

# LifePort<sup>®</sup> Kidney Transporter



## Work Instructions : Kidney Perfusion





# Work Instructions: Kidney Perfusion

## Introduction

This section provides information on routine use of the LifePort® Kidney Transporter — from preparing to receive a kidney to returning the unit for storage until its next use.

---

**NOTE:** Be sure to keep the Transporter plugged in and batteries charging when not in use.

---

## Professional Overview

Before using the Transporter in a clinical setting, thoroughly familiarize yourself with the device and kidney perfusion. Consider practicing on discarded or animal kidneys. Various settings should be tried and a sense obtained as to the effects on the kidney.

Be aware of the following important factors:

- **Select an infusion pressure** for use during transport according to good clinical practice to assure sufficient flow, while preventing vascular damage.
- **Secure cannulas** to avoid perfusate leaks, while preventing damage to the renal artery.
- **Inspect and position the cannulated artery** to avoid any twists or kinks that would occlude the flow of perfusate.
- **Maintain aseptic conditions** for the kidney and perfusate at all times. Sealing the Organ Cassette while following sterile procedures is required.
- **Maintain cold conditions** for the kidney by keeping the Transporter's ice container filled. Use only ice and water to prevent freezing.

## Maintaining the Transporter for Quick Response Use

**Before you receive the call** that the LifePort Kidney Transporter is needed, keep it ready to go at a moment's notice by performing the following procedures.



## ***Preparing the Transporter's Home Base Station***

The Transporter and its supplies and accessories are designed to be an integral part of the recovery team's supply pack, to be seamlessly included in the recovery and transplant process. The following preparations will keep the Transporter in a ready-to-use state, making sure the kidney recovery team can go to the donor site quickly and efficiently.

- Cubed or crushed ice — 10 lbs. or more — readily available in a freezer or icemaker.
- Batteries loaded in the Transporter and kept fully charged. Maintain the batteries' charge by keeping the Transporter plugged into an external power supply.
- Perfusion Circuit, sterile drapes, and cannula packed and ready
- Portable wheeled cart available and ready
- Surgical instruments, suture, solution decanter, and supplies packed and ready.
- Distilled, sterile or regular tap water (about 5 liters) — chilled in the refrigerator.
- Perfusion solution and organ flush solution — chilled in the refrigerator.



---

**CAUTION:** Use only machine perfusion solution. The Transporter is designed to work with machine perfusion solutions only. Check the labeling of the perfusion solution and make sure that it is intended for machine perfusion. If you are uncertain about which solutions are appropriate, contact Organ Recovery Systems for information on recommended perfusates that work best in the Transporter.

---

- Spare parts at hand, such as additional charged batteries, power cord, spare cannula, etc.

## **Prepping the Transporter to Go**

**When you receive the call** that the Transporter is needed, perform the following procedures to prep the device before taking it to receive a kidney. You can modify these instructions according to your institutions procedures.

---

**NOTE:** The following instructions are designed for two operators, one being gowned and gloved. In the case of a single operator, pay special attention to procedures performed inside a sterile field.

---



### **Make Sure You Have Everything You Need**

Using a checklist, double check all your equipment and supplies to make sure it is all packed and on the cart.

### **Recheck the Batteries**

Check the batteries to make sure that all are fully charged. Press the **POWER** button and verify that the Transporter powers up. Press the **POWER** button again to turn it off.

### **Visually Check Transporter and Perfusion Circuit**

Visually check the Transporter and Circuit for overall integrity and transport worthiness before each use. Do not use if parts are loose, cracked, or broken, or liquid is leaking.

Turn the Transporter **ON**, check ice and battery levels, and check its operation using the startup methods outlined below.

## ***Cooling Down the Transporter***



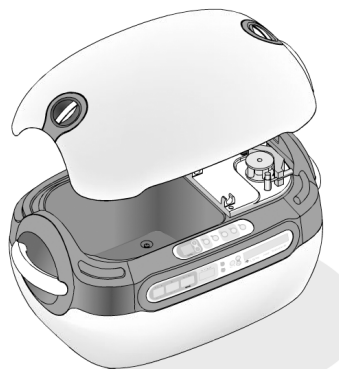
---

**CAUTION:** To avoid inadvertently freezing the kidney, **USE ONLY ICE AND WATER** in the Transporter Ice Container. A mixture of ice and water in the Ice Container will assure that temperatures remain within the appropriate range for kidney preservation.

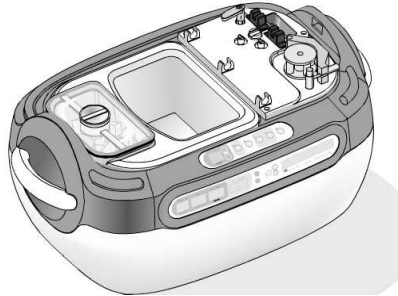
---

**NOTE:** As a safeguard to the kidney, the Transporter pump will not operate unless the Ice Container is chilled below 8° C.

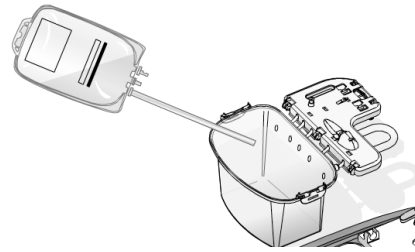
---



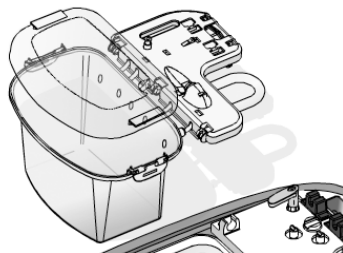
1. Remove the cover from the Transporter.
  2. Fill the Ice Container with crushed or cubed ice, and then pour in about 0.5 liter of cold water. Add more ice and water until filled, maximizing the amount of ice.
  3. Close the Ice Container when filled and make sure it is properly sealed.
-



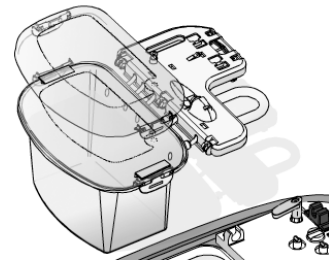
4. Place the Ice Container in the Transporter.



