SpectraPure®
INNOVATORS IN WATER TECHNOLOGY

SP-RO-90 RO™ BASIC

Reverse Osmosis Water Purification System

INSTALLATION AND OPERATING MANUAL

WARNING

Please read carefully before proceeding with installation. Failure to follow any attached instructions or operating parameters may lead to the product's failure and possible damage to property.

2019-10-03

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Thank You for your purchase of a *SpectraPure® System. With proper installation and maintenance, this system will provide you with high quality water for years to come. All SpectraPure® products are rigorously tested by us for safety and reliability. If you have any questions or concerns, please contact our customer service department at 1.800.685.2783.*

The SP-RO-90-BASIC is a low-waste RO system which has been specifically designed for easy-to-produce purified water. Purified water grows healthier freshwater fish than ordinary tap water. The SP-RO-90-BASIC™ System eliminates up to 99% of contaminants harmful to aquatic growth. Your fish will flourish with our "better than rain" quality water.

The SP-RO-90-BASIC™ System comes complete with:

- 90 gallon per day, high-rejection SpectraPure advanced thin-film membrane
- 3:1 waste ratio produces 33% less waste water
- 5 micron carbon block prefilter eliminates dirt, chlorine, herbicides and other organic pollutants.
- 5-foot feed tubing, 6-foot product and 5-foot waste tubing
- Garden hose adapter for tap water hookup
- One year warranty

SYSTEM SPECIFICATIONS:

Carbon Filter	5 micron carbon block prefilter (IL-CB-12)
RO Membrane Type	Thin-Film Composite (TFC)
Rejection Rate	98% typical
Input Water Pressure	60 psi (4.15 bar) line pressure*
Input Water Temp	77˚F (25˚C)
Recovery Rate	25% (i.e. 25% of the water will be collected as pure water)

Dimensions:

8" H x 15" W x 5" D

Nominal Membrane Flow Rates @ 60 psi, 77˚ F, & 250 ppm TDS :

GPD	Product Water Flow Rate	Concentrate Flow Rate
90	236 ml/min	710 ml/min

Reverse Osmosis Feed Water Requirements:

Operating Pressure*	40 – 80 psi (2.75 – 5.5 bar)
pH Range	3 – 10
Maximum Temperature	100˚ F (38˚ C)
Maximum Turbidity	1.0 NTU
Maximum Silt Density Index	5.0 (based on 15 min. test time)
Maximum Chlorine	less than 0.1 ppm
Maximum TDS	500 ppm
Maximum Iron	less than 0.1 ppm
Maximum Manganese	less than 0.1 ppm
Maximum Hydrogen Sulfide	0 ppm
Langelier Saturation Index	LSI must be negative

*Operating pressure less than 40 psi may require a booster pump:
Operating pressure greater than 80 psi may require a pressure regulator.

SpectraPure® Inc. Assumes no responsibility for water damage due to leaks. It is the user's responsibility to determine that the system is leak-free.

SYSTEM DESCRIPTION:

The SP-RO-90-BASIC™ System gives you a continuous supply of sparkling clear, delicious water for drinking, cooking, aquaculture, etc. Foods will look better and taste better too. The reliability with the Water Treatment System is greatly improved over other systems and costly maintenance can be avoided. The system eliminates the need to buy bottled water. Instead, it puts high quality water at your fingertips.

