



Operations Manual for

WM-WM1

By *RGF* Environmental Group, Inc





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Overview

Introduction

About *RGF*

Congratulations on the purchase of your new *RGF* Waste Water Treatment System. For over 25 years *RGF* Environmental Group, Inc. has been the industry leader in industrial wash water treatment systems with thousands of installations worldwide.

RGF Environmental Group, Inc. is committed to helping industry comply with strict EPA regulations. Founded in 1985, *RGF* pioneered the development of heavy equipment zero discharge wash water recycling systems. Since then, *RGF* has continuously expanded to encompass the entire scopes of water treatment concerns of industry. Today *RGF* offers a variety of products and services that is among the widest available in the pollution control equipment industry.

How to Use This Manual

As with any piece of new equipment, the first thing you should do is obtain a complete understanding of the operation and maintenance of the system before you begin. The best way to do this is to read the manual and associated documentation sent with the unit well before it is scheduled to be installed. *RGF* has invested a great deal of effort to make our manuals as informative and user friendly as possible to make the task of learning about your new system as enjoyable as possible.

How This Manual Is Organized

This manual is divided into the following major sections.

Shipment Inspection/ Receipt Checklist:

This section should be read immediately upon receipt of your system.

Safety:

A description of the labeling conventions employed in the manual to point out specific items relating to issues of personnel safety and proper operation of the system. General safety concerns and overall operational guidelines for the system.

Chapter 1: The WM-WM1 System

Unit familiarization, basic system information and system flow diagrams. Covers the overall concepts of the Vision 2000 UltraSorb® System.

Chapter 2: Installation

Provides important information to ensure proper equipment placement and connection.

Chapter 3: System Startup and Operation

Contains the steps required to properly start up your new system. The Operating Instructions outline the normal course of action for the routine operation of the system.

Chapter 4: Preventative Maintenance Schedule

Recommended periodicities for maintenance routines are located in this section. Personnel who will be maintaining the unit should familiarize themselves fully with this section.

Chapter 5: General Theory

A description of how the *RGFWM-WM1*® system actually separates, clarifies and treats the waste stream. In depth explanations of the processes and supporting information to help operators understand the physics and chemistry of the system.

Chapter 6: Controlling Water Quality

Without proper water chemistry control, even the most sophisticated systems will fail to perform to expectations. This section covers important topics, which must be continually considered for proper system operation.

Chapter 7: Engineering Drawings

Reference drawings and schematics of the system.

Chapter 8: Troubleshooting

This section provides possible remedies for unusual operating conditions that occur from time to time.

Chapter 9: Replacement Parts List

A convenient source for locating part numbers and nomenclature of commonly replaced items on the system.

Chapter 10: Sub-Component Manuals

Additional literature provided on individual components of the system. This section is useful for more detailed knowledge of technical specifications regarding a specific sub-component.

Sources of Help

If you are unable to answer questions you have about your system from the information in this manual, *RGF* provides the following additional sources of help.

- 1) Your local **RGF Licensed Distributor**. He has a service support staff that is trained on all systems.
- 2) **RGF Web Site Help Page** provides answers to commonly asked questions and late breaking information concerning system operation and maintenance.

<http://www.rgf.com>

- 3) If you still have questions or have comments, the **RGF Service Department** can be contacted by **e-mail** at:

e-mail: requests@rgf.com

E-mail queries receive first priority through the Service Department. Please include as much information as possible so our service staff can quickly return an answer.

Shipment Inspection

Shipment Inspection

Immediately upon receipt of the **WM-WM1® System**, you are responsible as the purchaser to take the shipping containers off the truck and inspect the equipment, storage tanks and parts for damage.

IF ANY VISIBLE DAMAGE TO THE EQUIPMENT IS EVIDENT:

- Notify the driver for the courier company **immediately** and write on the Bill of Lading what is damaged or missing.
- Call **RGF** immediately at **(561)-848-1826** or **FAX (561)-848-9454** a copy of the Bill of Lading with damage or missing items to **RGF**.

Pre-Installation Checklist

Remove the **RGF PACKING SLIP** and the **BILL OF LADING**. Verify the condition and presence of all the parts and components found on the pallets and skids. Remove the **LOOSE PARTS CHECKLIST** from inside of the **LOOSE PARTS BOX** and verify the condition and presence of all the parts and components within the box. If any of the items are missing, please contact your distributor immediately or **RGF** at **(561)-848-1826** or **FAX (561)-848-9454**.

Safety

Labeling Conventions in This Manual

Certain information contained in this manual is **VERY IMPORTANT**. In addition, there are varying degrees of importance of this special information. Since most of the special information regards safety related issues, this section explains the conventions used throughout this manual. The following information explains the various conventions used to highlight important information



This statement directly regards an immediate **RISK TO LIFE**.



This designation, along with its associated graphical representation, denotes information that must be completely understood and heeded in order to prevent Serious Personal Harm or Significant Environmental Consequences.



This designation brings special attention to information that sensitizes the reader to the importance of following the instruction carefully. Typically used for information that reduces the risk of equipment damage or increases personal safety of the operator.

Note:

This designation clarifies or brings attention to particularly useful information that increases unit performance or reduces operating costs.



General Safety Issues

- All operating procedures, cautions, and warnings **MUST** be adhered to when operating the **WM-WM1**[®] system and when using the recycled water processed through the system.
- All OSHA guidelines should be followed and material safety data sheets (MSDS) for all chemicals being used to treat the recycled water should be posted by the owner or operator of the system in a conspicuous place for all persons coming into contact with the system.
- Appropriate personal protective equipment **MUST** be used by all persons utilizing chemicals when maintaining and operating the system to avoid personal injury.
- Ensure all areas surrounding the system are adequately ventilated.
- Avoid adding excessive chemicals to the recycling system. (Refer to section 6.0, controlling water quality)

Note:

Additional safety precautions are listed throughout the manual.

Chapter 1: The WM-WM1 System

The Vision 2000 Concept

The Vision 2000 line was designed with modularity in mind, to suit each individual waste stream properly. **RGF** has available several standard models that may be integrated together as shown in Figure 1.1. However, depending on how your particular waste stream needs to be treated, depends on if your distributor or system integrator has added additional components to the standard system. If additional components have been added, it is important to become familiar with the components' names and functions and where they will fit into the waste streams flow through the system.

➤ Basic System Layout

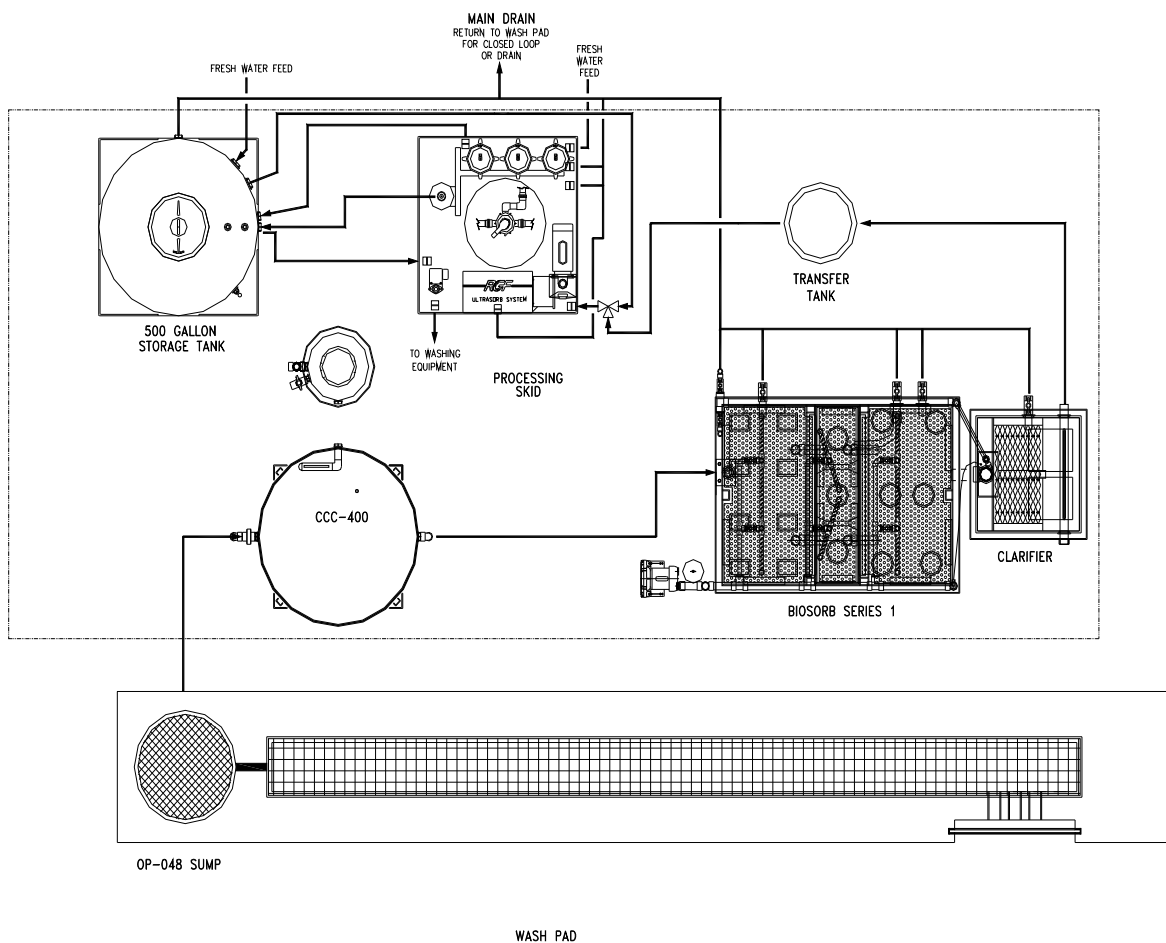


Figure 1.1

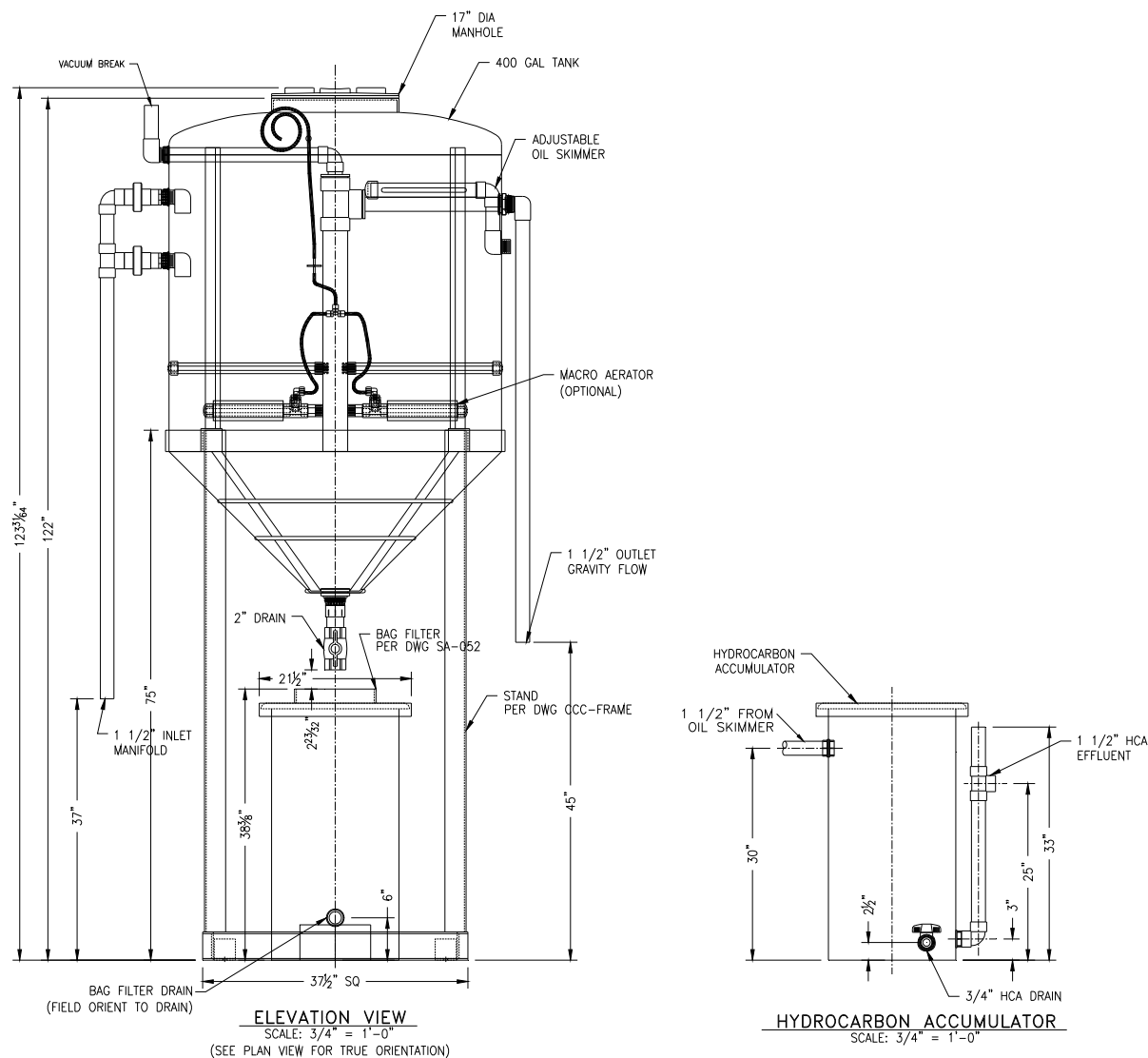


The WasteManagement® System

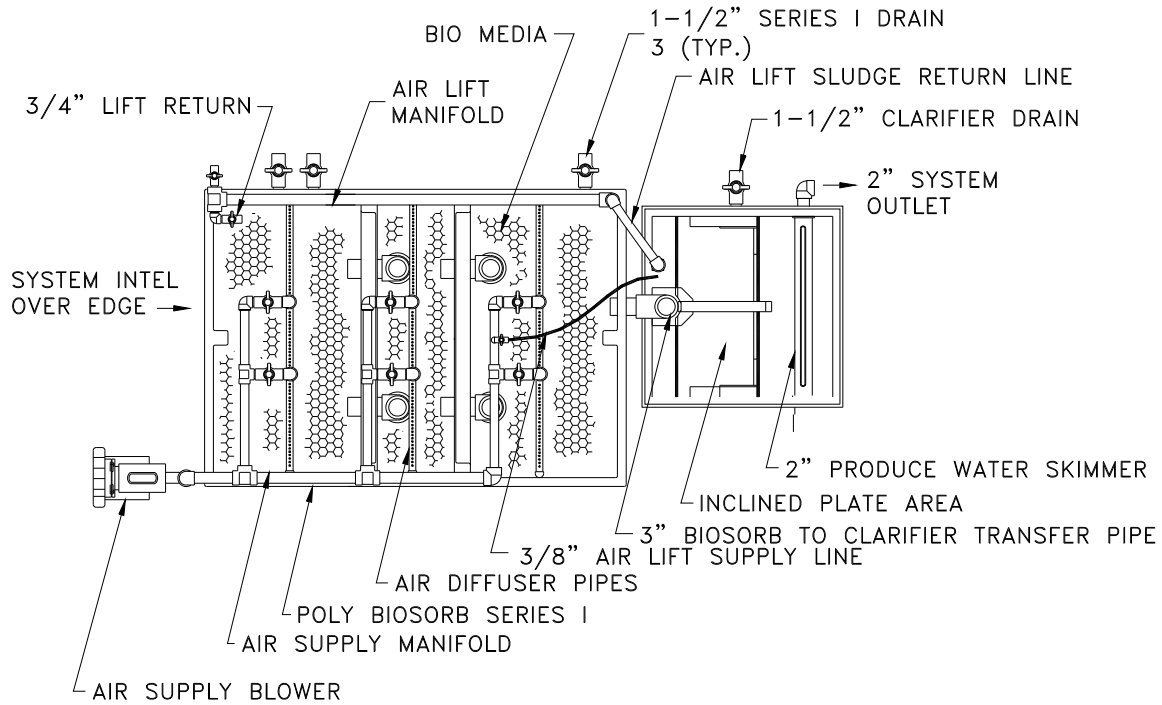
This manual contains information on system installation, start-up, operation and maintenance as well as containing useful information on controlling water quality, training bulletins, and the theory behind how the WM-WM1® System operates. In order to perform installation, start-up and maintenance procedures easily and correctly, it is important to become familiar with the system that you have. Chapter 1.0 is designed for just that purpose.

Unit Familiarization / Flow Diagram

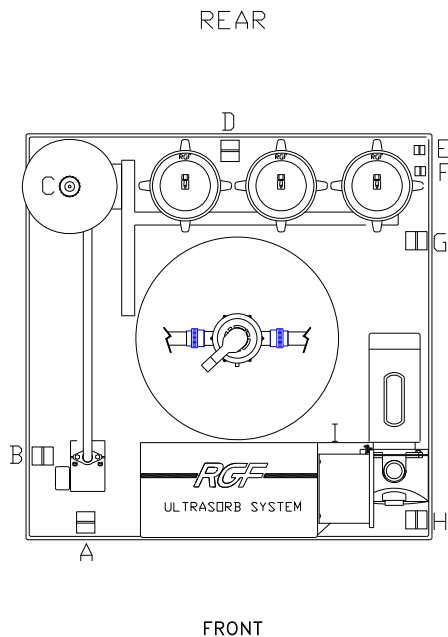
CCC-400



Biosorb Series I



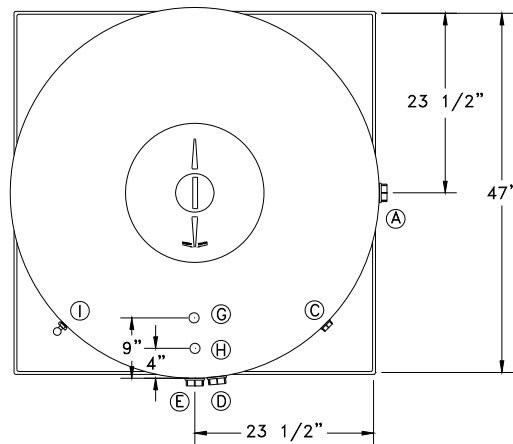
Process Skid



SYSTEM CONNECTIONS

- A - RECYCLED WATER OUTLET (FROM STORAGE TANK)
1 1/2" FPT
- B - CFC SYSTEM INLET (TO FROM STORAGE TANK)
1 1/2" FPT
- C - CFC SYSTEM RETURN (TO STORAGE TANK)
3/4" SLIP
- D - POLISH FILTER PRODUCT OUTLET (TO STORAGE TANK)
3/4" SLIP
- E - FRESH WATER INLET (FROM SOURCE)
3/4" FPT
- F - POLISH FILTER DRAIN (TO MAIN DRAIN RETURN)
3/4" SLIP UNION
- G - FILTER BACKFLUSH OUTLET (TO MAIN DRAIN RETURN)
1 1/2" FPT
- H - PROCESS PUMP INLET (FROM PROCESS TANK)
1 1/2" FPT
- L - 220VAC MAIN ELECTRICAL FEED (SIDE OF BOX)
30 AMP, 60 Hz, SINGLE PHASE W/ NEUTRAL & GROUND

Storage Tank



HOLES LIST

A	1 1/2" FPT TANK OVERFLOW
B	1 1/2" SLIP BALL VALVE TANK DRAIN
C	2" FPT FRESH WATER MAKE-UP
D	1 1/2" FPT PRODUCT WATER INLET
E	1 1/2" FPT CFC SYSTEM RETURN
F	1 1/2" FPT TANK OUTLET
G	1/2" SPIN LOW LEVEL FLOAT SWITCH
H	1/2" SPIN HIGH LEVEL FLOAT SWITCH
I	3/4" TANK LEVEL SIGHT TUBING

Chapter 2: Installation

Installation Requirements

The **WM-WM1® System** must be installed in strict compliance with these procedures in order for the warranty to be activated. The purchaser is responsible for bringing the required utilities (i.e. water, electricity and drainage) to the system and connecting them according to local codes. If the system must be modified by **RGF** or the distributor in order to meet the requirements of local codes, the purchaser will be required to pay the modification costs. When the purchaser has completed all of the above, a field representative will be furnished by the **RGF** Distributor. He will provide installation check-out, testing and training at no charge.

Please read the installation procedure completely and thoroughly before installing and operating the unit.

Installation Procedure

It is important to fully understand Chapter 1.0 to help to become familiar with all of the components and equipment names of your particular system for installation, start up, operating and maintenance procedures

NOTE:

Make sure to use Teflon tape or Teflon paste on all threaded connections and PVC glue (medium blue PVC cement) on all slip connections.

Equipment Placement

Place all of the equipment skids and tanks on the concrete pad location as desired. Allow a minimum of 2' clearance between components for access ways.

Main Drain Return Line

- A. **MAIN DRAIN RETURN LINE** should be imbedded in the equipment pad prior to system installation. If there is not one available, one should be plumbed to accommodate drain return lines from the components of the system. This return line should be readily accessible from the rear of each component such that all of the drain lines from each component can be plumbed into a common manifold and fed into the Main Drain Return Line (refer to the "Suggested Layout).

Main Electrical Connection

- A. **MAIN ELECTRICAL JUNCTION** for the particular system components should be planned into the equipment pad prior to system installation. Most installations will require 220 VAC, 30 amps, 1 phase, 60 Hz with a neutral and a ground as a minimum.

Centrifugal Coalescing Clarifier (CCC Tank)

Make the following connections to the Centrifugal Coalescing Clarifier.

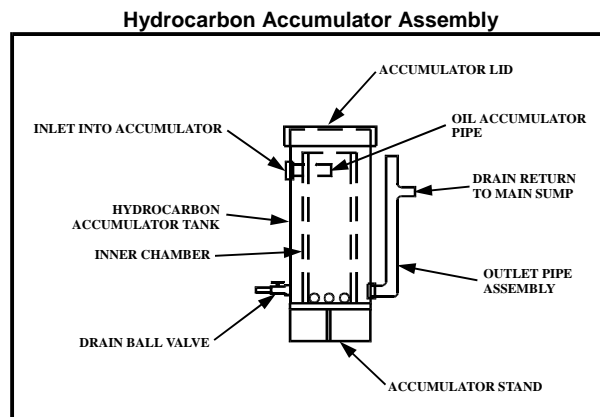
- A. Plumb a 1 1/2" PVC pipe line from the **SUMP LIFT STATION** to the 1 1/2" **CCC TANK INLET**. This line requires the use of a back flow preventor and an isolation valve.
- B. Plumb a 1 1/2" PVC pipe line from the 1 1/2" **CCC TANK OUTLET** to gravity feed to a recycling system or sewer discharge. This line requires the use of a anti-siphon and a throttle/isolation valve.
- C. Assemble the **BAG FILTER** underneath the cone tank. Attach the 1 1/2" **BALL VALVE** to the 1 1/2" **FPT DRAIN CONNECTION**. Plumb the **TANK DRAIN** to the **MAIN DRAIN RETURN LINE**.

Hydrocarbon Accumulator

Assemble the Hydrocarbon Accumulator and stand by the following procedure (Refer to the following figure for details).

- A. Assemble the **ACCUMULATOR STAND** by forming a "+" with the two 9" x 16" cross pieces with the flat sides up and placing the 16" square stand top on top of them. Use the 9 S.S. #6 x 5/8" Pan Phillips Screws and fasten the stand top to the cross pieces. Place and level it near the CCC Tank.
- B. Place the **HYDROCARBON ACCUMULATOR** on the stand.
- C. Plumb the 1 1/2" **OIL SKIMMER OUTLET** from the CCC Tank to the **HYDROCARBON ACCUMULATOR INLET**.

- D. Attach the **OIL ACCUMULATOR PIPE** to the inlet connection on the inside of the tank being sure the **INNER CHAMBER** is positioned so the pipe will pass through the side of the inner chamber.
- E. Attach the 1½" **OUTLET PIPE ASSEMBLY** to the Oil Accumulator Outlet. Plumb the Outlet Pipe Assembly from the "T" back to the main drain return line.
- F. Attach the 1½" **SLIP BALL VALVE** with the 1½" Dia. x 3" L to the 1½" threaded **DRAIN CONNECTION** on the side of the Accumulator. Plumb the Drain Connection of the Accumulator back to the main drain return line.



Biosorb Series I

➤ *Biosorb Series I and Clarifier Position*

- A. Position the inlet of the Biosorb Series I Tank to face towards the CCC 400 tank and the Clarifier should be positioned next to the Transfer tank.