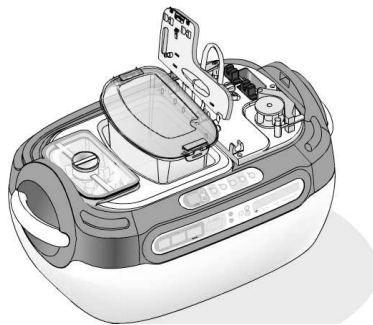
5. Aseptically decant 1 liter of chilled perfusate into the Cassette. Note: Cassette should be on sterile field.



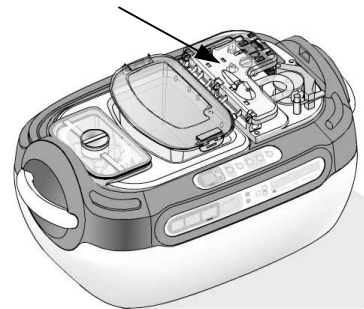
6. Aseptically cover the Cassette with the inner lid.



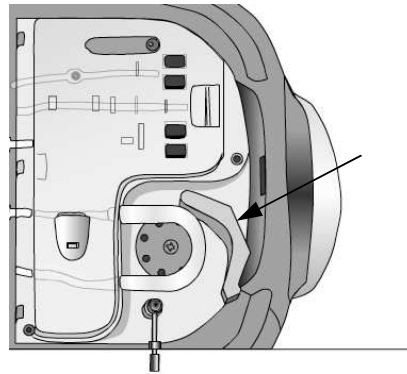
7. Aseptically cover the Cassette with the outer lid.



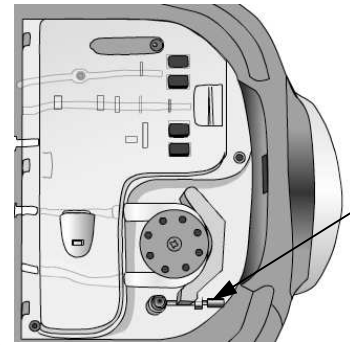
8. Pass the Perfusion Circuit off the sterile field and place the sealed perfusion circuit in the Ice Container. The tube frame must be perpendicular to the pump deck, and the hinges must be positioned inside of the receivers on the pump deck.



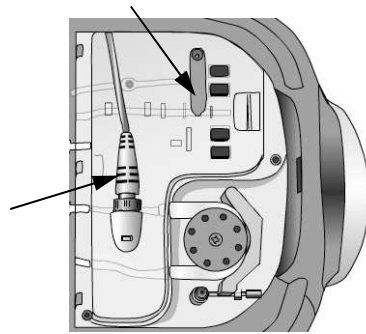
9. Rotate the Tube Frame flat onto the Pump Deck.



10. Open the Pump Head and stretch the tubing over the wheel.

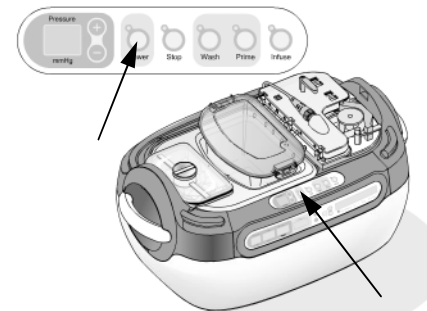


11. Close and latch the Pump Head raceway to clamp the tubing.



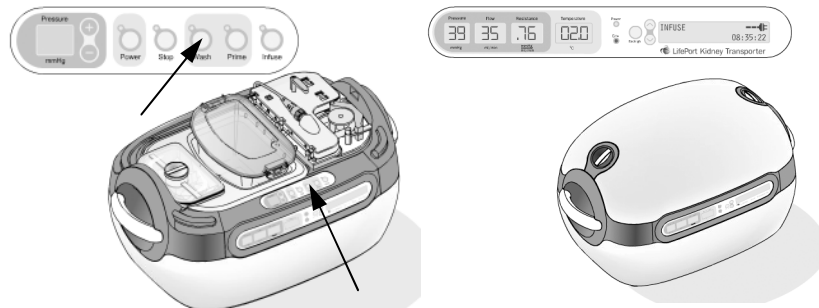
12. Rotate the Pump Deck Locking Arm 90° and snap into place.

13. Connect the Pressure Sensor Cable from the Pump Deck to the connector on the Tube Frame.



14. Press the **POWER** button on the Control Panel to energize the unit.

15. Check the Outer Display and verify that the top line reads **READY**.



16. Press the **WASH** button to circulate perfusate during travel and until ready to receive the kidney.
17. Grasping both handles, lift and gently rotate the Transporter to remove air from the Perfusion Circuit
18. Close and latch the cover.

---

**NOTE:** If the display reads: **Power up test FAILED**, reference the error number shown following in ***Troubleshooting and Diagnostics*** in the Operator's Manual.

---

### Traveling with the Transporter and Supplies

If you are taking a vehicle, push the cart with Transporter and supplies to the vehicle, and place the Transporter on the seat or in the trunk. Secure the Transporter from sliding or rolling. The cart and supply packs can also be loaded on the seats or in the trunk.