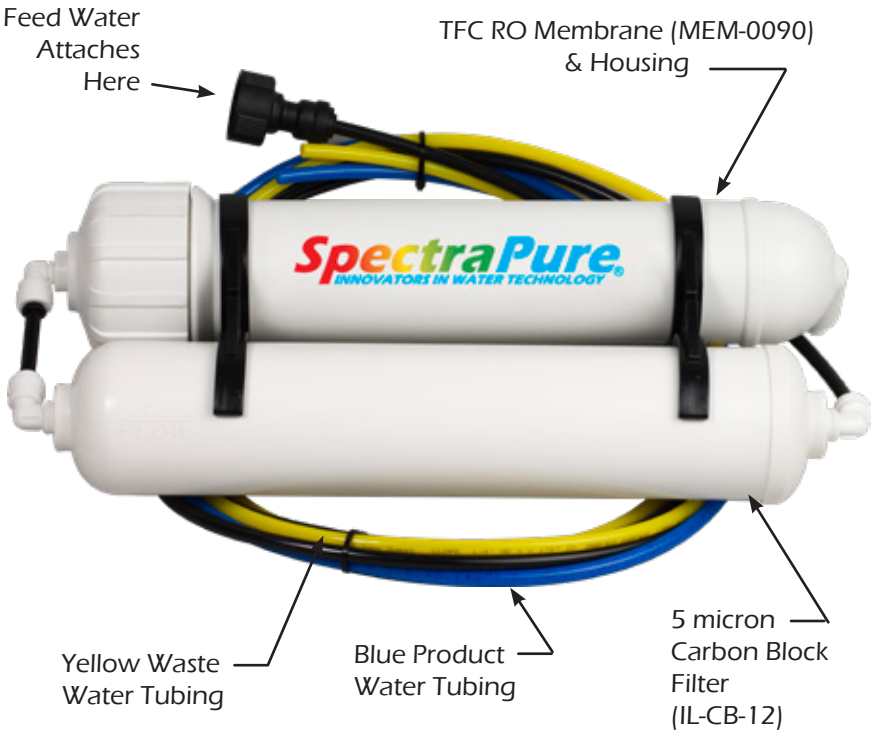
The incoming feed water from a cold water source is directed through BLACK tubing to the 5 micron carbon block prefilter. This filter is used to remove dirt, organics and chlorine from the feed water that can damage the membrane. The second stage of the system is the RO membrane.

Household water pressure is used to force tap water through the semipermeable RO membrane. The membrane only allows the purest of water molecules to pass through it while over 98% of most inorganic salts, all micro-organisms and almost all high molecular weight organics in the water are rejected and automatically rinsed from the membrane and sent down the drain.

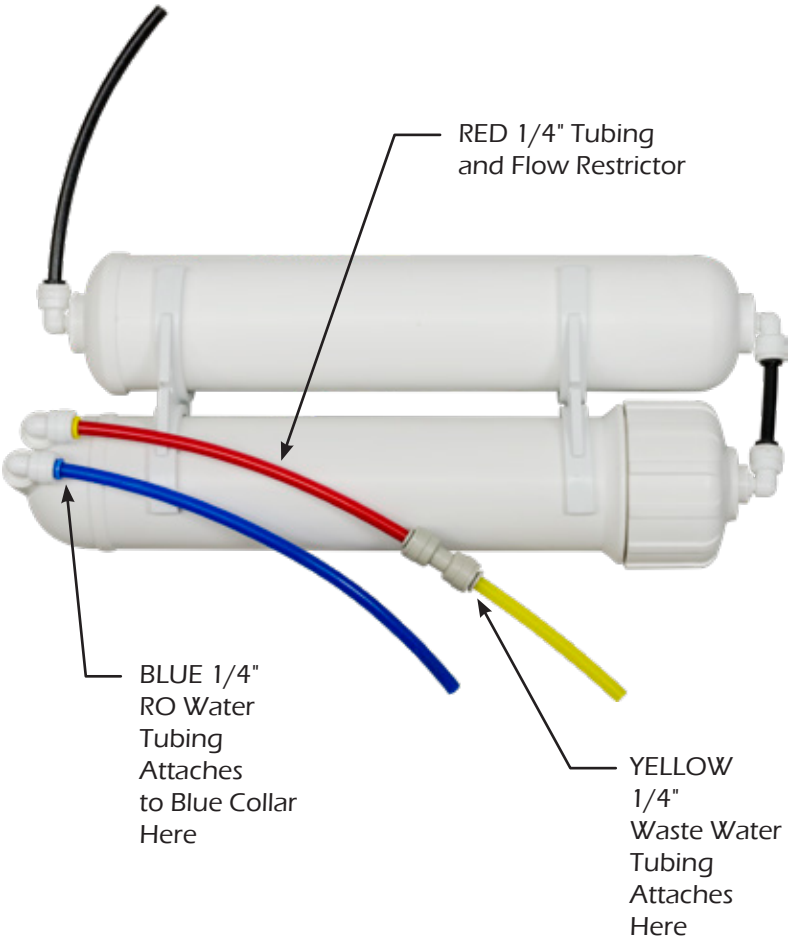
There is a thin capillary tube (called a Flow Restrictor) located inside the short red tubing that restricts and regulates the amount of water that goes to drain. This water is necessary to help keep the membrane flushed free of pollutants.