➤ Inlet Pipe Assembly

Pipe Lubrication Application

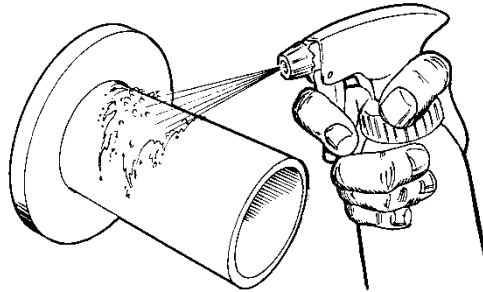


Figure 2.1

- A. Plumb a 2" line from the CCC 400 Outlet the Inlet of the Biosorb Series I. Include in this line a 2" Throttle/Isolation ball valve. This valve is provided to throttle the feed flow rate to the Biosorb during operation. Lubricate the 2" pipe with a soap and water mixture to allow for easy installation as illustrated above.
- B. Plumb a 3" outlet pipe from the Outlet of the Biosorb Series I Tank to the inlet on the Clarifier 3" tee fitting at top of tank.

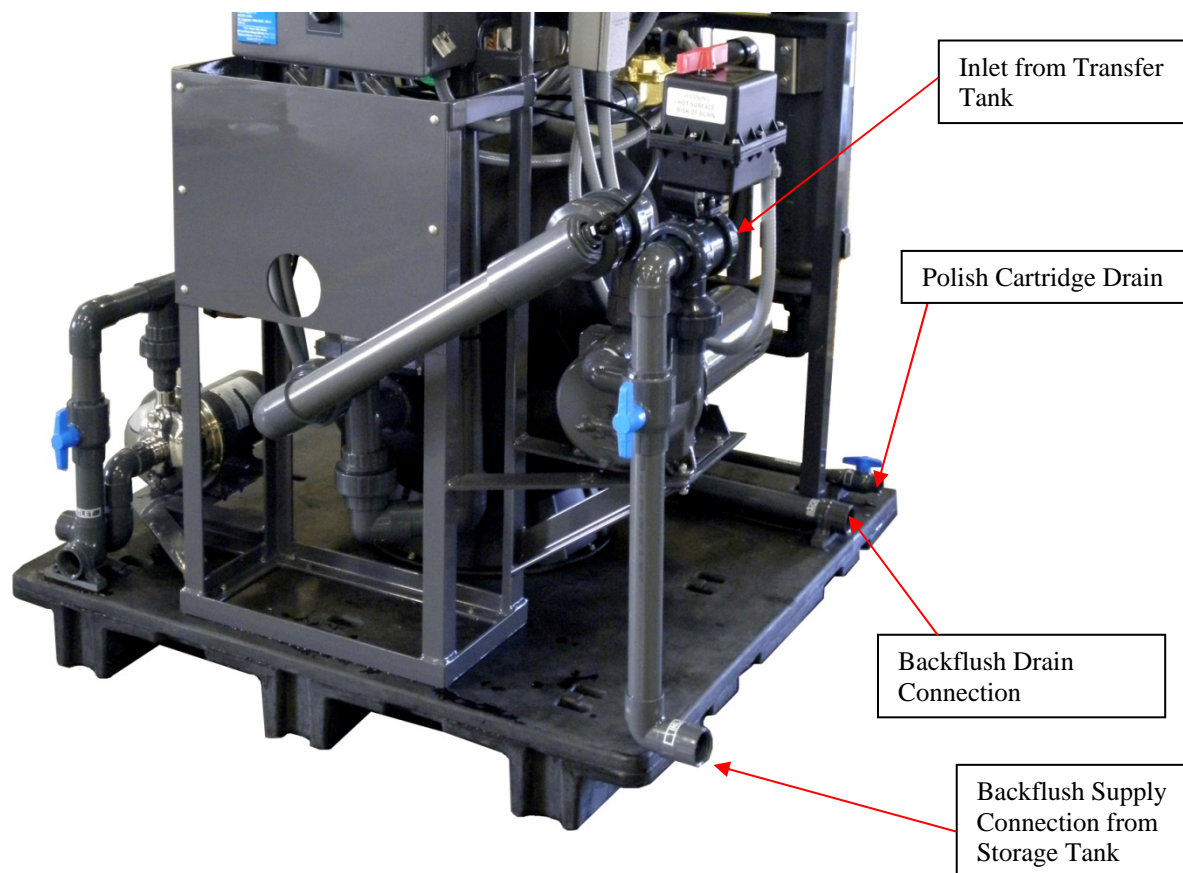
➤ Outlet Connection

- A. Plumb the Clarifier Outlet to the inlet of the transfer tank from either side of the skimmer assembly. The unused side of the skimmer should be capped.

➤ Additional Biosorb Series I Connections

- A. Position the Air Blower in a convenient position next to the Biosorb. Plumb the Blower into the Air Inlet on the Biosorb Tank. Install the air filter to the suction side of the blower. The suction side can be located by observing direction arrows.
- B. Plumb the Clarifier Sludge Suction line from the 3/4" connection on the Clarifier Tank to the sludge lift return on the Biosorb Tank.
- C. Connect the supplied 3/8" poly line on the Clarifier and connect it to the 3/8" compression ball valve located at the end of the Air Supply Manifold.
- D. Plumb all of the 1 1/2" drain lines to the Main Drain Return Line.

Series II Equipment Skid



➤ Inlet Connection

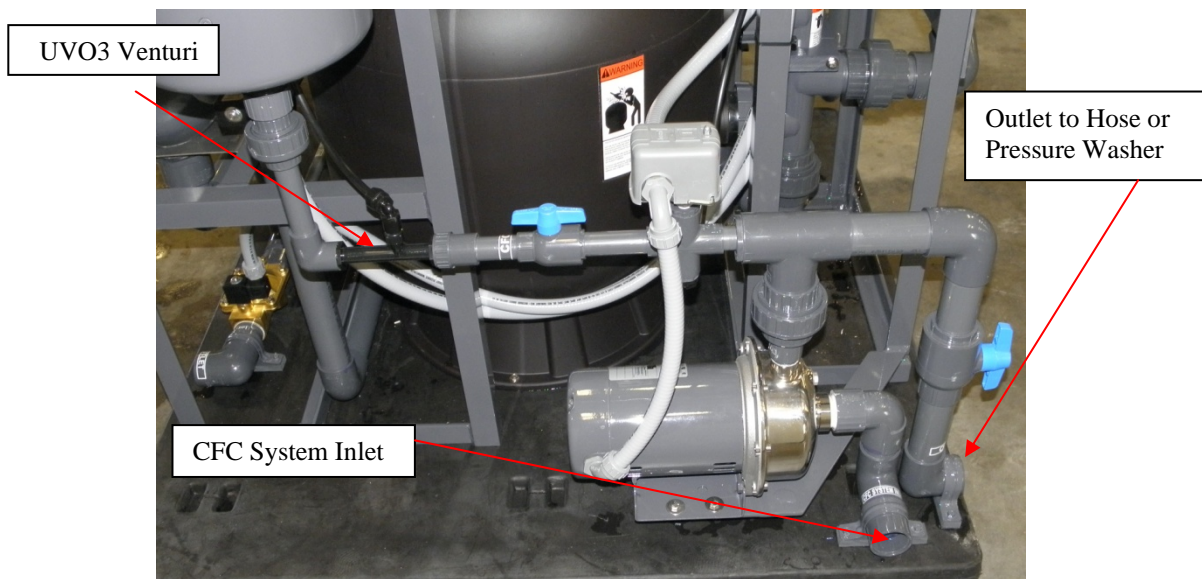
- A. Plumb from the Transfer Tank to the Series II Process Pump Inlet. This line should include the supplied Y-Strainer and ball valve.
- B. The Y-Strainer should be connected as indicated below or can be located between the Transfer Tank and Series II as desired.
- C. Attach the supplied 6" x 1 1/2" threaded nipple into the female adapter on the inlet of the Series II.
- D. Attach the Y-Strainer onto the nipple with the indicator arrow facing towards the Series II. The ideal position for the Y-Strainer is in the straight down position or at a 45° from the ground.
- E. Connect the supplied male adapter into the remaining end of the Y-strainer, and then continue plumbing to the Series II Skid.

➤ Fresh Water Inlet Connection

- A. Plumb a **FRESH WATER SOURCE** to the Equipment Skid 3/4" FPT **FRESH WATER INLET**. This line requires the use of an isolation ball valve and backflow preventer.

➤ CFC System Inlet / Outlet Connection

- A. Plumb from the **CFC SYSTEM INLET** to the **SERIES III STORAGE TANK OUTLET**. This line requires the use of an isolation ball valve.
- B. Plumb from the 3/4" **CFC SYSTEM OUTLET** fitting on the top of the UV/O³ Catalytic Chamber to the **SERIES III STORAGE TANK CFC SYSTEM RETURN INLET**.
- C. Plumb the **CFC BLEED BACK** from the 1/4" fitting on top of the UV/O³ Catalytic Chamber using part of the supplied 1/4" poly hose and lead into the **MAIN DRAIN RETURN LINE**.



➤ Drain Return / Bleed Line Connections

- A. Plumb the 3/4" **POLISHING FILTER DRAIN** to the **MAIN DRAIN RETURN LINE**.
- B. Plumb the **POLISHING FILTER BLEED LINES** (petcock valves on the sides and tops of the filters) to the **MAIN DRAIN RETURN LINE**.
- E. Plumb the 1 1/2" **MULTI-MEDIA FILTER DRAIN** to the **MAIN DRAIN RETURN LINE**.
- C. Plumb the Polishing Filters **SOLIDS BLEED VALVES** (bottom hose valves on housings) using part of the supplied 3/8" poly hose and lead back to the **MAIN DRAIN RETURN**.

NOTE:

The top hose valves are only needed for bleeding air from canister during startup.

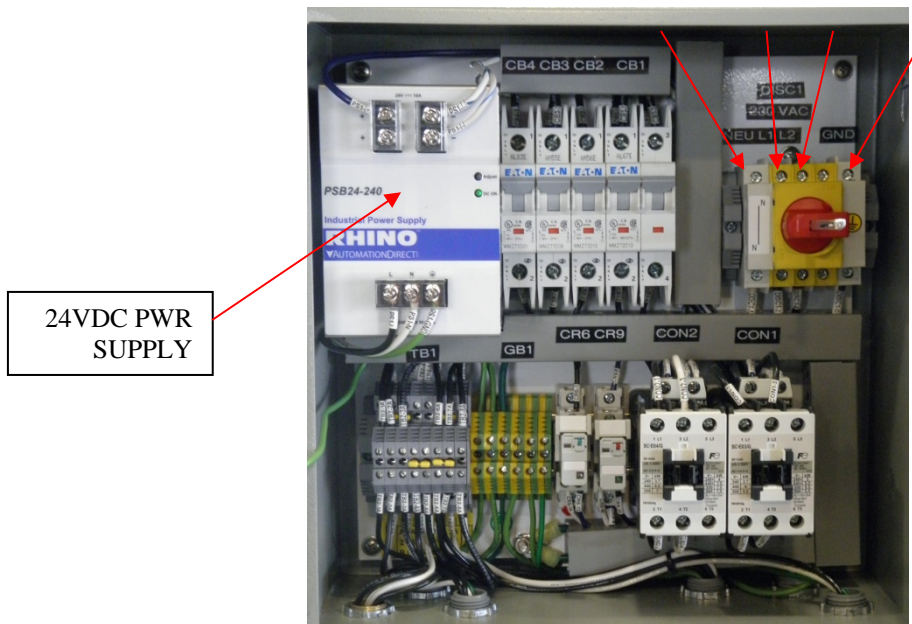
➤ **Electrical Connections**

- A. The 220 volt Electrical Connections to the **SERIES II ELECTRICAL JUNCTION BOX** should be connected by a certified electrician, according to local and national codes (refer to Section 8.3, Electrical Diagram).

IMPORTANT:

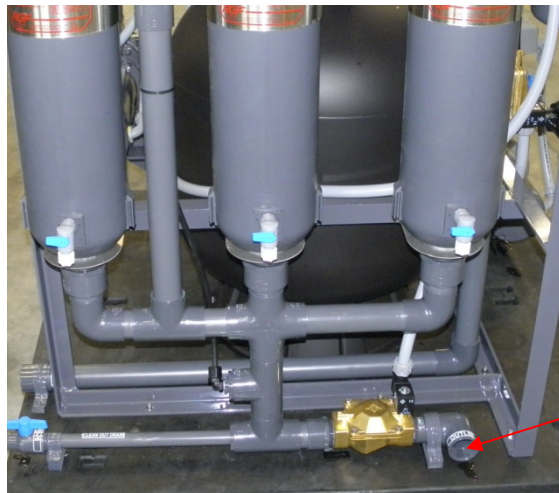
Do not turn on the power to the unit until instructed by this manual to do so. Damage to the system pumps will result otherwise.

NEUTRAL L1 L2 GROUND



➤ **Polish Filter Product Connection**

- A. Plumb the **PRODUCT OUTLET** to the **SERIES III STORAGE TANK PRODUCT INLET** (1 1/2" Product Inlet hole on top of Storage Tank).



Product Outlet

➤ **Polish Filter Backwash Connection**

- A. Plumb the **BACKFLUSH OUTLET** to the **MAIN DRAIN RETURN LINE**.

➤ **Delivery System Inlet / Outlet Connection**

- A. Plumb the **DELIVERY SYSTEM INLET** to the **STORAGE TANK DELIVERY OUTLET**. This line requires the use of an isolation ball valve.
- B. Plumb the **DELIVERY SYSTEM OUTLET** to the desired wash equipment.

➤ **Multi-Media Filter**

- A. Fill the Multi-Media Filter housing with the supplied media using the following procedure. Remove the Multi-Media Filter head assembly of the filter by unscrewing the lid from the top of the vessel using the supplied head wrench. Remove the head from the body assembly being careful not to lose the o-ring.
- B. Ensure the standpipe is properly installed and in the vertical position.
- C. Fill the media filter with water to just above the bottom laterals to prevent damage during media installation.
- D. Make a funnel out of cardboard to help install the media. First install all of the rock media in the bottom of the housing. Ensure the standpipe remains centered during media installation. Level out the first layer of media. Next, install all of the sand media into the housing, leveling upon completion. Then, install all of the anthracite carbon media, leveling upon completion.
- E. Reinstall the filter head. Ensure the o-ring for the head is intact before re-installation.

Series III Storage Tank

➤ **Overflow / Drain Connection**

- A. Plumb from the **STORAGE TANK OVERFLOW** to the nearest overflow / storm water containment, sanitary sewer or secondary storage tank according to local and national code or plumb to the Main Drain Return Line.

NOTE:

Check with local authorities as to local codes for overflow water.

- B. Plumb from the **STORAGE TANK DRAIN**, to the **MAIN DRAIN RETURN LINE**. This line requires the use of an isolation ball valve.

➤ **Fresh Water Inlet Connection**

- A. Plumb a **FRESH WATER SOURCE** to the 3/4" **FRESH WATER MAKE UP INLET**. This line requires the use of an isolation ball valve and backflow preventer.

➤ **Float Switch Connections**

- A. Attach all of the **STORAGE TANK FLOAT SWITCHES** according to Section 8.3 Electrical Diagram. These connections should be connected by a certified electrician according to local codes.

Chapter 3: System Startup and Operation

System Startup

➤ *Before you begin*

The following startup procedures must be followed thoroughly in order to prevent damage to the system components.



Do not apply power to the system until directed to do so in the specific startup procedure!

Centrifugal Coalescing Clarifier (CCC Tank)

➤ *Filling the System*

- A. Close the drain valve at the bottom of the tank and close the Hydrocarbon Accumulator drain.
- B. Fill the CCC Tank with water to its' normal operating level (where it starts to gravity overflow).
- C. Turn on the sump pump and adjust the Oil Skimmer so it will skim the surface of the water in the tank when the pump is in operation.
- D. Check the optional Macro Aerators to see that they are functioning properly (i.e. bubbling evenly inside of tank).

Biosorb Series I

➤ *Filling the System*

- A. Close all **DRAIN VALVES** (e.g. valves PF-1 and PD-2).
- B. Close all of the **ISOLATION VALVES** between the components of the system.
- C. Fill the tanks of the system evenly and at the same time in order to prevent damage to the compartment baffles of the tank. Continue to fill the system until the water in the tank starts to flow out of the Clarifier Skimmer.

Series III Storage Tank, Misc. Tanks and Pits

- A. Close the Storage Tank **DRAIN VALVE** and **ISOLATION VALVES**.

NOTE:

Do Not Open the Isolation Valves until directed to do so.

- B. Turn on the Fresh Water Supply to the Storage Tank. Fill the Storage Tank approximately 3/4 full (400 gallon mark) with fresh water with a garden hose.
- C. Ensure all of the **FLOAT SWITCHES** inside of the Storage Tank are free to swing.
- D. Fill the remaining tanks and pits of the system and wash pad to the filled position.

Series II Equipment Skid

➤ *Filling the System*

- A. Close all **DRAIN VALVES** (e.g. valves PF-1 and PD-2).
- E. Recheck all unions to ensure they are not missing o-rings and are all hand tightened.
- F. Ensure all filters are installed and the lids are hand tightened.
- G. Open all of the purge valves on top of the filter housings (PF-1, PF-2, and PF-3).
- H. Open the fresh water valves for the system (e.g., FW-1, FW-2 and FW-3). Allow the system to fill until water starts streaming from the purge valves, and then return the fresh water valves to close and then close all of the purge valves (PF-1, PF-2, PF-3, and PF-4).
- I. Open all of the **ISOLATION VALVES** between the components of the system.
- J. Prime the Process Pump by removing the square priming plug from the Process Pump housing until water starts streaming from the priming hole, then replace the plug. If the process tank is located below ground the pump will need to be primed by un-doing the top union of the pump and filling the casing with water.

- F. Prime the CFC System Pump by removing the gauge fitting on the top of the CFC Pump piping assembly. Water should start emitting from the gauge fitting. Continue until a steady stream emits, then replace the gauge fitting.

NOTE:

Proper priming of this pump is of extreme importance. Failure to ensure proper priming will inhibit proper operation of the pump and destroy it.

- H. Prime the Delivery Pump (Optional) by removing the square priming plug from the Delivery Pump housing until water starts streaming from the priming hole, then replace the plug.

➤ **Polishing Filter System**

- A. Prepare the Polishing Filter System valve positions for normal operation by opening PF-3 and PP-1 and closing PB-1 and PD-2. For **AUTOMATIC SYSTEMS** these valves are electric solenoid valves and will open and close automatically

➤ **CFC / CO³P System**

- A. Prepare the CFC System for normal operating by opening CFC-1.

Start-Up

- A. Open all of the isolation ball valves between the components of the system.
- B. **POWER CAN NOW BE APPLIED TO THE SYSTEM COMPONENTS.**

CFC SYSTEM START-UP

Start the CFC system by holding the **CFC SYSTEM PRIME LEVER** up (refer to Figure CFC-1) until the CFC pressure reaches approx. 11 psi, then release. The lever should remain in the up position. If it does not, then the CFC System is not properly primed, check the system valves to ensure they are properly opened and re-bleed the CFC pump. Once the CFC System is properly started, the Aux. System light and UV/O³ Catalytic Chamber indicator (blue light on the side of the chamber) should be illuminate indicating that power has been applied to the CFC System. Also, the CFC Pump will run continuously, and the Chemical Injector Pump will pump periodically. If in the event the CFC system loses prime, the lever will shut down to prevent equipment damage.

System Operation

Centrifugal Coalescing Clarifier (CCC Tank)

The system operates on a gravity flow / gravity separation process. Water from the sump pump enters the CCC Tank from the Inlet Manifold, invoking a whirlpool. This centrifugal action helps to separate the oils and solids from the waste stream causing oils to float to the surface and solids to fall to the bottom. The oils are removed by the oil skimmer and deposited in the Hydrocarbon Accumulator, where the remaining water and oils are further separated. The solids settle to the bottom of the cone tank. They are removed during periodic maintenance by dumping the accumulated solids into the bag filter, for easy transportation and disposal. The clarified water is then gravity fed out of the system to a recycling system or to sewer.

Biosorb Series I

➤ *Process Description:*

Biosorb Series I Tank:

The main job of treating and breaking down the pollutant and biological material in the reclaimed washwater takes place in the aeration chambers or “BIOZONES” of the Biosorb Series I Tank. A large volume of air is supplied to the aeration chambers from the supplied regenerative air blower. This air is introduced at the bottom of the chambers through a series of simple diffusers to create a fully aerated liquid. A complex system of microorganisms, supported on plastic media, uses the aerated conditions to break down the biodegradable material present in the wash water. This form of treatment is called secondary treatment and it produces a much cleaner effluent than the traditional septic tank style of primary treatment.

Clarification Stage – Biosorb Series I Clarifier:

Any solids or flocs produced in the Biosorb Series I “Bio-Zones” will settle out in this compartment under quiescent conditions. The sludge that accumulates at the bottom of this chamber is automatically returned to the Biosorb Series I tank for re-activation. The clarified effluent then passes through to the #2 Anaerobic Tank.

Series II Equipment Skid

➤ *Process System*

Water enters the Process System from the #2 Anaerobic Tank or optional process tank by the suction of the Process Pump and is passed through the Multi-Media Filter and then through the three Polishing Filters by the process pump where it is delivered to the Storage Tank.

For Automatic Systems, the Multi-Media Filter is automatically controlled and backwashed by the Multi-Media Filter Controller and the Polishing Filters are automatically backflushed by the PB-1, PF-3, PP-1 and PD-2 valves which are electric solenoid valves controlled by the BackwashTimer located in the main electrical junction box.

Controlling Flow

Flow through the Process System is controlled by the Multi-Media Filter Valve and the Polishing Filter Valves.

➤ **CFC System (Continuous Flow Control)**

Water is continuously fed through the CFC system from the Storage Tank by the suction of the CFC System Pump and is supplied to the CO³P Process. Flow through the CO³P Process passes recycled water through the Ozone and Chemical Venturi and the O₃/UV Catalytic Chamber, and is returned to the Storage Tank.

NOTE:

In order for the catalytic oxidation process (CO³P) to operate correctly, it is necessary to keep the hydrogen peroxide level in the Storage Tank above 10 ppm. For the first several weeks of operation of the system, monitor the level very closely. If the residual hydrogen peroxide level falls below the 10 ppm range, it will be necessary to increase the injection rate accordingly. The chemical output of the pump ranges from 0.96 GPD at the minimum setting to 16.2 GPD at the maximum setting.

Controlling Flow

Valve CFC-1 should be fully opened for normal operating conditions.

IMPORTANT:

Valve CFC-1 must never be shut completely off. The UV/O₃ Catalyzation Chamber requires continuous flow or the chamber will overheat and malfunction.

➤ **WATER SUPPLY (Optional)**

The water supply to the washing equipment is supplied by the optional Delivery Pump. This pump maintains pressurized feed to the washing equipment. If insufficient pressure is achieved, the delivery pump pressure can be increased by changing the pressure switch to a maximum of 45 psi.

Series III Storage Tank

➤ **Operation**

Water enters the Tank from either the Series II Skid or fresh water make-up. The water inside the tank is continuously pumped by the CFC System, through the CO³P Process, and returned. When wash water supply is needed, wash water flow is pumped by the optional delivery pump to the point of use. Float switches inside of the tank control the operation of the system.

This system has a high level (pump up) float switch. In addition, if the tank water level reaches a level below 18", the fresh water make-up valve will allow fresh water to enter the tank.

Operational Notes



• UV/O³ CATALYTIC CHAMBER

- 1) DO NOT look at the UV light in the chamber. PERMANENT DAMAGE OR BURNS TO EYES OR SKIN MAY RESULT.
- 2) DO NOT run the UV Chamber without water flow through the Chamber, The UV bulb needs water flow to keep it cool. DAMAGE TO THE BULB WILL RESULT.
- 2) DO NOT open or attempt to repair the chamber. If problems occur, call your serviceman or distributor for further instruction.
- 3) DO NOT BREATHE OR INHALE THE OZONE GAS. PROLONGED BREATHING OF NOTICEABLE AMOUNTS OF OZONE may result in: respiratory irritation to nasal passages, throat, bronchial and pulmonary membranes; headache, nausea, burning, watery irritated eyes. In some instances (such as enclosed spaces and tanks), significant concentrations of ozone may collect. Adequately vent all tanks and enclosed spaces before entering for maintenance or repair until the level of ozone has depleted down to acceptable levels (<0.1 ppm). If an ozone odor is still noticeable, continue ventilating until the odor is non-detectable. Ozone odor is similar to the smell near copy machines when making copies or Mig and Tig welders in operation and is the "fresh air " odor one sometimes notices after a thunderstorm.

GENERAL NOTE:

At a level of 1 ppm, ozone becomes intolerable to humans. A humans reaction to this level is the same as the reaction to a strong bleach or ammonia odor. Usually, the nose will indicate discomfort.



