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METRIC
Corporation ENVIRONMENTAL ENGINEERING AND SCIENCE

February 14, 2003

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Michael Hebert, Sparton Technology, Inc. Project Coordinator
United States Environmental Protection Agency - Region VI
Technical Section (EN-HX)
Compliance Assurance and Enforcement Division
1445 Ross Avenue
Dallas, Texas 75202



Dear Mr. Hebert:

Enclosed are 3 copies of our report "Final Source Containment System Operation and Maintenance Manual", for Sparton Technology, Inc., Coors Road facility.

I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based upon my inquiry of either the person or persons who manage the system and/or the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I further certify, to the best of my knowledge and belief, that this document is consistent with the applicable requirements of the consent decree entered among the New Mexico Environment Department, the U.S. Environmental Protection Agency, Sparton Technology, Inc., and others in connection with Civil Action No. CIV 97 0206 LH/JHG, United States District Court for the District of New Mexico. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,

METRIC Corporation

Gary L. Richardson, P.E.
Executive Vice President

GLR/ld

cc: Director, Water and Waste Management Division, NMED
✓ Chief, Hazardous Waste Bureau, NMED
Chief, Groundwater Bureau, NMED
Susan Widener, Sparton Technology, Inc., Jackson, MI
General Manager, Sparton Technology, Inc., Rio Rancho, NM
Don Gutierrez, Sparton Technology, Inc., Rio Rancho, NM
Tony Hurst, Hurst Engineering Services - 2 copies

**SPARTON TECHNOLOGY, INC.
COORS ROAD FACILITY
FINAL
SOURCE CONTAINMENT SYSTEM
OPERATION AND MAINTENANCE MANUAL**

**PREPARED FOR
SPARTON TECHNOLOGY, INC.
RIO RANCHO, NEW MEXICO**

**PREPARED BY
METRIC CORPORATION
ALBUQUERQUE, NEW MEXICO**

FEBRUARY 2003

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INTRODUCTION

During 2001 Sparton Technology, Inc. installed and tested the Source Containment System located on the Coors Road property in Albuquerque, New Mexico. The system was placed into operation on January 3, 2002. The Source Containment System was installed, tested and is operated in accordance with the "Work Plan for the installation of a Source Containment System" prepared by S. S. Papadopulos & Associates, Inc., Bethesda, Maryland, which is ATTACHMENT F of the Consent Decree entered March 3, 2000.

The Source Containment System consists of a containment well (CW-2), a water treatment building, and a series of rapid infiltration ponds as shown on FIGURE 1. The immediate objective of the Source Containment System is to create a capture zone, thereby restricting migration of contaminants off-site.

CONTAINMENT SYSTEM DESCRIPTION

The containment well (CW-2) and water treatment facility are located at 9621 Coors Road NW, Albuquerque, New Mexico. The containment well is 130 feet deep and is equipped with 4 ½ in. o.d. casing and a 3 hp Gould's submersible pump, as shown on FIGURE 2 and 3. The submersible pump control panel is located within the water treatment facility. The submersible pump is capable of producing up to 50 gal/min from the containment well. Well and submersible pump literature are contained in ATTACHMENT A.

As previously mentioned, CW-2 and the water treatment building are located at 9621 Coors Road NW. The water treatment building, shown on FIGURE 1, houses an air stripper and associated equipment which removes chlorinated solvents from the groundwater. The As-Built plans for the water treatment building and the Final Inspections for the building are contained in ATTACHMENT B.

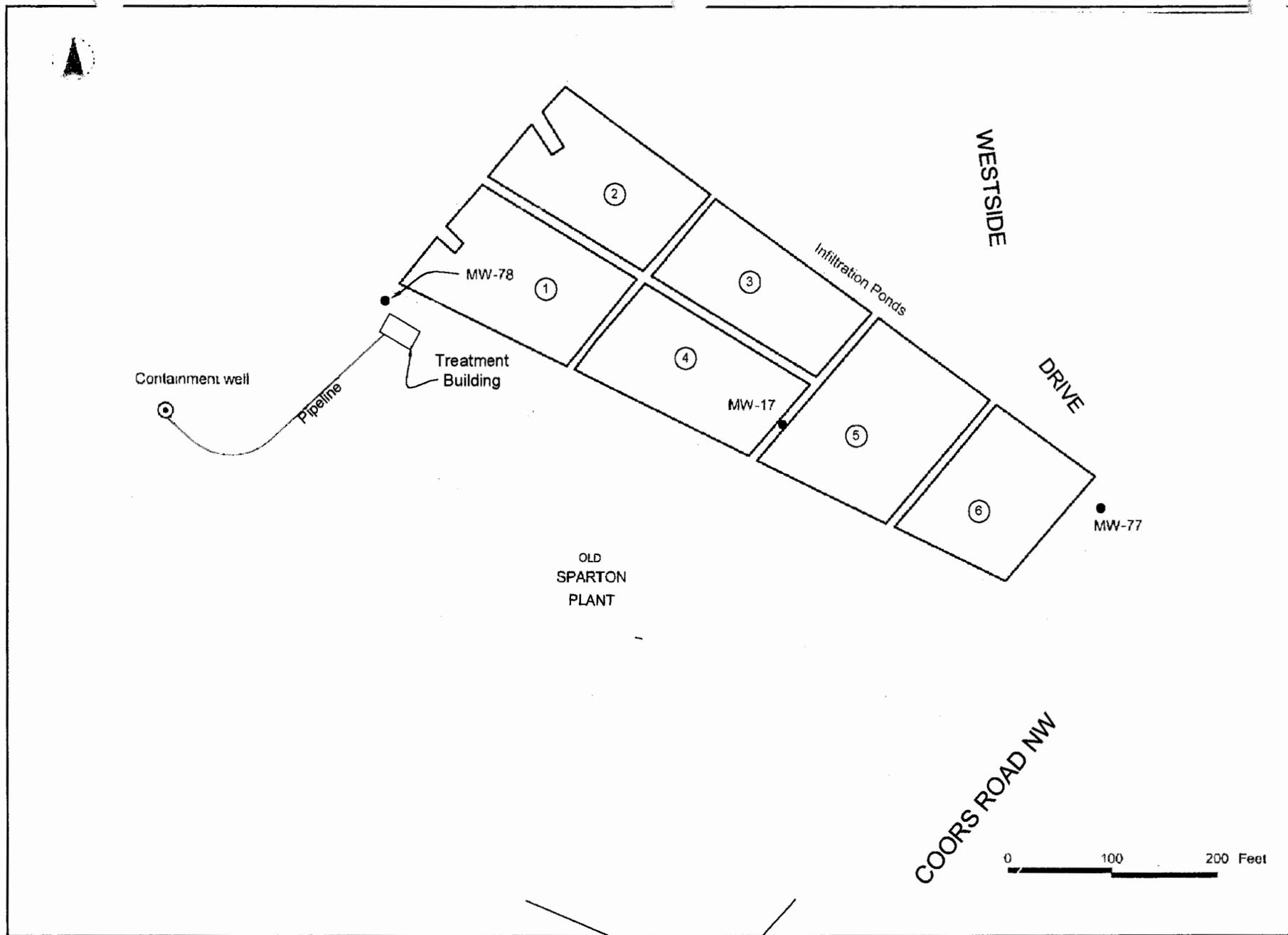


Figure 1 Layout of Source Containment System

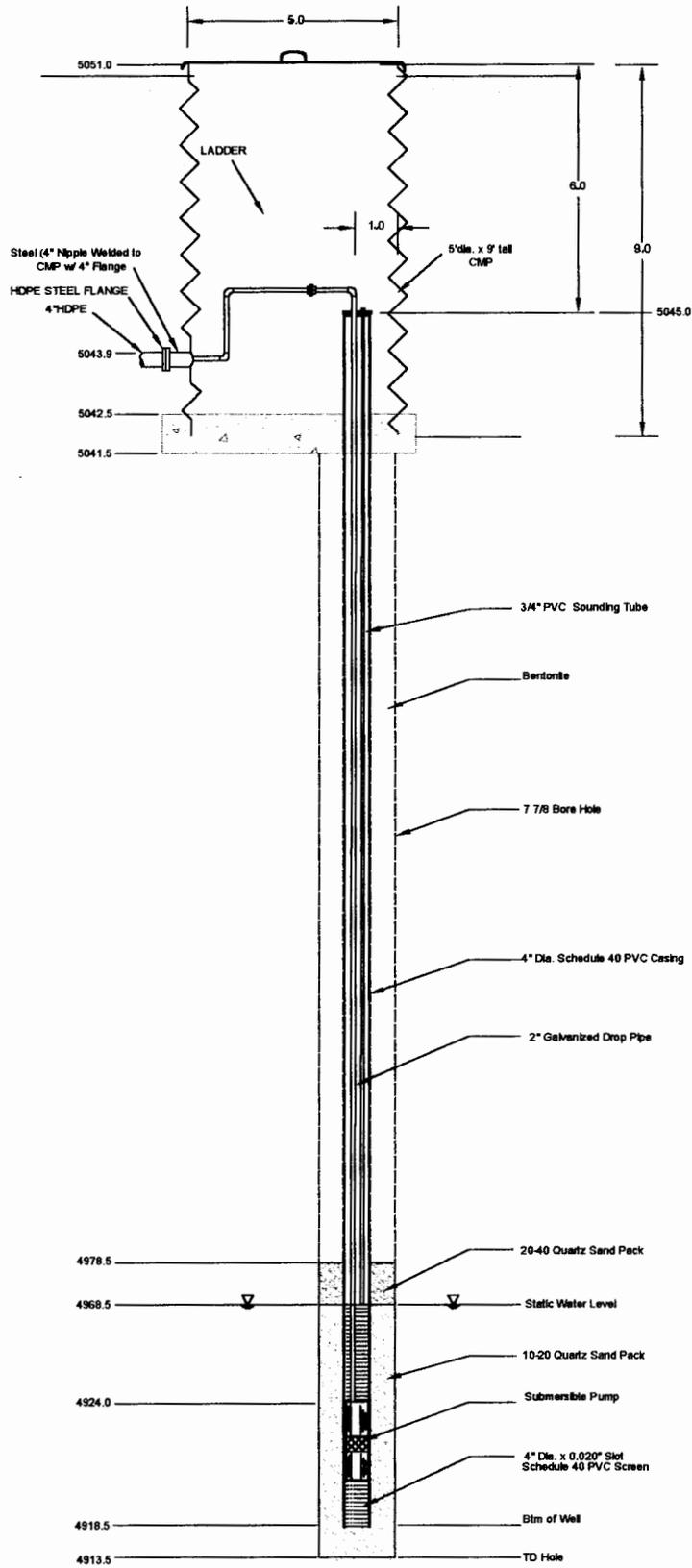


FIGURE 2
 COMPLETION DIAGRAM
 CW-2
 SPARTON

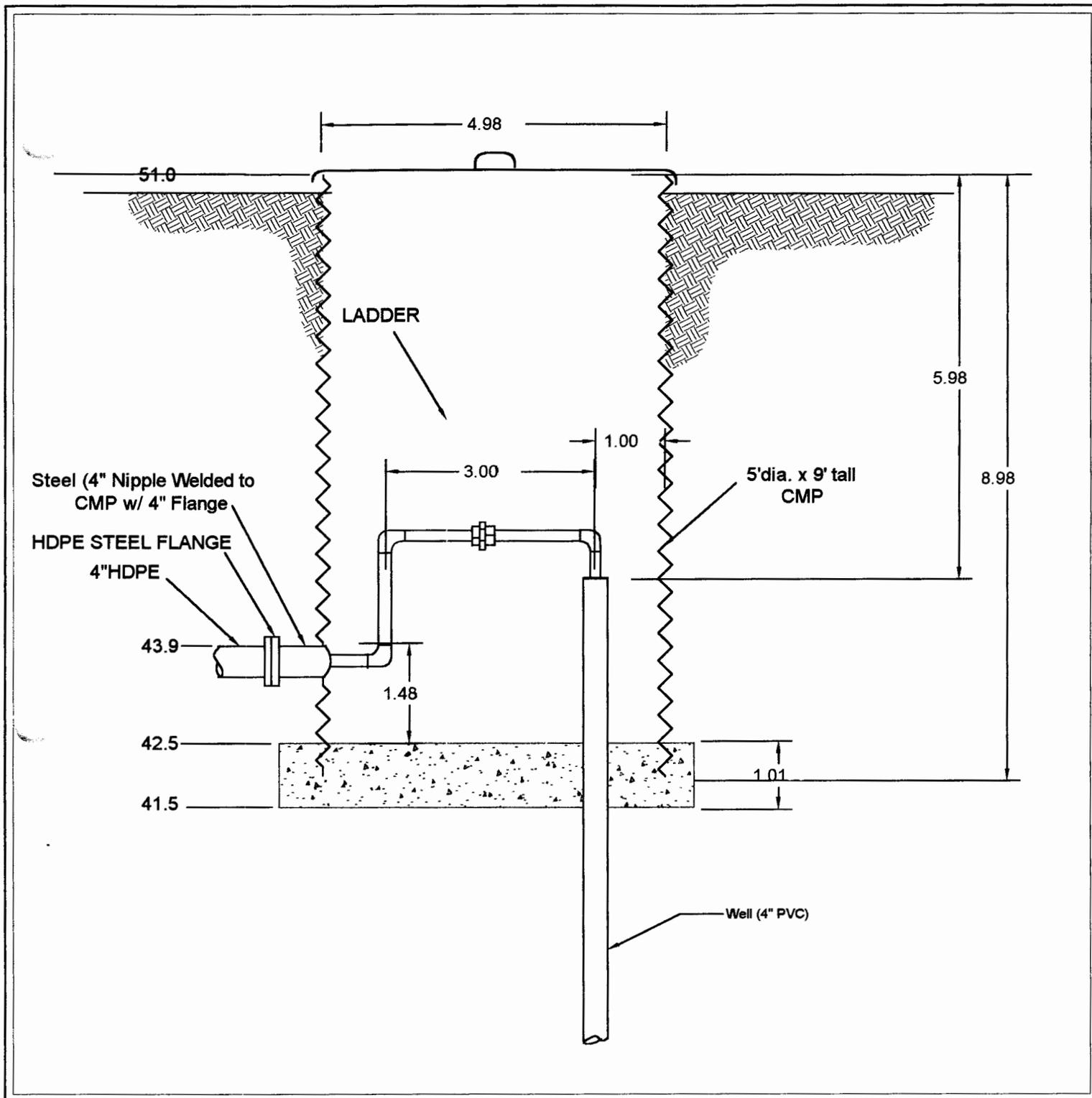


FIGURE 3
CW-2
WELL HEAD
SPARTON

The air stripper, housed in the water treatment building is an EPG model STAT 180. It is designed to treat up to 75 gpm of water containing up to 5000 ppb of trichloroethene to below 5 ppb. Air stripper literature is contained in ATTACHMENT C.

The water treatment system includes a 550 gallon polyethylene chemical feed tank and a chemical metering pump which injects AQUA MAG (a sodium ortho/polyphosphate blend) into the flow at the inlet to the air stripper. AQUA MAG is injected at a rate of 1.24 ppm phosphate to inhibit precipitation of calcium carbonate in the air stripper and piping. Chemical feed pump literature is contained in ATTACHMENT D.

The rapid infiltration ponds have been sized to receive a maximum of 50 gpm of treated groundwater. The water placed in the rapid infiltration ponds travels vertically through the vadose zone back into the aquifer (see FIGURE 1). The rapid infiltration ponds are anticipated to need cleaning about once per year. As-Built plans for the rapid infiltration ponds are presented in ATTACHMENT E.

The Source Containment System is equipped with numerous safeguards to prevent release (to the surface or to the aquifer) of untreated groundwater. The main air stripper panel will shut off the submersible pump in well CW-2 if any of the following conditions occur:

- Low blower pressure resulting from electrical or mechanical failure of the air stripper blower.
- High air stripper sump level resulting from misadjustment of the discharge valve, or discharge pump failure.
- High building sump level resulting from a large leak in the air stripper or piping within the building. The building sump has a capacity of about 2300 gal, which is about three times the maximum amount of water contained in the air stripper at any time.

- High Pond 6 level caused by clogging of the pond bottoms
- High well pit level
- Low chemical feed tank level.

When any of the above described or other conditions shuts off the submersible pump in well CW-2, the air stripper blower will subsequently shut off after a time delay to allow the water in transit in the air stripper to be treated. The submersible pump panel includes a flow switch to shut off the submersible motor if the pump fails or if a valve is closed.

The Sparton 5354 monitoring system will notify maintenance personnel immediately any time the submersible pump shuts off, via a telephone link. The designated maintenance person will travel to the system location, evaluate the reason for the shutdown, rectify the problem and restart the Source Containment System.

The Main Stripper Panel controls are described in ATTACHMENT C. The Sparton 5354 monitoring system is described in ATTACHMENT F.

OPERATING PERMITS AND REPORTING REQUIREMENTS

The Source Containment System is operated within the requirements of three permits.

The operation of containment well CW-2 is conducted under New Mexico State Engineer permit RG-73531-T. The permit allows diversion of up to 121 acre-feet per annum, and consumptive use of up to 15 acre-feet per annum is allowed. The permit requires that the amount of water diverted from the well be submitted to the Office of the State Engineer on or before the 10th day of each month for the preceding calendar month. New Mexico State Engineer office permit RG-73531-T and supplemental information is contained in ATTACHMENT G.

The operation of the air stripper is conducted under Albuquerque/Bernalillo County Authority-to-Construct Permit No. 1203 (see ATTACHMENT H). The permit allows operation of containment well CW-2 at a rate of up to 75 gpm. The air emission limits are as follows:

VOC - 0.22 lbs/hr
- 0.99 tpy

Hazardous Air Pollutants

- 1,1,1 Trichloroethene
8 mg/m³

- 1,1 Dichloroethylene
8 mg/m³

Operation of the rapid infiltration ponds are conducted under New Mexico Environment Department Discharge Plan Approval DP-1184 (see ATTACHMENT I) which allows discharge of up to 108,000 gpd of treated groundwater to the rapid infiltration ponds (see FIGURE 1).

The discharge plan approval requires monthly sampling and analysis of the air stripper effluent and quarterly monitoring and reporting of three monitoring wells (MW-17, MW-77, and MW-78 at locations shown in ATTACHMENT E) associated with the gallery.

OPERATIONAL RESPONSIBILITIES

Operation and Maintenance of Source Containment System is the responsibility of the General Manager of Sparton Technology, Inc., Rio Rancho, New Mexico. Day to day operation of the system has been assigned to the Environmental/Safety Engineer, Sparton Technology, Inc., Rio Rancho, New Mexico. METRIC Corporation, Albuquerque, New Mexico is retained to address operation and maintenance problems.

NORMAL OPERATION

Normal Startup Procedure

If the system was deliberately shut down, the following procedure should be used to start the system.

Main Air Stripper Panel

- Main Disconnect - On
- Alarm Reset - Press
- Discharge Pump HOA Switch - Auto
- Air Stripper Blower HOA Switch - Auto
- Submersible Pump HOA Switch - Auto

After placing Submersible Pump HOA Switch in Auto position, you have 10 seconds to perform the following:

Submersible Pump Panel

- Main disconnect - On
- HOA Switch - Hand
- Start Switch - Press

Normal Shutdown Procedure

Shut the system down for maintenance or repairs. The following procedure should be used.

Main Air Stripper Panel

- Submersible Pump HOA Switch - Off

The submersible pump in well CW-2 will stop, the stripper blower will continue to run for 1 or 2 minutes and then it will stop, and the discharge pump will continue to run until the air stripper sump is pumped down to the low level float and then it will stop.

Each time the water treatment building is visited for performance of scheduled or unscheduled tests, the activities performed should be documented on CW-2 Operation Log forms provided in ATTACHMENT J.

Tasks Performed One Time Per Week

- Read and record blower air pressure. It should be between 25 and 30 inches of water (Gauge 6). If it is outside these limits, identify and remedy the problem.
- Read and record the pressure reducing valve inlet and outlet pressures (Gauges 8 and 9). The outlet pressure should be between 5 and 10 psi. If it is outside these limits, identify and remedy the problem.
- Read and record the time and the accumulative water meter (Gauge 10) readings. It is important to record the time at the moment the accumulative water meter is read.
- With a stopwatch, measure the time, in seconds, required for one revolution (100 gal) of flow on the accumulative water meter. Calculate the instantaneous flow using the following equation:

$$\frac{6000}{\text{sec}/100 \text{ gal}} = \text{flow (gpm)}$$

The flow should be between 49 and 51 gpm. If it is not, adjust the inlet valve located just above the pressure reducing valve.

- Measure and record the time required for the water level in the sight glass on the air stripper to drop one inch with the discharge pump running. The time should be between 1 and 2 minutes. If it is not, adjust the outlet valves leading to the rapid infiltration ponds.

- Measure and record the volume of AQUA MAG solution remaining in the chemical feed tank by interpolating between 100 gallon increments marked on the tank. If the volume remaining is less than 200 gal, mix more solution. The mixture is as follows:

4.1 gal AQUA MAG/100 gal solution

Water to mix the solution is treated water obtained from the air stripper discharge via the PVC piping which enters the top of the chemical feed tank.

- Calculate and record the volume of AQUA MAG solution consumed per day between the two most recent chemical feed tank volume measurements using the following equation:
- $$\frac{(\text{tank volume between consecutive measurements}) \times 24}{(\text{number of hours between measurements})} = \text{volume of solution consumed per day}$$

The system should consume between 10 and 12 gal/day of AQUA MAG solution. If the consumption is not within these limits, identify and remedy the problem. small variations can be remedied by adjusting the chemical feed pump.

- Record the quantity of pure AQUA MAG on hand. If the quantity is less than 55 gal, order additional. AQUA MAG is available from

Treatment Technology, Inc.
P.O. Box 668
Evergreen, CO 80437-0668
(303) 670-3936

- Clean the floor and remove any trash in the building.

- Inspect the outside of the building and fence. If vandalism or damage has occurred, repair as necessary.

Tasks Performed One Time Per Month

- On the last day of each month (\pm two days), read and record the accumulative water meter (Gauge 10) for reporting to the New Mexico State Engineer Office.

Sample air stripper influent and effluent for analysis and reporting to the New Mexico Environment Department, Groundwater Bureau.

Tasks Performed One Time Per Quarter

- During February, May, August and November, monitor wells MW-17, MW-77, and MW-78 will be sampled and have the water levels measured.

Tasks Performed Two Times Per Year

- Check flow switch paddle for fatigue cracks.

Tasks Performed One Time Per Year

- Shut the system down by turning the submersible pump HOA switch on the Main Stripper Panel to off. Wait for the blower and discharge pump to stop (5 min \pm). Separate the air stripper at the joint below the bottom tray and lift all trays about 3 inches using the gantry crane. Inspect, with a flashlight, the bottom tray for calcium carbonate encrustation or other debris. If encrustation is observed in the trays, they should be cleaned with a high pressure washer and a wet/dry vacuum, using the gantry crane in the building, to lift the trays.

SYSTEM TROUBLE SHOOTING, REPAIRS, AND SUPPLIES

Startup After Automatic Shutdown

Anytime the system is shut down by the automatic control system or by a power failure, it is absolutely important for the responding technician to follow the following sequence:

- Document the status of the system including all alarms on the Main Stripper Panel (see FIGURES 4, 5, and 6). Document water levels in the air stripper sump, building sump, ponds and chemical feed tank. Document any other potentially relevant or unusual circumstances.
- Determine and document the cause(s) of the shutdown. TABLE 1 may be helpful in determining the cause(s) of the shutdown.
- Remedy the cause of the shutdown and restart the system.

For assistance with any trouble shooting, repairs or supplies, contact the people outlined in TABLE 2.

EQUIPMENT REPLACEMENT SCHEDULE

It is anticipated that mechanical equipment will need to be replaced at the following approximate intervals:

Well - redevelop	10 year
Submersible pump	10 year
Blower motor	10 year
Discharge pump	10 year

If it is necessary to replace any equipment, contact the people outlined in TABLE 2 who supplied the original equipment.

WASTE MANAGEMENT

Waste generated by the Source Containment System will be handled as follows:

AQUA MAG Drums - These will be cleaned and reused for collection of spent materials at Sparton's Rio Rancho facility.

Trash - This will be placed in the dumpster at Sparton's Rio Rancho facility.

Calcium Carbonate Encrustation - This material will be accumulated in a plastic bucket and analyzed for TCLP - chromium and TCLP - 8260. If the material does not exceed TCLP standards, it will be dried and placed in the dumpster at Sparton's Rio Rancho Facility. If the material exceeds TCLP standards it will be handled by a licensed waste transportation and disposal vendor.

Inoperable Equipment - Any inoperable equipment which has come in contact with untreated groundwater including submersible pumps, discharge pumps, and water piping will be steam cleaned in the air stripper building prior to leaving the site.

Decontamination and Purge Water - Water resulting from decontamination of equipment or purging of monitoring wells is discharged to the building sump and pumped to the inlet side of the air stripper by the sump pump for treatment by the air stripper.

Well Redevelopment Waste Water - This will be decanted and neutralized at the site and treated through the air stripper.

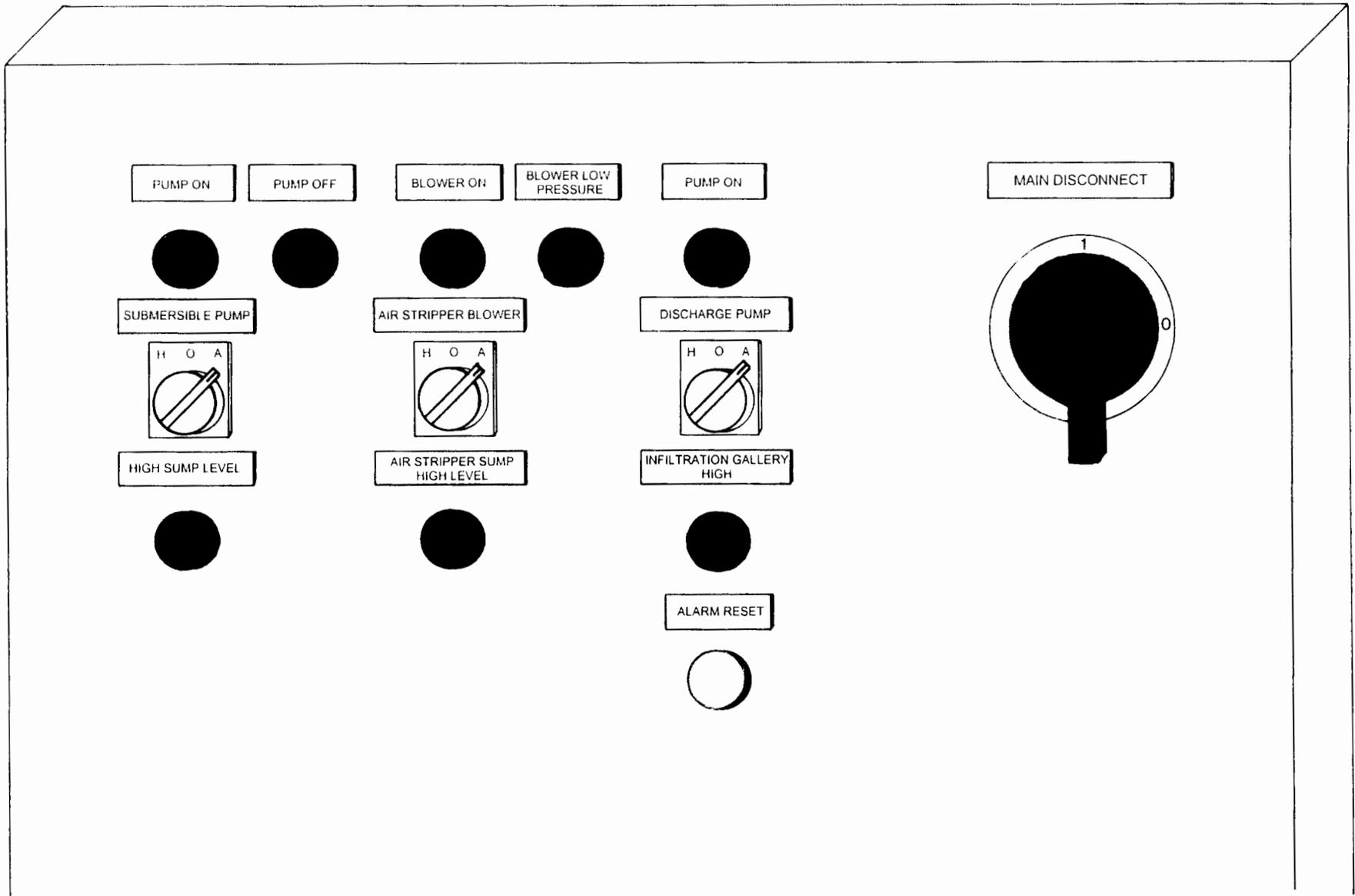


FIGURE 4

MAIN AIR STRIPPER PANEL STATUS
 SPARTON TECHNOLOGY, INC.

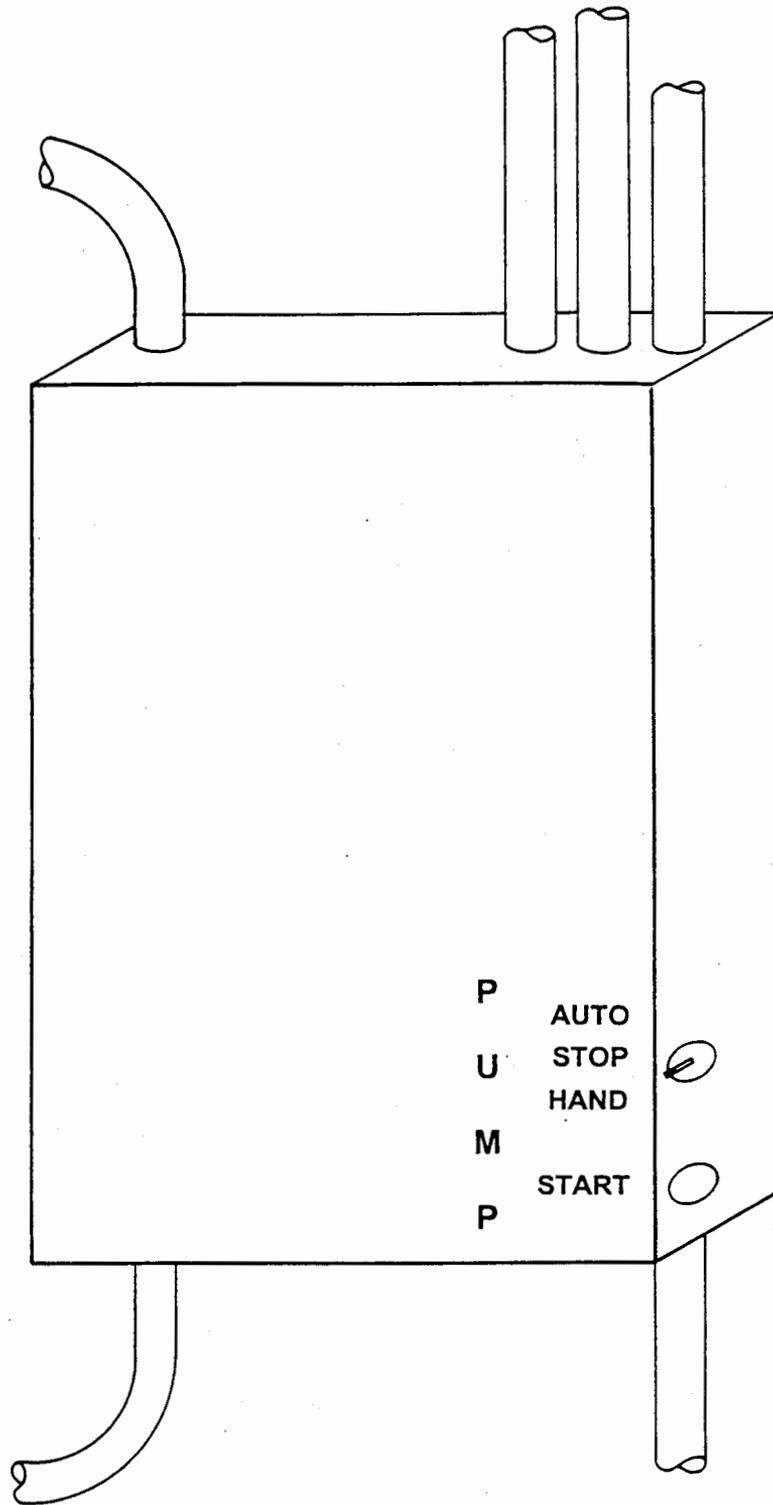


FIGURE 5

SUBMERSIBLE PUMP CONTROL PANEL
SPARTON TECHNOLOGY, INC.

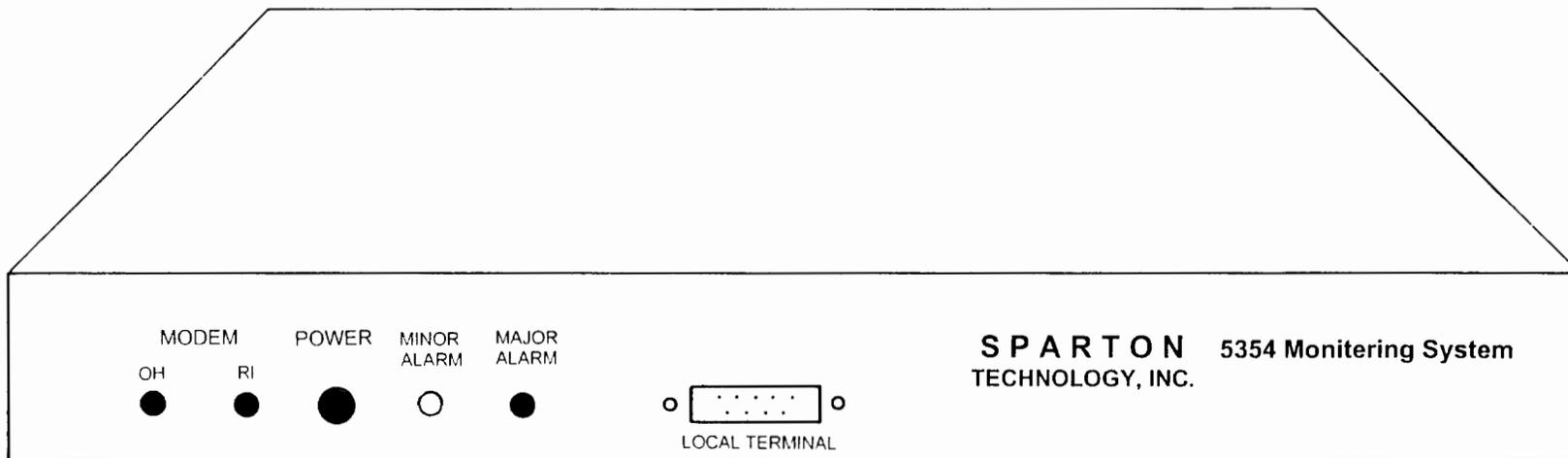


FIGURE 6

SPARTON 5354 MONITORING SYSTEM
SPARTON TECHNOLOGY, INC.

TABLE 1
AUTOMATIC CONTROL SYSTEM LOGIC SUMMARY

Item	When it Runs	When it Stops
Submersible Pump	Main Stripper Panel HOA-Auto and Blower Pressure >9 H ₂ O and Submersible Pump Panel HOA - hand and START - press	Main Stripper Panel low blower pressure or high air stripper sump level or high building sump level or high Pond 6 level or high well pit level or no flow from well pump or low chemical feed tank level
Blower	Main Stripper Panel HOA - auto	Submersible Pump Stops (with delay)
Discharge Pump	HOA - auto and water in air stripper sump up to middle float	Water in air stripper sump down to bottom float or high Pond 6 level
Sump Pump	High water level in pit and submersible pump on	Low water level in pit or submersible pump off
Chemical Feed Pump	Submersible pump on	Submersible pump off

TABLE 2
ASSISTANCE WITH TROUBLE SHOOTING, REPAIRS OR SUPPLIES

Problem Area	Company	Phone #	Contact
General System Operation	METRIC Corp.	505-828-2801	Gary L. Richardson
Well Submersible Pump Pump Panel Pressure Reducing Valve Water Meter Chemical Feed Pump Sump Pumps	Rodgers & Co., Inc.	505-877-1030	Clarence Rodgers
Air Stripper	EPA Companies, Inc.	1-800-443-7426	Jim Bailey
Water Treatment Building	Ron Romero, Inc.	505-242-5760	Ron Romero
Electrical	DRB Electric	505-877-8500	Randy Baker
Piping	Rodgers Plumbing & Heating, Inc.	505-243-9703	Jim Rodgers
Rapid Infiltration Ponds	METRIC Corp.	505-828-2801	Gary L. Richardson
5354 Monitoring System	Sparton Technology, Inc.	505-892-5300	Tim Hoover
AQUA MAG	Treatment Technology, Inc.	303-670-3936	Bryan McCarty

CONTINGENCY PLANS

Should monthly air stripper effluent testing indicate that the stripper efficiency is declining, the stripper will be cleaned and repaired as necessary to maintain the treatment efficiency.

Should weekly water level measurements in the rapid infiltration ponds indicate they are clogging, provisions will be made to clean the ponds.

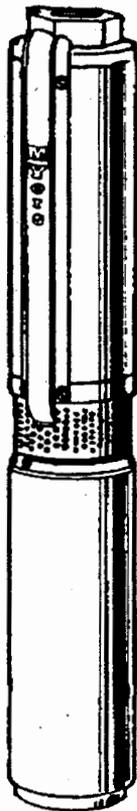
Should unforeseen operational issues or problems arise, these will be defined, solutions will be developed, and this plan will be revised as necessary.

HEALTH AND SAFETY PLAN

A health and safety plan for operation of the Source Containment System is contained in ATTACHMENT K.

ATTACHMENT A
WELL, PUMP, VALVE, WATER METER,
AND FLOW SWITCH LITERATURE

SJ Extension & RANGER Series Heavy Duty Four Inch Submersible Pumps Installation and Operation Guide 25-80 GPM (80-250 LPM)



- A** Pump Selection & InspectionPage 3
- B** Pre-Installation PreparationPage 3
- C** Cable SelectionPage 4
- D** Grounding Page 5
- E** Installation of Pump in WellPage 5
- F** Controlling Weak Wells Page 6
- G** Trouble-Shooting Pages 7 & 8

Myers[®]

Read this guide completely before installation

Myers recommends a waterwell driller or experienced waterwell serviceman to install new water systems – or to replace an existing submersible waterwell pump or pump motor.

Please read this entire Guide before installing your Myers Submersible Pump.

CAUTION: Do not run unit dry. Unit can be severely damaged if run dry. For safe testing, wait until pump is wired, grounded and completely submerged.

A Pump Selection & Inspection

1. Select the right pump & motor

Gallons per minute desired + pressure required + depth to pumping level determines which Myers 4" Submersible Pump size and model is right for your waterwell system.

All 4" Motors are NEMA Standard water lubricated motors. Single phase, 3-wire motors require control boxes

containing the capacitors, relay and combination starter, while three phase units require the Myers combination starters. Single phase, 2-wire motors do not require control boxes.

2. Inspect your new pump & motor

After purchase, check the pump and motor and other contents of the

shipping containers for possible damage. Do NOT lift the Submersible Motor by its attached electric motor cables.

Find the loose owner's information-plates and check the listed model number against the data on the motor and the pump.

B Pre-Installation Preparation

1. New Wells

a) Location of pump. If properly installed, your Myers Submersible Pump will provide years of dependable, trouble-free service. For new wells, always locate well to provide for easy removal and replacement of pump. The water tank and electrical controls can be located some distance from the well.

b) Determine depth of pump in well in order to purchase electrical cables of sufficient gauge and length to reach from pump motor to electrical motor control box – and to purchase galvanized iron pipe of sufficient length to reach from pump discharge to water tank. (See cable-length and cable-size charts.)

c) Location of water tank & electrical controls. Always install the pressure tank and electrical controls in a clean, dry basement or utility room to avoid dampness and temperature extremes. A pressure relief valve piped to a suitable drain is recommended.

2. Replacing pump (or motor only) in existing well

a) Turn off power at electrical control box.

b) Remove well seal from top of well.

c) Remove old pump from well:

1) if galvanized iron pipe was used originally, you'll find a number of rigid sections joined together. Pull pipe upward and dismantle each section as you go, untaping or unbanding electrical motor cables from each section until you reach pump.

2) when old pump is out of well, cut electrical cables as close to original splice connection as possible.

3) while new cable is preferred (because it will remain submerged for a number of years), you may wish to re-use the old cable. Wipe off and clean the insulation, examining carefully for cuts, cracks and abrasions. If in doubt, purchase new cable.

4) if new cable is necessary, measure length of old cable (from pump motor to power source) and purchase sufficient replacement lengths. (See wire-size and cable-length selection charts.)

3. Attaching pump to motor

a) Remove shaft protection clamp from top of motor.

b) Scrape mounting faces of both pump and motor. All rust and dirt must be completely removed.

c) The pump and motor must be kept in a straight line to assure proper shaft and coupling alignment. Carefully lower pump onto motor. If motor shaft splines and pump coupling splines do not engage, lift pump and rotate motor shaft only very slightly. Repeat until motor and pump are properly mated, then securely bolt together.

d) Install cable guard. Cable should be protected at the top of the guard with a heavy layer of tape or rubber pads.

D Grounding

1. Motor grounding instructions

CAUTION: Failure to ground this unit properly may result in severe electrical shock. Ground your submersible by using a Franklin pigtail with ground. If your unit does not have a grounded pigtail, the motor can be grounded by running a copper grounding wire from the pump discharge bowl to the main electrical system ground. Following is the recommended grounding procedure:

a) The grounding wire to be used must be the same size as the power conductor wires. Insulated stranded, insulated solid, or bare solid copper wire may be used. Aluminum wire is not suitable for this application.

b) If stranded wire is used, attach a crimp type wire ring terminal that will fit

the motor mounting studs. A fork-type terminal with ends turned up is also acceptable. Slip terminal onto stud, followed by locking washer. Securely tighten the screw.

c) If solid wire is being used, loop bare end of it around the stud followed by a locking washer. Securely tighten the nut.

CAUTION: Do not put the ground wire into a bind.

d) Connect the top end of the ground wire to the main electrical system ground.

WARNING: Reduced risk of electric shock during operation of this pump requires the provision of acceptable grounding: Caution: Failure to ground this unit properly may result in severe electrical shock. Grounding your new submersible pump is accomplished by running a copper grounding wire from the main electrical system ground to the green ground wire in the motor pigtail. Following is the recommended

grounding procedure: This pump is provided with a means for grounding. To reduce the risk of electric shock from contact with adjacent metal parts, bond supply box to the pump-motor-grounding means and to all metal parts accessible at the well head, including metal discharge pipes, metal well casing, and the like, by means of (1) an equipment-grounding conductor at least the size of the well-cable conductors, or the equivalent, that runs down the well with the well cable and (2) a clamp, a weld, or both if necessary, secured to the equipment-grounding lead, the equipment-grounding terminal, or the grounding conductor on the pump housing. The equipment-grounding lead, if one is provided, is the conductor that has an outer surface of insulation that is green with or without one or more yellow stripes. **NOTE:** N.E.C. requires submersible pumps be grounded at installation.

E Installation of Pump in Well

1. Before lowering pump

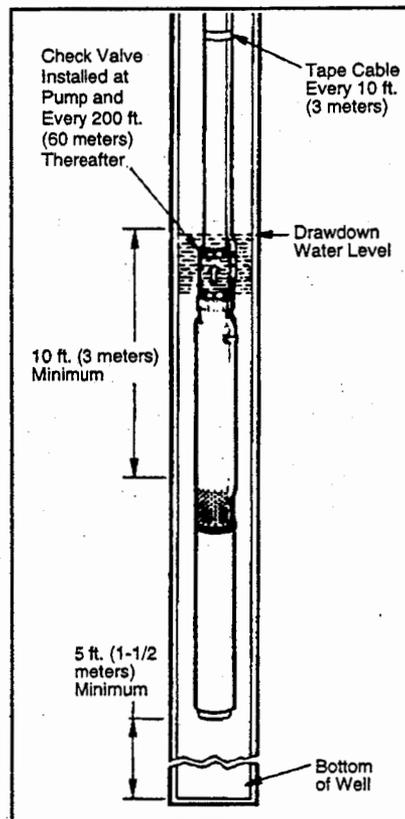
a) Smooth out any rough spots or sharp edges on the top lip of the well casing with a hammer or metal file to prevent damage to the pump or power cables when lowering into well.

b) As you add additional sections of galvanized iron pipe, apply pipe compound only to the male threaded ends of each section and tighten to next section.

c) Tape the power cables to the pipe, straight up from bottom to top. Do NOT spiral cable around the pipe. Use waterproof tape or nylon lock bands every 20 ft. (6 meters) on galvanized iron pipe.

Do not allow any excess cable between bands, cable must be as flat against pipe as possible.

2. Lowering the pump



a) Align pump carefully when beginning to lower it down the well casing. Do not let the pump, cables or pipe rub against the well casing. Take care that cable insulation is not dragged or scraped over the top lip of the well casing.

b) Depth of pump setting. Lower pump into well slowly without forcing. (On deep settings, we recommend that a check valve be installed at the pump and every 200 ft. (60 meters) thereafter to prevent water shock from traveling back to pump.)

Lower pump to at least 10 ft. (3 meters) below the maximum drawdown of the water level, if possible, and never closer than 5 ft. (1-1/2 meters) from the bottom of the well.

G Trouble-Shooting

The vast majority of service calls on waterwell systems are caused by either water-logged tanks or by problems which are electrical in nature.

The Myers submersible pump and waterwell system should be checked periodically for quality of water, draw-

down, pressure, GPM, cycling periods (how often the pump starts and how long it runs) and proper operation of all automatic controls.

Never operate the pump for long periods of time with the discharge valve closed. This could cause overheating resulting in damage to the

pump and its motor. A properly-sized relief valve should be installed before the tank to prevent the pump from operating with the discharge valve closed.

Familiarize yourself with potential problems and trouble-shooting solutions.

PROBLEM

PROBABLE CAUSE

SOLUTION

Pump won't run

Blown fuse, broken (or loose) electrical connections.

Check fuses, capacitor, relays and all electrical connections.

Pressure switch not closing.

Adjust or replace.

Motor overload protection contacts open.

Contacts will close automatically within short time.

Incorrect control box.

Check & replace if necessary.

Improper wiring connections.

Check wiring diagram.

Low voltage.

Check voltage at control box.

Pump stuck or clogged with foreign matter.

Pull pump and examine.

Pump runs, but no water pumped

Check valve installed backwards.

Reverse and re-install.

Setting too deep for rating of pump.

Check rating table.

Pump not submerged; not deep enough in well.

Lower pump if possible. Check recovery of well.

Pump in mud, impeller plugged or intake strainer clogged.

Pull pump and clean. Check well depth. Raise pump if necessary.

Reduced capacity

Strainer or impellers partially clogged or plugged.

Pull pump and clean.

Corroded discharge pipe.

Replace pipe.

Excessive pump wear.

Pull pump and replace worn parts. Or, replace pump.

Pressure switch won't cut out

Pressure switch not set correctly.

Revise settings: 20-lb cut-in, 40-lb cut-out; or 30/50 (depending on tank size).

Water level too low in well for rating of pump.

Check pump setting.

Switch opening clogged.

Clean out openings or, if necessary, replace switch.

Excessive wear on parts.

Replace worn parts.

THE RANGER

4" High Flow Submersible Pumps
1 - 10 HP
25, 35, 50 and 80 GPM

**Stainless Steel
Construction**



MYERS RANGER SERIES PUMPS PROVIDE LARGE VOLUMES OF WATER FOR USE IN IRRIGATION AND NUMEROUS OTHER WATER SYSTEM APPLICATIONS. Corrosion resistant design features, coupled with abrasion resistant components ensure long, reliable life in the toughest environments. For more information on Myers Ranger pumps, contact your Myers distributor or the Myers Ohio sales office at 419-289-1144.

BENEFITS AND FEATURES

- Tough corrosion resistant design.
- Abrasive handling design for long life.
- Powerful performance
 - head capabilities to 1100 feet
 - flow capacities to 100 gpm
- Easy installation
 - slim 3³/₄" diameter easily fits into 4" wells
- NEMA mounting dimensions.
- 2" NPT discharge.

