

EMS Guide

HeartMate 3[®]



This guide is produced by ICCAC – The International Consortium of Circulatory Assist Clinicians. The ICCAC is the professional society for MCS Clinicians throughout the world. It has been vetted by experts in MCS, Air Medical Transport, and Emergency Services. It should not replace the device operating manual as a primary source of information.

Questions and Answers Ventricular Assist Device

What is a Ventricular Assist Device (VAD)?

A ventricular assist device (VAD) is a mechanical pump that's used to support heart function and blood flow in people who have weakened hearts.

How does a VAD work?

The device takes blood from a lower chamber of the heart and helps pump it to the body and vital organs, just as a healthy heart would.

What are the parts of a VAD?

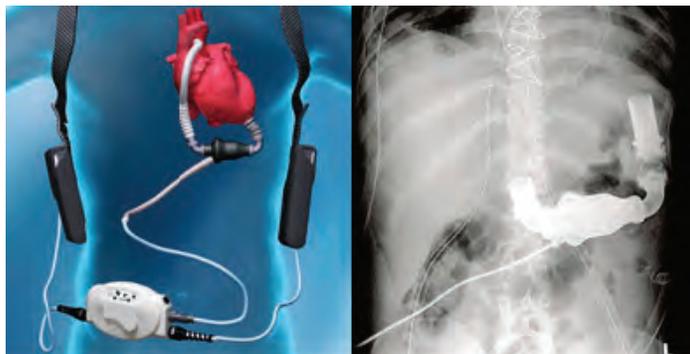
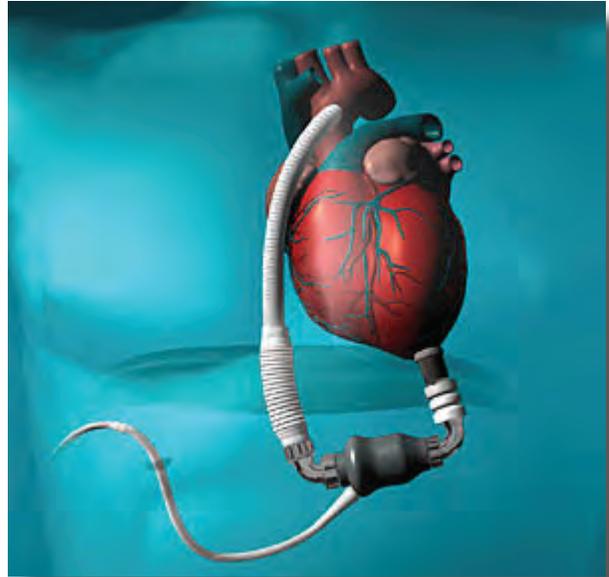
The basic parts of a VAD include: a small tube that carries blood out of your heart into a pump; another tube that carries blood from the pump to your blood vessels, which deliver the blood to your body; and a power source.

What is the power source?

The power source is either batteries or AC power. The power source is connected to a control unit that monitors the VAD's functions. The batteries are carried in a case usually located in a holster in a vest wrapped around the patients shoulders.

What does the control unit or controller do?

The control unit gives warnings, or alarms, if the power is low or if it senses that the device isn't working right. It is a computer.



The portability of the HeartMate II enables patients to resume many of their normal daily activities.

Color Coding System

MOST patients have a tag located on the controller around their waist that says what type of device it is, what institution put it in and a number to call. Most importantly is the color of the tag – it matches this EMS Field Guide and allows you to quickly locate the device you are caring for.

HEARTMATE III

HEARTMATE II

HEARTWARE

JARVIK 2000

FREEDOM DRIVER
Total Artificial Heart

Patient Management For VADs



1. **Assess the patients airway and intervene per your protocol.**
2. **Auscultate Heart Sounds to determine if the device is functioning and what type of device it is. If it is continuous flow device, you should hear a “whirling sound”.**
3. **Assess the device for any alarms.**
4. **Look on controller usually found around the waist of the patient and to see what color tag and device it is.**
5. **Match the color on the device tag to the EMS Guide.**
6. **Intervene appropriately based on the type of alarm, tag (device) and EMS Guide.**
7. **Start Large Bore IV.**
8. **Assess vital signs – Use Mean BP with Doppler – with the first sound you hear is the Mean Arterial Pressure (MAP).**
9. **If no Doppler, use the Mean on the non invasive blood pressure machine.**
10. **Transport to closest VAD center. Call the number on the device to get advice.**
11. **Bring all of the patients equipment.**
12. **Bring the significant other if possible to act as a expert on the device in the absence of consciousness in the patient.**