• POLISHING FILTER

- 1) Before servicing be sure to RELIEVE THE PRESSURE on the Polishing Filter(s) by using the drain valve and bleed valve or PERSONAL INJURY COULD RESULT!!!.
- 2) RGF Filters have been lab tested and time tested - COPY FILTERS HAVE BEEN KNOWN TO BREAK UP OR DISSOLVE, THEREBY PLUGGING OTHER PARTS OF THE UNIT CAUSING EXCESSIVE PRESSURE AND EQUIPMENT DAMAGE!!!



• **CFC SYSTEM PUMP:**

- 1) Proper priming of the CFC System Pump is essential to the operation of the pump. Improper priming of the pump will cause poor performance and eventual pump failure.
- 2) DO NOT OPERATE the CFC System Pump if the Storage Tank is emptied or DAMAGE TO THE PUMP WILL RESULT.



• **PROCESS PUMP:**

- 1) TO PREVENT DAMAGE TO THE PROCESS PUMP, DO NOT OPERATE without sufficient prime and net positive suction head (NPSH).
- 2) DO NOT OPERATE THE PUMP while the system valves are closed.



• **DELIVERY PUMP (OPTIONAL):**

- 1) TO PREVENT DAMAGE TO THE DELIVERY PUMP, DO NOT OPERATE without sufficient prime and net positive suction head (NPSH).
- 2) DO NOT OPERATE THE PUMP while the system valves are closed.

Chapter 4: Preventative Maintenance Schedule

Overview

The following section is developed to keep the **WM-WM1® System** in top working order. It is **NECESSARY** to follow the maintenance procedures below precisely as stated. The lack of maintenance, in the long run, will reduce productivity and can be both costly and time consuming. It is recommended that this format be copied and incorporated as a regular work routine.



Turn off all power, and release pressure before servicing the system. All gauges must read zero!

Required Tools and Supplies

- | | | |
|---------------------------------|--|--|
| ✓ Hammer | ✓ Adjustable End Wrench | ✓ 5 H.P. Shop VAC For Extracting Old Media |
| ✓ Garden Hose For Back Flushing | ✓ Tube Brush For UV/O ³ Chamber Cleaning | ✓ pH Test Strips |
| ✓ Garden Hose Nozzle | ✓ #1 Flat Head Screw Driver For Venturi Adjustment If Needed | ✓ Garbage Bag For Proper Filter Disposal |
| ✓ Rubber Boots And Gloves | ✓ Proper Safety Equipment | ✓ Square Head Shovel For Digging Out Trench Valley |

Daily Maintenance

Centrifugal Coalescing Clarifier (CCC Tank)

- A. Open the Drain Valve on the bottom of the CCC Tank and the Bag Filter Tank and allow to drain for several minutes to flush out sediments. Return valve to close. Remove the Filter Bag and properly dispose of the collected debris and sediment.
- B. Drain the water out of the bottom of the Hydrocarbon Accumulator using the Drain Valve. Let run until oil starts coming out of the drain. Return valve to close. If there is a large amount of oil in the accumulator, then it will need to be drained off and disposed of properly. Drain the oil off by connecting a hose to the tank drain and leading it to a 5 gallon can or drum.

BIOSORB® System Maintenance

➤ *Weekly Maintenance*

- A. Remove floating solids from the surface of the Clarifier.
- B. Check that the blower, sludge lift, and discharge pump are operating properly.

Sludge Maintenance Procedure

Large solids in the wastewater will settle out in both the holding tanks and the primary chamber. These solids collect at the base of these compartments and form sludge. This sludge degrades biologically over time but accumulates gradually and needs to be removed periodically.

It is important that the correct procedure for the de-sludging of the “BIOSORB” is carried out. The following steps need to be performed.

IMPORTANT: Please post Health and Safety information and issue a copy to personnel involved in the de-sludging of the system before commencing.

- A. Ensure that all power to the unit is switched off.
- B. Open the drain valves of the Biosorb Series I Tank for 30 seconds to remove settled sludges from the bottom of the tank.
- C. Liquid should be removed until approximately six inches (150 mm) is removed from each chamber.
- D. After de-sludging, the chambers and holding tanks should be refilled by adding clear water.
- E. After refilling, all electrical power to the units should be restored.

Series II Equipment Skid

➤ *Daily System Check*

Daily, with the system running, log the pressure gauge readings. Check the status of the indicator lights, hour meter, and chemical injection pump. Check the water level in the Storage Tank. Keep an accurate record of all of the readings and indicators to determine when certain components of the equipment skid will need maintenance.

NOTE:

Use the following as general rules:

Multi-Media Filter

If the pressure difference across the Multi-Media Filter is greater than 20 psi, the filter will need to be backwashed according to the Multi-Media Filter Procedure.

Polish Filter Gauges

If the pressure difference for the Polishing Filters is 10 psi or more, the filters need to be back flushed or manually cleaned.

CFC Pump Discharge Gauge

This gauge indicates the pressure in the CFC System. The system should operate at approximately 11 psi when there is no recycled water usage and 4-10 psi when there is recycled water usage.

Polishing Filters

➤ *Daily Maintenance*

Daily, or if the inlet and outlet pressure difference on the Polishing Filters is greater than 10 psi, the filters need to be back flushed by the following procedure.

AUTO BACK FLUSH NOTE:

For Automatic Systems, if it is found that the Polishing Filters are not being back flushed properly, then the Auto Back Flush Sequence will need to be adjusted accordingly.

UV/O³ Catalytic Chambers

➤ *DAILY MAINTENANCE*

- A. Ensure the UV/O³ Catalytic Chamber indicator light on the side of the chambers (at the top) is illuminated.

Weekly Maintenance

Trenches, Sumps, Pits, and Clarifiers

➤ *Weekly Maintenance*

Weekly, or as required, the trenches, sumps, pits and clarifiers of the pad need to be checked for sediment level. The trenches' sediment level should not be more than half of the depth of the trench. Dig out the trench using a shovel, and dispose of the waste accordingly. The sumps and pits should be dug out if there is at least 1/4 of the depth full of sediment. The clarifiers should be removed and dug out on a weekly basis, or as required, regardless of the amount of sediment.

IMPORTANT:

Dig out the trenches, sumps, pits and clarifiers as regularly as possible. Keeping them cleared of sediment build up will result in better water quality throughout the entire system.

Y-Strainer

➤ *Weekly Maintenance*

- A. Turn the Process Control Switch to **OFF**.
- B. Close the isolation valve to the Series I and valve PF-4 on the Series II.
- C. Unscrew bottom of the Y-strainer, taking care not to lose the o-ring, and completely clean screen basket.
- D. Reassemble Y-strainer bottom with o-ring in place.
- E. Open isolation valve to the Series I and valve PF-4 on the Series II and reapply power.
- F. Check for leaks.

Multi-Media Filter

➤ *Weekly Maintenance*

Weekly, or if the pressure difference across the Multi-Media Filter is greater than 20 psi, then the filter will need to be manually backwashed by the following procedure.

AUTOMATIC MULTI-MEDIA FILTERS

Manually Backwashing the Multi-Media Filter

- A. The Process Control Switch must remain in the **ON** position for this operation.
- B. Ensure there is sufficient water in the Process Tank to perform a sufficient backwash.
- C. Initiate a manual backwash cycle by placing the Manual Backwash switch in the Media Filter position. The following control sequence will occur:
 - The Process Pump will turn off.

- The backwash valve will move to the backwash position.
 - The Process Pump will restart, moving the water through the filter in the backwash direction then to the waste line. Backwashing will continue for 3 minutes.
 - The process Pump will turn off.
 - The Backwash valve will move back to the filter position.
 - The sandbed will be allowed to settle for 1 minute.
 - The Process Pump will turn back on and normal filtering will proceed.
- E. Return the Manual Backwash Switch to the OFF position. The pump will continue to process water.

Polishing Filters

➤ *Weekly Maintenance*

Weekly the Polishing Filters need to be removed and manually cleaned by the following procedure:

- A. Place the Process Switch in the OFF position
- B. Open the Filter Housing drain valve to release pressure and drain the filter housing.
- C. Remove the Filter Housing Lid.
- D. Remove Polish Filter Cartridge and clean with fresh water. Do not use pressure washer to clean filter cartridge.
- E. Re-install Filter Cartridge into the filter housing.
- F. Verify Housing Lid o-ring is in place.
- G. Install Filter Housing Lid.
- H. Close the Filter Housing drain valve.
- I. Place the Process Switch in the ON position

Storage Tanks

➤ *Weekly Maintenance*

- A. Open the drain valve to the Storage Tank and allow to drain for 1 minute to remove any accumulated solids from the bottom of the tank.
- B. Check inside the tank to ensure the float switches are free to swing. Remove any accumulated debris or scum from the surface of the tank water.

Monthly Maintenance

UV/O³ Catalytic Chambers

➤ *Monthly Maintenance*

Once a month, or as required, the UV/O³ Catalytic Chamber needs to be cleaned by the following procedure:



Shut off all power to the system before attempting to service or repair the UV/O³ Catalytic Chamber. The chamber operates under high voltage, which can cause severe shock if ends are removed while power is applied.

- A. Turn the main power to the system **OFF**.
- B. Close the Isolation Ball Valves (CFC-1) to the CFC System.
- C. Disconnect the union at the top of the **UV/O³** chamber. It may be necessary to disconnect the bottom union to thoroughly clean the lower portion of the tube.

NOTE:

Use caution in handling the UV/O³ Catalytic Chamber. The UV bulb is extremely fragile and will break if the chamber is mishandled.

- D. Insert an appropriate sized bottle brush and scrub the interior of the quartz glass tube. If a heavy build up of scale is present, prepare a solution of Citric Acid and scrub the tube until clean.
- E. Reconnect the inlet and outlet and open isolation ball valve (CFC-1).
- F. Turn the main power to the system back **ON**.

As Required Maintenance

Multi-Media Filter

➤ *As Required Maintenance*

If the Multi-Media Filter has a high-pressure differential after continued backwashing or if the Polishing Filters are continually fouled, then the media will have to be changed by the following procedure.

Changing the Filter Media

- A.** Turn the Process Control Switch to **OFF**.
- B.** Ensure all pressure is relieved from the system (all gauges should read zero). Loosen the unions of the Multi-Media Filter and remove the head. Remove the drain Plug from the bottom of the Multi-Media Filter.
- C.** Once all of the water has drained, use a 5 horsepower wet / dry shop vacuum to remove the old media. Once all the media has been removed, thoroughly clean and flush out the filter housing.
- D.** Replace the media with RGF Filter part # FL-078 and replace media to filter housing according to the Multi-Media Filter installation instructions.
- E.** Re-assemble the filter housing and return to normal operation.

Programmable Auto BackFlush

Change the Programmable Auto-Backflush sequence if the filters need to be back flushed more frequently. The Auto Back Flush Timer is factory pre-set to 24 hours between back flushes (T OFF dial) and two minutes of back flush (T ON dial).

- A.** Turn the main power to the system **OFF**.
- B.** Open the Electrical Junction Box and remove the ODR relay
- C.** The dials on the face of the relay control the amount of time between back flushes (T OFF dial) and the amount of time the back flush is performed (T ON dial).

To change the amount of time between back flushes, turn the **T OFF** dial to the desired amount of time (scale is in hours). To change the amount of time the back flush is performed, turn the **T ON** dial to the desired amount of time (scale is in minutes).

If more than 10 minutes of back flushing is preferred, it will be necessary to change the time scales of the relay. On the side of the relay are the Repeat Cycle switch settings which control the scale of the time OFF and time ON functions of the relay. They are factory set so the relay time OFF dial is in hours and the time ON dial is in minutes. To change them, refer to Chapter 10; Auto Back Flush Timer.

NOTE:

If the power to the system is turned OFF, the timer restarts its cycle from zero. The timer relay does not retain its time cycle during power OFF.

Winterizing the System

In areas of the country where the system will be shut down for the winter or there is a possibility of local freezing, the system will need to be drained down to prevent damage to the internal components and piping of the system. The water from the system should be hauled off or evaporated. All main sumps to the system should be turned off, pumps removed and covered to prevent damage to the sump basins. All power to the system should be shut off completely. The components of the system should be drained completely (e.g. pumps, filter housings, UV/O³ Chamber)

Chapter 5: General Theory

Overview

The Piping and Instrumentation Diagram in the Engineering Diagram Section outlines the path that the waste stream follows as it is recycled. The General Theory section explains each process of the recycling process. A comprehensive understanding of theory of the **WM-WM1 System** should be achieved to assist in the proper installation, operation and maintenance of the system.

Biosorb Series I System

Biosorb Series I

The Biosorb was designed to accommodate a variety of wastewater applications with high B.O.D. and C.O.D. levels. Our goal in treating wastewater high in organic contaminants is to convert the carbon into microorganisms that we can remove from the water by settling. The Biosorb provides an aerobic environment that encourages the growth of organisms - organisms that use organic material for both their carbon and energy source. The clarifier provides a method for settling out the bugs and re-activating them within the system.

Series II Equipment Skid

Process System

The process water enters the Process System of the Series II equipment Skid by the suction of the Process Pump. The water is filtered through the Multi-Media Filter removing large particulate from the waste stream then passed through the Polishing Filters for final polishing of the water. The Multi-Media and Polishing Filters are periodically backwashed to remove accumulated particulate.

The process water enters the Process System of the Series II equipment Skid by the suction of the Process Pump. The water is filtered through the two primary Polishing Filters of the system down to the 10 micron range before passing it on to the MS³ Membrane System. The third filter is the Back-Up Supply Filter, which is only activated by a low level signal in the Series III Storage Tank, which opens the SB-7 solenoid valve, then supplies this water to the Storage Tank. The Polishing Filters are equipped with air and solids purge valves and have a system for back flushing the filters. From the Process System, the water then enters into the MS³ Membrane System.

Supply Header

The supply header comprises a manifold of piping and valves, which allows the operator to select the water source to be supplied to the wash equipment. The operator may select either wash or rinse water to be delivered to the wash equipment. Rinse water typically is municipally supplied 40-60 psig "tap" water. Recycled wash water will come from one of the following sources depending on system parameters:

- 1) The CFC system is the primary source of recycled wash water.
- 2) When the Storage Tank is below the Low Level float set point, the wash water is supplied by the effluent of the #3 Back-Up Polish Filter.

Continuous Flow Control System (CFC System)

The CFC system consists of the CFC Pump, the UV/O³ Chamber, venturi injection, and hydrogen peroxide injection. The purpose of the system is to continuously provide recycled water at moderate supply header pressure and to continuously circulate water through the Catalytic Oxidation Process (CO³P). Although the terms CFC and CO³P are related and the systems utilize the same components. CFC refers to the mechanism for the hydraulic delivery system, and CO³P refers to the chemical and photochemical process for water treatment.

CFC Pump

The CFC Pump is a 1/6 Hp. centrifugal circulation pump that pumps the processed water from the storage tank to the Supply Header and through the CO³P system.

Catalytic Oxidation Process (CO³P System)

The Catalytic Oxidation Process is designed to reduce the Biologic Oxygen Demand (B.O.D.) and Chemical Oxygen Demand (C.O.D) of the recycled water. This is accomplished through the contact with hydrogen peroxide, ozone and ultraviolet light. The tri-reaction is completed when the ultraviolet light (catalyst and oxidizer) in the chamber excites the ozone (oxidizer) and hydrogen peroxide (oxidizer) to cause them to react faster in the aqueous solution (refer to Figure TRI-1). Ultraviolet light is also a remarkable sterilizer of living organics such as bacteria and algae. In turn, the three work together in breaking down organics to clarify the water before it is reused. This is all accomplished by the CFC system, which transfers the water from the tank passing it by the hydrogen peroxide injection and ozone injection and through the UV/O³ Catalytic Chamber and returning it back to the tank.

RGF Catalytic Oxidation Process

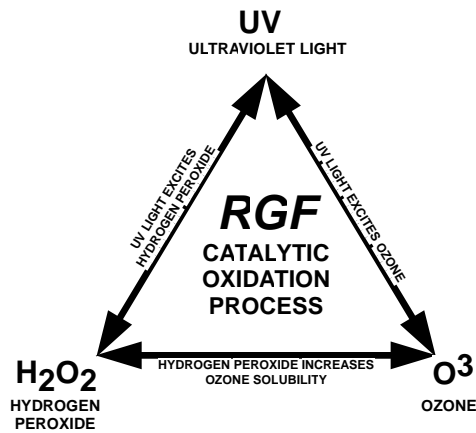


Figure TRI-1

UV/O₃ Catalytic Chamber

A cylindrical vessel used to produce Ozone (O₃) which is venturi injected in the CFC system, to prevent bacteria or algae growth. The chamber also produces ultraviolet light, which is a sterilizer used to UV destruct organics and excite ozone and hydrogen peroxide in the Catalytic Oxidation Process (CO³P) as the water passes through the chamber (refer to figure UV/O₃-1).

UV/O₃ Catalytic Chamber

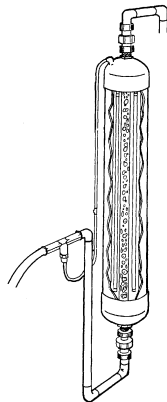


Figure UV/O₃-1

Delivery Pump

The Delivery pump is utilized to deliver the recycled water to the washing equipment. This pump supplies water at a rate of 45 gallons per minute at 20 - 40 psi. The pump contains a pressure switch and pressure tank.

Chapter 6: Controlling Water Quality

Overview

Controlling the waste water quality on the **WASHMASTER® System** is a very important process that can greatly enhance the quality of your recycled water. By controlling the pH level, Total Alkalinity, the amount of oxidizers and soaps that are used, you will be able to improve the quality of water in your system. There are many factors which control the water quality. These factors are listed below in order of their appearance in the following section:

pH / Alkalinity

pH

Total Alkalinity

Oxidizers

Hydrogen Peroxide

Ozone

Ultraviolet Light

Cleaning Agents

Enviro-Control

Water Conditioner 1 (WC-1)

Solids

Total Dissolved Solids (T.D.S.)

Total Suspended Solids (T.S.S.)

pH / Alkalinity

pH

pH (potential hydrogen) is a relative measure to indicate how acidic or alkaline a substance is. Thus, it denotes the degree or strength of alkaline or acidity. Some acids or alkaline substances are stronger than others and, in order to compare them, the pH scale has been devised. The pH numerical index ranges from 1.0 (extremely acidic) to 14.0 (extremely alkaline). The midpoint of 7.0 indicates that the solution is neutral. That is, it is neither acidic nor alkaline. Pure distilled water is a neutral solution. Note: High pH's tend to emulsify oils and reduce the efficiency of the unit. The use of high pH cleaners should be minimized.

The pH scale is a logarithmic scale and even though the difference from 0 to 14.0 doesn't seem very great, every unit on the pH scale is a difference of 10 times, and every two units is a difference of 100. For example, if you have an alkaline cleaning solution of 10.0 and increase it to 11.0, you are making that solution 10 times more alkaline. If you go up two degrees to a pH of 12.0, the solution becomes 100 times more alkaline, and so on.

➤ **Controlling pH:**

To Raise pH:

One chemical usually added to raise the pH level is Sodium Carbonate. How much to add is basically a trial and error operation, but a general rule of thumb that is good to follow is to add 1/4 pounds of Soda Ash for every 1,000 gallons of water within the system. After adding the Soda Ash, wait for about an hour before re-checking the pH level. Take whatever further action is indicated by the test.

To Lower pH:

The chemical normally added to lower the pH level is called Muriatic Acid, which is actually a dilute form of the more hazardous hydrochloric acid and comes in liquid form. Another acid product is the so called Dry Acid or Sodium Sulfate, which comes in a granular form. **Acid of any type should always be added directly to the water, NEVER the water to the acid! The amount of acid required is determined by performing an acid demand test with the water test kit.**

Total Alkalinity

Total Alkalinity is the measure of the total amount of alkaline chemicals in the water and **not** the same as pH. pH measures the **strength** of an alkaline (or acid), while alkalinity measures the **amount** of alkalis present. While pH and Total Alkalinity are not the same thing, **Total Alkalinity can have an effect on how fast or easily changes in pH can be accomplished.**

➤ Controlling Alkalinity

For our purposes, the **Total Alkalinity should be kept at about 150 ppm**. In general, alkalinity has not been a problem for recycling, providing you are using a **neutral soap**. If you have a drum of water and introduce a scoop of alkaline clearer, you may change the pH and get a reading of 12. That does not mean that if you add a second scoop of cleaner, you will get a different reading - in fact, it will probably be identical. What will change is the Total Alkalinity.

Oxidizers

Ozone

Ozone is another oxidizer that exhibits outstanding purifying characteristics. Ozone is different than hydrogen peroxide in that it is not in a liquid form. Ozone is produced by a unique process developed by **RGF** in which a special chamber called the **TurboHydrozone®** uses air as its agent to produce the ozone. A simple look at the blue indicator light on the chamber assures ozone is being produced. The ozonated air is then bubbled inside of the storage tank or is vacuum dragged into the CO³P System by the Ozone Venturi, which agitates the water thus oxidizing it, which reduces B.O.D.'s and C.O.D.'s, removes odors and improves water clarity.

UltraViolet Light

UltraViolet (UV) light is the third oxidizer used by **RGF** to complete the catalytic oxidation process (CO³P). UV light is a sterilizer, which kills organics by emitting ultraviolet light inside of the UV Catalytic Chamber. This ultraviolet energy is also used to excite the hydrogen peroxide and the ozone that is already in the water to enhance their individual oxidation potentials.

Cleaning Agents

In discharge systems the use of soaps or chemical additives is not recommended. If one must use detergents or additives they should be neutral pH, quick splitting variety and used sparingly. Cleaning Agents are added to open-looped recycling water systems to help remove the oils and road film off of the equipment being cleaned. Cleaning agents contain surfactants, which help to relieve the surface tension of the water, enabling the oils and particles to detach more readily from the equipment being cleaned. Some cleaning agents, however, may cause the oils to emulsify, which will not allow for easy removal, which in turn may end up back on the equipment. In order to prevent this, the cleaning agents in consideration for use with the system should be formulated with low to moderate foaming and limited oil emulsifying properties while remaining a neutral pH cleaner. **RGF** recommends the following two cleaning agents to be used with your system.

Enviro-Control

RGF has developed a specially formulated soap for closed-looped recycling systems called **Enviro-Control** to use with your system. This soap is a water white blend of biodegradable surfactants containing all of the qualities listed above, plus it helps

prevent bacteria and algae growth, inhibit corrosion. It has no dyes, perfumes or thickeners added, and it helps to flocculate oil accumulation.

Enviro-Control can be purchased in a super concentrated form through your distributor or **RGF** at 1-561-848-1826 or FAX 1-561-848-9454.

Water Conditioner-1 (WC-1)

Water conditioners are a good addition to a recycling system because they help to maintain good water quality and help in releasing suspended solids. **RGF** has available a water conditioner that can do all of this and more, the **Water Conditioner 1 (WC-1)**. This water conditioner has many water quality improving abilities. It aids in the flocculation of suspended solids, reduces B.O.D. and C.O.D. loading, and helps to soften the water. WC-1 also inhibits corrosion on your system, providing more years of service and will help to lower the total suspended solids count, which will improve the color and clarity of your recycled water. Since WC-1 can provide all of these benefits, it should be made a regular part of the chemical additions to your system.

Dissolved and Suspended Solids

Total Dissolved Solids (TDS)

T.D.S. represents the total conductive material actually dissolved in the water (refer to Section 11.0 Addendums / Training Bulletin - TB 001). It is the same as salt or sugar dissolved in water and should not be confused with suspended solids or turbidity. Total dissolved solids can include both organic and inorganic materials. Inorganic materials can be soluble in many cases and add to T.D.S.. Any chemical addition to the water will increase T.D.S. (except hydrogen peroxide). Water treatment chemicals often solve one problem but create another problem. While an addition of a floccing agent may remove suspended solids and turbidity, it may drastically increase T.D.S.

Eventually, a solution with increasing T.D.S. will reach a level where it is considered to be saturated (i.e. it has reached its solubility constant). Saturation is when the addition of a soluble or dissolved solid reaches the maximum ability of the water to hold it in solution at a given temperature. When the T.D.S. level exceeds this level, the material comes out of solution and either settles or forms crystals, which is how rock candy is made.

T.D.S. is measured by a special conductivity meter, which works on the principle that "pure" water has no conductivity of electrical current. The addition of material such as T.D.S. increases the electrical conductivity; therefore, the higher the reading, the higher the T.D.S. level. Readings are in microsiemens - a unit of low electrical current.

Total Suspended Solids (TSS)

T.S.S. represents the total amount of fine colloidal particles floating in a liquid, too small to settle out, but kept in motion by Brownian movement (refer to Section 11.0 Addendums / Training Bulletins - TB 002). Brownian movement is the rapid vibratory motion of particles suspended in a liquid caused by the bombardment of the particle by the moving molecules of the liquid. The velocity varies inversely

with the size of the particles and also depends on the viscosity of the medium. T.S.S., unlike T.D.S. (Total Dissolved Solids), does not dissolve in water and are deemed important because these solids will create unsightly conditions, sludge deposits and a demand for oxygen. Suspended solids can be organic or inorganic.