Construction Material

Discharge Bowl	Heavy Duty Stainless Steel
Suction Bowl	
Shell	
Suction Screen	
Coupling	
Shaft	
Lead Guard	
Staging	Engineered Thermoplastic
Shaft Bearing	Buna-N

WHERE INNOVATION MEETS TRADITION

Country water.™

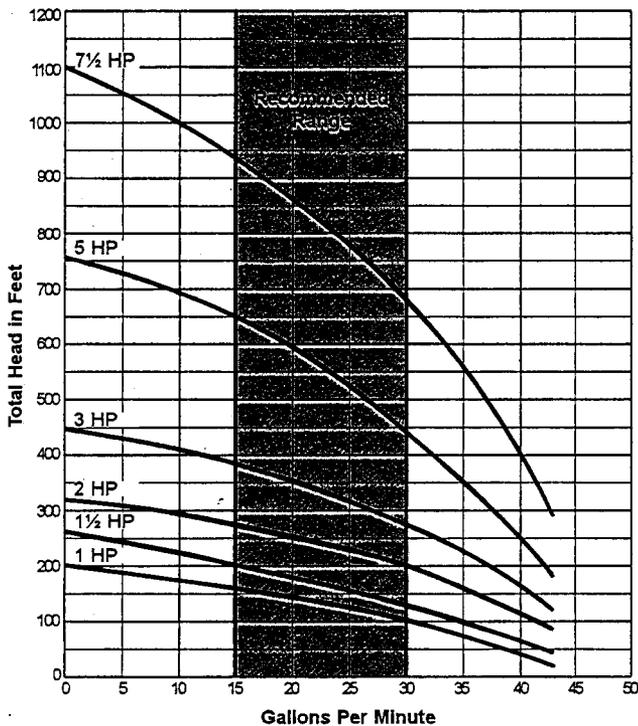
ISO 9001 Registered Quality System

Myers®

Pentair Pump Group

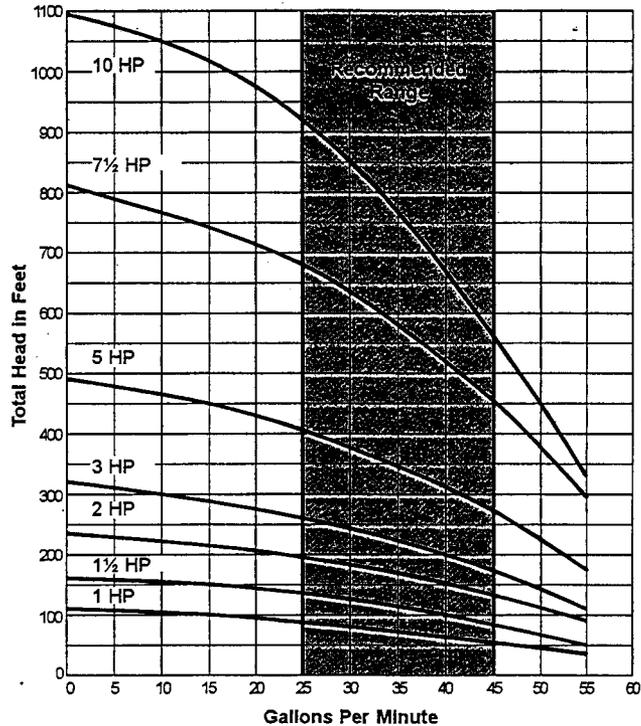
25 GPM Ranger Series

Performance Curves



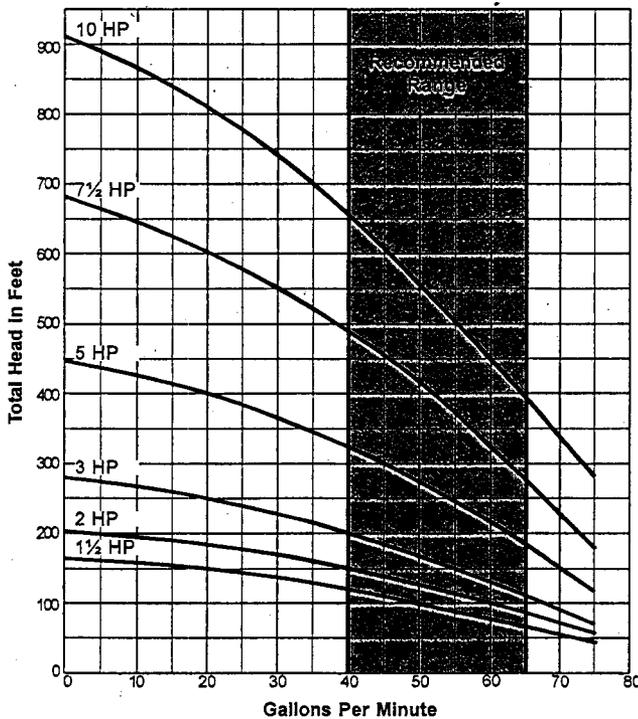
35 GPM Ranger Series

Performance Curves



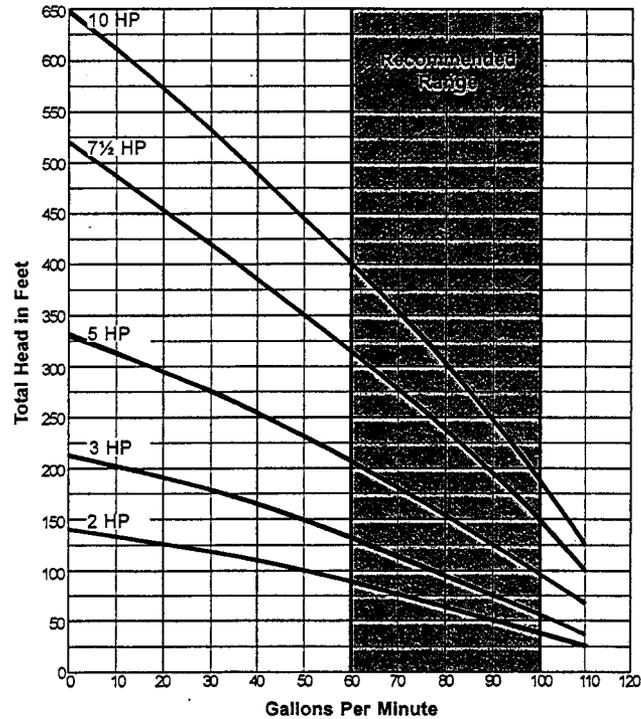
50 GPM Ranger Series

Performance Curves



80 GPM Ranger Series

Performance Curves

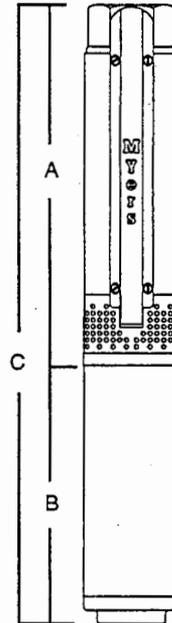


THE RANGER

4" High Flow Submersible Pumps
1 - 10 HP
25, 35, 50 and 80 GPM

SPECIFICATIONS

Cat. No.	HP	Flow Rate GPM	Stages	Length "A" In.	Weight Lbs.	Total Length "C" In.	Total Weight Lbs.
SS10-25	1	25	7	18	12	30	34
SS15-25	1½	25	9	21	15	34	38
SS20-25	2	25	11	24	16	38	43
SS30-25	3	25	15	30	20	51	60
SS50-25	5	25	25	48	30	71	82
SS75-25	7½	25	37	67	45	96	136
SS10-35	1	35	4	15	10	27	32
SS15-35	1½	35	6	18	13	31	36
SS20-35	2	35	8	22	15	36	42
SS30-35	3	35	11	28	22	49	58
SS50-35	5	35	18	43	28	66	78
SS75-35	7½	35	28	62	40	91	116
SS100-35	10	35	37	75	86	119	202
SS15-50	1½	50	6	21	15	34	38
SS20-50	2	50	7	23	16	37	43
SS30-50	3	50	10	31	20	52	60
SS50-50	5	50	16	48	32	71	82
SS75-50	7½	50	25	70	45	100	133
SS100-50	10	50	32	84	55	128	171
SS20-80	2	80	6	29	20	43	47
SS30-80	3	80	9	39	26	60	66
SS50-80	5	80	14	59	50	83	100
SS75-80	7½	80	22	86	66	116	132
SS100-80	10	80	27	100	75	144	191



PUMP END CATALOG IDENTIFICATION

SS10-25

25 = 25 GPM
35 = 35 GPM
50 = 50 GPM
80 = 80 GPM

10 = 1 HP
15 = 1½ HP
20 = 2 HP
30 = 3 HP
50 = 5 HP
75 = 7½ HP
100 = 10 HP

SS - STAINLESS STEEL

MOTOR/CONTROL BOX DATA

MOTOR CATALOG NUMBER	HP	NO. OF WIRES	PH	VOLTS	MAX. AMPS	LENGTH "B" IN.	WEIGHT LBS.	CONTROL BOX CATALOG NUMBER	WEIGHT LBS.
S2JF102	1	2	1	230	9.8	12	22	---	---
SJF102	1	3	1	230	9.8	12	22	CJF10-2	4
S2JF152	1½	2	1	230	13.1	15	30	---	---
SJF152	1½	3	1	230	11.6	14	27	CJF15-2	5
SJF1503	1½	3	3	200	7.4	13	23	CJ15-03	3
SJF1523	1½	3	3	230	6.4	13	23	CJ15-23	3
SJF1543	1½	3	3	460	3.2	13	23	CJ15-43	3
SJF2021	2	3	1	230	13.2	15	29	CJ20-21	11
SJF2003	2	3	3	200	9.3	14	27	CJ20-03	3
SJF2023	2	3	3	230	8.1	14	27	CJ20-23	3
SJF2043	2	3	3	460	4.1	14	27	CJ20-43	3
SJF3021	3	3	1	230	17	24	49	CJ30-21	15
SJF3003	3	3	3	200	12.5	21	40	CJ30-03	3
SJF3023	3	3	3	230	10.9	21	40	CJ30-23	3
SJF3043	3	3	3	460	5.5	21	40	CJ30-43	3
SJF5021	5	3	1	230	27.5	30	66	CJ50-31	15
SJF5003	5	3	3	200	20.5	24	50	CJ50-03	3
SJF5023	5	3	3	230	17.8	24	50	CJ50-23	3
SJF5043	5	3	3	460	8.9	24	50	CJ50-43	3
SJF5053	5	3	3	474	7.1	24	50	CJ50-53	3
SJF7503	7½	3	3	200	30.5	30	66	CJ75-03	3
SJF7523	7½	3	3	230	26.4	30	66	CJ75-23	3
SJF7543	7½	3	3	460	13.2	30	66	CJ75-43	3
SJF7553	7½	3	3	575	10.6	30	66	CJ75-53	3
SJF10043	10	3	3	460	18.8	44	116	CJ100-43	5
SJF10053	10	3	3	575	15	44	116	CJ100-53	5

* Does not include weight of shipping container

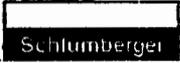
K3398 10/00
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Myers[®]
Pentair Pump Group

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419/289-1144, FAX: 419/289-6658, www.femyers.com

Myers (Canada), 269 Trillium Drive, Kitchener, Ontario N2G 4W5
519/748-5470, FAX: 519/748-2553



Water Division

Specifications

Application

Cold water measurement of flow in one direction

Maximum Operating Pressure

150 psi (1034 kPa)

Register

Direct reading, center sweep, roll-sealed, magnetic drive, with low flow indicator

Measuring Chamber

Nutating Disc, synthetic polymer

Options

Sizes

5/8", 5/8" x 3/4"
 3/4", 3/4" SL, 3/4" x 1"
 1", 1" x 1 1/4"

Units of Measure

U.S. Gallons ✓
 Imperial Gallons
 Cubic Feet
 Cubic Metres

Register Types

Direct Reading: ✓
 Synthetic polymer box and cover
 Bronze box and cover
 Remote Reading:
 ARB, ARB ProRead
 Pulsar-RM
 Tricon/VS
 Tricon/E

Bottom Caps

Synthetic polymer (5/8" only)

Cast Iron
 Bronze

Connections

Bronze, straight or bent

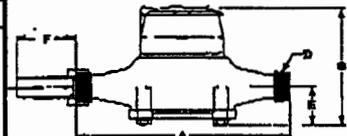
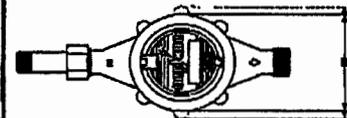
Operating Characteristics

Meter Size	Normal Operating Range @ 100% Accuracy ± 1.5%	AWWA Standard	Low Flow @ 95% Accuracy
5/8"	1/2 to 20 US gpm 0.11 to 4.5 m³/h	1 to 20 US gpm 0.23 to 4.5 m³/h	1/8 US gpm 0.03 m³/h
3/4"	3/4 to 30 US gpm 0.17 to 6.8 m³/h	2 to 30 US gpm 0.45 to 6.8 m³/h	1/4 US gpm 0.06 m³/h
1"	1 to 50 US gpm 0.23 to 11.4 m³/h	3 to 50 US gpm 0.68 to 11.4 m³/h	3/8 US gpm 0.09 m³/h

Registration

Registration (per sweep hand revolution):			
		5/8"	3/4" & 1"
✓ 10 US Gallons		✓	✓
10 Imperial Gallons		✓	✓
1 Cubic Feet		✓	✓
0.1 Cubic Metres		✓	✓
0.01 Cubic Metres		✓	✓

Registrar (6-wheel odometer):			
		5/8"	3/4" & 1"
10,000,000 US Gallons		✓	✓
10,000,000 Imperial Gallons		✓	✓
1,000,000 Cubic Feet		✓	✓
100,000 Cubic Metres		✓	✓
10,000 Cubic Metres		✓	✓



Dimensions

Meter Size	A In/mm	B In/mm	C			D		E In/mm	F In/mm	Approx Weight lbs/kg
			Std In/mm	ARB In/mm	Pul In/mm	Threads per inch	OD In/mm			
5/8"	7 1/2 191	3 5/8 92	4 7/8 124	5 3/8 137	6 3/4 171	14	1.030 26	1 5/8 41	2 1/2 64	3 3/4 1.7
5/8" x 3/4"	7 1/2 191	3 5/8 92	4 7/8 124	5 3/8 137	6 3/4 171	11 1/2	1.290 33	1 5/8 41	2 5/8 67	4 1.8
3/4"	9 229	4 3/8 111	5 1/2 140	5 3/8 148	7 3/8 187	11 1/2	1.290 33	1 7/8 48	2 5/8 67	6 2.7
3/4" SL	7 1/2 191	4 3/8 111	5 1/2 140	5 3/8 148	7 3/8 187	11 1/2	1.290 33	1 7/8 48	2 5/8 67	5 1/2 2.5
3/4" x 1"	9 229	4 3/8 111	5 1/2 140	5 3/8 148	7 3/8 187	11 1/2	1.626 41	1 7/8 48	2 3/4 70	6 1/2 2.9
1"	10 3/4 273	6 1/2 165	6 3/8 162	6 3/8 168	8 3/8 208	11 1/2	1.626 41	2 1/8 54	2 3/4 70	9 3/4 4.4
1" x 1 1/4"	10 3/4 273	6 1/2 165	6 3/8 162	6 3/8 168	8 3/8 208	11 1/2	1.865 47	2 1/8 54	2 13/16 71	10 1/4 4.6

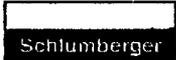
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- NORTHEAST:** 230 Gardner St. Suite 4 Hingham, MA 02043 (617) 749-5080
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CANADIAN SALES

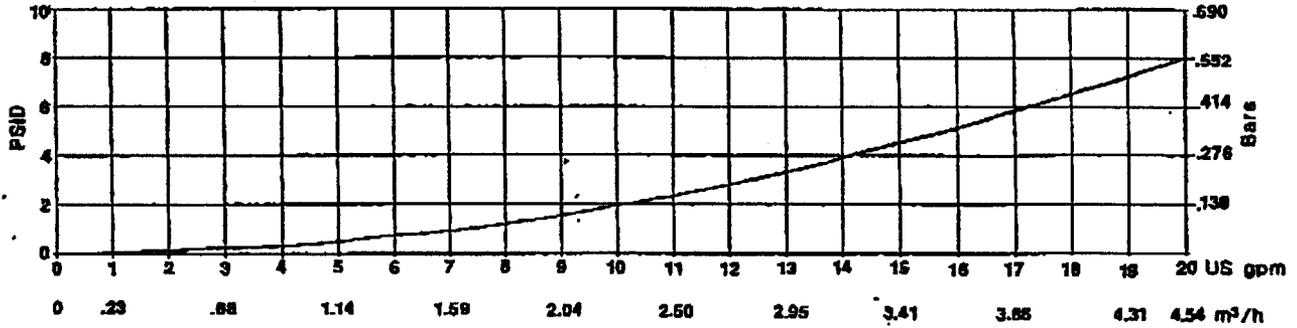
- Schlumberger Canada, LTD. Measurement Division 7275 West Credit Ave. Mississauga, Ontario, L5N 5M9 (416) 858-4211 FAX (416) 858-0428



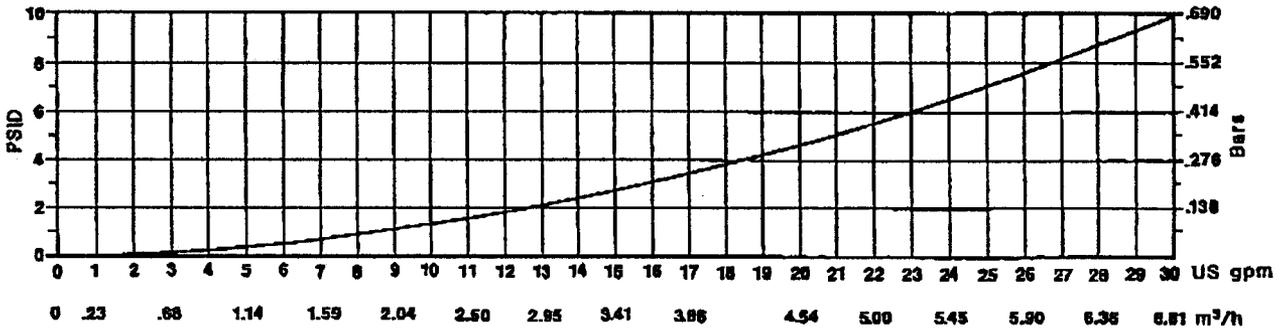
Water Division

5/8", 3/4" & 1" NEPTUNE T10 PRESSURE LOSS

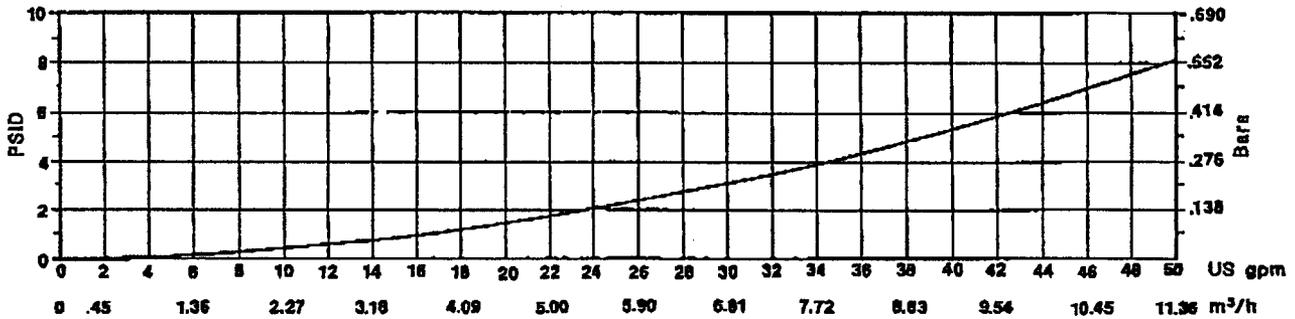
5/8"



3/4"

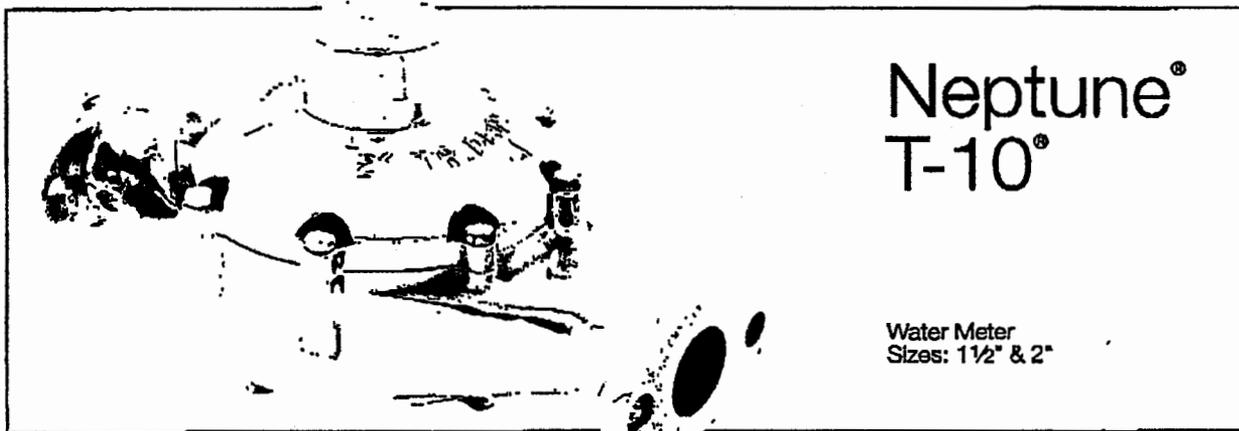


1"



Schlumberger

Water Division



Neptune[®] T-10[®]

Water Meter
Sizes: 1½" & 2"

Features and Benefits

Roll-Sealed Register

- Magnetic drive, low torque registration ensures accuracy
- Impact-resistant, flat, glass lens for legibility
- 1:1 Ratio, low flow indicator detects leaks
- Bayonet mount allows in-line serviceability
- Tamperproof seal pin deters theft
- Date of manufacture, size, and model stamped on dial face

Cast Bronze Maincase

- Sturdy, durable, corrosion resistant
- Resists internal pressure stresses and external damage
- Handles in-line piping stress
- Electrical grounding continuity
- Residual value

Nutating Disc Measuring Chamber

- Widest effective flow range for greater utility revenue
- Excellent low flow accuracy
- Corrosion resistant
- Floating chamber design is unaffected by meter position or in-line piping stress
- Three-piece chamber for easy serviceability

Systems Compatibility

- Adaptability to all Neptune Systems provides flexibility

Performance

Every Neptune T-10 water meter meets or exceeds the latest AWWA Standard, C700-90. Its nutating disc, positive displacement principle is time proven for accuracy and dependability since 1892, ensuring maximum utility revenue.

Construction

The Neptune T-10 water meter consists of three major component assemblies: a roll-sealed register, a cast bronze maincase, and a nutating disc measuring chamber.

The direct-reading register assembly is roll-sealed, eliminating lens fogging, and is coupled to the measuring chamber by a magnetic drive. The register contains a low flow indicator for leak detection and, for reading convenience, can be mounted on the meter in any of four positions. Also available are remote reading registers for the Neptune ARB[®] (Automatic Reading and Billing) Systems, Pulsar-RM visual remote system, and Tricon[™]/S and Tricon/E systems. The register is secured to the maincase via a tamperproof seal pin.

The corrosion-resistant cast bronze maincase will withstand most service conditions: internal water pressure, rough handling, and in-line piping stress.

The innovative floating chamber design of the nutating disc measuring element protects the chamber from frost damage while the unique chamber seal extends the low flow accuracy by bonding the chamber outlet port to the maincase outlet port. The nutating disc measuring element utilizes corrosion resistant materials throughout and a thrust roller to minimize wear.

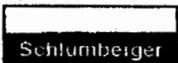
Warranty and Maintenance

Neptune T-10 water meters are warranted by Schlumberger for performance, materials, and workmanship. Schlumberger further offers an optional post-warranty maintenance program for extended service life.

When desired, owner maintenance is easily accomplished either by unitized replacement of major components or by parts repair of an individual component.

Guaranteed Systems Compatibility

All Neptune T-10 meters are guaranteed adaptable to our Pulsar-RM, ARB, CMR[®], Tricon/S, Tricon/E, NMR, and Unigun[™] Systems without removing the meter from service.



Water Division

Specifications

Application
Cold water measurement of flow in one direction.

Maximum Operating Pressure
150 psi (1034 kPa)

Register
Direct reading, center sweep, roll-sealed, magnetic drive with low-flow indicator

Measuring Chamber
Nutating disc, vulcanized hard rubber

Options

Sizes
1 1/2" Flanged or screw end
2" Flanged or screw end

Units of Measure
U.S Gallons
Imperial Gallons
Cubic Feet
Cubic Metres

Register Types
Director Reading:
Bronze box and cover (standard)
Remote Reading:
Pulser-RM
ARB Systems
Tricon/S
Tricon/E

Measuring Chamber
Synthetic Polymer

Companion Flanges
Cast Iron or Bronze

REGIONAL SALES and SERVICE OFFICES

- **NORTHEAST:** 230 Gardner St., Suite 4
Hingham, MA 02043
(617) 749-5080
- **CENTRAL:** 14700 Farmington Rd., Suite 106
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- **CUSTOMER SERVICE:**
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CANADIAN SALES
• Schlumberger Canada, Ltd.
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(416) 858-4211
FAX (416) 858-0428

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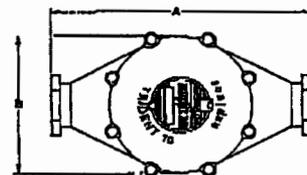
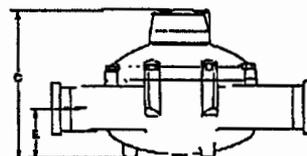
Operating Characteristics

Meter Size	Normal Operating Range @ 100% Accuracy (± 1.5%)	AWWA Standard	Low Flow @ 95% Accuracy
1 1/2"	2 to 100 US gpm 0.45 to 22.7 m³/h	5 to 100 US gpm 1.1 to 22.7 m³/h	3/4 US gpm 0.17 m³/h
2"	2 1/2 to 160 US gpm 0.57 to 36.3 m³/h	8 to 160 US gpm 1.8 to 36.3 m³/h	1 US gpm 0.28 m³/h

Registration

Registration (per sweep hand revolution):			
		1 1/2"	2"
100	US Gallons	✓	✓
100	Imperial Gallons	✓	✓
10	Cubic Feet	✓	✓
1	Cubic Metre	✓	✓
0.1	Cubic metres	✓	

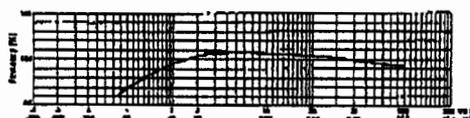
Register Capacity (6-wheel odometer):			
		1 1/2"	2"
100,000,000	US Gallons	✓	✓
100,000,000	Imperial Gallons	✓	✓
10,000,000	Cubic Feet	✓	✓
1,000,000	Cubic Metre	✓	✓
100,000	Cubic metres	✓	



Dimensions

Meter Size	A in/mm	B in/mm	C			D		E in/mm	Approx Weight	
			Std in/mm	ARB in/mm	Pul in/mm	Threads per inch	Thread Type		SP lbs/kg	Brz lbs/kg
1 1/2" Screw End	12 5/8 321	8 1/8 205	8 1/4 206	8 9/16 217	8 9/16 252	11 1/2	1 1/2" NPT	2 9/16 65	27 12.2	31 14.1
1 1/2" Flanged End	13 330	8 1/8 205	8 1/4 206	8 9/16 217	8 9/16 252	-	-	2 9/16 65	31 14.1	35 15.9
2" Screw End	15 1/4 387	9 7/8 240	9 5/8 237	9 3/4 248	11 1/8 283	11 1/2	2" NPT	3 1/8 79	34 15.4	40 18.1
2" Flanged End	17 432	9 7/8 240	9 5/8 237	9 3/4 248	11 1/8 283	-	-	3 1/8 79	38 17.2	44 20.0

ACCURACY CHARTS

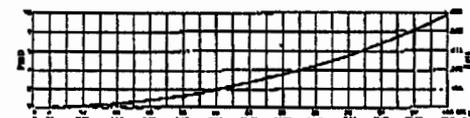


1 1/2"

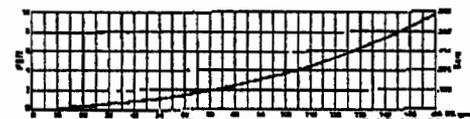


2" ✓

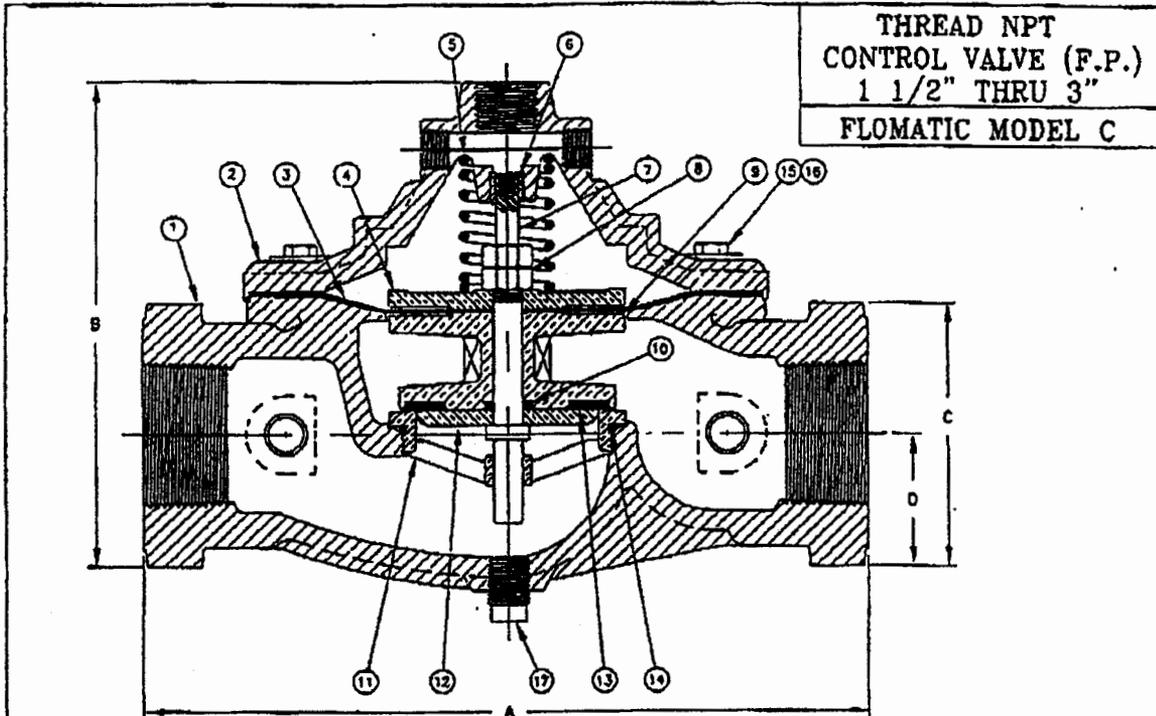
PRESSURE LOSS CHARTS



1 1/2"



2" ✓



FOR REFERENCE USE ONLY. SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

SIZE(in.)	PART No.	A	B	C	D	WT. lbs.
1 1/2	8471603	9 15/64	6 13/32	3 7/16	1 23/32	17
2	8471804	9 15/64	6 13/32	3 7/16	1 23/32	17
2 1/2	8471605					
3	8471606					

ITEM	QTY.	DESCRIPTION	MATERIAL	ASTM
1	1	VALVE BODY / (w I.D. TAGS)	DUCTILE IRON //(BRASS)	A-536
2	1	COVER	DUCTILE IRON	A-536
3	1	DIAPHRAGM	NITRILE/NYLON	-----
4	1	DIAPHRAGM PLATE	FEDERALLOY	I-836-FL
5	1	SPRING	STAINLESS STEEL	302
6	1	BUSHING	BRONZE	B140-83
7	1	STEM	STAINLESS STEEL	304
8	2	STEM NUT	STAINLESS STEEL	18-8
9	1	SPOOL	FEDERALLOY	I-836-FL
10	1	STEM O-RING	BUNA-N	-----
11	1	SEAT RING	FEDERALLOY	I-836-FL
12	1	SEAT PLATE	FEDERALLOY	I-836-FL
13	1	SEAT SEAL	BUNA-N	-----
14	1	SEAT RING O-RING	BUNA-N	-----
15	8	HEX HEAD BOLT & NUT 1/4-20x1-1/2	STAINLESS STEEL	18-8
16	8	FLAT WASHER 1/4	STAINLESS STEEL	18-8
17	1	DRAIN PLUG	STAINLESS STEEL	18-8

FLOMATIC[®] FLOMATIC CORPORATION
 GLENS FALLS, N.Y. 12801
 PHONE (513) 761-9797
 FAX (513) 761-9798

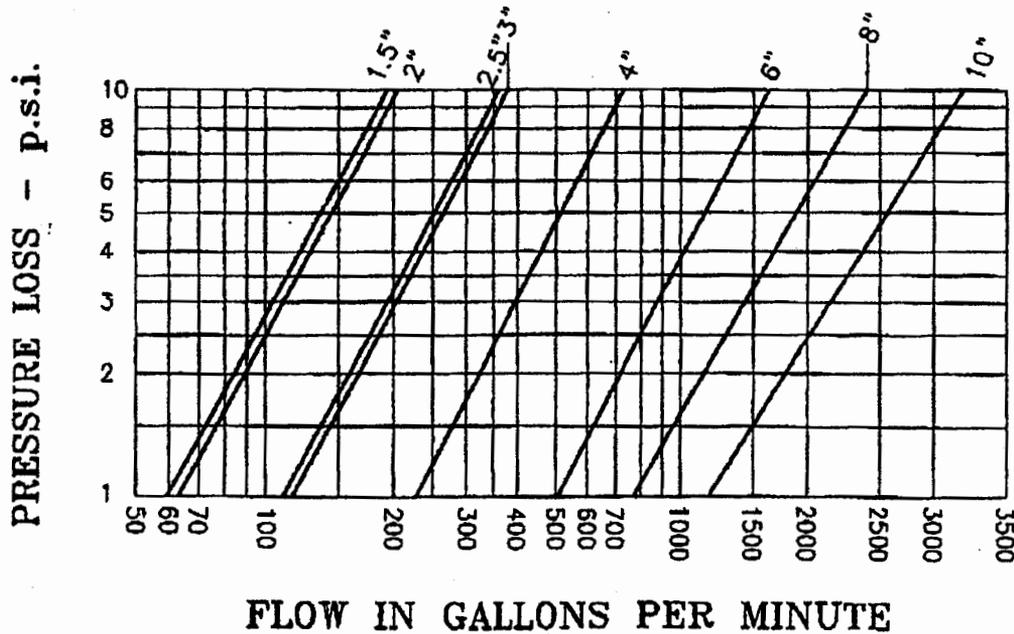
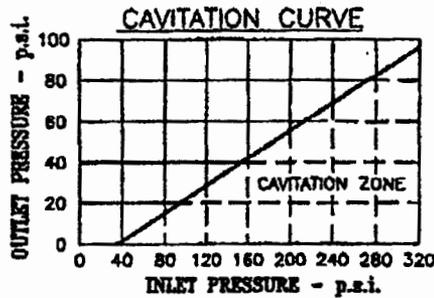
DATE: 7/27/95
 DWG. NO.: SCNPT
 REV.: 0 (7/99)

Cv FACTOR

U.S. SYSTEM: Cv = U.S. gal/min @ 1psi with 60°F water.
 METRIC SYSTEM: Cv = liters/sec @ 1 kPa with 15°C water.

**MODEL C
CONTROL VALVE**

VALVE SIZE	Inches	1.5	2	2.5	3	4	6	8	10
	mm	40	50	65	80	100	150	200	250
Cv FACTOR	Gal/Min	57	60	105	110	210	480	780	1200
	Litres/Sec	3.59	3.78	6.62	6.94	13.25	30.29	48.9	75.2
EQUIVALENT LENGTH OF PIPE	Feet	9.8	30.0	59.2	55	85.6	171.84	243	327
	Meters	2.99	9.14	18.04	16.75	26.09	52.38	74.11	99.73
FLOW RATE * VELOCITY OF 15 f.p.s.	MAX Gal/Min	90	160	340	225	600	1300	2300	3700
	MIN Gal/Min	2	2	5	5	15	40	50	100

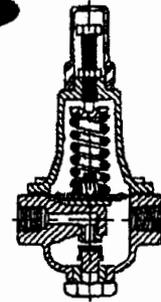


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DATE: 11/28/94
 DWG. NO.: SCHL
 REV.: E (3/01)

SEP-11-2001 16:41

P.04/05



Pressure Reducing Pilot Valve 3/8" Model PRP

Exclusive unleaded bronze valve body design.
June 7, 2001 Rev: 2



The Model PRP Pressure Reducing Control valve is designed to reduce a higher inlet (upstream) unregulated pressure to a lower outlet (down stream) regulated pressure. The Model PRP, especially designed to be used as a pressure-reducing pilot with control valves to automatically maintain a constant downstream pressure.

- ### Features
- Simple/Reliable construction
 - Unleaded Valve Body
 - Replaceable stainless steel seat
 - Corrosion Resistant Parts
 - Low friction Yoke Design
 - Standard range 30-300 PSI
 - One year warranty

Applications:

<i>Water Treatment Irrigation</i>	<i>Well water pumping Marine</i>	<i>Industrial Processing</i>
---------------------------------------	--------------------------------------	----------------------------------

How to specify and order:

Discount Code: "B"

Regulating Range PSI	Feet of Water	Factory Pre-set @ PSI	Regulating Spring Number	Model PRP Part Number	List Price
2-6.5 PSI	5-15 Ft	3.5 PSI	9600397A	152100A	\$158.95
2-30 PSI	5-70 Ft	10 PSI	9600397B	152100B	\$158.95
15-75 PSI	35-175 Ft	20 PSI	9600397C	152100C	\$158.95
30-300 psi	69-692 Ft	60 psi	9600397D	152100D	\$158.95

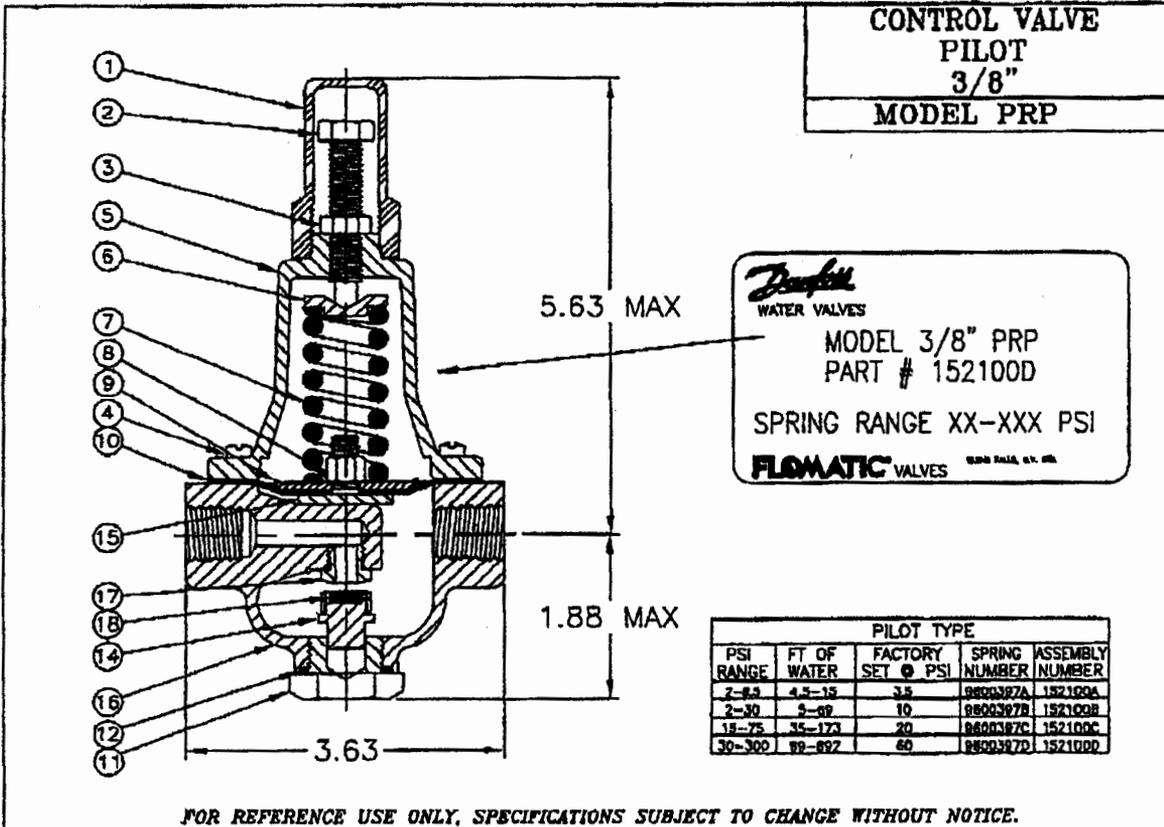
Fromatic also manufactures other type pilot valves and automatic control valves for municipal, industrial and irrigation applications.
www.fromatic.com

valvactive
VALVE SERVICE SYSTEM
1-800-319-4645

Fromatic Corporation, 145 Murray Street, Glens Falls, NY
Phone: 518-761-9797 Fax: 518-761-9798 www.fromatic.com

FLOMATIC VALVES

April 10, 2001 Rev: PRP 041001A



ITEM	QTY.	DESCRIPTION	P/N	MATERIAL	ASTM
1	1	ADJUSTMENT CAP	9906697	ABS	-----
2	1	ADJUSTING SCREW	8443M	STAINLESS STEEL	18-8
3	1	JAM NUT	8126J	STAINLESS STEEL	18-8
4	8	FILLISTER HD SLOTTED	8442	STAINLESS STEEL	18-8
5	1	COVER	8378297	FEDERALLOY	1-836-FL
6	1	SPRING BUTTON	9678397	STAINLESS STEEL	304
7	1	SPRING	SEE CHART	MUSIC WIRE	-----
8	1	NUT	8327A	GALVANIZED STEEL	-----
9	1	DIAPHRAGM PLATE	9678497	STEEL	-----
10	1	DIAPHRAGM	9778597	BUNA/NYLON	-----
11	1	PLUG BODY	8378797	BRASS	-----
12	1	O-RING	9708	BUNA-N	-----
13	1	3/8" PLUG (NOT SHOWN) OPTIONAL	8840	BRASS	-----
14	1	DISC RETAINER	8378697	BRONZE	-----
15	1	YOKE	8378197	FEDERALLOY	1-836-FL
16	1	BODY	8378T97	FEDERALLOY	1-836-FL
17	1	SEAT	8678897	STAINLESS STEEL	304
18	1	DISC	9778997	BUNA-N 80D	-----

FLOMATIC® FLOMATIC CORPORATION
 GLENS FALLS, N.Y. 12801
 PHONE (518) 761-9787
 FAX (518) 761-9798

DATE: 2/26/01
 DWG. NO.: S150097FL
 REV.: B (6/01)

WARNING—Misuse of pressure gauges may cause explosion and personal injury. Do not use without first reading and understanding these instructions and the apparatus installation and operating instructions.

METEK

U.S. GAUGE DIVISION • SELLERSVILLE, PENNSYLVANIA, 18960

USE AND INSTALLATION OF PRESSURE GAUGES

The following information on installation and use has been excerpted from ANSI B40.1-1980. The complete ANSI B40.1-1980 standard which contains additional information may be obtained at a cost of \$9.00 from the AMERICAN SOCIETY OF MECHANICAL ENGINEERS, United Engineering Center, 345 East 47th, New York, New York 10017.

3.3.4 Pressure Connection

Location of Connection

Stem Mounted—Bottom or Back
Surface Mounted—Bottom or Back
Flush Mounted—Back

Type of Connection

Taper pipe connections for pressures up through 20,000 psi are usually 1/8-27, 1/4-18, or 1/2-14 American Standard external or internal taper pipe threads (NPT) per ANSI B2.1, as required. Above this pressure, high pressure tubing connections, or equal, shall be used.

In applications of stem mounted gauges, especially with liquid-filled cases and where vibration is extremely severe, consideration should be given to the possibility of failure of the stem of associated piping caused by the vibrating mass of the gauge. A larger connection (e.g. 1/2 NPT instead of 1/4 NPT) and/or a stronger stem material (e.g. stainless steel instead of brass) should be considered.

3.3.4.10 Mounting a pressure gauge in a position other than that at which it was calibrated can affect its accuracy. Normal calibrating position is upright/vertical. For applications requiring mounting in other than this position, notify the supplier.

3.4.3.11 CAUTION TO USERS. PRESSURE GAUGES CAN BE RENDERED INACCURATE DURING SHIPMENT. DESPITE CARE TAKEN IN PACKAGING, TO INSURE CONFORMANCE TO THE STANDARD GRADE TO WHICH THE PRESSURE GAUGE WAS MANUFACTURED, IT SHOULD BE CHECKED BEFORE USE.

4.0 SAFETY

4.1 Scope

This section of the standard presents certain information to guide users, suppliers and manufacturers toward minimizing the hazards that could result from misuse or misapplication of pressure gauges with elastic elements. The user should become familiar with all sections of this standard as all aspects of safety cannot be covered in this section. Consult the manufacturer or supplier for advice whenever there is uncertainty about the safe application of a pressure gauge.

4.2 General Discussion

4.2.1 Adequate safety results from intelligent planning and careful selection and installation of gauges into a pressure system. The user should inform the supplier of all conditions pertinent to the application and environment so that the supplier can recommend the most suitable gauge for the application.

4.2.2 The history of safety with respect to the use of pressure gauges has been excellent. Injury to personnel and damage to property have been minimal. In most instances, the cause of failure has been misuse or misapplication.

4.2.3 The pressure sensing element in most gauges is subjected to high internal stresses, and applications exist where the possibility of catastrophic failure is present. Pressure regulators, chemical (diaphragm) seals, pulsation dampers, or snubbers, syphons, etc., are available for use in these potentially hazardous systems.

4.2.4 CAUTION. PRESSURES IN EXCESS OF FULL SCALE PRESSURE OR VACUUM SHOULD BE AVOIDED. OVERPRESSURE MAY CAUSE CALIBRATION CHANGE, DAMAGE TO THE ELASTIC ELEMENT OR GAUGE FAILURE AND THEREFORE SHOULD NOT BE APPLIED UNLESS RECOMMENDED BY THE GAUGE MANUFACTURER.

4.2.5 The following systems are considered potentially hazardous and must be carefully evaluated:

1. Compressed gas systems.
2. Oxygen systems.
3. Systems containing hydrogen or free hydrogen atoms.

4. Corrosive fluid systems (gas and liquid).

5. Pressure systems containing any explosive or flammable mixture or medium.

6. Steam systems.

7. Non-steady pressure systems.

8. Systems where high overpressure could be accidentally applied.

9. Systems wherein interchangeability of gauges could result in hazardous internal contamination or where lower pressure gauges could be installed in higher pressure systems.

10. Systems containing radioactive or toxic fluids (liquids or gases).

11. Systems installed in a hazardous environment.

4.2.6 When gauges are to be used in contact with media having known or uncertain corrosive effects or known to be radioactive, random or unique destructive phenomena can occur. In such cases the user should always furnish the supplier or manufacturer with information relative to the application and solicit his advice prior to installation of the gauge.

4.2.7 Fire and explosions within a pressure system can cause pressure element failure with very violent effects, even to the point of completely disintegrating or melting the pressure gauge. Violent effects are also produced when failure occurs due to: (1) hydrogen embrittlement, (2) contamination of a compressed gas, (3) formation of acetylides, (4) melting of soft solder joints by steam or other heat sources, (5) corrosion, (6) fatigue, (7) the presence of shock, and (8) excessive vibration. Nearly any failure in a compressed gas system produces violent effects.

4.2.8 Modes of Elastic Element Failure. There are four basic modes of elastic element failure: 1) failure due to fatigue; 2) failure due to application of overpressure; 3) corrosion failure and 4) explosive failure due to chemical reaction (explosion) within the element.

4.2.8.1 Fatigue Failure. Fatigue failure generally occurs along a highly stressed edge radius appearing as a small crack which propagates along the edge radius. Such failures are usually more critical with compressed gas media than with liquid media.

Fatigue cracks usually release the media fluid slowly so case pressure build-up can be averted by providing pressure relief openings in the gauge case. However, in high pressure elastic elements where the yield strength approaches the ultimate strength of the element material, fatigue failure may resemble explosive failure.

A restrictor placed in the gauge pressure inlet will reduce pressure surges and restrict fluid flow into the partially open bourdon tube. A restrictor should be considered for gauges used in compressed gas applications.

4.2.8.2 Overpressure Failure. Overpressure failure is caused by the application of internal pressure greater than the rated limits of the elastic element and can occur when a low pressure gauge is installed in a high pressure port or system. The effects of overpressure failure, usually more critical in compressed gas systems than in liquid filled systems, are unpredictable and may cause parts to be propelled in any direction. Cases with pressure relief openings will not always retain expelled parts.

Placing a restrictor in the pressure gauge inlet will not reduce the immediate effect of failure but will help control flow of escaping fluid following rupture and reduce potential of secondary effects.

It is generally accepted that solid front cases with pressure relief back will reduce the possibility of parts being projected forward in the event of failure.

The window material alone will not provide adequate protection against internal case pressure build-up and can, in fact, be the most hazardous component.

4.2.8.3 Corrosion Failure. Corrosion failure occurs when the elastic element has been weakened through attack by corrosive chemicals present in either the media inside or the environment outside it. Failure may occur as pinhole leakage through the element walls or early fatigue failure due to stress cracking brought about by chemical deterioration or embrittlement of the material.

A chemical (diaphragm) seal should be considered for use with pressure media that may have a corrosive effect on the elastic element.

4.2.8.4 Explosive Failure. Explosive failure is caused by the release of explosive energy generated by a chemical reaction such as can result when adiabatic compression of oxygen occurs in the presence of hydrocarbons. It is generally accepted that there is no known means of predicting the magnitude or effects of this type of failure. For this mode of failure a solid wall or partition between the elastic element and the window will not necessarily prevent parts being projected forward.

4.2.9 Pressure connection. See recommendations in paragraph 3.3.4.

4.3 Safety Recommendations

4.3.1 Operating Pressure. The pressure gauge selected should have a range such that the operating pressure occurs in the middle half (25 to 50%) of the scale. A good rule of thumb is to select a gauge with a full scale pressure two times the intended operating pressure.

Should it be necessary for the operating pressure to exceed 75% of full scale, contact the supplier for recommendations. This does not apply to Test, Retarded, or Suppressed Scale gauges.

4.3.2 Pressure Element

4.3.2.1 Compatibility with the Pressure Medium. The elastic element is generally a thin-walled member which of necessity operates under high stress conditions and must, therefore, be carefully selected for compatibility with the pressure medium being measured. None of the common element materials is impervious to every type of chemical attack. The potential for corrosive attack is established by many factors including the concentration, temperature and contamination of the medium. The user should inform the gauge supplier of the installation conditions so that the appropriate element materials can be selected.

4.3.2.2 In addition to the factors discussed above, the capability of a pressure element is influenced by the design, materials and fabrication of the joints between its parts.

Common methods of joining are soft soldering, silver brazing and welding. Joints can be affected by temperature stress and corrosive media. Where application questions arise, these factors should be considered and discussed by the user and manufacturer.

4.3.2.3 Some special applications require the pressure element assembly have a high degree of leakage integrity. Special arrangement should be made between manufacturer and user to assure that the allowable leakage rate is not exceeded.

4.3.3 Cases

4.3.3.1 Cases, Solid Front. It is generally accepted that a solid front case per Section 3.3.1 will reduce the possibility of parts being projected forward in the event of elastic element failure. An exception is explosive failure of the elastic element.

4.3.3.2 Cases, Liquid Filled. It has been general practice to use glycerine or silicone filling liquids. However, these fluids may not be suitable for all applications. They should be avoided where strong oxidizing agents including, but not limited to, oxy-

gen, chlorine, nitric acid and hydrogen peroxide are involved. In the presence of oxidizing agents potential hazard can result from chemical reaction, ignition or explosion. Completely fluorinated and/or chlorinated fluids may be suitable for such applications.

The user shall furnish detailed information relative to the application of gauges having liquid filled cases and solicit the advice of the gauge supplier prior to installation.

Consideration should also be given to the instantaneous hydraulic effect which may be created by one of the modes of failure outlined in 4.2.8. The hydraulic effect due to pressure element failure could cause the window to be projected forward even when a case having a solid front is employed.

4.3.4 Restrictor. Placing a restrictor between the pressure connection and the elastic element will not reduce the immediate effect of failure but will help control flow of escaping fluid following rupture and reduce the potential of secondary effects.

4.3.5 Specific Service Conditions

4.3.5.1 Specific Applications for pressure gauges exist where hazards are known. In most instances requirements for design, construction, and use of gauges for these applications are specified by State or Federal Agencies or Underwriters Laboratories, Inc. Some of these Specific Service gauges are listed below. The list is not intended to include all types and the user should always advise the supplier of all application details.

4.3.5.2 Oxygen Gauge. A gauge designed to indicate oxygen pressure. Cleanliness shall comply with Level IV (see Section 5.0). The dial shall be clearly marked with a universal symbol and/or USE NO OIL in red color.

4.3.5.3 Ammonia Gauge. A gauge designed to indicate ammonia pressure and to withstand the corrosive effects of ammonia. The gauge may bear the inscription AMMONIA on the dial. It may also include the equivalent temperature scale markings on the dial.

4.3.5.4 Acetylene Gauge. A gauge designed to indicate acetylene pressure. It shall be constructed using materials that are compatible with commercially available acetylene. The gauge may bear the inscription ACETYLENE on the dial.

4.3.5.5 Chemical Gauge. A gauge designed to indicate the pressure of corrosive and/or high viscosity fluids. The primary material(s) in contact with the pressure medium may be identified on the dial. It may be equipped with a chemical seal, pulsation damper, and/or pressure relief device. These devices help to minimize potential damage to personnel and property in the event of gauge failure. They may also reduce accuracy and/or sensitivity, however.

4.4 Reuse of Pressure Gauges

It is not recommended that pressure gauges be moved from one application to another. Should it be necessary, however, the following must be considered:

4.4.1 Chemical Compatibility. The consequences of incompatibility can range from contamination to explosive failure. For example, moving an oil service gauge to oxygen service can result in explosive failure.

4.4.2 Partial Fatigue. The first application may involve pressure pulsation which has expended most of the gauge life, resulting in early fatigue in the second application.

4.4.3 Corrosion. Corrosion of the pressure element assembly in the first application may be sufficient to cause early failure in the second application.

4.4.4 Other Considerations. When re-using a gauge all guidelines covered in this standard relative to application of gauges should be followed in the same manner as when a new gauge is selected.

IMPORTANT—Read other side for additional instructions and warnings.

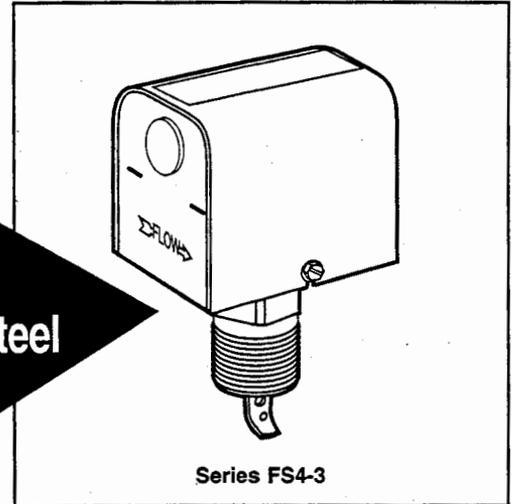


Series FS4-3 General Purpose Liquid Flow Switch

CE (specified models only)



Now
with
Stainless Steel
Paddles



OPERATION

This control is an independently mounted water flow sensing device that makes or breaks an electrical circuit when flow stops or starts.

 WARNING	
	<ul style="list-style-type: none"> • Before using product, read and understand instructions. • Save these instructions for future reference.
	<ul style="list-style-type: none"> • All work must be performed by qualified personnel trained in the proper application, installation, and maintenance of plumbing, steam and electrical equipment and/or systems in accordance with all applicable codes and ordinances. • To prevent electrical shock, turn off the electrical power before making electrical connections. • To prevent an electrical fire or equipment damage, electrical wiring insulation must have a rating of 167°F (75°C) if the liquid's temperature exceeds 180°F (82°C).
	<ul style="list-style-type: none"> • To prevent electrocution, when the electrical power is connected to the flow switch, do not touch the terminals. • Make sure flow switch electrical cover is secured before turning on electric power. <p>Failure to follow this warning could cause property damage, personal injury or death.</p>

SPECIFICATIONS

Maximum Liquid Pressure: 160 psi (11.3 kg/cm²)

Liquid Temperature Range (T_L): 32 - 300°F (0 - 149°C)

Ambient Temperature Range (T_s): 32 - 120°F (0 - 49°C)

Electrical Enclosure Rating: Nema Type 1 (IP 21)

Maximum Velocity: 10ft/sec (3M/sec)

Pipe Connection Thread Size: - 1" NPT - *All models except "J"*
 - 1" BSPT - *"J" models*

ELECTRICAL RATINGS

Voltage	Motor Switch Rating (Amperes)		Pilot Duty
	Full Load	Locked Rotor	
120 VAC	7.4	44.4	125 VA at 120 or 240 VAC 50 or 60 cycles
240 VAC	3.7	22.2	

CE Circuit Rating	
7.4 (7.4)/120~	0.3/120=
3.7 (3.7)/240~	0.15/240=

Models that meet CE Conformance:

FS4-3D-E

FS4-3J-E

FS4-3S-E

- **This Control:** is for continuous operations is not electronic has Type 1C action (micro interruption on operation)
- **LVD 73/23/EEC**
- **EMC 89/33/EEC**
 For applications with loads between 14mA and 3.7 Amps, power factors exceeding 0.65, an anticipated

system switch operation rate of less than 5 times per minute, and any one cycle greater than 3 seconds on and 3 seconds off.

Additional suppression may be required for applications outside these ranges.

- **Declaration of Conformity**
 Available on request.

FLOW RATES

Flow rates required to activate flow switch are shown in chart below. The values are calculated for sensing water (potable, non-polluted) in a horizontal pipe.

Settings will vary when used to sense flow of other fluids or if located in a vertical pipe.