---

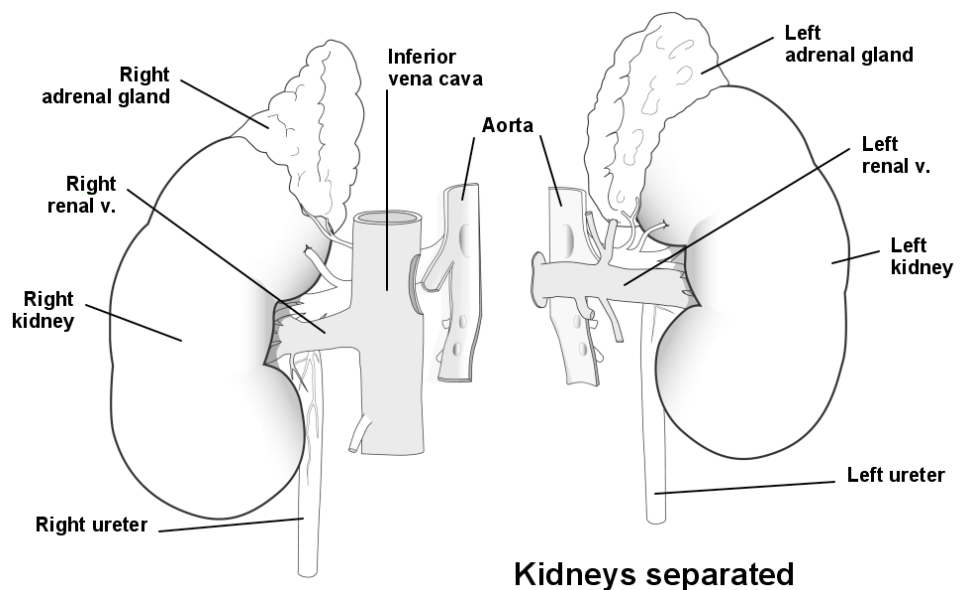
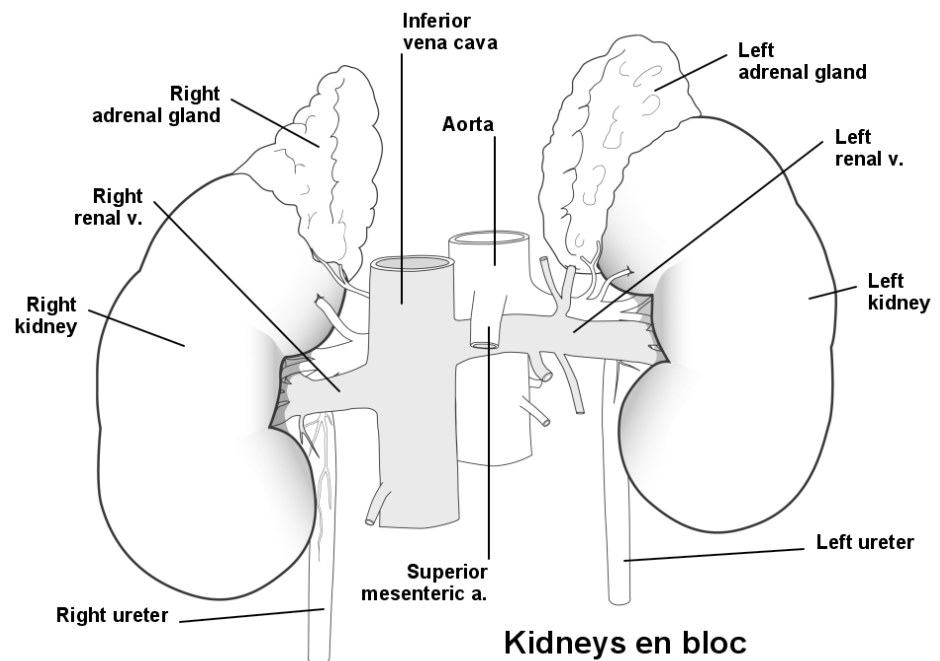
The Transporter can withstand the normal handling involved in traveling between hospitals; however, it should be kept in an upright orientation to minimize the potential for leaks, spills, or air bubbles. If the Transporter is transported in a car seat, the normal seatbelt can be used to restrain the Transporter while driving.

At the recovery site, the Transporter and supply packs can be reloaded onto the cart and pushed to the donor operating room.



## Isolating Kidney Vascular Structure

Use the procedures specified by your institution for isolating the kidney vascular structure. The following suggestions will facilitate the preparation of kidneys for placement in LifePort Disposable Cannulas.





1. Visually inspect the kidneys from a gross anatomy standpoint, paying close attention to the aorta, artery(s), vein(s), and ureter.
2. Direct a nonsterile assistant to note any anomalies into the perfusion record.

---

**NOTE:** If a nonsterile assistant is not available, write the anomalies on the perfusion record as soon as the procedure is finished.

---

3. Isolate the renal artery(s) and vein, making sure that no small polar arteries are transected.
  4. Feel the renal artery(s) for plaque inside the lumen of the artery.
  5. Inspect the orifice of the artery to see if there is a partial or completely occluded artery. Make a decision according to the following decision tree:
    - If the artery is not occluded, proceed to cannulation.
    - If the artery has any type of occlusion, determine whether the plaque will break off and block the artery or if cannulation will cause damage to the artery.
    - If you determine that cannulation will be safe, proceed to cannulation.
- 
- 

## Cannulating the Kidney



**CAUTION: Use Aseptic Procedures.** The Perfusion Circuit, canulas, and perfusate are provided presterilized. To minimize the potential for infection of the kidney (and its eventual recipient), aseptic procedures must be used whenever handling the kidney and perfusate, or whenever opening the Cassette or Tubeset. Aseptic procedures include the use of sterile field, gown, gloves, and instruments and aseptic management of IV tubing, as would be typical in surgical and nursing practice.

---



## Using the SealRing™ Cannula

**INDICATION:** The SealRing Cannula is used when the vessel to be perfused terminates with an aortic patch or similar. The example shown in the illustration is a kidney with isolated anatomical structures and aortic patch.

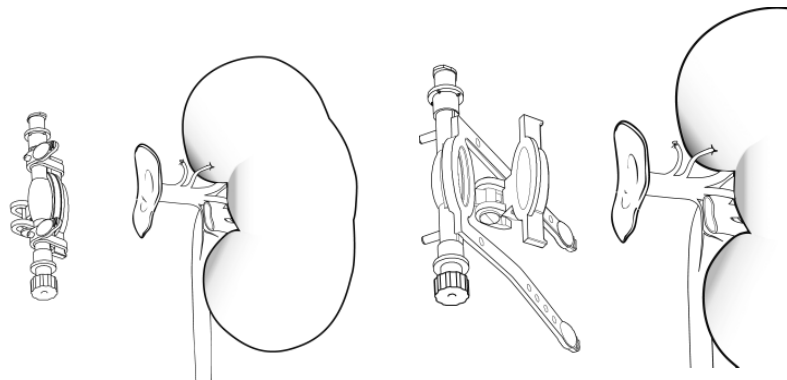
**Choose the size appropriate to the aortic patch.**

**NOTE:** Patches that contain multiple arteries in close proximity may be placed into one SealRing Cannula. Otherwise see “Using the Coupler.”