The standard way of testing waste water for suspended solids is to filter the waste water through a 0.45 μm (1 micron = 1 millionth of a meter) porosity filter. Anything on the filter paper after drying at a temperature of approximately 103°C is considered a portion of the suspended solids. Another way to measure suspended solids is by a device called a spectrophotometer. This device is used to measure photo metrically the quantity of light of a particular wavelength (S.S. = 810 nm) that is absorbed by the suspended solids in solution.

Chapter 7: Engineering Drawings

Outline

Biosorb Series I

An engineered diagram of the Biosorb Series I which indicates all of the inlet and outlet connections and dimensions, as well as location of major components.

Series II Equipment Skid

An engineered diagram of the Series II Equipment Skid which indicates all of the inlet and outlet connections and dimensions of the skid, as well as location of major components.

Series III Storage Tank

An engineered diagram of the Series III Storage Tank which indicates all of the inlet and outlet connections and dimensions associated with the tank.

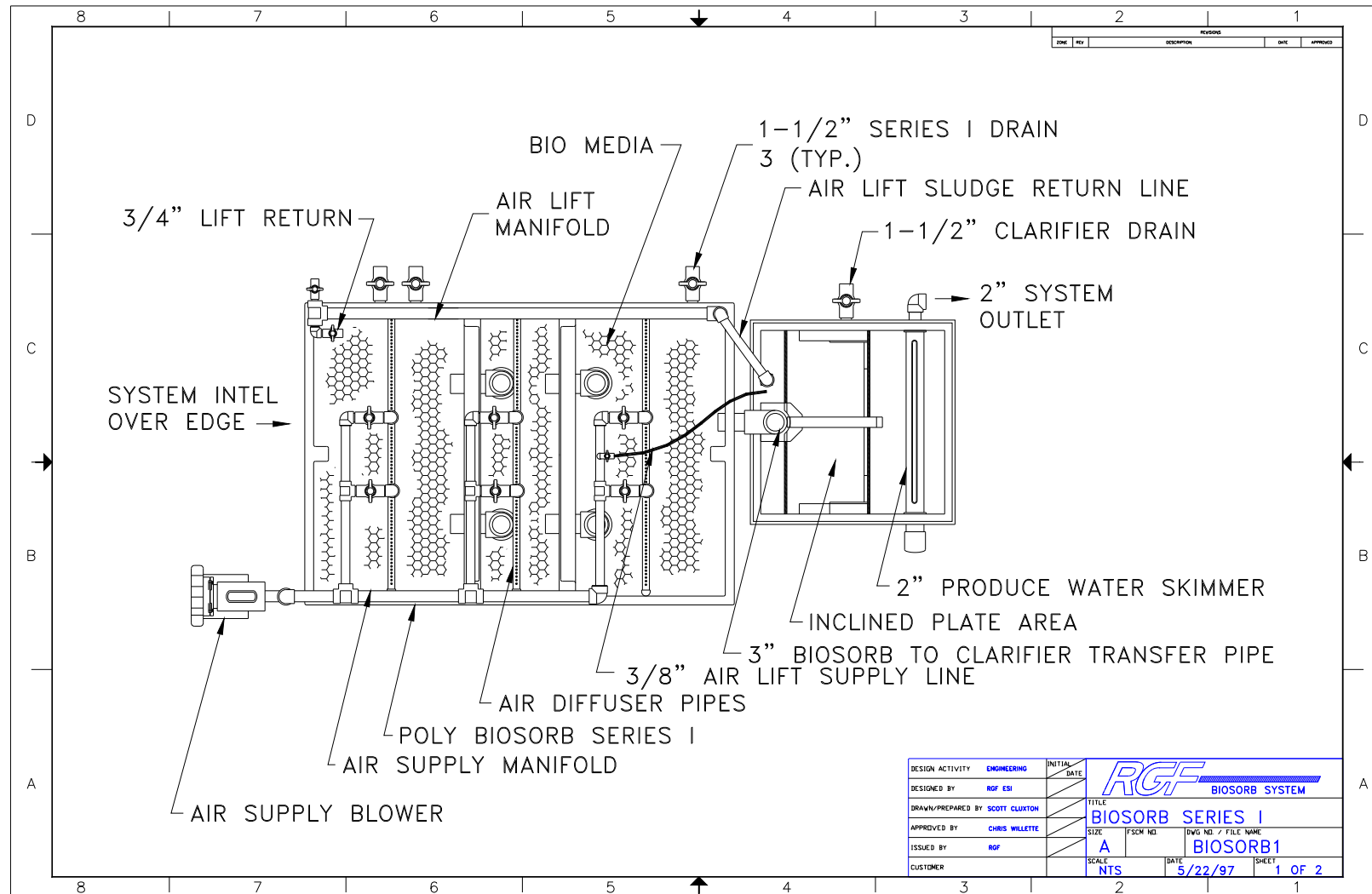
Plumbing & Instrumentation Diagram (P&ID)

An engineered diagram which indicates the flow path of the system outlining placement and nomenclature of valves, pressure gauges and unions.

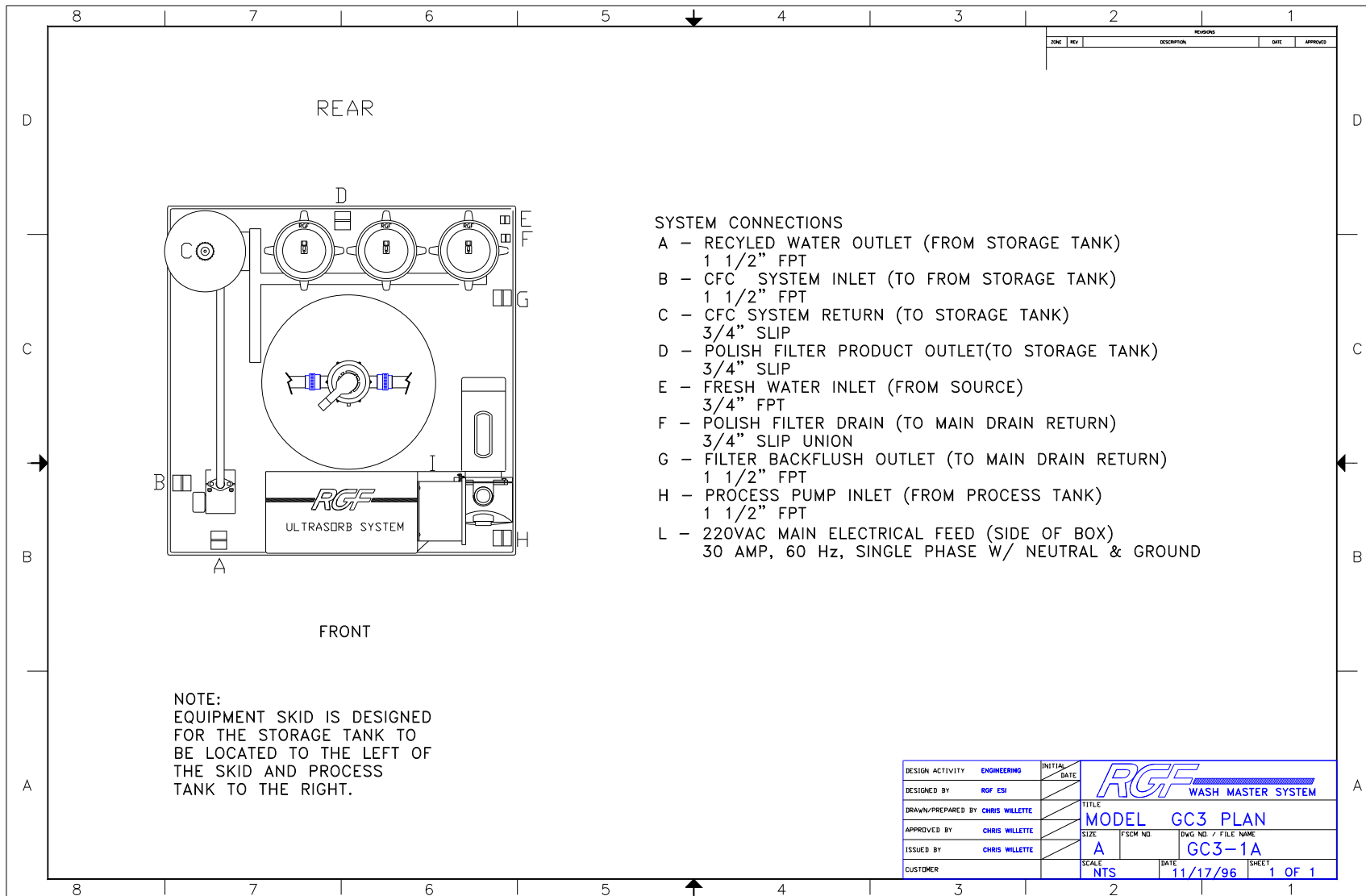
Electrical Diagram

An engineered diagram of the electrical connections and components associated with the system. This diagram is a very useful tool for the electrician when the installation is performed.

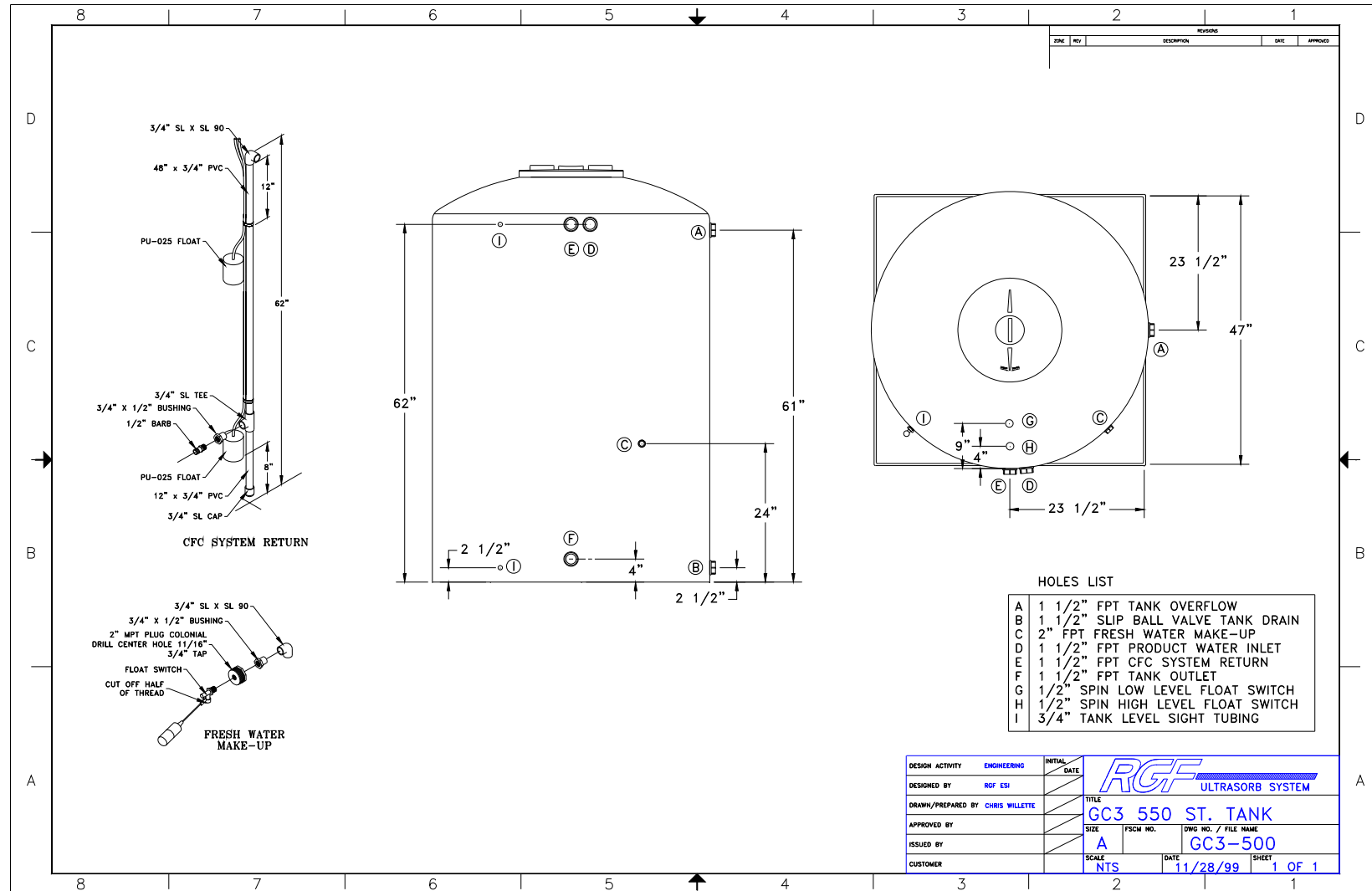
Biosorb Series I



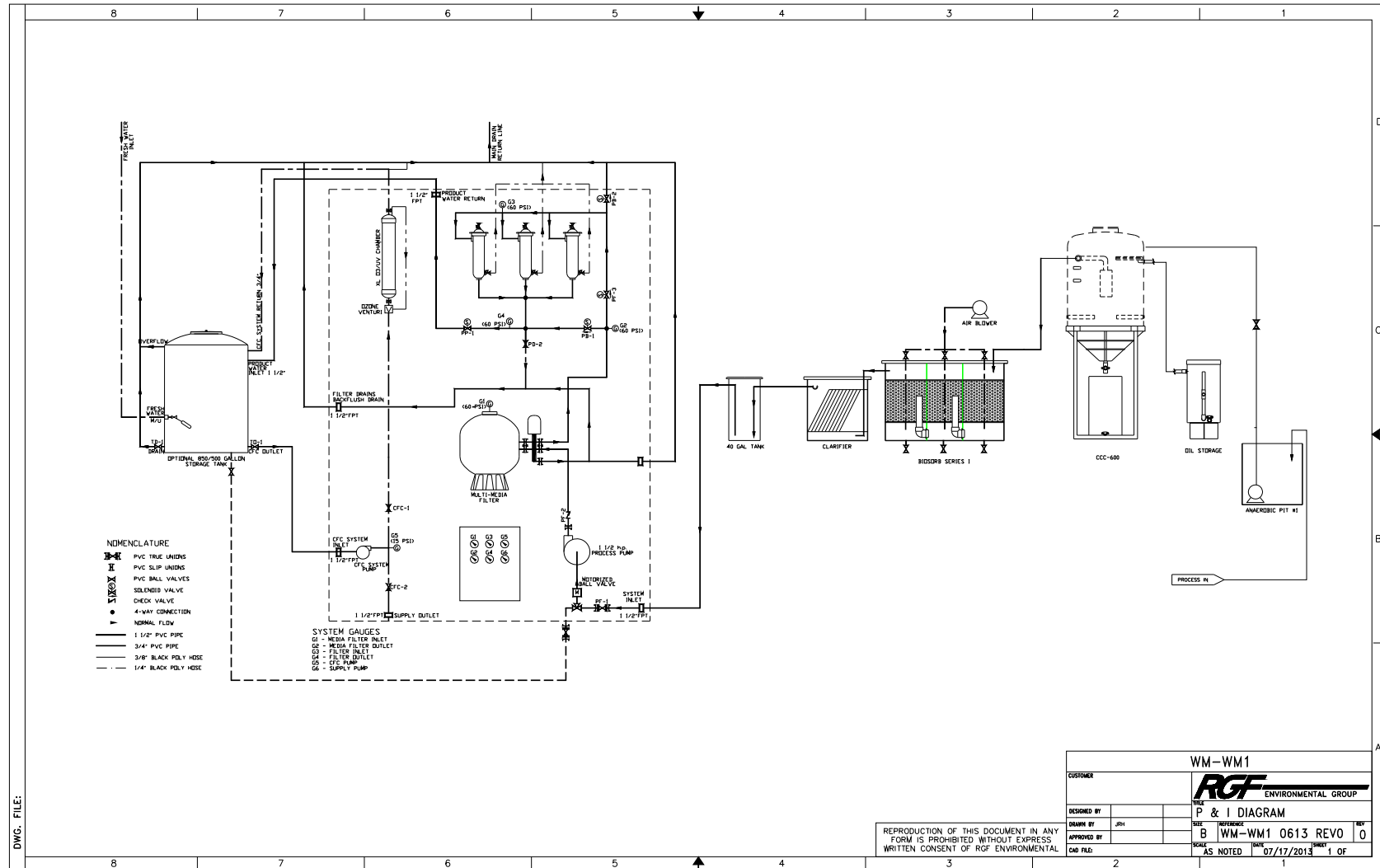
Series II Equipment Skid



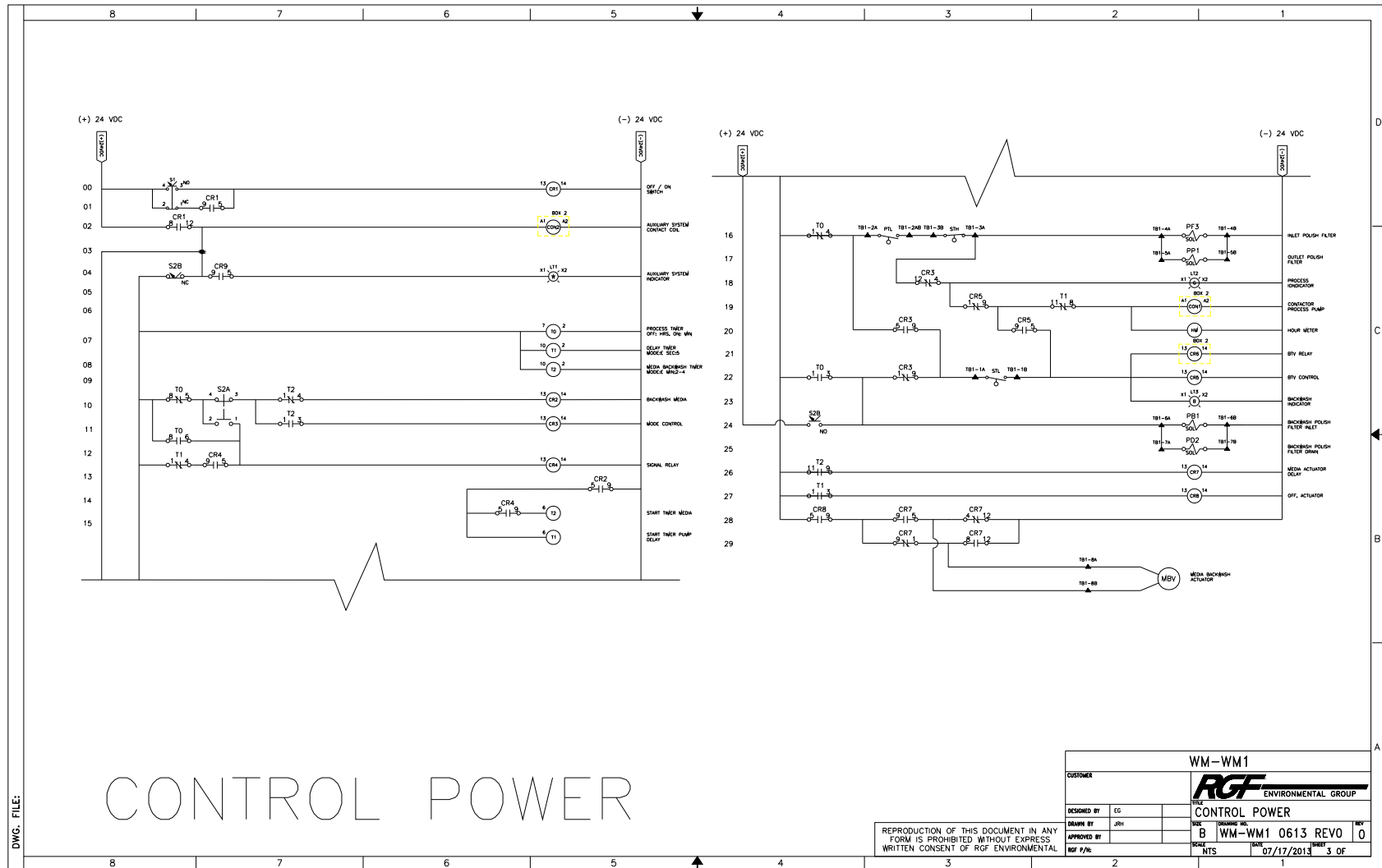
Series III Storage Tank



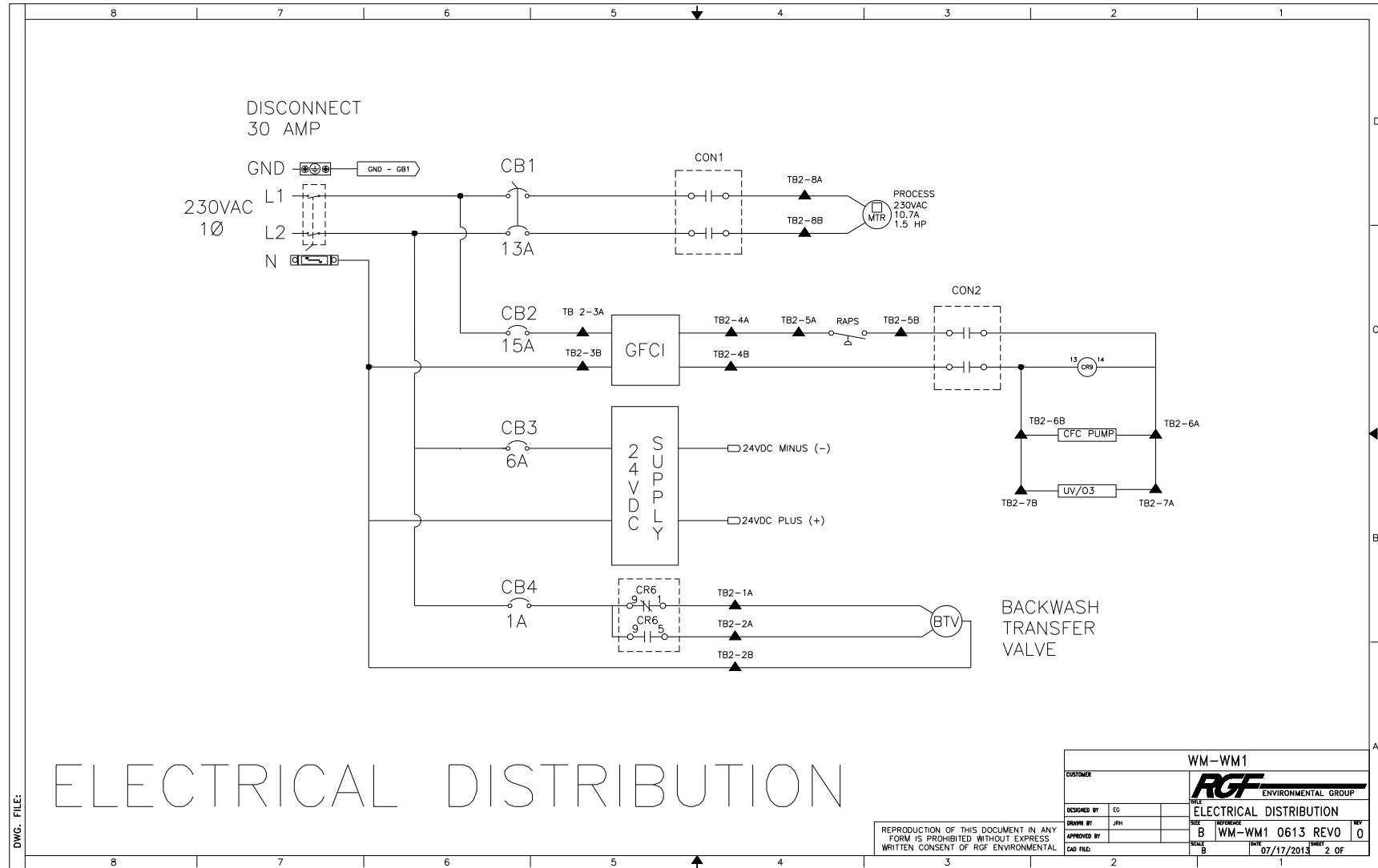
Piping & Instrumentation Diagram



Electrical Ladder Diagram



Electrical Diagram



Chapter 8: Troubleshooting

Flow

SYMPTOM	PROBABLE CAUSE	SOLUTION
PROCESS SYSTEM		
1. PROCESS PUMP NOT OPERATING	<p>A) POWER IS NOT APPLIED TO PUMP</p> <p>B) PUMP HAS LOST PRIME</p> <p>C) SYSTEM VALVES ARE IMPROPERLY ALIGNED</p>	<p>A) VERIFY POWER IS APPLIED; THE PROCESS SYSTEM CONTROL SWITCH IS IN THE PROCESS POSITION AND THE BREAKER IS SHUT. ENSURE FLOAT SWITCHES ARE PROPERLY POSITIONED, UNOBSTRUCTED AND FREE TO SWING AND ADEQUATE WATER IS IN BOTH SUCTION AND DISCHARGE TANKS. ENSURE THE PROPER ELECTRICAL CONNECTIONS WERE MADE TO THE SYSTEM. REFER TO THE PROCESS PUMP COMPONENT MANUAL.</p> <p>B) VERIFY SYSTEM LINEUP. ENSURE UNOBSTRUCTED FLOW TO PUMP SUCTION. REPRIME PUMP ENSURING THAT PUMP CASING IS WATER FILLED. OPEN THE PRIMING PLUG AND RE-PRIME PUMP.</p> <p>C) CONDUCT VALVE LINEUP WITH P&ID.</p>
2. NO OR LOW FLOW THROUGH PROCESS SYSTEM	A) POLISH FILTERS ARE CLOGGED WITH PARTICULATE	A) PERFORM A POLISHING FILTER BACK FLUSH IN ACCORDANCE WITH PMS. IF THIS DOES NOT REMEDY PROBLEM THEN FILTERS ARE FOULED AND NEED TO BE REPLACED.
2. NO OR LOW FLOW THROUGH PROCESS SYSTEM	<p>A) MULTI-MEDIA FILTER IS CLOGGED WITH PARTICULATE</p> <p>B) POLISH FILTERS ARE CLOGGED WITH PARTICULATE</p>	<p>A) PERFORM A MULTI-MEDIA FILTER BACK FLUSH IN ACCORDANCE WITH PMS. IF THIS DOES NOT REMEDY PROBLEM THEN FILTER IS FOULED AND NEEDS TO BE REPLACED.</p> <p>B) PERFORM A POLISHING FILTER BACK FLUSH IN ACCORDANCE WITH PMS. IF THIS DOES NOT REMEDY PROBLEM THEN FILTERS ARE FOULED AND NEED TO BE REPLACED.</p>