Pipe Size NPT in. (mm)	Settings	Mode of Operation		Max. Flow Rate gpm (lpm) w/o Paddle Damage
		Flow gpm (lpm)	No Flow gpm (lpm)	
1 (25)	Factory or Minimum	6 (22.7)	3.6 (13.6)	27 (102)
	Maximum	10.2 (38.6)	9.2 (34.8)	
1¼ (32)	Factory or Minimum	9.8 (37.1)	5.6 (21.2)	47 (178)
	Maximum	16.8 (63.6)	15 (56.8)	
1½ (40)	Factory or Minimum	12.7 (48.1)	7 (26.5)	63 (239)
	Maximum	23 (87.1)	19.5 (73.8)	
2 (50)	Factory or Minimum	18.8 (71.2)	9.4 (35.6)	105 (398)
	Maximum	32.8 (124.1)	24 (90.8)	
2½ (65)	Factory or Minimum	24.3 (92)	11.6 (43.9)	149 (565)
	Maximum	42.4 (160.5)	37.5 (141.9)	
3 (80)	Factory or Minimum	30 (113.6)	12 (45.4)	230 (872)
	Maximum	52.1 (197.2)	46.1 (174.5)	
4 (100)	Factory or Minimum	39.7 (150.3)	19.8 (74.9)	397 (1505)
	Maximum	73.5 (278.2)	64.2 (242)	
5 (125)	Factory or Minimum	58.7 (222.2)	29.3 (110.9)	654 (2479)
	Maximum	115 (435.3)	92 (348.2)	
6 (150)	Factory or Minimum	79.2 (300)	39.6 (150)	900 (3411)
	Maximum	166 (628.3)	123 (465.6)	

NOTE: DO NOT USE LIQUID FLOW SWITCHES ON SYSTEMS WITH FLOW VELOCITY GREATER THAN 10 FEET PER SECOND (3 METERS PER SECOND).

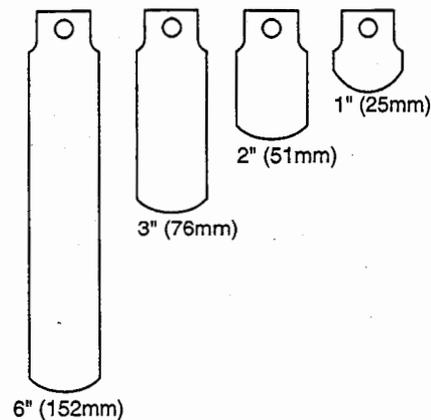
Values are ± 10%

INSTALLATION –

STEP 1 - Paddle Sizing

Determine the correct paddle length for your installation from the chart below.

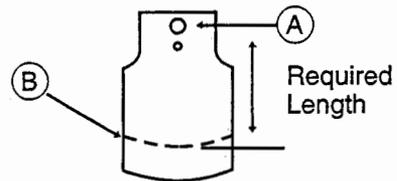
Pipe Size		Paddle (Standard Length)		Trim to Length	
in.	(mm)	in.	(mm)	in.	(mm)
1	(25)	1	(25)	N/A	
1 1/4	(32)	2	(51)	1 1/4	(32)
1 1/2	(40)	2	(51)	1 1/2	(38)
2	(50)	2	(51)	1 5/8	(41)
2 1/2	(65)	3	(76)	2 1/4	(57)
3	(80)	3	(76)	2 5/8	(67)
4	(100)	6	(152)	3 5/8	(92)
6	(150)	6	(152)	5 5/8	(143)
8+	(200+)	6	(152)	N/A	



NOTE:

- All models (except FS4-3RP) include 4 paddles.
- FS4-3RP includes 1" and 6" paddles only.

- a. If the paddle must be trimmed, measure the paddle from the center of the large hole (A) to the length required. Using non-serrated tin snips, trim the end (B) on a curve just like the paddle was originally cut.



- b. If the flow rate in the pipe exceeds the maximum adjustment on the Flow Switch use the following formula to change the paddle length.

$$\text{Paddle Length} = \frac{K}{\text{Flow Rate (GPM)}}$$

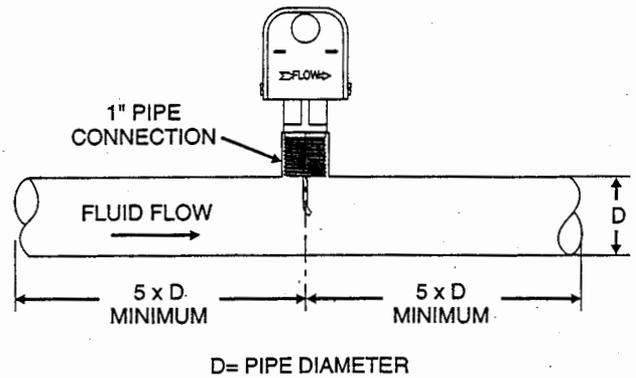
NOTE: If trimming the paddle for a no-flow action make sure there is enough flow to activate switch.

Series FS4-3 "K" Factor

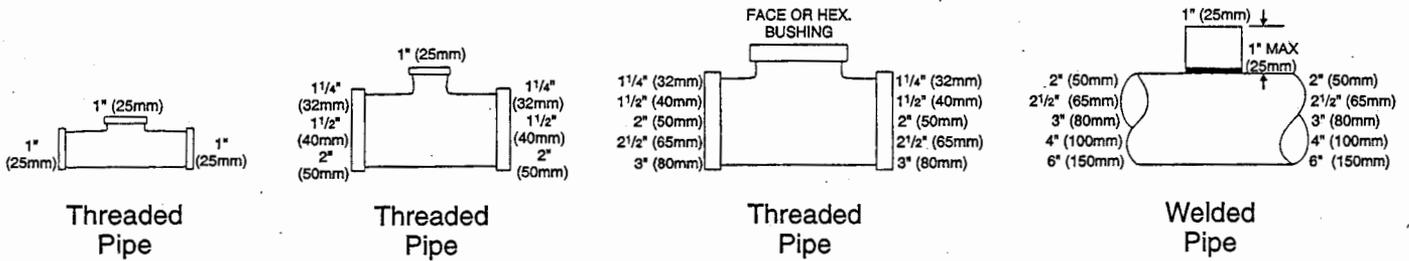
Pipe Size NPT in. (mm)	Flow Maximum Adjustment	No-Flow Maximum Adjustment
2 (50)	69.2	50.3
3 (80)	162.5	143.5
4 (100)	276.0	241.0
5 (125)	550.0	440.0
6 (150)	977.0	728.0

STEP 2 - Determine the Location of the Flow Switch

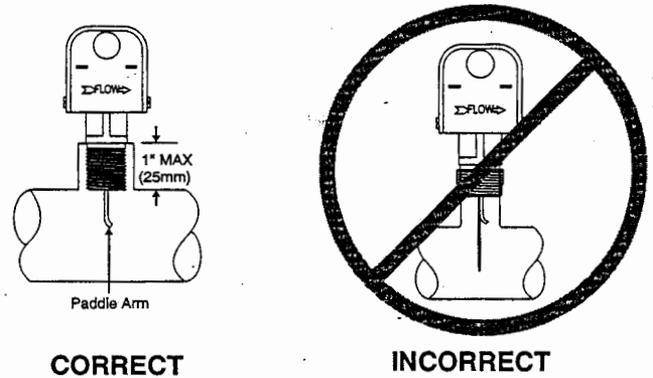
- The flow switch **should be located in a horizontal section of pipe** where there is a straight horizontal run of at least 5 pipe diameters on each side of the flow switch. The flow switch may be installed in a vertical pipe if the flow is in the upward direction.
- The flow switch **must be installed in the upright position** as shown with arrow mark on side of casting in the same direction as fluid will flow.
- Some system conditions that require more than 5 pipe diameters are high viscosity fluid and high fluid velocity.
- The flow switch must be installed in the pump suction piping when spring-loaded check valves and/or other close coupled accessories are installed in the pump discharge piping.



- a. The flow switch must be installed in the pipe using a threaded tee connection or welded fitting of minimum length such as a half coupling. Use a face or hex bushing to reduce the tee outlet to 1" (25mm) pipe thread if a reduced tee outlet thread size fitting is not available.

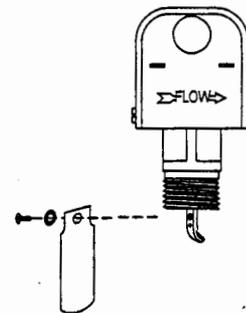


- b. When installing in brazed/soldered copper pipe, size the threaded adapter to ensure the paddle arm extends into the main run of the pipe



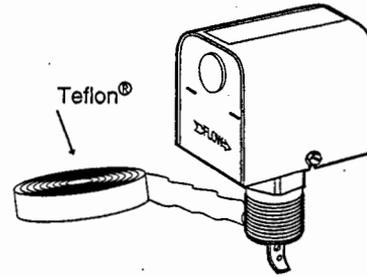
STEP 3 - Connecting the Flow Switch to Pipe

- a. Insert the 8/32 x 1/4" flathead screw through washer and paddle. Attach screw to opposite side of the paddle arm's curve and tighten to a torque of approximately 12-16 lb•in (1.36-1.81 N•m).

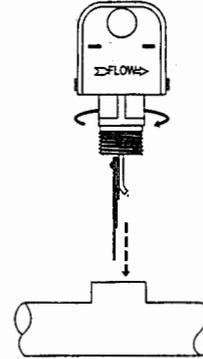


- b. Apply pipe sealing compound or Teflon tape to the flow switch pipe threads.

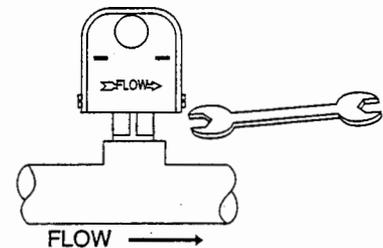
NOTE: Do not apply sealant to first threads as this switch is grounded (earthed) via the pipe mounting.



- c. Insert the flow switch into the pipe tee. Turn the flow switch two (2) or three (3) revolutions clockwise until tight. Do not put excessive force on cover when turning.



- d. Place a 1 3/8" open end wrench on flow switch body to tighten to final position. Final position is with arrow on housing aligned in the same direction as liquid flow.



STEP 4 - Electrical Installation

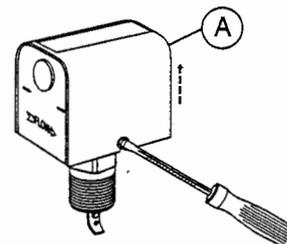
WARNING



- To prevent electrical shock, turn off the electrical power before making electrical connections.
 - To prevent an electrical fire or equipment damage, electrical wiring insulation must have a rating of 167°F (75°C) if the liquid's temperature exceeds 180°F (82°C).
 - To prevent electrocution, when the electrical power is connected to the flow switch, do not touch the terminals.
 - Make sure flow switch electrical cover is secured before turning on electric power.
- Failure to follow this warning could cause property damage, personal injury or death.

a. Cover Removal and Installation Procedure

- Using a flathead screwdriver, loosen but do not remove the two cover screws and remove the cover (A).
- Place the cover on the flow switch sliding the slots behind the two loose cover screws. Push the cover down into the flow switch and using a flat blade screwdriver, tighten the cover screws to a torque of 10 lb•in (1.13 N•m).

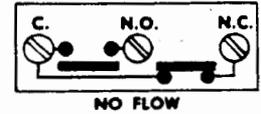
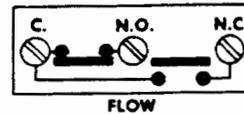


b. Electrical Conduit Connection

- Connect electric conduit to flow switch electrical enclosure.
- Follow accepted electrical practices when installing fittings and making connections.
- Refer to and follow local codes and standards when selecting the types of electrical fittings and conduit to connect to flow switch.

c. Determine which switch action is required for the flow switch.

- “Flow” means that the switch will close circuit C.-N.O. and open circuit C.-N.C. when flow rate is increased above setpoint of flow switch.
- “No Flow” means that the switch will open circuit C.-N.O. and close circuit C.-N.C. when flow rate is decreased below setpoint of flow switch.



- ## d. Based upon the mode of operation (“Flow” or “No-Flow”) required, complete the appropriate steps to connect wires to flow switch. Use a Phillip’s head screwdriver to loosen and tighten switch terminal screws when attaching wires.

For “Flow” Mode of Operation (Fig. 1)

If the flow switch will be used to actuate a signal, alarm or other device when **flow** occurs, connect the wire from that device to the “N.O.” contact. Connect the “Hot” power supply wire to “C” terminal.

For “No Flow” Mode of Operation (Fig. 2)

If the flow switch will be used to actuate a signal, alarm or other device when **no flow** occurs, connect the wire from that device to the “N.C.” contact. Connect the “Hot” power supply wire to “C” terminal.

NOTE: Repeat above to connect wires to second switch on “D” model flow switches.

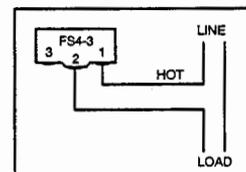
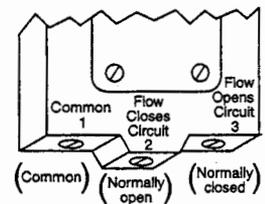
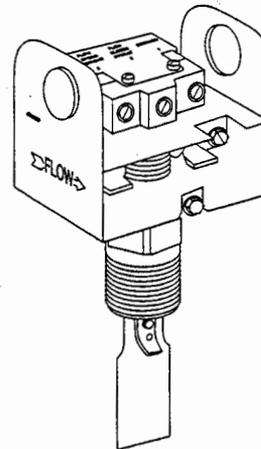


Fig. 1

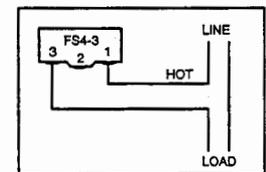
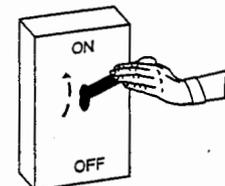


Fig. 2

STEP 5 - Testing

- Place cover on flow switch and turn on power. Initiate fluid flow through the system. Observe the device being activated by the flow switch to determine if device is operating as required.
- Turn off fluid flow to determine if device is operating as required.
- Repeat initiating and turning off fluid flow several times to test flow switch and device for proper operation.
 - If operating as required, put system into service.
 - If not operating as required, Flow Switch may need to be adjusted.



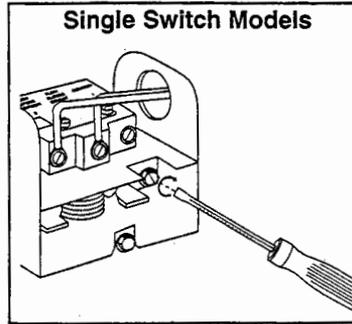
STEP 6 - Adjustment

Adjustment is necessary only if required flow/no-flow setpoints are **above** factory set minimum.

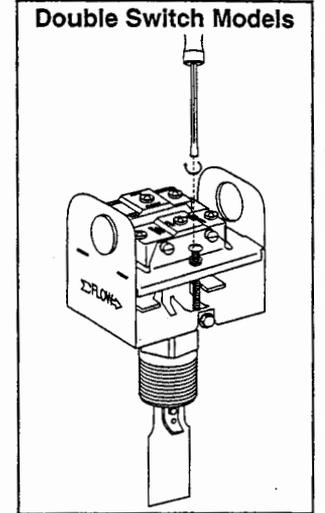
- a. Turn off power. Remove switch cover.
- b. Turn the adjusting screw clockwise to increase setpoint.

IMPORTANT: Do not attempt to lower flow switch setpoint from original factory minimum setting. Lowering (turning adjusting screw counterclockwise) the setpoint from original factory setting may cause erratic flow switch operation.

- c. Place cover on the flow switch and turn on power.
- d. Test the operation of the flow switch after each adjustment.



OR



MAINTENANCE

SCHEDULE:

- Inspect paddle annually. Turbulent or high flow velocity conditions may require more frequent inspection and/or replacement.
- Replace paddle if damaged or showing signs of wear.
- Replace flow switch every 5 years or 100,000 cycles, whichever occurs first.

TROUBLESHOOTING

Problem:

1. Flow Switch Does Not Operate

Solution:

- a. Make sure power has been turned on to device and flow switch.
- b. Verify that flow rate is high enough for flow switch to activate. Measure flow rate and match with velocities shown in flow rate chart.
- c. Check to see if paddle moves freely. Some system piping disassembly may be required.

2. Flow Switch Operates Erratically

Solution:

- a. Flow switch may be located in an area of high turbulence causing paddles to flutter.
- b. Adjustment screw may have been turned below original factory setpoint. Verify that flow rate is high enough for flow switch to activate. Measure flow rate and match with velocities shown in flow rate chart.
- c. Check to see if paddle moves freely. Some system piping disassembly may be required.

3. Flow Switch Does Not Deactivate

Solution:

- a. Check to see if paddle moves freely. Some system piping disassembly may be required.
- b. Measure flow rate and match with velocities shown in flow rate chart. Flow switch must prove flow before it can indicate no flow.

McDonnell & Miller



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ATTACHMENT B
WATER TREATMENT BUILDING AS-BUILT PLANS,
FINAL INSPECTIONS,
AND SPACE HEATERS AND SUMP PUMPS LITERATURE

**TO VIEW THE MAP AND/OR
MAPS WITH THIS DOCUMENT,
PLEASE CALL THE
HAZARDOUS WASTE BUREAU
AT 505-476-6000 TO MAKE AN
APPOINTMENT**

**CODE ADMINISTRATION DIVISION
CITY OF ALBUQUERQUE, P.O. BOX 1293
ELECTRIC SECTION**

Location 9681 Coors NW
Type of Inspection Finals
116411
Date 1-2-03 2003
Approved W. Hill Inspector

FORM B-21

P111200

**CODE ADMINISTRATION DIVISION
CITY OF ALBUQUERQUE, P.O. BOX 1293
BUILDING SECTION**

Location 9621 Coors NW
Type of Inspection Firm
Date 1-3 20 02
Approved A. Johnson Inspector

FORM B-19

P111202

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Dayton® Heavy-Duty Electric Unit Heater

Description

Dayton Heavy-Duty Electric Heaters are designed for continuous or intermittent use in factories, warehouses, public buildings, stock rooms, service stations, any large or exposed areas, or additions, can be installed for use in downflow or horizontal applications.

Features:

- 60 Hz
- Units 5 thru 15kw are field convertible from single to three phase
- 24 volt low voltage control circuit is standard except on 3 and 5kw 208, 240/208, and 277V units which have line voltage control
- Heavy-duty totally enclosed motors
- Aluminum finned, copper clad steel sheath heating element
- Advanced inlet louver design draws cool air across heating element for more efficient operation
- Automatic reset linear thermal protector
- Venturi outlet with large dynamically balanced fan blade
- Heavy gauge die-formed steel housing
- Optional vertical and horizontal brackets available

Specifications

Model	KW Rating	BTU/HR (1,000's)	Heater/Motor Voltage	Phase	Control Voltage	Amps Per Phase	-Fan Motor- HP	RPM	CFM at Outlet	FPM at Outlet	Air Temp. Rise (°F)	Air Throw (Horiz)
3UF78	(+)3.0	10.2	208	1	208	14.5	1/100	1600	350	800	27	12
3UF75	(+)3.0/2.2	10.2/7.5	240/208	1	240/208	12.5/11.0	1/100	1600	350	800	27	12
3UF77	(+)3.0	10.2	277	1	277	11.0	1/100	1600	350	800	27	12
3UF76	3.0	10.2	480	3	24	3.6	1/100	1600	350	800	27	12
3UF82	(+)5.0	17.0	208	1-3	208	24.0	1/100	1600	350	800	45	12
3UF79	(+)5.0/3.7	17.0/12.6	240/208	1-3	240/208	21.0/18.0	1/100	1600	350	800	45	12
3UF81	(+)5.0	17.0	277	1	277	18.0	1/100	1600	350	800	45	12
3UF80	5.0	17.0	480	3	24	6.0	1/100	1600	350	800	45	12
3UF85	7.5	25.6	208	1-3	24	36.0	1/30	1600	650	970	37	18
3UF83	7.5/5.6	25.6/19.1	240/208	1-3	24	31.3/27.0	1/30	1600	650	970	37	18
3UF84	7.5	25.6	480	3	24	9.0	1/30	1600	650	970	37	18
3UF88	10.0	34.1	208	1-3	24	48.0	1/30	1600	650	970	49	18
3UF86	10.0/7.5	34.1/25.6	240/208	1-3	24	42.0/36.0	1/30	1600	650	970	49	18
3UF87	10.0	34.1	480	3	24	12.0	1/30	1600	650	970	49	18
3UF91	15.0	51.2	208	1-3	24	72.0	1/20	1530	910	1640	52	35
3UF89	15.0/11.2	51.2/38.2	240/208	3	24	36.1/33.3	1/20	1530	910	1640	52	35
3UF90	15.0	41.2	480	3	24	18.0	1/20	1530	910	1640	52	35
3UF92	20.0/15.0	68.2/51.2	240/208	3	24	48.0/41.2	1/10	1500	1320	2060	48	41
3UF93	20.0	68.2	480	3	24	24.0	1/10	1500	1320	2060	48	41
3UF96	30.0	102.3	208	3	24	84.0	1/4	1600/1375	2100/1800	2100/2030	45/53	50
3UF94	30.0/22.5	102/77	240/208	3	24	72.0/63.0	1/4	1600/1375	2100/1800	2100/2030	45/53	50
3UF95	30.0	102.3	480	3	24	36.0	1/4	1600/1375	2100/1800	2100/2030	45/53	50
3UF99	50.0	170.5	208	3	24	139.0	1/2	1525/1420	3000/2600	3260/2900	53/61	60
3UF97	50.0/37.5	170/127	240/208	3	24	120.4/104.2	1/2	1525/1420	3000/2600	3260/2900	53/61	60
3UF98	50.0	170.5	480	3	24	60.2	1/2	1525/1420	3000/2600	3260/2900	53/61	60

(+) These models are wired for direct line voltage control.



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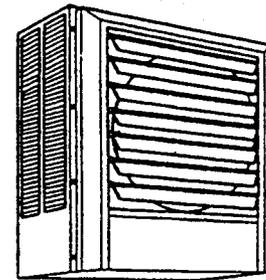


Figure 1

Unpacking

Remove the heater from the box and inspect it for any damage. If it appears to be damaged, immediately return.

Check the contents of the box to make sure it contains one heating unit.

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Dayton® Heavy-Duty Electric Unit Heater

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General Safety Information

▲ WARNING *To prevent electrical shock, disconnect all power coming to heater at main service panel before wiring or servicing.*

1. All wiring must be in accordance with the National and Local Electrical Codes in the United States and the heater must be grounded as a precaution against possible electric shock.
2. Verify the power supply voltage coming to heater matches the ratings printed on the heater nameplate before energizing.
3. This heater is hot when in use. To avoid burns, do not let bare skin touch hot surfaces.
4. Do not insert or allow foreign objects to enter any ventilation or exhaust opening as this may cause an electric shock, fire, or damage to the heater.
5. To prevent a possible fire, do not block air intakes or exhaust in any manner. Keep combustible materials, such as crates, drapes, etc., away from heater. Do not install behind door, furniture, towels, or boxes.
6. A heater has hot and arcing or sparking parts inside. Do not use it in areas where gasoline, paint or flammable liquids are used or stored.
7. Use this heater only as described in the manual. Any other use not recommended by the manufacturer may cause fire, electric shock, or injury to persons.
8. This heater is not approved for use in corrosive atmospheres such as marine, green house or chemical storage areas.

▲ CAUTION *All built-in thermostats: If the heater is used to prevent piping or liquids from freezing, and if the thermostat is set below 45° F (7°C), the fan must run continuously.*

Installation

LOCATION

▲ CAUTION *Heater must be mounted at least 7 feet above the floor to prevent accidental contact with the fan blade which could cause injury.*

▲ CAUTION *To prevent possible overheating or damage due to overheating, keep at least a 5 foot clearance in front of the heater. Refer to Table 1 for side, top and back clearance requirements.*

1. Arrange units so their discharge air streams are subjected to a minimum of interference from columns, and partitions.
2. Direct air stream away from room occupants in comfort heating.
3. Air streams should wipe exposed wall without blowing directly at them.
4. Direct air stream along the windward side of a room when installed in a building exposed to a prevailing wind.
5. Locate thermostat approximately 5 feet above the floor on the interior partition walls or posts away from cold drafts, internal heat sources, and away from heater discharge air streams.

6. Large rooms require multi-unit installations. Arrange units to provide perimeter air circulation where each unit supports the air stream from another.

MOUNTING

GENERAL

1. Position the heater so access door can be opened to provide access to the wiring and control compartment. If the heater is to be mounted with the access door facing a wall, the heater must be mounted far enough from that wall to allow full opening of the access door. (Approximately equal to the depth of the heater.) Refer to Table 1 below.
2. Heater may be mounted for vertical or horizontal discharge by the use of threaded rods. Refer to Table 2.
3. Optional mounting brackets permit horizontal pivoting of heater.
4. Louvers may be positioned to direct heated air in desired direction. For horizontal discharge, louvers should direct air either straight ahead or downward.

Table 1 - Wall and Ceiling Clearance, inches (mm) / Mounting Brackets

Unit	Discharge	Ceiling	Side Wall	Back Wall	Optional Mounting Brackets
3 & 5 kW	Horiz.	2 (50.8)	6 (152.4)	9 (228.6)	6X966
	Vert.	6 (152.4)	18 (457.2)	18 (457.2)	3UG06
7.5 to 10 kW	Horiz.	6 (152.4)	6 (152.4)	13 (330.2)	6X966
	Vert.	6 (152.4)	24 (609.6)	24 (609.6)	3UG06
15 to 20 kW	Horiz.	6 (152.4)	9 (228.6)	12½ (317.5)	6X967
	Vert.	6 (152.4)	24 (609.6)	24 (609.6)	3UG06
30 to 50 kW	Horiz.	16 (406.4)	12 (304.8)	18½ (470.0)	3UG64 & 3UG65
	Vert.	12 (304.8)	36 (914.4)	36 (914.4)	3UG08

Models 3UF75 thru 3UF99

Installation (Continued)

ROD MOUNTING

HORIZONTAL DISCHARGE

1. Install four threaded mounting rods in the threaded holes and secure in place using lock nuts. (See Table 2).
2. Securely attach the four mounting rods to the ceiling. (Refer to Table 1 for wall and ceiling clearances, and Table 2 for mounting rod spacing).

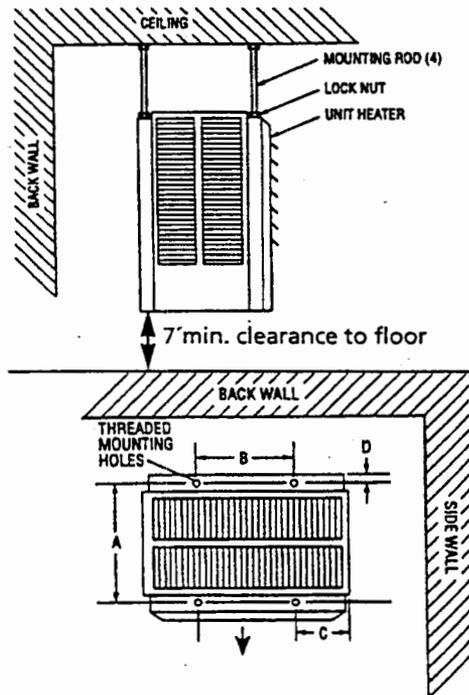


Figure 2 - Horizontal Discharge Mounting and Spacing

Table 2 - Mounting Rod Spacing

Unit	Rod Thread Type	(Figure 2) Horizontal				(Figure 3) Vertical			
		A	B	C	D	E	F	G	H
3 - 5kw	5/16-18	6 ¹ / ₁₆ "	6"	4 ¹ / ₁₆ "	3/4"	6"	9 ³ / ₄ "	2"	4 ³ / ₁₆
7.5 - 10	5/16-18	6 ¹ / ₁₆	8 ⁷ / ₈	5 ¹ / ₈	3/4	8 ⁷ / ₈	14 ⁵ / ₈	2	5 ¹ / ₈
15 - 20	5/16-18	11 ³ / ₈	8 ⁷ / ₈	5 ¹ / ₈	3/4	8 ⁷ / ₈	14 ⁷ / ₈	2	5 ¹ / ₈
25 - 30	3/8-16	10 ⁹ / ₁₆	14 ¹ / ₂	6 ³ / ₁₆	5/8	14 ¹ / ₂	21 ¹ / ₄	2 ³ / ₁₆	6 ³ / ₁₆
40 - 50	3/8-16	15 ¹⁵ / ₁₆	14 ¹ / ₂	6 ³ / ₁₆	5/8	—	—	—	—

VERTICAL DISCHARGE

1. Remove bolts from the threaded holes in the back of the heaters.
2. Install four threaded mounting rods in the threaded holes and secure in place using lock nuts.
3. Securely attach the four mounting rods to the ceiling. (Refer to Table 1 for wall and ceiling clearances, and Table 2 for mounting rod spacing dimensions.)

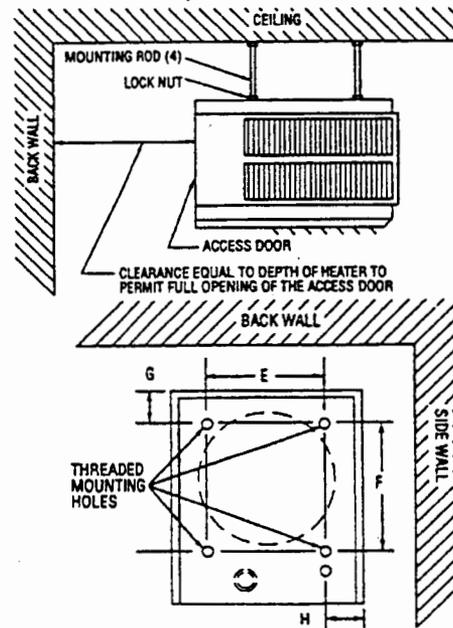


Figure 3 - Vertical Discharge Mounting and Rod Spacing

WIRING

BRANCH CIRCUIT (POWER)

1. Connect heater only to the voltage, amperage and frequency specified on the nameplate.
2. Field wiring must be properly sized to carry the amperage in accordance with the NEC.
3. The access door is hinged. There are either one or two screws accessible from the bottom that must be removed to gain access.
4. A knockout is provided in the back of the heater close to the power terminal board. The control terminal board knockout is 1/2 inch conduit size. The power terminal block knockout is multiple diameter. Use the diameter that fits the required conduit size.

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Dayton® Heavy-Duty Electric Unit Heater

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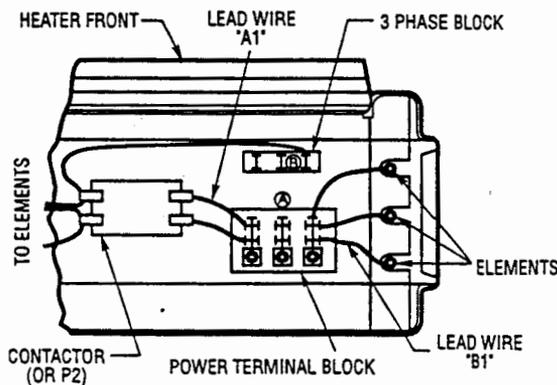
Installation (Continued)

5. A ground terminal is provided near the power terminal board. The ground wire should be connected before other connections are made.
6. The power terminal board is equipped with box terminals sized to accept the correct size power supply wire. Wire rated at 600V and 60° C is satisfactory for the heater branch circuit. Either

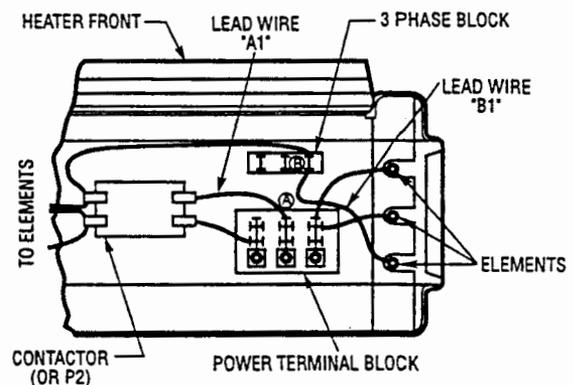
aluminum or copper wire is satisfactory for connection to the heater power terminal board box terminal. Copper wire is recommended.

7. Each heater has a wiring diagram affixed to the inside of the access door. Consult this diagram before making any field connections.
8. Single or three-phase connections may be used with heater models 3UF82, 3UF79, 3UF85, 3UF83,

3UF88, 3UF86, and 3UF91. These units are factory wired for single phase operation. If these heaters are for use with three-phased power, reconnect the wires as indicated in the wiring diagram attached to the heater. Additional information can be found by looking at the wiring illustrations in Figures 4a and 4b and following the directions shown below.



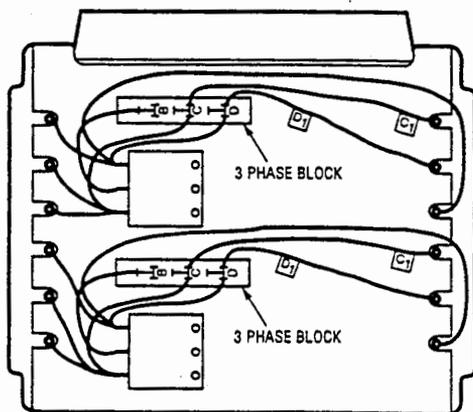
FACTORY-WIRED FOR SINGLE-PHASE POWER



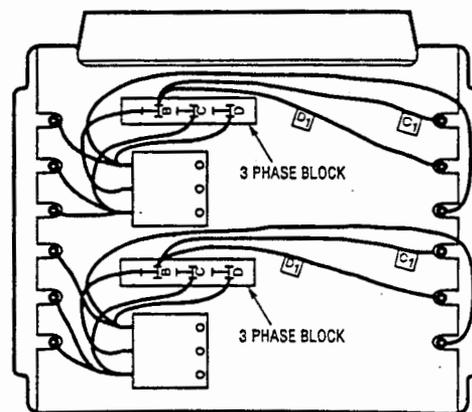
FIELD-WIRED FOR THREE-PHASE POWER

Figure 4a

Wiring Connections for Single-Phase and Three-Phase Power (3UF82, 3UF79, 3UF85, 3UF83, 3UF88 and 3UF86.)



FACTORY-WIRED FOR SINGLE-PHASE POWER



FIELD-WIRED FOR THREE-PHASE POWER

Figure 4b

Wiring Connections for Single-Phase and Three-Phase Power (3UF91)

Models 3UF75 thru 3UF99

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Installation (Continued)

On Models 3UF82, 3UF79, 3UF85, 3UF83, 3UF88, and 3UF86 (Figure 4a), move only the two wires marked "A1" and marked "B1"; do not move or change any other wiring. The element lead wire marked "B1" which is factory connected to the power terminal block (terminal located closest to the elements) must be moved to terminal "B" on the three-phase terminal block.

The relay (contactor lead wire "A1") must be moved from the end terminal of the power terminal block (terminal closest to the contactor or control terminal board) to the "A" terminal of the lower terminal block (center terminal).

Model 3UF91 (Figure 4b) has two three-phase terminal blocks located adjacent to the relays

(contactors). Move only the two wires marked "C1" and "D1" on each of these two three-phase terminal blocks to terminal "B". Do not move or change any other wires.

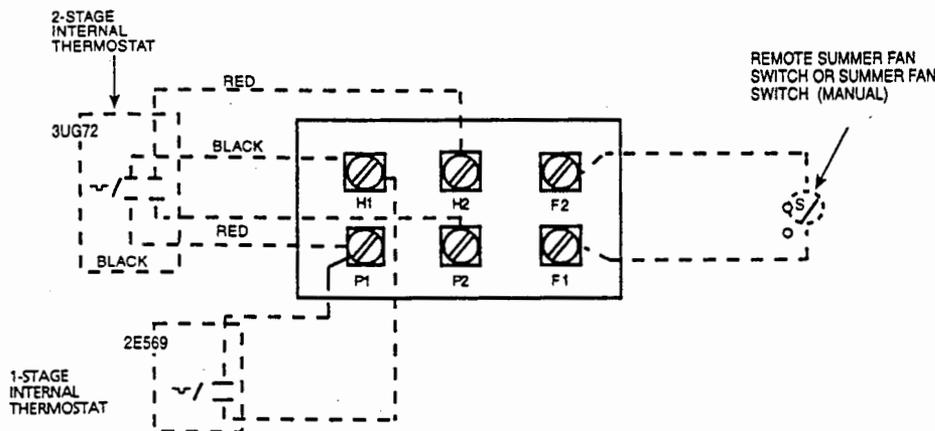
9. Electrical Accessories, either kits or factory-installed options, are shown connected by a dashed line on the heater wiring diagram.

10. 208/240 VOLT HEATER. Interchange transformer red and black primary leads (see wiring diagram) when the heater is to be connected to 208 volt supply.

1. Use 600 volt, NEC Class 1 insulated wire with a minimum 18 gage for thermostats and a minimum 14 gage for line voltage motor switch (Remote fan switch without relay).
2. Use a crimp-on type fork terminal on the wire end that attaches to the Heavy-Duty Electric Unit Heater control terminal board if more than one connection is to be made under the terminal screw.
3. Wire per Figure 5 for unit without contactors.
4. Wire per Figure 6 for unit with contactors.

CONTROL WIRING

⚠ WARNING *Line voltage is present on some of the terminals on the control terminal board. Always disconnect the power from the heater before making any connections to the control board to prevent hazard.*



NOTES:

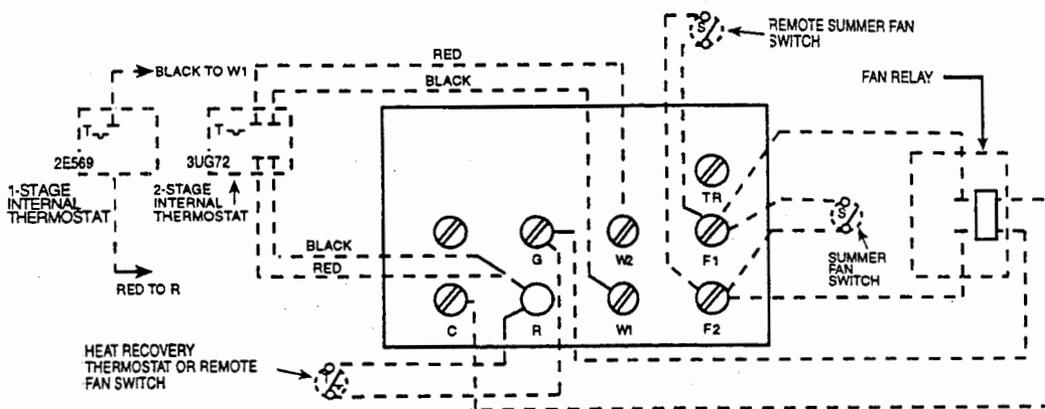
1. THIS STYLE CONTROL TERMINAL BOARD USED WITH MODELS 3UF78, 3UF75, 3UF77, 3UF82, 3UF79, 3UF81.
2. WHEN UNIT IS WIRED FOR SINGLE PHASE, JUMPER H1 TO H2. IF SINGLE POLE THERMOSTAT IS USED WITH SINGLE PHASE UNIT, CONNECT THERMOSTAT LEADS TO P1 AND H1.
3. EXTERNAL LINE VOLTAGE THERMOSTATS SHOULD BE TREATED AS SINGLE STAGE ONLY.

Figure 5 - Control Terminal Board (for Heaters Without Contactors)

Dayton® Heavy-Duty Electric Unit Heater

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Installation (Continued)



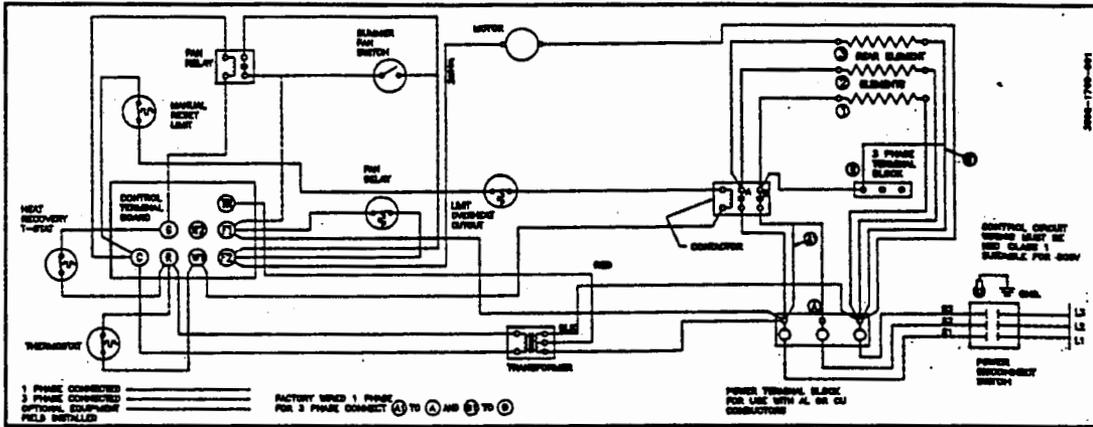
NOTES:

1. THIS STYLE CONTROL TERMINAL BOARD USED WITH MODELS EXCEPT 3UF78, 3UF75, 3UF77 AND 3UF81.
2. REMOVE JUMPER W1 TO W2 WHEN 2-STAGE THERMOSTAT IS USED.
3. *ONLY ONE OF THESE ACCESSORIES MAY BE INSTALLED IN A SINGLE HEATER.
4. EXTERNAL LINE VOLTAGE THERMOSTATS SHOULD BE TREATED AS SINGLE STAGE ONLY.

Figure 6 - Control Terminal Board (for Heaters With Contactors)

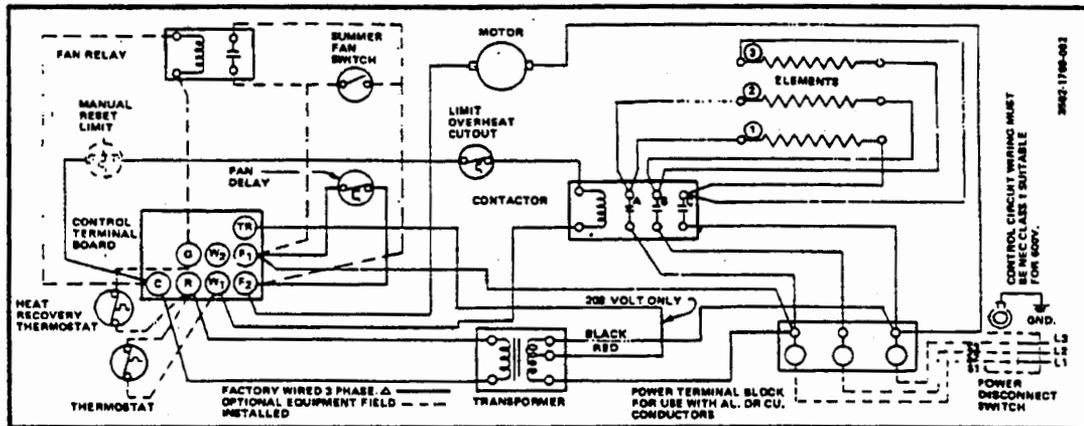
Models 3UF75 thru 3UF99

Diagram 1



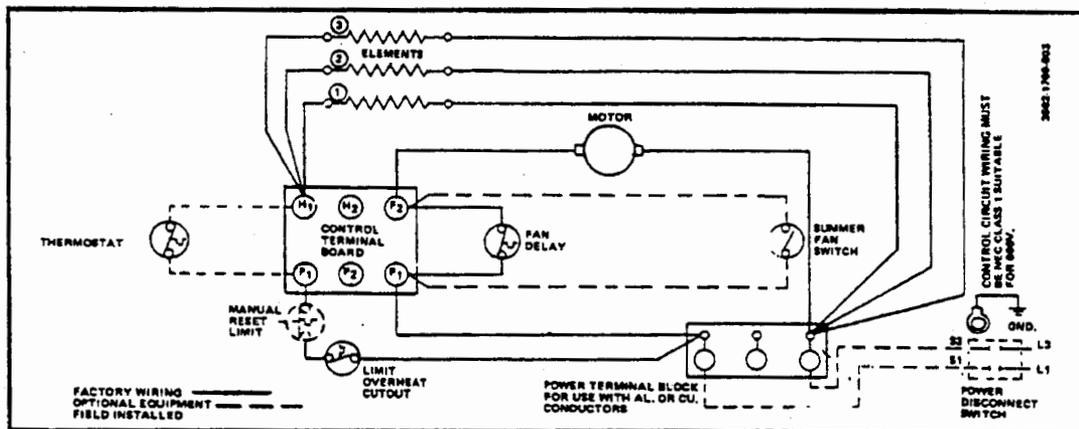
3 ELEMENT, SINGLE AND THREE PHASE
(MODELS 3UF83 AND 3UF86)

Diagram 2



3 ELEMENT, THREE PHASE
(MODELS 3UF76, 3UF80, 3UF84 AND 3UF87)

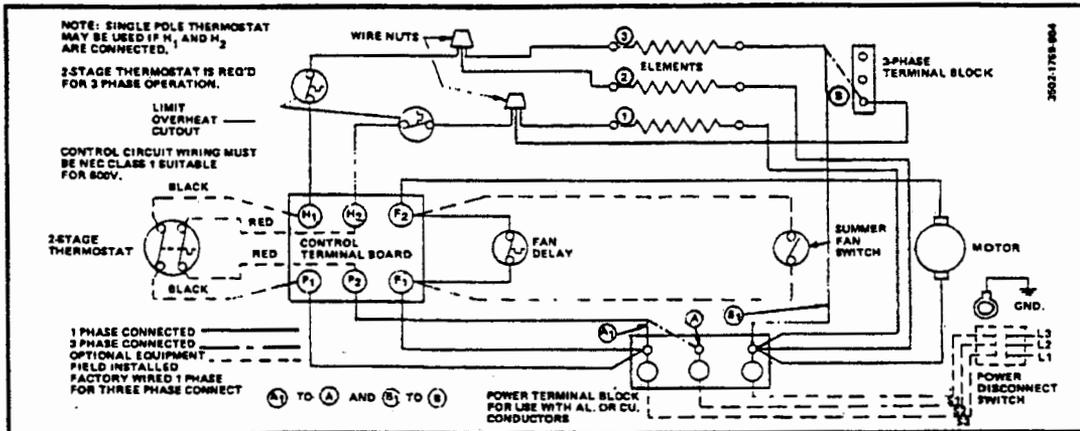
Diagram 3



3 ELEMENT, SINGLE PHASE
(MODELS 3UF75, 3UF77, 3UF78 AND 3UF81)

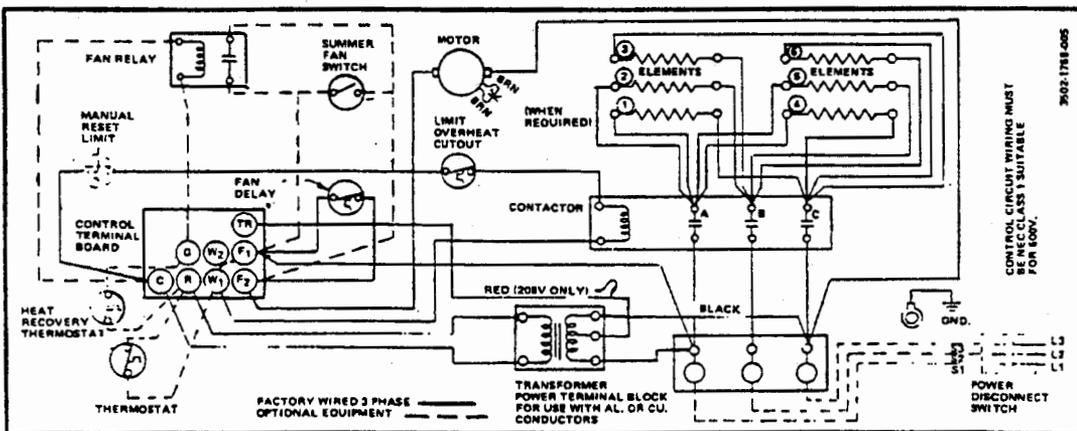
Models 3UF75 thru 3UF99

Diagram 4



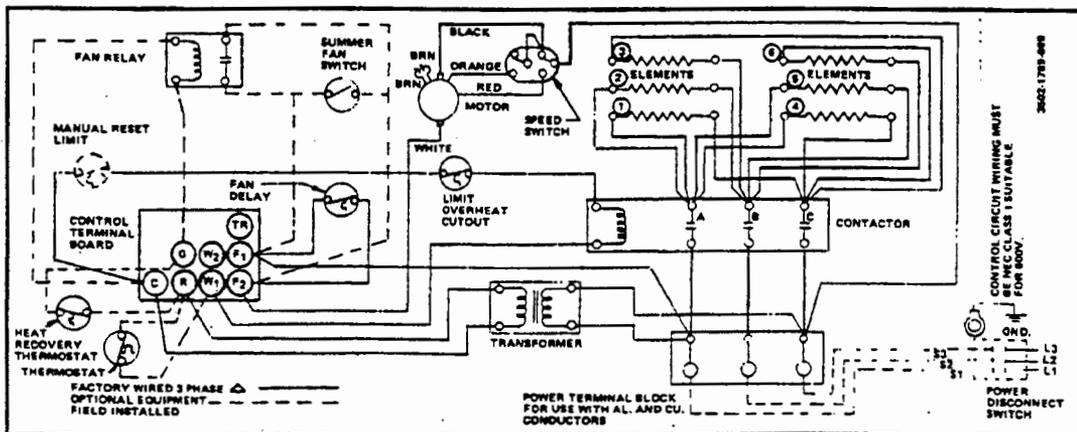
3 ELEMENT, SINGLE AND THREE PHASE (MODELS 3UF79 AND 3UF82)

Diagram 5



6 ELEMENT, THREE PHASE (MODELS 3UF89, 3UF90, 3UF92 AND 3UF93)

Diagram 6

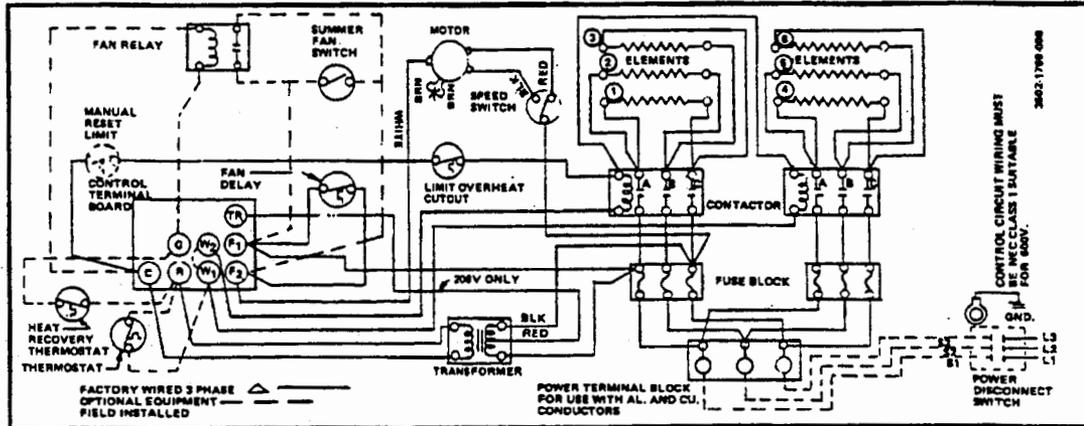


6 ELEMENT, THREE PHASE (MODEL 3UF95)

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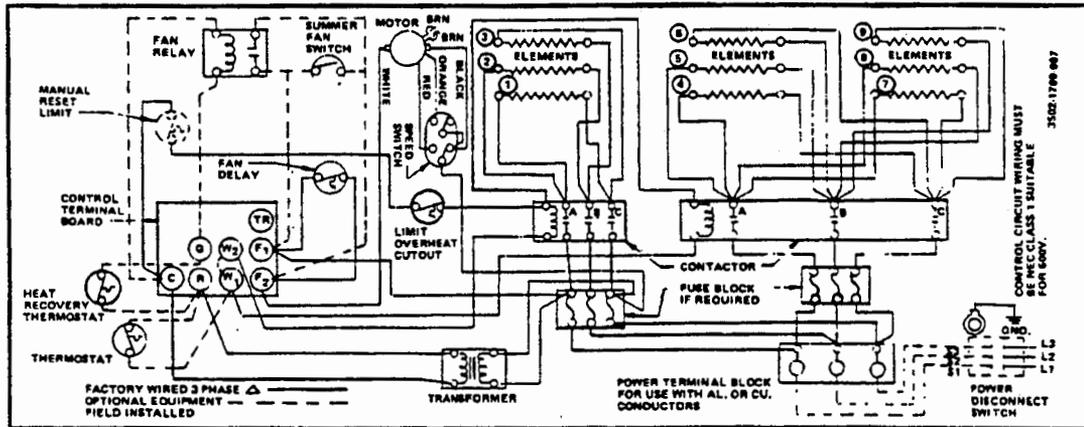
Models 3UF75 thru 3UF99

Diagram 7



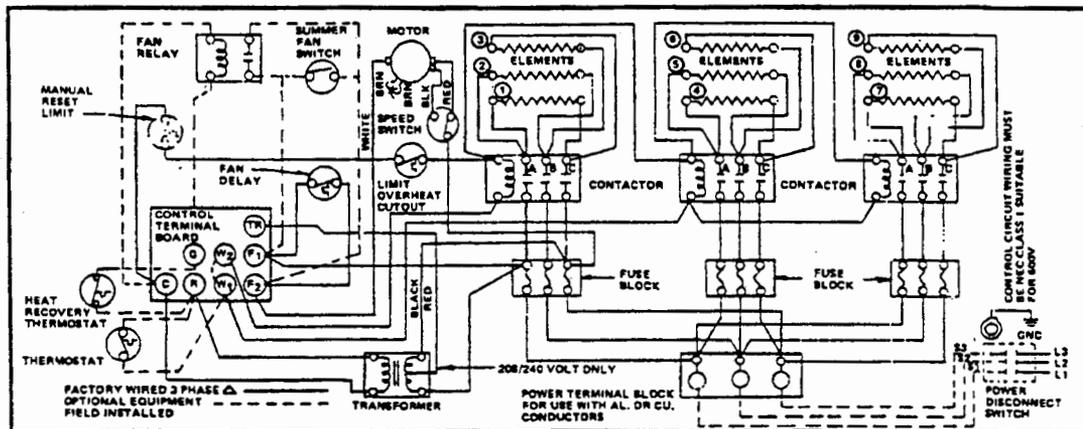
**6 ELEMENT, 2 CONTACTOR, THREE PHASE
(MODEL 3UF94)**

Diagram 8



**9 ELEMENT, 2 CONTACTOR, THREE PHASE
(MODEL 3UF98)**

Diagram 9

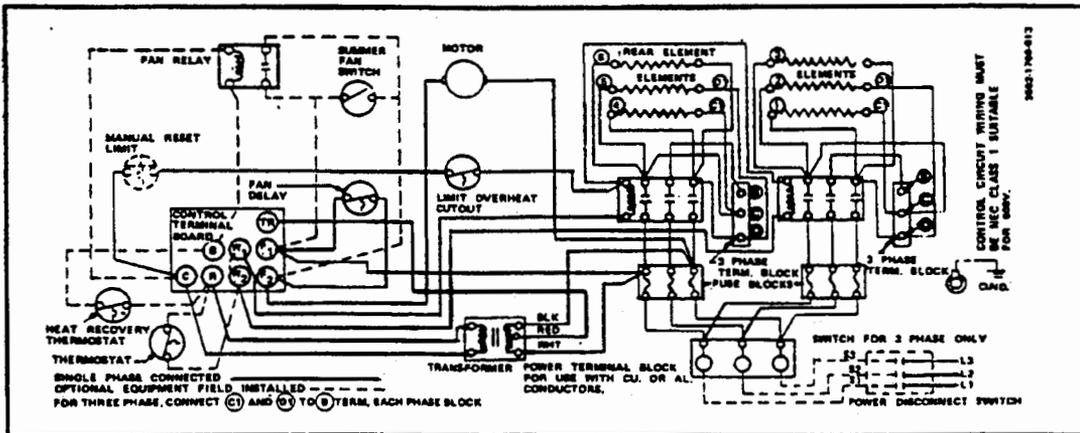


**9 ELEMENT, 3 CONTACTOR, THREE PHASE
(MODEL 3UF97)**

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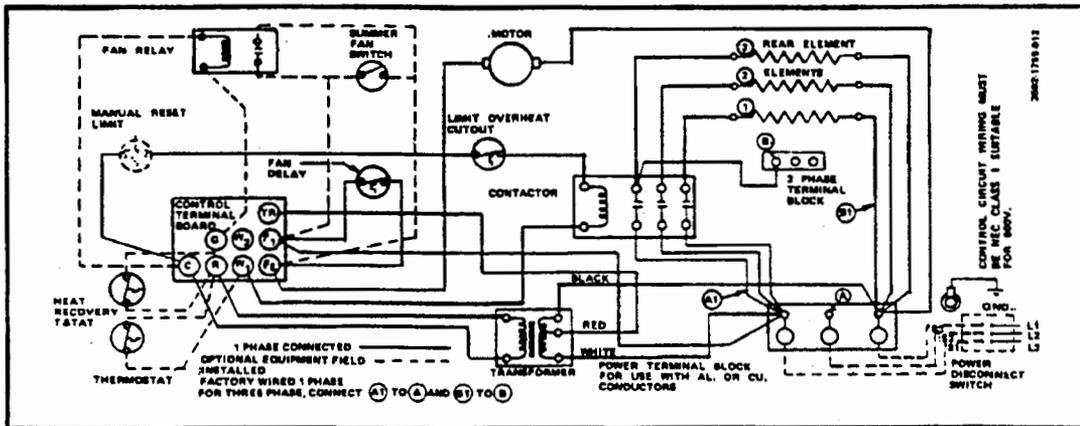
Models 3UF75 thru 3UF99

Diagram 10



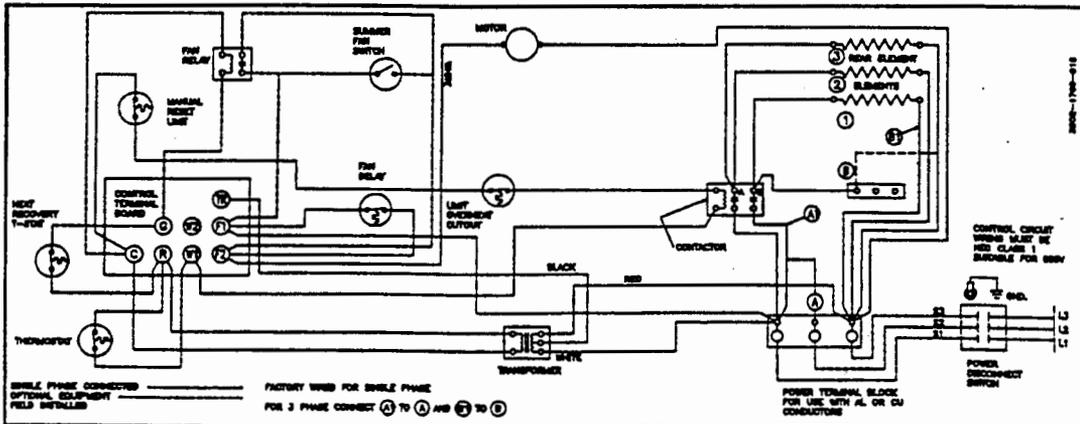
6 ELEMENT, 2 CONTACTOR, SINGLE AND THREE PHASE (MODEL 3UF91)

Diagram 11



3 ELEMENT, SINGLE AND THREE PHASE (MODEL 3UF88)

Diagram 13

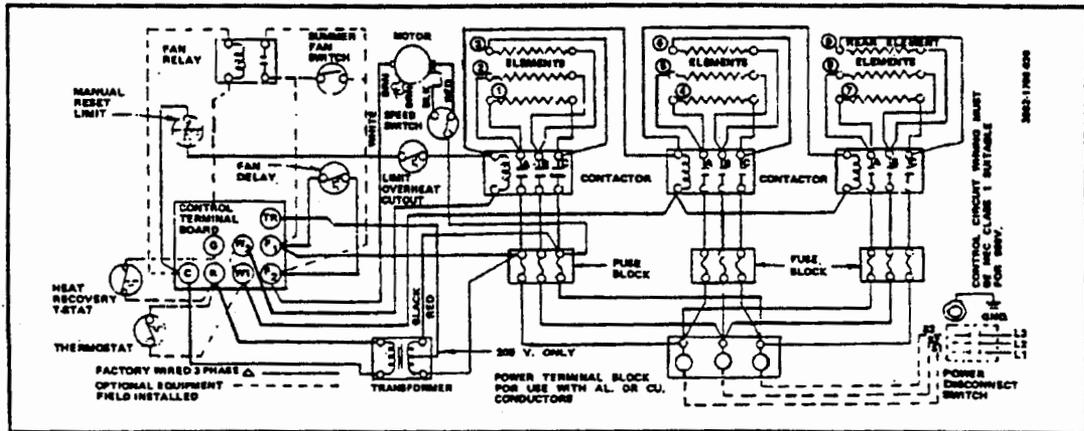


3 ELEMENT, SINGLE AND THREE PHASE (MODEL 3UF85)

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Models 3UF75 thru 3UF99

Diagram 13



**9 ELEMENT, 3 CONTACTOR, THREE PHASE
(MODEL 3UF99)**

Maintenance

⚠ WARNING *Make certain that the power source is disconnected before attempting to service or disassemble any component. If the power disconnect is out of the line of sight, lock it in the open position and tag it to prevent the application of power.*

ELECTRICAL

1. Once a year inspect the control panel wiring to make certain insulation is intact and all connections are tight. Inspect all heater and relay contacts. If the contacts appear badly pitted or burned, replace the contactor/relay.

