carilex®


**VT ONE NEGATIVE PRESSURE WOUND THERAPY SYSTEM**

# SERVICE MANUAL

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# General Information

## A. Introduction

This Carilex Service Manual provides repair and maintenance instructions for the VT One System.

Any trained maintenance staff member can perform the procedures described in the sections of this manual that are designated Level 1.

Only manufacture-authorized service personnel can perform the procedures described in the sections of the manual that are designated Level 2.

If the system cannot be repaired using the procedures described in the Level 1 sections of this manual and there are no manufacture-authorized service personnel available, please contact Carilex or your local distributor to receive a return authorization number and a return address where the system can be sent for repair and servicing.

## B. Safety Precautions

 **Open Flames:**

Do not expose this device to open flames, lighters, or cigarettes. This device draws room air continuously, therefore cigarette smoking is not recommended near this device. Cigarette smoke may damage internal components. Cigarettes may ignite bed linens.

CAUTION: DO NOT SMOKE CIGARETTES, PIPES, CIGARS, OR ANY OTHER RELATED PRODUCTS ON OR AROUND THIS SYSTEM. FLAMMABILITY HAZARD EXISTS.

## C. Warnings

 **Cross Contamination:**

This device should be decontaminated between patient installations. Refer to Power Unit and Mattress Maintenance Sections of this Manual for proper instructions. Failure to disinfect may result in cross contamination.

 **Risk of Electric Shock:**

DO NOT open back cover. This device is NOT user serviceable. This device should only be opened by qualified personnel approved by Carilex. Refer all service to your local Carilex authorized dealer.

 **Oxygen Equipment:**

Explosion risk if used in the presence of flammable anesthetics.

 **Electrical:**

Do not insert items into any opening of the power unit. This could short internal components, which could cause fire or electrical shock. This product is NOT AP/APG protected. REFER SERVICING TO QUALIFIED PERSONNEL ONLY.

 **IP22:**

In accordance with the acceptance conditions as required by IEC 60529-V2.2:2013

 **Class II product:**

This product is a Class II product. Do NOT cut or remove the grounding prong for shock prevention from the plug on this product if it is present. In the event that a non-compatible wall receptacle is found, it is the customer's personal responsibility and obligation to contact a qualified electrician to replace it with a compatible wall receptacle in accordance with the National Electrical Code.

 **Extension Cord:**

If for any reason, you find it necessary to use an extension cord, ONLY use an appropriate extension cord that has the same or higher electrical rating as the device it is being connected to.

 **Hospital Grade receptacle:**

Note: Grounding reliability can only be achieved when the plug is connected to an equivalent receptacle marked "Hospital Grade" or "Hospital Only".

# Maintenance - Level 1

## A. Introduction

Any trained maintenance staff member can perform the procedures described in the sections of this manual that are designated Level 1.

