

OPERATORS MANUAL FOR Mi-T-M® *FRO-1000-0ME1 FRO-2000-0ME1* REVERSE OSMOSIS SYSTEM



37-1517-102622

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A WARNING

▲ WARNING: This product can expose you to chemicals including Lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

INTRODUCTION

Congratulations on the purchase of your new Mi-T-M Reverse Osmosis System! You can be assured your Mi-T-M Reverse Osmosis System was constructed and designed with quality and performance in mind. Each component has been rigorously tested to ensure the highest level of acceptance.

This operator's manual was compiled for your benefit. By reading and following the simple safety, installation, operation, maintenance and troubleshooting steps described in this manual, you will receive years of trouble free operation from your new Mi-T-M Reverse Osmosis System. The contents of this manual are based on the latest product information available at the time of publication. Mi-T-M reserves the right to make changes in price, color, materials, equipment, specifications or models at any time without notice.

! IMPORTANT !

These paragraphs are surrounded by a "SAFETY ALERT BOX". This box is used to designate and emphasize Safety Warnings that must be followed when operating this Reverse Osmosis System.

Accompanying the Safety Warnings are "signal words" which designate the degree or level of hazard seriousness. The "signal words" used in this manual are as follows:

DANGER: INDICATES AN IMMINENTLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.

WARNING: INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.

CAUTION: INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED MAY RESULT IN MINOR OR MODERATE INJURY.

The symbols below this paragraph are "Safety Alert Symbols". These symbols are used to call attention to items or procedures that could be dangerous to you or other persons using this equipment.



ALWAYS PROVIDE A COPY OF THIS MANUAL TO ANYONE USING THIS EQUIPMENT. READ ALL IN-STRUCTIONS BEFORE OPERATING THIS BIOLOGICAL RECYCLING SYSTEM AND ESPECIALLY POINT OUT THE "SAFETY WARNINGS" TO PREVENT THE POSSIBILITY OF PERSONAL INJURY TO THE OPERA-TOR.

Once the unit has been uncrated, immediately write in the serial number of your unit in the space provided below.

SERIAL NUMBER_____

Inspect for signs of obvious or concealed freight damage. If damage does exist, file a claim with the transportation company immediately. Be sure that all damaged parts are replaced and that the mechanical and electrical problems are corrected prior to operation of the unit. If you require service, contact Mi-T-M Customer Service.

CUSTOMER SERVICE

CALL OUR TOLL-FREE NUMBER

for the Sales or Service Center nearest you!

800-553-9053

Please have the following information available for all service calls:

- 1. Model Number
- 2. Serial Number

3. Date and Place of Purchase

CONTENTS OF THE REVERSE OSMOSIS SYSTEM

Carefully unpack your new Mi-T-M Reverse Osmosis System. Check the contents against the packing list. Contact the freight line if a damage claim is required on any component. The following items are the basic equipment sent with your Reverse Osmosis System.

- 1. Reverse Osmosis Skid
- 2. Green float N.O. with bulkhead and strain relief
- 3. Tank fittings for permeate tubing, (2) quick connect elbows and (1) bulkhead
- 4. Total Dissolved Solids (TDS) tester
- 5. Spanner wrench
- 6. Manual, Parts list, Maintenance sheets
- 7. Any accessory tanks or filters

SPECIFICATIONS

MODEL	FRO-1000-0M10	FRO-2000-0M10	
Permeate Flow	1000 GPD	2000 GPD	
Total Flow	2.0 GPM	4.0 GPM	
Inlet Pressure	20-80 PSI		
Operating Pressure	200 PSI		
Salt Rejection	98%		
Maximum Recovery	50%		
Electrical Hook-Up	120V 1ø, 15AMP Plug		
Amp Draw	8 AMPS	12 AMPS	
Ro Pump	0.5 HP	0.75 HP	
Skid Dimensions (L X W X H)	60"Hx24"Wx38"L		
Total Weight	240 Lbs.	270 Lbs.	

