

# HEARTMATE XVE Left Ventricular Assist Device

## Instructions for changing Power Sources

Changing from PBU to Batteries:	Changing from Batteries to PBU:
<ol style="list-style-type: none"><li>1. Place 2 battery clips, 2 fully charged batteries and the white and black PBU cables within easy reach.</li><li>2. Place 1 fully charged battery into each battery clip by aligning arrows and pushing the battery into the clip until a gentle click is felt.</li><li>3. Unscrew the <b>white</b> system controller/PBU connector. Connect the <b>white</b> connector on the system controller to the first battery clip.</li><li>4. Unscrew the <b>black</b> system controller/PBU connector. Connect the <b>black</b> connector on the system controller to the second battery clip.</li><li>5. Place the battery clips with batteries into the holster or vest.</li></ol>	<ol style="list-style-type: none"><li>1. Make sure the PBU is plugged in, turned on and the Patient cable is connected and within easy reach.</li><li>2. Remove the battery clips from the vest/holster and place within easy reach.</li><li>3. Unscrew the <b>white</b> connector from the battery clip and connect it to the <b>white</b> system controller connector.</li><li>4. Unscrew the <b>black</b> connector from the battery clip and connect it to the <b>black</b> system controller connector.</li><li>5. Press the battery release button on the first battery clip and remove the battery for recharging.</li></ol>

- **Always make sure you have enough fully charged batteries with you at all times.**
- **Never remove both power connections at the same time or LVAD function will cease.**

## Changing Batteries:

1. Remove the first battery from its clip by pressing the battery-release button on the battery clip. Pull the battery out and put it aside for future recharging.
2. Align the arrows on the fully charged battery and the battery clip. Slide the fully charged battery into the clip until a gentle click is felt.
3. Repeat for battery #2.
4. Recharge batteries in the PBU. Turn the Velcro dots on the used batteries from white to black to indicate the batteries need to be recharged.

## Battery Fuel Gauge:

The Battery Fuel Gauge can be found on the top line of the System Controller. To see how much power is left, push and hold the Alarm Reset Switch and look at the green lights between the 2 battery pictures. The Battery Fuel Gauge estimates how much power is remaining.

4 green lights = 75-100% power

3 green lights = 50-75% power

2 green lights = 25-50% power

1 green light = < 25% power.

**To make sure there are no power disruptions, change the batteries when only 2 green lights are showing.**

## Yellow Battery Alarm

A yellow battery alarm with a once-per-second beep happens when there is **less than 15 minutes** of battery power left.

Immediately change batteries or go to PBU power.

## Red Battery Alarm

A red battery alarm with a continuous tone will happen when there **is less than 5 minutes** of power left. When the red battery alarm goes off, the LVAD will go into Power Saver Mode with a fixed rate of 50 beats per minute.

Immediately change batteries, go to PBU power or prepare to Hand Pump.

**System Controller Alarms:**

There are 2 types of alarms.

**Yellow Wrench:**

Yellow wrench alarms are not life threatening. The yellow wrench on the system controller will light up and sound a once-per-second beep. The reason for the alarm will be shown on the System Monitor or Display Module.

Use the *“Pocket Guide to Alerts and Alarms”* to help you problem solve the reason for the alarm.

<b>Alarm</b>	<b>What to Do</b>
Power Cable Disconnected	Check <b>all</b> cable connections.
System Controller Malfunction	Check System Controller connections. Change vent filter, check vent filter port for dust/debris Replace System Controller Replace PBU cable Replace PBU If Yellow wrench alarm continues after these interventions, and the VAD is still operating, contact VAD coordinator
Current/Power Limit Advisory	Same steps as for System Controller Malfunction
Controller Battery Module Low	Replace controller battery module

**To change the System Controller:**

1. Get back-up system controller.
2. Have patient lie down.
3. Disconnect power from defective System Controller.
4. Disconnect defective System Controller patient lead at Y connector.
5. Connect new System Controller to patient lead at Y connector
6. Restore power to new System Controller.

