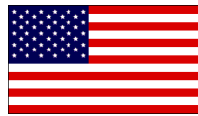


OPERATING MANUAL

Reverse Osmosis Equipment
Model: Frame Mount Vertical
FMV-1 through FMV-6



Made in U.S.A.

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Model: Frame Mount Vertical

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COMPONENT IDENTIFICATION

(Refer to the image for identification)

- A) **HIGH PRESSURE PUMP and PUMP MOTOR**
The pump is responsible for creating the necessary high pressure needed for efficient R.O. operation. Pressure is adjusted by the waste control valve.
CAUTION! Do not run pump dry - do not exceed the recommended operating pressure of 200 PSI.
The pump motor spins the pump at high speeds to create increased pressure to the R. O. membrane. Information regarding the motor style and electrical specifications is identified on label affixed to the motor.
- IMPORTANT (FOR THREE PHASE MOTORS): To prevent pump damage, motor direction of operation is extremely important before starting R. O. system. Motor direction will be indicated by arrow label affixed to the motor. If there is a question of how to check motor rotation, consult the factory.
- B) **REVERSE OSMOSIS MEMBRANE**
It is important when removing, then replacing the R.O. membrane, that the rubber seal (brine seal) is on the same end of the housing as it was when first removed.
- C) **PRE-FILTER IN GAUGE** This gauge measures the water pressure before the pre-filter. When there is a drop 10 - 15 psi difference of pressure readings between the pre-filter in and pre-filter out gauges, the pre-filter is getting clogged and must be changed. This gauge registers a reading at all times.
- D) **PRE-FILTER OUT GAUGE** This gauge measures the water pressure after the pre-filter. When there is a drop 10 - 15 psi difference of pressure readings between the two gauges, the pre-filter is getting clogged and must be changed. This gauge registers a reading only while system is running.
- E) **PRODUCT FLOW METER**
The product flow meter measures the amount of product water in gallons per minute or liters per minute.
- F) **WASTE FLOW METER**
This meter is calibrated in gallons per minute (gpm). The waste flow meter measures the amount of waste water to drain. The proper ratio of waste-to-product water recovery can be set by viewing this meter and comparing its flow to the product flow.
- G) **ADJUSTABLE RECYCLE VALVE**
This valve takes a portion of the waste water from the R.O. membrane and feeds it back into the inlet side of the high-pressure pump. The valve is used to fine-tune and adjust the pressure of the high-pressure pump.
- H) **ADJUSTABLE WASTE CONTROL VALVE**
This valve regulates the flow of waste water exiting the membrane. It creates the necessary operating pressure in the membrane. **CAUTION! This waste control valve should never be closed completely. Closing valve completely can result in membrane and system damage.**

Adjusting this valve to attain the proper waste/product water ratio is done by turning control knob located on the body of the valve. Turning clockwise will increase the pressure setting within the membrane and reduce the amount of waste water. **CAUTION! Do not exceed the maximum 200**

PSI setting recommended.

Turning counter clockwise will reduce the pressure in the membrane and increase the waste water. Recovery rates are determined by pre-treatment used and the type of water supply the system is installed on.

I) **SYSTEM PRESSURE GAUGE**

This gauge measures the water pressure in PSI that is discharged from the high-pressure pump. The pressure to this gauge is adjusted to recommended pressure of 200 PSI. By turning the waste control valve clockwise, the pressure will increase; counter clockwise will decrease pressure. **CAUTION: Do not close this waste valve completely. Do not exceed 200 PSI. Proper recovery must be set according to application.** This gauge registers a reading only while system is running.

- J) **FLOAT SWITCH CONNECTION** - A splice box is provided to make a connection between the tank float (level) switches and the R. O. system. The customer must provide wire to make this connection. Make sure all wire colors are matched from the float switch and R. O. system. The R. O. system will not start without the float switch connections being made.

COMPONENTS NOT VISIBLE ON IMAGE

PRE-FILTER The pre-filter removes sediment particles down to 5 micron to help protect the pump and R. O. membrane. The pre-filter is mounted to the frame. The pre-filter is not to be considered as the only method of pre-treatment. Refer to product specifications "Feed Water Parameters" for proper pre-treatment for your application.

