J4 connectors.
9. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
10. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:

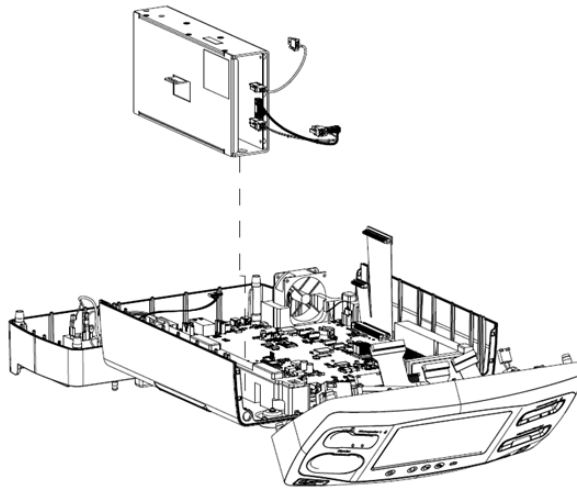


Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

11. Tighten the bolts to 15 in./lb. of force.
  12. Set up the generator and log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5.
- Note:** The system will issue an E233 error upon startup of the generator.
13. Valleylab Exchange automatically configures and registers the component.
  14. After successful completion of the component setup and registration, the generator will automatically restart.

15. Follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



## Speaker Replacement

### Equipment needed

- Torx T-10 driver
- Torx T-30 driver

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

**Notice**

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Using a T-10, remove the 2 screws holding the speaker bracket. Set them aside for reinstallation.
5. Remove the speaker and foam assembly.

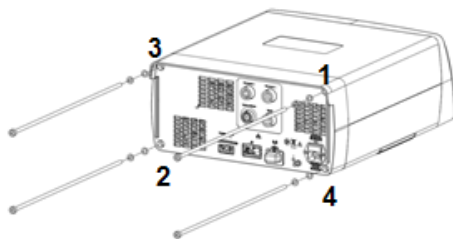
**Warning**

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

6. Locate and remove the replacement speaker and foam from the packaging. Orient the foam tab so that it slides into the front-panel assembly under the LCD module.
7. Reinstall the foam and speaker assembly.
8. Using a T-10, reinstall the bracket and fasteners and torque them to 5.0 in/lb.
9. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
10. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:

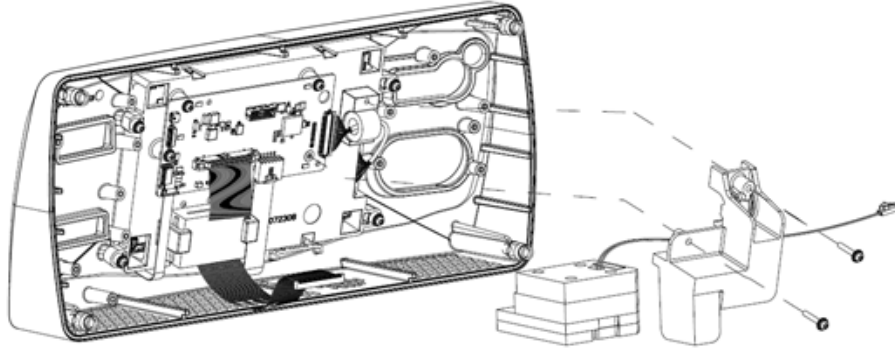


Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left

- Bottom right

11. Tighten the bolts to 15 in./lb. of force.



12. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## RF Fan Replacement

### Equipment needed

- Torx T-30 driver

#### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

#### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

#### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

**Notice**

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the fan power cable from P6.
5. Lift and remove the fan from the E-PAC.

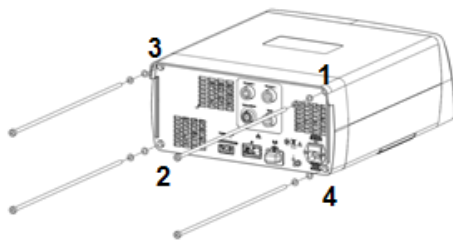
**Warning**

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

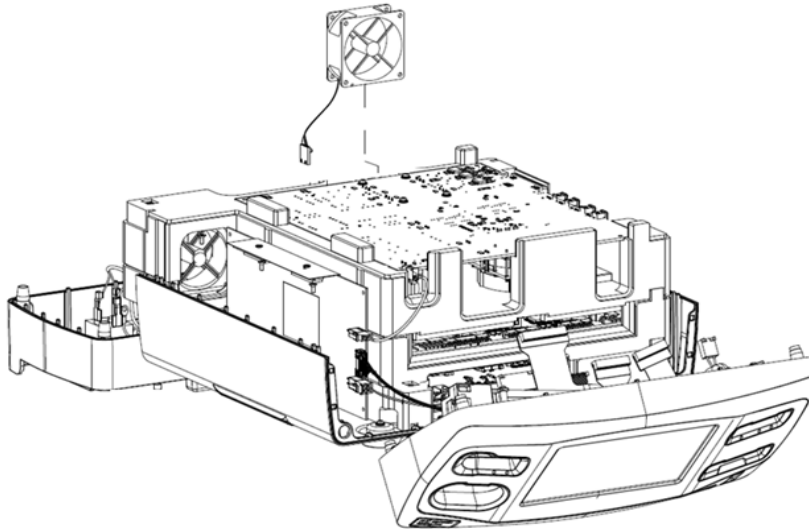
6. Locate and remove the replacement fan from the packaging. Orient the fan so that the power cable so that it is facing down and the fan is blowing out or towards the rear of the device.
7. Reconnect the power cable to P6.
8. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
9. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

10. Tighten the bolts to 15 in./lb. of force.



11. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## RF PCBA Replacement

### Equipment needed

- Torx T-30 driver
- Valleylab Exchange

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.

2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

**Notice**

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Remove the RF PCBA by holding the edges of the PCBA from the E-PAC foam.

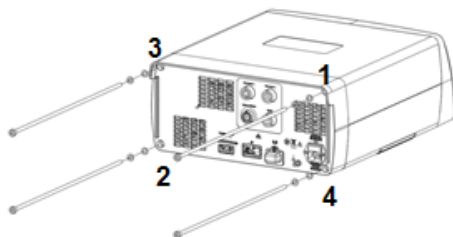
**Warning**

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

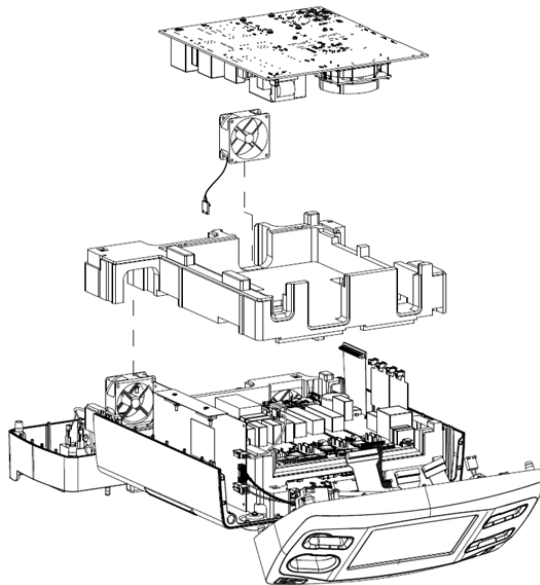
6. Locate and remove the replacement PCBA from the protective ESD bag handling the PCBA only by the edges of the board. Orient the RF PCBA so that the PCBA is facing down and that the 5 flex cable connection points are facing furthest away from the power supply.
7. Reconnect the red/black power connector and 5 flex cable connectors.
8. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
9. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left

- Top left
  - Bottom right
10. Tighten the bolts to 15 in./lb. of force.
  11. Set up the generator and log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5.  
**Note:** The system will issue an E233 error upon startup of the generator.
  12. Valleylab Exchange automatically configures and registers the component.
  13. After successful completion of the component setup and registration, the generator will automatically restart.  
**Note:** The system may issue an E239 error upon startup of the generator.
  14. Follow the Energy Calibration procedure outlined in this manual. See *Energy Calibration* on page 7-4.
  15. Follow the Periodic Safety Check (Routine Maintenance) procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



## Steering Relay PCBA Replacement

### Equipment needed

- Torx T-30 driver
- Valleylab Exchange

**Warning**

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

**Precaution**

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

**Notice**

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

**Notice**

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Remove the top level of E-PAC foam exposing the RF PCBA. Set the foam aside for reinstallation.
4. Remove the red/black power cable located near the power supply from the RF PCBA. Remove the 5 flex cable connectors from the side of the RF PCBA furthest from the power supply.
5. Leaving the RF PCBA and RF fan in the second level of E-PAC foam, remove the foam, fan, and PCBA as one assembly from the device. Set all aside for reinstallation.
6. Locate the power-supply fan directly behind the power supply. Remove the wire harness from the P8 connector on the Controller PCBA. Locate the Ladder flex cable connector opposite the power supply and remove the connector from J7 on the Steering PCBA.
7. Locate the 5 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, and P1 on the Steering Relay PCBA. Remove the front-panel assembly and set aside for reinstallation.
8. Locate and remove the two flex cables from the side of the Steering Relay PCBA furthest from the power supply P505, P507, P504, and P506. Set both aside for reinstallation.
9. Remove the Steering Relay PCBA by holding the edges of the PCBA from the E-PAC foam.