An optional manually-operated Flush Valve can be used to periodically rinse the accumulated impurities and concentrated waste water from the surface of the RO membrane to help increase the life of the membrane.

SINGLE MEMBRANE SYSTEM - 90 GPD - FRONT VIEW:



SINGLE MEMBRANE SYSTEM - 90 GPD - REAR VIEW:



WORKING WITH PUSH FITTINGS:

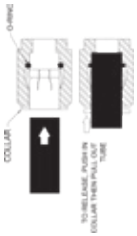
Push fittings are very reliable and convenient tubing connectors.

To remove the tubing from its push fitting:

1. Firmly depress and hold the push fitting collar down with your thumbnail.
2. While the push fitting collar is depressed, pull the tubing straight out of the push fitting. Once the tubing is removed, release the collar.

To reinsert the tubing into its push fitting:

1. Moisten the O-ring seal inside the push fitting by dripping a few drops of clean water into the fitting.
2. Grasp the tubing near the end, and insert the tubing into the push fitting.
3. Push the tubing into the fitting until resistance is felt, approximately 1/2 inch (12.7 mm). The tubing is now resting on the O-ring seal inside the fitting.
4. Firmly push the tubing approximately an additional 1/4 inch (6.35 mm) further into the fitting to completely seat the line into the fitting and past the O-ring seal.
5. Turn on the system water supply and check for leaks prior to further use or testing. If a leak is observed, you may not have pushed the tubing into the push fitting far enough to seal the tubing against the O-ring. Turn off the system water supply and reseat the tubing as described above.



SYSTEM INSTALLATION & INITIALIZATION:

1. Most of the components of this system are plastic and are subject to damage by ultraviolet light from the sun and other sources such as metal halide lighting.
2. Avoid installing this unit in an area where it may be subjected to bright light or direct sunlight, as algae is more likely to thrive inside the clear filter housings when exposed to bright light.
3. The unit must be kept out of areas that are subject to freezing temperatures.
4. High temperatures greater than 100˚ F (38˚ C) must be avoided. If the unit is used outside, avoid putting the system in direct sunlight or connecting it to a garden hose that may be exposed to sunlight.
5. Attach the garden hose adapter (connected to the black tubing) to your cold water source. Never run hot water (greater than 100˚ F/38˚ C) through the system.
6. Place the yellow concentrate (waste) tubing and the blue purified (product) water tubing temporarily into a drain. Do not restrict flow from these lines.
7. Open the cold water supply valve. The pressure should not exceed 80 psi.
8. Run the system for one hour to flush any membrane residue.
9. Check the system to ensure that all fittings are tight and leak-free before leaving the system unattended. (If anything is leaking, contact SpectraPure for assistance.)

   NOTE: If the unit is not used for several days, run the system for about 10 minutes before collecting any water. This will flush out any stale water in the system.

10. Finish the installation by directing the yellow line to a drain.
11. Direct the blue line to a collection reservoir.

CARBON BLOCK FILTER REPLACEMENT:

A Carbon Filter will usually last 4-6 months, depending on the chlorine (or chloramine) content of your tap water and quantity of water being produced. The best way to determine when your Carbon Block Prefilter needs replacement is to use a chlorine test kit.

Any chlorine level above 0.1 ppm will cause damage to the membrane and indicates that the carbon block filter must be changed. To test for chlorine breakthrough, collect a 10 ml sample of the concentrate from the yellow tubing and test the chlorine concentration using test kit TK-CL-10-KIT. If the chlorine concentration is above 0.1ppm, replace the carbon prefilter.

**NOTE: A drop in the system's production is, in most cases, an indication that the sediment filter has become saturated with contaminants, but a carbon filter can also decrease production if it's covered with extremely fine sediment. If the carbon becomes plugged with sediment, it will no longer be able to remove chlorine.

Carbon Block Filter Replacement

Materials Required: 5 micron Carbon Block Filter (IL-CB-12), Chlorine Test Kit (TK-CL-10-KIT)

Procedure:

1. Turn off water supply to the system.
2. Disconnect the two black tubes, remove the old filter and discard.
3. Install the new carbon block filter and reconnect the two black tubes.
4. Turn on system water supply and check for leaks.