CFC SYSTEM

1. CFC PUMP NOT OPERATING	<p>A) POWER IS NOT APPLIED TO PUMP</p> <p>B) PUMP HAS LOST PRIME</p> <p>C) SYSTEM VALVE IS IMPROPERLY ALIGNED</p>	<p>A) VERIFY POWER IS APPLIED; BREAKER IS SHUT. ENSURE THE PROPER ELECTRICAL CONNECTIONS WERE MADE TO THE SYSTEM. REFER TO THE CFC PUMP COMPONENT MANUAL.</p> <p>B) CHECK WATER LEVEL IN STORAGE TANK. ENSURE UNOBSTRUCTED FLOW TO PUMP SUCTION. REPRIME PUMP ENSURING THAT PUMP CASING IS WATER FILLED. CONDUCT VALVE LINEUP WITH P&ID.</p> <p>C) CONDUCT VALVE LINEUP WITH P&ID.</p>
2. UV/O3 CHAMBER ON HOUSING IS OFF	A) OZONE GENERATOR IS DEFECTIVE	A) CALL YOUR DISTRIBUTOR OR RGF FOR FURTHER TROUBLESHOOTING ADVICE.
3. UV/O3 CHAMBER LEAKS	<p>A) UV BULB RUBBER GROMMET IS IMPROPERLY SEATED.</p> <p>B) UV CHAMBER IS OVER PRESSURIZED</p> <p>C) INNER CHAMBER GLASS IS CRACKED OR BROKEN.</p>	<p>A) RE-SEAT BULB INTO GROMMET.</p> <p>B) ENSURE UNOBSTRUCTED FLOW. CONDUCT VALVE LINEUP WITH P&ID.</p> <p>C) INNER CHAMBER MUST BE REPLACED.</p>
4. CHEMICAL INJECTION PUMP NOT OPERATING CORRECTLY.	<p>A) POWER IS NOT APPLIED TO PUMP</p> <p>B) LOW OR EMPTY CHEMICAL CONTAINER.</p> <p>C) SUCTION AND DISCHARGE HOSES ARE KINKED.</p> <p>D) PUMP IS NOT RUNNING.</p>	<p>A) CHECK FOR POWER TO THE PUMP.</p> <p>B) FILL CHEMICAL CONTAINER WITH APPROPRIATE MIXTURE.</p> <p>C) CHECK HOSES FOR KINKS. REMOVE PUMP FLEXIBLE HOSE REALIGN AND REPLACE.</p> <p>D) CHECK CHEMICAL METERING KNOB FOR SETTING. IF NOT OFF, AND PUMP STILL NOT RUNNING, THEN PUMP IS DEFECTIVE.</p>

Electrical

The WashMaster® system should be installed by a licensed electrician and should have a properly sized overcurrent protection (i.e. circuit breaker) device installed upstream of the device. Electrical Troubleshooting should be conducted by an electrically trained individual after he has carefully reviewed the electrical drawing in Section 8.3. All indications should be considered: LED illumination, pump rotation and fluid flow.

SYMPTOM	PROBABLE CAUSE	SOLUTION
PROCESS SYSTEM		
1. INDICATOR LIGHTS NOT OPERATING	A) POWER IS NOT APPLIED B) LIGHT IS BLOWN OUT C) LOOSE WIRES D) BAD GROUND	A) VERIFY POWER IS APPLIED; THE SYSTEM B) CONSULT TECHNICIAN OR REMOVE 4X4 ELECT. BOX FROM REAR OF PANEL AND REPLACE LIGHT. C) CHECK ALL WIRE CONNECTIONS WITH MAIN POWER TURNED OFF AND TIGHTEN IF LOOSE. D) OPEN MAIN ELECT. BOX, CHECK GROUND STRIPS FOR LOOSE WIRE THEN TIGHTEN, IF NECESSARY
2. PROCESS SWITCHES NOT OPERATING	A) POWER IS NOT APPLIED B) LOOSE WIRES C) BAD GROUND D) BLOWN SWITCH	A) VERIFY POWER IS APPLIED; THE SYSTEM CONSULT TECHNICIAN OR REMOVE 4X4 ELECT. BOX FROM REAR OF PANEL AND REPLACE. B) CHECK ALL WIRE CONNECTIONS WITH MAIN POWER TURNED OFF AND TIGHTEN IF LOOSE. C) OPEN MAIN ELECT. BOX, CHECK GROUND STRIPS FOR LOOSE WIRE THEN TIGHTEN IF NECESSARY D) REMOVE 4X4 BOX ON REAR OF PANEL AND REPLACE PER ELECT. DIAGRAM.
3. UV/O3 LIGHT NOT OPERATING	A) GFI BLOWN BREAKER B) GFI LOOSE WIRES C) BURNED OUT BULB	A) OPEN GFI COVER AND PRESS RESET B) CHECK ALL WIRE CONNECTIONS WITH MAIN POWER TURNED OFF AND TIGHTEN IF LOOSE. C) CALL RGF OR YOUR DISTRIBUTOR

Chemistry

SYMPTOM	PROBABLE CAUSE	SOLUTION
CHEMICAL		
1. EFFLUENT RECYCLED WATER SMELLS	A) HYDROGEN PEROXIDE FEED SYSTEM SOLUTION IS LOW OR EMPTY. B) HYDROGEN PEROXIDE FEED SYSTEM IS NOT WORKING PROPERLY. C) UV/O3 CHAMBER NOT OPERATING.	A) REFILL HYDROGEN PEROXIDE FEED SYSTEM. B) REFER TO THE LMI PUMP OPERATION MANUAL. C) SEE ELECTRICAL: UV/O3 CHAMBER NOT OPERATING.
2. EFFLUENT RECYCLED WATER IS VERY CLOUDY.	A) HYDROGEN PEROXIDE FEED SYSTEM SOLUTION IS LOW OR EMPTY. B) HYDROGEN PEROXIDE FEED SYSTEM IS NOT WORKING PROPERLY. C) UV/O3 CHAMBER NOT OPERATING. D) THE WATER CONDITIONER (WC-1, OPTIONAL) HAS NOT BEEN ADDED OR RESIDUAL LEVEL IS LOW.	A) REFILL HYDROGEN PEROXIDE FEED SYSTEM. B) REFER TO THE LMI PUMP OPERATION MANUAL C) SEE ELECTRICAL: UV/O3 CHAMBER NOT OPERATING. D) INCREASE THE WC-1 INJECTION RATE.

NOTE:

If repeated attempts to reduce smell or clear up the recycled water fail to improve the water quality, or if the amount of soap needed to clean adequately rises to an unacceptable level. The water has become overburden with dissolved and suspended solids. The system should be drained and the spent water disposed of in accordance with local, state and federal regulations.

Chapter 9: Replacement Parts

General Ordering Information

When preparing to order replacement parts for your system:

- Have the **Model #** and **Serial #** of the unit ready when trying to order.
- Have the ship to address ready.
- Identify the part needed with the part # and description and call *RGF* or your local distributor to place an order.

Replacement Parts List

The following is a list of commonly needed replacement parts.

PART #	DESCRIPTION
--------	-------------

Filters and Parts

FL-078	FILTER MEDIA FOR MULTI-MEDIA FILTER
FP-073	MULTI-MEDIA FILTER VALVE ASSEMBLY
FL-086	POLISHING FILTER CARTRIDGE (ONE)
FP-51	O-RING FOR POLY FILTER HOUSING

Pumps and Parts

PU-131	1/2 Hp. CFC SYSTEM PUMP
PU-140	1-1/2 Hp. CENTRIFUGAL PROCESS PUMP
PU-142	VITON SEAL FOR 1 1/2 Hp., PUMP
PU-32	1/3 Hp. S.S. LIFT STATION SUMP PUMP
PU-20	PUMP UP FLOAT SWITCH (30' CORD)
PU-25	PUMP DOWN FLOAT SWITCH (30' CORD)
PU-129Y	PERISTALTIC CHEMICAL INJECTION PUMP

Valves and Unions

VA-06-1	3/4" PVC BALL VALVE
VA-06-4	1 1/2" PVC BALL VALVE
VA-100	3/4" SOLENOID VALVE ASSEMBLY (NORMALLY CLOSED)
VA-100-1	3/4" 1 1/2" ELECTRIC SOLENOID COIL ONLY (120 VAC)
VA-22	1/2" BRASS FLOAT VALVE WITH FLOAT
VA-100	1 1/2" SOLENOID VALVE ASSEMBLY (NORMALLY CLOSED)
PF-253	3/4" PVC UNION
PF-256	1 1/2" PVC UNION
VA-51	1/4" FPT X 3/8" TUBE 90 DEG PVC VALVE

Misc. Parts

PT-304	OZONE VENTURI
SA-005T-16	UV/O3 CATALYTIC CHAMBER
HF-23	1/4" O.D. POLYETHYLENE TUBING

Chapter 10: Sub-Component Manuals

Process Pump



ITT

BGT

Residential Water Systems

Goulds Pumps

GT IRRI-GATOR™ Self-Priming®
Centrifugal Pumps – 60 Hz



New base on 1½ – 3 HP models.



GOULDS PUMPS

Goulds Pumps is a brand of ITT Corporation.

www.goulds.com

Engineered for life

FEATURES

- ① ■ **Self-Priming Design:** Once pump is initially primed, filled with water, it will reprime when the water level rises above the end of the suction pipe.
- **Serviceable:**
 - Back pullout design allows disassembly of pump for service without disturbing piping.
 - Two compartment motor for easy access to motor wiring and replaceable components.
- **Diffuser (Guidevane):** Bolt down diffuser provides positive alignment with impeller. Diffuser has stainless wear ring for extended performance in abrasive conditions. F.D.A. compliant, injection molded, food grade, glass filled Lexan® for durability and abrasion resistance.
- **Impeller:** F.D.A. compliant, glass filled Noryl®. Corrosion and abrasion resistant.
- **Corrosion Resistant:** Electro-coat paint process is applied inside and out, then baked on.
- **Casing:** Cast iron construction. Four (4) bolt, back pull-out design. Tapped openings provided for vacuum gauge and casing drain.
- **Powered for Continuous Operation:** Pump ratings are within the motor manufacturer's recommended working limits. Can be operated continuously without damage.
- **Mechanical Seal:** Carbon/ceramic faces, BUNA elastomers, 300 series stainless steel metal parts. Pump design prevents the seal from running dry.

Goulds Pumps

GT Irri-Gator Self-Priming Centrifugal Pumps

APPLICATIONS

Specifically designed for the following uses:

- Lawn sprinkling
- Irrigation
- Air conditioning systems
- Heat pumps
- Water transfer
- Dewatering

SPECIFICATIONS

Pump:

- Pipe connections:
1½" NPT suction
1½" NPT discharge
- Capacities: to 110 GPM at 5 foot suction lift.
- Heads: to 128 feet.
- Reprime capabilities: to 25 feet suction lift.

- Maximum working pressure: 125 PSIG.
- Maximum water temperature: 140° F (60° C).
- Rotation: clockwise when viewed from motor end.

Motor:

- NEMA standard open drip proof.
- 60 Hz, 3500 RPM.
- Stainless steel shaft.
- Single phase: ¼–1½ HP, 115/230 V; 2 and 3 HP, 230 V only. Built-in overload with automatic reset.
- Three phase: 230/460 V. Overload protection must be provided in starter unit. Starter and heaters (3) must be ordered separately.
- Optional TEFC motors are available. See price book for order numbers.

AGENCY LISTINGS



Canadian Standards Association



Underwriters Laboratories

Goulds Pumps is ISO 9001 Registered.

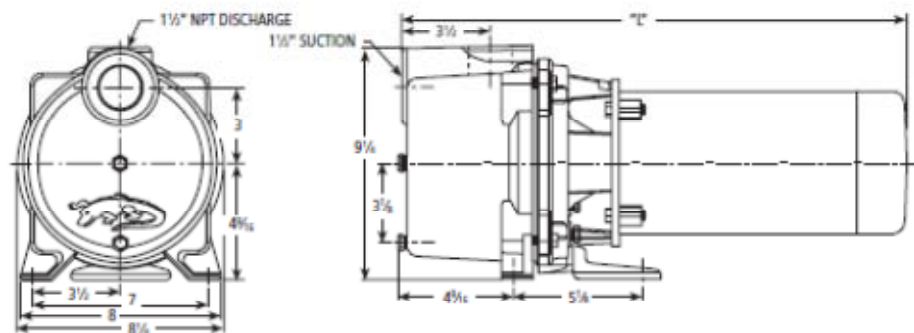
STANDARD ODP MODELS

Model	HP	Phase
GT07	¼	1
GT10	1	
GT15	1½	
GT20	2	
GT30	3	3
GT073	¼	
GT103	1	
GT153	1½	
GT203	2	
GT303	3	

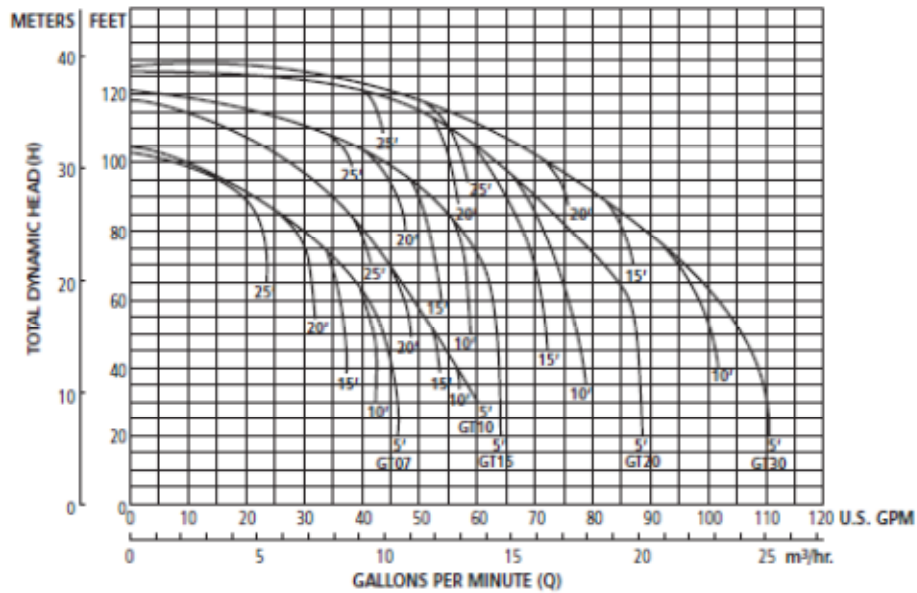
DIMENSIONS AND WEIGHTS

Model	GT07	GT10	GT15	GT20	GT30	GT073	GT103	GT153	GT203	GT303
HP	¼	1	1½	2	3	¼	1	1½	2	3
Length "L"	19½	19½	21½	20½	21½	19	19½	20½	20½	21½
Width	8½									
Height	9½									
Weight (lbs.)	48	52	60	65	76	49	52	55	69	71
Phase	Single					Three				

(All dimensions are in inches and weights in lbs. Do not use for construction purposes.)



PERFORMANCE CURVE



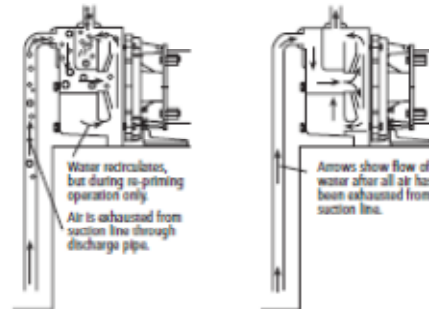
Single and three phase have same performance.

PERFORMANCE RATINGS

Model	PSI Discharge Pressure	Section Lift In Feet				
		5	10	15	20	25
GT07/ GT073	20	44	41	36	31	24
	30	34	31	26	22	14
	40	10	4	0	0	0
GT10/ GT103	20	53	51	49	46	41
	30	43	41	38	36	32
	40	29	22	16	8	0
GT15/ GT153	20	63	59	54	49	39
	30	60	55	51	46	37
	40	45	38	33	20	14
GT20/ GT203	20	86	77	70	59	46
	30	80	72	67	57	44
	40	65	60	57	50	43
GT30/ GT303	20	105	100	88	76	60
	30	92	90	84	75	57
	40	73	67	62	55	50

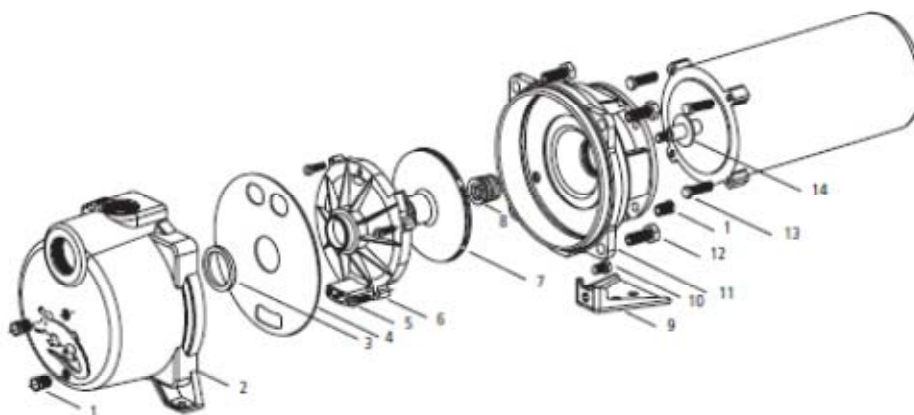
Performance ratings are in GPM.

SELF-PRIMING (AFTER INITIAL PRIME)[®]



COMPONENTS

Item No.	Description
1	Plug – 1/4" NPT
2	Casing
3	Seal ring – diffuser
4	Diaphragm
5	Machine screw
6	Diffuser
7	Impeller
8	Mechanical seal
9	Foot
10	Bolt – foot to adapter
11	Motor adapter
12	Bolt – casing to adapter
13	Bolt – adapter to motor
14	Deflector




ITT
2881 East Bayard Street, Seneca Falls, NY 13148
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www.goulds.com

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CFC System Pump

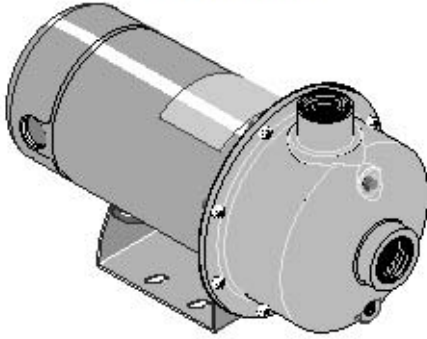


OWNER'S MANUAL

INSTALLATION AND OPERATING INSTRUCTIONS
REPAIR PARTS LIST

"SSCX" AND "SSCXS" SERIES CENTRIFUGAL PUMP

High Head



MODELS

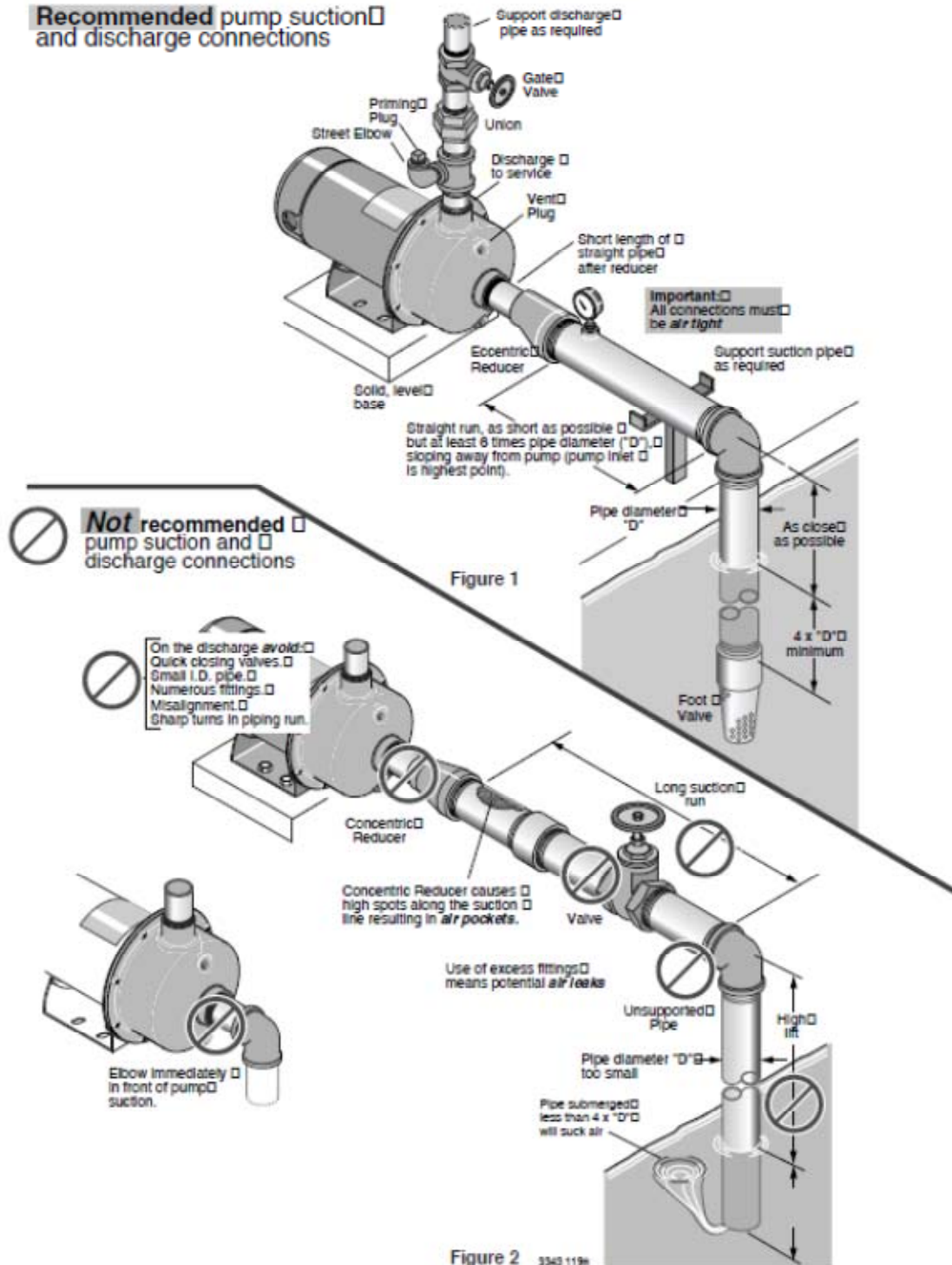
HP	Model Number	ODP MOTORS		TEFC MOTORS	
		115/230/60/1	208-230/460/60/3	115/230/60/1	208-230/460/60/3
1/2	SS1XN-½	B78635	B78636	B78647	B78648
3/4	SS1XN-¾	B78637	B78638	B78649	B78650
3/4	SS1XS-¾	B82411	B82412	B82413	B82414
1	SS1XN-1	B78639	B78640	B78651	B78652
1	SS1XS-1	B82415	B82416	B82417	B82418
1-1/2	SS1XN-1½	B78641	B78642	B78653	B78654
1-1/2	SS1XS-1½	B82419	B82420	B82421	B82422
2	SS1XN-2	B78643*	B78644	B78655*	B78656
2	SS1XS-2	B82423*	B82424	B82425	B82426
2-1/2	SS1XN-2½	B78645*	B78646	B78657*	B78658
2-1/2	SS1XS-2½	B82427*	B82428	B82429*	B82430

* 230 Volt only.