### Warning

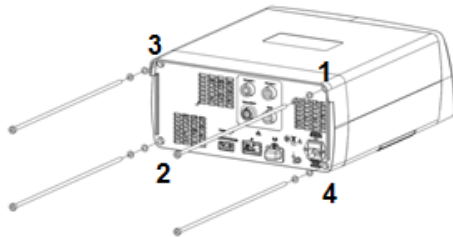


Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

10. Locate and remove the replacement PCBA from the protective ESD bag handling the PCBA only by the edges of the board. Orient the Steering Relay PCBA so that the PCBA will slide down into the E-PAC foam ensuring the five front panel connection points face the front of the device.
11. Reconnect the Ladder flex cable to J7 on the Steering PCBA, the power-supply fan to J8, and all five connections for the front panel P510, P511, P508, P509, and P1 on the Steering Relay PCBA.
12. Replace the 2nd layer of E-PAC foam with the RF PCBA and RF fan onto the Steering Relay PCBA foam ensuring that the power-supply fan slides into the E-PAC foam cutout on the 2nd level of foam. Reconnect the red/black power connector, 5 flex cable connectors, and RF fan connector.
13. Replace the top level of E-PAC foam onto the RF PCBA ensuring that the slots in the top level of foam align with the foam nubs from the 2nd layer of E-PAC foam.
14. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



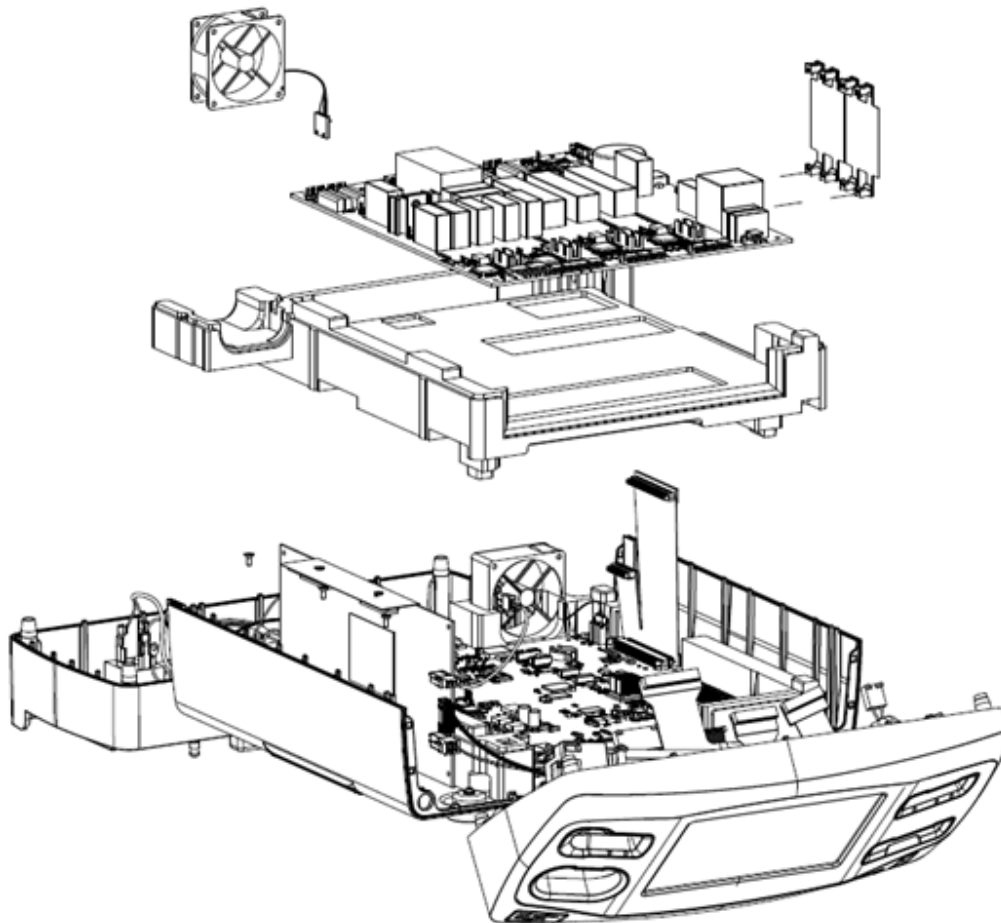
Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

15. Tighten the bolts to 15 in./lb. of force.
16. Set up the generator and log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5.

**Note:** The system may issue an E219 error upon startup of the generator. If so, continue to reboot the generator until an E233 error appears.

17. Valleylab Exchange automatically configures and registers the component.
18. After successful completion of the component setup and registration, the generator will automatically restart.
19. Follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



## Top Cover Replacement

### Equipment needed

- Torx T-30 driver

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least 5 minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

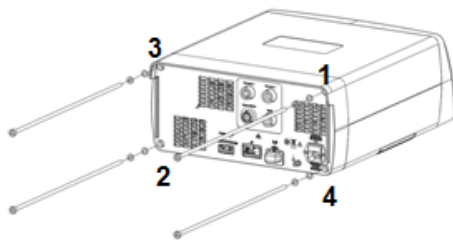
Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate and remove the replacement top cover from its packaging. Orient the cover to where the labeling is facing forward and is readable.
4. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
  - Bottom left
  - Top left
  - Bottom right
5. Tighten the bolts to 15 in./lb. of force.

6. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## Front-Panel Assemblies

### Front Bezel Replacement

#### Equipment needed

- Torx T-10 driver
- Torx T-30 driver

#### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

#### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

#### Notice

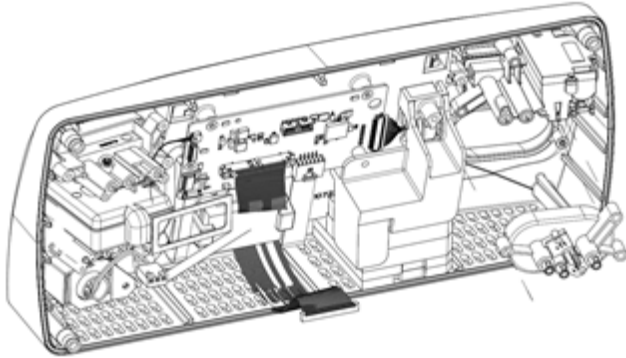
Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

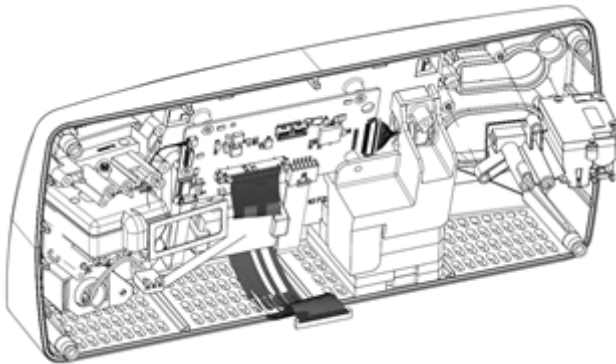
#### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

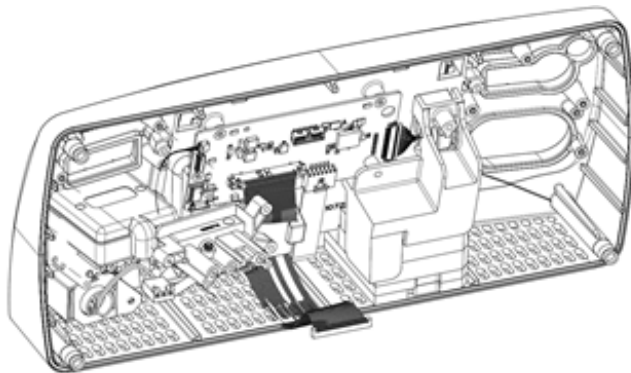
3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Using a T-10, locate and remove the three screws holding the Bipolar receptacle to the front-panel assembly. Set aside for reinstallation.



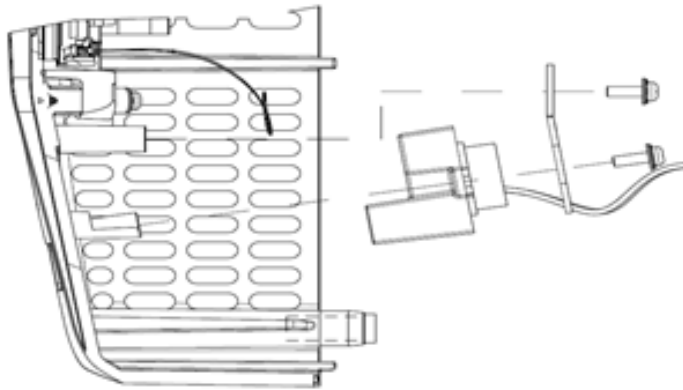
5. Using a T-10, locate and remove the three screws holding the Monopolar 2 receptacle to the front-panel assembly. Set aside for reinstallation.