RO MEMBRANE REPLACEMENT:

1. Turn off the water supply to the RO system. Place the system where the membrane housing(s) can be easily accessed.
2. Remove the black tubing from the membrane feed push fitting by depressing the collar on the fitting with your thumb and pulling the tubing from the push fitting. You should not have to remove the blue and yellow tubes.
3. Lift the membrane housing from the retention clips and unscrew the membrane housing cap. This may require two people.
4. Use a pair of pliers to grasp the membrane stem and pull the membrane from the housing.
5. Remove the black housing o-ring. Wash the empty housing with soapy water. Rinse thoroughly with hot, clean water.
6. Insert the new membrane into the housing, with the double o-ring end first. The o-rings and tube must fit into the recess at the bottom of the membrane housing. When the membrane is aligned with the recess, firmly push the membrane into the recess until it bottoms out.
7. Place the black housing o-ring on the housing rim and carefully screw the lid back on to the base. Hand-tighten.
8. Reconnect the black tubing to the membrane feed push fitting.
9. Check for leaks.

RO MEMBRANE DIAGNOSTICS:

In order to accurately determine the condition and performance of the RO Membrane, a conductivity tester capable of reading the tap water conductivity (or TDS) and the product water conductivity (or TDS) would typically be required.

You may also use an alkalinity test kit (on softened water sources) or a hardness test kit (on non-softened water sources).

Note: All water sources are different and are subject to changes in conductivity from season to season which could affect the TDS reading depending on the time of the year. For this reason, we recommend the use of a conductivity (TDS) tester in order to determine the most accurate measurement for determining the condition of the RO membrane.

TESTING THE QUALITY OF THE MEMBRANE:

The performance of a RO membrane is measured by its ability to reject salts or TDS (Total Dissolved Solids). This procedure will require a TDS Meter. SpectraPure offers several models:

MTR-TDS-EZ	HM Digital Hand-held TDS Meter
MTR-TDS-DM1	HM Digital In-Line Dual Probe TDS Meter

Procedure:

1. Measure tap water TDS. (Call it X)
2. Run the system for 15-20 minutes.
3. Rinse test instrument cell 2-3 times with RO water.
4. Measure RO water TDS directly from the blue product water line. (Call it Y).
5. Subtract RO water TDS from tap water TDS. (X - Y)
6. Divide this quantity by tap water TDS. (X - Y) ÷ X
7. Rejection = [(X - Y) ÷ X] ×100

TDS in the above procedure is measured in ppm or mg/l.
Important: Test the quality of the membrane once every 6 months.

Rejection of the RO Membrane Calculation Example

1. Tap water TDS = 150 ppm (X)
2. RO water TDS = 15 ppm (Y)
3. X - Y = 135 ppm
4. (X - Y) ÷ X = 135 ÷ 150 = 0.90
5. Rejection = [(X - Y) ÷ X] ×100 = 0.90 ×100 = 90%

Rejection rates less than 95% may indicate that the membrane should be replaced.

MEMBRANE PRODUCTION CALCULATION:

Membranes produce the rated gallons per day (GPD) at 60 psi (4.1 bars) operating pressure, 77°F (25°C) operating temperature and with no more than 500 ppm total dissolved solids.

Membrane output gallons per day (GPD) depends on operating pressure, water temperature and the TDS in the feed water.

Expected GPD = Rated GPD × PCF × TCF

PCF is the pressure correction factor
TCF is the temperature correction factor

Calculation of Pressure Correction Factor (PCF): The output (GPD) from the membrane is directly proportional to the applied pressure.

NOTE: The membrane is rated to produce the rated GPD at 60 psi. For any pressure other than 60 psi the output GPD is multiplied by the PCF.

PCF = Line Pressure (in psi) ÷ 60

Calculation of Temperature Correction Factor (TCF): The output (GPD) decreases with a decrease in temperature. This is due to water viscosity increasing with a decrease in water temperature.