## Power Unit

## A. Part Identification Overview

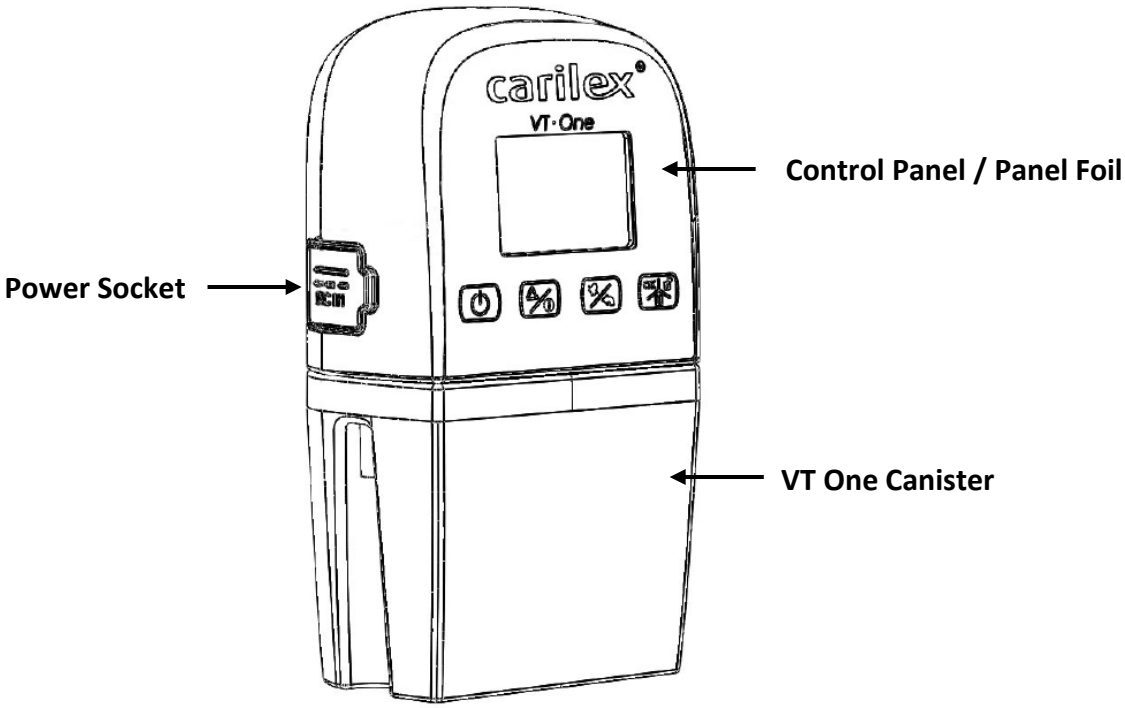
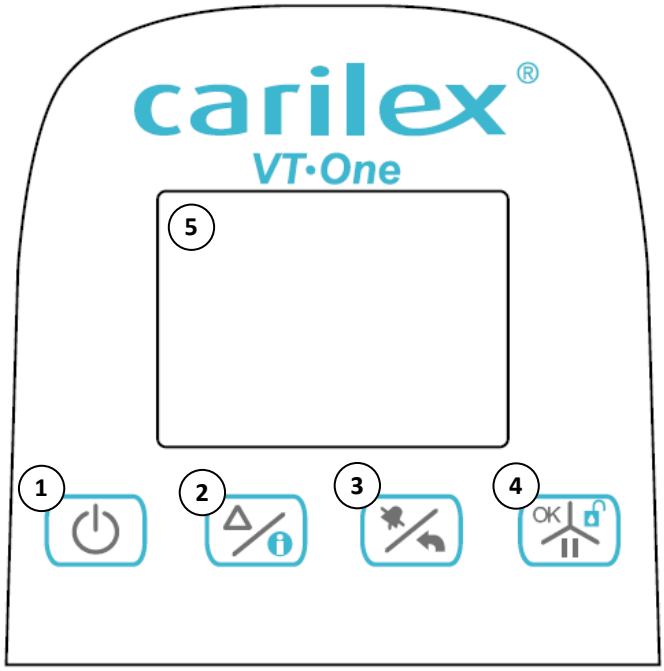



**Fig: 1**

## B. Control Panel Reference




| | |
|---|---|
| **1** | On / Off Button |
| **2** | Select / Info Button |
| **3** | Mute / Return Button |
| **4** | OK / Unlock / Pause Button |
| **5** | LCD Display |

**Fig: 2**

## C. Display Symbols Reference

| |
|---|
| Battery status |
| Low power |
| Canister full |
| Leakage indicator |
| Blockage Indicator |
| Call for service |
| Mute |
| Panel locked |
| The machine is operating |
| Pause |
| Continuous Mode |
| Intermittent Mode |
| Life time already used in days and hours |

## D. General Maintenance

**Body and Docking Ports**

1. Thoroughly inspect the body casing and panel foil for any damage, such as cracks, where moisture might get inside.
2. Remove the canister from the unit then inspect and clean the docking port, checking for any signs of foreign matter or damage.

**Power Adapter**

1. Thoroughly check the full length of the power cord for any damage such as brittleness or splits.
2. Check the power adapter casing for any damage such as cracking or splitting.

