

# USER MANUAL

## COMMERCIAL RO SYSTEM



**CHIRAG TECHNOPRODUCTS AND CONSULTANTS**

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## INDEX

1. Welcome
2. Introduction
3. Component Checklist
4. Warning & Precautions.
5. Safety Instructions
6. Installation Pre requirements.
7. RO Plant Components.
8. RO Plant startup Procedure.
9. RO Control Panel.
10. PSF & ACF Backwash Procedure.
11. Preventive Maintenance Schedule.

## WELCOME

Dear Customer,

Thank you for choosing CTPAC product. We welcome you to growing family of CTPAC customers.

CTPAC products are designed with latest cutting edge technology & norms available to make it more efficient in performance, Energy reliable and Eco friendly in nature.

In the upcoming pages of User Manual – easy to understand instructions are given to Install /use the CTPAC product.

If you have any queries OR suggestions please feel free to contact us.

We once again thank you for your decision to purchase our product. Looking forward long and fruitful business association with you.

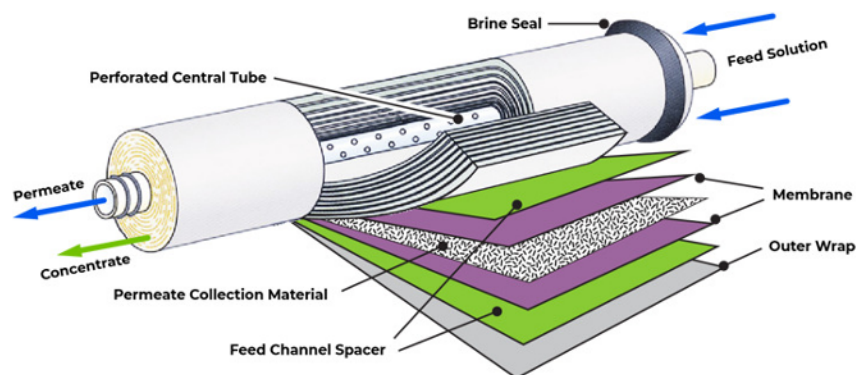
## INTRODUCTION

Reverse Osmosis (R/O) Systems are designed to provide the commercial and industrial user with the most trouble free, cost effective and reliable form of water treatment available, by providing every option necessary for a successful installation. RO systems utilize FRP pressure vessels, stainless steel frames and skids, solid state controls, integral conductivity monitors, flow controls, pressure gauges, throttling valves, high pressure relief valves, dual stage pre-filters, low suction pressure cut-off controls and recirculation loops on most models for high recovery rates and optimum performance.

Reverse Osmosis Systems are engineered to function with both well and municipal water sources (with chlorine removal provided). We utilize the most current membrane technology available.

### Principles of Reverse Osmosis

R/O systems employ thin film composite spiral wound membrane elements for superior performance. To simply describe the process, pump pressure is used to supply source water to reverse osmosis membranes. These special membranes allow only high quality water to permeate them. In turn, they reject metals, salts, ionic and organic impurities which are processed to waste. Suspended solids are removed by pre-filters which are standard components on all RO systems.



TYPICAL RO MEMBRANE

## CHECKLIST

Once received the consignment please check and confirm the material as per below checklist.

Sr. No.	Component	Quantity	Remarks
1.	RO Plant Skid		Quantity as per plant capacity.
2.	Sand Media		
3.	Carbon Media		
4.	Antiscalant Chemical Can		
5.	UV Set		
6.	Loose Piping set		
7.	Float switch		
8.	RO membranes		
9.	Micron Cartridge filters		
10.	Jumbo filter Spanner		

## WARNING/PRECAUTION

Please read and follow the following precautions.

- Do not drop or drag FRP vessel, Plant skid on the floor.
- Avoid use of Wrenches and spanners to tighten the Plastic parts like inlet outlet unions. All plastic parts should be hand tightened.
- Use Teflon tapes on threads during the connection. Avoid using plumbing glue and Jute threads.
- Use of plastic pipes for inlet, Outlet & drain connections are recommended.
- If you are using metal (MS, SS, GI) pipes for connections. Make sure for proper and rigid support.
- Bypass arrangements should be provided at RO inlet to control & regulate the flow and pressure going to the RO Plant.
- Bypass arrangements should also be provided to bypass the RO Plant during breakdown/maintenance work.

## SAFETY INSTRUCTIONS

- 1) Read this manual before installing system.
- 2) Electrical connection must be made by a licensed electrician or qualified person.
- 3) This R.O. system must be grounded.
- 4) All water connections must be made by a licensed /qualified plumber.
- 5) Make sure that all electrical connections will not become exposed to water in case of leaks or possible rupture in water lines due to pressure spikes, possible component failure, etc.
- 6) The water & Electric supply must be turned off before servicing.