2. For proper heater protection during operation, the correct size fuse must be used. The parts list contains the fuse size for all 30 and 50 KW units.

CLEANING

Clean the unit casing, fan and motor once a year. A dirty motor will tend to run hot and eventually will be damaged internally. Any rust spots on the casing should be cleaned and repainted.

LUBRICATION

All units up to 20KW have fan motors that are permanently lubricated so that only occasional cleaning is required. Units above 20KW have fan motors lubricated for 5 years of continuous duty or 10 years of intermittent operation. When required, remove the oil access plug on back of heater at motor intake grill, open oil cap, fill with S.A.E. No. 10 electric motor oil, replace plugs and access plug. Ensure that power is disconnected before attempting lubrication.

Troubleshooting Chart

Symptom	Possible Cause(s)	Corrective Active
Thermostat calls for heat, but heater does not function	<ol style="list-style-type: none"> 1. Open (blown) fuse 2. Incorrect wiring 3. Thermal cut-out open, deenergizing heater element and control circuit 	<ol style="list-style-type: none"> 1. Replace fuses, check for cause (See Replacement Parts List for fuse size) 2. Check wiring connections 3. Check for the following: Correct supply volts & phase Correct control wiring (heater control must be thru thermostat control wiring section only) Power interruption to heater during heater operation Restriction of air around heater 1-5 minute fan purge after thermostat off
Fan motor runs "hot"	<ol style="list-style-type: none"> 1. Dust accumulation or excessive dirt on fan motor 2. Dirt accumulation 3. Motor, needs lubrication 	<ol style="list-style-type: none"> 1. Clean fan motor and casing of grease and oil accumulation 2. Clean louvers and between heating elements 3. See Maintenance
Fan motor runs, but no heat	<ol style="list-style-type: none"> 1. Element contact not operating correctly 2. Element fuse blown 	<ol style="list-style-type: none"> 1. Check wiring for open circuit. Replace contactor if defective 2. Replace fuses, check for cause

ENGLISH

For Replacement Parts, call 1-800-323-0620

24 hours a day - 365 days a year

Please provide the following information:

- Model number
- Serial number (if any)
- Part description and number as shown in parts list

Address parts correspondence to:
 Grainger Parts Operations
 P.O. Box 3074
 1657 Shermer Road
 Northbrook, IL 60065-3074 U.S.A.

ENGLISH

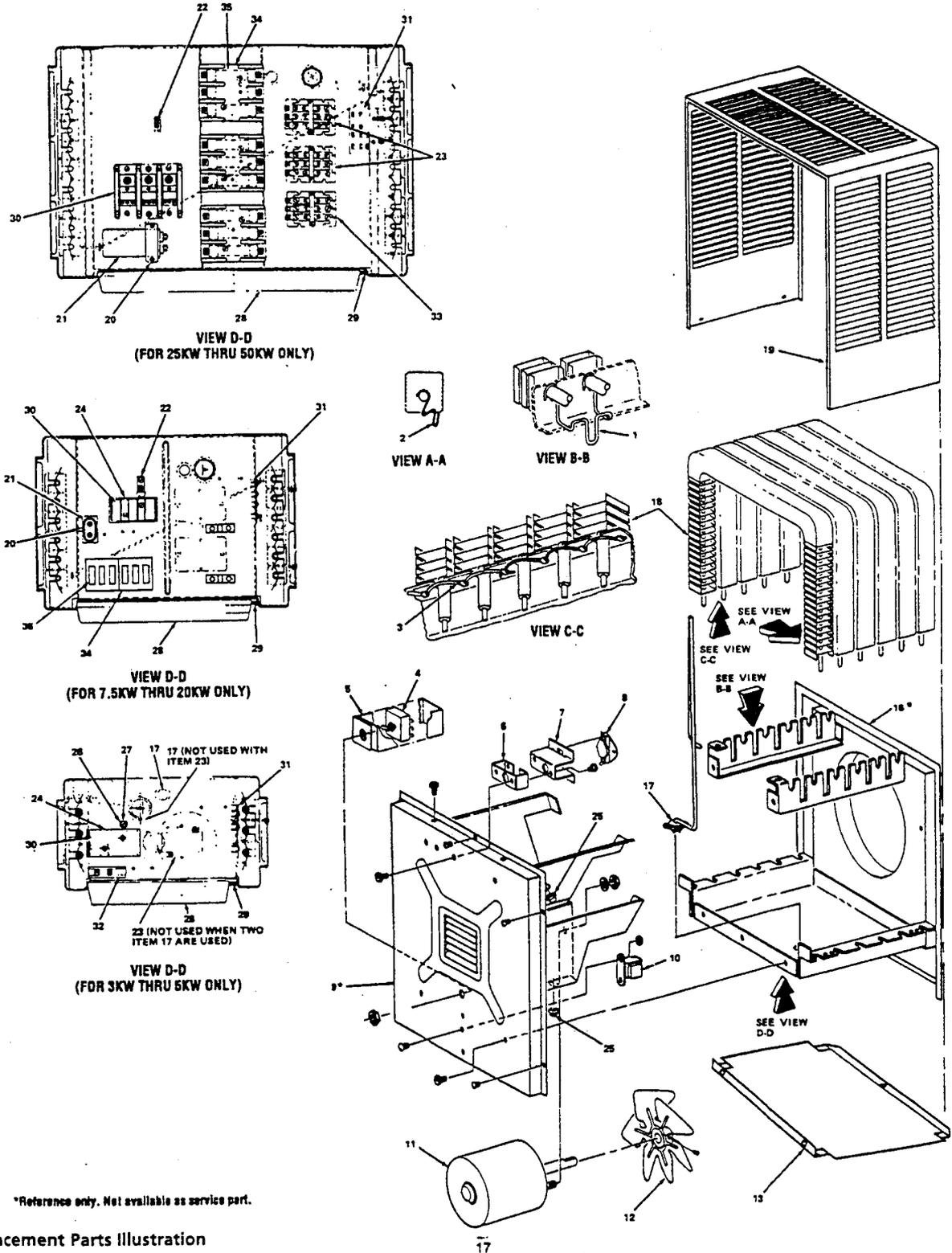


Figure 7 — Replacement Parts Illustration

Replacement Parts List

Model	Ref. 1 Element Spring	Ref. 2 Capillary Tube Spring	Ref. 3 Element Retainer Spring	Ref. 4 Switch	Ref. 5 Insulator	Ref. 6 Bracket Extension	Ref. 7 Switch Bracket	Ref. 8 Fan Delay Protector	Ref. 10 Transformer **
3UF75	5208 0073 000	5208 0072 000	5208 0074 000	—	—	—	—	4520 0010 000	—
3UF76	5208 0073 000	5208 0072 000	5208 0074 000	—	—	—	—	4520 0010 000	5814 0003 002
3UF77	5208 0073 000	5208 0072 000	5208 0074 000	—	—	—	—	4520 0010 000	—
3UF78	5208 0073 000	5208 0072 000	5208 0074 000	—	—	—	—	4520 0010 000	—
3UF79	5208 0073 000	5208 0072 000	5208 0074 000	—	—	—	—	4520 0010 000	—
3UF80	5208 0073 000	5208 0072 000	5208 0074 000	—	—	—	—	4520 0010 000	5814 0003 002
3UF81	5208 0073 000	5208 0072 000	5208 0074 000	—	—	—	—	4520 0010 000	—
3UF82	5208 0073 000	5208 0072 000	5208 0074 000	—	—	—	—	4520 0010 000	—
3UF83	5208 0073 000	5208 0072 000	5208 0074 000	—	—	—	—	4520 0010 000	5814 0003 000
3UF84	5208 0073 000	5208 0072 000	5208 0074 000	—	—	—	1215 0256 000	4520 0010 000	5814 0003 002
3UF85	5208 0073 000	5208 0072 000	5208 0074 000	—	—	—	1215 0256 000	4520 0010 000	5814 0003 000
3UF86	5208 0073 000	5208 0072 000	5208 0074 000	—	—	—	1215 0256 000	4520 0010 000	5814 0003 000
3UF87	5208 0073 000	5208 0072 000	5208 0074 000	—	—	—	1215 0256 000	4520 0010 000	5814 0003 002
3UF88	5208 0073 000	5208 0072 000	5208 0074 000	—	—	—	1215 0256 000	4520 0010 000	5814 0003 000
3UF89	5208 0073 000	5208 0072 000	5208 0074 000	—	2900 0031 000	1215 0282 000	—	4520 0010 000	5814 0003 000
3UF90	5208 0073 000	5208 0072 000	5208 0074 000	—	2900 0031 000	1215 0282 000	1215 0256 000	4520 0010 000	5814 0003 002
3UF91	5208 0073 000	5208 0072 000	5208 0074 000	—	2900 0031 000	1215 0282 000	1215 0256 000	4520 0010 000	5814 0003 000
3UF92	5208 0073 000	5208 0072 000	5208 0074 000	—	2900 0031 000	1215 0282 000	1215 0256 000	4520 0010 000	5814 0003 000
3UF93	5208 0073 000	5208 0072 000	5208 0074 000	—	2900 0031 000	1215 0282 000	1215 0256 000	4520 0010 000	5814 0003 002
3UF94	5208 0073 001	5208 0072 000	5208 0074 000	5216 0215 000	2900 0031 000	—	1215 0256 000	4520 0010 000	5814 0003 000
3UF95	5208 0073 001	5208 0072 000	5208 0074 000	5216 0215 000	2900 0031 000	—	1215 0256 000	4520 0010 000	5814 0003 002
3UF96	5208 0073 001	5208 0072 000	5208 0074 000	5216 0215 000	2900 0031 000	—	1215 0256 000	4520 0010 000	5814 0003 000
3UF97	5208 0073 001	5208 0072 000	5208 0074 000	5216 0215 000	2900 0031 000	1215 0282 000	1215 0256 000	4520 0010 000	5814 0003 000
3UF98	5208 0073 001	5208 0072 000	5208 0074 000	5216 0215 000	2900 0031 000	1215 0282 000	1215 0256 000	4520 0010 000	5814 0003 002
3UF99	5208 0073 001	5208 0072 000	5208 0074 000	5216 0215 000	2900 0031 000	1215 0282 000	1215 0256 000	4520 0010 000	5814 0003 000

Model	Ref. 11 Motor	Ref. 12 Fan Blade	Ref. 13 Cover	Ref. 17 Linear Limit Protector	Ref. 18 Element Assy.	Ref. 19 Element Guard	Ref. 20 Clamp	Ref. 21 Capacitor	Ref. 22 Terminal Lug
3UF75	3900 2002 006	1210 2000 000	1402 2166 001	4520 0011 000	1802 0087 000	1402 2163 001	—	—	—
3UF76	3900 2005 000	1210 2000 000	1402 2166 001	4520 0011 000	1802 0087 002	1402 2163 001	—	—	—
3UF77	3900 2002 007	1210 2000 000	1402 2166 001	4520 0011 000	1802 0087 001	1402 2163 001	—	—	—
3UF78	3900 2002 006	1210 2000 000	1402 2166 001	4520 0011 000	1802 0087 024	1402 2163 001	—	—	—
3UF79	3900 2002 006	1210 2000 000	1402 2166 001	4520 0011 000	1802 0087 035	1402 2163 001	—	—	—
3UF80	3900 2005 000	1210 2000 000	1402 2166 001	4520 0011 000	1802 0087 005	1402 2163 001	—	—	—
3UF81	3900 2002 007	1210 2000 000	1402 2166 001	4520 0011 000	1802 0087 004	1402 2163 001	—	—	—
3UF82	3900 2002 006	1210 2000 000	1402 2166 001	4520 0011 000	1802 0087 034	1402 2163 001	—	—	—
3UF83	3900 2014 004	1210 0090 000	1402 2167 002	4520 0011 001	1802 0087 006	1402 2164 002	—	—	3504 7002 001
3UF84	3900 0347 005	1210 0090 000	1402 2167 002	4520 0011 001	1802 0087 008	1402 2164 002	—	—	3504 7002 001
3UF85	3900 2014 004	1210 0090 000	1402 2167 002	4520 0011 001	1802 0087 031	1402 2164 002	—	—	3504 7002 001
3UF86	3900 2014 004	1210 0090 000	1402 2167 002	4520 0011 001	1802 0087 031	1402 2164 002	—	—	3504 7002 001
3UF87	3900 0347 005	1210 0090 000	1402 2167 002	4520 0011 001	1802 0087 011	1402 2164 002	—	—	3504 7002 001
3UF88	3900 2014 004	1210 0090 000	1402 2167 002	4520 0011 001	1802 0087 036	1402 2164 002	—	—	3504 7002 001
3UF89	3900 0361 000	1210 0090 001	1402 2167 003	4520 0011 001	1802 0087 012	1402 2164 003	—	—	3504 7002 001
3UF90	3900 0361 001	1210 0090 001	1402 2167 003	4520 0011 001	1802 0087 013	1402 2164 003	—	—	3504 7002 001
3UF91	3900 0361 000	1210 0090 001	1402 2167 003	4520 0011 001	1802 0087 037	1402 2164 003	—	—	3504 7002 001
3UF92	3900 0362 000	1210 0096 000	1402 2167 003	4520 0011 001	1802 0087 037	1402 2164 003	1417 5004 000	1432 0002 003	3504 7002 001
3UF93	3900 0362 001	1210 0096 000	1402 2167 003	4520 0011 001	1802 0087 015	1402 2164 003	1417 5004 000	1432 0002 003	3504 7002 001
3UF94	3900 0364 000	1210 0098 000	1402 2168 002	4520 0011 002	1802 0087 018	1402 2165 002	1417 5004 000	1432 0002 003	3504 7002 001
3UF95	3900 0363 000	1210 0098 000	1402 2168 002	4520 0011 002	1802 0087 019	1402 2165 002	1417 5004 000	1432 0002 001	3504 7002 001
3UF96	3900 0364 000	1210 0098 000	1402 2168 002	4520 0011 002	1802 0087 028	1402 2165 002	1417 5004 000	1432 0002 001	3504 7002 001
3UF97	3900 0350 000	1210 0097 000	1402 2168 003	4520 0011 002	1802 0087 022	1402 2165 003	1417 5004 000	1432 0002 004	3504 7002 001
3UF98	3900 0350 001	1210 0097 000	1402 2168 003	4520 0011 002	1802 0087 023	1402 2165 003	1417 5004 000	1432 0002 004	3504 7002 001
3UF99	3900 0350 002	1210 0097 000	1402 2168 003	4520 0011 002	1802 0087 030	1402 2165 003	1417 5004 000	1432 0002 004	3504 7002 001

NOTE: 9,14, 15 and 16 reference only. Not available as a service part.

(*) Two relays are used: 35A relay P/N, 5018 0004 100, and 40A relay, P/N 5018 0005 004.

Replacement Parts List

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Model	Ref. 23 Relay	Ref. 24 Insulator	Ref. 25 Bushing	Ref. 26 Ground Washer	Ref. 27 Ground Screw	Ref. 28 Louver	Ref. 29 Spring Louver	Ref. 30 Terminal Block, Power	Ref. 31 Terminal Block, Control
3UF75	—	—	—	6401 0084 000	5202 0290 002	3503 2000 011	5208 7005 001	5823 0004 000	5823 0001 000
3UF76	5018 0004 100	2900 0030 000	—	6401 0084 000	5202 0290 002	3503 2000 011	5208 7005 001	5823 0004 000	5823 0002 000
3UF77	—	2900 0030 000	—	6401 0084 000	5202 0290 002	3503 2000 011	5208 7005 001	5823 0004 000	5823 0001 000
3UF78	—	—	—	6401 0084 000	5202 0290 002	3503 2000 011	5208 7005 001	5823 0004 000	5823 0001 000
3UF79	—	—	—	6401 0084 000	5202 0290 002	3503 2000 011	5208 7005 001	5823 0004 000	5823 0001 000
3UF80	5018 0004 100	2900 0030 000	—	6401 0084 000	5202 0290 002	3503 2000 011	5208 7005 001	5823 0004 000	5823 0002 000
3UF81	—	2900 0030 000	—	6401 0084 000	5202 0290 002	3503 2000 011	5208 7005 001	5823 0004 000	5823 0001 000
3UF82	—	—	—	6401 0084 000	5202 0290 002	3503 2000 011	5208 7005 001	5823 0004 000	5823 0001 000
3UF83	5018 0003 000	—	—	—	—	3503 2000 012	5208 7005 001	5823 0004 000	5823 0002 000
3UF84	5018 0004 100	2900 0030 000	—	—	—	3503 2000 012	5208 7005 001	5823 0004 000	5823 0002 000
3UF85	5018 0003 000	—	—	—	—	3503 2000 012	5208 7005 001	5823 0004 000	5823 0002 000
3UF86	5018 0003 000	—	—	—	—	3503 2000 012	5208 7005 001	5823 0004 000	5823 0002 000
3UF87	5018 0004 100	2900 0030 000	—	—	—	3503 2000 012	5208 7005 001	5823 0004 000	5823 0002 000
3UF88	5018 0004 100	—	—	—	—	3503 2000 012	5208 7005 001	5823 0004 000	5823 0002 000
3UF89	5018 0005 004	—	—	—	—	3503 2000 012	5208 7005 001	5823 0004 001	5823 0002 000
3UF90	5018 0004 100	2900 0030 000	—	—	—	3503 2000 012	5208 7005 001	5823 0004 000	5823 0002 000
3UF91	5018 0005 004	—	—	—	—	3503 2000 012	5208 7005 001	5823 0004 003	5823 0002 000
3UF92	5018 0006 000	—	—	—	—	3503 2000 012	5208 7005 001	5823 0004 002	5823 0002 000
3UF93	5018 0004 100	2900 0030 000	—	—	—	3503 2000 012	5208 7005 001	5823 0004 000	5823 0002 000
3UF94	5018 0005 004	—	25221-60131	—	—	3503 2000 013	5208 7005 001	5823 0004 003	5823 0002 000
3UF95	5018 0005 004	2900 0030 000	25221-60131	—	—	3503 2000 013	5208 7005 001	5823 0004 001	5823 0002 000
3UF96	5018 0006 000	—	25221-60131	—	—	3503 2000 013	5208 7005 001	5823 0005 000	5823 0002 000
3UF97	5018 0005 004	—	25221-60131	—	—	3503 2000 013	5208 7005 001	5823 0005 000	5823 0002 000
3UF98	*	2900 0030 000	25221-60131	—	—	3503 2000 013	5208 7005 001	5823 0004 002	5823 0002 000
3UF99	5018 0006 000	—	25221-60131	—	—	3503 2000 013	5208 7005 001	5823 0005 000	5823 0002 000

Model	Ref. 32 Terminal Block 3 Phase	Ref. 33 Terminal Doublers	Ref. 34 Fuse Block	Ref. 35 Fuse
3UF75	—	5819 7012 005	—	—
3UF76	—	5819 7012 005	—	—
3UF77	—	5819 7012 005	—	—
3UF78	—	5819 7012 005	—	—
3UF79	5823 0003 000	5819 7012 005	—	—
3UF80	—	5819 7012 005	—	—
3UF81	—	5819 7012 005	—	—
3UF82	5823 0003 000	5819 7012 005	—	—
3UF83	5823 0003 000	5819 7012 005	—	—
3UF84	—	5819 7012 005	—	—
3UF85	5823 0003 000	5819 7012 005	—	—
3UF86	5823 0003 000	5819 7012 005	—	—
3UF87	—	5819 7012 005	—	—
3UF88	5823 0003 000	5819 7012 005	—	—
3UF89	—	5819 7012 005	—	—
3UF90	—	5819 7012 005	—	—
3UF91	5823 0003 000	5819 7012 005	2025 0002 000	2019 0007 010
3UF92	—	5819 7012 005	—	—
3UF93	—	5819 7012 005	—	—
3UF94	—	5819 7012 005	2025 7002 000	2019 7008 079
3UF95	—	5819 7012 005	—	—
3UF96	—	5819 7012 005	2025 7002 000	2019 7008 080
3UF97	—	5819 7012 005	2025 7002 000	2019 7008 080
3UF98	—	5819 7012 005	—	—
3UF99	—	5819 7012 005	2025 7002 000	2019 7008 078

* Two relays are used: 35A relay P/N, 5018 0004 100, and 40A relay, P/N 5018 0005 004.

For Replacement Parts, call 1-800-323-0620

24 hours a day - 365 days a year

Please provide the following information:

- Model number
- Serial number (if any)
- Part description and number as shown in parts list

Address parts correspondence to:

Grainger Parts Operations
 P.O. Box 3074
 1657 Shermer Road
 Northbrook, IL 60065-3074 U.S.A.

E N G L I S H

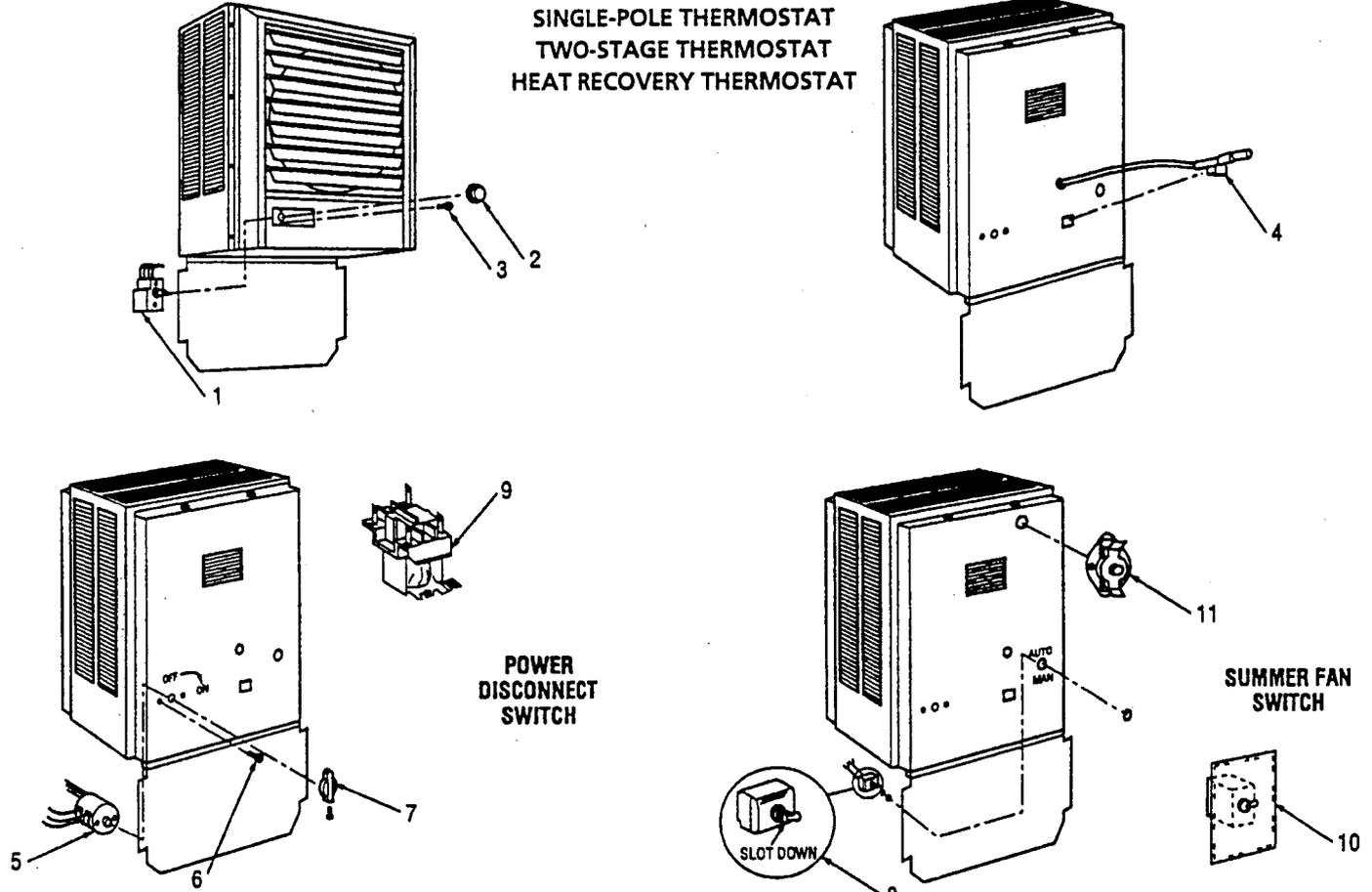


Figure 8 — Replacement Parts Illustration

Ref. No.	Description	Part No.	Qty.	
1	{ One Pole Thermostat	5813 0036 000	1	
		5813 0035 000	1	
2	Thermostat Knob	3301 2020 0051	1	
3	Screws	5202 7009 021	2	
4	Thermostat Clip	1403 0041 000	1	
5	{ 25A, OEM Switch	5216 0132 000	1	
		5216 0204 000	1	
		5216 0131 000	1	
		5216 0200 000	1	
6	{ Screw, M4 x 10, Rd. Hd. (25A)	5216 0132 000	1	
		Screw, 63A, M5 x 16, Rd. Hd.	1	
7	{ Knob, 25A, OEM "T1"	OEM "T1"	1	
		Knob, 25A, K & N	K & N S1B 6001	1
		Knob, 63A, OEM	OEM "S4"	1
		Knob, 63A, K & N	K & N S2B G001	1
8	Switch, Toggle, 600V	5216 2011 000	1	
9	Relay, Fan 24V Coil	5018 0008 000	1	
10	Switch Assembly	5216 0199 000	1	
11	Manual Reset Limit	4520 0012 000	1	



Dayton® Heavy-Duty Electric Unit Heater

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Limited Warranty

Dayton One-Year Limited Warranty. Dayton Electric Utility Heaters, Models covered in this manual, are warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specific legal rights which vary from jurisdiction to jurisdiction.

Limitation of Liability. To the extent allowable under applicable law, Dayton's liability for consequential and incidental damages is expressly disclaimed. Dayton's liability in all events is limited to and shall not exceed the purchase price paid.

Warranty Disclaimer. Dayton has made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustrations or descriptions.

Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in the "LIMITED WARRANTY" above is made or authorized by Dayton.

Product suitability. Many jurisdictions have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Dayton attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a product, please review the product application, and the national and local codes and regulations, and be sure that the product, installation, and use will comply with them.

Certain aspects of disclaimers are not applicable to consumer products; e.g. (a) some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some jurisdictions do not allow a limitation on how long an implied warranty lasts, consequentially the above limitation may not apply to you; and (c) by law, during the period of this limited warranty, and implied warranty of implied merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

Prompt Disposition. Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom the product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date, and number of dealer's invoice and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file claim with carrier.

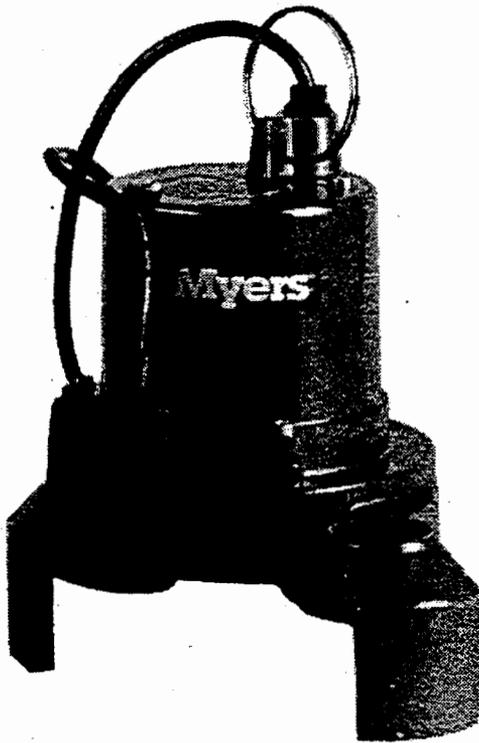
Manufactured for Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, Illinois 60714 U.S.A.

Myers®

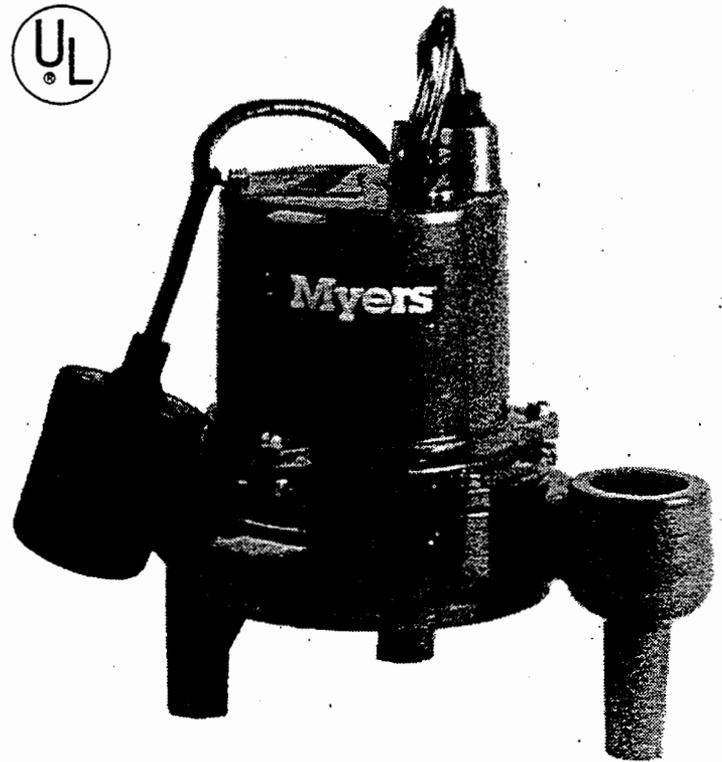
ME3H/ME3F SERIES Submersible Sump & Effluent Pumps

Installation and Service Manual

Automatic and manual models. Single phase power only - 115 or 230 volt.



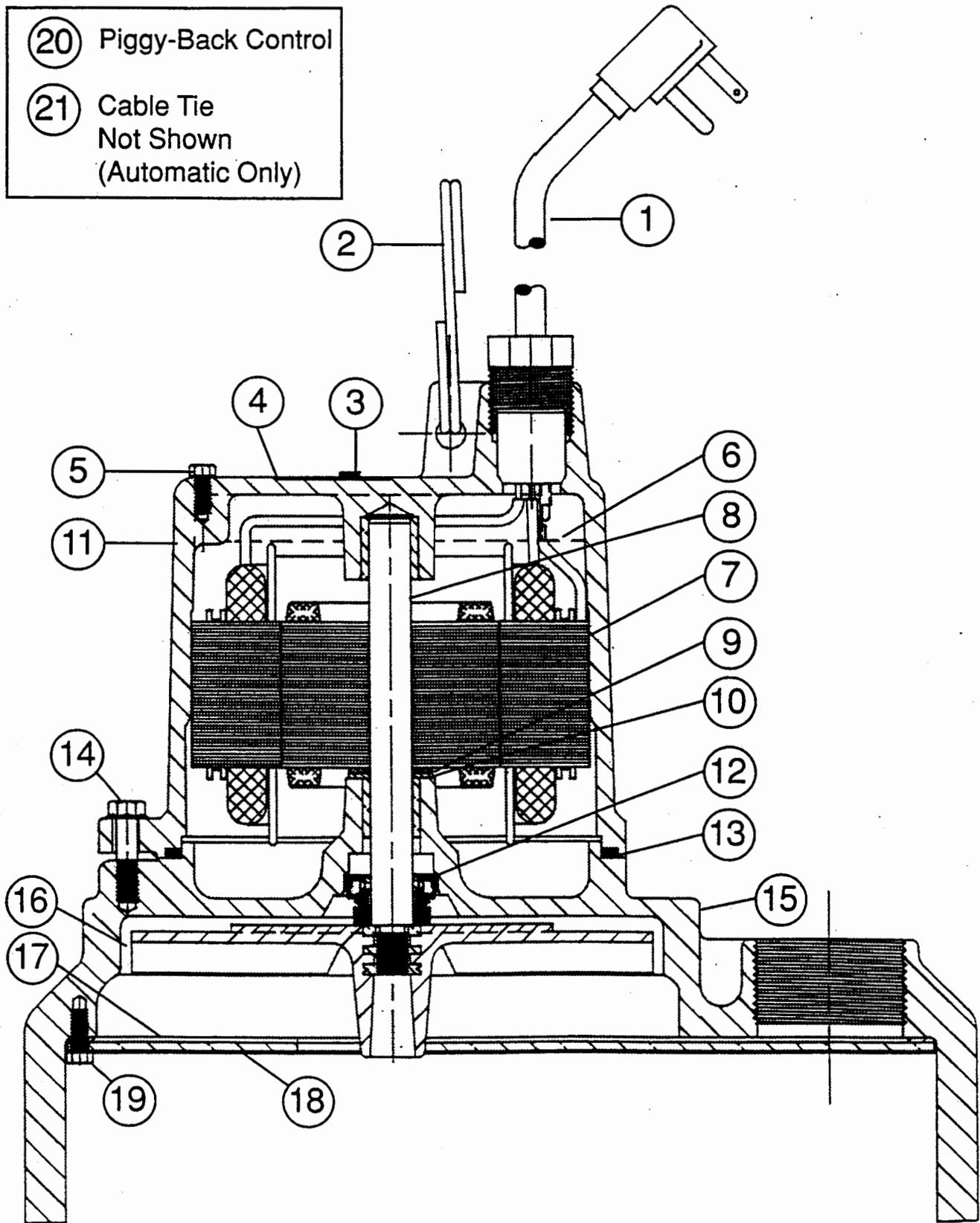
ME3H
SUMP/EFFLUENT PUMP



ME3F
SUMP/EFFLUENT PUMP

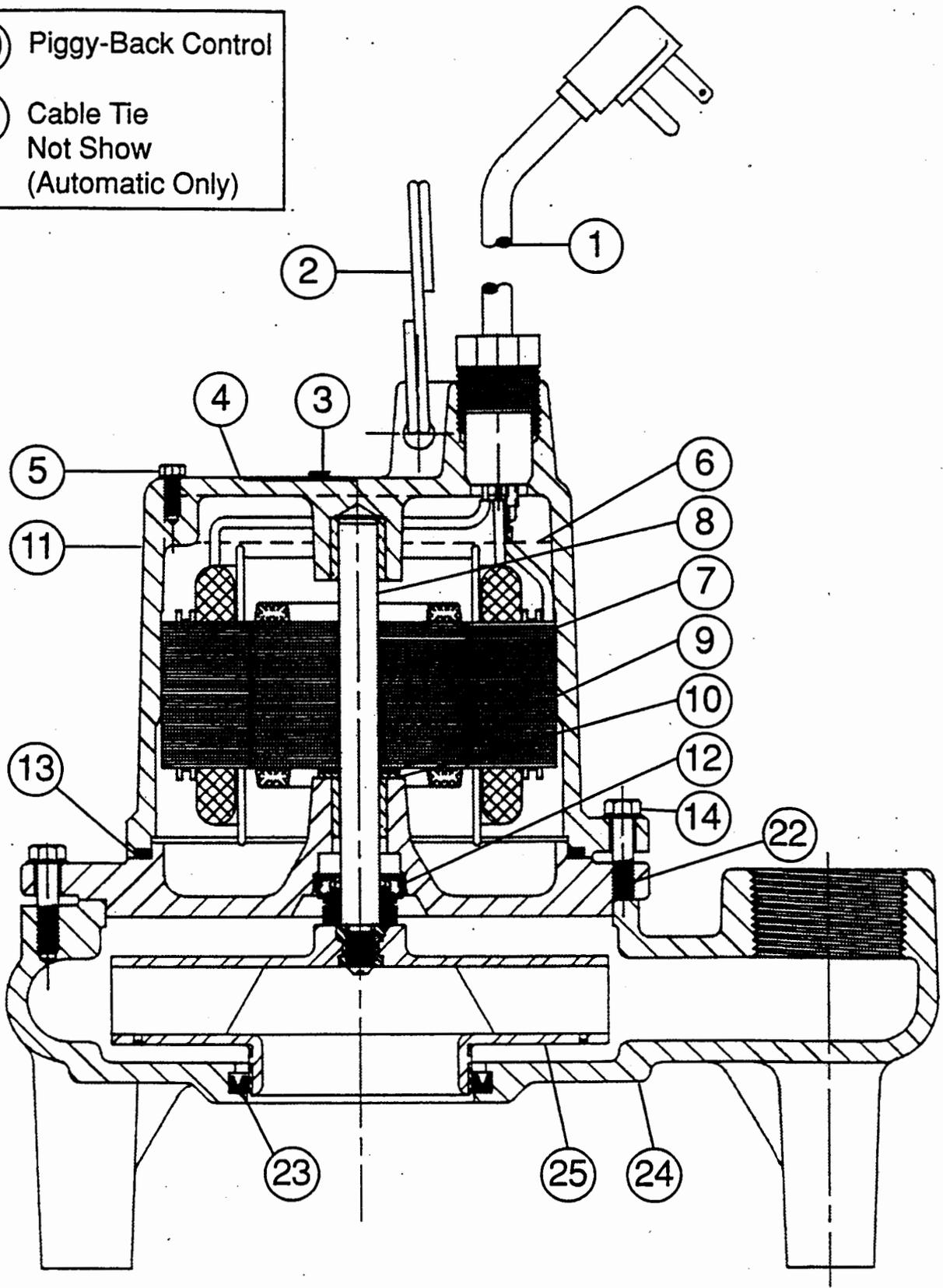
TYPICAL SECTION DRAWING FOR ME3H SERIES

- ②① Piggy-Back Control
- ②① Cable Tie
Not Shown
(Automatic Only)



TYPICAL SECTION DRAWING FOR ME3F SERIES

- ②① Piggy-Back Control
- ②① Cable Tie
Not Show
(Automatic Only)



PARTS LIST

Ref. No.	Description	No. Req'd.	Part Numbers
2	Ring, Lift	1	26230A000
3	Plug, 1/4" NPT	1	05022A056
4	Plate, Name (Not Stamped)	1	23780A000
5	Tapping, Screw (Manual)	1	09822A032
5	Tapping, Screw (Automatic)	1	09822A006
6	Oil, Transformer (1 Qt. In Can)	1	11009A002
8	Rotor with Shaft	1	22821A000
9	Washer, Thrust, SST	1	05030A243
10	Washer, Thrust, Graphite	1	05030A244
11	Housing, Motor	1	23770D002
	Housing with Stator 115 V, SRM4P, ME3F, ME3H		23770D060K
	230 V, SRM4P, ME3F, ME3H		23770D061K
12	Seal, 1/2" Shaft	1	21607A001
13	Gasket, Rubber	1	05014A172
14	Screw, Cap, 1/4-20 x 7/8 Lg. ME3H	3	18475A003
	ME3F	6	18475A003

Ref. No.	Description	No. Req'd.	Part Numbers
15	Case, Volute	1	26221D000
16	Impeller	1	26223C000
17	Gasket	1	26225C000
18	Plate, Suction	1	26222C000
19	Tapping, Screw	9	09822A006
20	Control, Level, 115V, 20', Piggy-Back	1	21813B131
20	Control, Level, 230V, 20', Piggy-Back	1	21813B133
21	Tie, Cable	1	17190A008
22	Plate, Seal	1	26227D000
23	Cup, HUVA	1	22835A007
24	Case, Volute	1	26226D000
25	Impeller	1	25301B000

CHART

Pump Catalog Number	Pump Engineer. Number	Pump Type	HP	V	Ph	① Cord, Electric	Cord Length	⑦ Stator Only	Winding Resistance in Ohms	Max. Amps	Locked Rotor Amps
ME3H-11	26228D000	Manual	1/3	115	1	21628B048	20'	21599B026	1.2	12.0	16.0
ME3H-21	26228D001	Manual	1/3	230	1	21628B049	20'	21599B027	4.3	6.0	8.2
ME3H-11P	26228D010	Automatic	1/3	115	1	21628B048	20'	21599B026	1.2	12.0	16.0
ME3H-21P	26228D011	Automatic	1/3	230	1	21628B049	20'	21599B027	4.3	6.0	8.2
ME3H-21L/P	26228D002	Manual	1/3	230	1	21628B049	20'	21599B027	4.3	6.0	8.2
ME3F-11	26229D000	Manual	1/3	115	1	21628B048	20'	21599B026	1.2	12.0	16.0
ME3F-21	26229D001	Manual	1/3	230	1	21628B049	20'	21599B027	4.3	6.0	8.2
ME3F-11P	26229D010	Automatic	1/3	115	1	21628B048	20'	21599B026	1.2	12.0	16.0
ME3F-21P	26229D011	Automatic	1/3	230	1	21628B049	20'	21599B027	4.3	6.0	8.2
ME3F-21L/P	26229D002	Manual	1/3	230	1	21628B049	20'	21599B027	4.3	6.0	8.2

NOTE: READ THESE INSTRUCTIONS CAREFULLY BEFORE ATTEMPTING TO INSTALL PUMP.

DESCRIPTION AND APPLICATION

ME3H & ME3F

Myers ME3H and ME3F Series Pumps are single seal units, available in automatic or manual, and are designed for use in effluent dosing, Septic Tank Effluent Pumping (S.T.E.P.) or normal sump and general dewatering applications where higher pressure is required. When used in Effluent dosing or S.T.E.P. applications, the pump must be installed in a separate tank or compartment at the discharge side of the septic tank. **NEVER INSTALL PUMP IN MAIN TANK WHERE SLUDGE COLLECTS. DO NOT USE PUMPS FOR RAW SEWAGE.**

General

The ME3H and ME3F pumps use a 1/3 HP shaded pole, 1550 RPM motor, and are available in 115 volt and 230 volt, single phase. Both the manual and automatic models come standard with a 20 ft. power cord. All automatic models come with a mechanical (mercury free) piggy-back float switch. The ME3H and ME3F pumps are designed to handle 3/4 inch spherical solids. The ME3H uses an engineered thermoplastic vortex impeller design to efficiently produce high pressures with low flows. The ME3F uses an engineered thermoplastic two vane non-clog impeller design to produce high pressures with medium flows. All pumps have a 1-1/2" discharge tapping.

WARNING! THESE PUMPS ARE NOT APPROVED FOR, AND SHOULD NOT BE USED IN SWIMMING POOLS OR FOUNTAINS.

AIR LOCKING

A pump is said to be air locked if water traps air in the pump and it cannot get out, thus preventing the pump from operating.

The ME3H/ME3F Sump Pumps have a 1/16" air vent hole in the impeller chamber to let out trapped air. If this hole becomes plugged, pump may air lock. As a secondary precaution a 1/8" hole should be drilled in the discharge pipe below the check valve. The check valve should be 12 to 18 inches above pump discharge. Do not put check valve directly into pump discharge opening.

PACKAGING

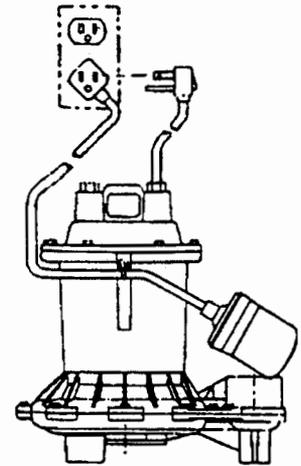
Each pump is packaged separately in a carton marked with a catalog number and Myers engineering number. The pumps are carefully packaged to prevent damage in shipping. However, occasionally damage may result due to rough handling. Carefully go over the pump and check for damage that could cause the pump to fail.

LEVEL CONTROLS

The automatic model ME3H and ME3F Series Pumps have a 20 ft. mechanical (mercury free), piggy-back float switch. The 115 or 230 volt piggy-back switch is tethered directly to the pump. The switch can optionally be mounted to the discharge pipe using a minimum 4" tether length. The switch must float free from pump and basin wall. Plug the switch cord into a properly grounded, rated voltage receptacle. Plug the power cord into the back of the switch cord and tape

the cords to the discharge pipe every 12". The power receptacle must be located outside the wet sump or basin due to the DANGER of current leakage.

On all duplex units or simplex installations with additional options like high water alarm, the power cord plug must be cut off and wired into a control panel or into a sealed junction box if used in wet sump or basin. The AWS-1 control also acts as a sealed junction box for connecting power cord to pump cord.



DESIGN OF PRESSURE SEWER SYSTEMS

MYERS has available complete computer SOFTWARE for designing PRESSURE SEWER SYSTEMS. This gives pipe sizes to use and gives exact flow from any pump or group of pumps in the system when operating simultaneously.

This design DISK for IBM® or COMPATIBLE computers is available to engineers on request.

MOTOR TYPE

The motors used in the ME3H and ME3F Series Pumps are pressed into the cast iron housings and surrounded by dielectric oil for superior heat dissipation. Both models use a 1/3 HP shaded pole, 1550 RPM motor. Both units have class A motor insulation, are available in single phase 115 and 230 volt with overload protection, and use a double sleeve bearing design. These pumps have no starting switches and do not require a control panel for simplex installation.

SAFETY WARNINGS

WARNING: Risk of electric shock. Pumps are supplied with a grounding conductor and grounding-type attachment plug on the power cord. To reduce the risk of electric shock, be certain that it is connected only to a properly grounded, grounding-type receptacle. DO NOT cut off ground pin or use an adapter fitting. DO NOT use an extension cord with this pump. Entire plug may be cut off if a control panel is used.

All pumps have a GROUND WIRE that is connected to the motor. This wire goes to the receptacle or control panel which must be connected to a good outside GROUND.

When wiring this pump follow all local electrical and safety codes and ordinances as well as the most recent National Electric Code (NEC-ANSI/NFPA 70).

UL AND CSA APPROVAL

All pumps have UL and CSA approval. Myers is a SSPMA certified pump member.

INSTALLATION

WARNING: Basin or tank must be vented in accordance with local plumbing codes. These pumps are not designed for and CANNOT be installed in locations classified as hazardous in accordance with the National Electric Code ANSI/NFPA 70.

CAUTION: Never enter pump chamber after sewage or effluent has been in basin. Sewage water can give off methane, hydrogen sulfide and other gasses which are highly poisonous.