 **IF THE POWER ADAPTER IS DAMAGED IN ANY WAY, DISCARD IT IMMEDIATELY**

## E. General Cleaning Instructions

 **ALWAYS UNPLUG THE POWER UNIT BEFORE CLEANING**

 **NEVER SPRAY LIQUIDS DIRECTLY ONTO A POWER UNIT**

 **NEVER IMMERSE A POWER UNIT IN ANY LIQUID**

**Routine Cleaning During Use**

1. Dampen a clean cloth with soap and water or a mild, neutral detergent and then wipe the power unit.

**Routine Decontamination Between Patients**

1. Dampen a clean cloth with soap and water or a mild, neutral detergent and then wipe the power unit.
2. Disinfect the power unit with hospital grade registered disinfectant. Let the power unit stand for the appropriate contact time, according to the manufacturer's instructions.
3. Dry the power unit using a clean, dry cloth or disposable paper towels.
4. Wrap the power unit in plastic and store in a cool, dry place.

# Maintenance and Repair - Level 2

## A. Introduction

The procedures described in Maintenance and Repair – Level 2 must only be carried out by manufacture-authorised service personnel. If your system cannot be repaired using the instructions in the Level 1 sections of this manual and you are not a manufacture-authorised service person, please contact Carilex Medical Inc. regarding repairs.