PURPOSE

The Mi-T-M Freshwater Reverse Osmosis (FRO) system is designed to remove dissolved solids and salts from a freshwater supply. The system will deliver the high quality water to a holding tank (not included) for future use.

IMPORTANT SAFETY WARNINGS

RISK OF ELECTRIC SHOCK OR ELECTROCUTION

Serious injury or death could occur if the system is not properly grounded. Your System is powered by electricity and may cause electric shock or electrocution if not installed properly.

Installation of this unit, including all electrical connections, must comply with all local, state and national codes.

This product must be grounded. Connect to a GFCI outlet when available. If the unit should malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. Do not ground to a gas supply line.

Improper connection of the equipment-grounding conductor can result in a risk of electrocution. Check with a qualified electrician or service personnel if you are in doubt as to whether the system is properly grounded.

Always be certain the unit is receiving proper voltage (+/- 5% of the voltage listed on the nameplate). Before installing electrical connections, be certain the power switches are in the "OFF" position.

Keep all connections dry and off the ground.

Do not touch pump, pump motor, discharge piping or water when the unit is connected to the power supply; regardless of whether the unit is operating correctly or experiencing an operation failure.

DO NOT allow metal components of the system to come in contact with live electrical components.

Electrical shock may occur if system is not operated properly. Serious injury or death may occur if electrical repairs are attempted by unqualified persons.

Never operate the system with safety guards/covers removed or damaged. Ensure all electrical covers are securely in place when unit is operating.

Any electrical wiring or repairs performed on this system should be done by Authorized Service Personnel in accordance with National and Local electrical codes.

Before opening any electrical enclosure, always shut off the system and drain the water. Disconnect the system from the power source. If the power disconnect is not in sight, lock it in the open position and tag it to prevent power usage. (Never assume the system is safe to work on just because it is not operating, it could restart at any time! Always disconnect from the power source.) Allow the system components to cool down.

RISK OF EXPLOSION OR FIRE

Serious injury or death could occur from an explosion or fire caused by a system electric spark.

This unit must be placed in an area that is well ventilated, free of flammable vapors, combustible dust, gases or other combustible materials.

RISK OF BURSTING

Serious injury or death could occur from bursting caused by excessive pressure in the system.

Do not mistreat the pressure gauges on the system. Pressure gauges will malfunction if they are subjected to excessive pressure, vibration, pulsation or temperature or if they are placed in an environment which causes corrosion of parts. Incorrect readings on a pressure gauge could mislead the operator and place him in a dangerous working condition.









IMPORTANT SAFETY WARNINGS

Do not use this system to pump flammable material! An explosion could occur from a gas vapor buildup inside the system.

Serious injury may occur if attempting to start the system when the pump is frozen.

In freezing temperatures, the unit must always be warm enough to ensure there is no ice formation in the pump. Do not start the system if it has been in a freezing environment without first allowing the pump to thaw.

RISK OF BURNS

Serious injury may occur from touching the electrical motor. This area can remain hot for some time after the system is shutdown.

Never allow any part of your body to contact the electrical motor until cooled.

RISK FROM MOVING PARTS

Serious injury may occur to the operator from moving parts on the system.

Do not operate the unit without all protective covers in place.

Follow the maintenance instructions specified in the manual.

RISK OF BODILY INJURY

Injury may occur from the system.

DO NOT allow children to operate this unit.

DO NOT overreach or stand on unstable support.

Wet surfaces can be slippery, wear protective foot gear and keep good footing and balance at all times.

Know how to stop the system. Be thoroughly familiar with controls.

Before servicing components, ALWAYS shut off the system.