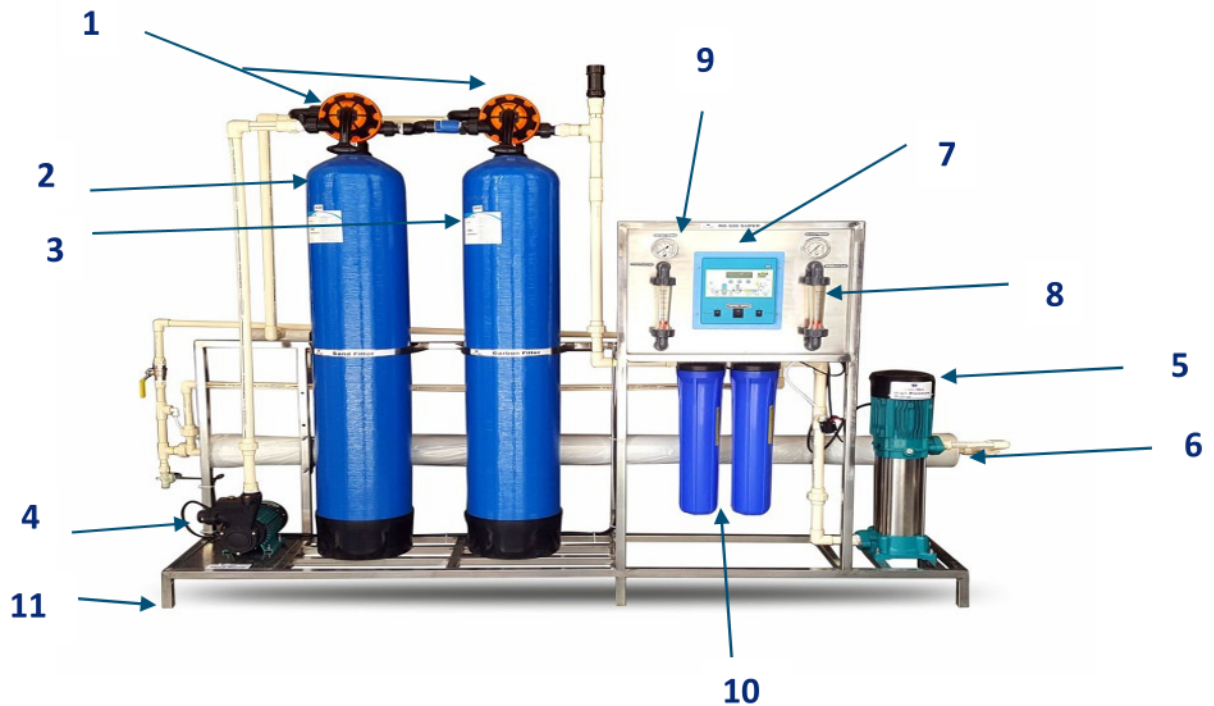
## INSTALLATION PRE-REQUIREMENTS

- RO Plant should be installed at a location in the Treatment system to get sufficient inlet Pressure from Feed pump or Overhead Tank.
- Firm level floor [RCC] capable of supporting the weight of RO Skid is required.
- Adequate space in and around the Softener is required for ease in operation and maintenance work.
- A shed is advisable that protects the RO Plant from constant exposure to sunlight.
- Drain arrangement should be there to carry away rinse/reject water.
- Feed Water should have following requirements-
  - Turbidity - less than 1 NTU.
  - Inlet water Pressure Min. - 1 kg/cm<sup>2</sup> & Max. 3.5 kg/cm<sup>2</sup>
- Piping system with adequate fittings and valves is required to connect inlet, Permeate, Reject & drain. All required pipes and fittings are in Clients scope.
- Electric supply – 230V, 50 Hz, single phase.



## RO PLANT COMPONENTS

Skid mounted RO plant is composed of different Electro Mechanical components.



1. MPV –Multiport Valve.
2. PSF – Pressure Sand Filter.
3. ACF – Activated Carbon Filter.
4. FP –Feed Pump.
5. HPP – high Pressure Pump.
6. RO Membrane with Housing.
7. RO Control Panel.
8. Flow Meter.
9. Pressure Gauge.
10. Micron Filters.
11. Mounting Skid.

Other Components – Dosing Pump, UV disinfection System, High Pressure Switch, Low Pressure Switch, TDS/Conductivity Sensor, and Reject control Valve.