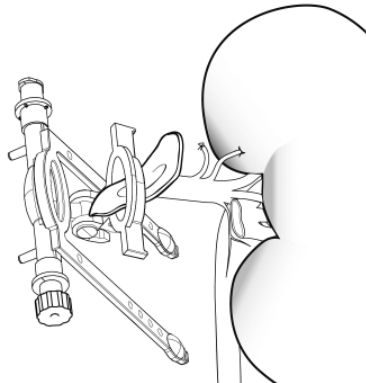
---

**NOTE:** Perform the following procedure on an aseptic field using aseptic technique.

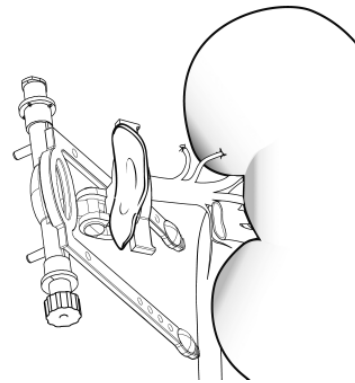
---



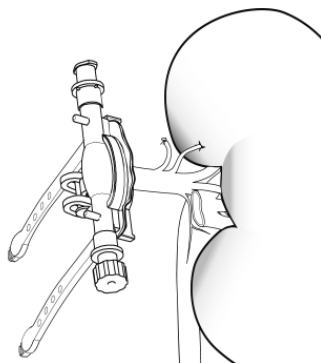
1. Use standard aseptic procedures to introduce the cannula onto the sterile field.
  2. Open the SealRing cannula.
-



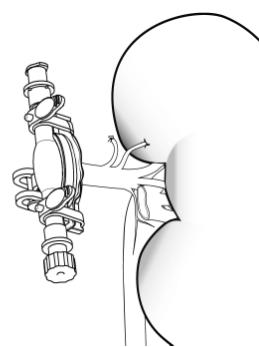
3. Slide the aortic patch through the center of the cannula ring.



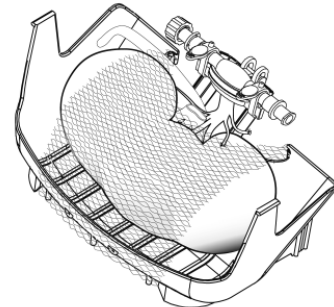
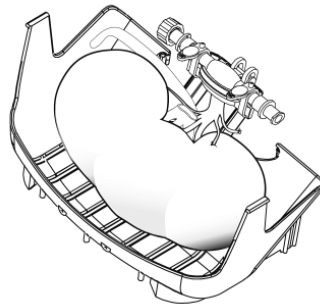
4. Lay the patch flat; making sure the tissue covers the entire sealing ring. If necessary, instruments may be used to temporarily hold the tissue in place until the cannula is secure.



5. Hinge the cannula closed, securing the tissue between the two halves.



6. Wrap each strap straightly and securely around both cannula halves, and fix the straps to their posts.
7. Gravity-flow small amounts of flush solution into the cannula, then check for and repair any leaks.



8. Place the kidney in the Organ Cradle and snap the cannula into the Cannula Mount.
9. Adjust the height and rotation of the Cannula Mount to comfortably position the vessel.
10. Visually inspect the vessel, ensuring there are no twists or occlusions.
11. Drape the mesh organ restraint over the kidney and secure the organ in the cradle.

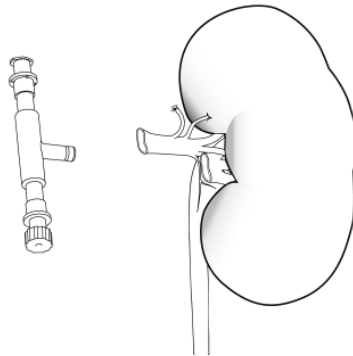
### ***Using the Straight Cannula***

**INDICATION:** The Straight Cannula is used when the vessel to be perfused terminates without a patch, has insufficient patch for SealRing™, or when intimal damage to the lining is not a risk. The example shown in the illustration is a kidney with isolated anatomical structures and no aortic patch.

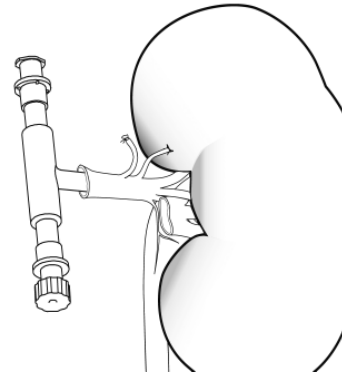
There are three sizes of straight cannula available:

- 3mm
- 5mm
- 8mm

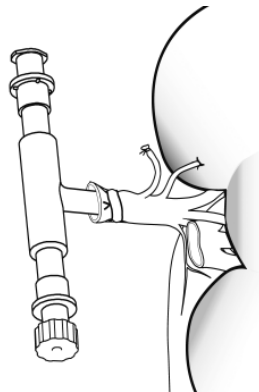
**NOTE:** Perform the following procedure on an aseptic field using aseptic technique.



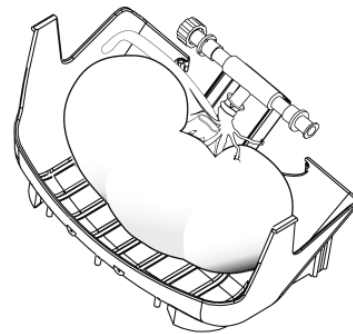
1. Use standard aseptic procedures to introduce the Straight Cannula onto the sterile field.



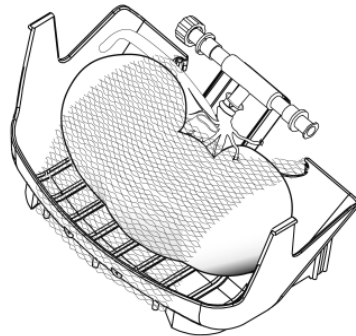
2. Insert the Straight Cannula tip no further than necessary into the vessel.