For this reason, Myers recommends installing effluent pumps with a quick removal system. The quick removal system may be a union or Cam-lok® coupling if the pipe or discharge hose is within reach from the surface, or a rail system type quick disconnect on deeper installations. See installation drawings for suggested installation.

The dosing tank or pumping chamber must be constructed of corrosion resistant materials and must be capable of withstanding all anticipated internal and external loads. It also must not allow infiltration or exfiltration. The tank must have provisions for anti-buoyancy. Access holes or covers must be adequate size and be accessible from the surface to allow for installation and maintenance of the system. Access covers must be lockable or heavy enough to prevent easy access by unauthorized personnel. The pumping chamber holding capacity should be selected to allow for emergency conditions.

The discharge pipe must be the same size as the pump discharge, 1-1/2" or larger. In order to insure sufficient fluid velocity to prevent any residual solids from collecting in the discharge pipe, it is recommended that a minimum flow of 2' per second be maintained. (12 GPM through 1-1/2" pipe, 21 GPM through 2" pipe and 46 GPM through 3" pipe). It is recommended that PVC or equal pipe is used for corrosion resistance. A full flow (ball or gate) shut off valve must be installed to prevent back flow of effluent if the pump must be removed for service. A check valve must be installed on pressure sewer systems and on other systems where conditions allow to prevent backflow and to reduce wear on the pump system.

A high water alarm must be installed on a separate circuit from the pump circuit. The alarm should have the ability to be tested for proper operation.

BEFORE DISMANTLING PUMP FOR REPLACEMENT OF PARTS

Clean pump thoroughly. Knock off all scale and deposits. Submerge complete unit in Clorox solution for one hour before taking apart.

POINTS TO CHECK IF PUMP DOES NOT RUN OR DOES NOT RUN PROPERLY

(1) Pump does not run or start when water is up in tank.

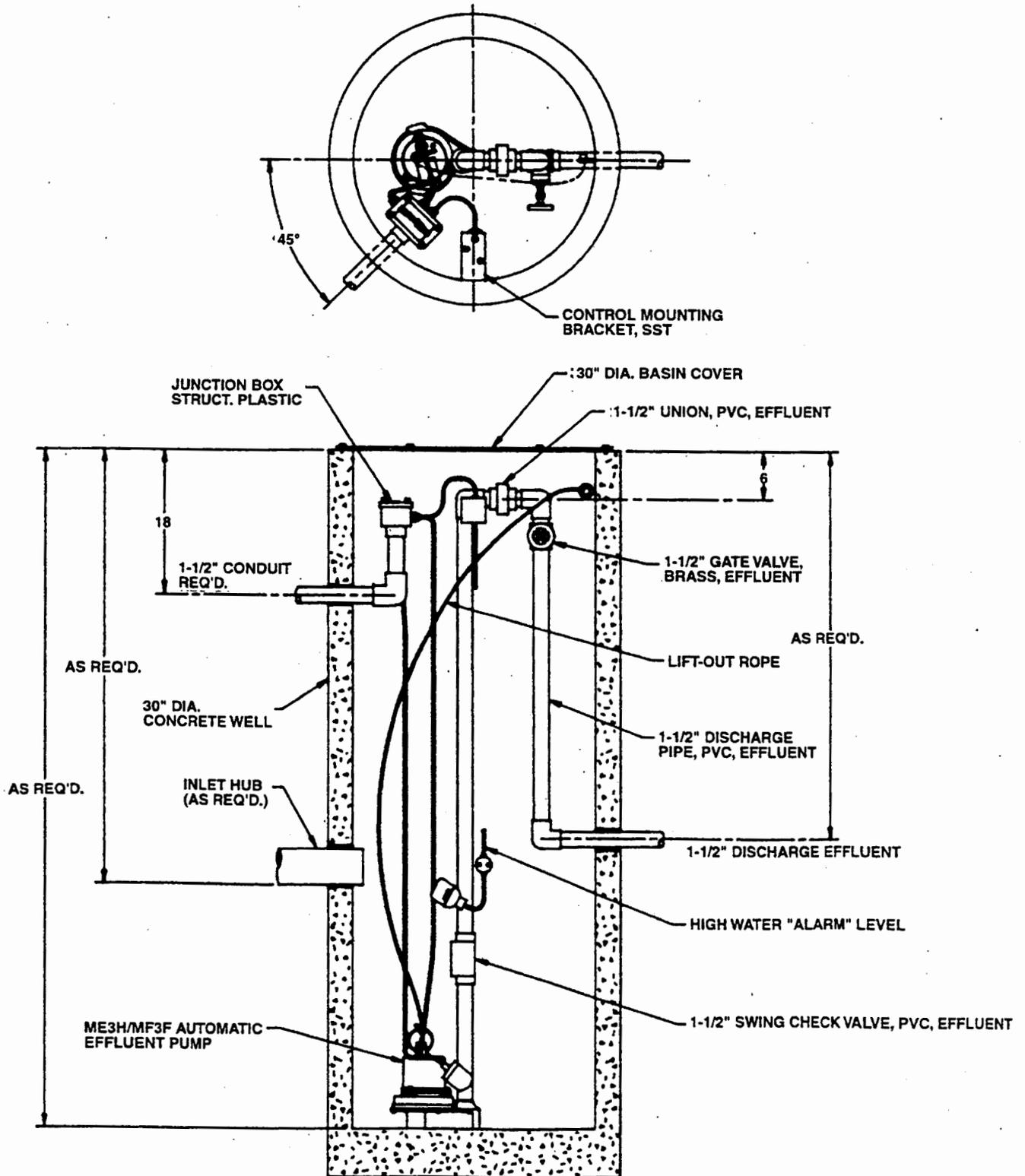
- (a) Check for blown fuse or tripped circuit breaker.
- (b) Check for defective level switch.
- (c) Where control panel is used be sure H-O-A switch is in the AUTO position. If it does not run, turn switch to the HAND position and if the pump runs then the trouble is in the automatic electrical system. Have ELECTRICIAN make electrical checks.
- (d) Check for burned out motor. Occasionally lightning can damage a motor even with lightning protection.
- (e) Where plug-in cords are used be sure contact blades are clean and making good contact. **DO NOT USE PLUG-IN CORDS INSIDE A SUMP OR WET WELL.**
- (f) Level control ball or weight may be stuck on side of basin. Be sure it floats freely.

(2) Pump runs but does not deliver flow.

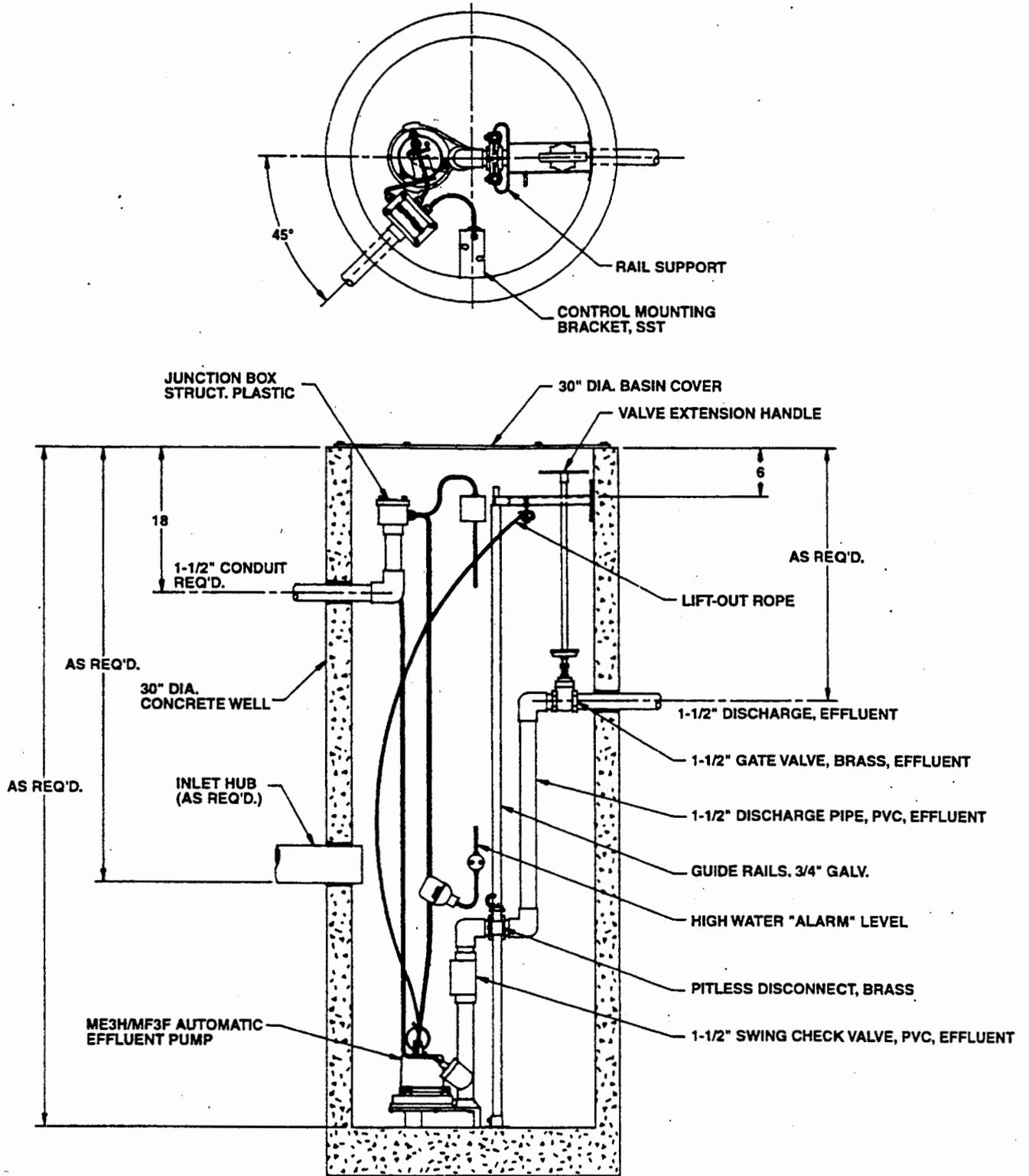
- (a) Check for air lock. Start and stop pump several times, if this does not help it may be necessary to loosen a union in the discharge line to relieve air lock.
- (b) Check valve may be installed backwards. Check flow arrow on valve body. Check shut-off valve. It may be closed.
- (c) Check vertical elevation. It may be higher than pump can develop. (See pump curve).
- (d) Pump inlet may be plugged. Remove pump to check.

CAUTION: ALWAYS UNPLUG POWER CORDS OR TURN OFF ALL MAIN AND BRANCH CIRCUIT BREAKERS BEFORE DOING ANY WORK ON THE PUMP. If control panel is remote from pump, disconnect lead wires to motor so that no one can turn the circuit breaker back on.

30" DIAMETER SIMPLEX ME3H/ME3F EFFLUENT UNION SYSTEM



30" DIAMETER SIMPLEX ME3H/ME3F EFFLUENT



CAUTION: FOR ANY WORK ON PUMP OR SWITCH, ALWAYS UNPLUG POWER CORD. DO NOT JUST TURN OFF CIRCUIT BREAKER OR UNSCREW FUSE.

TO REPLACE AUTOMATIC FLOAT

- (1) Unplug the pump power cord from the back of the piggy-back float plug.
- (2) Unplug the piggy-back float plug from the power receptacle.
- (3) Remove the pump from the sump if access to the tether point is inaccessible.
- (4) Disconnect the switch from its tether point and remove from the discharge piping.
- (5) Re-tether the new cord to the pump or discharge piping.
- (6) Cable tie or tape the power and switch cords to the discharge piping.
- (7) Plug the switch into the power receptacle.
- (8) Plug the power cord into the switch plug.
- (9) Fill basin and test switch operation.

ALL PUMP REPAIRS SHOULD BE DONE AT AN AUTHORIZED MYERS SERVICE CENTER.

ME3H SHAFT SEAL REPLACEMENT

- (1) Remove the oil fill plug located on the top of the motor housing and drain the oil in the housing. Properly dispose of the used oil. Do not reuse old oil since it may contain water from seal failure.
- (2) Lay the pump on its side. Remove the nine screws holding the suction plate onto the bottom of the volute case. Carefully remove the suction plate and gasket.
- (3) Insert a slotted screwdriver through the center of the impeller hub into the slot in the shaft. With a rubber mallet, carefully tap the impeller in a counter rotating direction while holding the shaft with the screwdriver.
- (4) Remove the rotating portion (ceramic) of the seal with fingers. Pry on the stationary portion (carbon) with a pair of slotted screwdrivers to remove from volute casing. Discard the old seal assembly parts. **NEVER USE OLD SEAL PARTS, REBUILD PUMP WITH ONLY NEW SEAL ASSEMBLY.**
- (5) Thoroughly clean the shaft and volute casing with a clean cloth. If the drained oil showed signs of water, then the motor should be air dried for several days to remove any remaining moisture.
- (6) Carefully remove the new seal assembly from the package. Add a film of new oil to the rubber O.D. on the stationary portion (carbon), and insert into the seal cavity on the volute casing. Using a pushing tool (a piece of PVC pipe works well), push on the rubber portion of the stationary seal until it is evenly seated into the seal cavity. With a clean cloth, carefully wipe the seal face.
- (7) Remove the rotating portion (ceramic) from the package and carefully wipe with a clean cloth. Add a film of new oil onto the motor shaft. Slide the rotating portion over the shaft with the rubber surface of the seal facing away from the stationary seal face. Center the seal on the shaft.
- (8) Place the impeller onto the shaft. Screw the impeller clockwise onto the shaft using a screwdriver to hold the shaft from turning and tighten impeller. Check to see that the impeller spins freely after tightening.

- (9) Replace the gasket and suction plate onto the bottom of the volute casing. Insert and tighten the nine retaining screws.
- (10) Replace oil in the motor housing using only Myers submersible transformer oil. The level should be 3/4" below the top of the motor housing. Check with dip stick to assure that the pump is properly filled.
- (11) Plug pump into grounded receptacle to test operation. Pump must run quiet and free of vibration.

ME3F SHAFT SEAL REPLACEMENT

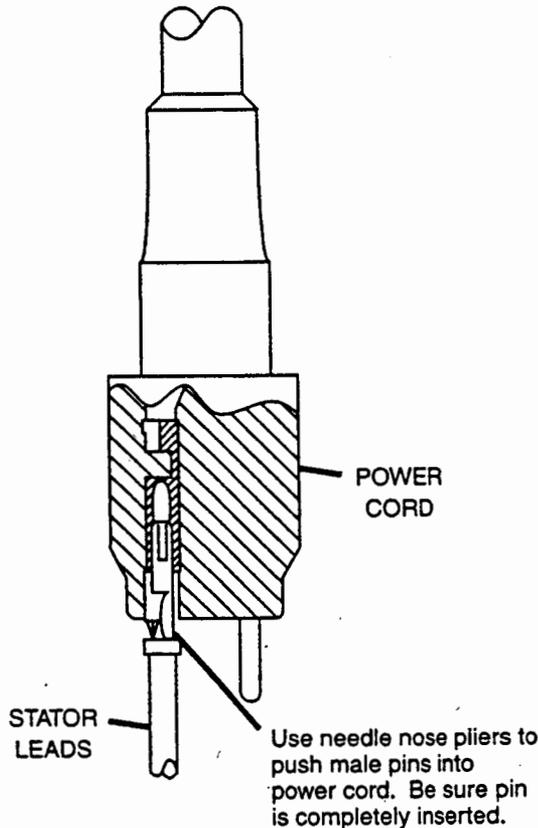
- (1) Remove the oil fill plug located on the top of the motor housing and drain the oil in the housing. Properly dispose of the used oil. Do not reuse old oil since it may contain water from seal failure.
- (2) Remove the four cap screws holding the volute case onto the seal plate. Lift the motor assembly up and out of the volute case.
- (3) Lay the motor assembly on its side. Insert a slotted screwdriver into the slot in the center of the shaft. With a rubber mallet, carefully tap the impeller in a counter rotating direction while holding the shaft with the screwdriver.
- (4) Remove the rotating portion (ceramic) of the seal with fingers. Pry on the stationary portion (carbon) with a pair of slotted screwdrivers to remove from volute casing. Discard the old seal assembly parts. **NEVER USE OLD SEAL PARTS, REBUILD PUMP WITH ONLY NEW SEAL ASSEMBLY.**
- (5) Thoroughly clean the shaft and volute casing with a clean cloth. If the drained oil showed signs of water, then the motor should be air dried for several days to remove any remaining moisture.
- (6) Carefully remove the new seal assembly from the package. Add a film of new oil to the rubber O.D. on the stationary portion (carbon), and insert into the seal cavity on the volute casing. Using a pushing tool (a piece of PVC pipe works well), push on the rubber portion of the stationary seal until it is evenly seated into the seal cavity. With a clean cloth, carefully wipe the seal face.
- (7) Remove the rotating portion (ceramic) from the package and carefully wipe with a clean cloth. Add a film of new oil onto the motor shaft. Slide the rotating portion over the shaft with the rubber surface of the seal facing away from the stationary seal face. Center the seal on the shaft.
- (8) Place the impeller onto the shaft. Screw the impeller clockwise onto the shaft using a screwdriver to hold the shaft from turning and tighten impeller. Check to see that the impeller spins freely after tightening.
- (9) Check the HUCA cup seal in the volute case inlet. If worn, replace.
- (10) Place the pump motor assembly upright and set it into the volute case. Make sure that the HUCA cup is aligned properly with the impeller wearing ring. Replace the four cap screws and tighten. Check that the impeller turns freely.
- (11) Replace oil in the motor housing using only Myers submersible transformer oil. The level should be 3/4" below the top of the motor housing. Check with dip stick to assure that the pump is properly filled.
- (12) Plug pump into grounded receptacle to test operation. Pump must run quiet and free of vibration.

POWER CORD REPLACEMENT

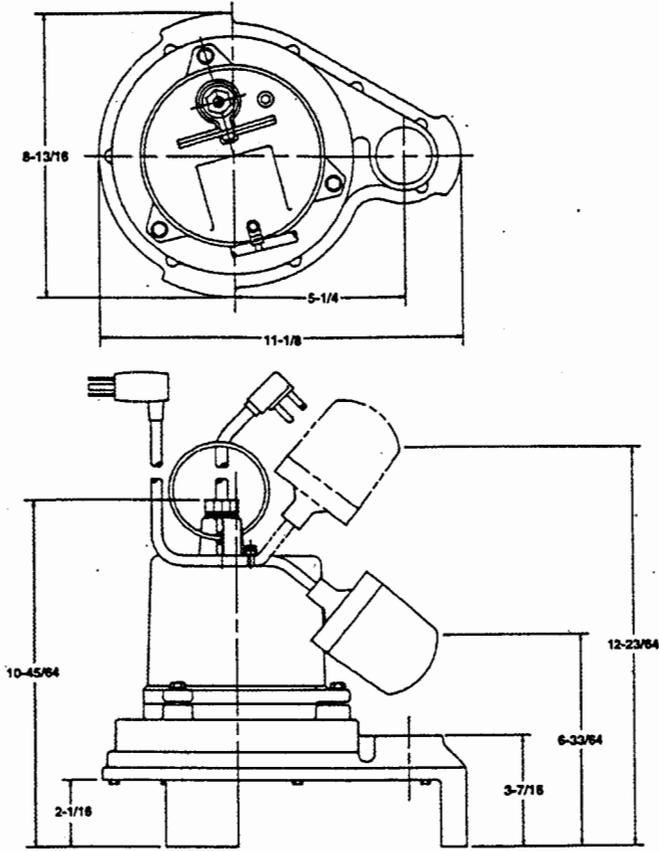
- (1) Loosen the plastic compression nut that retains the power cord. Slide nut out of the motor housing.
- (2) Pull the power cord from the motor housing by hand. The cord may need to be wiggled back and forth several times to loosen from the housing. Pull the power cord out until the connecting wires are fully exposed. Disconnect the motor power and ground leads with a pair of pliers.
- (3) Reconnect the motor power leads and ground to the new power cord. The ground terminal on the power cord has a male connector, and the power terminals on the new power cord are female.
- (4) Carefully push the connected wires into the motor housing until the molded body of the power cord seats. Make sure that the wires stay away from the rotor and shaft. Slide the nut into place and hand tighten. Tighten the nut with 13/16" wrench until snug, but do not over tighten.
- (5) Plug pump into grounded receptacle to test operation. Pump must run quiet, free of vibration, without tripping out breaker.

MOTOR REPLACEMENT

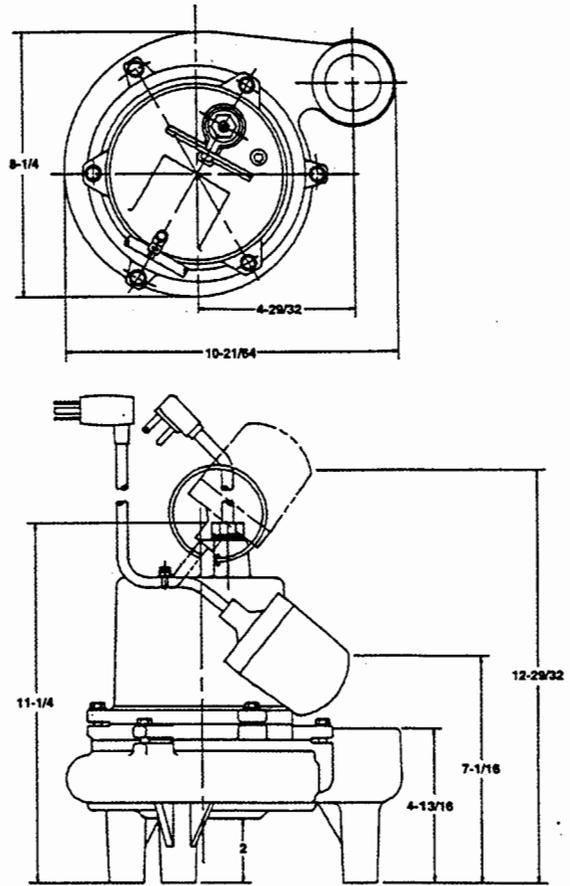
- (1) Disconnect the power cord and drain the oil as noted in the previous sections. If the oil shows signs of water or other contamination, it may be necessary to replace the seal assembly as noted in a previous section.
- (2) Loosen and remove the three cap screws retaining the motor housing. Lift the motor housing off of the pump assembly.
- (3) Remove the O-ring from the remaining pump assembly. Clean surface area and place new O-ring into position. Be careful not to cut O-ring when installing.
- (4) Position new motor housing (with new stator), onto the pump assembly. Align the screw bosses, and insert the three cap screws. Evenly tighten the cap screws.
- (5) Reinstall the power cord as noted in the previous section.
- (6) Replace oil in the motor housing using only Myers submersible transformer oil. The level should be 3/4" below the top of the motor housing. Check with dip stick to assure that the pump is properly filled.
- (7) Plug pump into grounded receptacle to test operation. Pump must run quiet, free of vibration, without tripping out breaker.



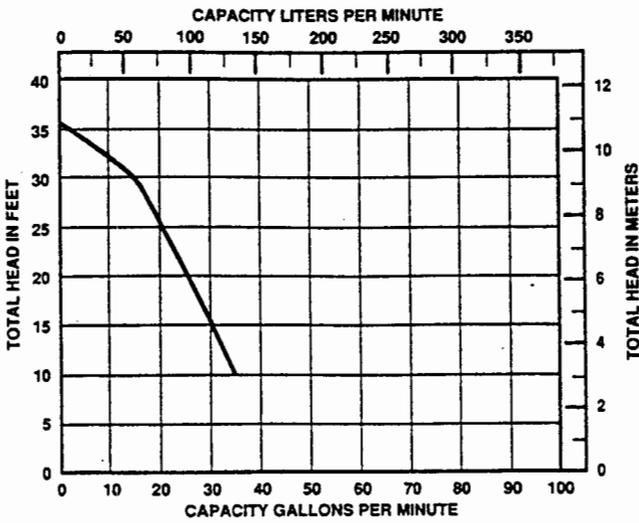
ME3H DIMENSIONAL DRAWING



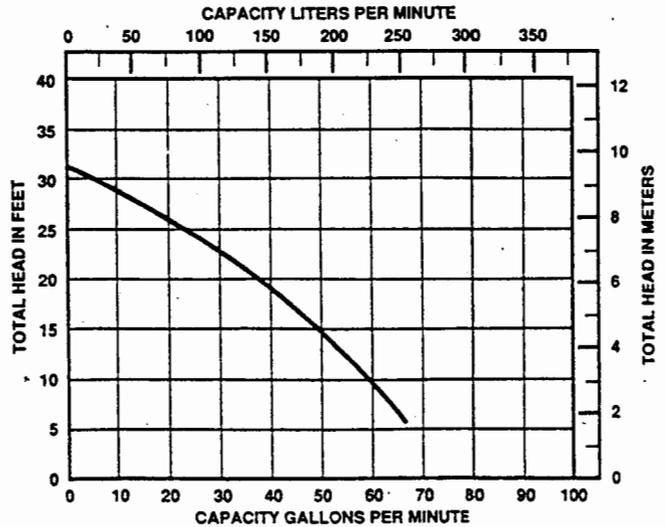
ME3F DIMENSIONAL DRAWING



ME3H PERFORMANCE



ME3F PERFORMANCE



MYERS LIMITED WARRANTY

F.E. MYERS warrants that its products are free from defects in material and workmanship for a period of 12 months from the date of installation or 18 months from the date of manufacture, whichever occurs first.

During the warranty period, and subject to the conditions hereinafter set forth, F.E. MYERS will repair or replace to the original user or consumer parts which prove defective due to defective materials or workmanship of MYERS. This remedy is exclusive and is the only remedy available to any person with respect to such MYERS product. Contact your nearest authorized MYERS distributor or MYERS for warranty service. At all times MYERS shall have and possess the sole right and option to determine whether to repair or replace defective equipment, parts or components.

Start-up reports and electrical system schematics may be required to support warranty claims. This warranty is effective only if MYERS supplied or authorized control panels are used.

LABOR, ETC. COSTS: MYERS shall IN NO EVENT be responsible or liable for the cost of field labor or other charges incurred by any customer in removing and/or reaffixing any MYERS product, part or component thereof.

THIS WARRANTY WILL NOT APPLY: (a) to defects or malfunctions resulting from failure to properly install, operate or maintain the unit in accordance with printed instructions provided; (b) to failures resulting from abuse, accident, or negligence; (c) to normal maintenance services and the parts used in connection with such service; (d) to units which are not installed in accordance with applicable codes, ordinances and good trade practices; or (e) if the unit is moved from its original installation locations, and (f) unit is used for purposes other than for what it was designed and manufactured.

RETURN OR REPLACED COMPONENTS: any item to be replaced under this Warranty must be returned to MYERS at Ashland, Ohio, or such place as MYERS may designate, freight prepaid.

PRODUCT IMPROVEMENTS: MYERS reserves the right to change or improve its products or any portions thereof without being obligated to provide such a change or improvement for units sold and/or shipped prior to such change or improvement.

WARRANTY EXCLUSIONS: as to any specific MYERS product, after the expiration of the time period of the warranty applicable thereto as set forth above. **THERE WILL BE NO WARRANTIES, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.**

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. No warranties or representations at any time made by any representative of MYERS shall vary or expand the provisions hereof.

LIABILITY LIMITATION: IN NO EVENT SHALL MYERS BE LIABLE OR RESPONSIBLE FOR CONSEQUENTIAL, INCIDENTAL OR SPECIAL DAMAGES RESULTING FROM OR RELATED IN ANY MANNER TO ANY MYERS PRODUCT OR PARTS THEREOF.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This Warranty gives you specific legal rights and you may also have other rights which vary from state to state.

Direct all notices, etc. to: Warranty Service Department, F.E. Myers, 1101 Myers Parkway, Ashland, Ohio 44805.

Myers®

F.E. Myers, 1101 Myers Parkway, Ashland, Ohio 44805-1969
419/289-1144, FAX: 419/289-6658, TLX: 948-7443

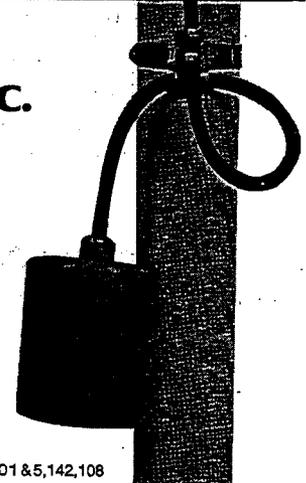
SJE PUMPMASTER® pump switch

Mechanically-activated, wide-angle switch designed to control pumps up to 1/2 HP at 120 VAC and 1 HP at 230 VAC.

This mechanically-activated, wide-angle pump switch provides automatic control of pumps in:

- potable water
- water
- sewage applications.

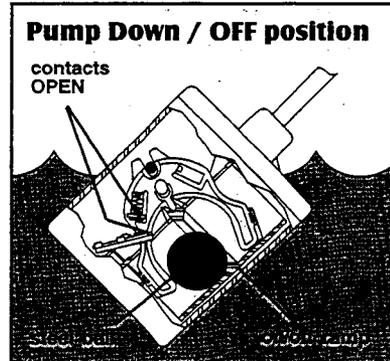
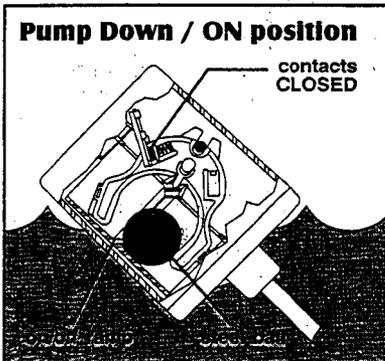
The SJE PumpMaster® pump switch is not sensitive to rotation or turbulence allowing it to be used in both calm and turbulent applications.



U.S. Patent Nos. 5,087,801 & 5,142,108

FEATURES

- Passed NSF Standard 61 protocol by an approved Water Quality Association laboratory.
- Heavy-duty contacts.
- Controls pumps up to 1/2 HP at 120 VAC and 1 HP at 230 VAC.
- Adjustable pumping range of 7 to 36 inches (18 to 91 cm).
- Includes standard mounting clamp and boxed packaging.
- UL Listed for use in water and sewage.
- CSA Certified.
- Three-year limited warranty.



OPTIONS

This switch is available:

- for pump down or pump up applications.
- with a 120 VAC or 230 VAC piggyback plug.
- without a plug for direct wiring in 120 VAC or 230 VAC applications.
- in standard cable lengths of 10, 15, 20, or 30 feet and 3, 5, 6, or 10 meters (longer lengths available).

SPECIFICATIONS

CABLE: flexible 16 gauge, 2 conductor (UL/CSA) SuOW water-resistant (OPE)

FLOAT: 3.05 inch diameter x 3.56 inch long, 17.75 x 9.04 cm high Impact corrosion resistant, PVC housing for use in sewage and water up to 140°F (60°C)

ELECTRICAL

120 VAC 50/60Hz Single Phase:
 Maximum Pump Running Current: 16 amps
 Maximum Pump Starting Current: 35 amps
 Recommended Pump HP: 1/2 HP or less

230 VAC 50/60Hz Single Phase:
 Maximum Pump Running Current: 16 amps
 Maximum Pump Starting Current: 35 amps
 Recommended Pump HP: 1 HP or less

Note: This switch must be used with pumps that provide integral thermal overload protection.

SJE PUMPMASTER
 SJE PUMPMASTER
 P.O. Box 708, Detroit Lakes, MN 56502
 1-888-DIAL-SJE • 1-218-847-1317
 1-218-847-4617 Fax
 Email: sjc@sjerhombus.com
www.sjerhombus.com

SJE PumpMaster® pump switch installation instructions

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Disconnect power before installing or servicing this product. A qualified service person must install and service this product according to applicable electrical and plumbing codes.

⚠ WARNING

EXPLOSION OR FIRE HAZARD

Do not use this product with flammable liquids. Do not install in hazardous locations as defined by National Electrical Code (ANSI/NFPA 70).

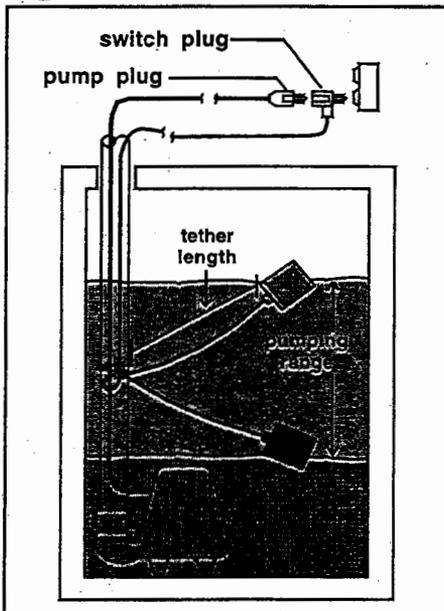
Failure to follow these precautions could result in serious injury or death. Replace product immediately if switch cable becomes damaged or severed. Keep these instructions with warranty after installation. This product must be installed in accordance with National Electrical Code (ANSI/NFPA 70) so as to prevent moisture from entering or accumulating within boxes, conduit bodies, fittings, or a housing of cable.

MOUNTING THE SWITCH

1. Determine the required cord tether length as shown in Figures A and B.
2. Place the cord into the clamp as shown in Figure C.
3. Secure the clamp to the discharge pipe as shown in Figure C. **Note:** Do not install cord under hose clamp.
4. Tighten the hose clamp using screwdriver. Over tightening may result in damage to the plastic clamp. Make sure the float cable is not allowed to touch the excess hose clamp band during operation.
5. Check installation. Allow system to cycle to insure proper operation.

Note: All hose clamp components are made of 18-8 stainless steel material. See your SJE-Rhombus supplier for replacements.

Figure A



PIGGY-BACK PLUG INSTALL

- Electrical outlet must not be located in pump chamber.
- Electrical outlet voltage, piggyback plug voltage, and pump voltage must match.

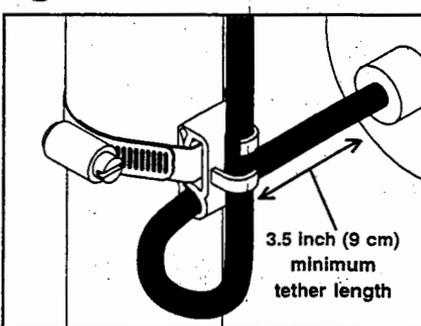
1. Follow steps 1 through 4 of "Mounting The Switch."
2. Insert switch's piggyback plug into outlet.
3. Plug pump into piggyback plug as shown in Figure A.
4. Check installation. Allow system to cycle to insure proper operation.

Figure B

Determining Pumping Range In Inches (1 Inch = 2.5 cm)							
tether length	5.5	6	10	14	18	22	24
pumping range	7	10	16	22	28	33	30

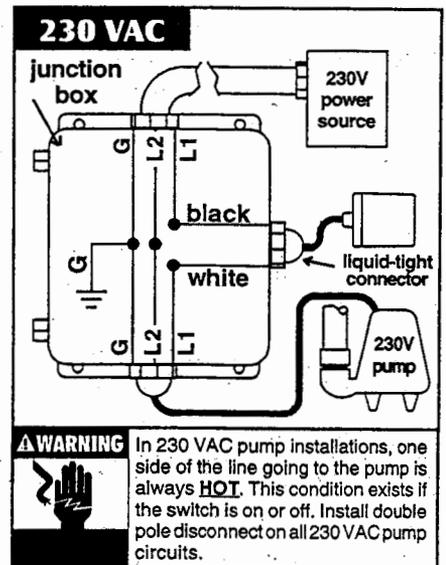
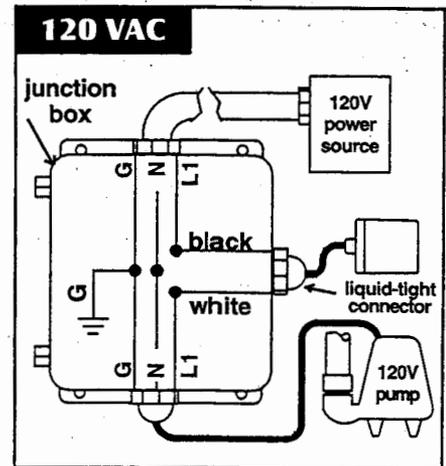
Use only as a guide. Pumping ranges are based on testing in non-turbulent conditions. Range may vary due to water temperature and cord shape. **Note:** As the tether length increases, so does the variance of the pumping range.

Figure C



DIRECT WIRE INSTALL

1. Follow steps 1 through 4 of "Mounting The Switch."
2. Wire switch as shown below.
3. Check installation. Allow system to cycle to insure proper operation.



SJE Rhombus
CONTROLS
SJ ELECTRO SYSTEMS, INC.

22650 County Highway 6 ■ P.O. Box 1708 ■ Detroit Lakes, Minnesota 56502 USA

1-888-DIAL-SJE (1-888-342-5753) ■ Phone: 218-847-1317 ■ Fax: 218-847-4617

E-mail: sje@sjerhombus.com

ACCESSORIES

Cable Weight, Cable Connectors, Hub Assembly, Cord Seal and Float Bracket.

CABLE WEIGHT

Provides an accurate pivot point for suspended float switches.

- Gripper teeth on clip and weight channel securely lock float cable into place
- Cable Weight can be adjusted without the use of tools



U.S. Patent 5,306,885

HOUSING: 1 pound, 12 ounce (0.8 kgs.), 2.8 inch diameter x 3.3 inch long (7.1 cm diameter x 8.4 cm), impact resistant, non-corrosive, PVC housing for use in liquids up to 140°F (60°C).

CLIP: injection molded acetal plastic.

WIRE/CABLE ACCOMMODATED: SJOW, SJTW, 18/2, 18/3, 16/2, 16/3, 14/2 and 14/3.

HUB ASSEMBLY

Available in 1, 1.5 and 2 inch sizes.

- UL Approved and CSA Certified terminal adapter

TERMINAL ADAPTER (HUB): PVC.

GASKET: neoprene.

LOCK NUT: metal.



CORD SEAL

Provides strain relief and a liquid-tight seal.

- Seals 1-3 cables in 2" terminal adapters
- 2 PVC plugs included (for unused cable positions)
- Ground wire



SEAL: neoprene.

WASHERS: stainless steel.

NUT AND BOLT: stainless steel.

WIRE/CABLE ACCOMMODATED: SJOW, SJTW, 18/2, 18/3, 16/2, 16/3, 14/2 and 14/3.

FLOAT BRACKET

Provides convenient installation of float switches.

- Four Float Bracket supports 1-4 floats
- Six Float Bracket supports 1-6 floats
- Can be directly mounted to wall or used with wall mounting device
- Provides convenient location to stow excess float cord
- Supplied with UL recognized cord strain relief connectors



METAL COMPONENTS: all metal components are made of 300 series stainless steel.

STRAIN RELIEF CONNECTORS: which accommodate 18/2, 18/3, 16/2, 16/3 SJOW and SJTW cords.

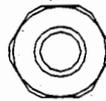
CABLE CONNECTORS



Provides strain relief and a liquid-tight seal.

- UL Approved and CSA Certified

Round Cable



Material:

polyimide flame-resisting, self-extinguishing plastic

O Ring:

neoprene plastic

Hole Requirement:

NPT threaded OR clearance holes (jam nut included)



sealing nut

O ring

jam nut

RCC-8	NPT Hub: .5 inch (1.27cm)
	Maximum Diameter: .480 inch (1.22 cm)
	Minimum Diameter: .270 inch (.68 cm)
	Wire/Cable (AWG) Accommodated: 18/2, 18/3, 18/4, 16/2, 16/3, 16/4, 14/2, 14/3

RCC-12	NPT Hub: .75 inch (1.90 cm)
	Maximum Diameter: .709 inch (1.80 cm)
	Minimum Diameter: .545 inch (1.38 cm)
	Wire/Cable (AWG) Accommodated: 14/2, 14/3, 14/4, 12/2, 12/3, 12/4, 10/2, 10/3

RCC-16	NPT Hub: 1.0 inch (2.54 cm)
	Maximum Diameter: .98 inch (2.49 cm)
	Minimum Diameter: .71 inch (1.80 cm)
	Wire/Cable (AWG) Accommodated: Round cable with outside diameter within range identified above.

Flat UF Cable



Material:

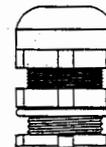
weather-stabilized thermo-plastic

O Ring:

neoprene plastic

Hole Requirement:

NPT threaded OR clearance holes (jam nut included)



sealing nut

O ring

jam nut

UFCC-8	NPT Hub: .50 inch (1.27 cm)
	Maximum: .26 x .56 slot
	Wire/Cable (AWG) Accommodated: 14/2, 12/2, 10/2

UFCC-12	NPT Hub: .75 inch (1.90 cm)
	Maximum: .26 x .56 slot
	Wire/Cable (AWG) Accommodated: 14/3, 12/3

Cord Seal, SJE Cable Weight and Float Bracket Installation Instructions

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Disconnect power before installing or servicing this product. A qualified service person must install and service this product according to applicable electrical and plumbing codes.

⚠ WARNING

EXPLOSION OR FIRE HAZARD

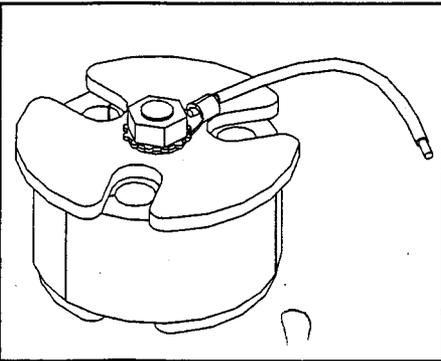
Do not use this product with flammable liquids. Do not install in hazardous locations as defined by National Electrical Code (ANSI/NFPA 70).

Failure to follow these precautions could result in serious injury or death. Replace product immediately if switch cable becomes damaged or severely kinked. Keep these instructions with warranty after installation. This product must be installed in accordance with National Electrical Code (ANSI/NFPA 70) so as to prevent moisture from entering or accumulating within boxes, conduit bodies, fittings, float housing, or cable.

CORD SEAL INSTALL

1. Pass the cables through the 2" terminal adaptor.
2. With the three position cord seal, route cables through the seal, leaving adequate cable to work with.
NOTE: If three cords are not used, plug open position(s) in the cord seal with the PVC plug(s) provided.
3. Insert the cord seal into the terminal adaptor and tighten hex nut until adequate strain relief is achieved.
4. Gather all ground wires, including ground conductor on the cord seal and secure to ground terminal.

Figure 1



SJE CABLE WEIGHT INSTALL

1. Lay cable in weight as shown in Figure 2.
2. Align clip with weight groove and slide clip towards cable as shown in Figure 2. Snap clip snugly up to cable and manually force clip to tightest possible position.
3. See Figure 3 for proper tether length.

Figure 2

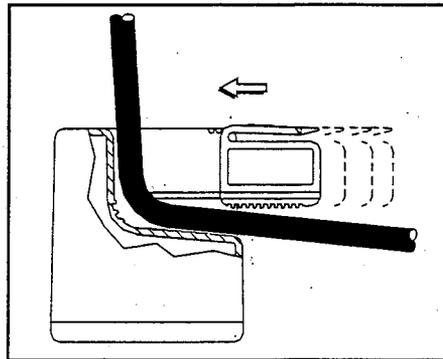
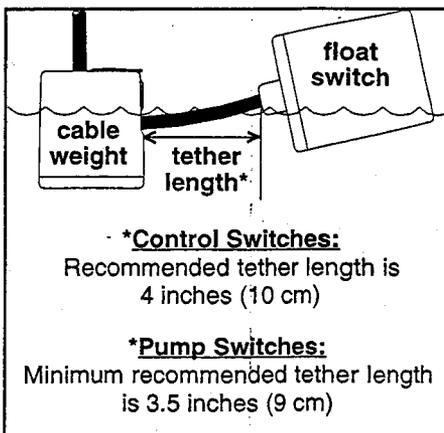


Figure 3



FLOAT BRACKET INSTALL

1. Drill holes in mounting surface 1-5/16 inches apart.
2. Install float bracket mounting device as shown in Figure 4.
NOTE: Use stainless steel fasteners appropriate for the mounting surface.
3. Determine float switch cord length to hang into tank to achieve proper activation level.
4. Install float switch cords to float bracket using strain relief connectors as shown in Figure 5.
5. Install float bracket into float bracket mounting device while stowing excess cable as shown in Figure 5.

Figure 4

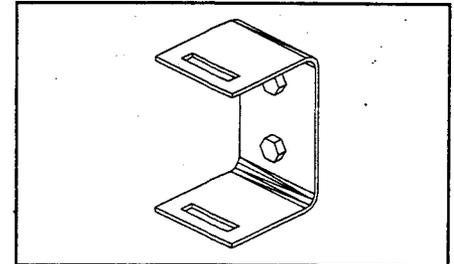
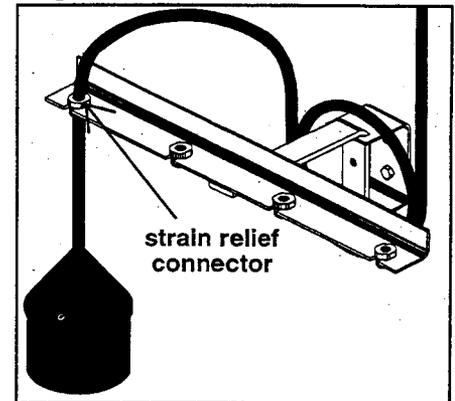


Figure 5



SJE Rhombus CONTROLS
SJ ELECTRO SYSTEMS, INC.

22650 County Highway 6 ■ P.O. Box 1708 ■ Detroit Lakes, Minnesota 56502 USA

1-888-DIAL-SJE (1-888-342-5753) ■ Phone: 218-847-1317 ■ Fax: 218-847-4617

E-mail: sje@sjerhombus.com

ATTACHMENT C
AIR STRIPPER LITERATURE



EPG Companies Inc.

**Operations & Maintenance
Manual**

FOR

**Sparton Technology, Inc.
Metric Corporation
Albuquerque, NM 87114**

EPG Job #01-5296

EPG Companies Inc.

Operations and Maintenance Index

Sparton Technology, Inc. – Metric Corporation

EPG Job # 01-5296

Bulletin	1055	List of Equipment
Drawing	05327	Air Stripper System
Pages	1-18	Operation and Maintenance Manual for Model STAT-180 Low Profile Air Stripper
Page	1-4	New York Blower Performance Data
Pages	1-6	Pressure Blowers Type HP Pressure Blowers
Page		Type RC Centrifugal Motor Pumps
Pages	1-14	Price Pump Company
Page		Absorption Silencers
Page		Integral Explosion-Proof Pressure Switches Specifications – Installation and Operating Instructions
Drawing	05346	Series 1400 Controller Schematics
Photo	A	Front Panel Layout
Photo	B	Back of Front Panel Layout
Photo	C	Back Panel Layout
Bulletin	0200c	Limited Warranty

List of Equipment

Sparton Technology, Inc. – Metric Corporation

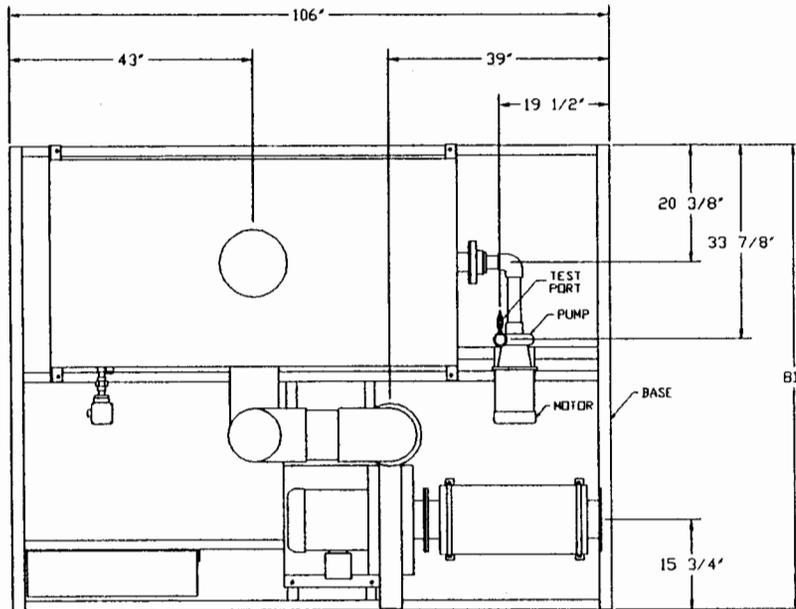
EPG Job # 01-5296

- 1 ea. Low-Profile Air Stripper, STAT 180, 5-Tray, Skid Mounted, with blower, 7 1/2HP, 460VAC 3Ø high efficiency TEFC motor, integral outlet damper, drain, inlet silencer, low pressure switch, pressure gauge, 3-point sensor/sight tube, discharge pup, 1HP 460VAC 3Ø TEFC motor, piping and EPG Series 1400 Controller, 460VAC 3Ø, NEMA 4, main disconnect, to control air stripper blower, HOA switch, green run light, off-delay timer, low air pressure switch with on-delay timer, red low air pressure alarm light, HOA switch for submersible pump, output enable/disable contacts (to submersible pump motor control or starter), input run contacts with on-delay timer (from submersible pump starter contacts), green pump run light, red pump shut down light, 3-point sensor, red high sump level alarm light, discharge pump, HOA switch, green run light, high sump level input contacts, red sump high level alarm light, high infiltration gallery level input contacts, red high infiltration gallery level alarm light, and manual alarms reset push button.
- 1 ea. Pulsatron Metering Pump, 14 GPD, 100 PSI.

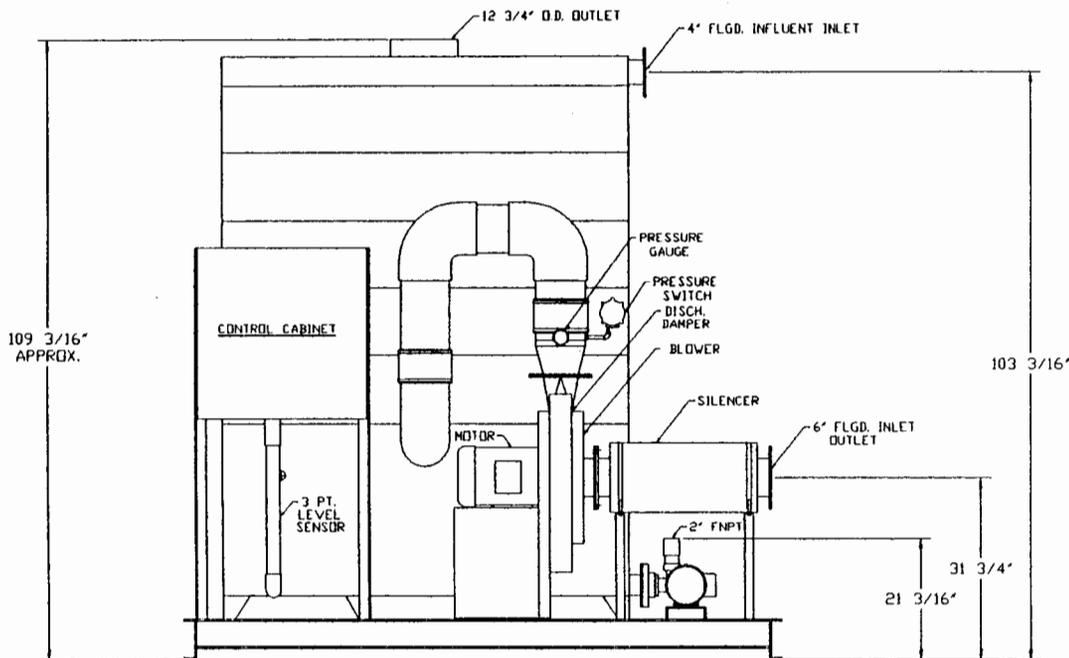
10

11

12



PLAN VIEW



SIDE ELEVATION

NOTE:
1. ESTIMATED WEIGHT-1700 LBS.

TOLERANCES		REVISIONS		JOB No.	
SIZE	FINISH	NO.	DATE	BY	DATE
1/8"	AS SHOWN	1			
1/16"	AS SHOWN	2			
1/32"	AS SHOWN	3			
0.001"	AS SHOWN	4			
0.002"	AS SHOWN	5			
0.005"	AS SHOWN	6			
0.010"	AS SHOWN	7			
0.020"	AS SHOWN	8			
0.050"	AS SHOWN	9			
0.100"	AS SHOWN	10			
0.200"	AS SHOWN	11			
0.500"	AS SHOWN	12			
1.000"	AS SHOWN	13			
2.000"	AS SHOWN	14			
5.000"	AS SHOWN	15			
10.000"	AS SHOWN	16			
20.000"	AS SHOWN	17			
50.000"	AS SHOWN	18			
100.000"	AS SHOWN	19			
1.000"	AS SHOWN	20			
2.000"	AS SHOWN	21			
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50000000000000000000000000.000"	AS SHOWN	97			
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200000000000000000000000000.000"	AS SHOWN	99			
500000000000000000000000000.000"	AS SHOWN	100			



Operation & Maintenance Manual

Model STAT-180

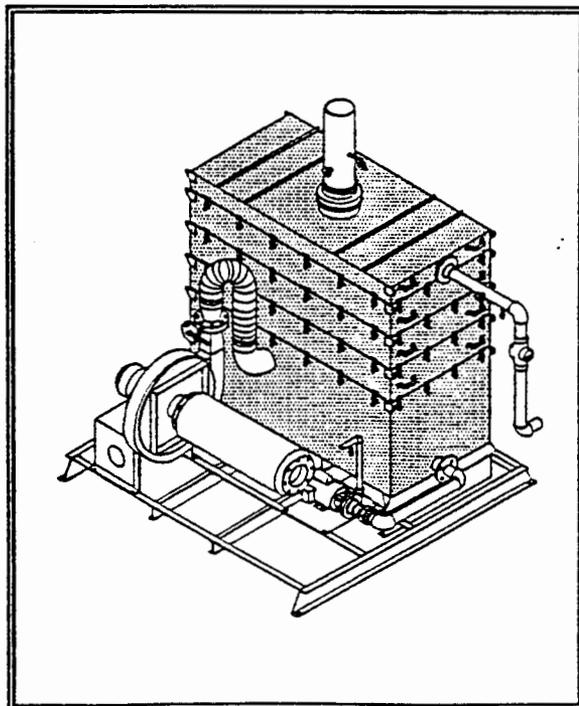
Low Profile Air Stripper

CONTENTS

1.0	Safety Precautions	1
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3.0	Process Description	2
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	Fact Sheets #1-3	Attached

- Always wear gloves, eye protection & protective clothing when working with the equipment.
- Be sure the STAT is properly vented and the duct hose between blower and STAT is fastened securely.
- The introduction of free-product into the STAT-180 is not recommended because it will adversely affect any nonmetallic materials and system performance.
- Take time to record your specific operating parameters on page 16.