## B. Tools Required

PH1 Screwdriver 

Small Flat Screwdriver 

Sharp Knife 

Superglue 

# Power Unit

## A. Part Identification Overview

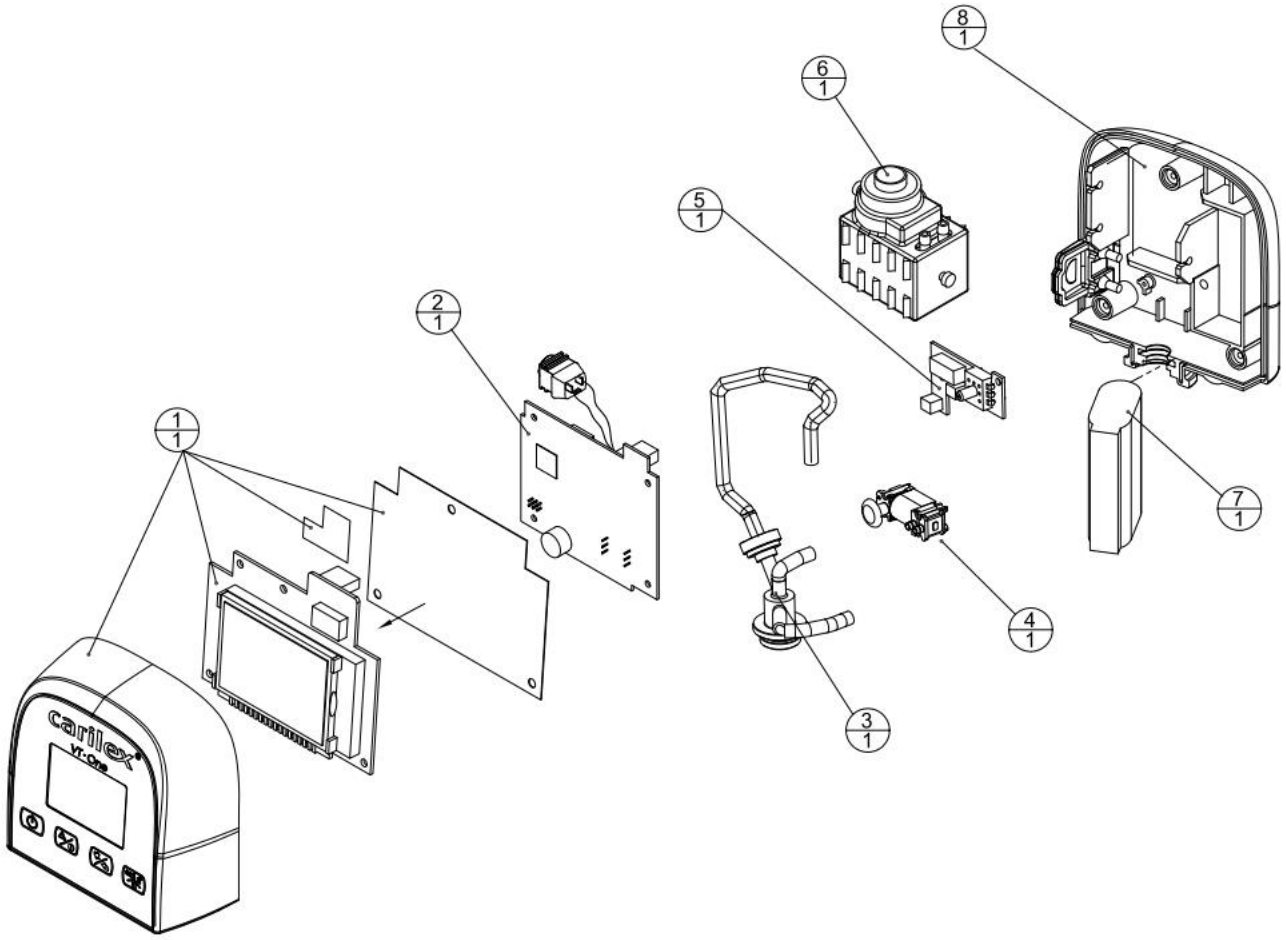



**Fig: 3**

1. Top Case Set
2. Control PCBA
3. Silicone Tube Set
4. Solenoid Valve Set
5. Sensor PCBA Set
6. Vacuum Motor
7. Battery Set
8. Bottom Case Set

## B. Replacing the Top Case Set

1. Remove the three screws from the back of the power unit. (Fig: 4)
2. Remove and lay over the top case. (Fig: 5)
3. Remove the four screws from the control PCBA. (Fig: 7)
4. Remove the two LCD display PCBA cables from the control PCBA. (Fig: 7)
5. Reverse the procedure to install the new top case set, ensuring that the wire and silicone tube routing is exactly as found and that the silicone tubes are not kinked then complete a function test once the unit is closed.

⚠ **ALWAYS DISCONNECT THE POWER ADAPATER FROM THE POWER SOCKET BEFORE CARRYING OUT REPAIRS ON THE POWER UNIT**

⚠ **ALWAYS DISCONNECT THE BATTERY SET FROM THE CONTROL PCBA BEFORE CARRYING OUT REPAIRS ON THE POWER UNIT**

⚠ To avoid electrostatic discharge, ground yourself by using a wrist grounding strap or by periodically touching an unpainted metal surface, such as the back panel of your computer.


**Fig: 4**

**Fig: 5**

## C. Replacing the Control PCBA

1. Follow the steps in “Replacing the Top Case Set” to remove the top case set.
2. Slide the power supply socket from the bottom case. (Fig: 6)
3. Remove the four screws from the control PCBA. (Fig: 7)
4. Remove the four connectors from the control PCBA. (Fig: 7)
5. Gently lift the control PCBA out of the power unit case.
6. Reverse procedure to install a new control PCBA, ensuring that the wire and silicone tube routing is exactly as found and that the silicone tubes are not kinked then complete a function test once the unit is closed.