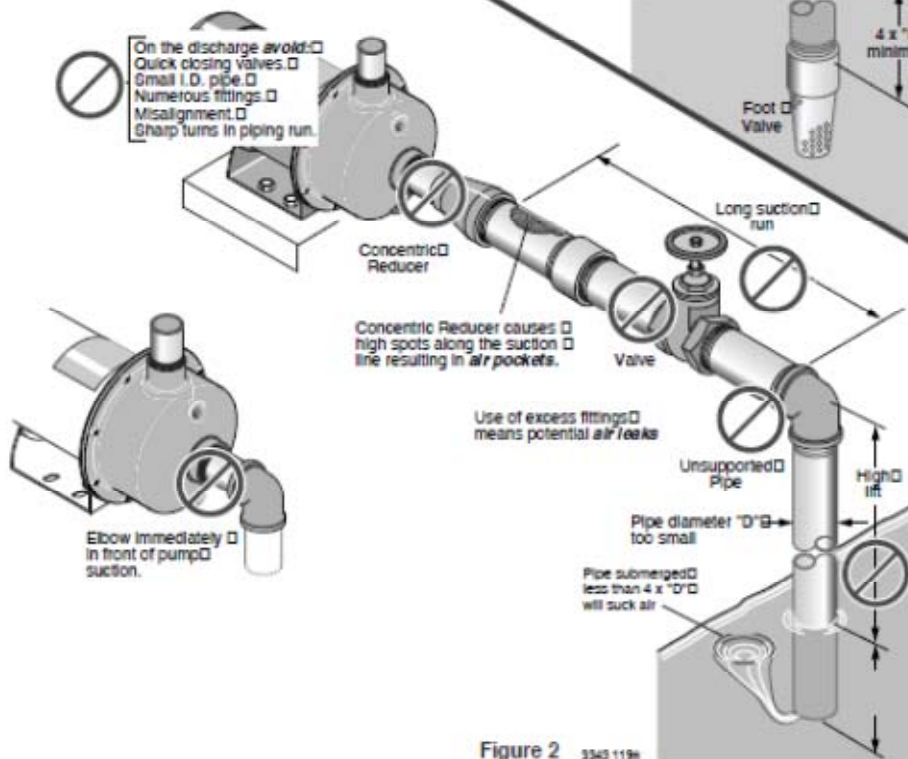
Berkeley Pumps / 293 Wright Street / Delavan, WI 53115

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Recommended pump suction and discharge connections



Not recommended pump suction and discharge connections



PIPING - GENERAL

Support both suction and discharge piping independently at a point near the pump to avoid putting a strain on the pump housing. Start all piping **AT THE PUMP**.

Increase pipe diameter at both the suction and discharge by one (1) standard pipe size (minimum) to obtain desired performance and flow rate. Refer to Table I when sizing pipe for your pumping system.

NOTE: Do not use pipe with smaller diameter on the suction side of pump.

TABLE I

Pipe Tapping Size On Pump		Recommended Pipe Size	
Suction	Discharge	Suction	Discharge
1-1/4	1	1-1/2	1-1/4
1-1/2	1-1/4	2	1-1/2

SUCTION PIPE

Increase pipe size from pump tapping as shown in Table I.

Figure 1 (Page 2) depicts a recommended run of pipe and fittings for the suction side of a centrifugal pump. Please refer to this illustration when choosing pipe and fittings for your suction connection.

IMPORTANT: All connections must be air tight!

Figure 2 (Page 2) depicts conditions that are **NOT DESIRABLE** on the suction side of a centrifugal pump and may cause problems in flow rate and priming. Please look this illustration over carefully before choosing pipe and fittings for your suction connection.

DISCHARGE PIPING

Increase pipe size from pump tapping as show in Table I. Figure 1 (Page 2) depicts a recommended run of pipe and fittings for the discharge. Install tee with priming plug as close to pump as possible. Figure 2 (Page 2) notes conditions that should be avoided. Please read over carefully before making discharge connection.

PRIMING THE PUMP

A pump is primed when all air in the suction line and pump volute has been evacuated and replaced with water.

To Prime:

1. Close valve in discharge line.
2. Remove priming plug from tee and fill pump and suction line with water until water is flowing back out of tee.
3. Replace priming plug.
4. Start pump and slowly open valve until desired water flow is achieved.

NOTE: If no water is pumped after 5 minutes, turn off pump, close valve, and repeat steps 1 thru 4.

⚠ WARNING Risk of explosion and scalding. Never run pump against closed discharge. To do so can boil water inside pump, causing hazardous pressure buildup and possible explosion.

⚠ CAUTION Risk of flooding. Do not run the pump dry. This will damage mechanical seal and void warranty. It may cause burns to person handling pump.

⚠ CAUTION Motor normally operates at high temperature and will be too hot to touch. It is protected from heat damage during operation by an automatic internal cutoff switch. Before handling pump or motor, stop motor and allow it to cool for 20 minutes.

TABLE II - RECOMMENDED FUSING AND WIRING DATA - 60/50 CYCLE MOTORS

MODEL	MOTOR HP	VOLTAGE	MAX. LOAD AMPERES	BRANCH FUSE* RATING AMPS	DISTANCE IN FEET FROM MOTOR TO METER				
					0' TO 100'	101' TO 200'	201' TO 300'	301' TO 400'	401' TO 500'
					WIRE SIZE				
SINGLE PHASE - ODP MOTORS									
SS1XN-1/2	1/2	115/230/1	8.8/4.4	15/15	14/14	12/14	10/14	8/14	8/12
SS1XN-3/4	3/4	115/230/1	12.4/6.2	20/15	12/14	10/14	8/14	6/12	6/12
SS1XS-3/4	3/4	115/230/1	14.8/7.4	20/15	12/14	8/14	6/14	6/12	4/10
SS1XN-1	1	115/230/1	14.8/7.4	20/15	12/14	8/14	6/14	6/12	4/10
SS1XS-1	1	115/230/1	19.2/9.6	25/15	10/14	8/14	6/12	4/10	4/10
SS1XN-1 1/2	1-1/2	115/230/1	19.2/9.6	25/15	10/14	8/14	6/12	4/10	4/10
SS1XS-1 1/2	1-1/2	115/230/1	24.0/12.0	30/15	10/14	6/12	6/12	4/10	3/8
SS1XKN-2	2	115/230/1	24.0/12.0	30/15	10/14	6/12	6/12	4/10	3/8
SS1XS-2	2	115/230/1	28.0/13.0	35/20	8/12	6/12	4/10	4/10	3/8
SS1XKN-2 1/2	2-1/2	115/230/1	28.0/13.0	35/20	8/12	6/12	4/10	4/10	3/8
SS1XS-2 1/2	2-1/2	115/230/1	28.0/13.0	35/20	8/12	6/12	4/10	4/10	3/8
SINGLE PHASE - TEFC MOTORS									
SS1XN-1/2	1/2	115/230/1	8.2/4.1	15/15	14/14	12/14	10/14	8/14	8/12
SS1XN-3/4	3/4	115/230/1	11.6/5.8	20/15	14/14	10/14	8/14	6/14	6/12
SS1XS-3/4	3/4	115/230/1	14.2/7.1	20/15	12/14	12/14	10/14	8/12	8/10
SS1XN-1	1	115/230/1	14.2/7.1	20/15	12/14	12/14	10/14	8/12	8/10
SS1XS-1	1	115/230/1	18.0/9.0	25/15	10/14	8/14	6/12	4/10	4/10
SS1XN-1 1/2	1-1/2	115/230/1	18.0/9.0	25/15	10/14	8/14	6/12	4/10	4/10
SS1XS-1 1/2	1-1/2	115/230/1	11.7	15	14	14	12	10	10
SS1XKN-2	2	230/1	11.7	15	14	14	12	10	10
SS1XS-2	2	230/1	11.7	15	14	14	12	10	10
SS1XKN-2 1/2	2-1/2	230/1	11.7	15	14	14	12	10	10
SS1XS-2 1/2	2-1/2	230/1	11.7	15	14	14	12	10	10
THREE PHASE - ODP MOTORS									
SS1XN-1/2	1/2	230/480/3	2.3/1.15	15	14/14	14/14	14/14	14/14	14/14
SS1XN-3/4	3/4	230/480/3	3.1/1.55	15	14/14	14/14	14/14	14/14	14/14
SS1XS-3/4	3/4	230/480/3	3.8/1.8	15	14/14	14/14	14/14	14/14	14/14
SS1XN-1	1	230/480/3	3.8/1.8	15	14/14	14/14	14/14	14/14	14/14
SS1XS-1	1	230/480/3	4.7/2.35	15	14/14	14/14	14/14	14/14	14/14
SS1XN-1 1/2	1-1/2	230/480/3	4.7/2.35	15	14/14	14/14	14/14	14/14	14/14
SS1XS-1 1/2	1-1/2	230/480/3	6.8/2.4	15	14/14	14/14	14/14	12/14	12/14
SS1XKN-2	2	230/480/3	6.8/2.4	15	14/14	14/14	14/14	12/14	12/14
SS1XS-2	2	230/480/3	8.5/4.25	15	14/14	14/14	14/14	12/14	12/14
SS1XKN-2 1/2	2-1/2	230/480/3	8.5/4.25	15	14/14	14/14	14/14	12/14	12/14
SS1XS-2 1/2	2-1/2	230/480/3	8.5/4.25	15	14/14	14/14	14/14	12/14	12/14
THREE PHASE - TEFC MOTORS									
SS1XN-1/2	1/2	208-230/480/3	2.2/1.1	15	14/14	14/14	14/14	14/14	14/14
SS1XN-3/4	3/4	208-230/480/3	2.9/1.45	15	14/14	14/14	14/14	14/14	14/14
SS1XS-3/4	3/4	208-230/480/3	3.6/6.8	15	14/14	14/14	14/14	14/14	14/14
SS1XN-1	1	208-230/480/3	3.6/6.8	15	14/14	14/14	14/14	14/14	14/14
SS1XS-1	1	208-230/480/3	4.8/2.4	15	14/14	14/14	14/14	14/14	14/14
SS1XN-1 1/2	1-1/2	208-230/480/3	4.8/2.4	15	14/14	14/14	14/14	14/14	14/14
SS1XS-1 1/2	1-1/2	208-230/480/3	6.0/3.0	15	14/14	14/14	14/14	14/14	12/14
SS1XKN-2	2	208-230/480/3	6.0/3.0	15	14/14	14/14	14/14	14/14	12/14
SS1XS-2	2	208-230/480/3	7.0/3.5	15	14/14	14/14	14/14	12/14	12/14
SS1XKN-2 1/2	2-1/2	208-230/480/3	7.0/3.5	15	14/14	14/14	14/14	12/14	12/14
SS1XS-2 1/2	2-1/2	208-230/480/3	7.0/3.5	15	14/14	14/14	14/14	12/14	12/14

*A Fusetron is recommended instead of a fuse in any motor circuit.

ELECTRICAL

Connection diagram for dual voltage, single-phase motors. Your dual-voltage motor's terminal board (under the motor end cover) will match one of the diagrams below. Follow that diagram if necessary to convert motor to 115 Volt power. Connect power supply wires to L1 and L2.

For 3-phase motors, TEFC motors, and motors that do not match these pictures, follow the connection diagram on the motor nameplate, or in the connection box.

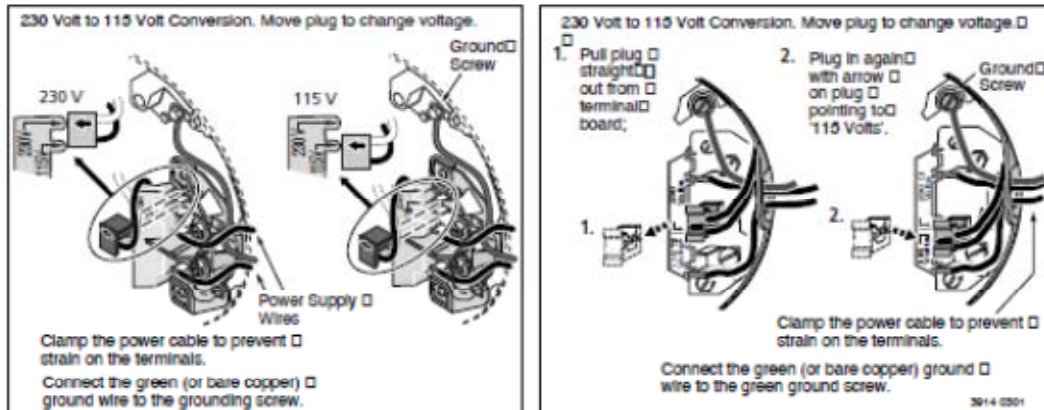


FIGURE 3 - 115/230V Dual Voltage Single Phase Wiring Diagram - ODP Motors

⚠ WARNING Hazardous voltage. Can shock, burn, or cause death. Disconnect power to motor before working on pump or motor. Ground motor before connecting to power supply.

WIRING

⚠ Ground motor before connecting to electrical power supply. Failure to ground motor can cause severe or fatal electrical shock hazard.

⚠ Do not ground to a gas supply line.

⚠ To avoid dangerous or fatal electrical shock, turn OFF power to motor before working on electrical connections.

⚠ Supply voltage must be within $\pm 10\%$ of nameplate voltage. Incorrect voltage can cause fire or damage motor and voids warranty. If in doubt consult a licensed electrician.

⚠ Use wire size specified in Wiring Chart (Page 3). If possible, connect pump to a separate branch circuit with no other appliances on it.

⚠ Wire motor according to diagram on motor nameplate. If nameplate diagram differs from diagrams above, follow nameplate diagram.

1. Install, ground, wire and maintain your pump in compliance with the National Electrical Code (NEC) in the U.S., or the Canadian Electrical Code (CEC), as applicable, and with all local codes and ordinances that apply. Consult your local building inspector for code information.
2. Provide a correctly fused disconnect switch for protection while working on motor. For switch requirements, consult your local building inspector for information about codes.

3. Disconnect power before servicing motor or pump. If the disconnect switch is out of sight of pump, lock it open and tag it to prevent unexpected power application.

4. Ground the pump permanently using a wire of the same size as that specified in wiring chart (Page 3). Make ground connection to green grounding terminal under motor canopy marked GRD, or Ⓧ.

5. Connect ground wire to a grounded lead in the service panel or to a metal underground water pipe or well casing at least 10 feet long. Do not connect to plastic pipe or insulated fittings.

6. Protect current carrying and grounding conductors from cuts, grease, heat, oil, and chemicals.

7. Connect current carrying conductors to terminals L1 and L2 under motor canopy. When replacing motor, check wiring diagram on motor nameplate against Figure 3. If the motor wiring diagram does not match either diagram in Figure 3, follow the diagram on the motor.

IMPORTANT: 115/230 Volt single phase models are shipped from factory with motor wired for 230 volts. If power supply is 115 volts, remove motor canopy and reconnect motor as shown in Figure 3. Do not try to run motor as received on 115 volt current.

8. Motor has automatic internal thermal overload protection. If motor has stopped for unknown reasons, thermal overload may restart it unexpectedly, which could cause injury or property damage. Disconnect power before servicing motor.

9. If this procedure or the wiring diagrams are confusing, consult a licensed electrician.

SERVICE

PUMP SERVICE

This centrifugal pump requires little or no service other than reasonable care and periodic cleaning. Occasionally, however, a shaft seal may become damaged and must be replaced. The procedure as outlined below will enable you to replace the seal.

NOTICE: Pumps use mechanical seals with a rubber seat ring or a sealing O-Ring. THESE SEALS ARE COMPLETELY INTERCHANGEABLE.

NOTICE: The highly polished and lapped faces of this seal are easily damaged. Read instructions and handle the seal with care. Some models are equipped with an impeller screw, which has a left hand thread. Before unscrewing the impeller, remove the impeller screw.

REMOVAL OF OLD SEAL

1. After unscrewing impeller, carefully remove rotating part of seal by prying up on sealing washer, using two screwdrivers (see Figure 4A). Use care not to scratch motor shaft.
2. Remove seal plate from motor and place on flat surface, face down. Use a screwdriver to push ceramic seat out from seal cavity (see Figure 4B).

INSTALLATION OF FLOATING SEAT (Figure 4C)

1. Clean polished surface of floating seat with clean cloth.

2. Turn seal plate over so seal cavity is up, clean cavity thoroughly.
3. Lubricate outside rubber surface of ceramic seat with soapy water and press firmly into seal cavity with finger pressure. If seat will not locate properly in this manner, place cardboard washer over polished face of seat and press into seal cavity using a 3/4" socket or 3/4" piece of standard pipe.
4. **DISPOSE OF CARDBOARD WASHER.** Be sure polished surface of seat is free of dirt and has not been damaged by insertion. Remove excess soapy water.

INSTALLATION OF ROTATING PART OF SEAL UNIT (Figure 4D)

1. Reinstall seal plate using extreme caution not to hit ceramic portion of seal on motor shaft.
2. Inspect shaft to make sure that it is clean.
3. Clean face of sealing washer with clean cloth.
4. Lubricate inside diameter and outer face of rubber drive ring with soapy water and slide assembly on motor shaft (sealing face first) until rubber drive ring hits shaft shoulder.
5. Screw impeller onto shaft until impeller hub hits shaft shoulder. This will automatically locate seal in place and move the sealing washer face up against seat facing. Reinstall impeller screw (if used).

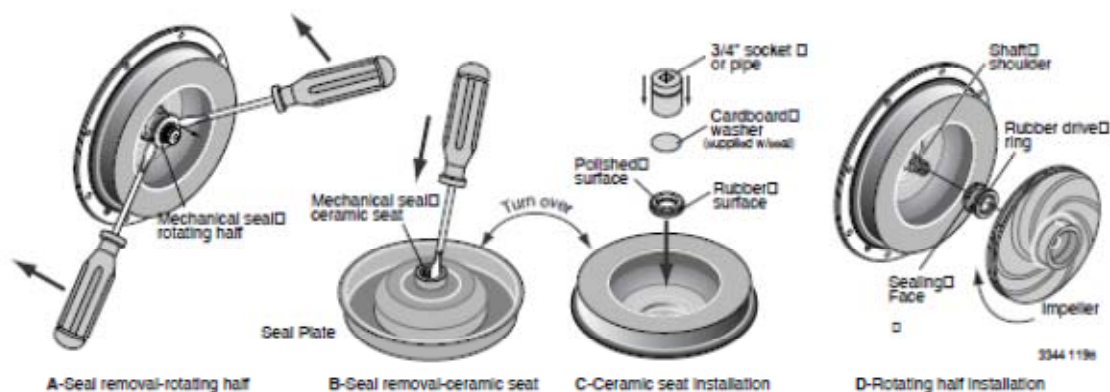


FIGURE 4: Seal replacement

TROUBLE - CAUSES AND REMEDY

TROUBLE AND CAUSE	REMEDY
FAILURE TO PUMP 1. Pump not properly primed.	1. Make sure pump casing and suction line are full of water. See priming instructions.
REDUCED CAPACITY AND/OR HEAD 1. Air pockets or leaks in suction line. 2. Clogged impeller.	1. Check suction piping. 2. Remove and clean.
PUMP LOSES PRIME 1. Air leaks in suction line. 2. Excessive suction lift and operating too near shut-off point. 3. Water level drops while pumping, uncovering suction piping.	1. Check suction piping 2. Move pump nearer to water level. 3. Check water supply. Add length of pipe to suction to keep submerged end under water.
MECHANICAL TROUBLES AND NOISE 1. Bent shaft and/or damaged bearings. 2. Suction and/or discharge piping not properly supported and anchored.	1. Take motor to authorized motor repair shop. 2. See that all piping is supported to relieve strain on pump assembly.

REPAIR PARTS LIST

Key No.	Part Description	No. Used	MOTOR AND HORSEPOWER					
			SS1XN-1/2	SS1XN-3/4	SS1XN-1	SS1XN-1 1/2	SS1XN-2	SS1XN-2 1/2
			B78635 B78647 B78636 B78648 1/2 HP	B78637 B78649 B78638 B78650 3/4 HP	B78639 B78651 B78640 B78652 1 HP	B78641 B78653 B78642 B78654 1-1/2 HP	B78643 B78655 B78644 B78656 2 HP	B78645 B78646 B78657 B78658 B80427† B80428†† B80429† B80430†† 2-1/2 HP
1*	Motor, 115/230V/60 Hz., 1 Phase, ODP	1	B80440	B80441	B80442	B80443	B80444	B80445
1*	Motor, 115/230V/60 Hz., 1 Phase, TEFC	1	B80452	B80453	B80454	B80455	B80456	B80457
1*	Motor, 208-230/460V/60 Hz., 3 Phase, ODP	1	B80446	B80447	B80448	B80449	B80450	B80451
1*	Motor, 230/460V/60 Hz., 3 Phase, TEFC	1	B80458	B80459	B80460	B80461	B80462	B80463
2	Water Slinger	1	17351-0009	17351-0009	17351-0009	17351-0009	17351-0009	17351-0009
3	Seal Plate	1	C3-200SS	C3-200SS	C3-200SS	C3-200SS	C3-200SS	C3-200SS
4	O-Ring**	1	111P0490	111P0490	111P0490	111P0490	111P0490	111P0490
5	Shaft Seal***	1	U109-6A	U109-6A	U109-6A	U109-6A	U109-6A	U109-6A
6	Impeller - 1 Phase	1	C105-92PNS	C105-92PMS	C105-92PLS	C105-92PBSS	C105-214PCASS	C105-214PASS
6	Impeller - 3 Phase	1	C105-92PNSA	C105-92PMSA	C105-92PLSA	C105-92PBSSA	C105-214PCASS	C105-214PASS
*	Impeller Screw - 1 Phase	1	-	-	-	-	C30-14SS	C30-14SS
*	Impeller Screw - 3 Phase	1	C30-14SS	C30-14SS	C30-14SS	C30-14SS	C30-14SS	C30-14SS
7	Casing/Diffuser Assembly	1	723S2990	723S2990	723S2990	723S2990	C101-286SS	C101-286SS
8	Washer	2	111P0990	111P0990	111P0990	111P0990	111P0990	111P0990
9	Stainless Steel Plug	2	121P2100	121P2100	121P2100	121P2100	121P2100	121P2100
10	Screw	8	121P0310	121P0310	121P0310	121P0310	121P0310	121P0310
11	Nut, M6x1	8	U36-207SS	U36-207SS	U36-207SS	U36-207SS	U36-207SS	U36-207SS
12	Base	1	J104-9F	J104-9F	J104-9F	J104-9F	J104-9F	J104-9F
12	Base (1 Phase, TEFC only)	1	J104-9A	J104-9A	J104-9A	J104-9A	J104-9A	J104-9A
12A	Motor Pad	1	C35-5	C35-5	C35-5	C35-5	C35-5	C35-5
13	Cap screws, 3/8-16x3/4"	2	U30-72SS	U30-72SS	U30-72SS	U30-72SS	U30-72SS	U30-72SS

* For repair or service to motors, always give the motor Model Number and any other data found on the Motor Model Plate.