Figure No.1
Typical STAT Unit



1.0 SAFETY PRECAUTIONS

Failure to observe these precautions could result in serious bodily injury and/or property damage.

- Be sure to read and understand this O & M manual before beginning operation. If you have any questions, please call EPG Companies Inc. at 800-443-7426.
- Be sure all electrical disconnects are "OFF" and locked out before servicing.

2.0 EQUIPMENT DESCRIPTION

The STAT-180 is a low profile stainless steel air stripper with a modular design capable of accommodating from 1 to 6 aeration trays. The design allows the trays to be easily removed, cleaned and replaced with minimal downtime. The following table summarizes the specifications for the typical STAT-180 low profile air stripper.

Table No.1
STAT-180 Specifications

#	Design Parameter	Specification
1	Tray Length	72 inches
2	Tray Width	36 inches
3	Height/Stage	10 inches
4	Overall Sump Height	24 inches
5	Demister Height	8½ inches
6	Maximum Height	92½ inches (6 trays)
7	Water Flow	10 - 200 gpm
8	Water Inlet	4 inch
9	Water Outlet	6 inch-Gravity Drain 3 inch-Pump Down
10	Air Flow	650 & 700 cfm
11	Air Inlet	8 inch
12	Air Outlet	12 inch

Be sure to refer to Section 12 at the end of this manual for specific operating parameters and dimensions.

The STAT-180 is equipped with the following standard system components:

- ✓ Pump-Down Collection Sump
 - Level Control Kit
 - Low, High, High-High Level Switches
- ✓ Gravity Drain Sump
 - Sight Glass
 - High Level Switch
- ✓ Aeration Trays
- ✓ Demister
- ✓ Blower

The STAT-180 can also be configured with the following optional components:

- ✓ Air Temperature Kit
- ✓ Air Flow Kit
- ✓ Water Flow Meter Kit
- ✓ Water Temperature Kit
- ✓ Sample Tap Kit
- ✓ Pump-Down Kit
- ✓ Blower Muffler Kit

3.0 PROCESS DESCRIPTION

EPG's STAT-180 air stripper is a sieve tray aeration unit and does not contain packing media.

In this technology the water and air are contacted in step-wise fashion through multiple trays. The water enters near the top and flows horizontally across each tray and through a downcomer to the tray below. A pressure blower provides air for the aerating process. The air enters the bottom of the unit and is forced through openings in the trays, bubbling through the water to form "a surface of foam" which provides extreme turbulence and excellent volatilization. The overall effect is a multiple counter-current contact of water and air, with each tray having a cross-flow of water opposing a vertical flow of air.

4.0 INSTALLATION

Be sure to carefully read all of the instructions before beginning the installation of the STAT-180 low profile air stripper.

4.1 Inspection

Upon receipt of the STAT unit, and before the unit is removed from the truck, be sure to inspect the system for damage to the shell, all the fittings, the inlet/outlet ports and the equipment. Structural damage to these items could compromise the integrity of the system.

DO NOT operate the unit if it has been damaged since this could result in damage to other equipment or personal injury. If the STAT-180 low profile air stripper sustains damage during transit, notify the carrier and call EPG immediately at 800-443-7426.

4.2 Loading & Unloading Unit

The STAT-180 should be unloaded and placed by an appropriately sized crane, forklift, or pallet jack operated by an experienced operator. A STAT unit with one tray weighs approximately 1,500 pounds and a STAT unit with 6 trays weighs approximately 2,500 lbs - excluding external piping (*refer to Section 12.0 at the end of this manual*).

The STAT-180 must be placed on a level concrete pad designed to handle the full operating load of the unit (*refer to Section 12.0 at the end of this manual*). The STAT base should be bolted to the concrete pad prior to initiating operation.

Be sure to follow proper safety procedures when loading & unloading the STAT unit.

4.3 Connections

Assemble and mount all of the external piping, valves, and instrumentation after the STAT is in place. Make sure that the piping is adequately supported so that excessive load or torque is not placed on the unit fittings.

4.31 Mechanical Connections

1. Locate and anchor the STAT unit in an area which allows access to all sides of the unit. Shim as needed to make sure STAT unit is level.
2. Attach exhaust stack (or off gas downcomer if required). Avoid unnecessary restrictions in off-gas ducting. Ducting should be sized for minimal friction loss according to the STAT design air flow rate. When in doubt, ducting should match the size of the STAT air discharge.

3. Connect the influent water piping to the influent flange or coupling. We recommend installing a sampling tap (sample tap kit, part No. 128320) in the influent piping and discharge piping. All interconnecting piping should be self-supporting.
4. Install the drain piping and pump-down kit if supplied.

For gravity drainage, connect the effluent water discharge piping to the discharge flange or coupling. Discharge piping should be the same diameter as the effluent flange or coupling on the STAT unit, or larger (see Table No. 2)

Table No. 2
Minimum Pipe Size for Gravity Drain

DRAIN DIAMETER (INCHES)	SLOPE PER FOOT		
	1/8 INCH	1/4 INCH	1/2 INCH
2	16 gpm	21 gpm	26 gpm
2 1/4	18 gpm	24 gpm	31 gpm
3	36 gpm	42 gpm	50 gpm
4	180 gpm	216 gpm	250 gpm
5	390 gpm	480 gpm	575 gpm
6	700 gpm	840 gpm	1,000 gpm

IMPORTANT: STAT gravity discharge lines require a vacuum relief system. This will prevent any type of vacuum on the float valve on the interior of the STAT. Do not attempt to pump out a STAT sump intended for gravity drain. A simple vacuum relief system is a tee inserted in the discharge piping with a vertical pipe open to the atmosphere. The tee should be installed as close as possible to the STAT discharge connection.

5. If no skid base is provided, locate and anchor the blower anywhere near the STAT air inlet tube, as long as the supplied flex ducting will reach from the blower discharge to the STAT inlet tube without kinking. Mount the blower off the floor, if possible. Secure ends of the flex ducting with hose clamps.

4.32 Electrical Connections

Make the following electrical connections, observing codes or restrictions (such as explosion-proof wiring) at your installation site:

1. Connect sump high level switch to control panel (if not already wired). The sump high level switch is located near the top of the sump sidewall. The switch is normally open until sump flooding occurs.
2. Connect blower low pressure switch to controls (if not already wired). The blower low pressure switch is located either on the blower outlet pipe or in the control panel. The blower low pressure switch has the following three options:

- ✓ Common
- ✓ Normally Open
- ✓ Normally Closed

See Operation for switch set-up.

3. For pump-down systems, a level control kit is provided in the sump sidewall (see options, page 14). This control must also be wired (if not wired already) in order to control the discharge pump.

5.0 START-UP

Upon completion of the system installation, checkout and start-up of the unit can be initiated.

Before starting the unit, check the following:

1. Verify that the blower low pressure switch is calibrated before start-up.

If blower low pressure switch does not

operate as described, see the manufacturer's data sheet supplied to adjust the set point of the switch.

2. Jog the blower motor and verify proper rotation direction.
3. If a transfer pump is supplied, jog the transfer pump motor and verify proper rotation direction.

After the unit is checked-out, start-up can be initiated to verify system operations prior to full scale operation. Whenever possible, it is advisable to use clean, fresh water for system start-up. This will eliminate possible exposure to potentially hazardous contaminants if mechanical adjustments are required.

1. Verify that all the valves are positioned properly.
2. Start the STAT blower.

It is important to start the blower first to ensure that the contaminated water is treated immediately upon entering the STAT unit.

Because the STAT-180 uses a centrifugal type blower, it is important to start the blower under LOAD to minimize the motor in-rush current and reduce the subsequent rise in the motor winding temperature. To accomplish this, Carbonair has incorporated a flow restricting valve into the design which is preset to provide system back pressure to the blower during start-up.

The flow restricting valve is actuated by excessive air flow on start up of the blower. The valve throttles the flow to maintain the airflow below the recommended maximum of the unit. The valve then fully opens when it senses a sufficient amount of water in the STAT unit to create the desired back pressure and design flow rate. This reduces the start-up load on the blower motor and helps to extend the operating life of the unit.

3. Start the flow of clean water to the unit.

Stripping starts immediately as the downcomer blocking valve forces air into the processing area of each tray, preventing air from passing upward through the downcomer.

After flow is initiated, water enters the top demisting section and flows into the top tray. The water flows over the weir and gravity-flows across each successive tray in a serpentine pattern.

If the STAT unit is not equipped with a transfer pump, the water accumulates in the sump section and then gravity-drains to the discharge point through the mechanical float valve. The mechanical float valve prevents pressurized air to escape through the effluent flange.

If the STAT unit is set up for pump-out operation, a mechanical float valve is not used.

4. Immediately start the transfer pump to remove the treated water from the STAT sump (if supplied).
5. Check the system for leaks.
6. Check system pressures and equipment temperatures. Verify that the operating parameters are within equipment design specifications.
7. Measure the water and air flows to the unit.
8. Check the pressure drop across the trays and compare with the pressure drop chart in Section 10. Verify that the pressure drop is within system design guidelines.
9. Adjust air flows as necessary to optimize blower and system performance.

Air Flow Adjustment and Measurement

You must have a means of measuring air flow to correctly operate your STAT unit. EPG can provide you with an air flow kit (Part No. KI 132008) composed of a flow element, a

magnehelic gauge and tubing that when installed, provide a means of measuring the air flow through the system.

This STAT unit is designed to operate at the air flow rate specified in section 12.0 of this manual. The blower air flow rate is not preset at the factory. Varying field conditions and the sensitivity of the blower damper require that the damper be set in the field. Improper adjustment of the valve can lead to excessive water carry over in the exhaust stream as well as a lowered stripping efficiency.

To adjust the STAT operating air flow rate, first turn on the STAT blower and begin to introduce water into the system at the design flow rate. (Note: You must have a means of measuring the water flow rate (flow meter) on the influent line, down stream of any pumps). Once the system is accepting water at the operating flow rate note the measured air flow rate using the air flow kit. If the measured air flow rate is above or below the design air flow rate listed in Section 12.0, you must adjust the damper on the outlet of the centrifugal blower. Moving the damper towards the shut-off position will *decrease* the air flow through the unit. Moving the damper towards the open position will *increase* the air flow through the STAT.

Note: You must periodically check and adjust the air flow during the operation of the system. Conditions may change (like increase or decrease in water flow rates, addition of down stream air treatment technologies or fouling of the air stripper) that will increase or decrease back pressure in the blower and cause the air flow rate to deviate from the design flow rate.

6.0 OPERATION

When STAT is operating within its parameters, a base line pressure drop should be established. This can be monitored during operation for maintenance purposes. Your STAT system should be supplied with the proper blower for overcoming the total pressure drop through the system. If adding gas phase carbon adsorption to the off-gas of a STAT unit previously operated with atmosphere discharge, contact

EPG to determine if the current blower/ducting configuration will be adequate.

Once the system has been tested with fresh water, proceed with treating contaminated water.

7.0 TROUBLE SHOOTING

There are a few situations that may arise while operating the STAT-180 which can adversely effect the performance of the unit and/or result in abnormally high maintenance costs. If these situations cannot be resolved using the following trouble shooting guide, contact EPG at 800-443-7426 for additional help.

1. Situation:

Excessive condensate or foam is noted leaving the exhaust of the STAT.

Probable Cause:

There are two main items that can cause water carry over into the exhaust:

- a. Air flow rate that is in excess of the rated air flow of unit.
- b. Surfactants in the water such as soaps, detergents and other organic compounds may cause a stable bubble froth to form and accumulate in the stripper.

Solution:

- a. Measure the air/water flows and compare with the design water and air flow rate of the system. If air flow is excessive, the flow should be adjusted to design conditions.
- b. It may be necessary to add a defoaming agent to influent water of the STAT. This agent will prevent stable bubble formation and allow the STAT to operate properly. Additional information is found in Fact Sheet #8. Contact EPG at 800-443-7426 for information on defoaming agents.

2. Situation:

The pressure drop across the trays is higher at initial start-up than it should be according to the pressure drop chart in Section 10.

Probable Cause:

If this occurs, the flow of air through the tray holes is restricted. The most common causes for this pressure drop build up are:

- a. Sediment/solids in the water stream have clogged the holes in the aeration trays.

At initial start-up, sometimes there can be an excessive amount of solids introduced into the system from the well(s). Eventually, these solids are removed from the well(s) and cleaner ground water is produced.

- b. The flow of air through the STAT unit is greater than the system design specifications.
- c. The flow of water through the STAT unit is greater than the system design specifications.

Solution:

- a. Measure the air/water flows and check the pressure drop curve to determine the design pressure drop and compare with the actual pressure drop.
- b. If the flows are in excess of design specifications, adjust flows accordingly.
- c. If process flow adjustments have no effect, clean out the STAT unit and develop the well(s) further before introducing flow to the STAT unit.

3. Situation:

Deteriorating treatment performance.

Probable Cause:

Treatment performance can deteriorate for a number of reasons including:

- a. Inadequate air/water ratio resulting in poor volatilization of organic components.

- b. Influent contaminant concentrations higher than initial design parameters.
- c. Influent contaminant components different than initial design parameters.

Solutions:

- a. Verify that the system flows are within the design specifications.
- b. Verify that the air/water ratio is within design specifications.
- c. Clean the STAT trays.
- d. Conduct influent analyses to verify initial design parameters - components and concentrations.
- e. Call EPG for assistance if operating parameters have changed - system modifications may be necessary.

4. Situation:

The STAT sump high level alarm frequently trips due to high sump level conditions.

Probable Cause:

If the sump high level alarm trips, it means that the water is not being removed as quickly as it is accumulating in the sump. This could occur for the following reasons:

- a. The transfer pump has failed.
- b. The influent flow rate exceeds the effluent drainage or pumping capacity.
- c. The drain piping is not sufficiently sloped to adequately drain the sump.
- d. The effluent piping is plugged.

Solutions:

- a. Verify that the transfer pump is operating properly.
- b. Measure the influent flow rate and check the effluent drainage design to determine if the influent flow rate exceeds the effluent drainage system capacity.

- c. If the flow rate is within design specifications, clean the effluent piping to clear any blockages.

8.0 MAINTENANCE

There are several maintenance tasks which must be performed periodically to ensure continued, trouble free operation. These tasks are discussed in subsequent sections.

8.1 Disassembly

Read all installation instructions before beginning disassembly. Contact EPG for replacement parts.

- 1. Prior to disassembly of unit, turn off influent pump and allow blower to operate for a few minutes.

This will allow contaminated water within aeration plates to be treated as the unit drains.

- 2. When effluent flow has completely stopped, turn off blower and turn main power disconnects to the off position and lock them out.

Be sure that STAT is completely drained by removing plug at the bottom of sump.

- 3. Disconnect and remove air discharge stack or ducting from unit.

This procedure may not be necessary if space permits removal of the demister section with stack attached.

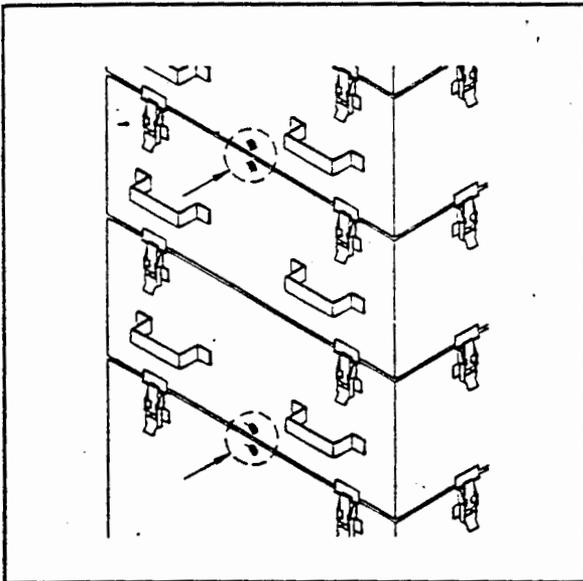
- 4. Disconnect the influent piping. Make sure loose influent piping is adequately supported.

- 5. Starting with the demister section, unfasten the lever-lock clips and lift off the demister section.

6. Before and during disassembly, it is important to note the placement of the aeration trays. Taking time to familiarize yourself with the STAT unit will make reassembly faster and easier.

Alignment of buttons on trays, sump and demister should be noted. Proper assembly of STAT requires alignment of buttons as shown in Figure No. 2.

Figure No. 2
Proper Alignment of STAT Buttons



7. The unit must always be disassembled piece by piece from the top down. It is recommended that removed pieces be set on wooden supports, such as a pallet, to avoid damage to the gasket sealing surfaces.
8. Each section must be raised a few inches prior to moving the piece horizontally.
9. Paying special attention to the placement of each aeration tray, remove each tray until only the sump section remains. Again, make note of proper alignment of buttons.
10. Once all aeration trays are removed, check the integrity of the gasket material.

11. When cleaning the demister section and aeration trays, be careful not to damage the gaskets. The mist eliminator pad may have to be cleaned with water pressure or cleaning solvent. If this is unsuccessful, the pad must be replaced.
12. The sump section should be cleaned in the same manner. Check the float valve gravity flow system in the sump section (if supplied) for plugging and material deterioration.

Check each tray downcomer valve for scale and bacteria build-up. Clean if necessary.

13. Prior to reassembly, make sure the areas that mate with the gasket material are clean and free of foreign matter.
14. While the unit is drained, remove the level float assembly from the sight glass (if pump out) and check for contaminant build-up and scaling. Completely clean the assembly to ensure proper operation.

The float assembly should be checked periodically even while the system is operating by viewing the floats through the sight glass. Do not remove the float assembly if the system is under pressure or the water level is above the sump.

8.2 Reassembly

1. To reassemble the unit, follow the disassembly instructions in reverse order. A light coating of silicone grease on the gasket surface before reassembly will act as an inert gasket sealant and lubricant. DO NOT use any other material for gasket sealant, as it may affect the operation of the STAT unit. If silicone grease or replacement gasket material is not available, contact EPG for supplies. Keep in mind that each piece **MUST** be put back in the same position and orientation as before disassembly. Improper assembly could cause malfunction or damage to the STAT unit. Refer to Figure No. 2 for button alignment.

2. Connect all inlet and outlet piping, discharge stacks, etc., prior to restarting unit.
3. Whenever possible, use clean, fresh water for system testing after reassembly. Start the blower first. Once blower is operating, start influent pump(s) or water flow.
4. After starting the influent pump(s), check for leaks throughout the system.

Refer to Operation of STAT, page 5.

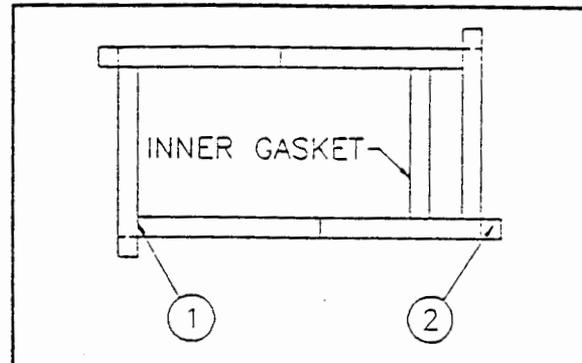
8.3 Gasket Replacement

1. Disassemble STAT, placing the trays gasket side up on clean surface. Observe corner pattern of gasket seal (Figure No. 2).
2. Using sharp putty knife, remove old gasket and as much adhesive as possible.
3. Tip trays upside down and remove silicone grease with putty knife, then mineral spirits. Repeat process on demister.
4. Remove remaining gasket fragments, adhesive residue, and leftover silicone grease with mineral spirits. Change cloths frequently. This should leave the surfaces clean. In some cases, however, patches of residue still remain on the flange. You must then "scuff" the flange surface as explained in step 5.
5. Prepare flange for new adhesive by "scuffing" the flange surface with a belt sander (40-50 grit belt). Run sander along lengths of flange. Use only light pressure as only a slightly roughened surface is all that is required.
6. Wash the flange area with denatured alcohol. This should remove all traces of mineral spirits or oil and leave the surface clean, dry and dust-free, as required.
7. Cut one set of gaskets (two ends, two sides and one inner piece) $\frac{1}{2}$ " longer than tray dimensions and square at the ends

(see Fig. No. 3). Position gasket strips on a flat surface, smooth sides down, porous sides up.

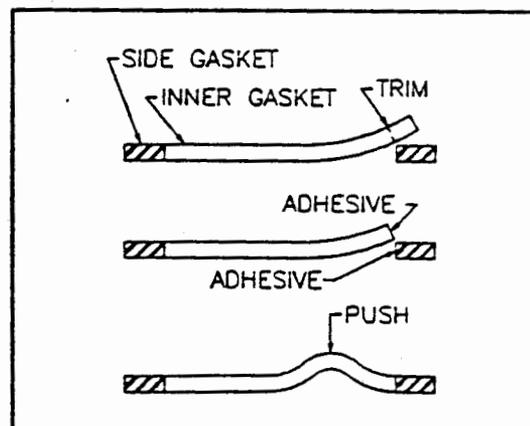
8. Apply a thin, uniform bead (1/4" wide) of silicone adhesive (RHINO HYDE 100% Silicone RTV) to tray's flange surface.

Figure No. 3
Gasket Strips



9. Carefully position gasket onto flange (adhesive sides together), as shown in Figure No. 3. Do not pull or stretch gaskets. Trim overlaps as shown in Figure No. 4.

Figure No. 4
Installing Inner Gasket

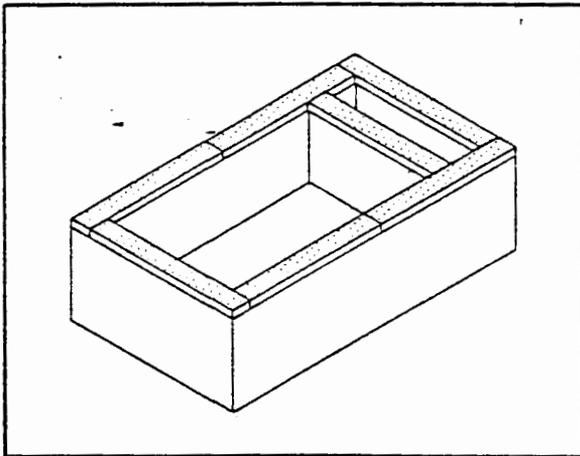


10. Position inner gasket strip with one end abutting side gasket; the other end overlapping opposite side gasket (Figure No. 4). Install abutting end by applying silicone adhesive on adjoining edges as shown in Figure No. 3. Press in place.

- Trim overlapping end of inner gasket as shown in Figure No. 4, and apply adhesive to adjoining edges. Abut joining surfaces and press in place. The gasket material is extremely stretchy and may ripple somewhat, but small ripples can easily be pressed flat.

Figure No. 5 shows how the gasket should look when it is properly installed.

Figure No. 5
Trimmed Gasket on Flange



- Allow 30 minutes to start adhesive set-up, then apply very thin layer of silicone (Dow Corning #111) to smooth side of gasket to strengthen seal between gasket and tray above.
- STAT may be reassembled, but allow 24 hours to cure adhesive before system is started. (See Reassembly.)

8.4 Acid Cleaning

The need for cleaning a STAT unit is determined by an increase in pneumatic pressure drop and a decrease in air flow rate. The decrease in air flow rate will result in deterioration of stripping efficiency. This can be caused by the holes in the tray becoming clogged with bacterial or/and inorganic materials. These materials, e.g. calcium, magnesium, iron, and manganese, can be easily removed from the STAT unit with an acid solution.

Refer to the attached fact sheet for additional information on inorganic fouling in air strippers.

8.4.1 Equipment Set-up

Acid cleaning of a STAT unit involves a closed-loop recirculation of an acid solution between the STAT unit and a holding tank. From past experience, a 3% hydrochloric solution (10 gallons of muriatic acid solution in 100 gallons of clean water) has been found to be effective in cleaning STAT units. The pH of the cleaning solution should be below 1.0. A 50% sodium hydroxide (NaOH) solution is recommended for neutralizing the spent acid solution after the cleaning is accomplished. Table No. 3 shows the recommended minimum volumes of holding tanks and the volumes of acid solutions required for cleaning each STAT model.

Table No. 3
Minimum Holding Tank & Acid Volumes

Volume	Gallons
Holding Tank	400
Cleaning Solution	200
Muriatic Acid	20
50% Caustic Soda	12

Also given, are the minimum required amounts of muriatic acid and sodium hydroxide solutions. Please notice that the cleaning solution is recommended to fill only 50% of a holding tank. Its purpose is to reduce the chance of splashing the acid solution out of the holding tank.

If the discharge of total suspended solids (TSS) is regulated, a bag filter will be needed for removing the re-precipitated inorganic substances from the cleaning solution after being neutralized. A pore size of less than 1 micron is recommended for the bag filter.

8.42 Safety Precautions for Acid Wash

Check the acid and alkali compatibility of all the materials, such as pump, holding tank, pipes, valves, and flow meter. All the materials constructed in STAT units are acid resistant.

☐ WARNING: Always wear appropriate protective clothing when performing an acid wash, including; goggles, rubber gloves, coveralls, boots, etc.

When working with acid, be sure to:

1. Follow all safety procedures when handling acid and alkali solutions.
2. Use a proper chemical handpump when transferring the acid and alkali solutions.
3. Install an easily accessible eye wash and shower at the site.
4. Prepare lime stone, soda ash, lime, or sodium bicarbonate for neutralizing the acid solution in case of spill.

8.43 Procedure

After the piping has been set up and the required materials have been prepared, the following procedure is recommended:

1. Fill 50% of holding tank with clean water.
2. Add a muriatic solution into the holding tank to make approximately a 3% acid solution (10 gallons of muriatic acid per 100 gallons of water).

☐ WARNING: NEVER ADD WATER TO ACID. Excessive heat is generated immediately upon contact creating a very dangerous situation. ONLY ADD ACID TO WATER!! Adding acid to water allows the heat of solution to be dissipated more effectively, safely and less violently.

3. Start to recirculate the cleaning solution. A low recirculation flow rate is recommended in order to prevent the STAT unit from a flooding condition. A maximum recirculation flow rate of 40 gpm is recommended for the STAT-180. Past experience has shown that recirculation for about 2 hours will be sufficient for the acid cleaning. After 2 hours of recirculation, the pneumatic pressure drop across the STAT unit should significantly decrease.
4. Neutralize the spent cleaning solution by gradually adding, while recirculating, a 50% caustic soda solution into the holding tank to a pH of around 7.0. Be slow in adding the caustic soda solution since even a small excessive amount can abruptly increase the pH. Then you must add the acid solution to neutralize the cleaning solution. After neutralization, you should see the dissolved solids precipitate in the holding tank if the scale has been removed from the STAT unit.
5. Discharge the neutralized cleaning solution from the holding tank. The bag filter will be needed if the TSS removal is required by the regulation.

☐ WARNING: Before discharging the neutralized spent acid, be sure to check discharge permits requirements and/or other local regulations.

6. Rinse the STAT unit by adding clean water into the holding tank with approximately the same volume as the cleaning solution. Recirculate the water for about 15 minutes. Discharge the rinsing water after neutralization. The STAT unit will be ready for a normal operation.
7. Do not forget to rinse all the equipment and clothing with clean water after using.

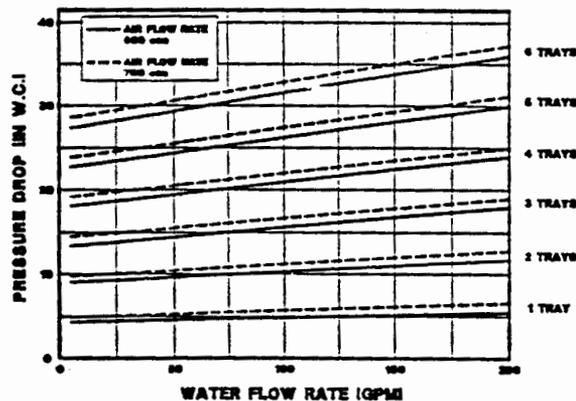
9.0 SPARE PARTS

When ordering spare parts, refer to the drawings at the end of this manual. Be sure to provide the unit model number and the complete description of the part.

10.0 PRESSURE DROP CHART

The following pressure drop chart shows the estimated pressure drop in inches of water at different liquid flow rates through the STAT-180 with 1,2,3,4,5, and 6 aeration tray configurations. These curves apply to STAT units with clean aeration trays.

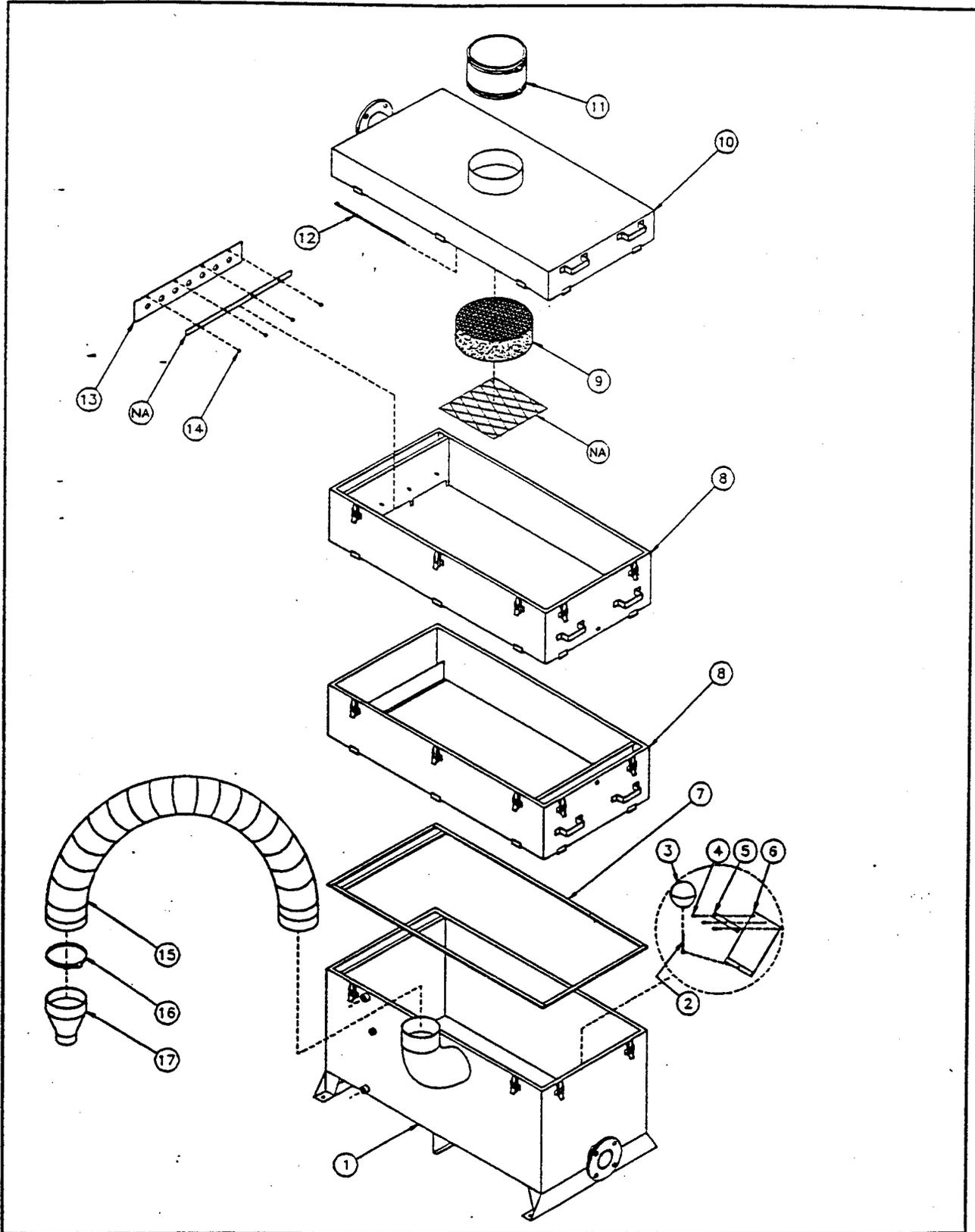
Figure No. 6
Pressure Drops through a Clean STAT-180
at Different Water Flow Rates



11.0 DRAWINGS

Assembly drawings have been included on pages 12 and 14 to simplify the part identification and ordering process. A parts list is included along with the corresponding order number.

Figure No. 7
STAT-180 Low Profile Air Stripper - Exploded Assembly Drawing No.1



12.0 SPECIFIC OPERATING PARAMETERS

Job _____

Recommended Air Stripper _____

Serial Number _____

Cross-Sectional Dimensions _____

Number of Plates _____

Design Liquid Flow Rate _____

Critical Compound _____

Average Concentration _____

Effluent Concentration Requirement _____

Air Flow Rate _____

Air-to-Water Ratio _____

Control Panel Yes ___ NO ___ Rating: _____

Water Discharge Gravity _____ Pump Out _____

Air Discharge Atmosphere _____ Post Treatment _____

Blower Motor HP _____ Phase _____
Volts _____ Rating _____

Level Switch(es) Standard _____ Explosion-Proof _____

Pressure Switch Standard _____ Explosion-Proof _____
Mounting: Blower _____ Panel _____

OPTIONAL FEATURES INCLUDED:

- | | | | |
|-------------------------------|--------------------------|----------------|--------------------------|
| Air Temperature Kit | <input type="checkbox"/> | Sample Tap Kit | <input type="checkbox"/> |
| Air Flow Kit | <input type="checkbox"/> | Pump-Down Kit | <input type="checkbox"/> |
| Water Flow Meter Kit | <input type="checkbox"/> | Blower Kit | <input type="checkbox"/> |
| Water Temperature Kit | <input type="checkbox"/> | | |

NOTES: _____



The
New York Blower
Company

Date: 5/18/2001
File: V11437
Sequence: 1
Revision:

Control: 100
Chg Order:
Processor: KJW

FAN INFORMATION

Quantity: 1
Product Line: Pressure Blower
Size: 2206A
Class/Wheel Type: Aluminum
Rotation: CCW
Arrangement: 4
Discharge: UB
Motor Position:
Motor By: NYB
Mounting By: NYB
Bearing Mfg. & Model:

Total fan wt. With accessories: 428 lbs

DRIVE INFORMATION

TY	DESCRIPTION	PART NUMBER
	Motor Sheave	
	Motor Bushing	
	Fan Sheave	
	Fan Bushing	
	Belt	
	Belt Centers:	in

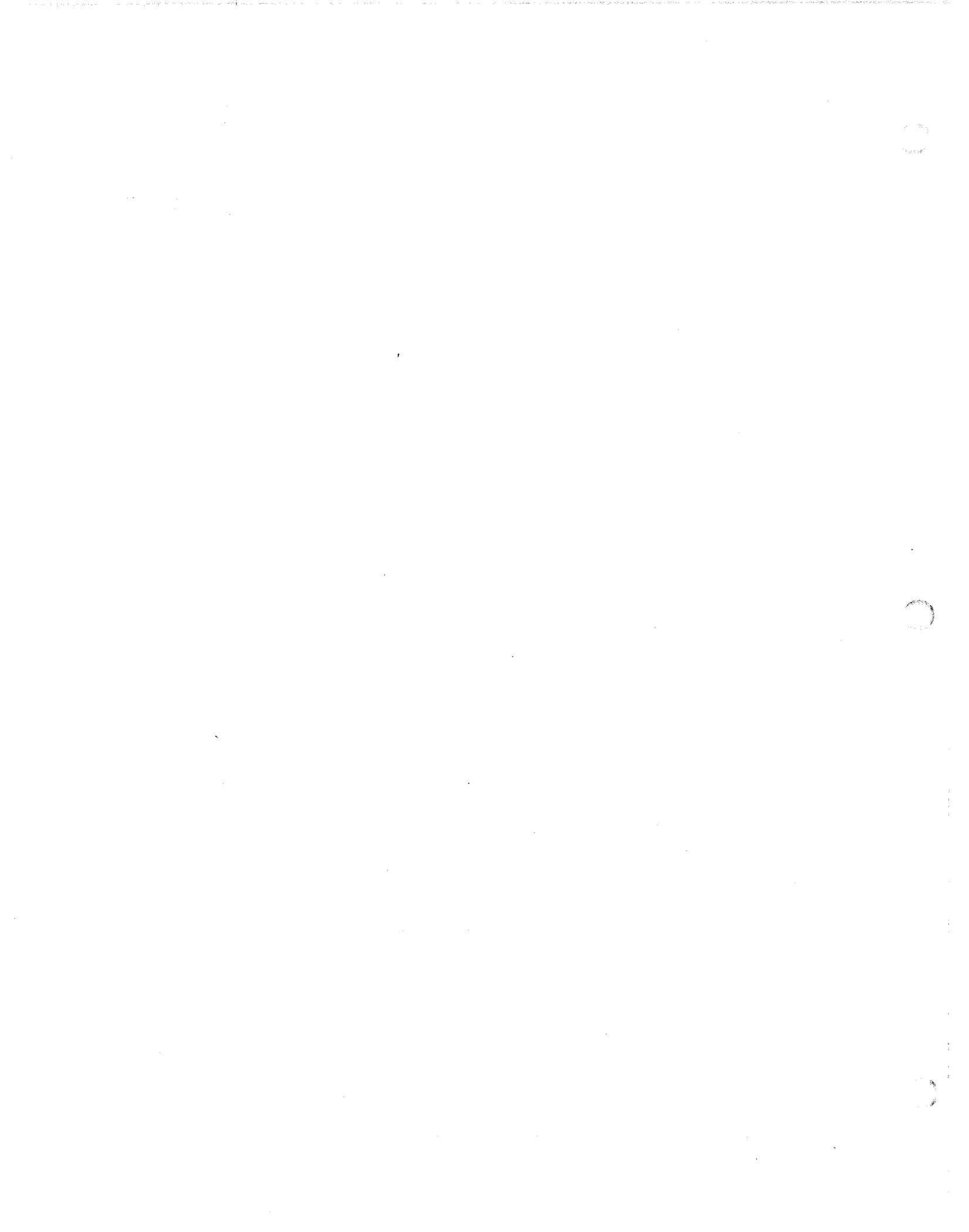
SF:
Belt Tens:

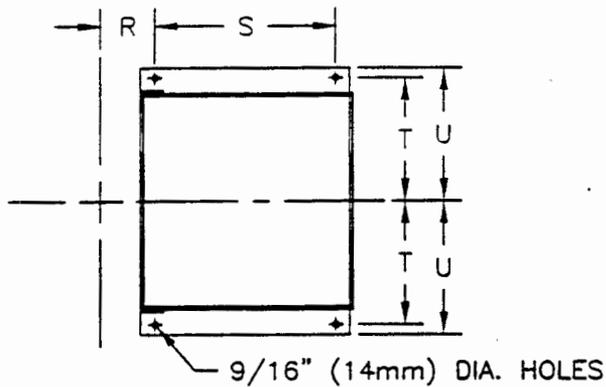
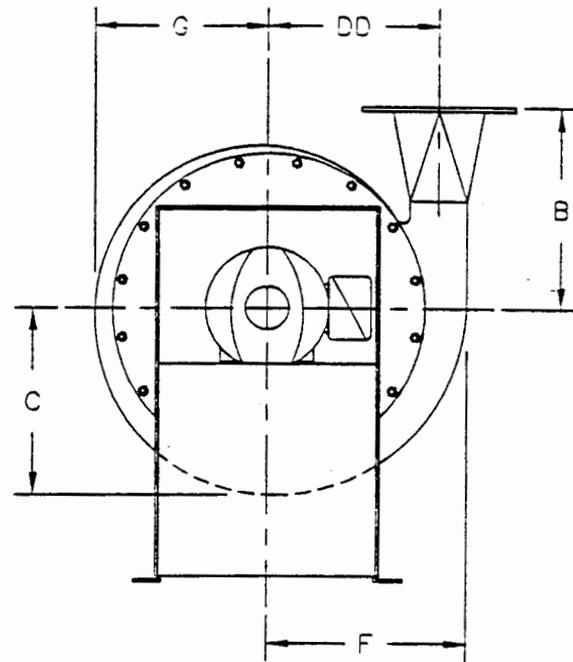
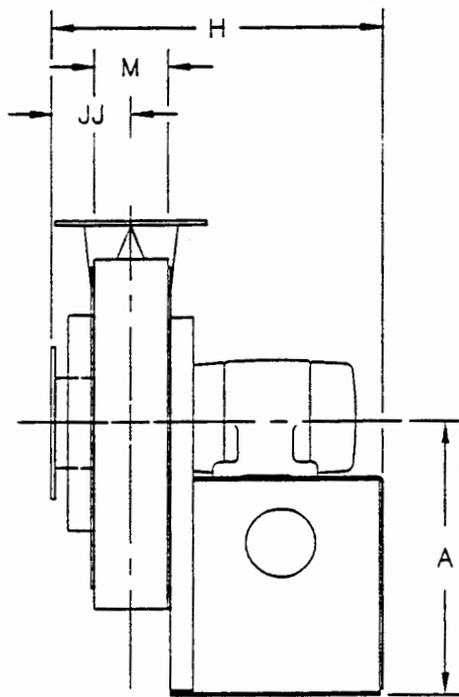
FAN PERFORMANCE DATA

Capacity	CFM	SP	VRM	BHP	TEMP	DENS	WALT	MAX SS
STANDARD	650	37	3500	5.83	70	0.075	0	3900
OPERATING	650	30.8	3500	4.85	70	0.06241	5000	3900
FUTURE TEST								

SALES MEMO INFORMATION

QTY	DESCRIPTION	Drawing#
1	CCW UB, SIZE 2206A7.5 PRESSURE BLOWER, ALUM-WHEEL, ARR-4 FLANGED INLET 06" FLANGED OUTLET 06"	V11437-100-02
1	7.5 HP, 3600 RPM, 3-60-230/460 V., TEFC HI-EFF ENCL, FRAME 213T MOTOR AND MOUNTING BY NYB	
1	DRAIN	
1	DAMPER, OUTLET, SINGLE VANE INTEGRAL	V11437-100-03





PRESSURE BLOWERS ARE ROTATABLE
IN THE FIELD BY 22 1/2° INCREMENTS.

MAXIMUM TEMPERATURE: 180°F (82°C)

FURNISHED WITH FLANGED INLET AND
OUTLET WHICH FITS ANSI 150 PIPE
FLANGES.

ITEM	DIMENSIONS	
	in	mm
A	24 3/4	629
B	17 3/4	451
C	16 1/2	419
F	17 1/2	445
G	15 1/2	394
H	25	635
M	3 7/8	98
R	3 3/8	86
S	14 1/8	359
T	10 7/8	276
U	11 3/4	298
DD	14 7/8	378
JJ	6 1/8	156

FLANGED OUTLET	DIMENSIONS	
	in	mm
I.D.	6	152
B.C.	9 1/2	241
O.D.	11	279
NO. HOLES	8	-
DIA. HOLES	7/8	22

FLANGED INLET	DIMENSIONS	
	in	mm
I.D.	6	-
B.C.	9 1/2	241
O.D.	11	279
NO. HOLES	8	-
DIA. HOLES	7/8	22

TOLERANCE: ±1/8" (±3mm)

nyb The
New York Blower
Company

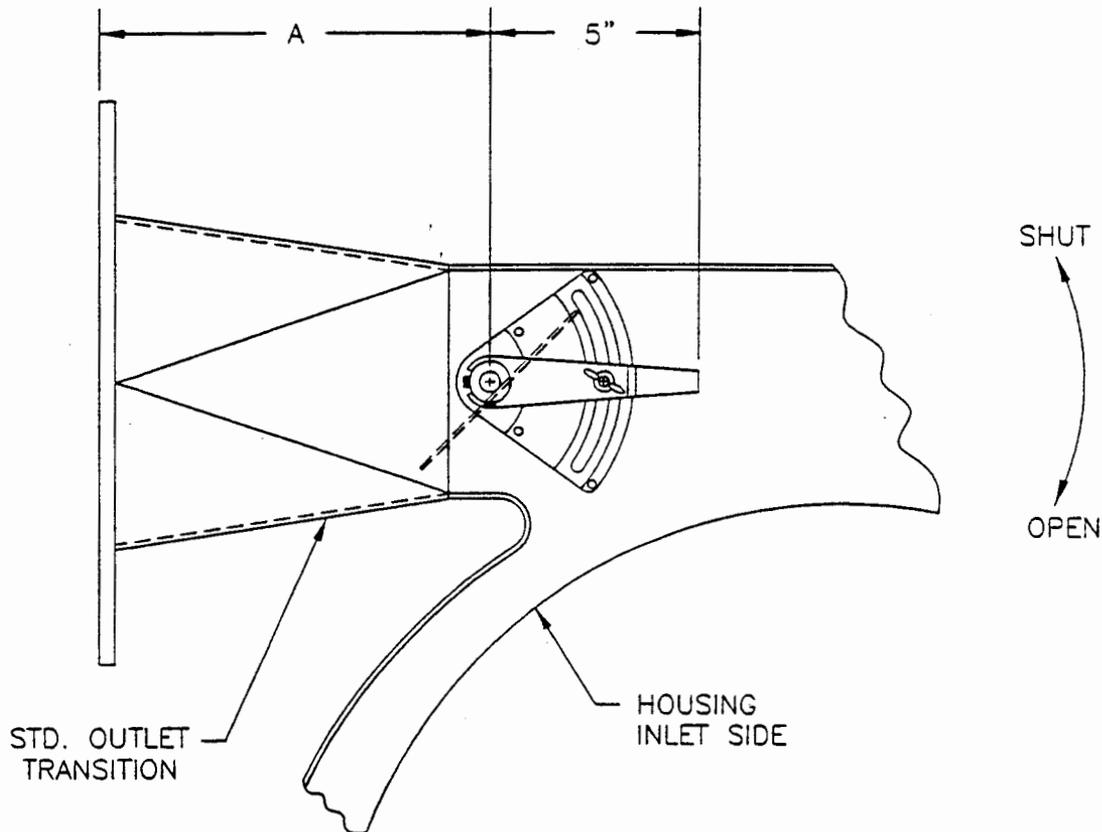
7660 Quincy Street, Willowbrook, IL 60521

PRESSURE BLOWER
SIZE 2206 CCW UB

Date 05-18-01 Certified KJW

Drawing No. V11437-100-2 Rev.

▲ AIR FLOW



CW FAN SHOWN

DAMPER IS A SINGLE VANE TYPE.

DAMPER MOUNTS TO FAN WITH CONTROL ARM ON INLET SIDE OF FAN. DAMPER OPERATES CW TO OPEN AS VIEWED FROM INLET SIDE FOR BOTH CW & CCW FANS.

TOLERANCE: $\pm 1/8"$ ($\pm 3\text{mm}$)

ITEM	DIMENSIONS	
	in	mm
WHEEL DIA.	22	-
OUTLET DIA.	6	-
A	9 5/8	244

nyb The
New York Blower
Company

7660 Quincy Street, Willowbrook, IL 60521

**PRESSURE BLOWER
INTEGRAL OUTLET DAMPER**

Date 05-18-01 Certified KJW

Drawing No. V11437-100-03 Rev.



Performance Curve

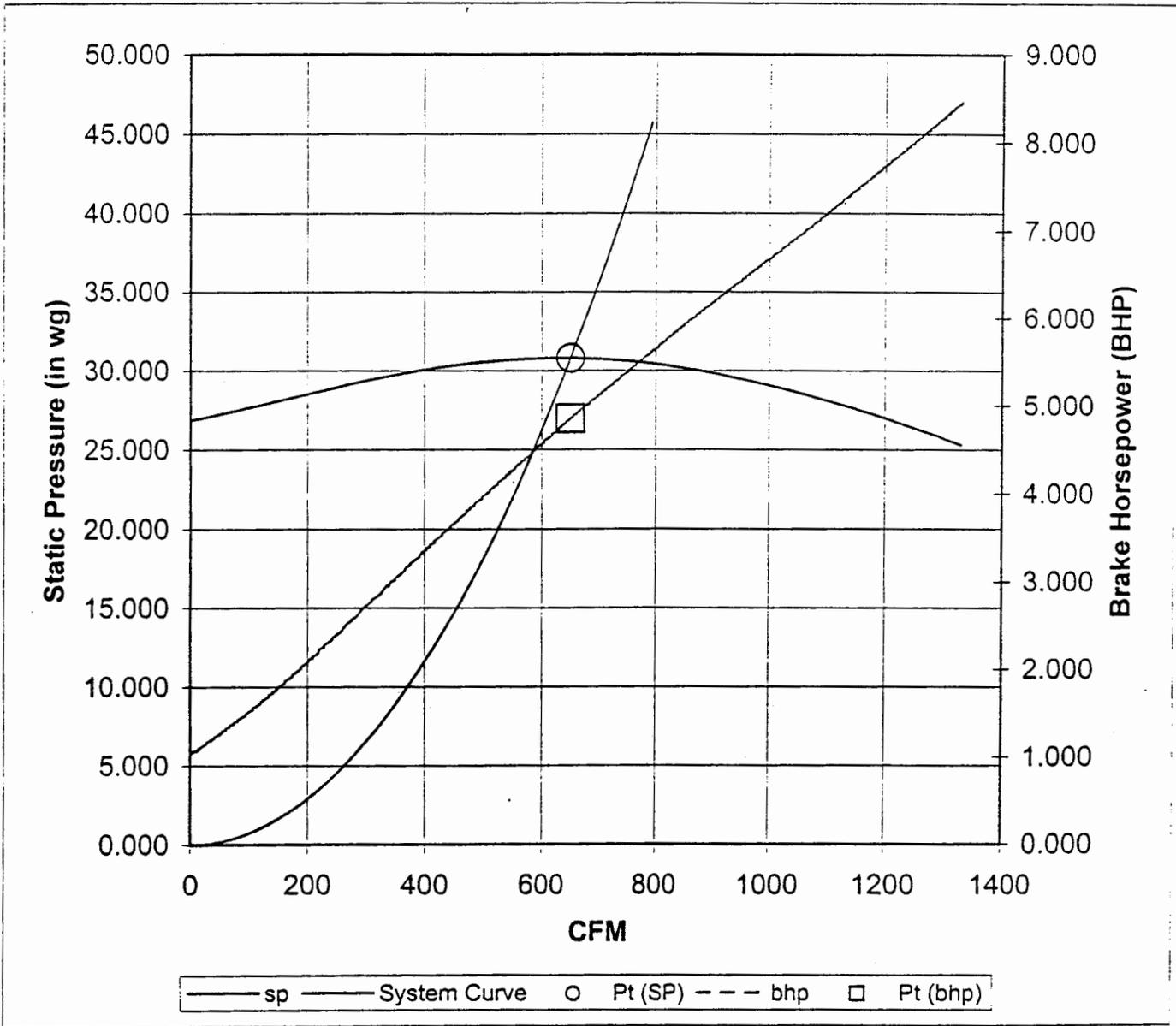
Date: 18-May-01
 Performance
 Options:
 Outlet Damper

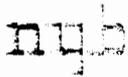
File: V11437-100
 Product Line: Pressure Blower
 Size: 2206A
 Capacity: Operating
 CFM: 650
 SP: 30.8
 RPM: 3500
 BHP: 4.85
 Density: 0.062
 Max Safe Speed: 3900

KJW



Temperature: 70
 Altitude: 5000





The
New York Blower
Company®

7660 QUINCY STREET—WILLOWBROOK, ILLINOIS 60521-5596
TEL: (630) 794-5700 • FAX: (630) 794-5776 • WEB: <http://www.nyb.com> • E-MAIL: nyb@nyb.com

INSTALLATION
MAINTENANCE,
OPERATING
INSTRUCTIONS

IM-140

PRESSURE BLOWERS TYPE HP PRESSURE BLOWERS

WARNING

THIS FAN HAS MOVING PARTS THAT CAN CAUSE SERIOUS BODILY INJURY. BEFORE OPERATING OR STARTING MAINTENANCE READ THE INSTALLATION AND MAINTENANCE INSTRUCTIONS AND THE AMCA SAFETY PRACTICES MANUAL PROVIDED WITH THIS FAN.

DURING OPERATION

1. KEEP BODY, HANDS, AND FOREIGN OBJECTS AWAY FROM THE INLET, THE OUTLET, AND THE OTHER MOVING PARTS OF THE FAN SUCH AS SHAFTS, BELTS, AND PULLEYS.

2. DO NOT OPERATE AT EXCESSIVE SPEEDS OR TEMPERATURES.

BEFORE STARTING MAINTENANCE WORK:

LOCK POWER SUPPLY IN OFF POSITION AND IMMOBILIZE FAN WHEEL.