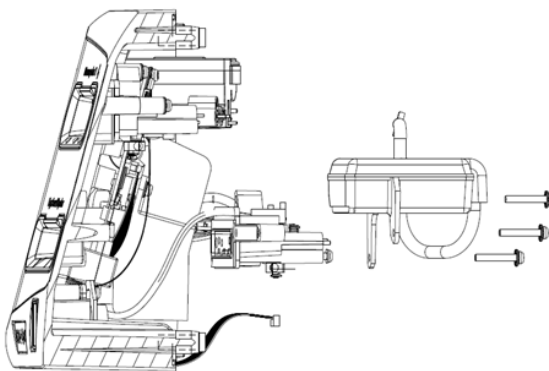
6. Using a T-10, locate and remove the three screws holding the Monopolar 1 receptacle to the front-panel assembly. Set aside for reinstallation.



7. Using a T-10, locate and remove the two screws holding the REM assembly to the front-panel assembly. Set aside for reinstallation.

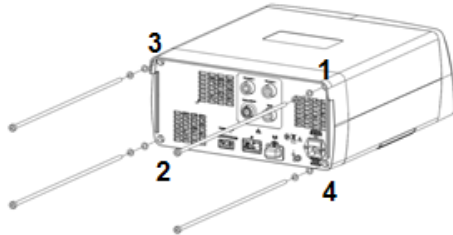


8. Using a T-10, locate and remove the three screws holding the LigaSure/Bipolar receptacle and VIBE to the front-panel assembly.



9. Locate and remove the P1 and J2 connector from the display PCBA. (Stopped here 10/8)
10. Insert all three screws into the replacement Monopolar 3 receptacle.
11. Place the receptacle into the front-panel assembly taking care not to damage the surrounding cables during installation.
12. Torque the three screws to 5 in/lb.
13. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.

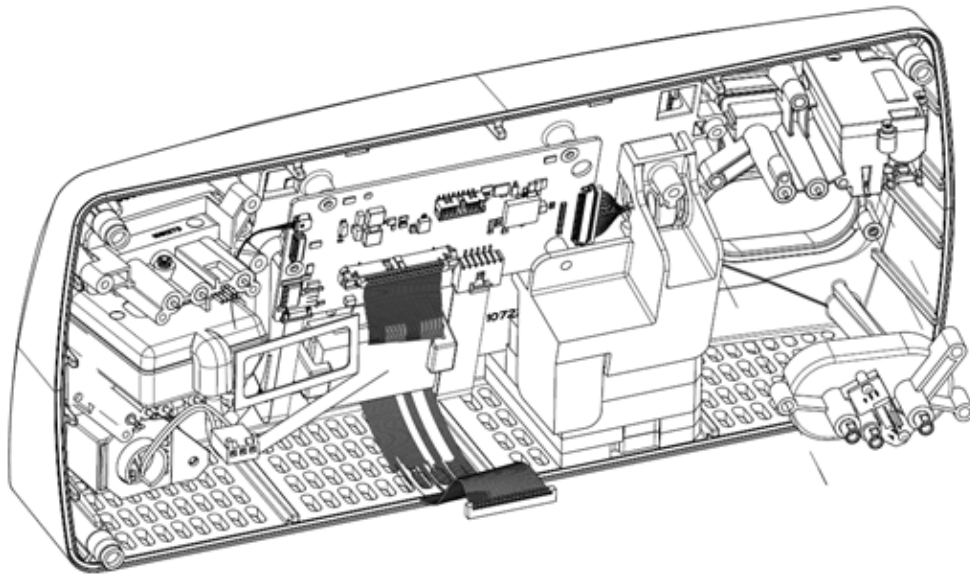
14. Replace the cover on the device and lift the front and rear panels up to the top cover.  
Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

15. Tighten the bolts to 15 in./lb. of force.



16. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## Bipolar Receptacle Replacement

### Equipment needed

- Torx T-10 driver
- Torx T-30 driver

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

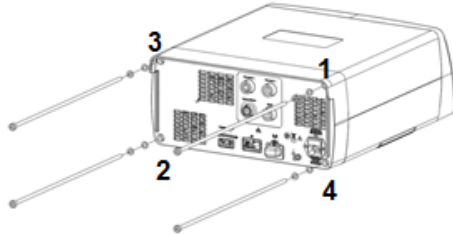
1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

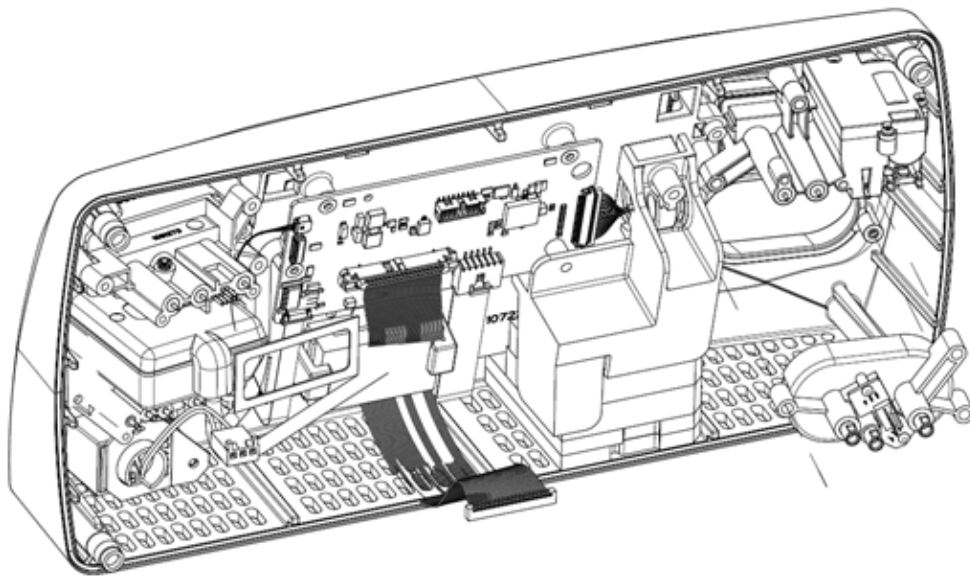
3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Using a T-10, locate and remove the three screws holding the Bipolar receptacle to the front-panel assembly. Set aside for reinstallation.
5. Remove the Bipolar receptacle from the front-panel assembly taking care not to damage the surrounding cables during removal.
6. Locate and remove the replacement Bipolar receptacle from the packaging.
7. Insert all three screws into the replacement Monopolar 3 receptacle.
8. Place the receptacle into the front-panel assembly taking care not to damage the surrounding cables during installation.
9. Torque the three screws to 5 in/lb.

10. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
11. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
  - Bottom left
  - Top left
  - Bottom right
12. Tighten the bolts to 15 in./lb. of force.



13. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## LigaSure/Bipolar Receptacle Replacement

### Equipment needed

- Torx T-10 driver
- Torx T-30 driver

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

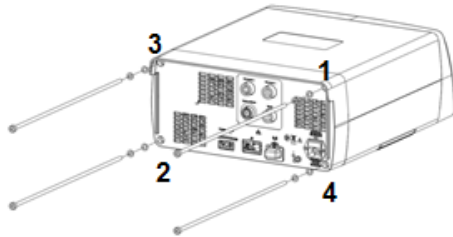
1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Using a T-10, locate and remove the three screws holding the LigaSure/Bipolar receptacle to the front-panel assembly. Set aside for reinstallation.
5. Locate and remove the VIBE assembly from the top of the LigaSure/Bipolar receptacle. Set aside for reinstallation.
6. Remove the LigaSure/Bipolar receptacle from the front-panel assembly taking care not to damage the Monopolar-receptacle ribbon cable during removal.
7. Locate and remove the replacement LigaSure/Bipolar receptacle from the packaging.
8. Assemble the VIBE assembly onto the replacement LigaSure/Bipolar receptacle and insert all three screws into the assembly.
9. Place the VIBE and receptacle assembly into the front-panel assembly taking care not to damage the Monopolar-connector ribbon cable during installation.