HeartMate III[®] with Pocket Controllers

- 1. Can I do external CPR?**
Only if absolutely necessary
- 2. If not, is there a “hand pump” or external device to use?**
No.
- 3. If the device slows down (low flow state), what alarms will go off?**
A red heart alarm light indicator and steady audio alarm will sound if less than 2.5 lpm. Can give a bolus of normal saline and transport to an LVAD center.
- 4. How can I speed up the rate of the device?**
No, it is a fixed speed.
- 5. Do I need to heparinize the patient if it slows down?**
Usually no, but you will need to check with implanting center.
- 6. Can the patient be defibrillated while connected to the device?**
Yes.
- 7. If the patient can be defibrillated, is there anything I have to disconnect before defibrillating?**
No.
- 8. Does the patient have a pulse with this device?**
Likely they will not because it is a continuous flow device, however some patients may have a pulse as this pump was designed with an “artificial pulse.”
- 9. What are acceptable vital sign parameters?**
MAP 70 - 90 mm Hg with a narrow pulse pressure.
- 10. Can this patient be externally paced?**
Yes.

FAQs

- Pump has “artificial pulse” created by speeding up & slowing down of pump. This can be heard when auscultating the heart and differs from other continuous flow devices.
- May not be able to obtain cuff pressure (continuous flow pump).
- Pump connected to electric line exiting patient’s abdominal area and is attached to computer which runs the pump.
- Pump does not affect EKG.
- All ACLS drugs may be given.
- A set of batteries last 14 – 16 hours
- Any emergency mode of transportation is ok. These patients are permitted to fly.
- Be sure to bring **ALL** of the patient’s equipment with them.

Trouble Shooting HeartMate III[®] with Pocket Controllers When the Pump Has Stopped

- Be sure to bring ALL of the patient’s equipment with them.
- Fix any loose connection(s) to restart the pump.
- If the pump does not restart and the patient is connected to batteries replace the current batteries with a new, fully-charged pair. (see *Changing Batteries* section on next page)
- If pump does not restart, change controllers. (see *Changing Controllers* section on next page)

Alarms: Emergency Procedures



Yellow or Red Battery Alarm: Need to Change Batteries. See changing batteries section on next page.



Red Heart Flashing Alarm: This may indicate a Low Flow Hazard. Check patient--the flow may be too low. If patient is hypovolemic, give volume. If patient is in right heart failure-- treat per protocol. If the pump has stopped check connections, batteries and controllers as instructed in the section above.



Trouble Shooting HeartMate III®

Changing Batteries

WARNING: At least one power lead must be connected to a power source **AT ALL TIMES**. Do not remove both batteries at the same time or the pump will stop.

- Obtain two charged batteries from patient's accessory bag or battery charger. The charge level of each gray battery can be assessed by pressing the battery button on the battery. (Figures 1 and 2)
- Remove only **ONE** battery from the clip by pressing the button on the grey clip to unlock the battery. (Figure 3)
- Controller will start beeping and flashing yellow signals and will read **POWER DISCONNECT** on the front screen. (Figure 4)
- Replace with new battery by lining up **RED** arrows on battery and clip. Gently tug on battery to ensure connection. If battery is properly secured, the beeping and yellow flashing will stop. (Figure 5)
- Slide a new, fully-charged battery (Figure 4) into the empty battery clip by aligning the **RED** arrows. The battery will click into the clip. Gently tug at battery to ensure connection. If battery is properly secured, the beeping and green flashing will stop.
- Repeat previous steps with the second battery and battery clip.

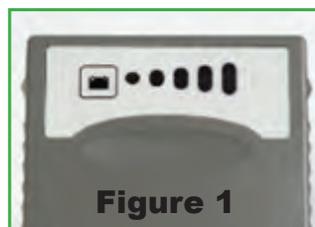


Figure 1

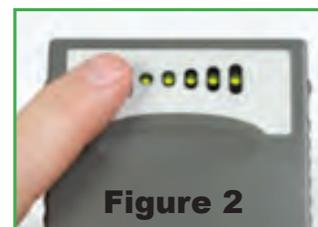


Figure 2



Figure 3



Figure 4



Figure 5

CAUTION—Investigational device. Limited by Federal (or United States) law to investigational use.