INLET SOLENOID VALVE This valve is located on the input side of pressure pump. This valve will shut off the feed supply of water when the unit is in the non-operating mode. This valve is a normally closed valve when not supplied with electrical current. If electrical current should be shut off, this valve would close, thus stopping the feed water.

THROTTLE VALVE (optional feature)

This is a ball valve located on the discharge side of pump. This valve is normally installed on systems with pumps that are larger than required to cut-back on flow and pressure output. (Used on high capacity systems and systems designed for expand ability). This valve can be fine-tuned for proper system flow and pressure parameters.

K) **ELECTRICAL CONTROL BOX**

All 110 volt systems are supplied with a cord and plug ready to plug into a 110 volt electrical outlet.

All 220 volt single phase systems are supplied with a cord only. The plug is provided by customer and must match their electrical outlet.

All three phase systems' electrical connections can be made directly to the motor contactor or wired to factory supplied wires installed on motor contactor already. If so, use splice box mounted to control box to contain factory wires with supply wires. Use proper-sized wire nuts to secure connections.

NOTE: ALL R. O. SYSTEMS' ELECTRICAL REQUIREMENTS ARE LABELED. R. O. SYSTEM MUST NOT BE PLUGGED INTO ELECTRICAL OTHER THAN THAT OF LABEL AFFIXED TO SYSTEM.

ELECTRICAL CONTROL BOX STATUS LIGHTS:

Off/On switch - controls the electrical supply to the R. O. unit.

Power light - indicating switch is on and there is power to system.

Running light - indicating R. O. system pump is running.

Flushing light - (optional feature) indicates R. O. system is rapid flushing to drain.

NOTE: The system pressure during flushing will be lower than normal. No adjustments to waste and recycle needle valves during this mode.

Low pressure light - indicates that there is a feed water pressure or flow to the R. O. system.

Tank full light - indicates that the storage tank is full of water. The R. O. system is in the stand-by mode until the tank level drops signaling the R. O. system to re-start.

ELECTRICAL CONTROL BOX CONTROLS (refer to line drawing)

K-1) LOW PRESSURE SWITCH

This switch is fed from the feed water before going into the high pressure pump. Should the feed water drop below 10 PSI, the contacts in this switch would open and shut down the RO unit. Should feed water pressure return, the RO unit will automatically restart. This switch is adjustable from 0 - 40 PSI. Recommended setting is 12 -15 PSI. **CAUTION:Do not bypass this switch.**

K-2) LEVEL CONTROL RELAY (for dual-level control systems only - 24v low voltage)

Its purpose is to automatically start and stop the R.O. unit by a signal from the product water storage tank sensor.

K-3) MOTOR CONTACTOR

Heavy-duty rated motor contactor to start and stop the high pressure pump motor.

K-4) TIME DELAY ON

Time delay is adjustable from 1 - 60 seconds. Its purpose is to allow the R.O. system to fill completely with water before the pump starts.

K-5) OFF DELAY

Allows continued electrical signal to all motor controls for 10 - 15 seconds during low water pressure spikes.

K-6) FLUSH TIMER (optional feature)Non-adjusting timer used for automatic hourly fast flush.

K-7) 110v RELAY

Provides a dry contact signal to the off delay powered by the low pressure switch.

K-8) FUSES (TO AVOID THE RISK OF FIRE it is important that the fuses are replaced with the same or equal rated fuse that was supplied with the R.O.)