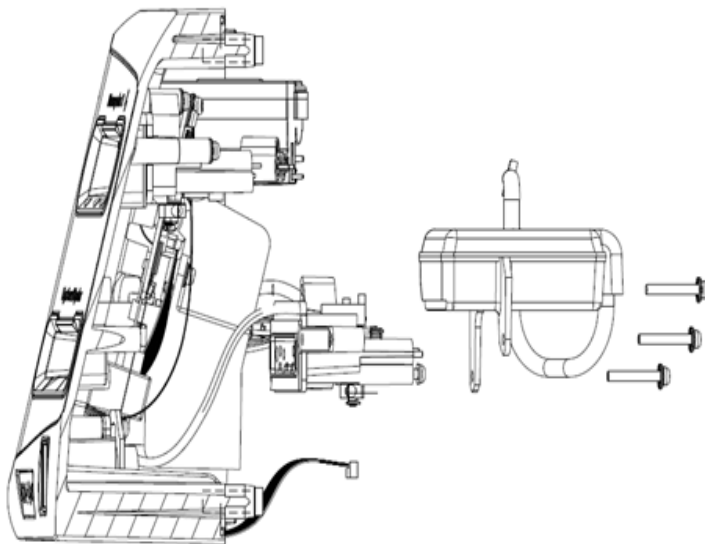
10. Torque the three screws to 5 in./lb.
11. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
12. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

13. Tighten the bolts to 15 in./lb. of force.
14. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



## Monopolar 1 Receptacle Replacement

### Equipment needed

- Torx T-10 driver
- Torx T-30 driver

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

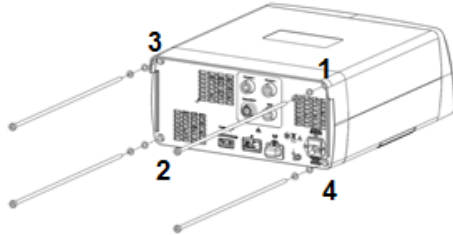
1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

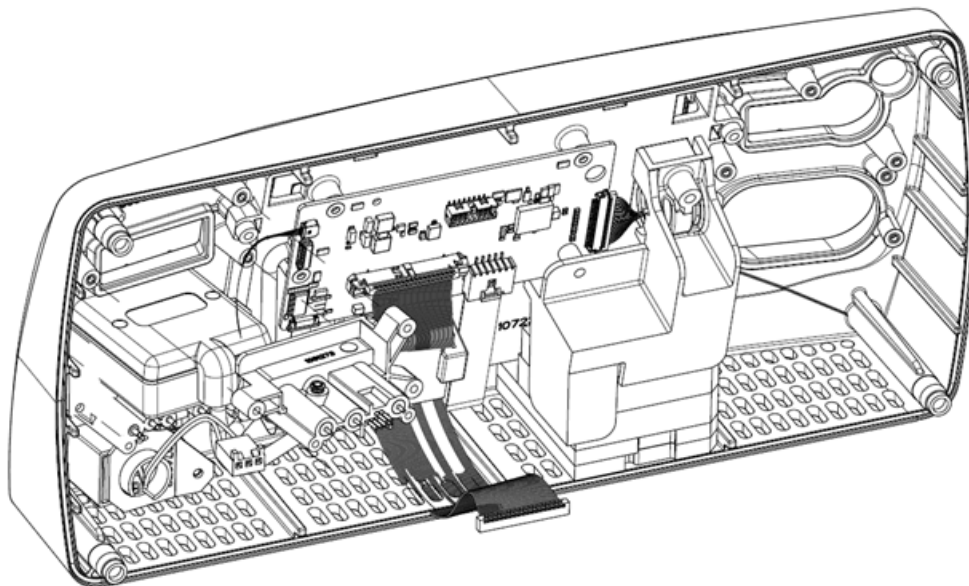
3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Using a T-10, locate and remove the three screws holding the Monopolar 1 receptacle to the front-panel assembly. Set aside for reinstallation.
5. Remove the Monopolar 1 receptacle from the front-panel assembly taking care not to damage the surrounding cables during removal.
6. Locate and remove the replacement Monopolar 1 receptacle from the packaging.
7. Insert all three screws into the replacement Monopolar 1 receptacle.
8. Place the receptacle into the front-panel assembly taking care not to damage the surrounding cables during installation.
9. Torque the three screws to 5 in/lb.

10. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
11. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
  - Bottom left
  - Top left
  - Bottom right
12. Tighten the bolts to 15 in./lb. of force.



13. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## Monopolar 2 Receptacle Replacement

### Equipment needed

- Torx T-10 driver
- Torx T-30 driver

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

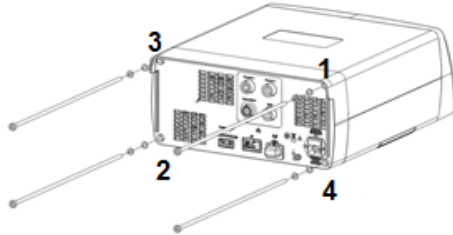
1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

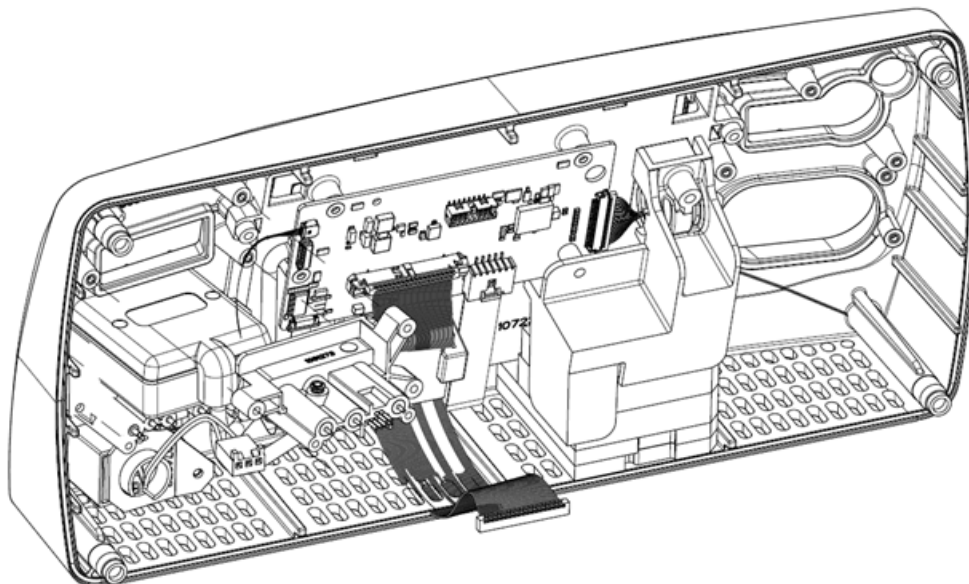
3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Using a T-10, locate and remove the three screws holding the Monopolar 2 receptacle to the front-panel assembly. Set aside for reinstallation.
5. Remove the Monopolar 2 receptacle from the front-panel assembly taking care not to damage the surrounding cables during removal.
6. Locate and remove the replacement Monopolar 2 receptacle from the packaging.
7. Insert all three screws into the replacement Monopolar 3 receptacle.
8. Place the receptacle into the front-panel assembly taking care not to damage the surrounding cables during installation.
9. Torque the three screws to 5 in/lb.

10. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
11. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
  - Bottom left
  - Top left
  - Bottom right
12. Tighten the bolts to 15 in./lb. of force.



13. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## VIBE Replacement

### Equipment needed

- Torx T-10 driver
- Torx T-30 driver
- Valleylab Exchange

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Locate the three screws holding the LigaSure/Bipolar receptacle and VIBE to the front-panel assembly and remove with a T-10 driver.
5. Locate and remove the VIBE assembly from the top of the LigaSure/Bipolar receptacle. Set aside the receptacle and screws for reinstallation.

### Warning

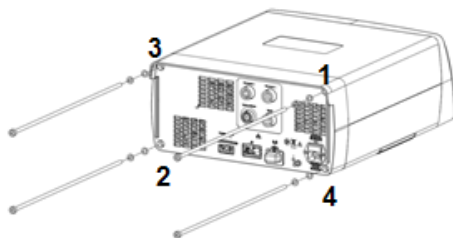


Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

6. Locate and remove the replacement VIBE from the ESD packaging.
7. Assemble the VIBE assembly onto the replacement LigaSure/Bipolar receptacle and insert all three screws into the assembly.
8. Place the VIBE and receptacle assembly into the front-panel assembly taking care not to damage the monopolar connector flex cable during installation.
9. Torque the three screws to 5 in/lb.
10. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
11. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:

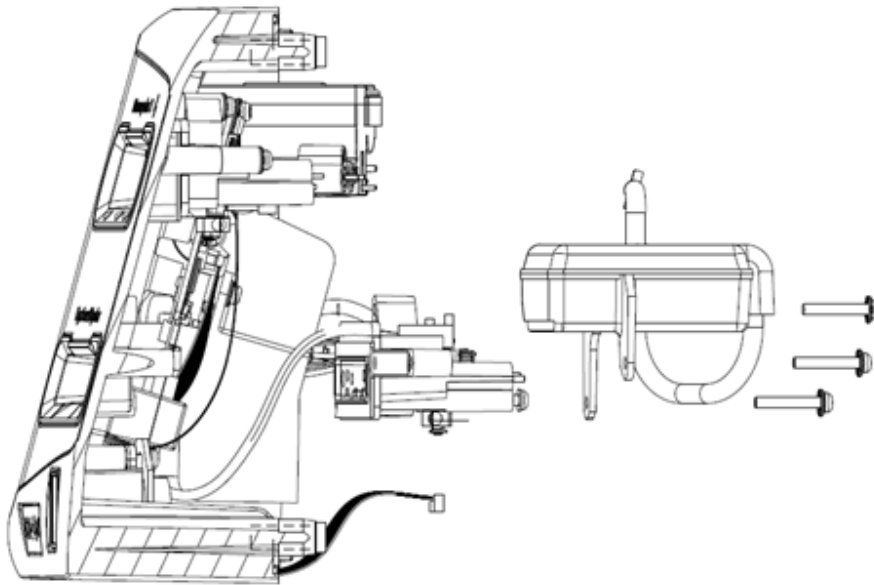


Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

12. Tighten the bolts to 15 in./lb. of force.
13. Set up the generator and log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5.  
**Note:** The system will issue an E233 error upon startup of the generator.
14. Valleylab Exchange automatically configures and registers the component.