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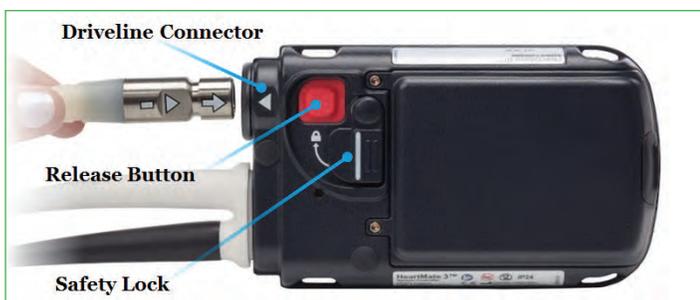
Changing Controllers

- Place the replacement Controller within easy reach, along with the batteries/battery clips. The spare Controller is usually found in the patient's travel case.
- Make sure patient is sitting or lying down since the pump will momentarily stop during this procedure.

- Attach the battery clips to the spare controller by lining up the half moons and gently pushing together and attach the batteries to the spare controller by aligning the **RED** arrows.



- On the back of the replacement controller, rotate down the perc lock so the red tab is fully visible. Repeat this step on the original controller until the red tab is fully visible.



SAFETY LOCK
UNLOCKED



SAFETY LOCK
LOCKED

- Disconnect the drive-line from the original controller by pressing down on the red tab and gently pulling on the metal end. The pump will stop and an alarm will sound. **Note:** The alarm will continue until the original controller is put to sleep. You can silence the alarm by pressing the silence button.



Getting the replacement controller connected and pump restarted is the first priority.

- Connect the replacement Controller by aligning the **BLACK ARROWS** on the driveline and replacement Controller and gently pushing



the driveline into the replacement Controller. The pump should restart, if not complete the following steps:

- Step 1.** Firmly press the Silence Alarm or Test Select Button to restart the pump.
 - Step 2.** Check the power source to assure that power is going to the controller.
 - Step 3.** Assure the perc lead is fully inserted into the socket by gently tugging on the metal end. **DO NOT** pull the lead.
- After the pump restarts, rotate up the perc lock on the new controller so the red tab is fully covered. If unable to engage perc lock to a fully locked position, gently push the driveline into the controller to assure proper connection. Retry to engage perc lock.
 - Disconnect power from the original Controller. The original Controller will stop alarming once power is removed.
 - Hold down battery symbol for 5 full seconds for complete shutdown of old controller.



Adapted from Sweet, L. and Wolfe, Jr., A. Mechanical Circulatory Devices in Transport in ASTNA: Patient Transport Principles and Practice, 4th ed., Mosby, 2010 in press.

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Trouble Shooting HeartMate III[®] with Pocket Controllers

Modular Cable

The HeartMate 3 has a modular cable connection near the exit site of the driveline (Figure 1). This allows a damaged driveline to be quickly replaced (if damage is external).

- When disconnecting a driveline, **NEVER** use the modular cable connection.
- If this section of the driveline requires replacement, this must be performed at and by the implanting center. Patients are not given a back-up modular cable.
- If the connection is loose, there will be a yellow/green line at the connection showing (Figure 2). If the line is visible, it can be retightened by turning with the arrow in the locked direction. It will ratchet and stop turning once tight.



Figure 1

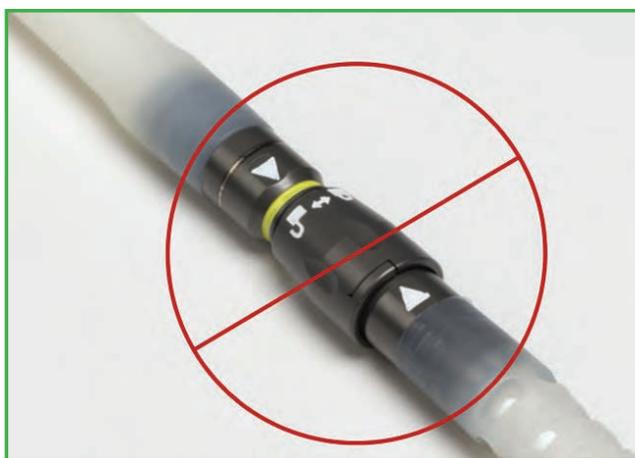


Figure 2