98-0250

A WORD ABOUT SAFETY

The above **WARNING** decal appears on all **nyb** fans. Air moving equipment involves electrical wiring, moving parts, sound, and air velocity or pressure which can create safety hazards if the equipment is not properly installed, operated and maintained. To minimize this danger, follow these instructions as well as the additional instructions and warnings on the equipment itself.

All installers, operators and maintenance personnel should study AMCA Publication 410, "Recommended Safety Practices for Air Moving Devices", which is included as part of every shipment. Additional copies can be obtained by writing to New York Blower Company, 7660 Quincy St., Willowbrook, IL 60521.

ELECTRICAL DISCONNECTS

Every motor driven fan should have an independent disconnect switch to isolate the unit from the electrical supply. It should be near the fan and must be capable of being locked by maintenance personnel while servicing the unit, in accordance with OSHA procedures.

MOVING PARTS

All moving parts must have guards to protect personnel. Safety requirements vary, so the number and type of guards needed to meet company, local and OSHA standards must be determined and specified by the user. Never start a fan without having all safety guards installed. Check regularly for damaged or missing guards and do not operate any fan with guards removed. Fans can also become dangerous because of potential "wind-milling", even though all electrical power is disconnected. Always block the rotating assembly before working on any moving parts.

SOUND

Some fans can generate sound that could be hazardous to exposed personnel. It is the responsibility of the system designer and user to determine sound levels of the system, the degree of personnel exposure, and to comply with applicable safety requirements to protect personnel from excessive noise. Consult **nyb** for fan sound power level ratings.

AIR PRESSURE AND SUCTION

In addition to the normal dangers of rotating machinery, fans present another hazard from the suction created at the fan inlet. This suction can draw materials into the fan where they become high velocity projectiles at the outlet. It can also be extremely dangerous to persons in close proximity to the inlet, as the forces involved can overcome the strength of most individuals. Inlets and outlets that are not ducted should be screened to prevent entry and discharge of solid objects.

ACCESS DOORS

DANGER

DO NOT OPEN UNTIL THE POWER SUPPLY HAS BEEN LOCKED OFF AND THE SHAFT HAS STOPPED ROTATING. FAILURE TO DO THIS CAN RESULT IN SERIOUS BODILY INJURY. 98-0249

The above **DANGER** decal is placed on all **nyb** cleanout doors. These doors, as well as access doors to the duct system, should never be opened while the fan is in operation. Serious injury could result from the effects of air pressure or suction.

Bolted doors must have the door nuts or fasteners securely tightened to prevent accidental or unauthorized opening.

RECEIVING AND INSPECTION

The fan and accessories should be inspected on receipt for any shipping damage. Turn the wheel by hand to see that it rotates freely and does not bind. If dampers or shutters are provided, check these accessories for free operation of all moving parts.

F.O.B. factory shipping terms require that the receiver be responsible for inspecting the equipment upon arrival. Note damage or shortages on the Bill of Lading and file any claims for damage or loss in transit. **nyb** will assist the customer as much as possible; however, claims must be originated at the point of delivery.

HANDLING AND STORAGE

Fans should be lifted by the base, mounting supports, or lifting eyes only. Never lift a fan by the wheel, shaft, motor, motor bracket, housing inlet, outlet, or any fan part not designed for lifting. A spreader should always be used to avoid damage.

On a direct drive Arrangement 8 fan, lifting holes are provided in the motor base to assist in handling the fan assembly. These lifting holes should be used in conjunction with the lifting eyes when lifting and positioning the fan onto its foundation. A heavy round steel bar or appropriate fixture can be passed through the lifting holes to simplify attachment of the lifting device. Be sure to follow all local safety codes when moving heavy equipment.

Whenever possible, fans and accessories should be stored in a clean, dry location to prevent rust and corrosion of steel components. If outdoor storage is necessary, protection should be provided. Cover the inlet and outlet to prevent the accumulation of dirt and moisture in the housing. Cover motors with waterproof material. Refer to the bearing section for further storage instructions.

Check shutters for free operation and lubricate moving parts prior to storage. Inspect the stored unit periodically. **Rotate the wheel by hand every two weeks to redistribute grease on internal bearing parts.**

FAN INSTALLATION

nyb wheels are dynamically balanced when fabricated. Complete assembled fans are test run at operating speeds to check the entire assembly for conformance to **nyb** vibration limits. Nevertheless, all units must be adequately supported for smooth operation. **Ductwork or stacks should be independently supported as excess weight may distort the fan housing and cause contact between moving parts.** Where vibration isolators are used, consult the **nyb** certified drawing for proper location and adjustment.

Slab-Mounted Units

A correctly designed and level concrete foundation provides the best means of installing floor-mounted fans. The mass of the base must maintain the fan/driver alignment, absorb normal vibration, and resist lateral loads. The overall dimensions of the concrete base should extend at least six inches beyond the base of the fan. The weight of the slab should be two to three times the weight of the rotating assembly, including the motor. The foundation requires firmly anchored fasteners such as the anchor bolts shown in Figure 1.

Move the fan to the mounting location and lower it over the anchor bolts, leveling the fan with shims around the bolts. Fasten the fan securely. When grout is used, shim the fan at least 3/4-inch from the concrete base. (See Figure 1.) When isolation is used, check the **nyb** certified drawing for installation instructions.

Elevated Units

When an elevated or suspended structural steel platform is used, it must have sufficient bracing to support the unit load and prevent side sway. The platform should be of welded construction to maintain permanent alignment of all members.

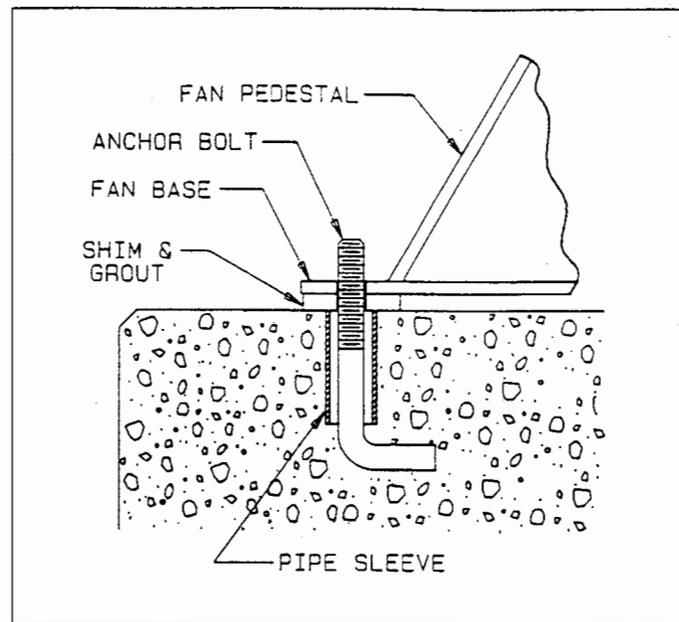


Figure 1

V-BELT DRIVE

Installation

1. Remove all foreign material from the fan and motor shafts. Coat shafts with machine oil for easier mounting. Mount the belt guard backplate at this time if partial installation is required prior to sheave mounting.
2. Mount sheaves on shafts after checking sheave bores and bushings for nicks or burrs. Avoid using force. If resistance is encountered, lightly polish the shaft with emery cloth until the sheave slides on freely. Tighten tapered bushing bolts sequentially so that equal torque is applied to each.
3. Adjust the motor on its base to a position closest to the fan shaft. Install belts by working each one over the sheave grooves until all are in position. Never pry the belts into place. On **nyb** packaged fans, sufficient motor adjustment is provided for easy installation of the proper size belts.
4. Adjust sheaves and the motor shaft angle so that the sheave faces are in the same plane. Check this by placing a straightedge across the face of the sheaves. Any gap between the edge and sheave faces indicates misalignment. Important: This method is only valid when the width of the surface between the belt edge and the sheave face is the same for both sheaves. When they are not equal, or when using adjustable-pitch sheaves, adjust so that all belts have approximately equal tension. Both shafts should be at the right angles to the center belt.

Belt Tensioning

1. Check belt tension with a tensioning gage and adjust using the motor slide base. Excess tension shortens bearing life while insufficient tension shortens belt life, can reduce fan performance and may cause vibration. The lowest allowable tension is that which prevents slippage under full load. Belts may slip during start-up, but slipping should stop as soon as the fan reaches full speed. For more precise tensioning methods, consult the drive manufacturer's literature.
2. Recheck setscrews, rotate the drive by hand and check for rubbing, then complete the installation of the belt guard.

- Belts tend to stretch somewhat after installation. Recheck tension after several days of operation. Check sheave alignment as well as setscrew and/or bushing bolt tightness.

COUPLING

Coupling alignment should be checked after installation and prior to start up. Alignment is set at the factory, but shipping, handling, and installation can cause misalignment. Also check for proper coupling lubrication. For details on lubrication and for alignment tolerances on the particular coupling supplied, see the manufacturer's installation and maintenance supplement in the shipping envelope.

Installation

Most **nyb** fans are shipped with the coupling installed. In cases where the drive is assembled after shipping, install the coupling as follows:

- Remove all foreign material from fan and motor shafts and coat with machine oil for easy mounting of coupling halves.
- Mount the coupling halves on each shaft, setting the gap between the faces specified by the manufacturer. Avoid using force. If mounting difficulty is encountered, lightly polish the shaft with emery cloth until the halves slide on freely.

Alignment

- Align the coupling to within the manufacturer's limits for parallel and angular misalignment (see Figure 2). A dial indicator or laser can also be used for alignment where greater precision is desired. Adjustments should be made by moving the motor to change shaft angle, and by the use of foot shims to change motor shaft height. Do not move the fan shaft or bearing.
- When correctly aligned, install the flexible element and tighten all fasteners in the coupling and motor base. Lubricate the coupling if necessary.
- Recheck alignment and gap after a short period of operation, and recheck the tightness of all fasteners in the coupling assembly.

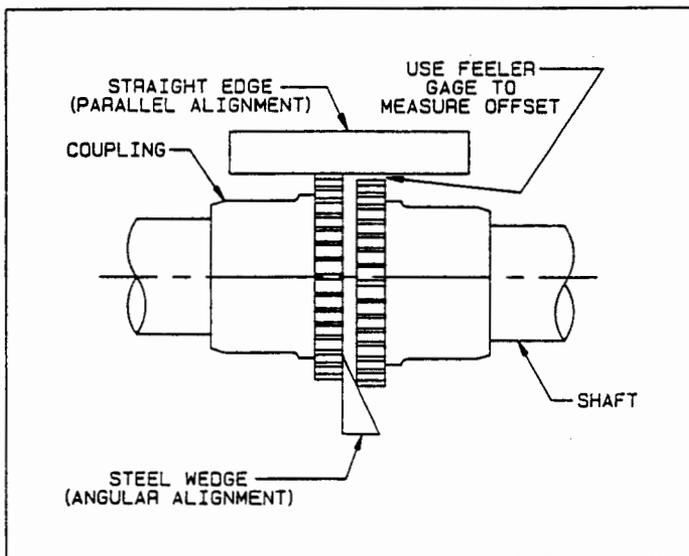


Figure 2

START-UP

Safe operation and maintenance includes the selection and use of appropriate safety accessories for the specific installation. This is the responsibility of the system designer and requires consideration of equipment location and accessibility as well as adjacent components. All safety accessories must be installed properly prior to start-up.

Safe operating speed is a function of system temperature and wheel design. Do not under any circumstances exceed the maximum safe fan speed published in the **nyb** engineering supplement, which is available from your **nyb** field sales representative.

! CAUTION

BEFORE INITIAL OPERATION:

- TIGHTEN ALL SET SCREWS IN FAN WHEEL.
- TIGHTEN ALL SET SCREWS IN BEARINGS.
- REPEAT AFTER 8 HOURS OF OPERATION.
- REPEAT AGAIN AFTER TWO WEEKS OPERATION.

98-0271

Procedure

- If the drive components are not supplied by **nyb**, verify with the manufacturer that the starting torque is adequate for the speed and inertia of the fan.
- Inspect the installation prior to starting the fan. Check for any loose items or debris that could be drawn into the fan or dislodged by the fan discharge. Check the interior of the fan as well. Turn the wheel by hand to check for binding.
- Check drive installation and belt tension.
- Check the tightness of all setscrews, nuts and bolts. When furnished, tighten hub setscrews with the wheel oriented so that the setscrew is positioned underneath the shaft.
- Install all remaining safety devices and guards. Verify that the supply voltage is correct and wire the motor. "Bump" the starter to check for proper wheel rotation.
- Use extreme caution when testing the fan with ducting disconnected. Apply power and check for unusual sounds or excessive vibration. If either exists, see the section on Common Fan Problems. To avoid motor overload, do not run the fan for more than a few seconds if ductwork is not fully installed. On larger fans, normal operating speed may not be obtained without motor overload unless ductwork is attached. Check for correct fan speed and complete installation. Ductwork and guards must be fully installed for safety.
- Setscrews should be rechecked after a few minutes, eight hours and two weeks of operation (see Tables 1 & 2 for correct tightening torques).

NOTE: Shut the fan down immediately if there is any sudden increase in fan vibration.

Table 1 - WHEEL SETSCREW TORQUES

Setscrew Size Diameter (in.)	Carbon Steel Setscrew Torque*	
	lb.-in.	lb.-ft.
1/2	600	50
5/8	--	97
3/4	--	168

* Stainless Steel setscrews are not hardened and should not be tightened to more than 1/2 the values shown.

Table 2 - BEARING SETSCREW TORQUE, lb.-in.

Setscrew Diameter	Manufacturer				
	Link-Belt	Sealmaster	SKF	McGill	Dodge
1/4	90	65	50	85	--
5/16	185	125	165	165	160

Note: Split pillow block bearings are fixed to the shaft with tapered sleeves and generally do not have setscrews.

FAN MAINTENANCE

nyb fans are manufactured to high standards with quality materials and components. Proper maintenance will ensure a long and trouble-free service life.

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked. In many cases, a fan can windmill despite removal of all electrical power. The rotating assembly should be blocked securely before attempting maintenance of any kind.

The key to good fan maintenance is regular and systematic inspection of all fan parts. Inspection frequency is determined by the severity of the application and local conditions. Strict adherence to an inspection schedule is essential.

Regular fan maintenance should include the following:

1. Check the fan wheel for any wear or corrosion, as either can cause catastrophic failures. Check also for the build-up of material which can cause unbalance resulting in vibration, bearing wear and serious safety hazards. Clean or replace the wheel as required.
2. Check the V-belt drive for proper alignment and tension (see section on V-belt drives). If belts are worn, replace them as a set, matched to within manufacturer's tolerances. Lubricate the coupling of direct-drive units and check for alignment (see section on couplings).
3. Lubricate the bearings, but do not over lubricate (see the bearing section for detailed specifications).
4. Ceramic-felt shaft seals require no maintenance, although worn seals should be replaced. When lip-type shaft seals are provided, lubricate them with "NEVER-SEEZ" or other anti-seize compound.
5. During any routine maintenance, all setscrews and bolts should be checked for tightness. See the table for correct torques.
6. When installing a new wheel, the proper wheel-to-inlet clearance must be maintained (see Figure 3).

WHEEL BALANCE

Airstreams containing particulate or chemicals can cause abrasion or corrosion of the fan parts. This wear is often uneven and can lead to significant wheel unbalance over time. When such wear is discovered, a decision must be made as to whether to rebalance or replace the wheel.

The soundness of all parts should be determined if the original thickness of components is reduced. Be sure there is no hidden structural damage. The airstream components should also be cleaned to remove any build-up of foreign material. Specialized equipment can be used to rebalance a cleaned wheel that is considered structurally sound.

Balance weights should be rigidly attached at a point that will not interfere with the housing nor disrupt airflow. Remember that centrifugal forces can be extremely high at the outer radius of a fan wheel. Welding is the preferred method of balance weight attachment. Be sure to ground the welder directly to the fan wheel. Otherwise, the welding current could pass through the fan bearings and damage them.

WHEEL-INLET CLEARANCE

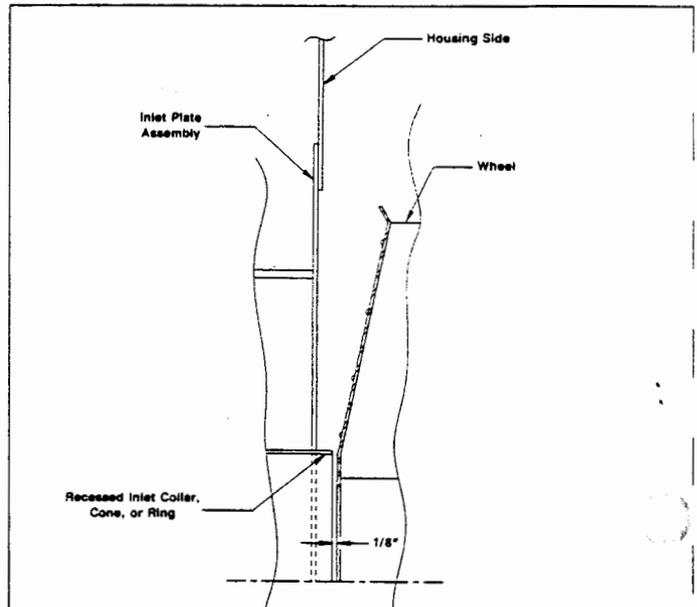


Figure 3

BEARINGS

Storage

Any stored bearing can be damaged by condensation caused by temperature variations. Therefore, nyb fan bearings are filled with grease at the factory to exclude air and moisture. Such protection is adequate for shipment and subsequent immediate installation.

For long term or outdoor storage, mounted bearings should be regreased and wrapped with plastic for protection. **Rotate the fan wheel by hand at least every two weeks to redistribute grease on internal bearing parts.** Each month the bearings should be purged with new grease to remove condensation, since even a filled bearing can accumulate moisture. Use caution when purging, as excessive pressure can damage the seals. Rotate the shaft while slowly adding grease.

Operation

Check the setscrew torque before start-up (see table for correct values). Since bearings are completely filled with grease at the factory, they may run at an elevated temperature during initial operation. Surface temperatures may reach 180°F. and grease may bleed from the bearing seals. This is normal and attempt should be made to replace lost grease. Bearing surface temperatures will decrease when the internal grease quantity reaches a normal operating level. Relubrication should follow the recommended schedule.

Lubrication

Use the table for relubrication scheduling according to operating speed and shaft diameter. Bearings should be lubricated with a premium quality lithium-based grease conforming to NLGI Grade 2. Examples are:

Mobil - Mobilith AW2 Chevron - Amolith #2
 Texaco - Premium RB Shell - Alvania #2

These greases are for bearing surface temperatures of 40°F. to 180°F. For surface temperatures of 181°F. to 230°F. use Mobilith SHC220.

Do not use "high temperature" greases, as many are not formulated to be compatible with fan bearings.

Add grease to the bearing while running the fan or rotating the shaft by hand. Be sure all guards are in place if lubrication is performed while the fan is operating. Add just enough grease to cause a slight purging at the seals. Except on split pillowblocks. Completely filled bearings will run hotter until a sufficient amount of grease is purged out of the seals.

Split pillowblock bearings (Link-Belt P-LB6800 & P-LB6900, SKF SAF 22500, Dodge SAF-XT) should be cleaned and repacked at approximately every eighth lubrication interval. This requires removal of the bearing cap. Clean out old grease and repack the bearing with fresh grease. Pack the bearing fully and fill the housing reservoir to the bottom of the shaft on both sides of the bearing. Replace the bearing cap, being careful not to mix caps as they are not interchangeable from one bearing to another. **Do not over lubricate.**

COMMON FAN PROBLEMS

Excessive Vibration

A common complaint regarding industrial fans is "excessive vibration". **nyb** is careful to ensure that each unit is precisely balanced prior to shipment; however, there are many other causes of vibration including:

1. Loose mounting bolts, setscrews, bearings or couplings.
2. Misalignment or excessive wear of couplings or bearings.
3. Misaligned or unbalanced motor.
4. Bent shaft due to mishandling or material impact.
5. Accumulation of foreign material on the wheel.
6. Excessive wear or erosion of the wheel.
7. Excessive system pressure or restriction of airflow due to closed dampers.
8. Inadequate structural support, mounting procedures or materials.
9. Externally transmitted vibration.

Inadequate Performance

1. Incorrect testing procedures or calculations.
2. Fan running too slowly.
3. Fan wheel rotating in wrong direction or installed backwards on shaft.
4. Wheel not properly centered relative to inlet cone.
5. Damaged or incorrectly installed cut off sheet or diverter.
6. Poor system design, closed dampers, air leaks, clogged filters, or coils.
7. Obstructions or sharp elbows near inlets.
8. Sharp deflection of airstream at fan outlet.

Excessive Noise

1. Fan operating near "stall" due to incorrect system design or installation.
2. Vibration originating elsewhere in the system.
3. System resonance or pulsation.
4. Improper location or orientation of fan intake and discharge.
5. Inadequate or faulty design of supporting structures.
6. Nearby sound reflecting surfaces.
7. Loose accessories or components.
8. Loose drive belts.
9. Worn bearings.

BEARING LUBRICATION INTERVAL [months]

RPM Shaft	1 - 500	501- 1000	1001- 1500	1501- 2000	2001- 2500	2501- 3000	3001- 3500	3501- 4000
1 7/16	6	6	5-6	4-6	4-6	3-5	2-4	2-4
1 11/16	6	6	4-6	4-6	2-4	2-4	2	1-2
2 3/16			6	4-6	4	2-4	2	--
2 7/16			6	4-6	4	2-4	2	--
2 15/16			4-6	4-6	2-4	2	1-2	--

Ball Bearings & Split Pillowblock →  ← Non-Split Pillowblock Spherical Roller Bearings

NOTE:

1. These are general recommendations only; specific manufacturer's recommendations may vary slightly.
2. Assumes clean environment, -20°F. to 120°F.
 - a. Consult The New York Blower Company for operation below -20°F. ambient.
 - b. Ambient temperatures greater than 120°F. will shorten bearing life.
 - c. Under extremely dirty conditions, lubricate more frequently.
3. Assumes horizontal mounting configuration. For vertically mounted applications, lubricate twice as frequently.

Premature Component Failure

1. Prolonged or major vibration.
2. Inadequate or improper maintenance.
3. Abrasive or corrosive elements in the airstream or surrounding environment.
4. Misalignment or physical damage to rotating components or bearings.
5. Bearing failure from incorrect or contaminated lubricant or grounding through the bearings while arc welding.
6. Excessive fan speed.
7. Extreme ambient or airstream temperatures.
8. Improper belt tension.
9. Improper tightening of wheel setscrews.

REPLACEMENT PARTS

It is recommended that only factory-supplied replacement parts be used. **nyb** fan parts are built to be fully compatible with the original fan, using specific alloys and tolerances. These parts carry a standard **nyb** warranty.

When ordering replacement parts, specify the part name, **nyb** shop and control number, fan size, type, rotation (viewed from drive end), arrangement and bearing size or bore. Most of this information is on the metal nameplate attached to the fan base.

For assistance in selecting replacement parts, contact your local **nyb** representative or visit: <http://www.nyb.com>.

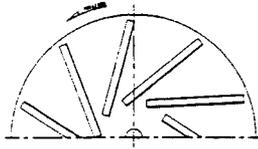
Example: Part required: Wheel/shaft assembly
 Shop/control number: B-10106-100
 Fan description: Size 2206A10 Pressure Blower
 Rotation: Clockwise
 Arrangement: 4

Suggested replacement parts include:

Wheel	Component parts: Damper
Shaft •	Motor
Bearings*	Coupling*
Shaft Seal*	Sheaves*
	V-Belts*

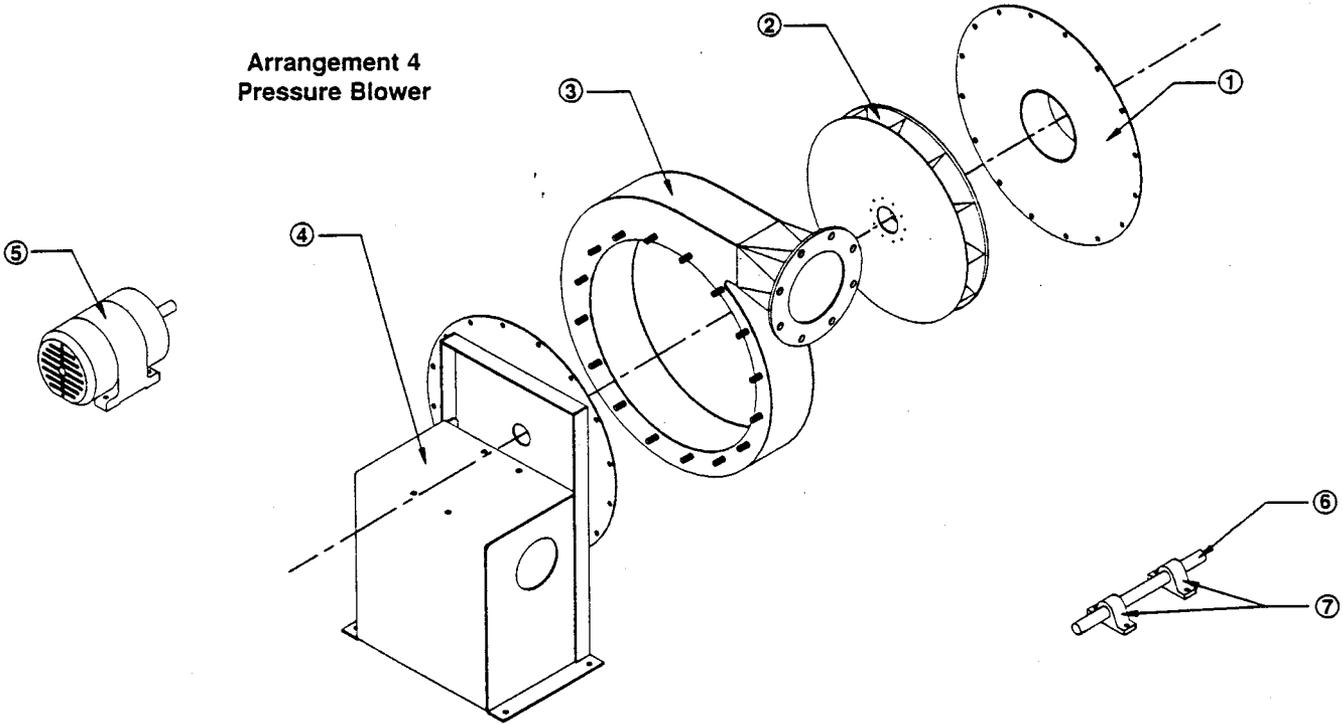
• For Arrangement 1/8 fan only.

SPECIFY ROTATION AS VIEWED FROM DRIVE SIDE

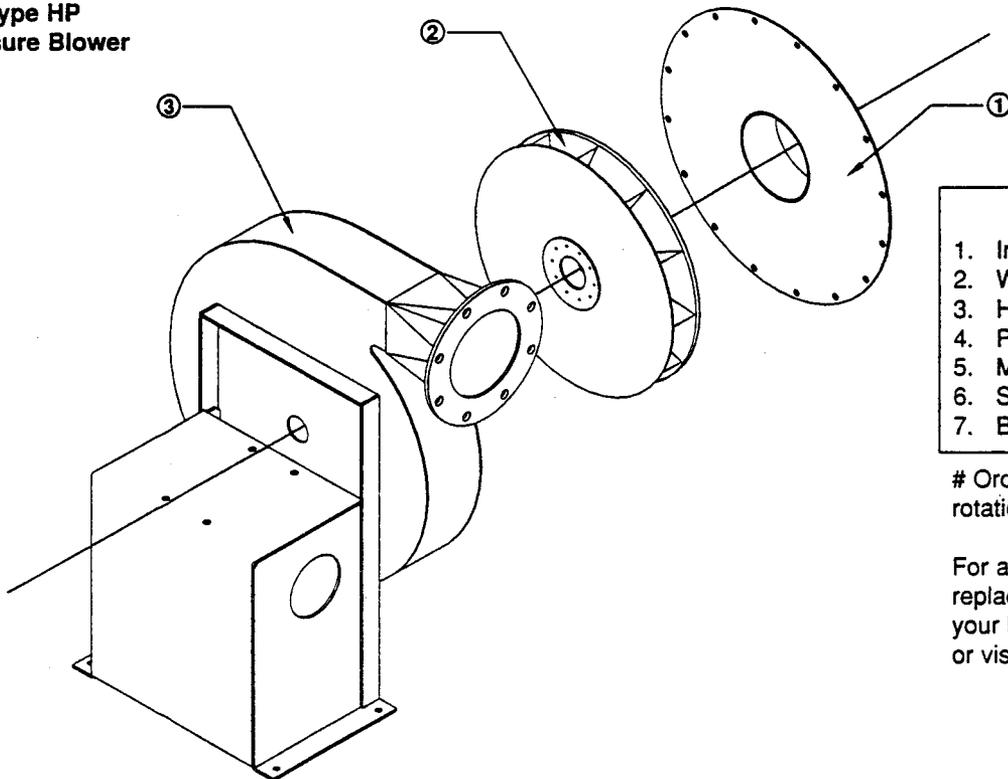


ARROW INDICATES COUNTER CLOCKWISE ROTATION

Arrangement 4
Pressure Blower



Arrangement 4
Type HP
Pressure Blower



Parts List

- 1. Inlet Plate Assembly
- 2. Wheel #
- 3. Housing #
- 4. Pedestal Assembly
- 5. Motor
- 6. Shaft
- 7. Bearings

Order for parts must specify rotation.

For assistance in selecting replacement parts, contact your local **nyb** representative or visit: <http://www.nyb.com>.

Flow to 400 GPM
Head to 75 ft.

Type RC

CENTRIFUGAL MOTOR PUMPS

Flows to 400 GPM
Heads to 75 Feet

MATERIALS
All Iron (RC-AI)
CIBF (RC-BF)

APPLICATIONS

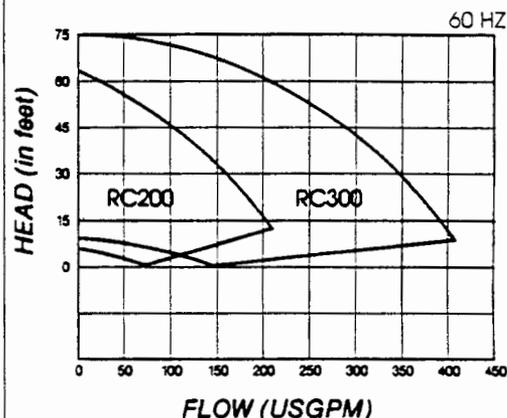
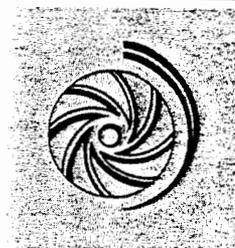
- **INDUSTRY**—Aquaculture, Coolant pumps, cold water circulating, chemical transfer, cooling tower pumps
- **O.E.M.**—Circulating washers, machine tool coolants

FEATURES

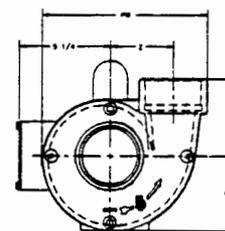
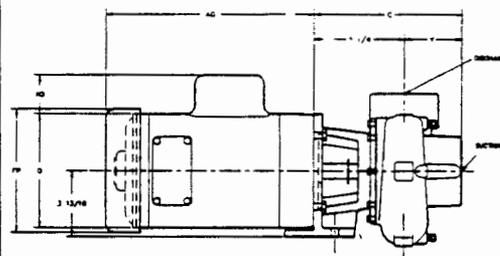
- **SIZES:** RC200 – 2' x 2' x 4'
RC300 – 3' x 3' x 4 1/2'
- Motors are standard NEMA 'C' face design with ball-bearings
- Single and three phase are available in Drip Proof, Totally Enclosed or Explosion Proof design. Up to 5 HP in three phase DP or TE, and up to 3 HP in three phase X-P
- Semi-open, high efficiency Francis type impeller
- Mechanical Seal: 5/8" Type 6A Buna, Carbon vs. Ceramic single seal standard
- Viton® Type 21 and Teflon® Type 9 single seals optional. Other seal faces and elastomers available
- Double Type 21 Viton®, Neoprene or EPR seals optional
- Seal flush, seal quench optional
- Shaft 316 SS Standard

ALSO AVAILABLE

- WITH AIR MOTOR DRIVE
- FRAME MOUNTED
- VERTICAL MOTOR PUMP



Curve for reference only. See engineering curves for final selection.



	PUMP END DIMENSIONS						
	C	Y	PH	Z	X	DO	DISCHARGE
RC200	8 1/8	2 7/8	7 1/8	2 1/2	3 3/4	3 1/2	2" NPT
RC300	8 9/16	3 5/16	8 5/8	3 11/16	4 1/2	4 5/16	3" NPT

	DISCHARGE	SUCTION
RC200	2" NPT	2" NPT
RC300	3" NPT	3" NPT

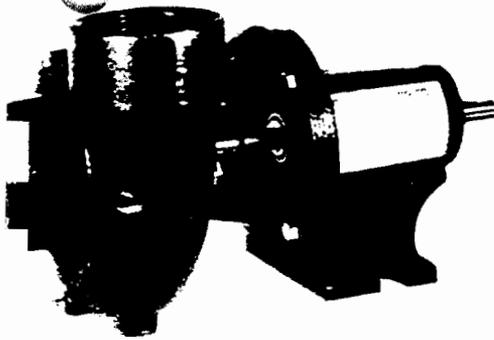
NOTE: Motor dimensions will vary by motor and make. Dimensions are to be used for reference only.

PRICE[®]
PUMP CO.

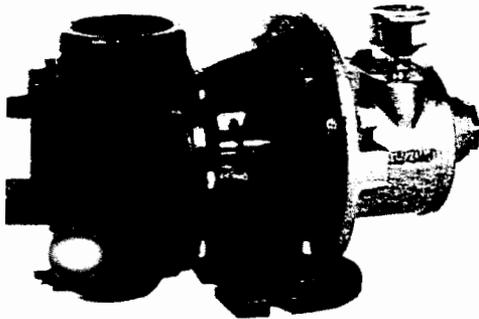


Flow to 400 GPM
Head to 75 ft.

Also Available:



*RC300P
Frame Mounted*



*RC200
With Air Motor*



*RC300V
Vertical*

Type RC



TECHNICAL INFORMATION

CATEGORY	RC200	RC300
Minimum Recommended Flow	10 GPM	50 GPM
Maximum Solid Size	.38"	.31"
Maximum Working Pressure*		
T.6 (std.)	75 PSI	75 PSI
T.21 (optional)	150 PSI	150 PSI
Maximum Temperature*	300° F	300° F

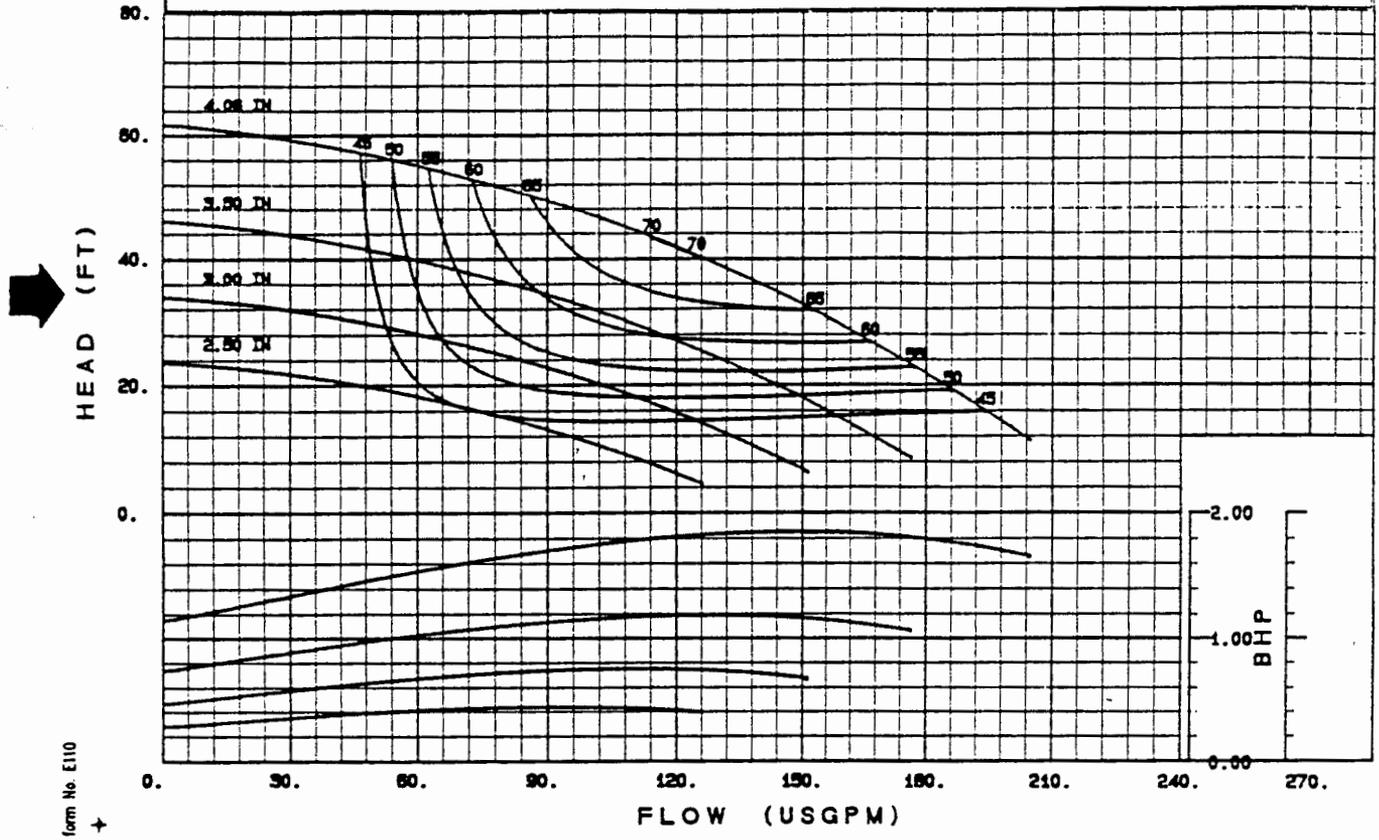
*With Standard Seal and Gasket—Temperature limit will also vary according to liquid pumped. Contact Factory for higher Pressure/Temperature options.

MATERIALS OF CONSTRUCTION

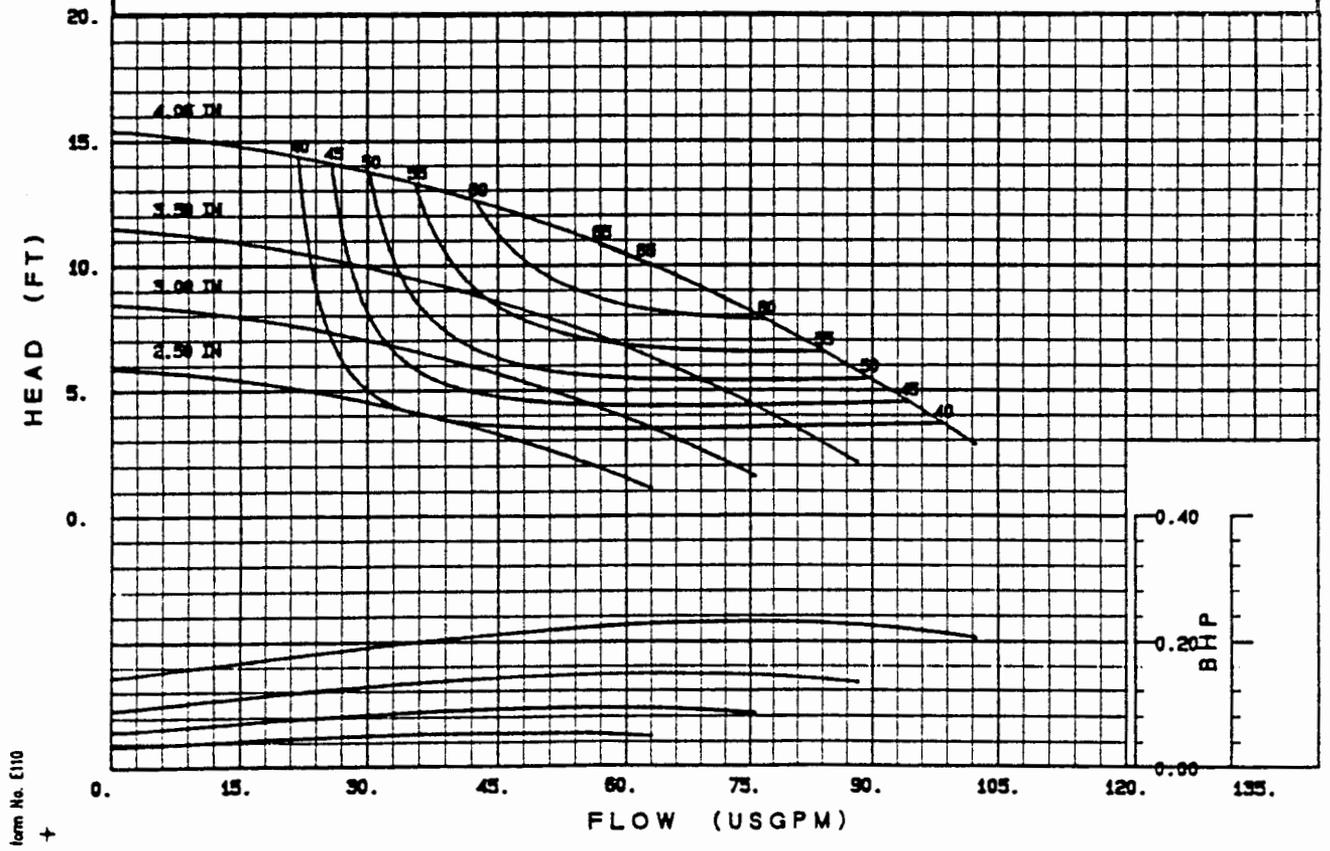
	AI	BF
Volute	Cast Iron	Cast Iron
Impeller	Cast Iron	Bronze
Bracket	Cast Iron	Cast Iron
Shaft	316 SS	316 SS
Fasteners	Plated Steel	Plated Steel
Gasket	Syn. Fiber	Syn. Fiber

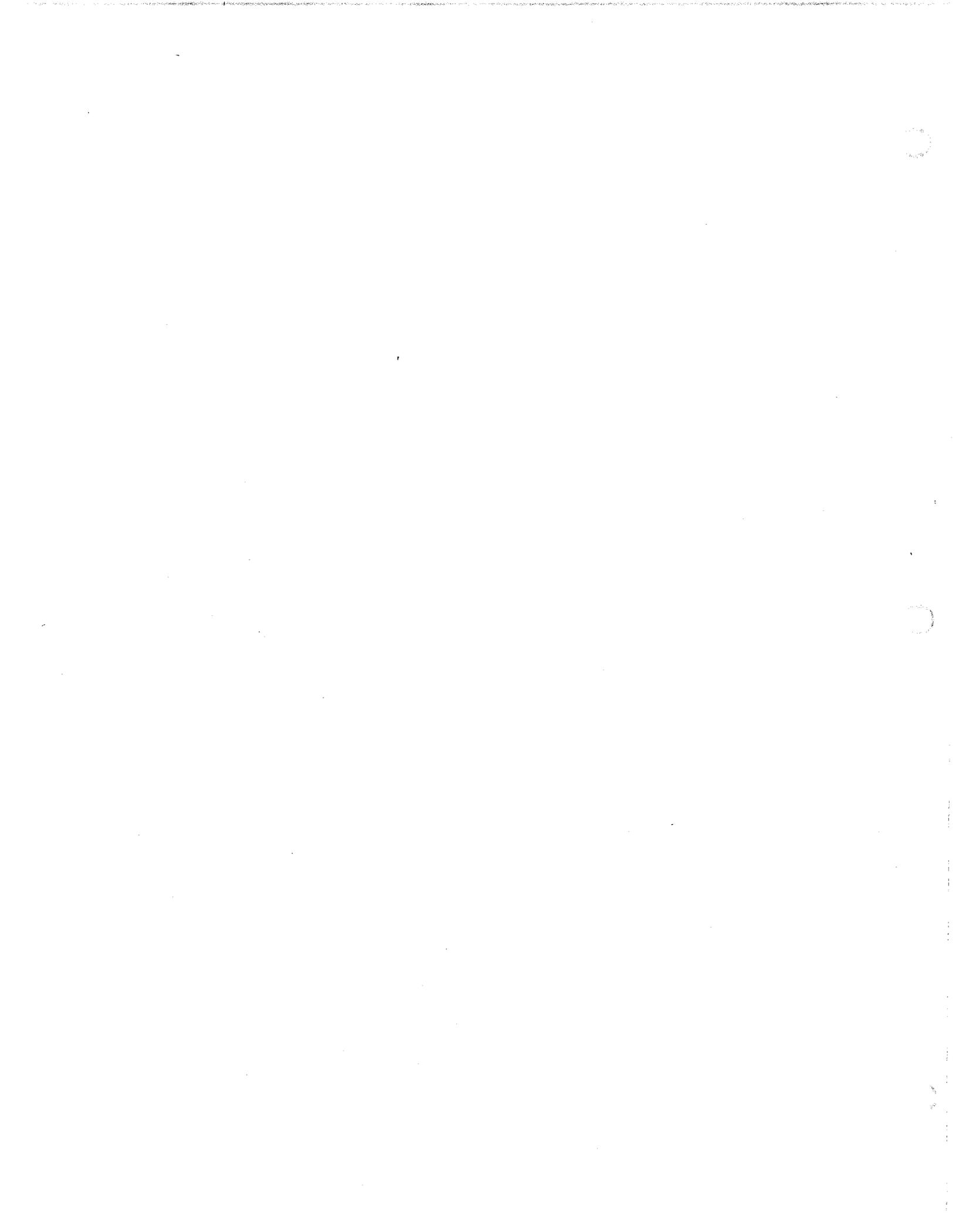


PRICE PUMP CO. CURVE NUMBER: 4770078 MODEL: RC200 SIZE: 2X2X4 RPM: 1750
 IMPELLER DIA: VARIOUS MIN. IMPELLER DIA: 2.50" MAX. IMPELLER DIA: 4.06" MAX. SOLIDS: .38"
 CUSTOMER: PPCO CUSTOMER'S P.O.
 REMARKS: 08-01-94



PRICE PUMP CO. CURVE NUMBER: 4770078 MODEL: RC200 SIZE: 2X2X4 RPM: 1750
 IMPELLER DIA: VARIOUS MIN. IMPELLER DIA: 2.50" MAX. IMPELLER DIA: 4.06" MAX. SOLIDS: .38"
 CUSTOMER: PPCO CUSTOMER'S P.O.
 REMARKS: 08-01-94







Price Pump Company

Type CD/RC Installation, Operating and Maintenance Manual

Caution:

Before installing, repairing or performing maintenance on this pump, read these instructions completely.

If pump has been used to pump hazardous materials be certain that all materials have been removed prior to working on the pump.

Warning!!

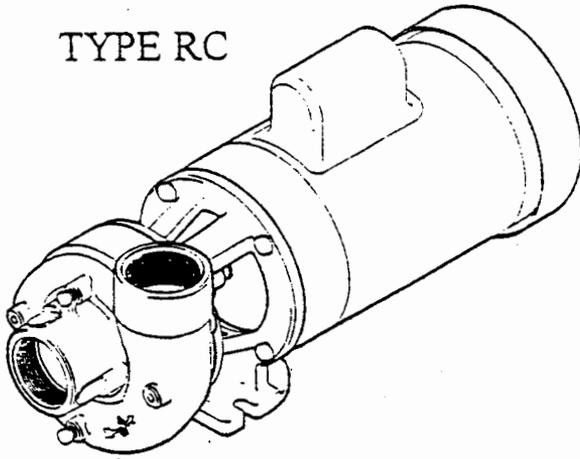
Ground motor before connection to electrical power supply!! Failure to ground motor can cause severe or fatal electrical shock hazard!!

Do not ground to gas supply line!!

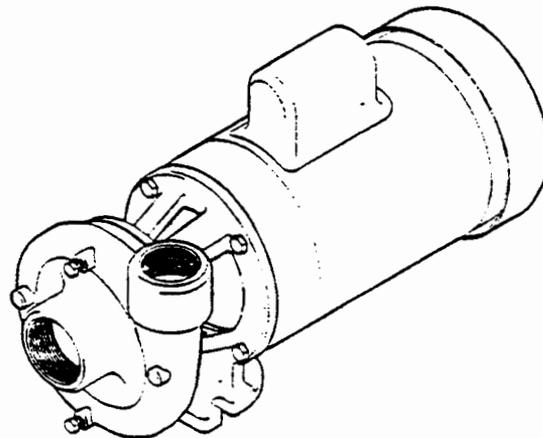
Match voltage to nameplate voltage on motor. Incorrect voltage can cause fire or seriously damage motor, voiding warranty.

Before disassembling be certain all liquid is removed from the pump.

TYPE RC



TYPE CD



Close Coupled Motor Pumps

These pumps require no special care in mounting, although it is suggested that they be firmly bolted to a level surface.

Adequate air movement over motor will help prevent overloads.

Power Frame Mounted Pumps

These pumps must be mounted on a rigid steel base that will not warp or flex. Each pump must be mounted such that **the pump shaft centerline is on center with the driver shaft centerline.** Pad and/or shims will be required on either pump, driver or both. The two shafts should not touch each other and the distance between them depends on the coupling used to connect them. **Misalignment will cause bearing failure and void warranty.** Pumps are **rough aligned at the factory but must be**

realigned after shipment and installation. Pulley driven pump must have pulleys inline and good belt tightness practices followed.

Direction of Rotation

Note: Motor shaft rotation is viewed from the suction end of pump. A rotational arrow is shown on the front of the pump volute casing.

Incorrect rotation can cause pump damage, failure or reduced performance, voiding warranty. It is best to check rotation by momentarily energizing or jogging the motor prior to filling pump with liquid.

Warning! Do not operate pump without liquid for more than a few seconds, as damage will result to mechanical seal.

PLUMBING

All piping should be supported independently of the pump. Piping should not exert any stress on the

pump connections.

Suction Piping Horizontal Pumps

Suction line must provide adequate suction pressure and smooth liquid flow for proper pump operation. Air entrapment in the suction line because of leaks or improper design may cause the pump to lose prime and fail. This pump is not self-priming, therefore the suction must be flooded at start up. Also, the suction line must provide sufficient pressure and smooth flow to pump inlet to prevent pump cavitation. A length of straight pipe a minimum of 5 times the pump inlet diameter and preferably 10 times the diameter should be installed in the suction line where it enters the pump. Elbows, fittings or valves installed close to the suction can disrupt liquid flow and cause malfunction. Suction lines must be at least the same size as the pump inlet or

TYPE CD/RC MAINTENANCE AND REPAIR

Before attempting any repairs under warranty, contact Distributor to obtain factory authorization. Repairs carried out without authorization may void warranty. Many causes of pump system failure are due to improper system design. Refer to the trouble shooting list in this manual before carrying out pump inspection.

DISASSEMBLY

1. Disconnect power source to motor.
2. Disconnect electrical connections tagging wires carefully to preserve correct rotation. Loosen motor base.
3. Remove pump and motor assembly to repair area.
4. Remove volute from pump.
5. Unscrew and remove impeller lockdown and lockwashers. Slide impeller off shaft. Do Not throw shaft key away.
6. Remove seal head from the shaft. Type 6A: Remove seal head from bracket. Type 21: Slide seal head from the shaft. Type 9: Loosen set screws and slide seal head off shaft.
7. Remove four motor bolts and remove bracket from motor.
8. Remove seal seat from bracket. Use wooden or plastic dowel to tamp the seat from the bracket.

REASSEMBLY

1. Clean seat cavity of the bracket thoroughly.
2. Thoroughly clean pump shaft. Assure that the shaft is not grooved and that there is no evidence of pitting or fretting. If the shaft is grooved, fretted or worn, replace it.
3. Install the pump shaft onto the motor shaft, aligning set screws of the pump shaft with the keyway of the motor shaft. Install slinger between the pump shaft setscrews.
4. For Type 6A
 - a. Place bracket on firm surface with seat cavity (pump end) up. Using a tool (1-19/64"ID x 1-5/8" OD x 1/2" deep), press seal into seal cavity with carbon face of seal (volute end up) up. Press until flange is seated in seal cavity of bracket. Press only on outer flange of seal. Avoid touching carbon surface.
 - b. Place bracket on motor (aligning the base if applicable). Secure bracket with four motor bolts.
 - c. Pull pump shaft forward until shoulder of pump shaft contacts back of bracket and slightly snug one setscrew to hold shaft in place.
 - d. Apply small amount of vegetable oil on the pump shaft and I.D. of seat elastomer. Gently place seat on end of shaft with ceramic face down toward seal. After sliding impeller onto shaft, seat will be properly located.
 - e. Slide impeller onto shaft ensuring seat is pushed flush with shoulder of shaft and impeller hub.
 - f. Install shaft key, impeller flatwasher, lockwashers and lockdown bolt.

Tighten securely (10ft.lbs.) Caution: Serviceable Loctite must be used on lockdown bolt. Lockwasher pairs must be assembled cam face to cam face. See diagram

- g. Loosen pump shaft set screw.
 - h. Install new volute gasket/o-ring and mount volute to bracket. Secure with bolts and tighten evenly.
 - i. Setting impeller clearance: Slide pump shaft forward until impeller touches volute. Slide shaft back .010-.015". Tighten pump shaft set screws. Turn shaft by hand to ensure impeller does not rub against volute. Proceed to step 9.
5. For Type 21, 8, 9 seals: Place the bracket on a firm surface with the seat cavity (pump end) up. Then place a small amount of vegetable oil on the seat cup or o-ring seat. Place the seat in the seat cavity with the polished face up toward the pump end. Evenly push seat into cavity with fingers then gently tap seat

into place with a wooden dowel or plastic rod (1-1/8" outside diameter). To help ensure the seat is not damaged place the cardboard disk supplied with the seal over the seat face.