15. After successful completion of the component setup and registration, the generator will automatically restart.
16. Register the component using Valleylab Exchange. See *Software Updates* on page 10-5.



17. Follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## REM Assembly Replacement

### Equipment needed

- Torx T-10 driver
- Torx T-30 driver

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

**Notice**

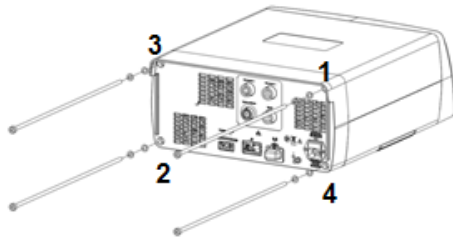
Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

**Notice**

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Locate the two screws holding the REM assembly to the front-panel assembly and remove with a T-10 driver. Set aside for reinstallation.
5. Remove the metal bracketing from the bad REM assembly. Set aside for reinstallation.
6. Remove the REM assembly from the front-panel assembly taking care not to damage the LigaSure/Bipolar connector flex cable during removal.
7. Locate and remove the replacement REM assembly from the packaging.
8. Locate the metal bracketing and orient the bracket so that the bend tab is facing upwards.
9. Place the REM assembly into the front-panel assembly taking care not to damage the LigaSure/Bipolar connector flex cable during installation.  
**Note:** Flip the front-panel assembly over to see the front of the panel. Ensure that the REM assembly is within the housing and flush with the front panel.
10. Orient the metal bracket so that both holes align to the mounts. Insert the screws and torque them to 5 in/lb.
11. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
12. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:

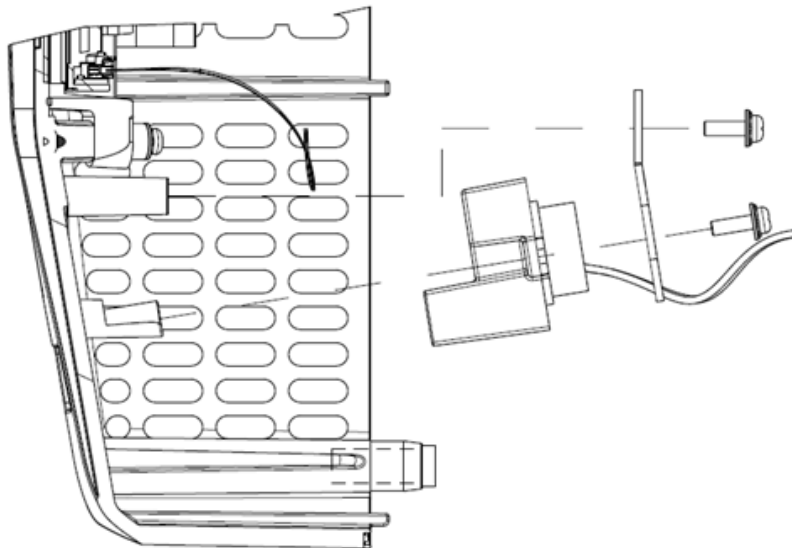


Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

13. Tighten the bolts to 15 in./lb. of force.

14. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



## LCD Module Replacement

### Equipment needed

- Torx T-30 driver
- #1 Phillips screwdriver

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Locate and remove the P1 and J2 connector from the display PCBA.
5. Using a T-10, remove the 2 screws holding the speaker bracket. Set them aside for reinstallation.
6. Using a T-10, remove the 3 screws holding the display PCBA to the LCD mount. Set them aside for reinstallation.
7. Remove the fan and foam assembly. Set aside for reinstallation.

**Warning**

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

8. Carefully remove the LCD assembly from the front panel ensuring that no damage occurs to the flex cables within the assembly.
9. Locate and remove the touchscreen connector from the P5 connection point on the display PCBA.
10. Remove the touchscreen assembly from the LCD assembly. Set aside for reinstallation.
11. Remove the backlight cable (4-wire, black) from the rear of the LCD module. Set aside for reinstallation.
12. Remove the LCD display cable (20-wire, multi-color) from the rear of the LCD module. Set aside for reinstallation.
13. Using the #1 Phillips screw driver, remove the bottom 2 screws holding the LCD module into the metal housing. **Do not** remove all four screws. Set screws aside for reinstallation.

**Warning**

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

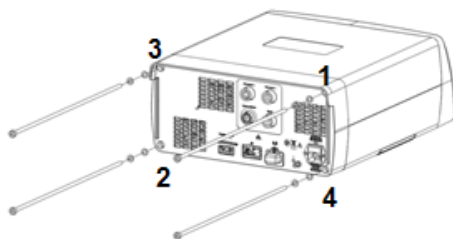
14. Locate and remove the replacement LCD module from the protective ESD bag. Orient the LCD module so that the backlight and LCD display cable connection points can be seen through the LCD module metal housing.
15. Using the #1 Phillips screw driver, reinstall the two LCD module mounting screws. Torque to 1.7 in/lb.
16. Reinstall both the backlight and LCD display cables into the replacement LCD module.
17. On the touchscreen, locate the smooth, glass side and the bumpy, touchscreen side. Orient the touchscreen so that the smooth, glass side is towards the LCD module and the bumpy, touchscreen side is facing away from the LCD module.
18. Reinstall the touchscreen connector on the P5 connection point on the display PCBA.

19. Holding the touchscreen against the LCD module, carefully insert the left side of the LCD assembly into the mounting points nearest to the Monopolar 2 and LigaSure/ Bipolar receptacles ensuring that no damage occurs to the flex cables within the assembly.
20. Supporting the touchscreen and LCD module from the front side of the front-panel assembly, gently lower the right side of the LCD assembly onto the mounting points nearest to the Monopolar 1 and bipolar receptacles.

**Note:** Properly inspecting the touchscreen alignment in the next step is CRITICAL to the installation. Failure to properly inspect and then secure the fasteners can lead to broken touchscreens. Breaking touchscreens during the installation process may not be covered by the product warranty.

21. Holding the LCD module into the front-panel assembly, rotate the front-panel assembly to inspect the LCD/touchscreen alignment in the front-panel assembly. The LCD/touchscreen assembly should be:
  - Flush with the front panel
  - Center aligned with no visual offsets vertically or horizontally
  - Parallel with the front-panel assembly cutout without rotational offset
22. Reinstall the 3 screws into the LCD mounts and secure them to 5 in/lb.
23. Reinstall the 2 screws and fan bracket and secure them to 5 in/lb.

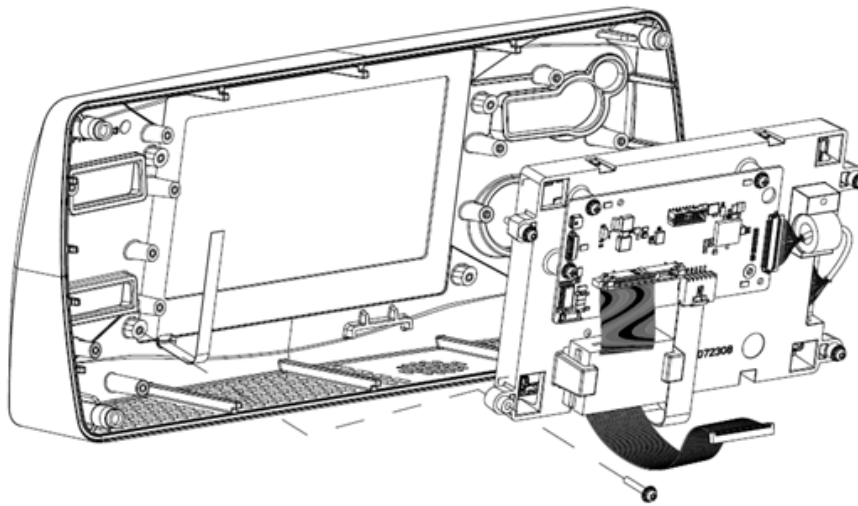
**Note:** Over torquing the screws holding the LCD assembly to the front panel may result in cracking of the touchscreen assembly. Breaking touchscreens during the installation process may not be covered by the product warranty.
24. Reconnect P1 on the display PCBA.
25. After ensuring that the locking feature is pulled out of J2, insert the flex cable into J2. Complete the connection by sliding the locking feature towards the PCBA.
26. Reinstall the foam and speaker assembly.
27. Reinstall the 2 screws holding the speaker into place and torque to 5.0 in/lb.
28. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
29. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

30. Tighten the bolts to 15 in./lb. of force.



31. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## Touchscreen Assembly Replacement

### Equipment needed

- Torx T-10 driver
- Torx T-30 driver
- M2 hex

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

#### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

#### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together.  
Remove the cover and set the cover and screws aside for reinstallation.

#### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 6 wire harnesses connecting the front panel to the top-level assembly and remove P510, P511, P508, P509, P4, and P1. Remove the front-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
4. Locate and remove the P1 and J2 connector from the display PCBA.
5. Using a T-10, remove the 2 screws holding the speaker bracket. Set them aside for reinstallation.
6. Using a T-10, remove the 3 screws holding the display PCBA to the LCD mount. Set them aside for reinstallation.
7. Carefully remove the LCD assembly from the front panel ensuring that no damage occurs to the flex cables within the assembly.
8. Locate and remove the touchscreen connector from the P5 connection point on the display PCBA.
9. Remove the touchscreen assemble from the LCD assembly.

#### Warning



Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

10. Locate and remove the touchscreen from the protective ESD bag. On the touchscreen, locate the smooth, glass side and the bumpy, touchscreen side. Orient the touchscreen so that the smooth, glass side is towards the LCD module and the bumpy, touchscreen side is facing away from the LCD module.
11. Reinstall the touchscreen connector on the P5 connection point on the display PCBA.
12. Holding the touchscreen against the LCD module, carefully insert the left side of the LCD assembly into the mounting points nearest to the Monopolar 2 and LigaSure/ Bipolar receptacles ensuring that no damage occurs to the flex cables within the assembly.
13. Supporting the touchscreen and LCD module from the front side of the front-panel assembly, gently lower the right side of the LCD assembly onto the mounting points nearest to the Monopolar 1 and bipolar receptacles.

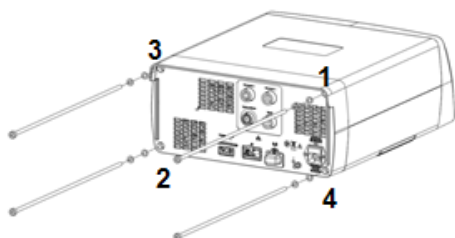
**Note:** Properly inspecting the touchscreen alignment in the next step is CRITICAL to the installation. Failure to properly inspect and then secure the fasteners can lead to broken touchscreens. Breaking touchscreens during the installation process may not be covered by the product warranty.

14. Holding the LCD module into the front-panel assembly, rotate the front-panel assembly to inspect the LCD/touchscreen alignment in the front-panel assembly. The LCD/touchscreen assembly should be:
  - Flush with the front panel
  - Center aligned with no visual offsets vertically or horizontally
  - Parallel with the front-panel assembly cutout without rotational offset

15. Reinstall the 2 screws into the LCD mounts and secure them to 5 in/lb.

**Note:** Over torquing the screws holding the LCD assembly to the front panel may result in cracking of the touchscreen assembly. Breaking touchscreens during the installation process may not be covered by the product warranty.

16. Reconnect P1 on the display PCBA.
17. After ensuring that the locking feature is pulled out of J2, insert the flex cable into J2. Complete the connection by sliding the locking feature towards the PCBA.
18. Orient the front-panel assembly so that it aligns with the top-level assembly and is ready for reassembly. Replace all six connections for the front panel P510, P511, P508, P509, P4, and P1.
19. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:

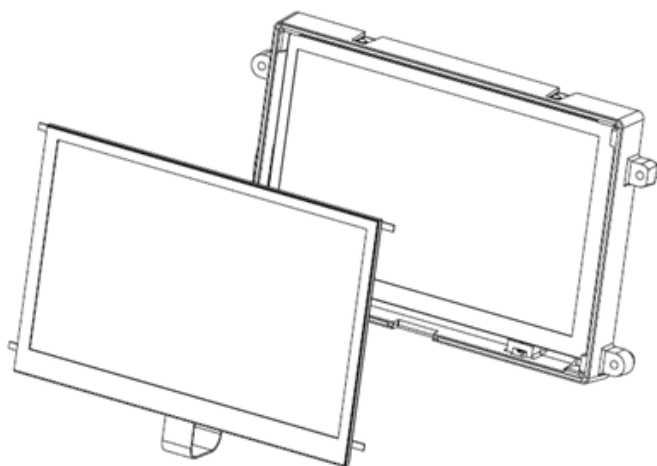


Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

20. Tighten the bolts to 15 in./lb. of force.

21. Upon completion of the component replacement, follow the touchscreen calibration procedure outlined in this manual. See *Touchscreen Calibration* on page 7-2.



## Rear-Panel Assemblies

### EMI Filter Replacement

#### Equipment needed

- Torx T-30 driver
- #1 Phillips Screwdriver

#### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

#### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

#### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

#### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate and remove the line (brown), neutral (blue), and ground (green/yellow) wires from the EMI filter.
4. Locate the two screws holding the EMI filter to the rear panel and remove with a #1 Phillips screwdriver. Set the fasteners aside for reinstallation.
5. Remove the EMI from the rear-panel assembly.

**Warning**



Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

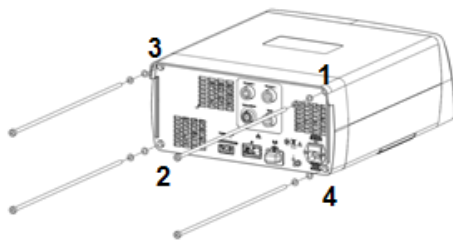
Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

6. Locate and remove the replacement EMI filter from the packaging.
7. Place the EMI filter into the rear-panel assembly ensuring proper orientation with the fuse drawer on top as shown in the illustration.
8. Reinstall and torque the two screws to 5 in/lb.
9. Reinstall the line (brown), neutral (blue), and ground (green/yellow) wires the to the EMI filter.

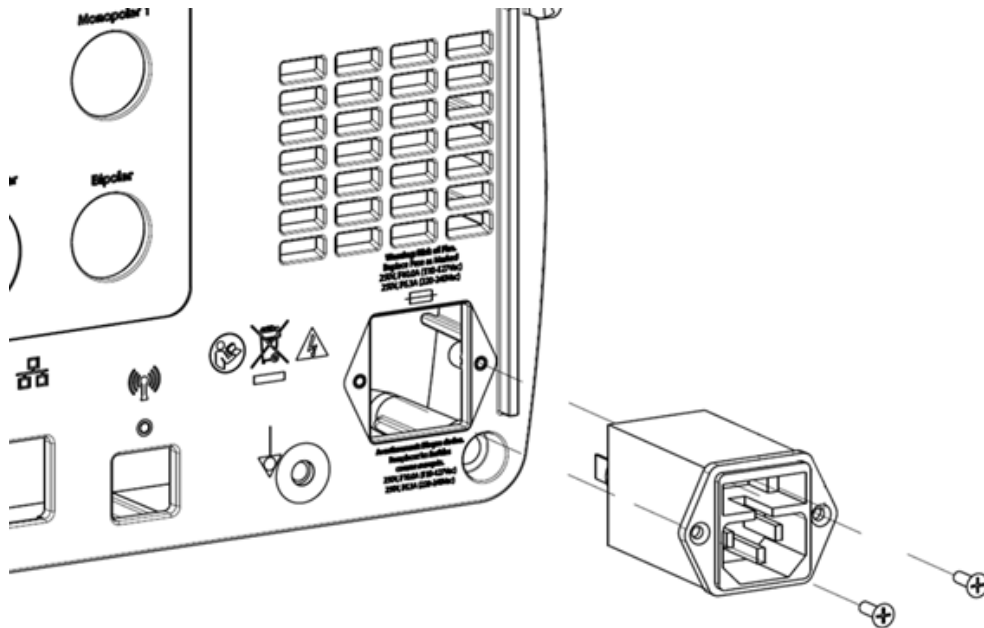
**Note:** Ensure proper electrical connections to the EMI filter. Incorrect connection may cause irreversible damage to the device.

10. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right



11. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## Equipotential Ground Connection Replacement

### Equipment needed

- Torx T-30 driver
- 10 mm wrench

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

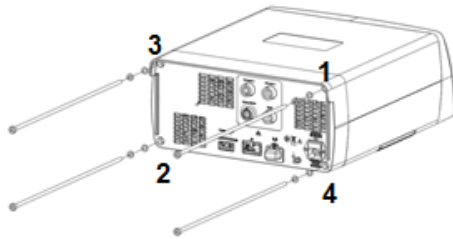
### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 3 ground wire harnesses connecting the rear panel to the top-level assembly and remove the 3 nuts holding the wire harnesses in place using a 10 mm wrench.
4. Using a 10 mm wrench, remove the ground connection from the rear of the rear panel.
5. Locate and remove the replacement equipotential ground connection from the packaging.
6. Thread the equipotential ground connection into the rear-panel assembly.
7. Torque the equipotential ground connection to 15 in/lb.
8. Using a 10 mm wrench, replace the ground wires to the equipotential ground connection on the rear panel. The order of placement is:
  - 1) Ground wire from the power supply wire harness
  - 2) Ground wire from the EMI filter
  - 3) Ground wire from the chassis ground

Tighten the nuts to 15 in/lbs of force.