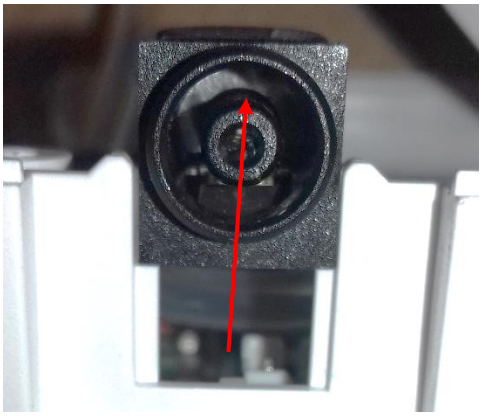
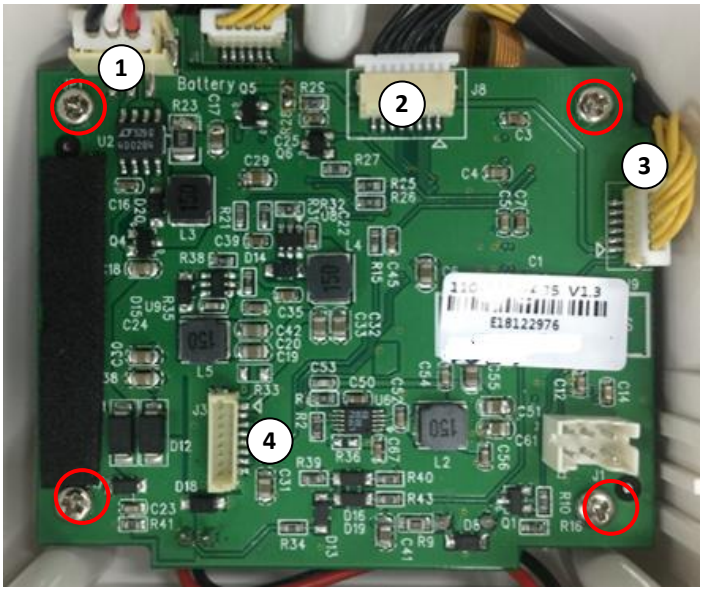


**Fig: 6**




| | |
|---|---|
| **1** | Battery Connector |
| **2** | LCD Display PCBA Connector (Black) |
| **3** | LCD Display PCBA Connector (Yellow) |
| **4** | Control PCBA Connect to Sensor PCBA |

**Fig: 7**

## D. Replacing the Silicone Tube Set

1. Follow the steps in “Replacing the Top Case Set” to remove the top case set.
2. Remove the silicone tubes from the vacuum motor (Fig: 11), solenoid valve set (Fig: 9) and pressure sensor. (Fig: 10)
3. Remove the docking port from the power unit casing. (Fig: 8)
4. Reverse the procedure to install a new silicone tube set, ensuring that the silicone tube routing is exactly as found and that the wires and silicone tubes are not kinked or trapped in the power unit casing then complete a function test once the unit is closed.

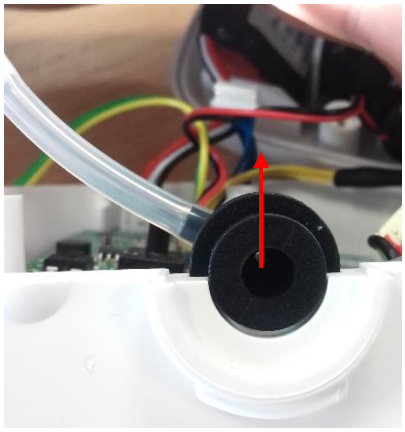


**Fig: 8**

## E. Replacing the Solenoid Valve Set

1. Follow the steps in “Replacing the Top Case Set” to remove the Top Case Set.
2. Pull out the silicone from the solenoid valve set. (Fig: 9)
3. Remove the docking port from the power unit casing. (Fig: 8)
4. Disconnect the solenoid valve connector from the sensor PCBA. (Fig: 10)
5. Reverse the procedure to install a new solenoid valve set, ensuring that the wire and silicone tube routing is exactly as found and that the silicone tubes are not kinked then complete a function test once the power unit is closed.

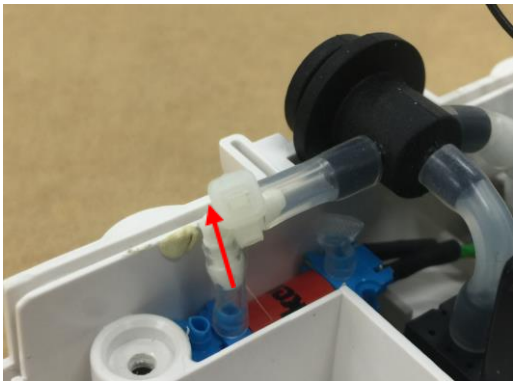
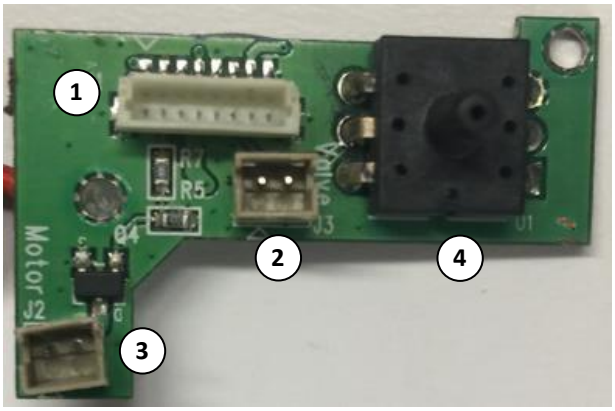