3. Secure the vessel in place using silk ties, vessel loops, or another appropriate material. A groove in the tip is provided for positioning and securing.
4. Gravity-flow small amounts of flush solution into the cannula, then check for and repair any leaks.



5. Place the kidney in the Organ Cradle and snap the Straight Cannula into the Cannula Mount.
6. Adjust the height and rotation of the cannula.
7. Mount the Cannula to comfortably position the vessel.
8. Visually inspect the vessel, ensuring there are no twists or occlusions.

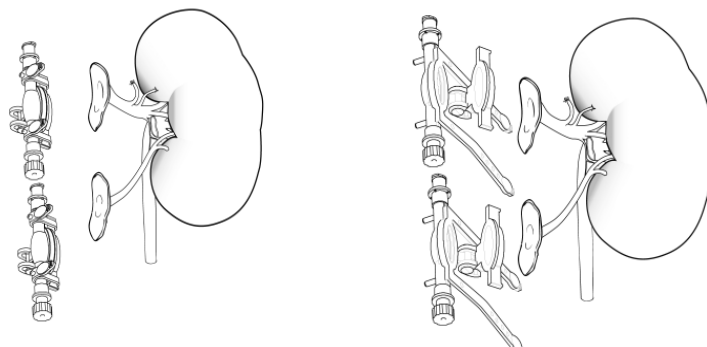


9. Drape the mesh organ restraint over the kidney and secure the organ in the Organ Cradle.

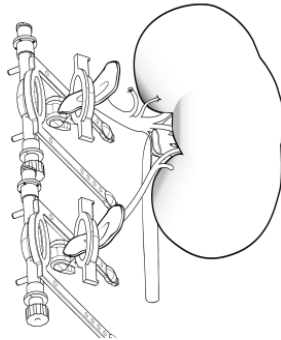
### Using the Coupler

**INDICATION:** The Coupler is used to connect two or more Seal-Ring or Straight cannulas when multiple vessels must be perfused. The example shown in the illustration is a kidney with isolated anatomical structures and two separate aortic patches.

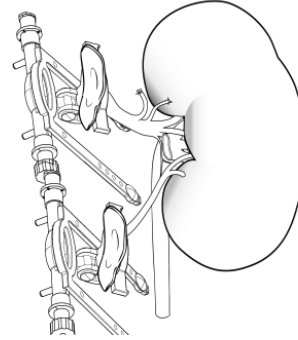
**NOTE:** Perform the following procedure on an aseptic field using aseptic technique.



1. Use standard aseptic procedures to introduce the cannulas onto the sterile field.
2. Open the SealRing cannulas.

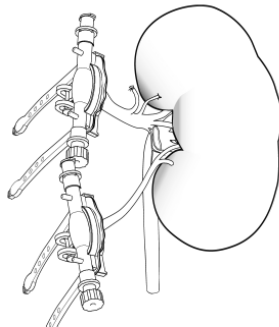


3. Slide aortic patches through the center of each cannula ring.

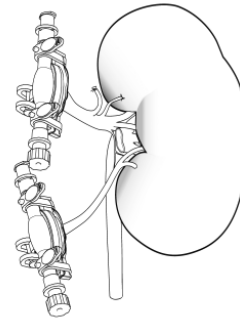


4. Lay each patch flat; making sure the tissue covers the entire sealing ring. If necessary, instruments may be used to temporarily hold the tissue in place until the cannula is secure.

---

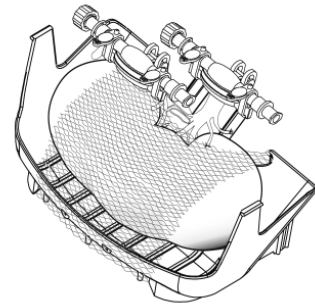
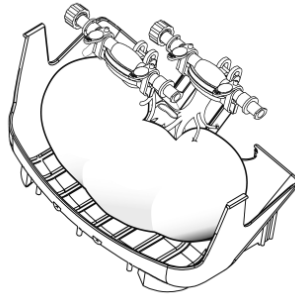


5. Hinge the cannulas closed, securing the tissue between the two halves.

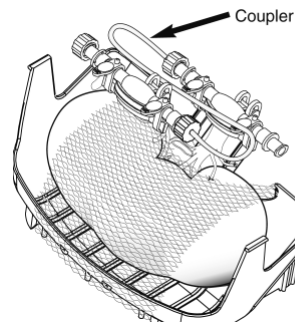


6. Wrap each strap straightly and securely around both cannula halves and fix the straps to their posts.  
7. Gravity-flow small amounts of flush solution into the cannula, then check for and repair any leaks.

---



8. Identify a main vessel.
  9. Place the kidney in the Organ Cradle and snap the cannula connected to the main vessel into the Cannula Mount.
  10. Adjust the height and rotation of the Cannula Mount to position the vessel.
  11. Visually inspect the vessel, ensuring there are no twists or occlusions.
  12. Drape the mesh organ restraint over the kidney to secure the organ in the cradle.
- 



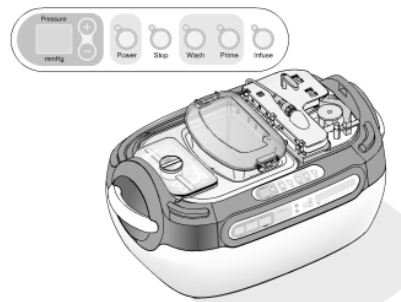
13. Replace the end cap of the main cannula with one end of the Coupler.
  14. Attach the second end of the Coupler to the infuse port of the next cannula.
-



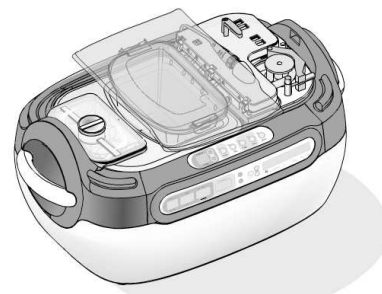
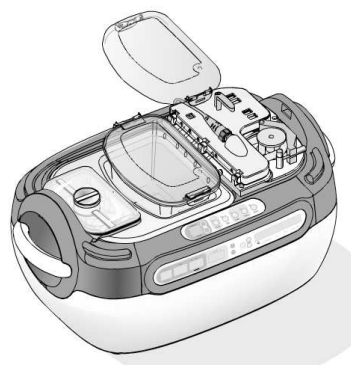
## Placing the Kidney in the Transporter

**BEFORE YOU BEGIN:** Make sure you have prepared the Transporter following instructions provided in the **Professional Overview** section.