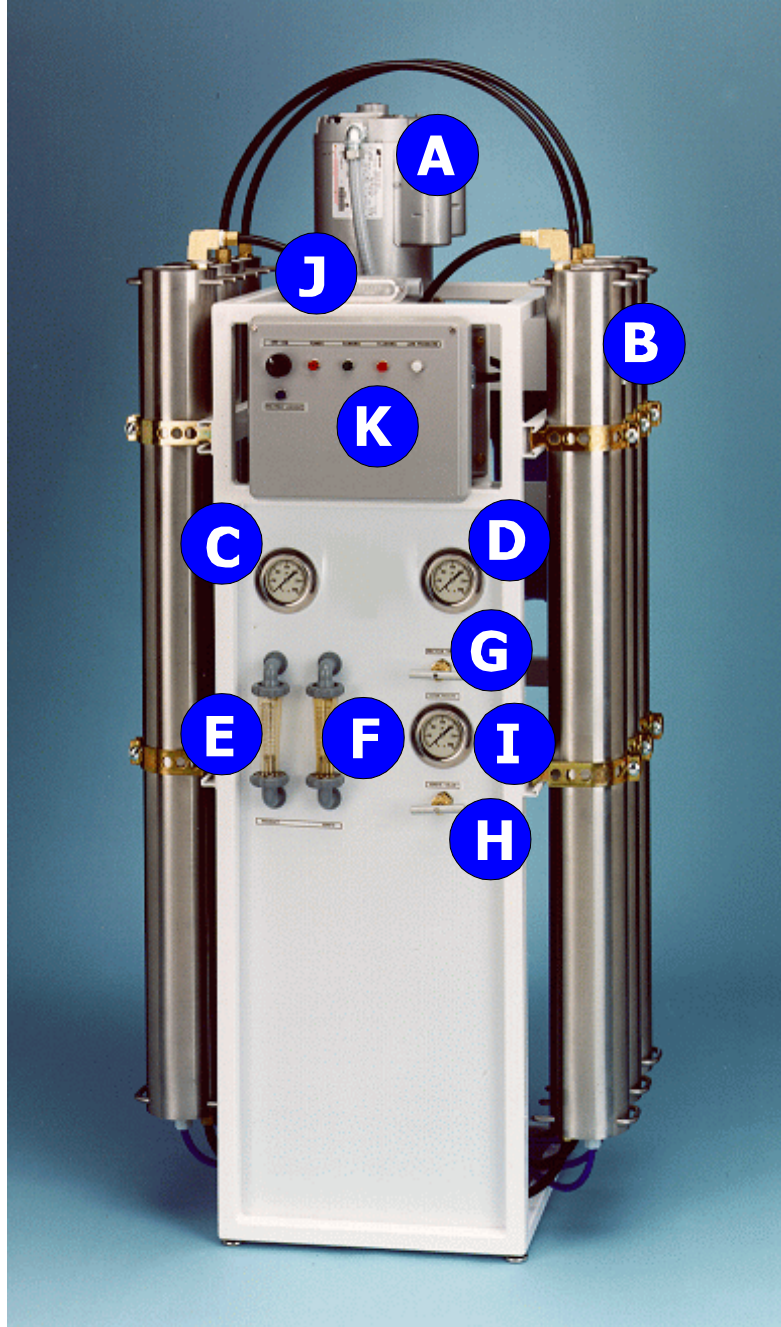
- 110 volt controls fuse
- 208-220/440-460 volt input to transformer fuse
- 24 volt transformer fuse

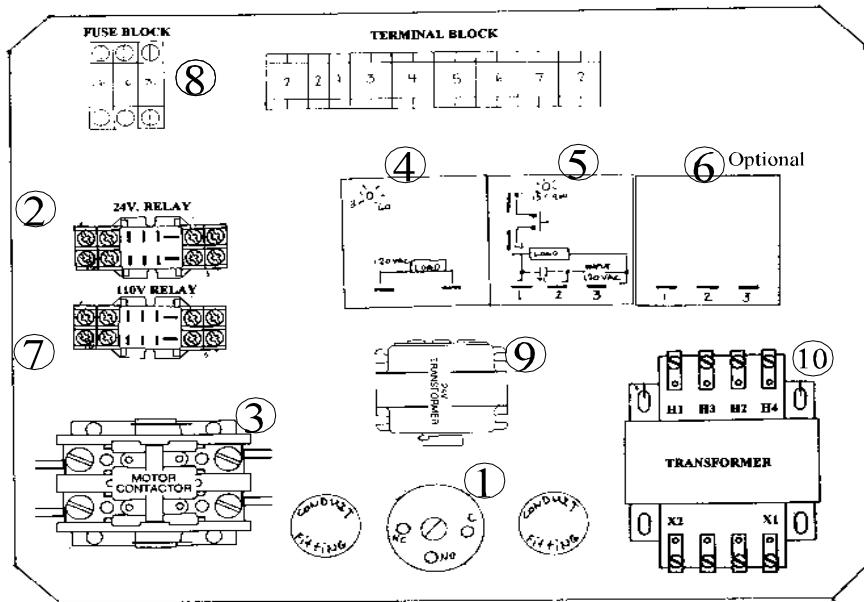
K-9) 24v TRANSFORMER

Provides low voltage for level switches.

