

Fresnius Manual

Function of Hemodialysis machine

Hemodialysis machine is used to provide homodialysis treatment by controlling extracorporeal blood circuit and Dialysate.

In extracorporeal blood circuit, blood is circulated from patient to dialyzer and at the same time toxic substances are removed venous and arterial blood pressures are monitored.

In Dialysate circuit, the concentrates are mixed with purified water, heated and sent to the dialyzer.

Organization of the Hemodialysis machine

The back of the machine holds utility connections such as water source, drain, and utility connections.

The front of the machine contains the Control Panel, modules and the Dialyzer.

- Control panel houses the computer that runs the treatment program
- Modules are used for safe transmission of blood to and from the dialyzer.
- Dialyzer is the primary concern where the concentrates are mixed and pumped to the dialyzer.

Components of Control Panel

- General Operation Section
- Treatment Display Screen
- Extracorporeal Blood Circuits
- Dialysate

Modules

1. Arterial Drip Chamber Module: It is a panel which guides for blood tubing and holder for arterial drip chamber. The button used to raise the ADC is located in Blood Pump Module.
2. Blood Pump Module: It draws the blood from the patient and pumps it to the dialyzer and back to the patient in a closed circuit.
3. Heparin Pump Module: It provides a means of injecting heparin into the blood circuit during the course of action.
4. Level Detector Module: It maintains the level of fluid in venous drip chamber.

Steps for preparing for Hemodialysis

1. Press the power key (green) and "Select Program" will appear on the screen.
2. Insert the acid concentrate collector (red line) into a jug containing sufficient acid concentration for the entire treatment.
3. If the machine is used for normal dialyses press the Dialysis button.
4. Verify that the concentrate type matches the prescribed concentrate type and that the acid/bicarbonate or acetate concentrate matches the type selected.
5. After the concentrate displayed is correct, verify the Base Na⁺ [137] and bicarbonate [33] are prescribed and press the CONFIRM button.
6. Insert the bicarbonate concentrate connector (blue line) into the jug containing the sufficient bicarbonate concentration for the entire treatment.

Extracorporeal Blood Circuit

- Arterial bloodline (patient to dialyzer) [Negative Value]
- Venous bloodline (dialyzer to patient) [Positive Value]

Priming the blood circuit: 2 ways

1. Standard Prime method
2. Prime Amount method

Testing Hemodialysis machine

1. The dialyzer must be connected to the shunt.
2. The machine must be in alarm-free condition.
3. The arterial and venous lines must be removed from the pressure monitor ports.
4. UF [Ultrafiltration] and SVS [Sodium Variation System] must be off.

To activate new treatment key- Press New TX and press CONFIRM

To set a treatment parameter

1. Begin by selecting any treatment. The background color turns brighter yellow.
2. Use the number or the arrow keys to select the desired value.
3. After entering the value press, CONFIRM to enter the value.
4. If an incorrect value is entered press, ESCAPE to reset the parameters.

Setting Acid/Bicarbonate Alert

The acid/bicarbonate alert sounds an alert when fluid level in either of the jugs is drained to 20% of its original amount. In addition to the alarm, some warnings such as LOW ACID WARNING, LOW BIC WARNING, and LOW ACETATE WARNING will appear in the status box.

1. From the Dialysate screen, touch “Acid/Bicarbonate Alert” and then Acid/Bic subscreen will appear.
2. Touch Acid and enter the actual amount.
3. Touch bicarbonate and enter the actual amount.

4. Press Alert until an **X** appears on the “On” button.
5. Press Confirm.
6. Touch Dialysate to close the Acid/Bicarbonate subscreen.

The alarm window can be shifted up or down to within 0.5 mS/cm of the default setting using **Alarm Position button**, and can be widened or narrowed using **Alarm Width button**.

Ultrafiltration

Use the UF goal and UF time buttons to determine the necessary UF rate for the treatment. The UF rate is limited to between 1000 to 4000ml/hr and UF goal is limited to 9990ml.

When the UF button is turned off, no Ultrafiltration occurs and when the Tx clock button is turned on, the UF pump is automatically started.

When the UF goal is achieved, UF time is set to 0.00 and the UF rate goes to 70ml/hr or 300ml/hr.

To enter an Ultrafiltration Profile

1. From the Home or SVS profile screen, touch **UF Profile** to open “UF Profile” Screen.
2. Touch the profile button which represents a graphical manner in which the Ultrafiltration is to be carried out.
3. If not previously entered from the Home screen. Enter the UF goal and the UF time values.

To set the Hemodialysis for sequential dialysis

1. Set UF treatment parameters. Set the UF time to include the combined treatment and the pure UF times.
2. Turn on Dialysate flow. Yellow light will flash.