REVERSE OSMOSIS SYSTEM FLOW CHART



FLOW CHART AND THEORY OF OPERATION

Pressurized water at 20-80PSI is hooked up to **Solenoid Valve (1)**. When the Reverse Osmosis system turns on, **Solenoid Valve (1)** opens to let water into the system. The water passes through the **Inlet Filter (2)** which removes sediment and also serves as a housing for the cleaning and storages cartridges. The **Pressure Switch (3)** monitors feed pressure and shuts the system down if low pressure is detected. After the **Pressure Switch (3)** water makes its way to the **Reverse Osmosis Pump (4)**

The **Reverse Osmosis Pump (4)** boosts the water pressure to operating pressure and pumps the water to the **Reverse Osmosis Membranes (6)**. The **Reverse Osmosis Inlet Gauge (5)** monitors the pump pressure. At the **Reverse Osmosis Membranes (6)**, water travels up and down along the membranes, where the high pressure forces some of the water through the membranes and out the top center of the housing leaving behind salts and other dissolved solids. This water, called the **Permeate (12)**, can flow through the optional **Permeate Flow Meter (13)** to fill a **Holding Tank (17)** (not included). The **Permeate Tank Valve (15)** and **Permeate Drain Valve (14)** are used to direct the **Permeate (12)** to drain during start-up or cleaning, while the **Permeate Sampling Valve (16)** is used to collect samples for water quality testing.

The water that does not pass through the **Reverse Osmosis Membranes (6)** is referred to as the **Concentrate (7)** and contains the salts and other dissolved solids that were rejected by the membrane. The majority of the **Concentrate (7)** passes through the **Reverse Osmosis Concentrate Valve (10)** to the optional **Concentrate Flow Meter (11)** and to the drain. The **Reverse Osmosis Concentrate Valve (10)** restricts the flow and creates the high pressure on the membranes. A portion of the concentrate can be recycled though the **Reverse Osmosis Recycle Valve (8)** and **Reverse Osmosis Recycle Check Valve (9)** back to the **Reverse Osmosis Pump (4)** to increase the system recovery.



- 1 MEMBRANES FRO-1000
- 2 PUMP ASSY
- 3 FRAME ASSEMBLY
- 4 CONTROL PANEL ASSEMBLY
- 5 INLET ASSEMBLY FRO
- 6 HOUR METER
- 7 RUN/ CLEANING SWITCH
- 8 UNIT (ON/OFF)
- 9 LIGHT RO PUMP ON

- 10 LIGHT TANK FULL
- 11 LIGHT RO CLEANING
- 12 LIGHT CHECK FILTERS
- VALVE 1 PERMEATE OUTLET
- VALVE 2 PERMEATE SAMPLE
- VALVE 3 CONCENTRATE RECYCLE
- VALVE 4 CONCENTRATE OUTLET
- VALVE 5 INLET SOLENOID

FRO-1000 UNIT ASSY 041422ATL

REVERSE OSMOSIS SYSTEM FEATURES (FRO-2000)



- FRO-2000 UNIT ASSY 041422ATL
- 3 PUMP ASSY
- 4 FRAME ASSEMBLY
- 5 INLET ASSEMBLY FRO
- 6 HOUR METER
- 7 RUN/ CLEANING SWITCH
- 8 UNIT (ON/OFF)
- 9 LIGHT RO PUMP ON

- 12 LIGHT CHECK FILTERS
- VALVE 1 PERMEATE OUTLET
- VALVE 2 PERMEATE SAMPLE
- VALVE 3 CONCENTRATE RECYCLE
- VALVE 4 CONCENTRATE OUTLET
- VALVE 5 INLET SOLENOID

INSTALLATION

ATTIRE:

Proper attire is essential to your safety. It is advised to utilize whatever means necessary to protect eyes, ears, and skin.

INLET WATER SUPPLY:

The FRO system is intended to be fed from a clean, pressurized water supply. Water supply must be able to maintain 20PSI at the total flow requirement of the system. Contaminants in the water such as hardness, sediment, and chlorine will decrease performance and lifetime of the system. Chlorine will permanently damage the membranes while hardness and sediment will cause slower flow rates and more frequent cleaning.

The system comes standard with a small filter for sediment but additional pre-filters are recommended. Carbon filters are recommended to remove chlorine while water softeners or anti-scale filters are recommended to reduce hardness. Pre-testing the water is recommended to determine what pre-filtering steps should be taken. If any chlorine is present a carbon filter is recommended. If hardness is over 7 grains per gallon a softener or anti-scale filter is recommended.