## RO PLANT START UP PROCEDURE

### Pre start-up -

Once systems are installed check the following:

- Make sure there are no obstructions in the concentrate or permeate lines.
- Make sure Feed Water Tank is at sufficient level.
- Treated Water tank is empty OR no Residual Water.
- Be sure the level control assembly (Float switch) is properly connected.
- Check the pump rotation to coincide with the arrow on pump in manual mode.
- Verify all pre-treatment equipment is installed and operational.
- Tighten all plumbing fittings (important) their Components.
- In Manual Mode Rinse the PSF & ACF to remove dirt.

### System start-up procedures-

- This RO plant is designed to work in fully automatic mode as per system control parameters set and in Manual Mode also.
- The parameters in control panel are preset to defaults. Unless required there is no need to change the settings.
- Make sure that PSF and ACF's MPV are in service mode.
- On control panel –select Auto Mode and press START button to start the RO Plant.
- To STOP the plant Press STOP button on control Panel.
- Various parameters will be displayed on LCD screen.
- Adjust the Reject control valve to set the permeate and reject flow at desired level.

\*\* - Please go through control Panel section to get complete operating information.



## RO CONTROL PANEL



- Make – Proton.
- Model – 11M.
- Supply voltage: 230VAC  $\pm$ 10%, 50Hz.
- Working – Auto /Manual Mode.
- Warm up time : 10 Sec
- Front Panel Controls : 4 Programming Keys, 4 Control Switches (Power On/Off, Auto/Manual, RWP On/Off, HPP On/Off)
- Indications: 2X16 LCD Display, LED Indications for: LPS,HPS, RW Tank Empty, TW Tank Full, Flush Solenoid On, RWP On, HPP On.

### Instruction for Settings the panel

1. SET: Used to change the controller from RUN mode to FUNCTION mode for parameter setting.
2. INC: Up scroll the parameters & parameter value. (Also to restart the system)
3. DEC: Down scroll the parameters & parameter value. (also to ack. cond. High Alert)
4. ENT: This key is used to Select/Save & to move to next parameter.

### Note:

- To Load default parameter Press INC key on power ON.
- To view RUN-HOUR, press SET & INC both keys at a time.
- To view Total cumulative flow (optional) press SET & DEC both keys at a time.

### Operation of the panel

To enter settings mode press SET key, it shows three menus as follows:

- RO parameter. [Password 10]
- Pump electrical parameter. [Password 9995]
- Exit.

To edit parameter select particular menu & enter correct password with the help of INC/DEC keys then press ENT key, to change value and view next parameter press INC/DEC keys. If no key is pressed for five second then controller automatically goes to initial display.

### Procedure to change parameter settings

1. Press SET key.
2. Select particular parameter.
3. Enter Correct Password.
4. Press ENT to get password accepted.
5. Using INC & DEC key user can change setting parameters.
6. Press INC Key to increment parameter value up to maximum limit.
7. Press DEC key to decrement parameter value down to minimum limit.
8. To save the settings (value) press ENT key, then press SET key, scroll to EXIT, press ENT again.
  - Any electrical faults at RWP and / or HPP such as Overload, Dry Run, Over Voltage, Under Voltage the RO stops after the set trip values and delays, with relevant fault display on the LCD.
  - Conductivity value, Voltage, Pump Current and various states are displayed on the LCD screen.

### Field Terminal Details -

Terminal	Description	Connection
HPP	High Pressure Pump	R,Y,B /P-Phase, N- Neutral
RWP	Raw Water Pump	R,Y,B /P-Phase, N- Neutral
Dosing O/P	Dosing Pump Power	L-Line (Phase), N- Neutral
Flushing O/P	Flushing Solenoid Valve Power	L-Line (Phase), N- Neutral
MPV O/P	Auto Multiport Valve Power	L-Line (Phase), N- Neutral
Pump Time (I/P)	HPP On Feed Back For MPV (POT free CNT)	NO, C
AUX1 I/P	MPV BW Status -1 (POT free CNT)	NO, C
AUX2 I/P	MPV Pump On Status-2 (POT free CNT)	NO, C
RWE I/P	Raw Water Tank Empty (POT free CNT)	NO, C (Close to Activate)
TWL I/P	Treated Water Tank Full (POT free CNT)	NO, C (Close to Activate)
HP I/P	High Pressure Switch (POT free CNT)	NO, C (Close to Activate)
LP (I/P)	Low Pressure Switch Input (POT free CNT)	NO, C (Close to Activate)
Conductivity	Conductivity Sensor Input	T1, T2