** Models B80427, B80428, B80429 and B80430 use Part Number U9-434.

*** Models B80427 and B80428 use Shaft Seal Number U109-432SS.

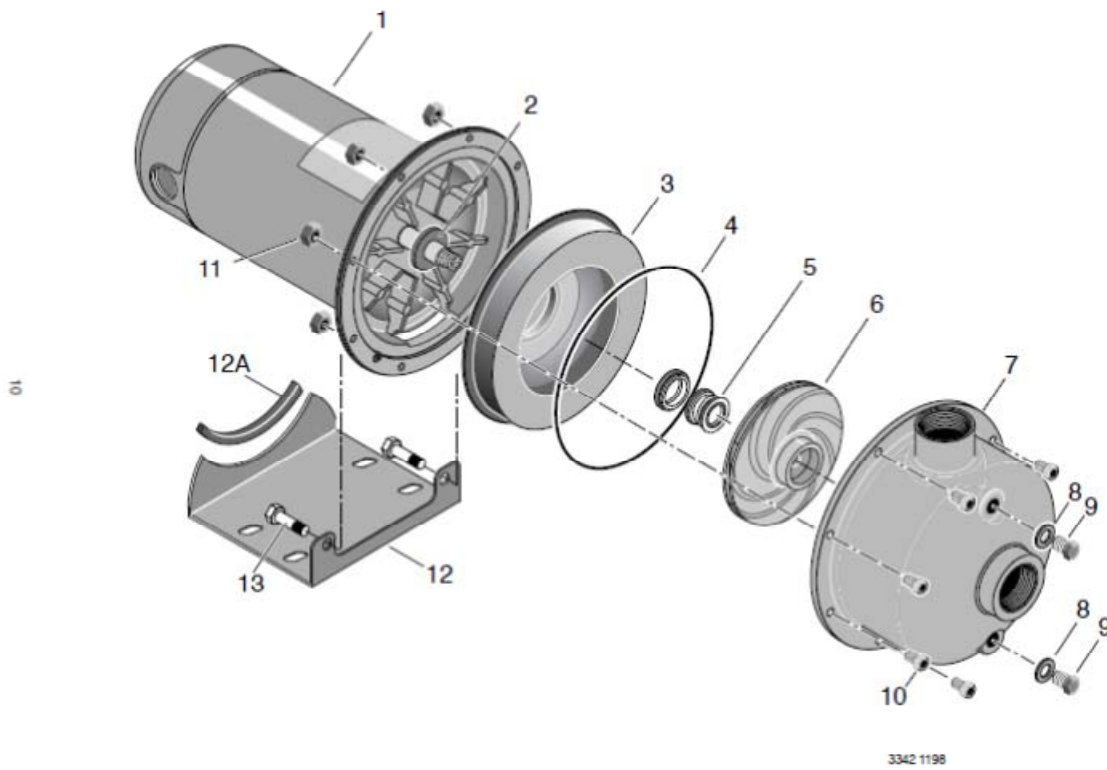
Models B80429 and B80430 use Shaft Seal Number U9-437.

† These models use Motor Number B80445.

†† These models use Motor Number B80451.

- Not illustrated.

SSCXS Series

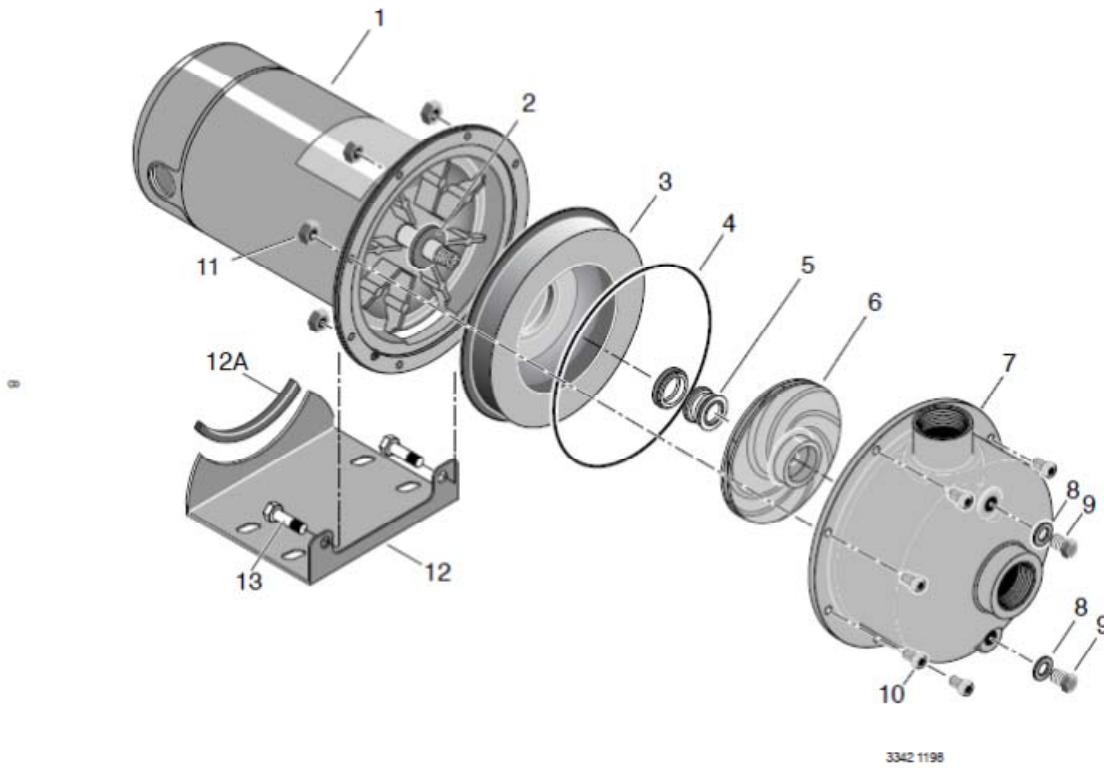


REPAIR PARTS LIST

Key No.	Part Description	No. Used	MOTOR AND HORSEPOWER				
			SS1XS-N	SS1XS-1	SS1XS-1½	SS1XS-2	SS1XS-2½
			B82414 B82413 B82412 B82411 ¾ HP	B82418 B82417 B82416 B82415 1 HP	B82422 B82421 B82420 B82419 1-1/2 HP	B82426 B82425 B82424 B82423 2 HP	B82430 B82429 B82428 B82427 2-1/2 HP
1	Motor, 115/230V/60 Hz., 1 Phase, ODP	1	B80442	B80443	B80444	B80445	B80445
1	Motor, 115/230V/60 Hz., 1 Phase, TEFC	1	B80454	B80455	B80456	B80447	B80447
1	Motor, 208-230/460V/60 Hz., 3 Phase, ODP	1	B80448	B80449	B80450	B80451	B80451
1	Motor, 230/460V/60 Hz., 3 Phase, TEFC	1	B80460	B80461	B80462	B80463	B80463
2	Water Slinger	1	17351-0009	17351-0009	17351-0009	17351-0009	17351-0009
3	Seal Plate	1	C3-200SS	C3-200SS	C3-200SS	C3-200SS	C3-200SS
4	O-Ring	1	U9-434	U9-434	U9-434	U9-434	U9-434
5	Shaft Seal*	1	U109-196A	U109-196A	U109-196A	U109-196A	U109-196A
6	Impeller	1	731S6230	731S6220	731S6210	731S6200	731S6190
	• Impeller Screw - 1 Phase	1	—	—	—	C30-14SS	C30-14SS
	• Impeller Screw - 3 Phase	1	C30-14SS	C30-14SS	C30-14SS	C30-14SS	C30-14SS
7	Casing/Diffuser Assembly	1	723S2990	723S2990	723S2990	723S2990	723S2990
8	Washer	2	111P0990	111P0990	111P0990	111P0990	111P0990
9	Stainless Steel Plug	2	121P2100	121P2100	121P2100	121P2100	121P2100
10	Screw	8	121P0310	121P0310	121P0310	121P0310	121P0310
11	Nut, M6x1	8	U36-207SS	U36-207SS	U36-207SS	U36-207SS	U36-207SS
12	Base	1	J104-9F	J104-9F	J104-9F	J104-9F	J104-9F
12	Base (1 Phase, TEFC only)	1	J104-9A	J104-9A	J104-9A	J104-9A	J104-9A
12A	Motor Pad	1	C35-5	C35-5	C35-5	C35-5	C35-5
13	Capcrews, 3/8-16x3/4"	2	U30-72SS	U30-72SS	U30-72SS	U30-72SS	U30-72SS

* Models B82413, B82414, B82417, B82418, B82421, B82422, B82425, B82426, B82429, B82430 use Part Number U9-437.
• Not illustrated.

SSCX Series



Auto Backflush Timer

OMRON®

Solid-State Repeat-Cycle Timer

H3CR-F

1/16 DIN Solid-State Repeat-Cycle Timer

- Wide power supply ranges of 100 to 240 VAC 24 VAC/VDC, 12VDC
- Combinations of independent long or short ON/OFF time settings are possible
- Fourteen time ranges from 0.05 s to 30 h or 1.2 s to 300 h
- Repeat cycle models with either ON start or OFF start operating functions
- Easy sequence checks through instantaneous outputs for a zero set value at any time range
- 11-pin and 8-pin models are available



Ordering Information

Part number	Repeat cycle OFF start	H3CR-F	H3CR-F8	H3CR-F-300	H3CR-F8-300
	Repeat cycle ON start	H3CR-FN	H3CR-F8N	H3CR-FN-300	H3CR-F8N-300
Timing units	0.05 s to 30 h			1.2 s to 300 h	
Terminal form	11-pin models		8-pin models	11-pin models	8-pin models
Supply voltages	100 to 240 VAC, 24 VAC/DC, 12 VDC				
Operating mode	Repeat cycle				

Note: Specify both the model number and supply voltage when ordering.

Example: H3CR-F 24 VAC/DC

Supply voltage

MODEL NUMBER LEGEND

H3CR - -

1 2 3 4

1. Classification

F: Repeat cycle timers

2. Configuration

None: 11-pin socket

8: 8-pin socket

3. Repeat cycle mode

None: OFF start

N: ON start

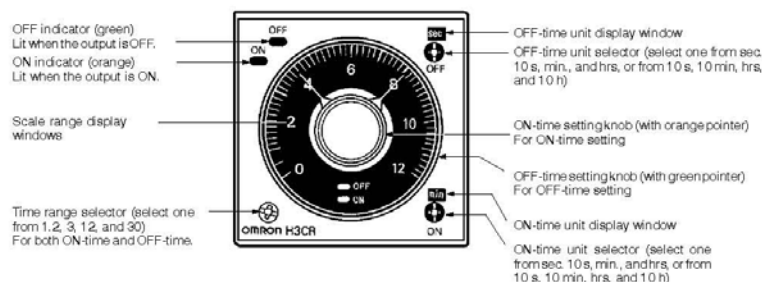
4. Specified Type

300: Long time range (1.2 s to 300 h) type

■ ACCESSORIES

Description			Part number
Sockets	11-pin	Bottom surface or track mounting, top screw terminals	P2CF-11
		Bottom surface or track mounting, top screw terminals, finger-safe terminal conforms to VDE0106/P100	P2CF-11-E
		Back mounting, for use with Y92F-30 mounting adapter, bottom screw terminals	P3GA-11
	8-pin	Bottom surface or track mounting, top screw terminals	P2CF-08
		Bottom surface or track mounting, top screw terminals, finger-safe terminal conforms to VDE0106/P100	P2CF-08-E
		Back mounting, for use with Y92F-30 mounting adapter, bottom screw terminals	P3G-08
		Terminal cover for P3G sockets, conforms to VDE0106/P100	Y92A-486
Panel mounting adapter	Fits behind panel, ideal for side-by-side installation. Use P3G _ _ sockets		Y92F-30
	Panel-mounting adapter (88 mm x 58 mm x 66 mm)		Y92F-73
	Panel-mounting adapter (58 mm x 50 mm x 66 mm)		Y92F-74
Protective cover	Hard plastic cover protects against dust, dirt and water; not for use with panel covers		Y92A-48B
NEMA 4 cover	Waterproof front cover		Y92A-48N
Colored panel covers	Light gray (Munsell No. 5Y7/1) to match case		Y92P-48GL
	Medium gray (Munsell No. 5Y5/1)		Y92P-48GM
	Black (Munsell No. N1.5)		Y92P-48GB
Mounting track	DIN rail, 50 cm (1.64 ft) length; 7.3 mm thick		PFP-50N
	DIN rail, 1 m (3.28 ft) length; 7.3 mm thick		PFP-100N
	DIN rail, 1 m (3.28 ft) length; 16 mm thick		PFP-100N2
End plate			PFP-M
Spacer			PFP-S

■ RANGE SELECTION



0.05 s to 30 h Models

Time range	Time units			
	s (sec)	x 10 s (10 s)	min	h (hrs)
1.2	0.05 to 1.2	1.2 to 12	0.12 to 1.2	
3	0.3 to 3	3 to 30	0.3 to 3	
12	1.2 to 12	12 to 120	1.2 to 12	
30	3 to 30	30 to 300	3 to 30	

Note: Instantaneous output is available at any time range. To obtain instantaneous output, set to below 0.

1.2 s to 300 h Models

Time range	Time units			
	x 10 s (10 s)	x 10 min (10 min)	h (hrs)	x 10 h (10 h)
1.2	1.2 to 12	1.2 to 12	0.12 to 1.2	1.2 to 12
3	3 to 30	3 to 30	0.3 to 3	3 to 30
12	12 to 120	12 to 120	1.2 to 12	12 to 120
30	30 to 300	30 to 300	3 to 30	30 to 300

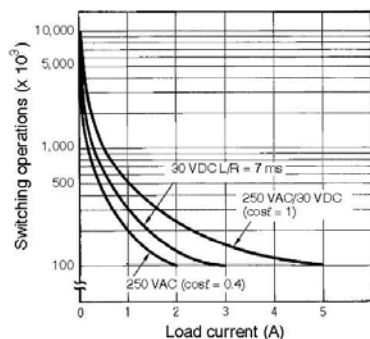
Note: Instantaneous output is available at any time range. To obtain instantaneous output, set to below 0.

Specifications

Part number		H3CR-F/-F-300	H3CR-F8/-F8-300	H3CR-FN/-FN-300	H3CR-F8N/-F8N-300
Operating mode		OFF start		ON start	
Supply voltage (see note)	AC	100 to 240 VAC (50/60 Hz)			
	AC/DC	24 VAC/DC (50/60 Hz)			
	DC	12 VDC			
Operating voltage range		85% to 110% of rated supply voltage, 90% to 110% with 12-VDC models			
Power consumption	AC	100 to 240 VAC: 10 VA (100 VAC applied)			
	AC/DC	24 VAC/DC: 2 VA (24 VAC applied)/1 W (24 VDC applied)			
	DC	12 VDC: 1 W			
Start, Reset, Gate inputs		ON-impedance: 1 k Ω max. ON residual voltage: 1 V max OFF impedance: 500 k Ω min.			
Control outputs	Type	DPDT relay			
	Max. load	5 A at 250 VAC, p.f. = 1			
	Min. load	10mA at 5 VDC			
Repeat accuracy		$\pm 0.3\%$ full scale max. ($\pm 0.3\%$ full scale max. ± 10 ms in ranges of 1.2 and 3 s)			
Setting error		$\pm 5\%$ full scale max ± 0.05 s max.			
Resetting system		Time-limit operation/time-limit reset or self-reset			
Resetting time		Minimum power-opening time: 0.1 sec			
Indicators		Output ON indicator (orange LED), output OFF indicator (green LED)			
Materials		Plastic case (light gray Munsell 5Y7/1)			
Mounting		Panel, DIN track, or surface depending on socket selected			
Connections		11-pin round socket	8-pin round socket	11-pin round socket	8-pin round socket
Weight		Approx. 100 g (4.23 oz.)			
Approvals		UL, CSA, CE			
Ambient temperature	Operating	-10° to 55°C (14° to 131°F) with no icing			
	Storage	-25° to 65°C (-13° to 149°F) with no icing			
Humidity		35% to 85%			
Vibration	Mechanical durability	10 to 55 Hz with 0.75-mm single amplitude each in three directions			
	Malfunction durability	10 to 55 Hz with 0.5-mm single amplitude each in three directions			
Shock	Mechanical durability	980 m/s ² (100G) each in three directions			
	Malfunction durability	98 m/s ² (10G) each in three directions			
Variation due to voltage change		$\pm 0.5\%$ full scale max. ($\pm 0.5\%$ full scale max. ± 10 ms in ranges of 1.2 and 3 s)			
Variation due to temperature change		$\pm 2\%$ full scale max. ($\pm 2\%$ full scale max. ± 10 ms in ranges of 1.2 and 3 s)			
Service life	Mechanical	20 million operations min. (under no load at 1,800 operations/h)			
	Electrical	100,000 operations min. (5 A at 250 VAC, resistive load at 1,800 operations/h)			
Insulation resistance		100 M Ω min. (at 500 VDC)			

Note: A power supply with a ripple of 20% max. (single-phase power supply with full-wave rectification) can be used with each DC model.

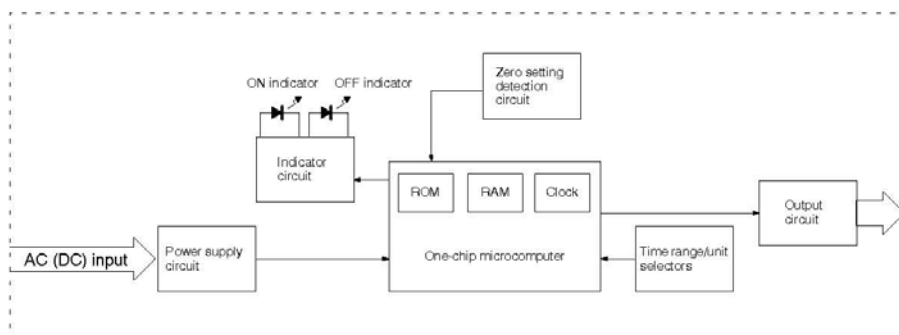
Engineering Data



Note: A maximum current of 0.15 A can be switched at 125 VDC (cosφ = 1) and a maximum current of 0.1 A can be switched if L/R is 7 ms. In both cases, a life of 100,000 operations can be expected. The minimum applicable load is 10 mA at 5 VDC (failure level: P).

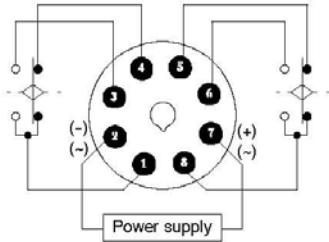
Operation

■ BLOCK DIAGRAMS

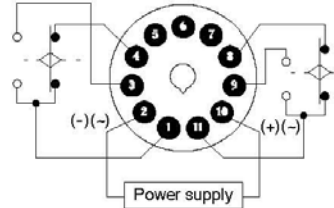


Timing Charts

H3CR-F8
H3CR-F8N
H3CR-F8-300
H3CR-F8N-300

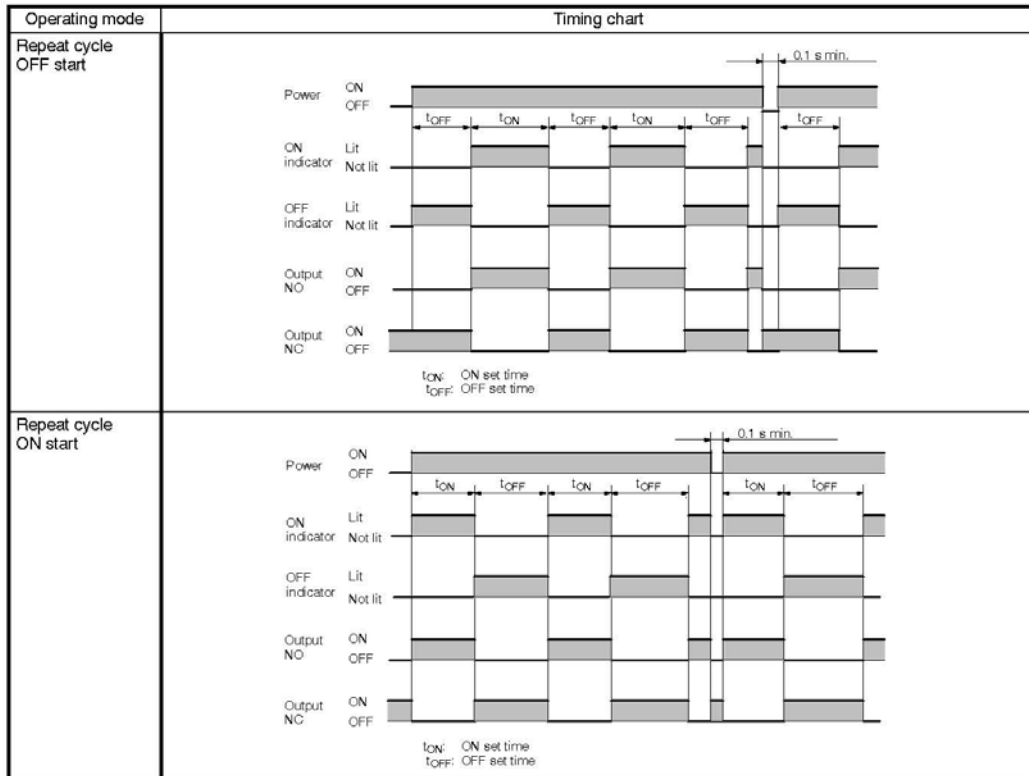


H3CR-F
H3CR-FN
H3CR-F-300
H3CR-FN-300



Note: Leave terminals 5, 6, and 7 open.
Do not use them as relay terminals.

Note: Part numbers with an "N" included are Repeat cycle ON start timers. All others are Repeat cycle OFF start timers.

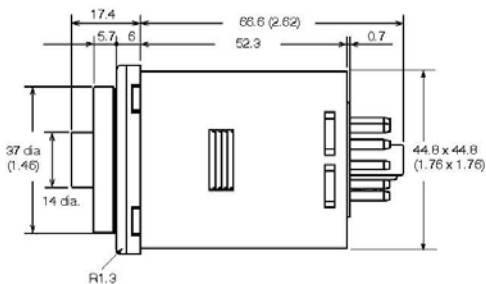
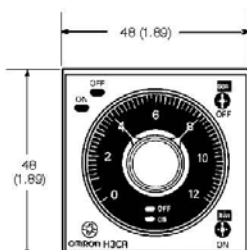


Dimensions

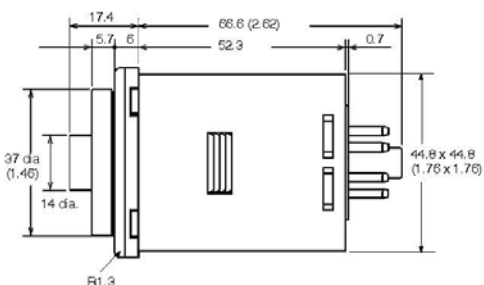
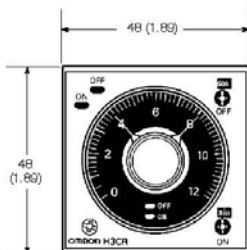
■ TIMERS

Unit: mm (inch)

H3CR-F
H3CR-FN
H3CR-F-300
H3CR-FN-300



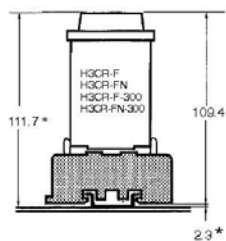
H3CR-F8
H3CR-F8N
H3CR-F8-300
H3CR-F8N-300



■ TRACK MOUNTING

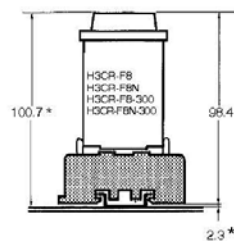
11-Pin Models

P2CF-11/P2CF-11-E



8-Pin Models

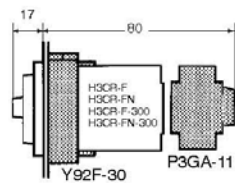
P2CF-08/P2CF-08-E



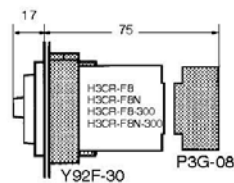
* These dimensions vary with the kind of DIN track (reference value).

■ PANEL MOUNTING

11-Pin Models



8-Pin Models



H3CR-F

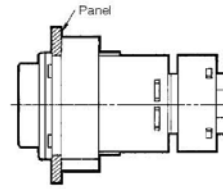
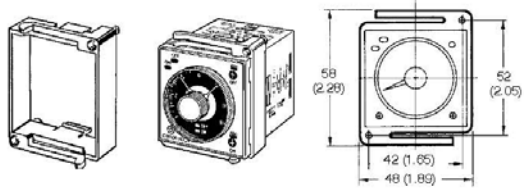
OMRON

H3CR-F

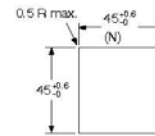
■ PANEL-MOUNTING ADAPTERS

Unit: mm (inch)

Y92F-30



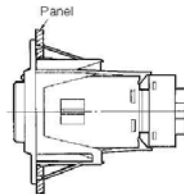
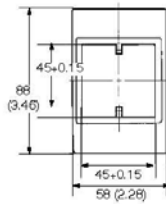
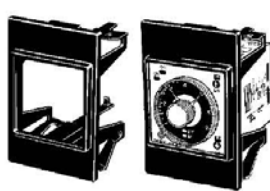
Panel Cutout



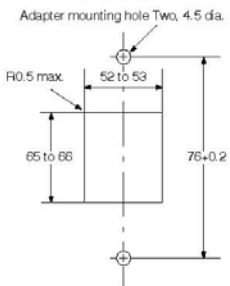
Note: Recommended panel thickness is 1 to 3.2 mm.