**Fig: 9**

## F. Replacing the Sensor PCBA

1. Follow the steps in “Replacing the Top Case Set” to remove the Top Case Set.
2. Disconnect the control PCBA connector from the Sensor PCBA. (Fig: 10)
3. Disconnect the solenoid valve connector from the sensor PCBA. (Fig: 10)
4. Disconnect the vacuum motor connector from the sensor PCBA. (Fig: 10)
5. Remove the silicone tube from the pressure sensor. (Fig: 10)
6. Remove the two screws from the sensor PCBA. (Fig: 10)
7. Reverse the procedure to install a new solenoid valve set, ensuring that the wire and silicone tube routing is exactly as found and that the silicone tubes are not kinked then complete a function test once the power unit is closed.




| | |
|---|---|
| **1** | Control PCBA Connect to Sensor PCBA |
| **2** | Solenoid Valve Connector |
| **3** | Vacuum Motor Connector |
| **4** | Pressure Sensor Connector |

**Fig: 10**

## G. Replacing the Vacuum Motor

1. Follow the steps in “Replacing the Top Case Set” to remove the top case set.
2. Remove the vacuum motor connector from the sensor PCBA. (Fig: 10)
3. Remove the silicone tube from the vacuum motor. (Fig: 11)
4. Remove the three vacuum motor retainer rubbers from the bottom case. (Fig: 11 & Fig: 12)
5. Reverse the procedure to install a new vaccum motor, ensure that all wire and silicone tube routing is exactly as found and that none of the silicone tubes are kinked then complete a function test once the power unit is closed.

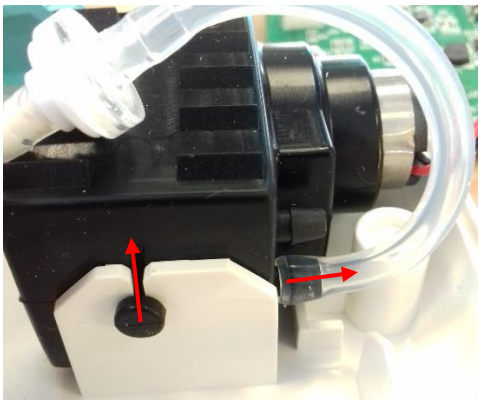


**Fig: 11**

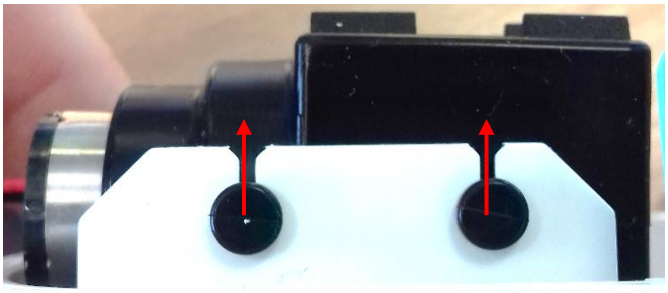


**Fig: 12**

## H. Replacing the Battery Set

1. Follow the steps in “Replacing the Top Case Set” to remove the top case set.
2. Remove the battery set connector from the control PCBA. (Fig: 7)
3. Lift the battery set (Fig: 13) from the power unit case.
4. Reverse the procedure to install a new battery set, ensuring that the wire routing is exactly as found and that none of the wires or silicone tubes are kinked or trapped in the power unit casing then complete a function test once the power unit is close.