Temperature Correction Factor Table (TCF)

°F /°C	TCF	°F /°C	TCF	°F /°C	TCF
41.0 /5	0.521	59.0 /15	0.730	77.0 /25	1.000
42.8 /6	0.540	60.8 /16	0.754	78.8 /26	1.031
44.6 /7	0.560	62.6 /17	0.779	80.6 /27	1.063
46.4 /8	0.578	64.4 /18	0.804	82.4 /28	1.094
48.2 /9	0.598	66.2 /19	0.830	84.2 /29	1.127
50.0 /10	0.620	68.0 /20	0.857	86.0 /30	1.161
51.8 /11	0.640	69.8 /21	0.884	87.8 /31	1.196
53.6 /12	0.661	71.6 /22	0.912	89.6 /32	1.232
55.4 /13	0.684	73.4 /23	0.941	91.4 /33	1.267
57.2/14	0.707	75.2 /24	0.970	93.2 /34	1.304

Membrane Output Calculation Example

What is the expected GPD from a 100 GPD System at 40 psi pressure and 60°F water temperature?

PCF = 40 ÷ 60 = 0.666
TCF = 0.754 (from Table above)

Expected GPD = 100 × 0.666 × 0.754 = 50.2 GPD ± 15%

50.2 GPD would be the Actual Production Rate

TIPS FOR LONG MEMBRANE LIFE:

1. Replacement of 5 micron carbon block filter at least once every 6 months or when chlorine breakthrough occurs, or when water production is severly reduced. This will ensure good membrane life and protect the membrane from chlorine damage.
2. Membrane should not be operated at lower than the specified 2:1 concentrate to purified water ratio.
3. Operating reverse osmosis systems on softened feed water greatly reduces the chances of membrane fouling.
4. Use an optional flush valve **after each use** of the system to extend membrane life.

STORAGE

1. It is recommended that you store your RO System in a cool place when not being used.
2. Your RO System must always be protected from freezing or temperatures above 113˚ F (45˚C).

Product Water - Low Production Rate

Cause	Corrective Action
Plugged prefilter	Replace prefilter
Low water temperature	Heat feed water or use higher GPD membrane
Low feed pressure	Use booster pump or use higher GPD membrane
Fouled membrane	Replace membrane

Membrane Troubleshooting Guide

The following chart illustrates the procedure for determination of RO membrane performance. However, the chart represents only rough guidelines for determining performance of RO membrane. Depending on your tap water chemistry, the rejection characteristics of the membrane may vary significantly.

Method of Testing	Calculate % Rejection	Test Results	Conclusion
TDS/ Conductivity Tester	Measure feed water and RO product water TDS/ Conductivity	Is Rejection greater than 95%?	No - Replace Membrane Yes - Membrane OK
Alkalinity Test Kit	Measure feed water and RO product water Alkalinity	Is Rejection greater than 90%?	No - Replace Membrane Yes - Membrane OK
Hardness Test Kit**	Measure feed water and RO product water Hardness	Is Rejection greater than 90%?	No - Replace Membrane Yes - Membrane OK

**Caution: This test is not to be used on softened water sources.

OPTIONAL ACCESSORIES:

UV PURIFIER KIT (UV-1GPM-KIT) - Are you on a private well or other potentially unreliable source of water? You may require a UV kit to destroy harmful bacteria, viruses and other contaminants. Ultraviolet kills up to 99% of all viruses and bacteria for the safest water. This kit contains everything you need to add UV to your Reverse Osmosis System.

BOOSTER PUMP KITS (HFBP-MO-115) - SpectraPure® Booster Pump Kits are ideal for use on water sources with pressures below 40 psi such as private wells, gravity feed water systems and high-rise apartments. A pressure gauge is necessary to monitor the booster pump pressure.

REPLACEMENT PARTS:

Part Number	Description
IL-CB-12	5 micron Carbon Block Prefilter
MEM-0090	90 gpd TFC Membrane
FR-90-RED	Flow Restrictor for 90gpd/340 lpd System

ACCESSORIES:

Part Number	Description
MTR-TDS-EZ	Hand-held TDS Meter
MTR-TDS-DM1	Inline Dual-Probe TDS Meter
MTR-PH80	Hand-held pH Meter
MTR-EC/TDS-C100	Hand-held EC/TDS Meter
FAU-SNP	Quick Connect Faucet Adapter
TK-CL-10-KIT	Total Chlorine Test Kit
TK-CL-10TABS	10 Replacement Tabs for Chlorine Test Kit
GHA-4	1/4" Garden Hose Adapter
PGK	Pressure Gauge Kit
BV-4JG	1/4" Ball Valve