## Red Heart

Red Heart alarms are life threatening and require an immediate response. The red heart on the system controller will light up and sound a continuous audio tone. The reason for the alarm will show up, in capital letters on the System Monitor or Display Module. A Timer will start counting to show you how long the alarm has been on for.

Use the ***“Pocket Guide to Alerts and Alarms”*** to help you problem solve the reason for the alarm.

Alarm	What to Do
No Op or Low Beat Rate (<35 beats/min)	<ul style="list-style-type: none"><li>• Check and tighten <b>all</b> connections</li><li>• Change vent filter/check filter port for debris</li><li>• Prepare to Hand Pump</li><li>• Call Surgeon</li></ul>
Low Stroke Volume (< 25ml/min) Low Flow (< 1.5 L/min)	<ul style="list-style-type: none"><li>• Prepare to hand pump</li><li>• Call Surgeon</li></ul>

## Instructions for Using the HeartMate Hand Pump

1. **Disconnect the System Controller from the power source.**
2. **Remove the air vent filter on the Y-Connector and connect the Hand Pump to the vent port.**
3. **Squeeze & Hold White.**
4. **Squeeze & Hold Black.**
5. **Release White.**
6. **Release Black.**
7. **Count to 10.**
8. **Press & Release White.**
9. **Commence Pumping.**

## Troubleshooting the HeartMate XVE

### Mode of Operation:

1. Occasionally the HeartMate LVAD accidentally gets changed into “fixed mode.” The patient will usually notice a slower heart rate, decreased output and the patient may feel tired or weak.
2. If you think the patient may be in the wrong mode you can connect the patient to the system monitor/display monitor. The visual display will tell you which mode is in operation.  
To change modes – push the “mode” key on the system controller – it will beep once for fixed mode and twice for auto mode. Confirm mode by checking pump rate and output and visualizing mode on monitor display.

If the system monitor/display module is not accessible you can push the mode key on the controller. The controller will beep once for FIXED rate mode and 2 beeps for AUTO rate mode.

## **Performing HeartMate System Controller Self-Test**

If you are having trouble with the system controller or repeated alarms, you may be asked to do a System Controller Self-Test. To do the self-test:

1. Make sure you are connected to the PBU with the System Monitor or Display Module.
- 2. Lie the patient down.**
3. Press and hold the ***Mode Switch button*** on the System Controller for 3-5 seconds or until alarm is activated.
4. Make sure all of the lights on the front panel of the Controller illuminate and both PBU & Controller alarms sound (about 14 seconds).
5. If the ***Yellow Wrench symbol*** remains lit at the end of the test, an Advisory Condition will be displayed on the System Monitor or the Display Module.
6. Correct the reason for the alarm and repeat the self-test to make sure everything is ok.

**During hospitalization, the VAD coordinator will do the self-test on a scheduled basis. You do not need to do the System Controller self-tests unless instructed to do so by a member of the VAD team.**

## Using the HeartMate Pneumatic Drive Console

1. Turn Pneumatic Console on.
2. Allow Console to complete system self-test.
3. Ensure Stroke Volume Limiter (SVL) is connected to back of console at brass fitting.
4. Disconnect Hand Pump from Vent Port of Y-Connector.
5. Connect patient end of SVL to Vent Port of Y-Connector.
6. Vent System.  
    To Vent System:
  - Open pigtail on SVL diaphragm
  - Press & Hold Vent Key.
  - Wait 3-5 seconds.
  - Close "Pigtail"
  - Release Vent key

**LVAD function will cease for approx 10 seconds for Vent cycle to complete.**

7. Press Fixed Key to Begin Pump Operation.
8. Adjust Fixed Rate by Pressing Up or Down Arrows.
9. Check Movement of SVL Diaphragm Every Hour. If Diaphragm continues to move poorly re-vent. If the diaphragm to move poorly Notify VAD Team/Technical Support Hotline.
10. Vent Pneumatic System Every 4 Hours.