**Fig: 13**

## I. Replacing the Bottom Case

1. Follow the steps in “Replacing the Top Case Set” to remove the top case set.
2. Follow the steps in “Replacing the Vacuum Motor” to remove the vacuum motor from the bottom case.
3. Follow the steps in “Replacing the sensor PCBA” to remove the sensor PCBA from the bottom case.
4. Use a small, thin, flat-bladed knife, lift the corner of the information sticker on the rear case and pull then gently pull the sticker away from the case.
5. Reverse the procedure to install the new bottom case, ensuring that the information sticker (Fig: 14) is replaced securely using super glue if required, that the wire and silicone tube routing is exactly as found and that none of the silicone tubes are kinked then complete a function test once the power unit is closed.

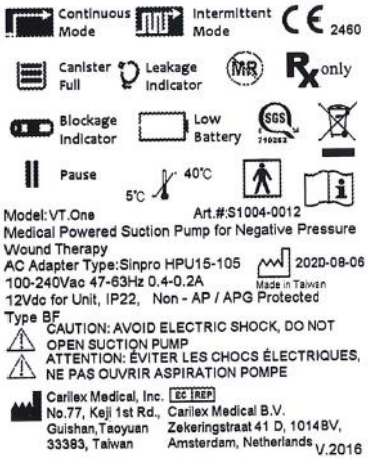



**Fig: 14**

# Testing

## A. Introduction

The procedures described in this section of the manual can be carried out by any trained member of staff.

## B. Tools Required

Multimeter with DC voltage mode ----------

# Power Unit

## A. Function Test

| Stage | Steps |
|---|---|
| Power On | • Plug the power adapter into the wall socket and into the power unit<br>• Switch the wall socket on<br>• Press and hold the power button to switch the power unit on<br>• The power unit will display the continuous mode icon |
| Buttons | • Press the up button to toggle between continuous and intermittent modes<br>• Press the OK button to select a therapy<br>• Press the return button to return to the previous display |
| Vacuum Motor, Solenoid Valve and Pressure Sensors | • Attach a canister to the power unit and closed tight the clip from the canister.<br>• Press and hold the power button to switch the power unit on.<br>• Select 'Intermittent' from the 'Select Therapy' list then press the OK button to confirm<br>• Set the 'High' pressure to -150mmHg then press the OK button to confirm<br>• Set the 'Low' pressure to -20mmHg then press the OK button to confirm<br>• Check that the reading on the LCD display quickly reaches 150mmHg ±5 and confirms the reading.<br>• Wait for five minutes for the solenoid valve to open and check that the reading on the LCD display quickly reaches 20mmHg ±5 and confirms the reading. |
| Power Off | • Press and hold the power button to switch the power unit off<br>• Switch the wall socket and the power switch on the power unit off then disconnect the power adapter from both |

## B. Battery Voltage Test

*The battery should be charged and voltage tested every three months.*

1. Follow the steps in “Replacing the Battery Set” to remove the battery from the power unit.
2. Set your multimeter to DC voltage mode and measure the voltage between the red and black wires on the battery. (Fig: 15)
3. If the voltage is lower than 6V replace the battery with a new battery.
4. Connect the battery to the power unit, return it to the battery compartment and secure the battery compartment.
5. Plug the power adapter into the power unit and switch the power switch on allowing four hours for the battery to charge.

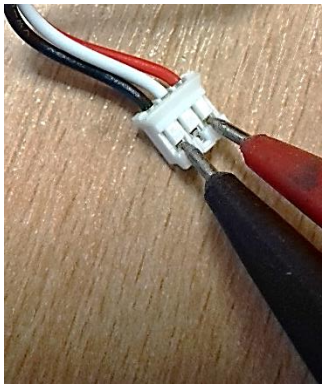


**Fig: 15**

**STORE THE BATTERY IN A DRY ENVIRONMENT**

| | Minimum Temperature | Maximum Temperature | Maximum Relative Humidity |
|---|---|---|---|
| **Charged battery** | -20°C | 35°C | 70% |
| **Charging battery** | 5°C | 40°C | 70% |

**ALWAYS DISPOSE OF DEFECTIVE BATTERIES IN ACCORDANCE WITH LOCAL ENVIRONMENTAL REGULATIONS**

# Troubleshooting

## A. Introduction

The procedures described in Troubleshooting that are marked Level 2 must only be carried out by manufacture-authorised service personnel. All other procedures in described in Troubleshooting can be carried out by any trained maintenance personnel.