INSTALLATION

- 1. Unboxing-Carefully unpackage the following contents:
 - a. Main Skid
 - b. Float and tank fittings
 - c. Total Dissolved Solids (TDS) meter
 - d. Manual/Parts List/Maintenance Sheets
 - e. Any accessory filters or items.
- 2. Location and connection
 - a. Set skid on level surface with access to control panel, pre-filters, and membranes. Adjust feet as needed to keep skid level.
 - b. Keep a few feet around the front and the sides for operation and maintenance items.
- 3. Prepare permeate holding tank (recommended holding tank size is daily volume to be used.)
 - a. Drill ¾" hole at top of holding tank for tube connection. Install bulkhead, and elbows on each end of the bulkhead.
 - b. Drill 1-5/8" bulkhead about 10" from top of tank. Install strain relief, green float with a 3" tether inside holding tank.
 - c. Wire float back to main control box. See wiring diagram in box.
 - d. Drill any required drain holes, outlet holes for water use.
- 4. Make plumbing connections.
 - a. Connect permeate tube to elbow on outside of tank.
 - b. Run Concentrate drain hose to drain.
 - c. Connect garden hose from water supply to inlet garden hose fitting. See inlet water supply requirements from above section.

INSTALLATION



PRE-OPERATION CHECKLIST

BEF	ORE PROCEEDING, ANSWER ALL THE QUESTIONS ON THIS CHECKLIST.	YES	NO
COD	ES:		
1.	Does the electrical wiring meet all codes?		
2.	Does plumbing meet all codes?		
LOC	ATION:		
1.	Is the unit located on a hard level surface free of flammable vapors, combustible dust, gases or other combustible materials?		
2.	Is the unit located in a large ventilated area?		
ELEC	CTRICAL:		
1.	Is the unit properly grounded?		
2.	Does the power supply, voltage and amperage match the data plate?		
PLU	MBING:		
1.	Is the plumbing sized correctly?		
2.	Are all plumbing connections secure?		
GEN	ERAL:		
1.	Have all operators using this unit read and understood this entire manual?		
2.	Has the unit been installed by qualified service people who followed the instructions listed in this manual?		
IF "NO" WAS MARKED TO ANY OF THESE QUESTIONS, CORRECT THE SITUATION BEFORE OPERATING.			

Operator's Manual

PREPARATION

PRE-START UP:

1. Be certain concentrate valve is all the way open (Counter Clock-wise).

WARNING: IF CONCENTRATE VALVE IS CLOSED AT START-UP IT CAN CAUSE PERMANENT DAMAGE TO THE MEMBRANES.

2. Be certain all switches on control panel are off.

OPERATION

START-UP

- 1. Plug in unit to 120V 15-amp wall outlet
- 2. Turn on water supply
- 3. Turn on Main Power Switch
- 4. Flush membranes before operation:
 - a. Direct permeate to drain line, or discard the water that accumulates in holding tank while starting up. Shut off valve to tank and open sample valve. Connect a tube to drain, container or ground from sampling valve.
 - b. Turn system on for 15 minutes by turning RO pump switch to Run. (It is common for the check filter light to come on while starting up and purging air, restart system by turning RO pump switch OFF then back to RUN).
 - c. After 15 minutes of flushing, turn RO pump switch to OFF.
 - d. Direct permeate to tank by opening tank valve and shutting off sample valve.