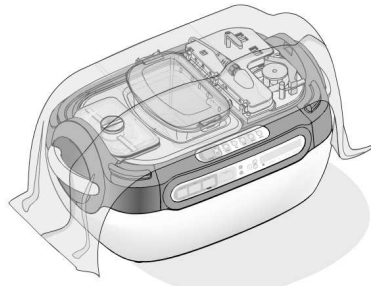
**NOTE:** Perform the following procedure using aseptic technique.



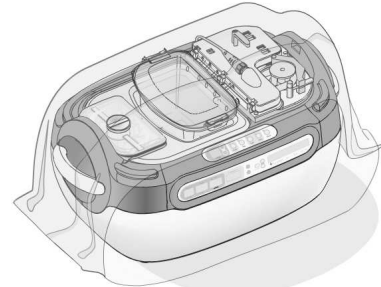
1. *A person outside the sterile field:* Remove the cover of the Transporter.
2. *A person outside the sterile field:* Press the **STOP** button to halt the wash cycle circulating perfusate in preparation for use.



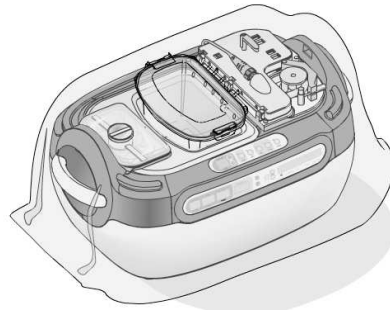
3. *A person outside the sterile field:* Remove the outer cover from the cassette.
4. *Aseptically:* Place the folded surgical drape (supplied) over the Transporter as shown.



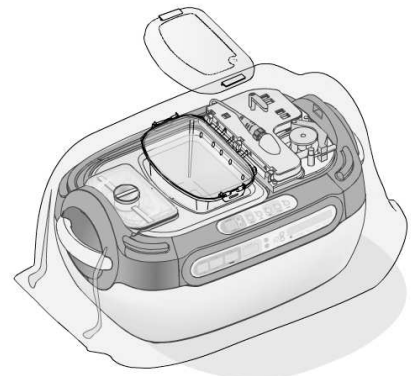
5. Unfold the drape along the length of the Transporter.



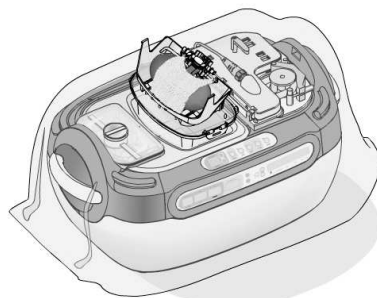
6. Fully unfold the drape, side-to-side.



7. Position the drape opening around the cassette.



8. Remove the inner cassette cover.



9. Place the Organ Cradle in the Transporter cassette.



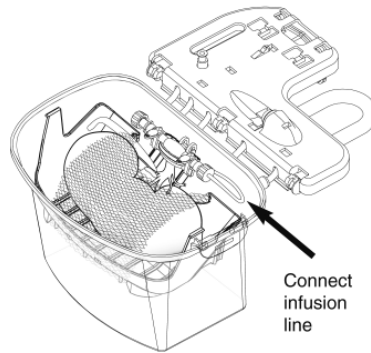
## Priming the Infuse Line

When the cradle containing the kidney has been placed in the cassette, use the following procedure to prime the infuse line, removing bubbles from the line and renal artery.

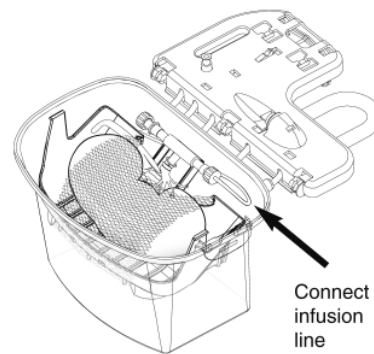
**NOTE: Perform the following procedures using aseptic technique**

1. Connect the infuse line as shown, and tighten the luer lock fitting.

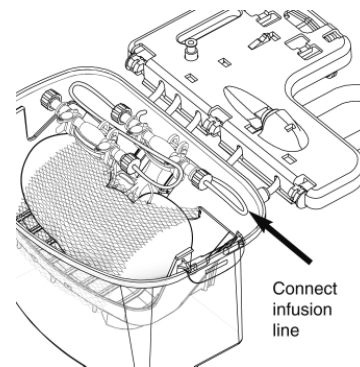
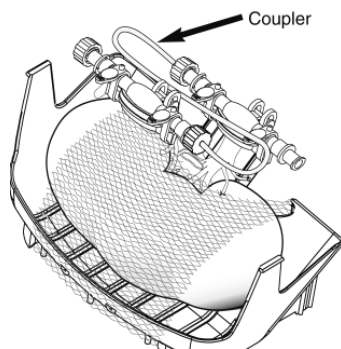
*With the SealRing Cannula:*



*With the Straight Cannula:*

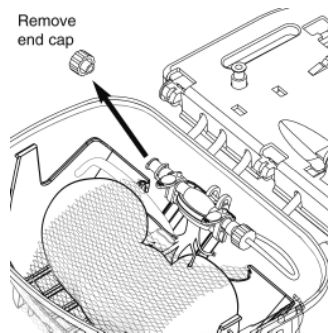


*With the Coupler:*

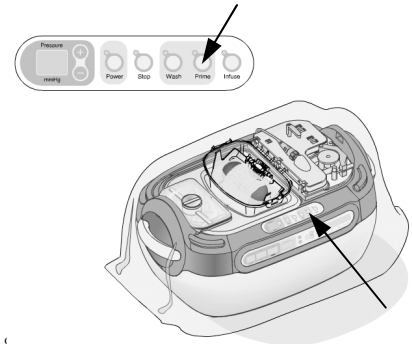


- Replace the end cap of the main cannula with one end of the Coupler.
- Attach the second end of the Coupler to the infuse port of the next cannula.
- Connect the Infuse Line to the main cannula.

