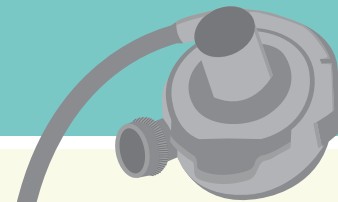


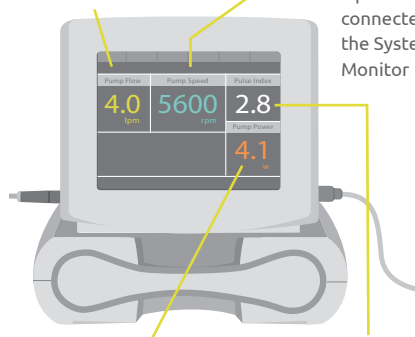
# HeartMate 3™ LVAD



## Pump Settings

**FLOW: Liters Per Minute (LPM)** Flow is estimated by the power used at a certain speed. Increased speed should increase flow.

**SPEED: Revolutions per Minute (RPM)** This parameter is the only one that can be changed when a patient is connected to the System Monitor



**POWER: Watts** Power needed to rotate the rotor and generate blood flow

**PULSATILITY INDEX** Measures flow pulses that go through the heart with contraction

## More about Pulsatility Index (PI)

- Typical range is 3–5
- Calculated to indicate the amount of work the native heart is doing compared to the amount of support the pump gives
- Lower the PI= the more work the device does
- Higher the PI= the more work the native heart does

$$\frac{\text{Power}_{MAX} - \text{Power}_{MIN}}{\text{Power}_{AVG}}$$

\*Think of Power as Flow

## PI Events

- PI detection is used to recognize change and to decrease the risk of significant ventricular suction events
- When a significant change is detected, the pump speed will drop to the low speed limit (usually set 200–400 RPM below set speed)
- Pump speed ramps up to set speed in 50 RPM increments
- **NOT all PI events are suction events**
- No alarm is associated with PI events (not a suction event)

## Causes

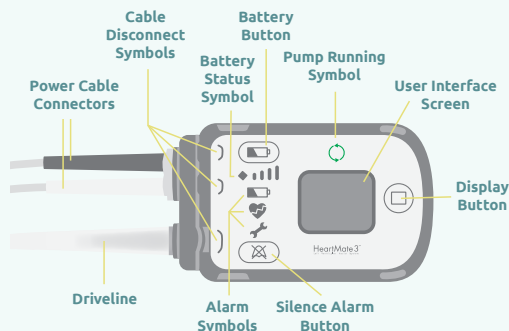
- Could be innocent things like coughing or sneezing
- Could also indicate clinical conditions requiring attention (ie. sudden changes in blood volume or arrhythmias)

## Interpreting PI

		Central Venous Pressure (CVP)	Mixed Venous Sat (M.V.)	Cardiac Output (C.O.)
<b>LOW PI</b>	Speed too high	↓	↑	↑
	Aortic Insufficiency	↑/↓	↓	↑
	Sustained Inflow Obstruction	↑	↓	↑/↓
<b>HIGH PI</b>	Hypovolemia	↓	↓	↓
	Hypertension	↑/↓	↑/↓	↓
	Speed too low	↑	↓	↓

## System Controller

- Provides power to the device via the driveline
- Constantly monitors the LVAD system
- The alerts are audio and visual—if an alarm is present, brief instructions will appear on the screen



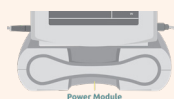
## System Controller Changeout

- Connect the **back-up batteries** to the clips (skip this step if using the mobile power unit)
- Connect the **back-up controller** to a power source (batteries or mobile power unit)
- Open the **safety lock** on the damaged controller and press the **red button** to release the driveline—while pressing the red button, pull the driveline out of the damaged controller
- On the new backup controller, line up the **driveline arrow** to the controller arrow and insert driveline into new controller until you hear a “click”—check that the **double arrow symbol is green** indicating the pump is turned on
- Remember to **close the red door** once the driveline is engaged

## Power Sources



**Batteries**  
A pair of batteries can power the VAD for 10–17 hrs when fully charged. They take up to 4 hrs to recharge



**Power Module**  
The System Controller and Power Module are connected through the Power Cable Connectors



**Mobile Power Unit (MPU)**  
The System Controller and MPU are connected through the Power Cable Connectors

## Anticoagulation

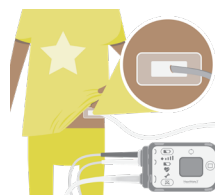


- Heparin (or in some instances Bivalirudin) POD 1–2
- Aspirin POD 1–2
- Coumadin POD 2–7
- INR Goal: 2–3
- Coumadin and aspirin given indefinitely



## Blood Pressure

- Device has an artificial pulse that ‘beats’ 30 times/min
- Doppler blood pressures are recommended (even when an arterial line is in place)
- Important to control BP because high blood pressure decreases flow
- Goals for BP determined by VAD care team

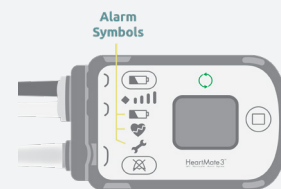


## Driveline Care

- Driveline should always be anchored to skin to prevent tugging
- Dressing changes must be performed using sterile technique

## Alarms

- Hazard:** Broken red heart alarms are potentially life-threatening and require immediate intervention—*Potential causes include:*
  - The VAD is powered off, or has stopped
  - Low flow (set at 2.0 or 2.5 L/min)
  - Driveline is disconnected, causing VAD to stop
- Advisory:** Yellow wrench alarms are important, but non-life-threatening—*Potential causes include:*
  - Low battery
  - Controller fault



## Emergency Care

- Defibrillation or cardioversion allowed if necessary
- Chest compressions can be used if needed