OPERATION

- 1. Indicator Lights:
 - a. RO Pump On- RO pump is running.
 - b. Tank Full- Float in holding tank is up indicating tank is full.
 - c. Check Filters- Inlet pressure was low and system shut down. Check, clean, or replace the inlet strainer, inlet filters, and water supply line. Turn 3-way switch off then back to RUN or CLEANING to reset.
 - d. Cleaning Cycle- Cleaning Cycle is currently running. The cycle takes 1 hour.
- 2. Selector Switch:
 - a. RUN- System will turn on automatically when tank float is down. Inlet solenoid will open and Pump will turn on. System will shut down when tank float is up.
 - b. OFF- System remain off.
 - c. CLEANING- System will turn on automatically and start the programmed cleaning cycle. This will take about 1 hour.
- 3. Turn RO pump switch to RUN. (RO system will automatically turn on when high level holding tank float is down).
- 4. Adjust operating pressure to 200 PSI for permanent operation by slowly closing concentrate valve
- 5. Monitor system the first couple hours of operation and re-adjust concentrate valve as needed to keep operating pressure near 200PSI. DO NOT INCREASE OPERATING PRESSURE OVER 225PSI.
- 6. The recycle valve can be opened slightly while concentrate valve is closed more to increase system recovery. It is not recommended to decrease concentrate flow rate below the permeate flow rate. DO NOT INCREASE OPERATING PRESSURE OVER 225PSI.
- 7. Monitor system on daily basis. Perform maintenance as explained in the next section.

MAINTENANCE AND MONITORING: fill out performance chart on a weekly basis. Preform maintenance as required below.

- 1. Inlet garden hose strainer: Check, clean or replace when Check Filter light is activated.
- 2. Inlet Filter: Check, clean or replace in Check Filter Light is activated. (Check filter light will also come on if water supply has been compromised so check all lines and valves coming from water supply.)
- 3. Membranes: Cleaning required when:
 - a. Permeate flow drops below rated flow rate.

OPERATION

- b. TDS readings are high compared to start-up performance.
- 4. Membrane Cleaning cycle: (Permeate water from holding tank can still be used while cleaning, but no additional water will be processed until cleaning is complete). Each Cleaning cycle will take approximately 1 hour.
 - a. Turn RO system switch to OFF.
 - b. Remove inlet filter from small inlet filter housing.
 - c. Install Alkaline Cleaning Cartridge (58-0025), in small inlet filter housing and tighten housing.
 - d. Direct Permeate to drain line.
 - e. Completely open concentrate valve.
 - f. Turn RO switch to CLEANING.
 - i. RO Cleaning light will turn on.
 - ii. RO pump will start up and run for 45 seconds to saturate the membranes with cleaning solution and pump will shut off.
 - iii. Membranes will soak with pump off for 1 hour.
 - iv. After 1 hour pump will turn back on and run for 5 minutes to flush solution from membranes.
 - v. Cycle is complete when cleaning light turns off.
 - g. Remove Alkaline cleaning cartridge and replace with Acidic cleaning cartridge 58-0024. Run cleaning cycle again by turning RO Switch to Cleaning.
 - h. After cycle is complete cleaning light turns off. Cleaning is complete.
 - i. Turn RO switch to OFF.
 - j. Replace empty acidic cleaning cartridge with 5 micron filter.
 - k. Direct permeate back to tank.
 - I. Turn RO system back to ON and reset RO inlet pressure to 200PSI by adjusting concentrate valve.

SHUT-DOWN

- 1. Normal Shut-Down (less than 3 weeks): Turn 3-way RO system switch to OFF, and main power switch off.
- 2. Long duration shut-down and storage (Over 3 weeks). Turn RO Pump switch to OFF.
 - a. Direct Permeate to drain line. Open drain valve, Close tank valve.
 - b. Remove filter from small inlet filter housing.
 - c. Install Storage Cartridge (58-0023), in small inlet filter housing and tighten housing.
 - d. Open concentrate valve all the way.
 - e. Turn RO pump switch to CLEANING
 - f. Pump will turn on for 45 seconds to pump storage solution into membrane housings.
 - g. After pump shuts off Turn RO Pump switch to off.
- 3. Winterizing: Follow guidelines for Long duration shut-down and storage. In addition:
 - a. Drain all water from inlet lines, filters and pump.
 - b. Drain all water from holding tank.
 - c. Drain membrane permeate line by loosening the plugs on the bottom of membrane housings.

TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	REMEDY
No power at Control Panel	Power failure to Control Panel	Plug in unit to 120V outlet, Check circuit breaker to outlet
Check Filter Light	Water Supply Shut-off to unit	Turn on water supply
On	Inlet garden hose screen clogged	Clean or replace
	Inlet filters clogged	Clean or replace
	Inlet solenoid not working	Replace solenoid
Low Permeate Flow	Low Operating Pressure	Set Pressure to 200PSI by closing concentrate valve
	Clogged/Dirty membranes	Clean or replace membranes
High Permeate TDS	Damaged membranes	Replace membranes
RO Pump not	Tank is full	Lower water level in tank
turning on	Damaged or disconnected tank float	Replace float
	RO Pump switch on Off or Cleaning	Turn to Run
	Overload or Fuses tripped	Reset Overload, Replace Fuses, Replace motor
RO pump on but low pressure	Concentrate valve open	Set Pressure to 200PSI by mostly closing concentrate valve
	Pump failure or clogged	Clean or replace pump

REPLACEMENT PARTS

DESCRIPTION	REORDER#
RO STORAGE CARTRIDGE	58-0023
RO CLEANING CARTRIDGE ACID	58-0024
RO CLEANING CARTRIDGE ALKALINE	58-0025
TDS HANDHELD METER	33-0653
FILTER 20" PLEATED POLY- 20 MICRON	19-0216
FILTER - 20" 10 MICRON	19-0302
FILTER - 20" CARBON 5 MICRON	19-0303
FILTER - 20" ANTI-SCALE	19-0304
FILTER - 10" 5 MICRON	19-0305
RO MEMBRANE	19-0306
FILTER- 10" PLEATED 1 MICRON	19-0311
FILTER- 20" PLEATED 1 MICRON	19-0312
FILTER- 20" PLEATED 5 MICRON	19-0313
20" BIG BLUE HOUSING	19-0633
10" BLUE HOUSING	19-0634
MEMBRANE O-RING LUBRICANT (5oz tube)	58-0026
TEST STRIPS	33-0314

MONITORING CHART

NOTE: To record pressures and flows, RO system must be on. If tank is full, turn RO pump dial to cleaning mode and system will run for 45 seconds. Remember to return dial to Auto operation when recording is complete.

Date	Hours	Pressure RO Pump	Concentrate Flow (GPM) (measure time to fill container and calculate)	Permeate Flow (GPM) (measure time to fill container and calculate)	Temp. (deg C)	TDS inlet or concentrate (ppm)	TDS permeate (ppm)
					1		
					1		
					ĺ		
					1		
					1		
					1		
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STATEMENT OF WARRANTY

Mi-T-M warrants all parts (except those referred to below) of your new Reverse Osmosis System to be free from defects in materials and workmanship during the following periods:

For One (1) Year from the date of original purchase.

Defective parts not subject to normal wear and tear will be repaired or replaced at Mi-T-M's option during the warranty period. In any event, reimbursement is limited to the purchase price paid.

EXCLUSIONS

- 1. The motor is covered under separate warranty by its respective manufacturer and is subject to the terms set forth therein.
- 2. Normal wear parts:

Seals	Filters	Gaskets
O-rings	Packings	Pistons
Valve Assembly	Brushes	Microbes
Sensors		

3. Parts damaged due to:

-normal wear, misapplication, modifications/alterations, abuse,
-operation at other than recommended speeds, pressures or temperature,
-the use of caustic liquids,
-chloride corrosion or chemical deterioration,
-fluctuations in electrical or water supply,
-operating unit in an abrasive, corrosive or freezing environment.

- Parts damaged by failure to follow recommended:
 -installation, operating and maintenance procedures.
- 5. This warranty does not cover the cost of:
 - -normal maintenance or adjustments,
 - -labor charges,
 - -transportation charges to Service Center,
 - -freight damage.
- 6. The use of other than genuine Mi-T-M parts will void warranty. Parts returned, prepaid to Mi-T-M's factory or to an Authorized Service Center will be inspected and replaced free of charge if found to be defective and subject to warranty. There are no warranties which extend beyond the description of the face hereof. Under no circumstances shall Mi-T-M bear any responsibility for loss of use of the unit, loss of time or rental, inconvenience, commercial loss or consequential damages.