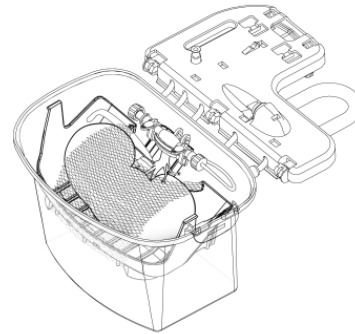
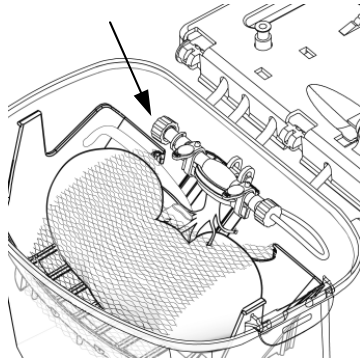
**NOTE:** For simplicity, illustrations from this point forward will show the SealRing Cannula as the example.



2. Remove the end cap from the cannula to provide a path for bubbles to escape.



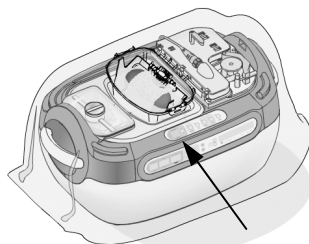
3. Viewing through the sterile drape, press the **PRIME** button to start the pump.  
4. Check for bubbles in the perfusate flowing from the disconnected end of the cannula and through the clear cannula material.



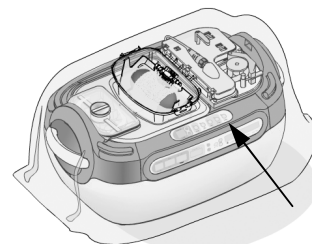
5. Replace the end cap — causing the Transporter to beep and automatically stopping the pump. Proceed to step 9.

**NOTE:** If the pump does not stop automatically, indicating a leak, press the **STOP** button through the sterile drape. Proceed to step 6

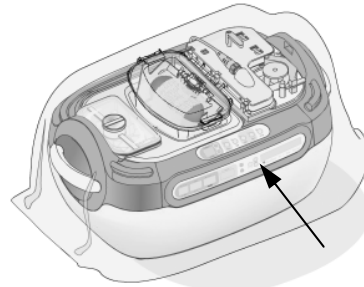
6. Visually check for leaks. Leaks may be sealed by re-positioning the tissue in the cannula or by adjusting the tension on the cannula straps. Leaks may also arise from transected arterial branches that, if non-essential, must be ligated (tied).
7. Verify that the tubeset is properly assembled.
8. Repeat the Priming Procedure (steps 2-5) to double-check for leaks and bubbles.



9. Viewing through the sterile drape, press the **UP/DOWN** arrow button to select the infusion systolic pressure.  
**NOTE:** The default setting is 30 mmHg.



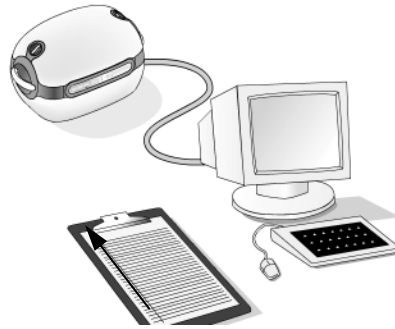
10. Press the **INFUSE** button to start the infusion process. Repeat visual inspection for leaks around cannula or from arterial branches.



11. Viewing through the drape, check the operating parameters on the Outer Display, including:
  - Pressure
  - Flow
  - Vascular Resistance
  - Temperature
12. Replace the inner cover over the cassette.
13. Remove the sterile drape.



14. *A person outside the sterile field:* Close and latch the outer cover over the cassette and replace the Transporter cover.  
**NOTE:** This procedure is performed by a person outside the sterile field.
15. Recheck operating parameters on the Outer Display and record on the chart, per hospital procedure.
16. Verify that the Transporter is in **INFUSE** mode.



---

**NOTE:** You can also connect the Transporter data port to a computer and, using HyperTerminal or the LifePort Data Station, stream or download all operating parameters. For more information, refer to the Operator's Manual or contact an Organ Recovery Systems representative.

---

*The Transporter is now ready to travel.*

## Preparing to Travel to the Transplant Site

### ***Transport from the Recovery Site***

After the recovery, secure the Transporter and supplies for travel. Recheck the Transporter cover to make sure it is closed and latched. Place the other supply packs containing the disposables, instruments, and supplies on the cart as well.

### ***Make Sure You Take Everything You Brought***

Reviewing your checklist, double check all your equipment and supplies to make sure that nothing is being left behind.

### ***Transport the Transporter and Supplies***

If you are taking a vehicle, push the cart with Transporter and supplies to the vehicle, and place the Transporter on the seat or in the trunk. Secure the Transporter from sliding or rolling. The cart and supply packs can also be loaded on the seats or in the trunk. If transported in a passenger seat, the normal seatbelt can be used to restrain the Transporter while driving.



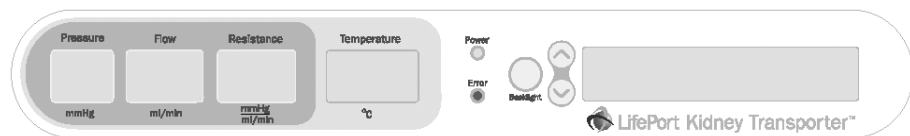
**CAUTION:** Keep the Transporter upright during transportation. Avoid direct sunlight and hot or cold temperature extremes. Extended exposure to outdoor conditions (sunlight, heat or cold), can affect the time that the Transporter can maintain proper temperatures. If the Transporter must be operated under these conditions, frequently monitor the temperature and maintain proper ice levels.

## Traveling to the Transplant Site

When the transplant team is ready, the Transporter and supplies can be transported to the transplant team via a combination of the wheeled cart and vehicles, as required.