Note: Adapter installs behind the panel. It is ideal for side by side installation. Use P3G-11 or P3G-08 sockets.

Y92F-73

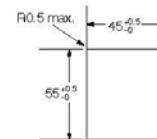
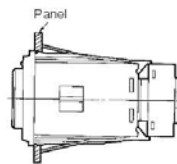
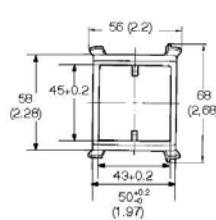


Panel Cutout



Note: The mounting panel thickness should be 1 to 3.2 mm.

Y92F-74

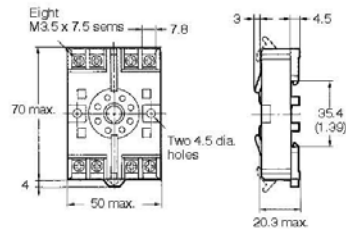
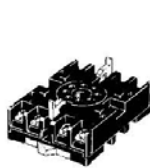


Note: The mounting panel thickness should be 1 to 3.2 mm.

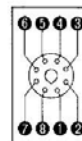
■ SOCKETS

Track-Mounting/Front-Connecting Socket

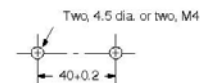
P2CF-08



Terminal Arrangement/ Internal Connections (Top View)



Surface Mounting Holes



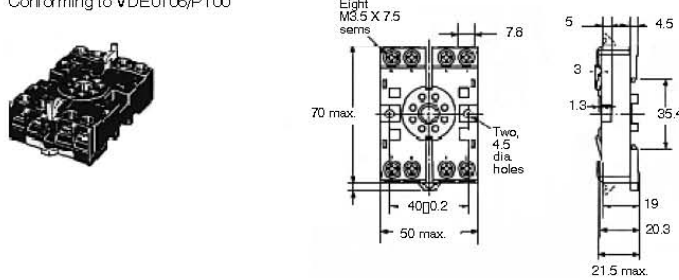
H3CR-F

OMRON

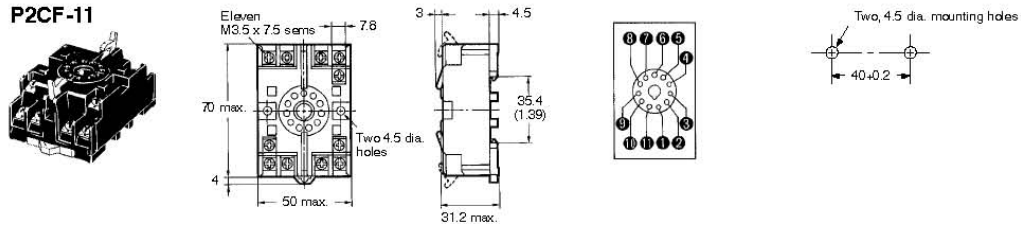
H3CR-F

P2CF-08-E (Finger-Safe Terminal Type)

Conforming to VDE01 06/P1 00

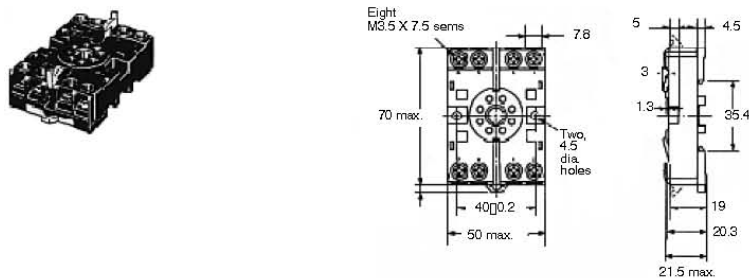


P2CF-11



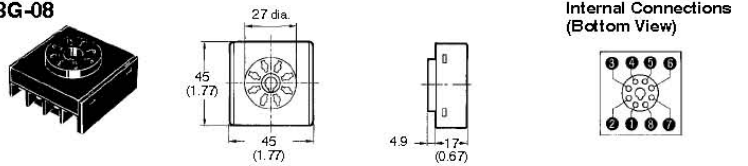
P2CF-08-E (Finger-Safe Terminal Type)

Conforming to VDE01 06/P1 00

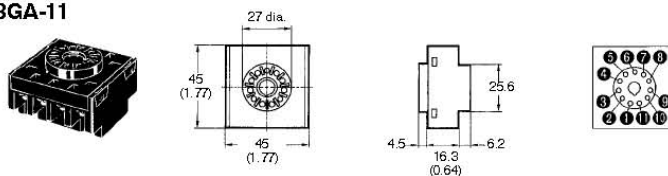


Back-Mounting Socket

P3G-08



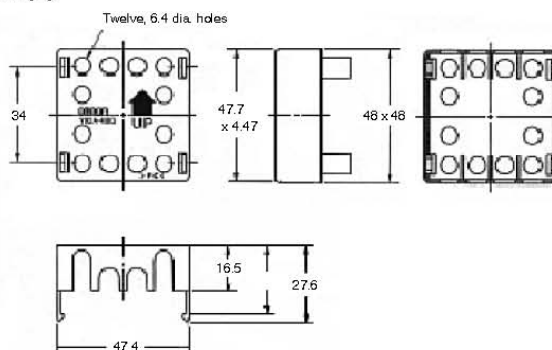
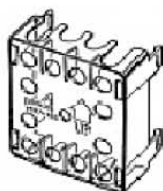
P3GA-11



Finger-Safe Terminal Cover for P3G(A)

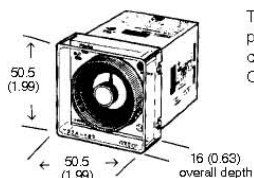
Conforming to VDE0106/P100

Y92A-48G



PROTECTIVE COVER

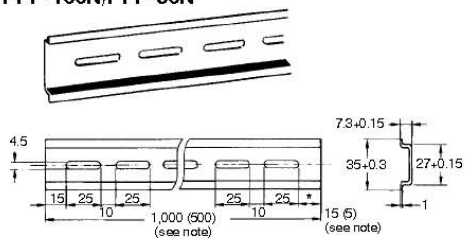
Y92A-48B



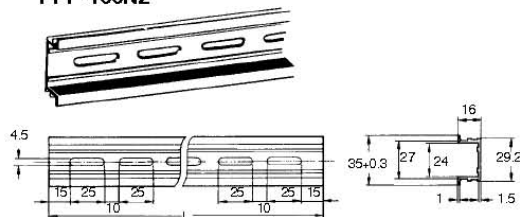
The hard plastic protective cover prevents accidental resetting. It also shields the front panel from dirt and water. The cover is intended for use in areas where unusual service conditions do not exist. The Y92A-48B cover cannot be used with the Y92P Panel Covers below.

MOUNTING TRACK AND ACCESSORIES

PFP-100N/PFP-50N

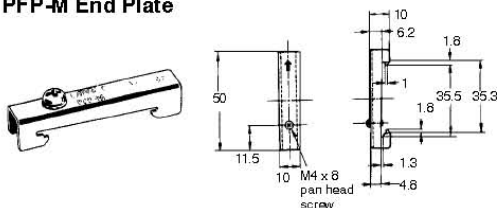


PFP-100N2

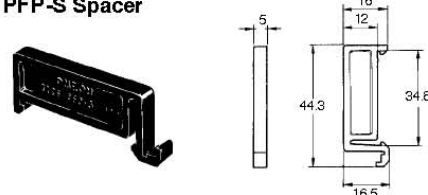


Note: The values shown in parentheses are for the PFP-50N.

PFP-M End Plate



PFP-S Spacer



System Warranty



ULTRASORB® System Limited Warranty

This warranty supersedes and replaces any warranty statements orally made by the Sales Person, Distributor, or Dealer or contained in written instructions or other Brochures or informational documents in relation to this product.

THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF

The Manufacturer Warrants, parts only for a period of twelve (12) months from the time of startup, not to exceed fourteen (14) months from the date of shipment, the new **ULTRASORB®** System to be free from defects in material and workmanship under the normal use and service when operated and maintained in strict accordance with the **ULTRASORB®** System operating instructions.

The Manufacturer's obligations under this warranty is being limited to repairing or replacing any part found to its satisfaction to be so defective, provided that such part is, upon request, returned to the Distributor or Manufacturer, with freight prepaid. This warranty does not cover parts damaged by decomposition from chemical action or wear caused by abrasive materials, nor does it cover damage resulting from misuse, abuse, or any other than its intended use, accident, neglect, or from improper operation, maintenance, installation, modification or adjustments.

This warranty does not cover parts or equipment used with the **ULTRASORB®** System that are not made by the manufacturer, since these items are covered by warranties from the respective manufacturer. The Manufacturer makes no warranty as to electrical apparatus or other materials not of its manufacturer.

The Manufacturer's sole responsibility shall be limited to repair or replacement of the equipment within the terms stated herein above.

The Manufacturer shall not be liable for consequential or punitive damages whether or not caused by manufacturer's negligence or resulting from any expressed or implied warranty or breach thereof. Consequential damages for the purpose of this agreement shall include, but are not limited to, the loss of use, income or profit, or loss of or damage to property occasioned by or arising out of in-operation, use, the operation, installation, repair, or replacement of the equipment or otherwise.

It is understood that any controversy or claim arising out of or relating to the **ULTRASORB® System Warranty** herein or the alleged breach thereof, shall be settled by arbitration in accordance with the rules of the Arbitration Association of America, Palm Beach County, Florida, and judgment upon the award rendered by the arbitrator(s) may be entered in any court barring jurisdiction thereof.

PROCESS PERFORMANCE WARRANTY

The Manufacturer Warrants that when installed and operated in accordance with the Manufacturer's written instructions, the **ULTRASORB® System** will remove dirt, oil, and grease from wash water. No other warranty expressed or implied should be considered valid. There are numerous operating conditions which will affect the efficiency of the **ULTRASORB® System**, thereby making any general water quality statement unrealistic.

WARRANTY SERVICE

In order to validate your warranty, fill out the **Warranty Validation Form** and return to **RGF** at the address below:

RGF WARRANTY DEPARTMENT

Outside of Florida (800) - 842 - 7771

In Florida (561) - 848 - 1826

or FAX (561) - 848 - 9454

To obtain warranty service contact **RGF** and a warranty representative will help with the warranty problem and determine the status and a **Warranty Authorization Number** will be given at that time. Be prepared to answer specific questions on the problem at hand. If there are warranted parts that need to be returned, fill in the **Warranty Authorization Number on the Warranty Request Form** along with the items being submitted for warranty and an brief explanation of the problem or defect and return it and the part(s) to:

RGF Environmental Group, Inc.
c/o Warranty Department
1101 West 13th Street
Riviera Beach, Florida 33404



ULTRASORB® System Limited Warranty Policy

RGF ENVIRONMENTAL GROUP, INC. ["Manufacturer"] Warrants the **ULTRASORB® System** to be free from DEFECTS in Material and Workmanship.

HOW LONG IS THE WARRANTY?

- For twelve (12) months from the date of initial startup of the system; not to exceed fourteen (14) months from the date of delivery.
- The Installation / Startup Record and Warranty Registration Form should be signed and dated by an authorized officer or employee of the customer and returned to RGF promptly to activate the warranty.

HOW DO I CONTACT RGF ENVIRONMENTAL GROUP ABOUT MY WARRANTY, A QUESTION, OR A COMPLAINT?

- A question or a complaint may be addressed directly by your local Distributor or dealer.
- If they can not answer the question or complaint directly, then call or FAX the Warranty Department at RGF at:

RGF WARRANTY DEPARTMENT
Outside of Florida (800) - 842 - 7771
In Florida (561) - 848 - 1826
or FAX (561) - 848 - 9454

ARE THERE ANY PARTS THAT ARE NOT COVERED BY THIS WARRANTY? (That the Manufacturer will not repair or replace)

- Parts that are damaged by decomposition from chemical action or wear caused by abrasive materials, nor does it cover damage resulting from misuse, abuse, any other than it's intended use, accident, neglect, or from improper operation, maintenance, installation modification or adjustments.
- Parts not made by the Manufacturer, such as the electric pressure pump motor or other materials not of it's manufacturer. However, RGF will process the claim with the pump or other manufacturer.

WHAT SHOULD BE DONE IN THE EVENT THAT THE EQUIPMENT IS DAMAGED BY SHIPPING?

- Immediately upon receipt of the system, the purchaser is responsible to take the shipping containers off of the truck and inspect the equipment and parts for damage.
- If there is any visible damage to the equipment:
 1. Notify the driver of the courier company immediately and write on the Bill of Lading what is damaged or missing.
 2. Call **RGF** immediately at **1 - (800) - 842 - 7771** outside of Florida, **1 - (561) - 848- 1826** in Florida, or **FAX 1- (561) - 848 - 9454**.

WHAT IF DAMAGE IS FOUND ON THE EQUIPMENT AFTER THE COURIER HAS LEFT?

- Claims for concealed shipping damage must be reported to the courier and a copy sent to RGF in writing via **FAX 1 - (561) 848 - 9454** or certified U.S. mail within fifteen (15) days from the date of delivery.

NOTE:

The courier company will not cover the damages if the foregoing steps are not adhered to.

STEPS THAT SHOULD BE TAKEN IF WARRANTY WORK OR REPLACEMENT IS NEEDED.

- Call your local distributor or RGF Warranty Department and notify them of the problem or malfunction. Be prepared to be very descriptive with the problem.
- If it is determined that a part has malfunctioned due to defect, a **Warranty Authorization Number** will be given for tracking the part. Fill out the **Warranty Request Form** along with the Warranty Authorization number and return it along with the defective part prepaid to:

**RGF Environmental Group, Inc
c/o Warranty Department
1101 West 13th Street
Riviera Beach, Florida 33404**

THINGS THAT SHOULD BE DONE TO HELP KEEP THE ULTRASORB SYSTEM RUNNING EFFICIENTLY.

Read the Operations Manual thoroughly.

- Make sure all of the employees who operate the system are fully trained on the procedures for operating the system and follow preventive maintenance routines strictly.
- Do not run water that has contaminants through the system that it is not designed to remove.
- Make sure the system is operated in accordance with the Manufacturer's suggested instructions.
- Replace filters as recommended in the Operations Manual.
- Control the water quality in accordance with RGF's suggested guidelines.
- Keep sump pits, trenches, and weirs cleared of heavy sediment build up. Heavy solids build up will cause the sump pump to overheat and fail to operate properly. Failure to prevent this will void the sump pumps warranty.
- Lack of a water clarifier (such as hydrogen peroxide, chlorine, WC-1, Ozone, etc.) will cause algae to grow resulting in plugged filters and foul smell.

WHAT SERVICE CAN IS EXPECTED FROM THE DISTRIBUTOR?

- The Distributor will install, perform the initial startup, and train your personnel.

Should there be any questions relating to this warranty policy information, please feel free to contact our customer service representative at:

RGF Customer Service

Outside of Florida (800) - 842 - 7771

In Florida (561) - 848 - 1826

FAX (561) - 848 - 9454

or Write

RGF Environmental Group, Inc.

c/o Customer Service Dept.

1101 West 13th Street

Riviera Beach, FL 33404



Product Registration and Return Forms

RGF

RGF

ENVIRONMENTAL GROUP

ULTRASORB® System Warranty Request Form

NOTE: THIS FORM MUST BE COMPLETED AND ACCOMPANY ALL RETURNED ITEMS

Warranty Authorization Number: W-_____

CUSTOMER: NAME _____
ADDRESS _____
PHONE _____ FAX _____

DISTRIBUTOR: NAME _____
ADDRESS _____
CONTACT _____

UNIT: MODEL _____
SERIAL # _____
DATE OF PURCHASE _____

ITEMS BEING SUBMITTED FOR WARRANTY:

PLEASE LIST THE PARTS AND GIVE A BRIEF DESCRIPTION OF THE PROBLEM.

ITEMS

1) _____
2) _____

DESCRIPTION (COMMENTS)

1) _____
2) _____
3) _____

SHIP TO: *RGF ENVIRONMENTAL GROUP, INC.
c/o WARRANTY DEPTMENT
1101 West 13th Street
RIVIERA BEACH, FLORIDA 33404
FAX 561-848-9454*

(FOR RGF USE ONLY)

DATE ITEMS RECV'D _____
RECEIVED BY _____
REPLACEMENT PART SENT/WARRANTY APPROVED ☐ WARRANTY DENIED ☐



ULTRASORB® System Warranty Validation Form

To validate the Warranty for the system, this form must be read, signed and returned to:

*RGF Environmental Group, Inc
c/o Warranty Department
1101 West 13th Street
Riviera Beach, Florida 33404
FAX 561-848-9454*

1. I have inspected the system upon arrival for shipping damage and have reported any problems to the local distributor, the courier company, or *RGF* within the required time period.
2. I have been provided with training on the operation and procedures for the system by the distributor or *RGF* representative, during the installation and startup of the system.
3. I understand it is the customer's responsibility to:
 - Regularly monitor and maintain the water chemistry of the system and to utilize properly only any chemicals or cleaning agents that are compatible with the equipment.
 - To regularly clean out the sump pit and perform suggested preventive maintenance on the system in order to keep the system in good working order. I understand that failing to do so will adversely effect the efficiency of the system. I also understand, that it is my responsibility to properly dispose of the used filters, pit sediment, and any other by-products accordingly.
 - Protect the system from extreme (high/low) temperatures to prevent damage to the components and piping of the system.
 - Notify the local distributor or *RGF* Warranty Dept. immediately upon any malfunction of the system in order to receive warranted work or parts.
4. I understand that any controversy or claim arising out of or relating to the **ULTRASORB® System Warranty** herein or the alleged breach thereof, shall be settled by arbitration in accordance with the rules of the Arbitration Association of America, Palm Beach County, Florida, and judgment upon the award rendered by the arbitrator(s) may be entered in any court baring jurisdiction thereof.

I hereby acknowledge the above.

Customers Name _____

Address _____

Signature _____ **Date** _____



ULTRASORB® System Installation / Startup Record

Model Number _____ Installation Date _____

Serial Number _____ Start-Up Tech. _____

Distributor _____ Customer _____

_____ Address _____

Phone () _____ FAX () _____ Contact _____

Names of Trainees	Position	Initials
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

What is Being Cleaned _____ Hr's. Per Day _____

Washpad Design & Const. By? _____

Is the Washpad Satisfactory? Yes ____ No ____ If No, Explain _____

Was the Unit Missing Parts? Yes ____ No ____ If Yes, Explain _____

Did the Unit Have Shipping or Hidden Damage? Yes ____ No ____ If Yes, Explain _____

List Any Options/Modifications with this Unit. _____



ULTRASORB® System Installation / Startup Checklist

MAINTENANCE PROCEDURES, CHECK IF COVERED & APPLICABLE

<input type="checkbox"/> Overall System Description	<input type="checkbox"/> Sump Pump & Maintenance
<input type="checkbox"/> EPA & Sewer Rules	<input type="checkbox"/> Electrical, Shutoffs, Etc.
<input type="checkbox"/> Wash Pad Maintenance	<input type="checkbox"/> Centrifugal Separator
<input type="checkbox"/> Solids Cleaning Procedure	<input type="checkbox"/> Oil Accumulator
<input type="checkbox"/> Bleed Lines	<input type="checkbox"/> Coalescing Tubes
<input type="checkbox"/> Solids Grid	<input type="checkbox"/> Hydrocarbon Absorber II
<input type="checkbox"/> Filter Media	<input type="checkbox"/> Centrifugal Pump
<input type="checkbox"/> Hydrocarbon Absorber III	<input type="checkbox"/> Chlorinator
<input type="checkbox"/> Jet Pump and Switch	<input type="checkbox"/> Fresh Water Make-up
<input type="checkbox"/> TurboHydrozone	<input type="checkbox"/> Air Compressor
<input type="checkbox"/> Polishing Filters	<input type="checkbox"/> Pressure Gauges
<input type="checkbox"/> Pressure Tank	<input type="checkbox"/> 3 Way Control Valve
<input type="checkbox"/> Options: _____	<input type="checkbox"/> Options: _____
<input type="checkbox"/> Options: _____	<input type="checkbox"/> Options: _____

CRITICAL FUNCTIONS AND PROCEDURE DISCUSSIONS

<input type="checkbox"/> Basic Water Chemistry; pH, Alkalinity, TDS	<input type="checkbox"/> Operator Safety; Clothing, Ventilation, Etc.
<input type="checkbox"/> Algae/Bacteria Control; Chlorine, Hydrogen Peroxide	<input type="checkbox"/> Cleaning Agents; Enviro- Control, Ultra-Safe
<input type="checkbox"/> Water Cycling, WC1	<input type="checkbox"/> Water Management
<input type="checkbox"/> Water Testing; ETS Kit, pH Paper, TDS Meter	<input type="checkbox"/> Recycled / Fresh Water
	<input type="checkbox"/> Where to Get Help; Manuals, Distributor, <i>RGF</i>

CUSTOMER HANDOUTS AND SUPPORT MATERIAL

<input type="checkbox"/> Operating Manuals	<input type="checkbox"/> Water Test Kit
<input type="checkbox"/> Maintenance Video	<input type="checkbox"/> Spare Parts List

CUSTOMER EVALUATION OF START-UP TRAINING:

How Would You Rate Your Training? Good ____ Fair ____ Poor ____

General Comments _____

RGF Tech. Rep. Signature _____

Trainees Signature _____



ULTRASORB® System Client Questionnaire

Company Name _____

Contact Person _____

Location _____

Phone () _____

RGF Dealer/Salesman _____

Purchase Date (approx.) _____

Model _____ Serial Number _____

HOW WOULD YOU RATE THE FOLLOWING:

	GOOD	FAIR	POOR
General Operation	_____	_____	_____
Recycled Water Quality	_____	_____	_____
Quality of System	_____	_____	_____
Service & Support	_____	_____	_____
Warranty	_____	_____	_____
Installation / Training	_____	_____	_____
Safety	_____	_____	_____
RGF Dealer / Salesman	_____	_____	_____
Value	_____	_____	_____

Would you purchase another RGF System? Yes ____ No ____

Comments _____

Completed By: _____ Date _____

Please return this form to:

RGF Environmental Group, Inc.
c/o Customer Service Dept.
1101 West 13th Street
Riviera Beach, FL 33404
Fax: 516-848-9454

Glossary of Terms

Aeration Tower

Tall 2" dia. PVC pipe on the Series I Tank used to mix air into the waste stream to enhance oil separation and remove V.O.C.'s (volatile organic compounds).

Back Flush Cartridge Filter

A small cartridge filter used to remove any solids from the back flush water which may clog the MS³ Membranes or Polishing Filters during back flushing.

CFC System Pump

A continuous flow control centrifugal pump used to circulate the recycled water through the CO³P System (Chemical Injection, Ozone Venturi and UV/O³ Catalytic Chamber) and supplies the water to the cleaning equipment.

CO³P system

(Catalytic Oxidation Process) System of low cost oxidant production is designed to provide a hydroxyl radical for contaminated water treatment. This system utilizes ozone, UV and hydrogen peroxide to create a hydroxyl radical ion for maximum oxidation and biodegradation.

Control Panel

Contains all the controls for the system: flow control valves, pressure gauges, indicator lights, and the hour meter.

H.I.P. Absorber

An absorption media filter designed to remove herbicides, insecticides and pesticides from the recycled water stream.

HCA-3 Absorber

Housed in a polyethylene vessel, is a hydrocarbon absorber used as a final measure of removing oils before the water is processed through the Polishing Filters or MS³ Membranes. The Absorber consists of two highly absorbent medium, polyisocyanurate and fibrous polypropylene, to absorb low micron particles of oils, fuels, solvents, and hydrocarbons.

Main Drain Return Line

A recommended method of returning the drains of the system to the front end of the trench system. This line should be sized accordingly to accommodate the system drains.

Ozone and Chemical Venturi

A venturi used in the CO³P system, which draws ozone produced by the UV/O³ Catalytic Chamber and mixes it with the hydrogen peroxide before it enters the chamber.

Polishing Filter

Housed in a polypropylene vessel, used to pre-filter the water before it is processed through the rest of the system.

Process Pump

A centrifugal pump located on the equipment rack of the Series II Equipment Skid, pumps the process water through the specific filters of the system.

Series II Electrical Junction Box

Contains all the electrical relays, timers and terminals for the system and connects them to the motors, lights, switch and UV chambers of the system.

Series II Equipment Skid

Contains all of the components of the system for processing the water.

Series III Storage Tank

A 500 (or 800) gallon cylindrical polyethylene tank used to store the recycled water for later use.

UV/O³ Catalytic Chamber

The new UV/O³ combination chamber produces over three times the ozone and approximately twice the ultraviolet radiation as our initial design. When these two components of the CO³P process are combined into one unit, they become more effective, efficient and compact.