3. Touch Dialysate flow to highlight it.
4. Use the number or arrow keys to enter 0.
5. This will deactivate the “Flow Off” warning for 5 min.

To set Sodium Variation System (SVS) Profile

1. From the Home Screen, touch the SVS profile.
2. Select the prescribed profile.
3. Touch Start Na⁺ and enter the starting max value.
4. Touch Base Na⁺ and enter the final Na concentration value.
5. Touch the SVS profile and enter the running time for the SVS profile.
6. Press CONFIRMS to save the SVS changes.

Heparin Delivery System

1. Fill the syringe with the prescribed amount of heparin for the entire treatment.
2. In the Heparin screen, touch the “Syringe” button. The syringe menu opens.
3. Use the Up/down keys to scroll the drop-down menu until the syringe type is highlighted.
4. Press CONFIRMS.

Final Dialysate Components

It contains Sodium, Bicarbonate and the minor Dialysate components shown on the “Dialysate” screen. The 2008K hemodialysis machine maintains Dialysate sodium and bicarbonate at the prescribed level using volumetric proportioning system.

When the operator changes the prescribed bicarbonate, the acid stream also changes in order to maintain the prescribed Final Dialysate Sodium constant and vice versa.

The minor electrolyte components of potassium, calcium, magnesium are the part of the acid stream and will change from the nominal settings when acid/bicarbonate is changed from its nominal.

Test and Options Screen Settings

There are 2 sections

The left side section is used to initiate the self test and show the results.

The right side section is used to set the machine for various treatment options.

Pediatric Dialysis

For pediatric dialysis, the prescribed blood pressure may be low but the UF rate must be higher than 70ml/hr for fluid removal.

Pediatric Dialysis is enabled by pressing “Pediatric” button on the touch screen and an X appears.

Blood Pressure Screen Settings

It works in conjunction with the blood pressure module which takes the patient’s blood pressure reading and the pulse and the pressure is displayed on the left side of the blood pressure screen.

Monitoring the treatment

Home Screen Monitoring

It provides a view of the status and the progress of the treatment. The flow rate, temperature, the status of the UF process and, the time left for the treatment can all be found here.

Arterial Pressure

It is the measure of pressure under the arterial drip chamber. This pressure is read by a transducer inside the blood pump module. The drip chamber and the transducer are connected by a pressure line that runs from the arterial drip chamber to the arterial pressure port (PAr).

Venous Pressure

It is the measure of pressure under the venous drip chamber. This pressure is read by a transducer inside the level detector module. The drip chamber and the transducer are connected by a pressure line that runs from the venous drip chamber to the venous pressure port (PVen).

Transmembrane Pressure [TMP]

It is equal to the venous pressure minus the Dialysate pressure in mm Hg and it is normally negative.

Trend Screen Monitoring

Similar to “Home” Screen which provides treatment status information.

Kt/V and Access Flow [AF] Monitoring

Online Clearance (OLC) used in estimating the effectiveness of the dialysis treatment is viewed in Kt/V AF screen.

K-dialyzer clearance of Urea

t-dialysis time

V-Volume of distribution of urea, approx equal to patient's total body water.

BTM/BVM Monitor Screen

BTM-Blood Temperature Monitor

BVM-Blood Volume Monitor

BTM has 2 primary functions

1. To regulate patient's temperature.
2. To use temporary changes in Dialysate temperature to measure the extent of recirculation at the blood access site.

Blood Recirculation Procedure

1. Return Blood if possible.

To recirculate blood within extracorporeal blood circuit

2. Touch the Tx Clock button and press "CONFIRM".
3. Press the blood pump **start/stop** button to stop the blood pump.
4. Disconnect the arterial and venous bloodlines.
5. Unclamp saline bag.
6. Press the start/stop key to start the blood pump.
7. Press RESET to clear the alarm.

Renalyx Manual

User Interface

A tablet is used for user interface. HB machine is controlled via touch screen feature. The tablet will communicate with the machine through USB interface connection.

Machine Power ON

Power ON the main power supply, heater and switch on the tablet. The system will boot up and carry out the self-test. On screen, the test in progress, the name of the self-test will be displayed as each self-test progress.

User Login

A pop-up screen appears when the all the self-tests are successfully completed providing an option to the user to choose either nurse mode or technician mode.

Program Selection Mode

After the successful login, the user enters the “Program selection mode” where the option is given to select either Treatment mode or Calibration mode.

Rinse Mode

Connect acid and bicarbonate to the machine. Connect the dialyzer inlet and outlet to the dialyzer shunt. Press “Start” to start the RO water rinse.