K-10) TRANSFORMER (not required for 110v equipment)

A step-down transformer to provide 110v current to motor controls.





ELECTRICAL CONTROL BOX (includes optional flush timer #6 and transformer #10 required for 220volt systems)

INSTALLATION INSTRUCTIONS
(200 PSI SYSTEM)

1. INLET WATER SUPPLY
The inside of the pre-filter - 3/4" to 1" FPT.
2. PRODUCT WATER OUTLET
1/2" FPT fitting on outside of flow meter tube. On systems without flow meters, product flow is always center part of membrane.
3. WASTE WATER OUTLET
1/2" FPT fitting on outside of flow meter tube. On systems without flow meters, waste outlet is the side port of membrane opposite of the feed side.
4. LINE VOLTAGE INLET
110V or 220V grounded. The system's electrical supply is indicated on side of electrical box. Be sure to install correct size breaker for your system. Refer to page for correct sizing.
5. STORAGE TANK LEVEL CONTROL CONNECTION
Top of electrical control box (refer to the line-drawing provided in this manual for your particular system purchased).

Insuring that all other plumbing, electrical and necessary pre-treatment, post-treatment (pH control, UV sterilization, etc.) and point-of-use connections are complete, unit is now ready for start-up, but before initiating start-up, read the next section carefully. The next section will explain the individual components and their use within the RO unit. Refer to the line-drawing provided in this manual for your particular RO system purchased.

PRE-START CHECK LIST

1. Pre-filter cartridge in place
2. Minimum inlet pressure 40 PSI
3. Control switch to "Off"
4. System is plugged into proper electrical supply (as indicated on side of electrical box).
5. Open waste valve 3 - 5 turns
6. Waste and product tubes connected to drain and storage tank
7. Level controls properly connected

NOTE: FOR THREE PHASE MOTORS ONLY To prevent pump damage, motor direction of operation is extremely important before starting R. O. system. Motor direction will be indicated by arrow label affixed to the motor. If there is a question of how to check motor rotation, consult factory.

START-UP

1. Do not start system until pre-start check list is completed.
2. Turn control switch to "On".
3. Time delay will activate and unit should start after 15 - 30 seconds.
4. Immediately monitor high pressure gauge to insure that system does not exceed 200 PSI.
5. Slowly adjust the waste control valve so that:
NOTE: Systems with Automatic Flush feature; the system must complete flush cycle before final adjustments can be made.
 - a) Product flow meter (GPM) is at proper rate
 - b) Waste flow meter (GPM) is at proper rate
 - c) High pressure gauge is at proper 200 PSI
6. System should now be running properly.
7. Product water PPM should take about 20 minutes to reach optimum quality.
8. To check low pressure switch, turn off inlet ball valve. Low pressure switch will activate at 12 - 15 PSI.

This Manual created 8/26/91,
modified 10/21/93

TROUBLE SHOOTING

SYMPTOM	PROBABLE CAUSE	SOLUTION
RO unit will not start	No electrical power to control circuit	Check power
	Storage tank level full	Drain some water out of tank
	On-Off switch	Check or replace
	Time delay not operating	Check or replace
	Fuse	Check or replace
	Coil in magnetic motor starter burned out	Check or replace
	Low feed pressure	Check low pressure
	Pump/motor	Check or replace
	Level control relay	Check or replace
	Low feed pressure	Feed water valve turned off
Feed solenoid valve defective		Check or replace
Pre-filter clogged		Check or replace
Inlet water restriction		Check
Low pressure switch defective		Check or replace
Upstream pre-treatment		Check
Inlet water pressure		Check
No high pressure		Waste valve open
	Waste bypass open	Check (adjust)
	High pressure gauge broken	Check or replace
	Pump impellers worn	Check or replace
	Low water volume to pump	Check
	Restriction in tubing to gauge	Check or replace
	No waste water	Waste valve closed
Clogged drain line		Check
No product water or low product water	Pump pressure low	Check / adjust
	Waste valve open too much	Check / adjust
	Membrane clogged	Check / clean or replace
	Water temperature low	Check
High conductivity product water	PPM monitor defective . . . Probe defective . . .	Check Adjust or replace
	Low pump pressure	Check / adjust
	Membrane clogged or fouled	Check / clean or replace