## Monitoring with the Outer Display

During transit and when waiting for the transplant team to be ready for the kidney, you can use the Outer Display to monitor status and conditions inside the Transporter.



### OUTER DISPLAY

The Outer Display provides the following information:

- **Pressure** — the actual pressure of pumping action. The Transporter will not exceed the value set on the Control Panel.

**NOTE:** If pumping is pulsatile, the pressure shown here is systolic.

- **Flow** — as measured at the pumphead. This value is a calculation based on the velocity of revolution (RPM) of the pumphead and volume within the pump tubing loop.
- **Resistance** — a calculation based on the average pressure divided by flow.
- **Temperature** — as measured in the ice container.
- **Power LED** — glows steady green when the Transporter is powered ON, whether under battery power or an external power supply. The Power LED flashes green when the unit is powered OFF, but is connected to an external power supply.



- **Error LED** — flashes red when the Transporter encounters an error. Reference the error number shown on the Message Display in *Troubleshooting and Diagnostics* in the Operator's Manual.
- **Backlight** — toggles off and on to light up the Outer Display for easier viewing in low light conditions.
- **Message Display** — provides information on Mode (e.g., infuse, wash, prime, etc.), Power Status (battery or external power supply), and runtime since the INFUSE button was pressed. You can press the UP/DOWN ARROW buttons to scroll through additional information useful for the chart as you travel:
  - Beats per minute (pulsatile models only)
  - Diastolic Pressure (pulsatile models only)
  - Average Pressure (a real-time calculation based on systolic and diastolic values) (pulsatile models only)
  - Perfusate Temperature measured inside the bubble trap.
  - Minimum and maximum temperatures reached

---

**NOTE:** If the Transporter is connected to a PC, you can check these values as streamed data during transit.

---

- Time of day (24-hour format)
- Data memory remaining. From the point when the INFUSE button was pressed, the Transporter can create and store five files of 48 hours each. When the fifth file is filled, the data memory stops recording until the Transporter is powered off and back on, and the user chooses to delete files.
- Battery life remaining. The Transporter has four batteries, which are used in series. Scroll to review the percentage of remaining power and Mode (whether Standby or On Line) for each battery.

### ***Checking Battery Power and Ice***

The Transporter is designed so the batteries and ice will last for 24 hours of operation with the cover in place and latched. Monitor battery and ice levels during kidney preservation on the Transporter.



---

**NOTE:** The Transporter will alarm when the batteries have two hours remaining or when the temperature in the ice bucket reaches 8°C. Make a habit of checking temperature and battery level.

---

### **Adding More Ice**

Check the temperature on the Outer Display to make sure that it is steady and below 8°C.

- If the temperature is climbing towards 7° or 8°C, open the Transporter Cover and visually check the ice level.
- If the ice is mostly melted, remove some water from the Ice Container (using a cup, scoop, hand pump, or electrical pump) and refill with ice.

### **Replacing Batteries**

Check the battery level on the message display. Whenever the Transporter is not in transit, plug the Transporter into an external power supply so the batteries are maintained in a charged condition.

- If the batteries are running low, plug the Transporter into an external power supply if possible.
- If an external power supply is not available, the depleted Transporter batteries may be replaced with extra charged Transporter batteries. Batteries may be “hot swapped” without disrupting device function.



---

**CAUTION:** Be sure to replace the batteries only one at a time, to ensure that the Transporter will continue to operate during battery replacement.

---

## ***Arriving at the Transplant Hospital***

Observe the following when arriving at the transplant hospital.

- Carry the Transporter or roll it in using the wheeled cart into the transplant OR.
- Follow hospital procedures for moving equipment into the OR.
- Find a nonsterile table in the OR for the Transporter, or park the wheeled cart in the OR, where the cart can act as a table. The table or parking place should be near the sterile back table to ease the process of transferring the kidney from the Transporter to the back table.



- If a power outlet is nearby, plug in the Transporter to power, charge, and preserve the batteries.
- Monitor perfusion parameters to make sure that the Transporter is working properly at all times.

## Waiting until Recipient Surgery Is Ready

If there is a waiting period before the recipient surgery is ready, the kidney is perfused and monitored inside the Transporter to maintain its transplantable condition. During such a period of perfusion, the following activities may take place:

- **Monitoring the kidney:** Pressure, flow, vascular resistance, and temperature can be regularly recorded to observe the vascular trends in the kidney during perfusion.
- **Monitoring the perfusate:** Perfusate samples may be taken aseptically, via the needleless port.
- **Recharging the supplies:** The Transporter may be plugged into an external power supply to enable continued operation while recharging the batteries. The Ice Container should be checked occasionally and replenished when the ice is running low and temperature is beginning to rise.
- **Sterility and hypothermia maintenance:** Even when the Transporter is not pumping, the kidney is maintained under cold and aseptic conditions, sealed in the cassette and surrounded by ice.

## Removing the Kidney from the Transporter for Transplant

Follow these procedures when the transplant surgeon is ready for the kidney.

1. Unlatch and remove the Transporter cover.
2. Remove the Outer Cassette Lid and place it upside-down on a table where it will be undisturbed.
3. Press the **STOP** Button to stop the infusion pump.

A scrubbed-in member of the transplant team should continue with the following procedures:

1. Cover the Transporter with the Sterile Drape.
2. Remove the inner cassette lid.
3. Remove the kidney from the Organ Cassette as follows:



- a. Introduce the empty stainless steel bowl for the kidney to the sterile field near the draped Transporter.
- b. Disconnect the cannula from the infusion tubing.
- c. (Optional): Direct the Infuse Line into the stainless steel bowl and press the **PRIME** button to flow cold perfusate into the bowl. When enough perfusate has been transferred, press the **STOP** button to stop the flow.
- d. Lift the kidney cradle from the Organ Cassette and place it in the bowl.
- e. Carry the bowl to the back table or to the recipient table, remove the kidney from cradle, remove cannula(s) from artery(s), and proceed with pretransplant preparation of the kidney.
- f. Once the kidney has been removed from the Transporter, the device can be powered off and prepared to return to home base station.