### Pump Electrical Parameter Settings : (Password 9995)

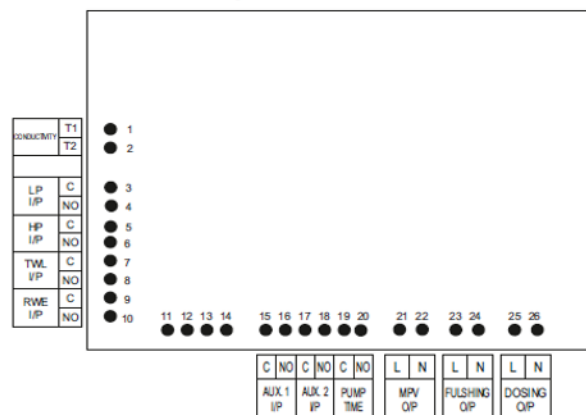
Parameter	Default	Min	Max	Unit
HPP Over Load	15.0	2.0	40.0	Amp
RWP over load	10.0	2.0	40.0	Amp
OL Trip Delay	5	1	30	Sec
HPP Underload	0.0	0.0	40.0	Amp
RWP Underload	0.0	0.0	40.0	Amp
UL trip delay	1	30	5	Sec
OV Set Pt	280	100	500	V
UV Set Pt	160	0	400	V
HPP unbalance current	40	20	100	Percnt
RPW unbalance current	40	20	100	Percnt
UB Trip Delay	1	30	5	Sec

### ARO Parameter Settings : ( Password 10)

Parameter	Default	Min	Max	Unit
Slow flush time	5	0	999	sec
Fast Flush time	10	0	999	sec
Auto Flush enable	Yes	Yes	No	-
Flush Interval	120	5	360	min
Cond./TDS Const	1	0.1	2.0	-
Conductivity high	200	10	2000	µS
Conductivity Very high	300	10	2000	µS
LP trip delay	50	0	300	Sec
Pre-Treatment Mode	Manual	Manual	AMPV -I1 -C1	-
RW Float Bypass	No	No	Yes	-
TW Float Bypass	No	No	Yes	-
LP Switch Bypass	No	No	Yes	-
HP Switch Bypass	No	No	Yes	-
Cond./TDS Bypass	No	No	Yes	-
BW Alert Bypass	Yes	No	Yes	-
Select Cond./TDS	Cond.	Cond.	TDS	-
Set MAN BW Time	24	24	Hr.	-
Aux. Output	Alarm	-Pump Time	-Alarm	-

\*\*\* Note – We advise not to change default parameters set.

### Control Terminal Layout –



### **Working -**

There are two modes of operation,

1. Auto Mode
2. Manual Mode

All the protections like Current Overload, Over/Under Voltage, and Phase Current Imbalance are effective in Auto as well as manual mode. Auto/ Manual selection is done with the help of a front panel switch. In either mode, in case of a fault, the relevant pump motor is tripped.

It can be set for Manual pre-treatment operation or Automatic pre-treatment operation.

### **Starting Sequence**

After switching on the power it checks for the following inputs:

1. If level of the Permeate Tank is low, Level Of the Raw Water tank is high, it will start the Raw water pump & slow flushing plus fast flushing started after HPP is on.
2. After slow flush time lapses, the controller will check for low pressure input and if found ok and stable, it will start the High Pressure Pump, thus starting the RO operation.

### **Stopping Sequence**

At the following conditions Controller will stop the RO operation.

1. If the Stop key is pressed
2. If the Treated Water Tank is full (open)
3. If the Raw Water tank is empty (close)

When any of the above conditions take place controller stops the RO operation after fast and then slow flushing as programmed (except RWT empty condition.)

### **Trip sequence**

At the following conditions, the controller will trip the RO operation. Pressing the Start switch can resume the operation.

1. High Pressure switch active.
2. Conductivity Very High
3. Electrical faults like Overload, Under load (dry Run), Current Unbalance and Single Phase/Reverse Phase.