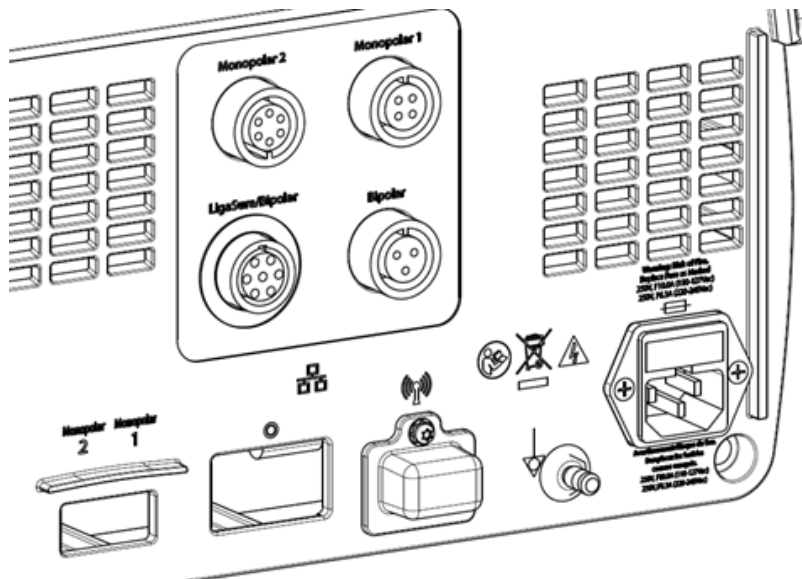
9. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

- Top right
- Bottom left
- Top left
- Bottom right

10. Tighten the bolts to 15 in/lbs of force.



11. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## FTSW PCBA Replacement

### Equipment needed

- Torx T-10 driver
- Torx T-30 driver
- 10 mm wrench
- Valleylab Exchange

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.<sup>2</sup>

### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Remove the four bolts that secure the device front and rear enclosures together. Remove the cover and set the cover and screws aside for reinstallation.

### Notice

When removing the bolts, ensure the front panel does not fall or put strain on the cables connecting it to the body of the generator. Connector damage could result.

3. Locate the 3 ground wire harnesses connecting the rear panel to the top-level assembly and remove the three nuts holding the wire harnesses in place using a 10mm wrench.
4. Locate and remove the Line (brown) and Neutral (blue) wires from the EMI filter.
5. Remove the rear-panel assembly and set the remaining top-level assembly pieces aside for reinstallation.
6. Locate the two screws holding the FTSW PCBA to the rear-panel assembly and remove with a T-10 driver. Set the fasteners aside for reinstallation.
7. Remove the FTSW PCBA by holding the edges of the PCBA from the assembly.

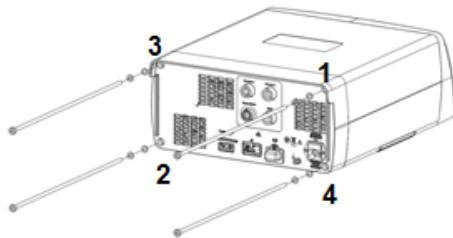
**Warning**

Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

8. Locate and remove the replacement FTSW PCBA from the protective ESD bag handling the PCBA only by the edges of the board.
9. Place the FTSW PCBA into the rear-panel assembly ensuring proper orientation as the PCBA will only go on the rear panel one way.
10. Reinstall and torque the two screws to 5 in/lb.
11. Using a 10mm wrench, replace the ground wires to the equipotential ground connection on the rear panel. The order of placement is:
  - 1) Ground wire from the power supply wire harness
  - 2) Ground wire from the EMI filter
  - 3) Ground wire from the chassis ground
 Tighten the nuts to 15 in/lbs of force.
12. Replace the cover on the device and lift the front and rear panels up to the top cover. Replace the four bolts into the rear of the device and tighten in the following pattern:



Bolt-tightening descriptions from the rear view:

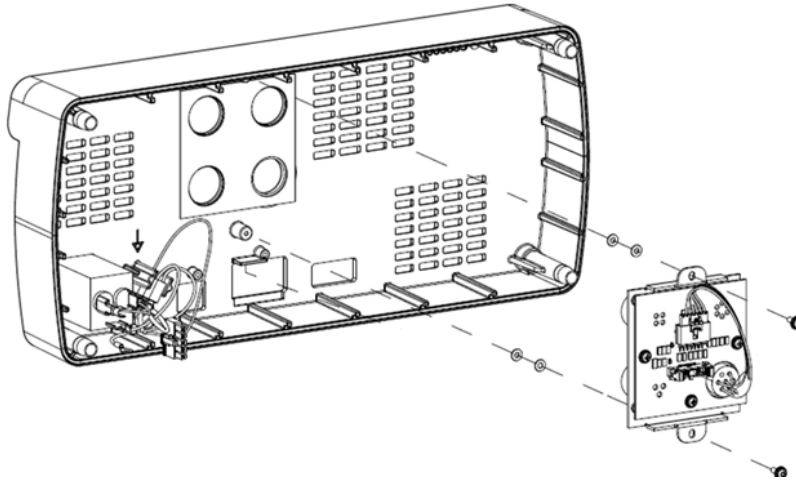
- Top right
- Bottom left
- Top left
- Bottom right

Tighten the bolts to 15 in./lb. of force.

13. Set up the generator and log into Valleylab Exchange as you would when updating software. See *Software Updates* on page 10-5.

**Note:** The system will issue an E233 error upon startup of the generator.

14. Valleylab Exchange automatically configures and registers the component.
15. After successful completion of the component setup and registration, the generator will automatically restart.
16. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See v.



## Fuse Replacement

### Equipment needed

- #1 Flathead screwdriver

### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

### Precaution

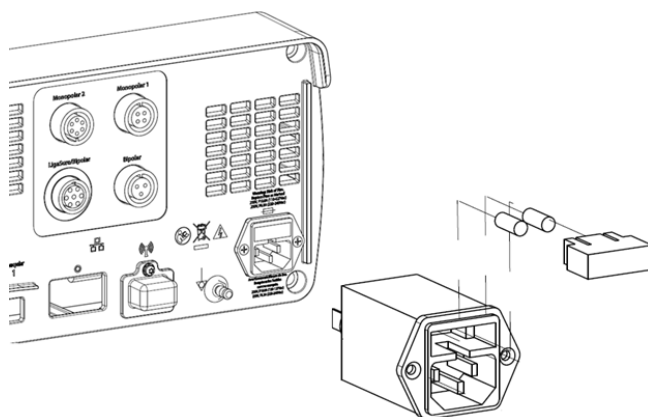
The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.

2. Release the fuse drawer by inserting a small flathead screwdriver into the slot on the drawer above the power cord receptacle. Slide the drawer out.
3. Replace each fuse with one of the same type and rating.
4. Slide the fuse drawer into its slot until it snaps into place.



5. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.

## WiFi Replacement

### Equipment needed

- Torx T-10 driver

#### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

#### Precaution

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

#### Notice

Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

1. Turn off the generator. Disconnect the power cord from the wall receptacle.

2. Using a T-10, locate and remove the single screw holding the WiFi cover to the rear panel assembly. Set the fasteners aside for reinstallation.
3. Locate and remove the WiFi device by holding the edges of the WiFi device and pulling away from the generator.

#### Warning

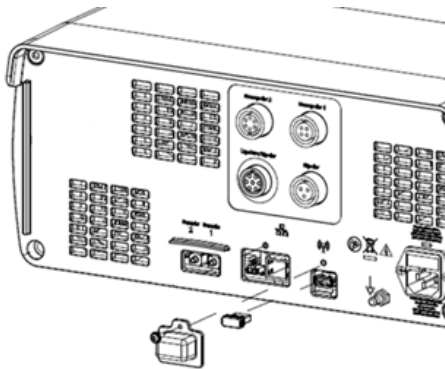


Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities.

Electrical appliances that are incorrectly disposed in dumps or landfills can leach dangerous substances causing contamination of soil and groundwater, and damaging the environment.

Contact your local government, or point of sale for information regarding the collection of waste electrical appliances

4. Locate and remove the replacement WiFi device from the protective bag.
5. Place the WiFi device into the rear of the generator ensuring proper orientation as the WiFi device will only go into the connector one way.
6. Reinstall and torque the two screws to 5 in/lb.
7. Upon completion of the component replacement, follow the periodic safety check procedure outlined in this manual. See *Periodic Safety Check (Routine Maintenance)* on page 7-7.



## Back Panel Disassembly and Re-assembly

### Equipment needed

- Torx T-10 driver

#### Warning

**Electric Shock Hazard** To allow stored energy to dissipate after power is disconnected, wait at least five minutes before replacing parts.