If your system cannot be repaired using the instructions in the Level 1 sections of this manual and you are not a manufacture-authorised service person, please contact Carilex Medical Inc regarding repairs.

 **ENSURE THAT THE POWER SUPPLY IS NOT CONNECTED TO THE POWER UNIT BEFORE OPENING THE POWER UNIT CASE**

 **ENSURE THAT THE POWER UNIT CASE IS CLOSED AND SCREWED TOGETHER BEFORE CONNECTING THE POWER SUPPLY**

## B. Power Unit

| No Battery Charging Symbol | No Backlight | System Unresponsive to Buttons | Continuous Alert or Insufficient Performance | Can't Power On | Troubleshooting Guidelines |
|---|---|---|---|---|---|
| ★ | | | | | • Check that the power adapter is connected to the wall socket and power unit and that the wall socket is switched on<br>• Level 2: Replace the control PCBA and check its function with "Function Test" |
| | ★ | | | | • Press a button on the control panel<br>• Check that the power adapter is connected to the wall socket and power unit and that the wall socket is switched on<br>• Level 2: Check that the battery is connected to the power unit<br>• Level 2: Check the voltage in the battery using "Battery Voltage Test"<br>• Level 2: Replace the control PCBA and check its function with "Function Test" |
| | | ★ | | | • Level 2: Check that the yellow LCD display connector is connected to the control PCBA<br>• Level 2: Replace the top case set and check its function with "Function Test"<br>• Level 2: Replace the control PCBA and check its function with "Function Test" |
| | | | ★ | | • Check the docking ports for blockages<br>• Check the canister docking tubes for blockages<br>• Check the LCD display for low battery<br>• Level 2: Check the silicone tube set for damage or kinking<br>• Level 2: Replace the control PCBA and check its function with "Function Test"<br>• Level 2: Replace the solenoid valve and check its function with "Function Test"<br>• Level 2: Replace the vacuum motor and check its function with "Function Test" |
| | | | | ★ | • Check that the power adapter is connected to the wall socket and power unit and that the wall socket is switched on<br>• Check the LCD display for battery charging<br>• Level 2: Replace the control PCBA and check its function with "Function Test" |

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# Product Service Record

F101.04

| General Information | |
|---|---|
| Date: | |
| Service Technician: | |
| Company: | |
| Location: | |
| Product Serviced: | |
| Serial Number: | |
| Device Article Number: | |
| Invoice Number: | |
| In Warranty:<br><br>General Problems Description: | Yes / No |

| Parts Replaced or Repaired | Problems Identified | Serial Number (Record if applicable) | Function Test |
|---|---|---|---|
| | | Old:<br>New: | Follow Service Manual:<br>NO._____<br>Result: ☐PASS ☐NG |
| | | Old:<br>New: | |
| | | Old:<br>New: | |
| | | Old:<br>New: | |

For Carilex QA Division use only: 類別： A: 硬體設計類 B:軟體設計類 C:機構設計類 D:製造品質 E:檢驗品質 F: 供應商品質 G:其他

是否建議開立 ECR ☐No. ☐ Yes, ECR/ECN#_____

是否建議開立 Customer Complain

☐No(Consumables/ User error/ others_____).

☐Yes(Abnormal function/ Volume of abnormal quality/ others_____), CC NO._____

For Carilex Sales Div. use only: (已經超過保固期之維修費用請打 D/N 收款, 請在此記錄 D/N#)

Device sent back to customer on _____ via _____

(表格與 D.C.C 發行之最新版本相符)