## Trouble Shooting -

Message On Display	Possible Cause and Action
LOW PRESSURE	<ul style="list-style-type: none"> <li>▪ Check Pressure Switch connection is made and check if it is C-NO contact. Ensure it is NO contact.</li> <li>▪ Check the Pressure switch setting. It should match the design pressure post cartridge filter.</li> <li>▪ Check pump pressure. If required clean filters.</li> </ul>
HIGH PRESSURE	<ul style="list-style-type: none"> <li>▪ Pressure Higher than Pressure Switch set value.</li> <li>▪ Check if the C-NO contact is made. RO membrane clogged.</li> </ul>
RAW WATER TANK EMPTY	<ul style="list-style-type: none"> <li>▪ Check if C- NO (at RW Tank not empty) contact from Floaty is connected.</li> <li>▪ Raw Water tank is actually empty.</li> </ul>
TREATED WATER TANK FULL	<ul style="list-style-type: none"> <li>▪ Check if C- NO (at TW Tank Full) contact from Floaty is connected.</li> <li>▪ Treated water tank is actually full.</li> </ul>
Cond/TDS HIGH	<ul style="list-style-type: none"> <li>▪ High Conductivity/TDS in the water line with cond. sensor. Or increase the set point.</li> </ul>
Cond/TDS VERY HIGH	<ul style="list-style-type: none"> <li>▪ Very High Conductivity/TDS in the water line and RO plant is tripped. Or increase the set point.</li> </ul>
UNDER VOLTAGE	<ul style="list-style-type: none"> <li>▪ Supply Voltage Lower than set value.</li> <li>▪ Wait for it to recover to Set uV + 10V or lower the uV set point. It is necessary to check the currents of the motors while they are running at lower voltage than the rated voltage. This can have bearing on the overload current settings. Lower the uV set value.</li> </ul>
OVER VOLTAGE	<ul style="list-style-type: none"> <li>▪ Supply Voltage is higher than the oV limit set.</li> <li>▪ Wait for it to recover to Set oV - 10V or increase the oV set point.</li> <li>▪ It is important to check the max voltage limit for motors' operation.</li> </ul>
RWP/HPP UB FAULT	<ul style="list-style-type: none"> <li>▪ Pump motor is drawing unbalanced current. The difference is more than % value been set.</li> <li>▪ Check the phase voltages. Check motor winding.</li> <li>▪ Increase the UB setting % value</li> </ul>
RWP/HPP UL FAULT	<ul style="list-style-type: none"> <li>▪ Pump running dry.</li> <li>▪ Check the UL current setting value. Increase the set value if necessary.</li> <li>▪ UL current set point is relevant to a particular voltage.</li> <li>▪ If the voltage drops considerably, dry run current for the motor may change.</li> </ul>
RWP/HPP OL FAULT	<ul style="list-style-type: none"> <li>▪ Pump drawing more current than the normal rated current.</li> <li>▪ This can happen due to lesser supply voltage than the rated motor voltage.</li> <li>▪ Increase the OL current setting value</li> </ul>



## PSF & ACF BACKWASH PROCESS

Backwash is used to remove the dirt trapped in the Filter after use.

Backwash is achieved by reversing the flow of water through the Filter by positioning the MPV lever at appropriate position.

Backwash frequency depends upon inlet water quality and dirt accumulated in the Filter. First backwash for PSF is carried out then same process is repeated for ACF.

Backwash is carried out by following steps-

1. Select the Manual Mode on RO Panel. Every time while operating lever of Multiport Valve, always make sure to switch off the feed Pump from RO panel
2. Now, Switch off the Feed Pump in service mode.
3. Position MPV of ACF in drain mode.
4. Position the MPV lever of PSF from Service to Backwash.
5. Switch on the Feed Pump for @ 2-3 minutes to remove dirt through drain pipe.
6. Switch off the Feed Pump.
7. Position the PSF -MPV lever from Backwash to Rinse mode.
8. Switch on the Feed Pump for @1 Minutes to remove dirt & grits.
9. Switch off the Feed Pump.
10. Position the PSF MPV lever from Rinse to Service Mode.
11. Now, Position the MPV lever of ACF from Drain/Service to Backwash.
12. Switch on the Feed Pump for @ 1-2 minutes to remove dirt through drain pipe.
13. Switch off the Feed Pump.
14. Position the ACF -MPV lever from Backwash to Rinse mode.
15. Switch on the Feed Pump for @1 Minutes to remove dirt & grits.
16. Switch off the Feed Pump.
17. Position the ACF MPV lever from Rinse to Service Mode.
18. Now both PSF & ACF filter is ready for next filtration cycle.



## PREVENTIVE MAINTAINCE SCHEDULE

<b>COMPONENT</b>	<b>DAILY</b>	<b>WEEKLY</b>	<b>MONTHLY</b>	<b>6 - MONTHLY</b>	<b>YEARLY</b>
PSF & ACF Backwash	✓				
Micron filter Cleaning		✓			
Micron filter Replacement			✓		
Water Leakage	✓				
Antiscalant Level Checking	✓				
Membrane Flushing				✓	
Membrane Cleaning					✓
UV System Checking			✓		
Float Switch		✓			
Dosing Pump Operation	✓				



# THANK YOU



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