**Precaution**

The system contains electrostatic-sensitive components. When repairing the system, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized system. Handle PCBAs by their non-conductive edges. Use an antistatic container for transport of electrostatic-sensitive components and PCBAs.

**Notice**

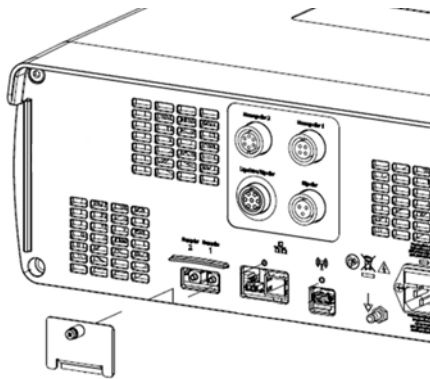
Perform all steps including the recalibration listed below. Failure to recalibrate the system after replacing the components may result in the system becoming inoperable.

**Disassembly**

1. Turn off the generator. Disconnect the power cord from the wall receptacle.
2. Using a T-10, locate and remove the single screw holding the back-panel cover to the rear-panel assembly.

**Re-assembly**

1. Reinstall the back panel and fastener assembly, and torque the screw to 5 in./lb.
2. Upon completion of the PCBA replacement, no calibration is required.





# Chapter 10

## Maintenance and Repair

This chapter presents the following information:

- The manufacturer's responsibility
- Routine maintenance and safety checks
- Cleaning the energy platform
- Product service
- Service manual copies and updates
- Returning the energy platform for service
- Software updates
- Covidien Technical Service
- Training and education

### Precaution

Read the instructions, warnings, and precautions provided with this energy platform and associated accessories before using. Specific instructions for electrosurgical instruments are not included in this manual.

## Responsibility of the Manufacturer

Covidien is responsible for the safety, reliability, and performance of the energy platform only if all of the following conditions have been met:

- Installation and setup procedures in this manual are followed.
- Assembly, readjustments, modifications, or repairs are carried out by persons authorized by Covidien.
- The electrical installation of the relevant room complies with local codes and regulatory requirements, such as IEC and BSI.
- The equipment is used in accordance with the Covidien instructions for use.

For warranty information, refer to the *Limited Warranty* section in this manual.

## Routine Maintenance and Periodic Safety Checks

### Notice

Refer to Chapter 6, *Testing Setup and Functional Tests* for maintenance recommendations and function and output-power verification procedures.

### ***When should the energy platform be checked or serviced?***

Covidien recommends that the energy platform be inspected by qualified service personnel at least once a year. This inspection should include adjusting the system to factory specifications.

### ***When should the power cord be checked or replaced?***

Check the power cord before each use of the system or at the intervals recommended by your institution. Check the power cord for exposed wires, cracks, frayed edges, or a damaged connector. Replace damaged cords.

### ***When should the fuses be replaced?***

An internal component malfunction can damage the fuses. The system fuses may need to be replaced if the system fails the power-on self-test or if the system stops functioning, even though it is receiving power from a wall outlet.

## Cleaning

### Warning

**Shock Hazard** Before cleaning or servicing the unit, disconnect the power plug from the power outlet in order to completely isolate the generator from mains power.

### Notice

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

Do not spray cleaning fluids directly on the generator as damage to the generator may occur.

1. Turn off the system and unplug the power cord from the wall outlet.
2. Thoroughly wipe all surfaces of the energy platform and power cord with a damp cloth and mild cleaning solution or disinfectant. The energy platform will withstand the effects of cleaning over time without degrading the enclosure or display quality.

## Product Service

Covidien recommends that all VLFT10GEN systems be returned to the manufacturer for all service requirements. If any service is required without returning the system to the manufacturer, Covidien recommends that only qualified personnel service the VLFT10GEN system.

Covidien defines qualified personnel as a person with electrosurgical equipment repair experience, such as biomedical personnel, and/or individuals who have taken official Covidien training courses.

## Returning the Energy Platform for Service

Before returning the energy platform, call a Covidien sales representative for assistance. If the energy platform is to be sent to Covidien, do the following:

1. Obtain a return authorization number.

Call the Covidien Technical Service Center (see page 10-6) to obtain a Return Authorization Number. Have the following information ready before calling:

- 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

2. Clean the energy platform.

See the previous section, *Cleaning*.

3. Ship the energy platform.

- a. Attach a tag to the energy platform that includes the return authorization number and the information (hospital, phone number, etc.) listed in step 1.
- b. Be sure the energy platform is completely dry before packing it for shipment. Package it in its original shipping container, if available.
- c. Ship the energy platform, prepaid, to the Covidien Service Center.

## Software Updates

Software updates are available directly from Covidien by using the Valleylab Exchange Remote Software System application.

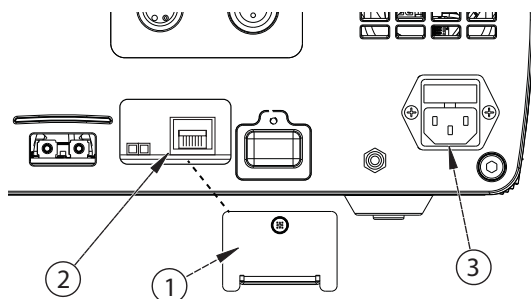
Go to <http://www.medtronic.com/covidien/support/valleylab-exchange> to download and install the latest version of the Valleylab Exchange application. For additional information, the *Valleylab Exchange Remote Software System User's Guide* is available on the Valleylab Exchange website.

### Updating Energy Platform Software

Once the Valleylab Exchange application has been installed on the computer to be used for the update, follow these brief instructions. Refer to the *Valleylab Exchange Remote Software System User's Guide* for more extensive information if needed.

#### To remotely update software on a VLFT10GEN Energy Platform:

1. Turn on the facility computer that has Valleylab Exchange installed,
2. Remove cover on back of generator to expose the data ports.



- ① Ethernet receptacle cover
- ② Ethernet receptacle
- ③ Power cord receptacle

3. Connect Ethernet cable to the Ethernet receptacle on the back of the energy platform.
4. Connect the other end of the cable to a LAN connector on the facility computer.
5. Plug the system power cord into the power cord receptacle.
6. Plug the other end of the cord into a grounded power receptacle.
7. Turn on the generator by pressing the On/Off button and wait for the power-on self-test to complete.
8. Touch the Service/Settings button on the front panel of the generator to view the *Service and Settings* menu.
9. Touch the **System** button from the menu to view the *System Menu*.
10. Touch **Network**.

11. Select **Enable Network Default Pt. to Pt.**
12. On the facility computer, open the Valleylab Exchange application. Valleylab Exchange prompts the user to put the energy platform in service mode.
13. Start the software update from Valleylab Exchange. See *Software Updates* on page 10-5.
14. Confirm the start of the software upgrade on the generator touchscreen. A progress bar on the generator will inform you that the software update is in process.
15. After the successful completion of the software update, the generator will automatically restart.
16. When Valleylab Exchange indicates the upgrade is complete, turn off the generator by depressing the On/Off button for 3 seconds.
17. Unplug the system power cord from the wall receptacle.
18. Unplug the system power cord from the rear panel receptacle.
19. Disconnect the Ethernet cable from the facility's LAN connector.
20. Disconnect the Ethernet cable from the back of the generator.
21. Replace cover on back of generator to cover the data ports.

## Service Manual Copies and Updates

The latest version of this service manual is available at  
<http://www.medtronic.com/covidien/support/biomed-connect/electrosurgery>.

To request a hard copy of the service manual, call the telephone numbers listed in the next section.

## Covidien Technical Service

For service, contact Covidien Technical Service or your VLFT10GEN sales representative. Contact a Covidien technical-service representative by telephone, email, or through the Internet:

- USA and Canada: 1 800 5 8522 Option 2
- International: 1 303 476 7996
- Email— [valleylab.technicalservice@covidien.com](mailto:valleylab.technicalservice@covidien.com)
- Internet—<http://www.medtronic.com/covidien/support/service-centers>

**or**

<http://www.medtronic.com/covidien/support/biomed-connect/electrosurgery>

## Training/Education

For clinical professionals and service training options, please refer to the Covidien web site:  
<http://www.covidien.com/education>.





**Rx**  
ONLY



**COVIDIEN**

Part No. PT00047922

COVIDIEN, COVIDIEN with logo, and Covidien logo and Positive Results for Life are U.S. and internationally registered trademarks of Covidien AG. Other brands are trademarks of a Covidien company, <sup>TM</sup> \* brands are trademarks of their respective owner.

May be covered by U.S. Patents: [www.covidien.com/patents](http://www.covidien.com/patents)

©2013 Covidien.

Made in USA. Printed in USA.

 Covidien llc, 15 Hampshire Street, Mansfield, MA 02048 USA.

 Covidien Ireland Limited, IDA Business & Technology Park, Tullamore.

[www.covidien.com](http://www.covidien.com)

1 303 530 2300 [T]

1 800 255 8522 [T]

REV 10/2016