ONE YEAR LIMITED WARRANTY:

SpectraPure, Inc.® warrants the product to the original owner only to be free of defects in material and workmanship for a period of one year from the date of receipt. SpectraPure's liability under this warranty shall be limited to repairing or replacing at SpectraPure's option, without charge, F.O.B. SpectraPure's factory, any product of SpectraPure's manufacture. SpectraPure will not be liable for any cost of removal, installation, transportation or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by SpectraPure are subject to the warranty provided by the manufacturer of said products and not by SpectraPure's warranty. SpectraPure will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair or, if the product was not installed in accordance with SpectraPure's or other manufacture's printed installation and operating conditions, or damage caused by hot water, freezing, flood, fire or acts of God.

SpectraPure will not be responsible for any consequential damages arising from installation or use of the product, including any water or mold damage due to flooding which may occur due to malfunction or faulty installation, including, but not limited to failure by installer to over- or under-tighten fittings, housings, and/or push-style fittings, or improper installation of push-style fittings. Consumable items such as prefilters and membranes are not covered under the one year warranty.

To obtain service under this warranty, the defective system or components must be returned to SpectraPure with proof of purchase, installation date, failure date and supporting installation data. Any defective product to be returned to the factory must be sent freight prepaid. Documentation supporting the warranty claim and a Return Merchandise Authorization (RMA) number must be included. SpectraPure will not be liable for shipping damages due to the improper packaging of the returned equipment and all returned goods must also have adequate insurance coverage and a tracking number.

SpectraPure will not pay for loss or damage caused directly or indirectly by the presence, growth, proliferation, spread or any activity of "fungus", wet or dry rot or bacteria. Such loss or damage is excluded regardless of any other cause or event that contributes concurrently or in any sequence to the loss. We will not pay for loss or damage caused by or resulting from continuous or repeated seepage or leakage of water, or the presence or condensation of humidity, moisture or vapor, that occurs over a period of 14 days or more. "Fungus" and "fungi" mean any type or form of fungus or Mycota or any byproduct or type of infestation produced by such fungus or Mycota, including but not limited to, mold, mildew, mycotoxins, spores, scents or any biogenic aerosols.

SpectraPure will not be liable for any incidental or consequential damages, losses or expenses arising from installation, use, or any other causes. There are no expressed or implied warranties, including merchantability or fitness for a particular purpose, which extend beyond those warranties described or referred to above.

* **The one year limited warranty does not apply to consumable items, including but not limited to, filters and cartridges unless specifically stated above.**

TERMS AND CONDITIONS:

1. Shipping charges on units or parts submitted to our facility for repair or replacement must be borne by the registered purchaser. After repair or replacement, the factory will return the unit or part freight prepaid to the customer.
2. We assume no warranty liability in connection with our equipment other than as herein specified.
3. This warranty is in lieu of all other warranties expressed or implied, including warranties of fitness for a particular purpose.
4. We do not authorize any person or representative to assume for us any other obligation on the sale of our equipment. This is the exclusive remedy and liability for consequential damages under any and all warranties which are excluded to the extent exclusion is permitted by law.
5. Proof of original purchase date must accompany all warranty claims.
6. SpectraPure, Inc. Reserves the right to change prices without notice when necessary. All prices in the catalog are quoted in US dollars.
7. Claims for error in quantity or condition must be made within 10 days of receipt of material. SpectraPure, Inc. will not be responsible for any claimed shortages not reported within 10 days. Returns other than warranty claims may be subject to 20% restocking fee.
8. SpectraPure, Inc. cannot be held liable for damage or loss to a shipment by a freight carrier. Check shipment for damage before acceptance or note on freight bill subject to inspection for concealed damage. Consignee must file claim. SpectraPure, Inc. will offer as much assistance as possible.
9. A complete credit check is required prior to shipping on a Net 30 basis. In the interim period during which credit references are being evaluated, all orders must be prepaid until approved.
10. All returned checks (due to insufficient funds or closed accounts) will be subjected to a **$35 penalty charge.**
11. Invoices on Net 30 accounts not paid within 30 days of shipment will be considered delinquent and will accrue Finance charges at the rate of 1.5% per month (18% per annum).