- 6. Place bracket on motor (aligning the base if applicable). Secure bracket with four motor bolts.
- 7. Pull pump shaft forward until shoulder of pump shaft contacts back of bracket and slightly snug one setscrew to hold shaft in place
- 8. Install seal head assembly
 - For Type 21 Seals:
 - a. Lubricate shaft and elastomer with vegetable oil.
 - b. Install rotary seal head onto pump shaft and slide toward seat until carbon face contacts ceramic seat.
 - c. Install seal spring and retainer.
 - d. Install impeller. Install key in pump shaft. Slide impeller onto shaft ensuring that the spring retainer does not slip between the shoulder of the shaft and the hub of the

impeller. Install impeller flatwasher, lockwashers and lockdown. Tighten securely (10 ft. lbs.) Caution:

- Serviceable Loctite must be used on lockdown bolt. Lockwasher pairs must be assembled cam face to cam face. See diagram
- e. Loosen pump shaft set screw.
- f. Install new volute gasket/o-ring and mount volute to bracket. Secure with bolts and tighten evenly.
- g. Slide pump shaft forward until impeller touches volute. Slide shaft back with a screwdriver .010-.015". Tighten pump shaft set screws. Turn shaft by hand to ensure impeller does not rub against volute. Proceed to step 9.

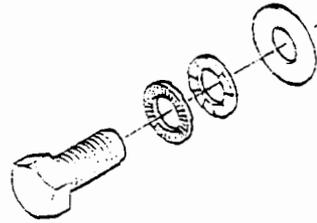
For Type 8 & 9 Seals:

- a. Install impeller. Install key in pump shaft. Slide impeller onto shaft and install impeller washer and lockdown bolt. Tighten securely.

- b. Loosen pump shaft set screw.
- c. Install new volute gasket/o-ring and mount volute to bracket. Tighten at least two bolts at this time.
- d. Slide pump shaft forward until impeller touches volute. Slide shaft back .010"-.015". Tighten pump shaft set screws. Turn shaft by hand to ensure impeller does not rub against volute.
- d. Remove volute and impeller.
- e. Install seal head onto pump shaft sliding gently past shoulder of shaft. Slide seal head toward seat until carbon face contacts ceramic seat. Tighten seal head setscrews to pump shaft. Remove clips in seal head and discard.
- j. Reinstall impeller, flatwasher, lockwashers and lockdown bolt. Tighten securely (10 ft. lbs.)
Caution:
Serviceable Loctite must be used on lockdown bolt.

- Lockwasher pairs must be assembled cam face to cam face. See diagram
- k. Install new volute gasket and mount volute to bracket. Secure with bolts and tighten evenly.
 - l. Rotate pump shaft by hand to ensure impeller does not rub against volute.
9. Return pump to installation, reconnect electric connections.
 10. Start pump momentarily to observe shaft rotation. If rotation corresponds to the rotation arrow, pump may be put into service. If rotation is incorrect, switch any two leads on 3-phase motors. Check wiring diagram of motor for single phase rotation.
 11. Remove top pipe plug (if applicable) from the front of volute and prime pump thoroughly, making sure all air is purged.
 12. Start pump allowing adequate time to purge all air from system. Observe any gauges, flow meters, etc. to see if pump performs properly.

Diagram A



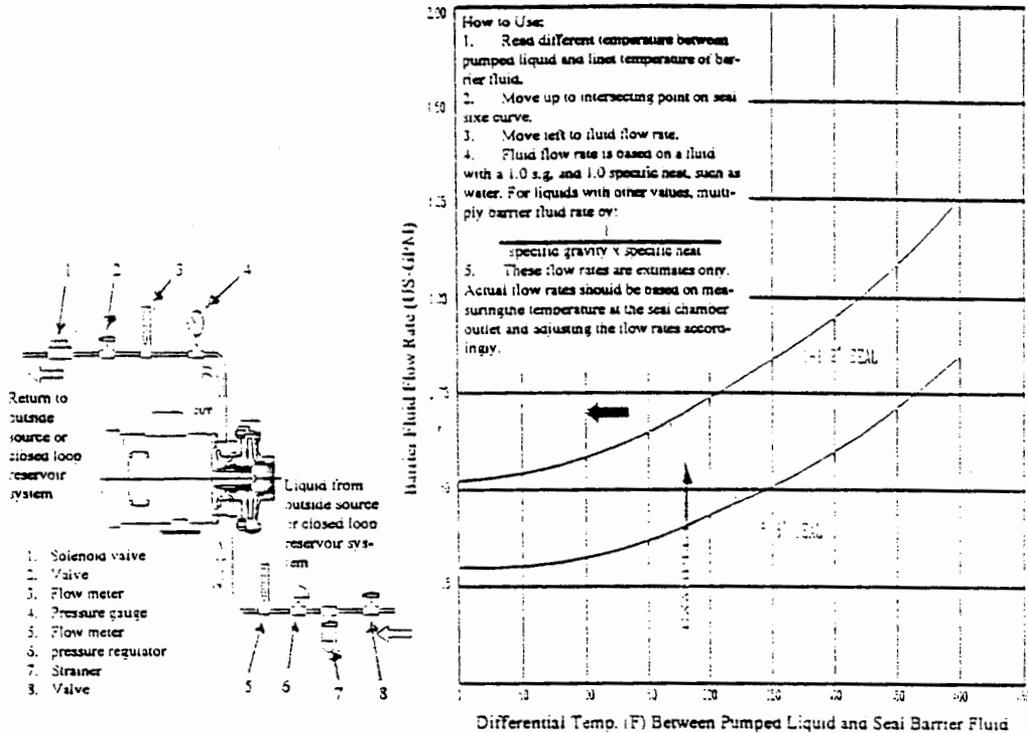
Lockdown Assembly

Double Seal Installation

REASSEMBLY

1. Clean seat cavity of the bracket and seal plate thoroughly.
2. Thoroughly clean pump shaft. Assure that the shaft is not grooved and that there is no evidence of pitting or fretting. Polish the shaft with extra fine emery cloth and clean the keyway. If the shaft is grooved, fretted or worn, replace it.
3. Install the pump shaft onto the motor shaft, aligning set screws of the pump shaft with the keyway of the motor shaft. Ensure all debris and burrs are removed from the motor shaft and that the slinger is in place.
4. Place bracket on motor (aligning the base if applicable). Secure bracket with four motor bolts.
5. Pull out pump shaft as far as it will go toward volute end and slightly snug one set screw to hold shaft in place.
6. Place a small amount of vegetable oil on the seat cup. Install seats into seat plate and bracket with polished faces up. Evenly push seat into seat cavity with fingers, then gently tap seat into place with a wooden dowel or plastic rod (1-1/8" outside diameter).
7. Install seal head assembly:
For Type 21:
 - a. Lubricate shaft and elastomer with vegetable oil.
 - b. Install first rotary seal head onto pump shaft and slide toward seat using a twisting motion until carbon face touches seal seat.
 - d. Install second rotary seal head onto shaft sleeve with carbon facing towards pump end.
8. Install seal plate onto pump end of bracket with new gasket and tighten three allen cap-screws evenly (note: use Teflon pipe sealant on bolts).
9. Install impeller:
 - a. Install key in pump shaft.
 - b. Slide impeller onto shaft.
 - c. Install impeller washer and lockdown. Tighten.
10. Loosen pump shaft set screw.
11. Install new volute gasket, or O-ring and mount volute. Secure with bolts and tighten evenly.
12. Move shaft back with a screwdriver .010-.015". Tighten pump shaft set screws. Turn shaft by hand to ensure impeller does not rub against volute.
13. Return pump to installation, reconnect electric connections.
14. Start pump momentarily to observe shaft rotation. If rotation corresponds to the rotation arrow on the pump, it may be put into service. If rotation is incorrect, switch any two leads on 3-phase motors to change rotation. Check wiring diagram of motor for single phase rotation correction.
15. Remove top pipe plug (if applicable) from the front of volute and prime pump thoroughly, making sure all air is purged. Turn shaft one revolution and then refill. Replace the pipe plug.
16. Start pump allowing adequate time to purge all air from system. Observe any gauges, flow meters, etc., to see if pump performs properly.

DOUBLE SEAL COOLING FLOW RATE CHART



Double Seal Piping Instructions

1. Piping of the double seal arrangement should be done in accordance with all governmental regulations and safety codes.
2. All double seals require a barrier flush between the seal for proper lubrication and cooling. The barrier liquid must be maintained at 10-15 PSIG above the discharge pressure of the pump and it must be chemically compatible with the

Procedures For Checking Double Seals for Leakage Option 1: (2 flow meters)

Install flow meters on the inlet and outlet lines. Normal operating conditions will be indicated by equal or near equal flow on both flow meters. If the inlet flow meter shows

pumped liquid, material construction of the pump, and seals (5/8" double seals have 18-8 parts).

3. The barrier flush shall have a minimum flow rate in accordance with the graph below. If water is used as a fluid, the inlet temperature should not exceed 140 deg F.

4. A positive pressure must be maintained to the barrier flush between the seal faces even when the pump is not running. To

more flow than the outlet, this could indicate excessive leakage.

Option 2: (1 flow meter)

1. Shut off flow at outlet needle valve (item 2).
2. Shut off inlet gate valve (item 8) for 15 seconds maximum.
3. If pressure in seal cavity

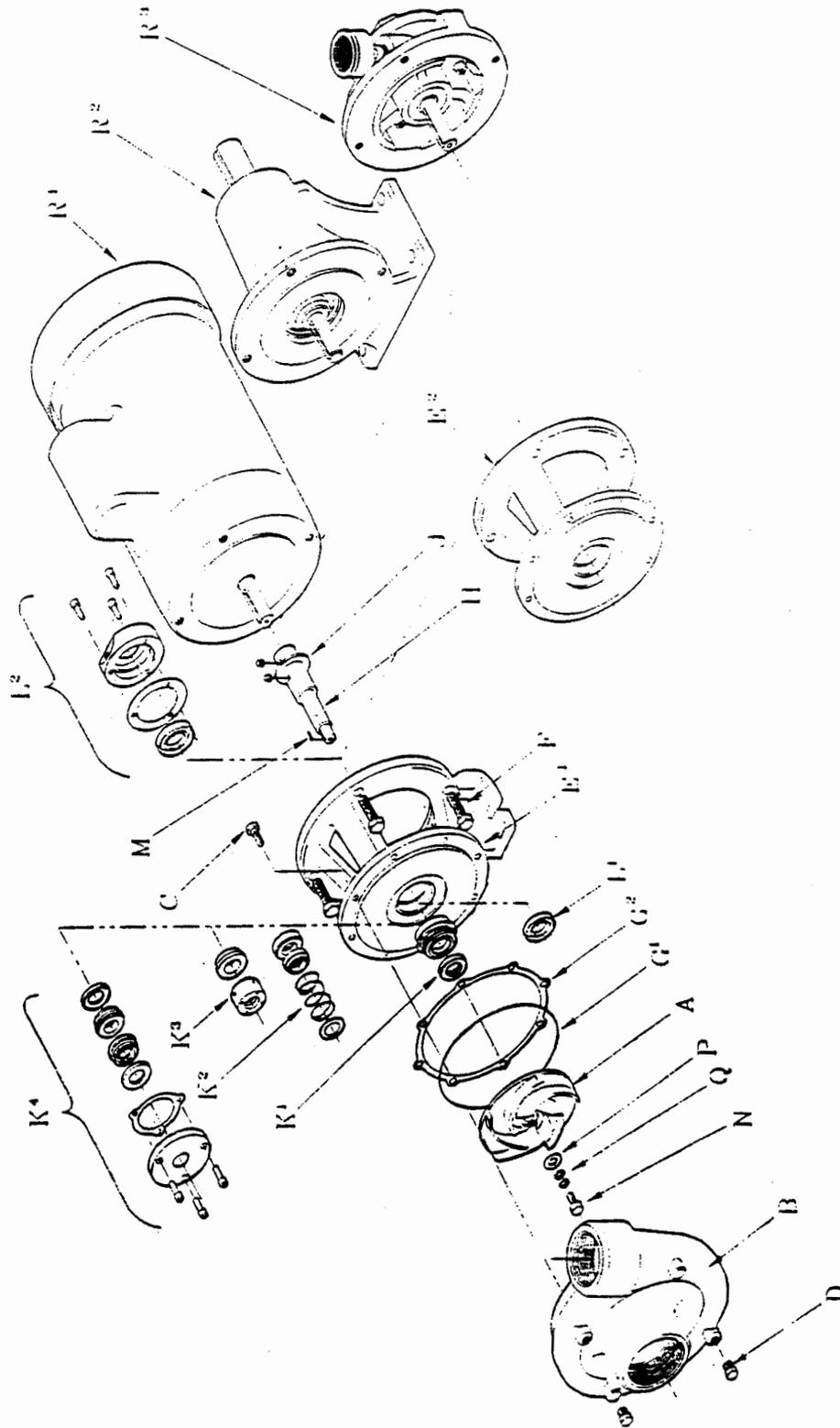
conserve the barrier liquid, a solenoid valve (item 1) may be installed and connected electrically in parallel with the motor so the barrier fluid flows only when the pump is running. Note: The maximum pressure of the barrier fluid at the inlet is 150 PSIG.

5. The inlet should be connected to the bottom and the outlet to the top of the seal cavity.

drops rapidly rather than gradually while the gate valve is closed, the seal is leaking excessively.

4. To restart, open gate valve first then reset valve on outlet.

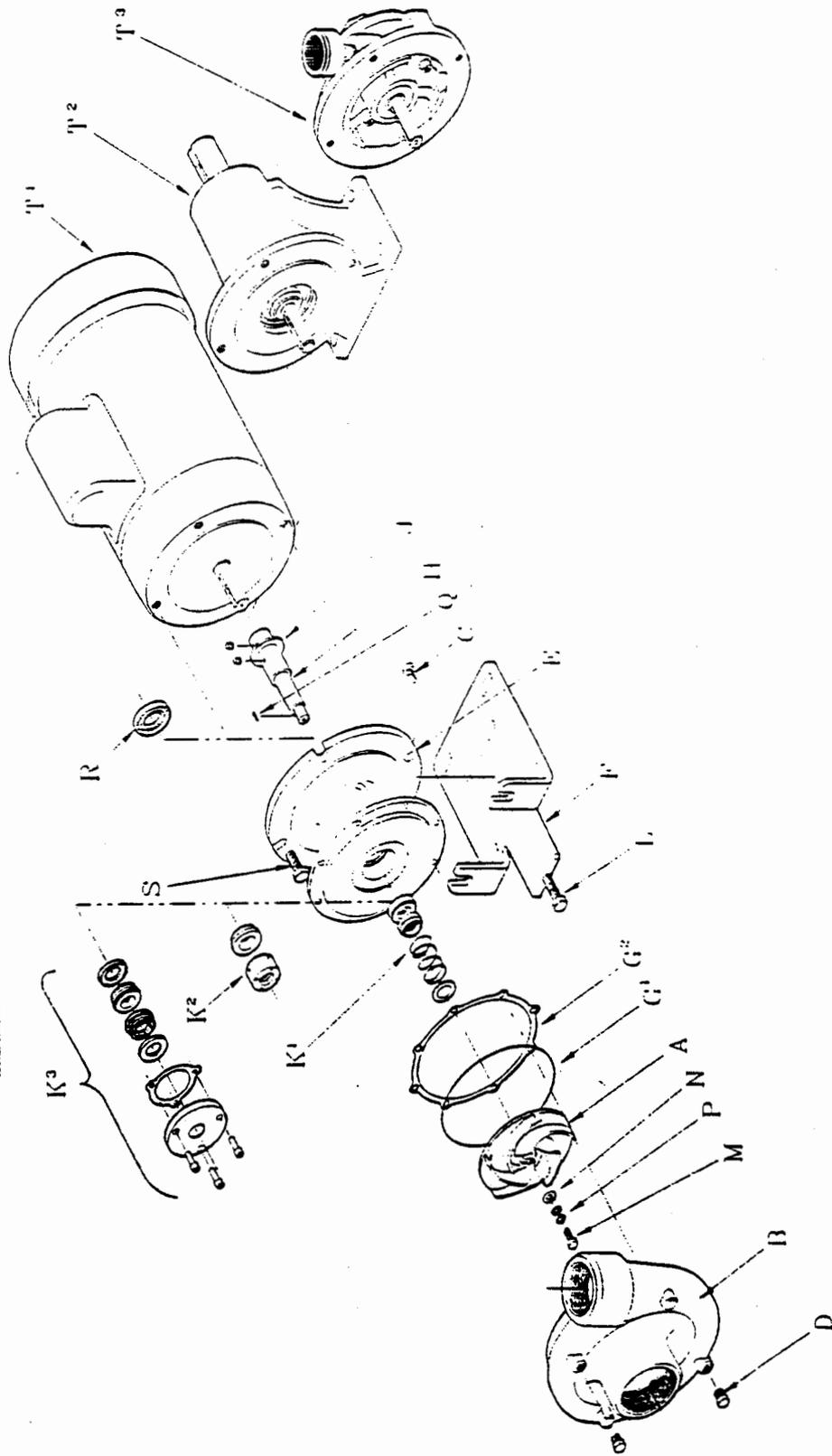
TYPE CD AI, BF, AB PARTS LIST



	<u>CD100A1</u>	<u>CD100BF</u>	<u>*CD100AB</u>	<u>*CD150A1</u>	<u>*CD150BF</u>	<u>*CD150AB</u>
A. Impeller / specify diameter	2402-dia.	2404-dia	2404-dia	2408-dia.	2410-dia	2410-dia.
B. Volute	2401	2401	2403-0	2407-0	2407-0	2409-0
C. Volute bolt	0573 (4 req)	0573 (4 req)	0376 (4 req)	0573 (8 req)	0573 (8 req)	0376 (req)
D. Pipe plug	0557	0557	0558	0557	0557	0558
E ¹ . Bracket with foot	2426	2426	2400	2426	2426	2400
E ² . Bracket without foot	2428	2428	2440	2428	2428	2440
F. Motor bolt (4 req.)	0588	0588	0592	0588	0588	0592
G ¹ . O-Ring volute gasket						
Buna (standard)	n/a	n/a	3074	3074	3074	3074
Fluorocarbon	n/a	n/a	3070	3070	3070	3070
PTFE	n/a	n/a	3071	3071	3071	3071
Neoprene	n/a	n/a	3072	3072	3072	3072
EPR	n/a	n/a	3073	3073	3073	3073
G ² . Gasket, fiber	0506	0506	n/a	n/a	n/a	n/a
	<u>Part No. All Models</u>		<u>Part No. All Models</u>			
H. Shaft 5/8" I.D.	2421-1		N. Impeller lockdown		0575	
	2422-1		P. Impeller flatwasher		2423	
J. Slinger	0522		Q. Impeller lockwashers		2344	
			R ¹ . Motor - specify part number			
K ¹ . T6A Buna (standard)	0538		R ² . Power Frame			
T6A Fluorocarbon	0539		For use with 5/8" I.D. shafts		5478	
K ² . T21 Fluorocarbon	0553		For use with 7/8" I.D. shafts		5501	
K ³ . T9 PTFE	1150		R ³ . Air motor - specify part number			
K ⁴ . Double seal/seat						
T21 Fluorocarbon	0985 (2ea. required)		CD (A1, BF, AB) Repair Parts Kit			
T21 Neoprene	0984		P/N 2222	Includes: 5/8" Shaft, Slinger, Impeller lockdown assy., and impeller key.		
T21 EPR	1023		P/N 2222-1	Includes: 7/8" shaft, slinger, Impeller lockdown assy., and impeller key.		
Double seal plate	0973		NOTE: Must order Gasket or O-ring and Seal/Seat separately.			
Gasket PTFE	0974					
Bolt	0977 (3ea. required)					
L ¹ . T6A. quench lip seal Fluorocarbon	0899					
M. Impeller key	2424					

* These Models Use An O-Ring Volute Flange Gasket (G¹)

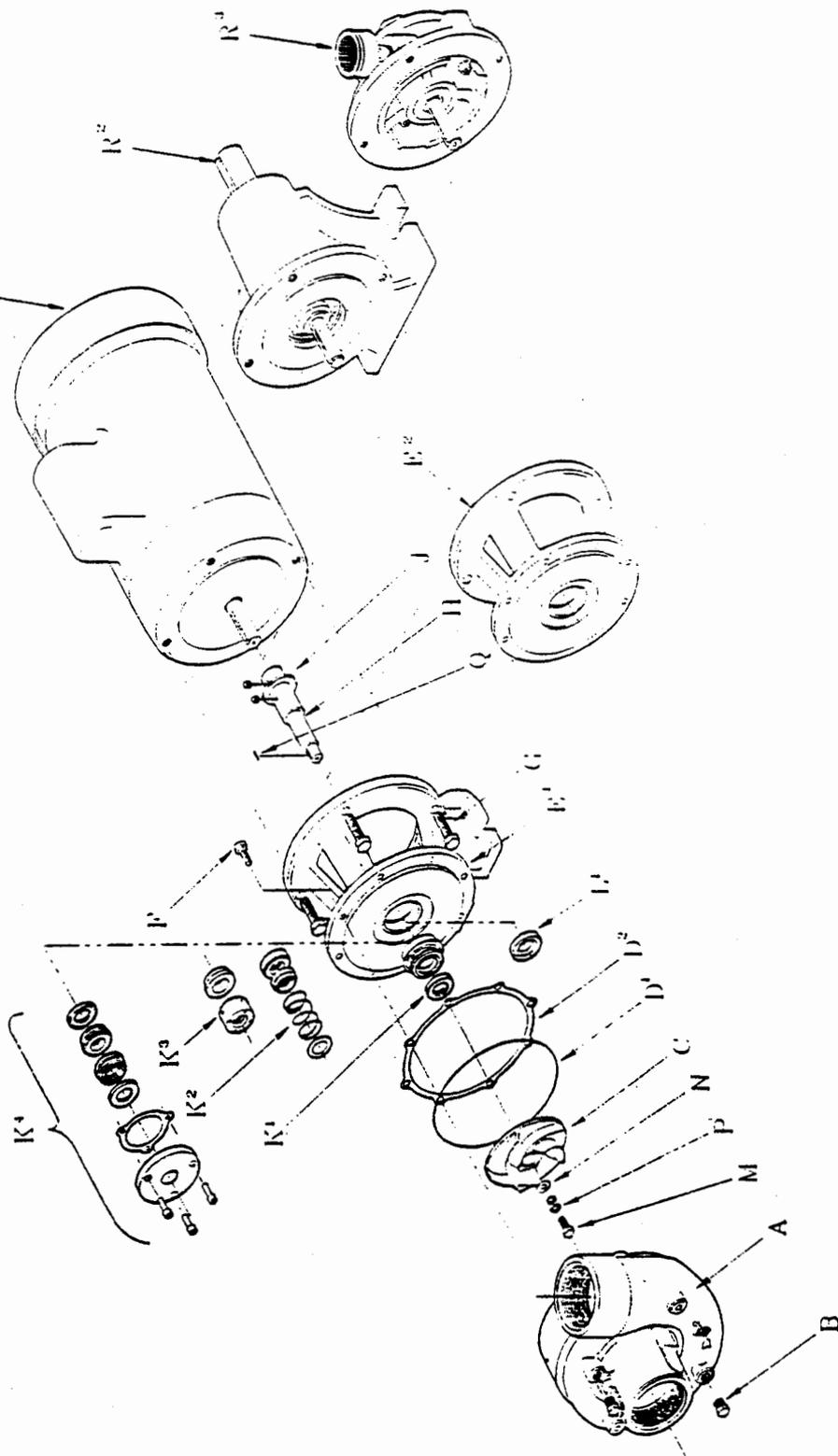
TYPE CDSS PARTS LIST



	<u>CD100SS</u>	<u>CD150SS</u>		<u>CD100SS</u>	<u>CD150SS</u>
A. Impeller	2448-dia.	2412-dia.	Double seal plate	0973	0973
B. Volute	0247	0247	Seal plate gasket, PTFE	0974	0974
C. Volute bolt (8 req.)	0917	0917	Seal plate bolts (3 req.)	0256	0256
D. Pipe plug	0559	0559	L. Motor bolt	0673	0673
E. Bracket	0972	0972	M. Impeller lockdown bolt	0575	0575
F. Pump Base	0199	0199	N. Impeller lockdown washer	2423	2423
G ₁ . O-ring (for volute flange)			P. Impeller lockwasher (2 req.)	2344	2344
Fluorocarbon (std)	3070	3070	Q. Impeller key	2424	2424
Buna	3074	3074	R. Fluorocarbon Quench lip seal	0891	0891
PTFE	3071	3071	S. Motor bolt (2 req.)	0593	0593
Neoprene	3072	3072	T ₁ . Motor - specify P/N		
EPR	3073	3073	T ₂ . Power Frame		
G ₂ . Gasket, PTFE (for CD100SS only)	0507	N/A	For use w/ 5/8" shaft	5478	5478
H. Shaft w/ setscrews 5/8" I.D.	2421-1	2421-1	For use w/ 7/8" shaft	5501	5501
Shaft w/ setscrews 7/8" I.D.	2422-1	2422-1	T ₃ . Air motor - specify P/N		
J. Slinger	0522	0522			
			CD (AI, BF, AB) Repair Parts Kit		
<u>Seal/seat</u>			P/N 2205	Includes: 5/8" Shaft , Slinger, Impeller lockdown assy., and impeller key.	
K ₁ . K ₂ .	T. 9 PTFE, carbon vs				
ceramic	1150	1150	P/N 2205-1	Includes: 7/8" shaft, slinger, Impeller lockdown assy., and impeller key.	
K ₃ . Double seal arrangement					
T. 21 Fluorocarbon, carbon vs ceramic	0985	0985			
T. 21 Neoprene, carbon vs ceramic	0984	0984			
T. 21 EPR, carbon vs ceramic	1023	1023			

NOTE: Must order Gasket or O-ring and Seal/Seat separately.

RC PARTS LIST



TYPE RC PARTS LIST

	<u>RC200</u>	<u>RC300</u>		<u>RC200</u>	<u>RC300</u>
A. Volute	0183	0183	L. T. 6A Quench lip seal, Viton®	0899	0899
B. Pipe plug	0557	0557	M. Impeller lockdown bolt	0575	0575
C. Impeller (specify diameter)			N. Impeller lockdown washer	2423	2423
All iron	4184-dia.	4230-dia.	P. Impeller lockwasher (2 req.)	2344	2344
Bronze fitted	4128-dia.	4119-dia.	Q. Impeller key	2424	2424
D. Gasket (volute flange)	0506	0506	R ₁ . Motor - specify P/N		
E ₁ . Bracket with foot	2426	2426	R ₂ . Power Frame		
E ₂ . Bracket without foot	2428	2428	For use w/ 5/8" shaft	5478	5478
F. Volute bolts (8 req.)	0573	0573	For use w/ 7/8" shaft	5501	5501
G. Motor bolts (4 req.)	0588	0588	R ₃ . Air motor - specify P/N		
H. Shaft w/ setscrews 5/8" I.D.	2421-1	2421-1			
Shaft w/ setscrews 7/8" I.D.	2422-1	2422-1			
J. Slinger	0522	0522			
<u>Seal/seat</u>					
K ₁ . T. 6A Buna, carbon vs ceramic	0538	0538			
K ₂ . T. 21 Viton®, carbon vs ceramic	0553	0553			
K ₃ . T. 9 Teflon®, carbon vs ceramic	1150	1150			
K ₄ . Double seal arrangement					
T. 21 Viton®, carbon vs ceramic	0985	0985			
T. 21 Neoprene, carbon vs ceramic	0984	0984			
T. 21 EPR, carbon vs ceramic	1023	1023			
Double seal plate	0973	0973			
Seal plate gasket, Teflon®	0974	0974			
Seal plate bolts (3 req.)	0256	0256			

RC Repair Parts Kit

Repair Kit // 5/8" keyed shaft	P/N 2204
Repair Kit // 7/8" keyed shaft	P/N 2204-1

Kit includes: Gasket (volute flange), pump shaft w/setscrews, slinger, impeller lockdown and key

Note: Seal/seat must be ordered in addition to kit



General Terms Of Sale For Products

1. GENERAL

A. Seller's price is based on these sales terms and (i) this document together with any additional writings signed by Seller shall represent the final, complete and exclusive statement of the agreement between the parties and may not be modified, supplemented, explained or waived by parol evidence, Buyer's purchase order, a course of dealing, Seller's performance or delivery, or in any other way except in writing signed by an authorized representative of Seller, and (ii) these terms are intended to cover all activity of Seller and Buyer hereunder, including sales and use of products, parts and work and all related matters (references to products include parts and references to work include construction, installation and start-up). Any reference by Seller to Buyer's specifications and similar requirements are only to describe the products and work covered hereby and no warranties or other terms therein shall have any force of effect. Catalogs, circulars and similar pamphlets of the Seller are issued for general information purposes only and shall not be deemed to modify the provisions hereof.

B. The agreement formed hereby and the language herein shall be construed and enforced under the Uniform Commercial Code as in effect in the State of California on the date hereof.

2. TAXES

Any sales, use or other similar type taxes imposed on this sale or on this transaction are not included in the price. Such taxes shall be billed separately to the Buyer. Seller will accept a valid exemption certificate from the Buyer if applicable; however, if an exemption certificate previously accepted is not recognized by the governmental taxing authority involved and the Seller is required to pay the tax covered by such exemption certificate, Buyer agrees to promptly reimburse Seller for the taxes paid.

3. PERFORMANCE, INSPECTION AND ACCEPTANCE

A. Unless Seller specifically assumes installation, construction or start-up responsibility, all products shall be finally inspected and accepted within thirty (30) days after arrival at point of delivery. Products not covered by the foregoing and all work shall be finally inspected and accepted within thirty (30) days after completion of the applicable work by Seller. All claims whatsoever by Buyer (including claims for shortages) excepting only those provided for under the WARRANTY AND LIMITATION OF LIABILITY and PATENTS Clauses hereof must be asserted in writing by Buyer within said thirty (30) day period or they are waived. If this contract involves partial performance, all such claims must be asserted within said thirty (30) day period for each partial performance. There shall be no revocation of acceptance. Rejection may be only for defects substantially impairing the value of products or work and Buyer's remedy for lesser defects shall be those provided for under the WARRANTY AND LIMITATION OF LIABILITY Clause.

B. Seller shall not be responsible for non-performance or for delays in performance occasioned by any causes beyond Seller's reasonable control, including, but not limited to, labor difficulties, delays of vendors or carriers, fires, governmental actions, or shortages of material, components, labor, or manufacturing facilities. Any delays so occasioned shall affect a corresponding extension of Seller's performance dates which are, in any event, understood to be approximate. In no event shall Buyer be entitled to incidental or consequential damages for late performance or for a failure to perform. Seller reserves the right to make partial shipments and

to ship products, parts or work which may be completed prior to the scheduled performance date.

C. In the event that Seller has agreed to mount motors, turbines, gears, or other products which are not manufactured by Seller and which are not an integral part of Seller's manufactured product, and a delay in the delivery of such products to Seller occurs that will cause a delay in Seller's performance date, Seller reserves the right to stop its product upon completion of manufacture and to refund an equitable portion of the amount originally included in the purchase price for mounting without incurring liability for non-performance.

D. Seller reserves to itself the right to change its specifications, drawings and standards if such changes will not impair the performance of its products, and parts, and further that such products, and parts, will meet any of Buyer's specifications and other specific product requirements which are a part of this agreement.

E. The manufacture and inspection of products and parts shall be to Seller's Engineering and Quality Assurance standards plus such other inspections, tests or documentation as are specifically agreed to by Seller. Requirements for any additional inspection, tests, documentation, or Buyer witness of manufacture, test, and/or inspection shall be subject to additional charges.

4. TITLE AND RISK OF LOSS

Title and risk of loss shall pass to buyer upon delivery of products at the designated Ex Works place (Incoterms 1990) unless otherwise agreed by the parties. See Reverse

5. EROSION AND CORROSION

It is specifically understood that products and parts sold hereunder are not warranted for operation with erosive or corrosive fluids. No product or part shall be deemed to be defective by reason of failure to resist erosive or corrosive action of any fluid and Buyer shall have no claim whatsoever against Seller therefore.

6. WARRANTY AND LIMITATION OF LIABILITY.

A. Seller warrants only that its product and parts, when shipped, and its work (including installation, construction and start-up), when performed will meet all applicable specifications and other specific product and work requirements (including those of performance), if any, of this agreement, and will be free from defects in materials and workmanship. With respect to products, parts and work not manufactured or performed by Seller, Seller's only obligation shall be to assign to Buyer, to the extent possible, whatever warranty Seller requires from the manufacturer. All claims for defective products or parts under this warranty must be made in writing immediately upon discovery and, in any event, within one (1) year after (retest start-up or eighteen (18) months after shipment, whichever first occurs, and all claims for defective work must be made in writing immediately upon discovery and in any event, within one (1) year of completion thereof by Seller. Defective items must be held for Seller's inspection and returned to the original f.o.b. point upon request. **THE FOREGOING IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHATSOEVER, EXPRESS, IMPLIED AND STATUTORY, INCLUDING WITHOUT LIMITS MERCHANTABILITY AND FITNESS.**

B. Upon Buyer's submission of a claim as provided above and its substitution, Seller shall at its option either (i) repair or replace its product, part or work at the original place of

delivery, or (ii) refund an equitable portion of the purchase price.

C. THE FOREGOING IS SELLER'S ONLY OBLIGATION AND BUYER'S EXCLUSIVE REMEDY FOR BREACH OF WARRANTY AND, EXCEPT FOR GROSS NEGLIGENCE, WILLFUL MISCONDUCT, AND REMEDIES PERMITTED UNDER THE PERFORMANCE, INSPECTION AND ACCEPTANCE AND THE PATENTS CLAUSES HEREOF, THE FOREGOING IS BUYER EXCLUSIVE REMEDY AGAINST SELLER FOR ALL CLAIMS ARISING HEREUNDER OR RELATING HERETO WHETHER SUCH CLAIMS ARE BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHER THEORIES. BUYER'S FAILURE TO SUBMIT A CLAIM AS PROVIDED ABOVE SHALL SPECIFICALLY WAIVE ALL CLAIMS FOR DAMAGES OR OTHER RELIEF, INCLUDING BUT NOT LIMITED TO CLAIMS BASED ON LATENT DEFECTS. IN NO EVENT SHALL BUYER BE ENTITLED TO INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, NOR FOR DAMAGES FOR LOSS OF USE, LOST PROFITS OR REVENUE, INTEREST, LOST GOODWILL, WORK OR PRODUCTION STOPPAGE, IMPAIRMENT OF OTHER GOODS, INCREASED EXPENSES OF OPERATION, OR THE COST OF PURCHASING REPLACEMENT POWER OR OTHER SERVICES BECAUSE OF SERVICE INTERRUPTIONS. FURTHERMORE, IN NO EVENT SHALL SELLER'S TOTAL LIABILITY FOR DAMAGES OF BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS OR PARTS MANUFACTURED BY SELLER AND UPON WHICH SUCH LIABILITY IS BASED. ANY ACTION ARISING HERE-UNDER OR RELATED HERETO, WHETHER BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHER THEORIES, MUST BE COMMENCED WITHIN ONE (1) YEAR AFTER THE CAUSE OF ACTION ACCRUES OR IT SHALL BE BARRED.

7. PATENTS

Seller agrees to assume the defense of any suit for infringement of any patents brought against Buyer to the extent of such suit charges infringement of an apparatus or product claim by Seller's product in an of itself, provided (i) said product is built entirely to Seller's design, (ii) Buyer notifies Seller in writing of the filing of such suit within ten (10) days after the service of process thereof, and (iii) Seller is given complete control of the defense of such suit, including the right to defend, settle and make changes in the product for the purpose of avoiding infringement of any process or method claims, unless infringement of such claims is the result of following specific instruction furnished by Seller.

8. EXTENT OF SUPPLY

Only products and listed in Seller's proposal are included in this agreement. It must not be assumed that Seller has included anything beyond same.

9. MANUFACTURING SOURCES

To maintain delivery schedules, Seller reserves the right to have all or any part of the Buyer's order manufactured at any of Seller's or its licensee's plants on a world-wide basis.

(TermsJ-93Bob)

Application

For silencing intake and discharge of centrifugal compressors in areas requiring maximum silencing.

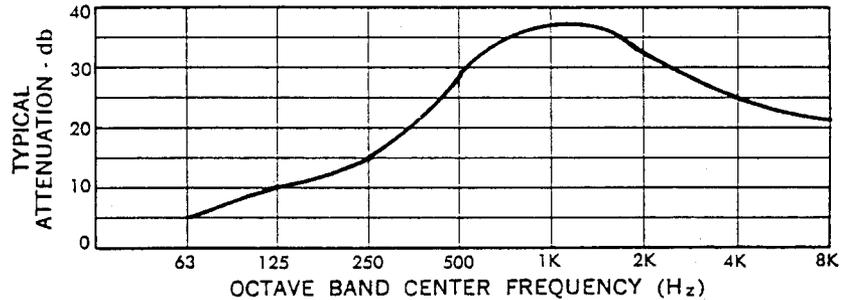
Design

Gas flows through annular passage lined with appropriate acoustic material to produce the desired noise reduction. Internal design provides minimum pressure drop. The C23 may be installed vertically or horizontally.

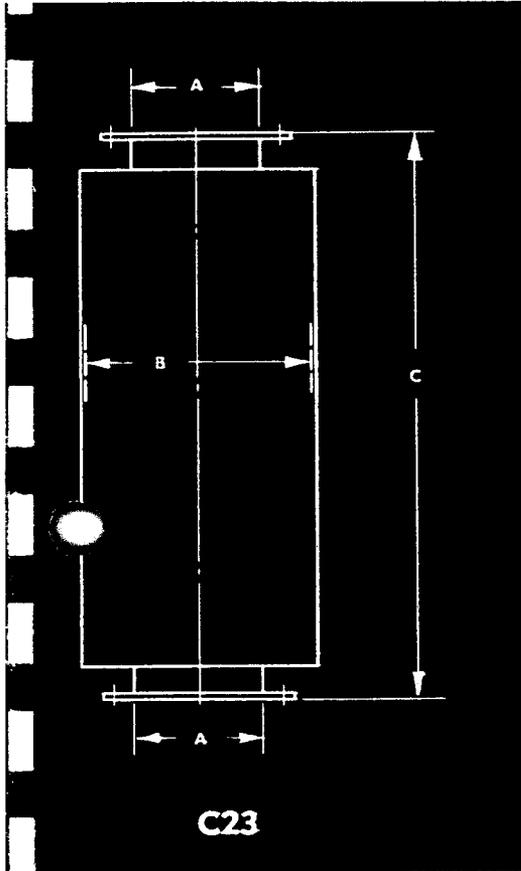
Construction

All welded sheet and plate steel. Absorption material appropriate for operating conditions. Exterior surfaces are prime coated. Flanges are drilled to match 125 lb. American Standard Flanges. Side connections, mounting brackets, or special paint available at extra cost.

Typical Attenuation Curve



Model	A	B	C	Wt.
C23 - 4	4	10	23	40
C23 - 5	5	11	27	63
C23 - 6	6	12	31	87
C23 - 8	8	18	38	157
C23 - 10	10	20	44	234
C23 - 12	12	23	56	346
C23 - 14	14	26	62	468
C23 - 16	16	30	68	642
C23 - 18	18	32	74	778
C23 - 20	20	34	80	969
C23 - 22	22	36	88	1241
C23 - 24	24	40	92	1571
C23 - 26	26	42	104	1864
C23 - 28	28	46	116	2300
C23 - 30	30	48	122	2658
C23 - 32	32	50	130	3181
C23 - 36	36	57	140	4300
C23 - 42	42	66	164	6137
C23 - 48	48	74	188	8205



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Silencers**

Specialists in Industrial Silencing

Stoddard Silencers, Inc.
P.O. Box 397 • Grayslake, Illinois 60030
Telephone (708) 223-8636 • FAX (708) 223-8638

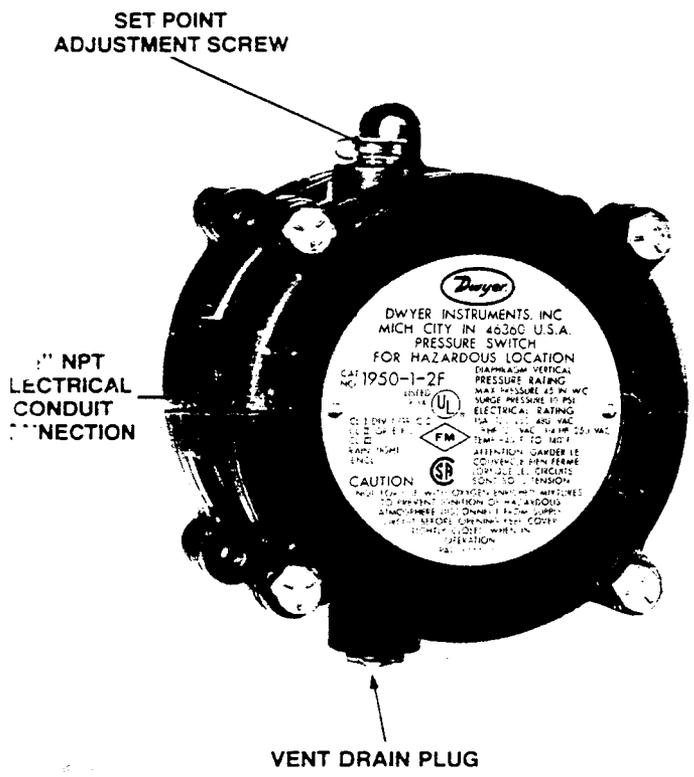




SERIES 1950

INTEGRAL EXPLOSION-PROOF PRESSURE SWITCHES Specifications - Installation and Operating Instructions

UL and CSA Listed, FM Approved For
CL. I GR. C,D - CL. II GR. E,F,G - CL. III



Model 1950 Switches: Operating ranges and dead bands.

To order specify Model Number	Operating Range Inches, W.C.	Approximate Dead Band	
		At Min. Set Point	At Max. Set Point
1950-04	0.03 to 0.35	0.02	0.09
1950-00	0.07 to 0.15	0.04	0.05
1950-0	0.15 to 0.5	0.10	0.15
1950-1	0.4 to 1.6	0.15	0.20
1950-5	1.4 to 5.5	0.3	0.4
1950-10	3.0 to 11.0	0.4	0.5
1950-20	4.0 to 20.0	0.4	0.6

Model Number	Operating Range PSI	Approximate Dead Band	
		Min. Set Point	Max. Set Point
1950P-2	.5 to 2.0	0.3 PSI	0.3 PSI
1950P-8	1.5 to 8.0	1.0 PSI	1.0 PSI
1950P-15	3.0 to 15.0	0.9 PSI	0.9 PSI
1950P-25	4.0 to 25.0	0.7 PSI	0.7 PSI
1950P-50	15.0 to 50	1.0 PSI	1.5 PSI

PHYSICAL DATA

Temperature Limits: -40° to 140°F (-40° to 60°C), 1950P-8, 15, 25 & 50: 0° to 140°F (-17.8° to 60°C), 1950-04: -30° to 130°F (-34.4° to 54.4°C).

Rated Pressure: 1950 - 45 IN. W.C., 1950P - 35 PSI, 1950P-50 only - 70 PSI.

Maximum surge pressure: 1950 - 10 PSI, 1950P - 50 PSI, 1950P-50 only - 90 PSI.

Pressure Connections: 1/8" NPT.

Electrical Rating: 15 amps, 125, 250, 480 volts, 60 Hz. A.C. Resistive 1/8 H.P. @ 125 volts, 1/4 H.P. @ 250 volts, 60 Hz. A.C.

Wiring connections: 3 screw type; common, norm. open and norm. closed.

Conduit connections: 1/2" NPT.

Set point adjustment: Screw type on top of housing. Field adjustable.

Housing: Anodized cast aluminum.

Diaphragm: Molded fluorosilicone rubber. 04 model, silicone on nylon.

Calibration Spring: Stainless Steel.

Installation: Mount with diaphragm in vertical position.

Weight: 3 1/4 lbs. 04 model, 4 lbs., 7 oz.

Response Time: Because of restrictive effect of flame arrestors, switch response time may be as much as 10-15 seconds where applied pressures are near set point.

NOTE: The last number-letter combination in the 1950 model number identifies the switch electrical rating (number) and diaphragm material (letter). The 2F combination is standard as described in the physical data above. In the case of special models, a number 1 rating is the same as 2; a number 3 or 4 rating is 10A 125, 250, 480 VAC - 1/8 HP 125 VAC, 1/4 HP 250 VAC; and a number 5 or 6 rating is 1A 125 VAC. A letter B indicates a Buna-N diaphragm, N; Neoprene, S; Silicone, and V; Viton.

The New Model 1950 Explosion-Proof Switch combines the best features of the popular Dwyer Series 1900 Pressure Switch with a compact explosion-proof housing.

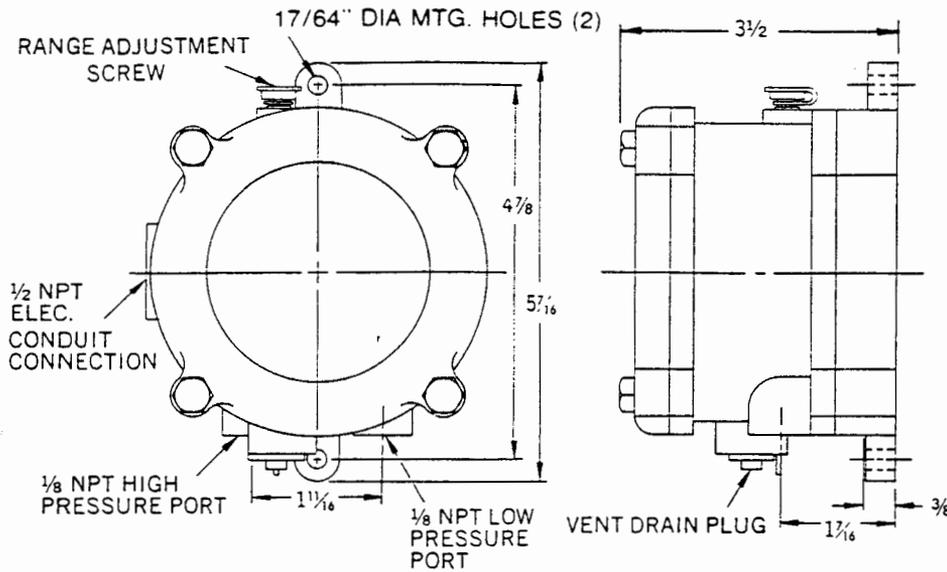
The unit is U.L. and CSA listed, FM approved for use in Class I, Groups C & D, Class II, Groups E, F, & G and Class III atmospheres. It is also totally rain-tight for outdoor installations. Twelve models allow set-points from .03 to 20 inches W.C. and from .5 to 50 PSI.

Easy access to the SPDT switch for electrical hook-up is provided by removing the top plate of the three-part aluminum housing. Adjustment to the set point of the switch can be made without disassembly of the housing. The unit is very compact, about half the weight and bulk of equivalent conventional explosion-proof switches.

CAUTION: For use only with air or compatible gases. Use of the Model 1950 switch with explosive media connected to the **Low** pressure port (including differential pressure applications in such media) is not recommended. Switch contact arcing can cause an explosion inside the switch housing which, while contained, may render the switch inoperative. If switch is being used to sense a single positive pressure relative to atmosphere, run a line from the low pressure port to a non-hazardous area free of combustible gases. This may increase response time on -0 and -00 models.

INTEGRAL EXPLOSION-PROOF PRESSURE SWITCHES

Installation and Operating Instructions



1950-04: 7-3/4" dia. x 4-11/32" depth.
For complete dimensions request drawing 28-700175-00 from our Customer Service Department.

1950 SWITCH OUTLINE DIMENSIONS

INSTALLATION

1. Select a location free from excess vibration and corrosive atmospheres where temperatures will be within the limits noted under Physical Data on page 1. Switch may be installed outdoors or in areas where the hazard of explosion exists. See page 1 for specific types of hazardous service.
2. Mount standard switches with the diaphragm in a vertical plane and with switch lettering and Dwyer nameplate in an upright position. Some switches are position sensitive and may not reset properly unless they are mounted with the diaphragm vertical. Special units can be furnished for other than vertical mounting arrangements if required.
3. Connect switch to source of pressure, vacuum or differential pressure. Metal tubing with 1/4" O.D. is recommended, but any tubing which will not restrict the air flow can be used. Connect to the two 1/8" NPT female pressure ports as noted below:
 - A. Differential pressures - connect pipes or tubes from source of greater pressure to high pressure port marked HIGH PRESS. and from source of lower pressure to low pressure port marked LOW PRESS.
 - B. Pressure only (above atmospheric) - connect tube from source of pressure to high pressure port. The low pressure port is left open to atmosphere. See CAUTION on page 1.
 - C. Vacuum only (below atmospheric pressure) - connect tube from source of vacuum to low pressure port. The high pressure port is left open to atmosphere.
4. To make electrical connections, remove the three hex head screws from the cover and after loosening the fourth captive screw, swing the cover aside. Electrical connections to the standard single pole, double throw snap switch are provided by means of screw terminals marked "common," "norm open," and "norm closed." The normally open contacts close and the normally closed contacts open when pressure increases beyond the setpoint. Switch loads for standard models should not

exceed the maximum specified current rating of 15 amps resistive. Switch capabilities decrease with an increase in ambient temperature, load inductance, or cycling rate. Whenever an application involves one or more of these factors, the user may find it desirable to limit the switch current to 10 amps or less in the interest of prolonging switch life.

ADJUSTMENT

To change the setpoint:

- A. Remove the plastic cap and turn the slotted Adjustment Screw at the top of the housing clockwise to raise the setpoint pressure and counter-clockwise to lower the setpoint. After calibration, replace the plastic cap and re-check the setpoint.
- B. The recommended procedure for calibrating or checking calibration is to use a "T" assembly with three rubber tubing leads, all as short as possible and the entire assembly offering minimum flow restriction. Run one lead to the pressure switch, another to a manometer of known accuracy and appropriate range, and apply pressure through the third tube. Make final approach to the setpoint very slowly. Note that manometer and pressure switch will have different response times due to different internal volumes, lengths of tubing, fluid drainage, etc. Be certain the switch is checked in the position it will assume in use, i.e. with diaphragm in a vertical plane and switch lettering and Dwyer nameplate in an upright position.
- C. For highly critical applications check the setpoint adjustment and if necessary, reset it as noted in step A.

MAINTENANCE

The moving parts of these switches need no maintenance or lubrication. The only adjustment is that of the setpoint. Care should be taken to keep the switch reasonably clean. Periodically the vent drain plug should be rotated then returned to its original position. This will dislodge deposits which could accumulate in applications where there is excessive condensation within the switch.

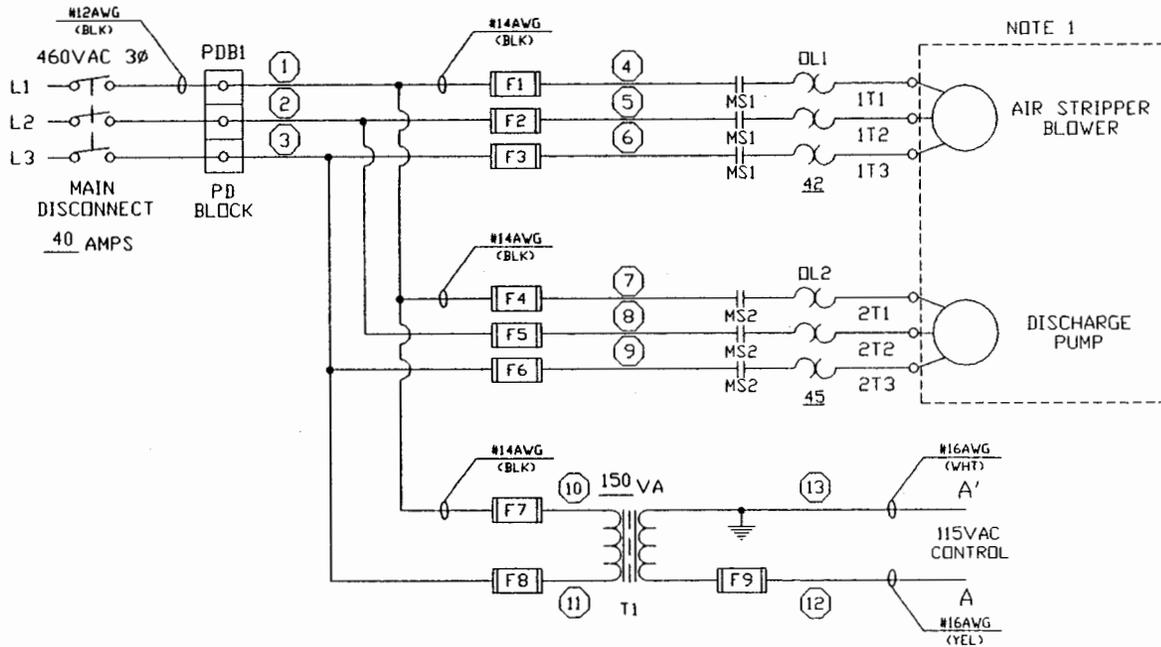


DWYER INSTRUMENTS, INC.

2701 Erie St., Chicago, Ill. 60610, U.S.A.
219/375-3600 Fax 219/372-3057

MOTOR	HP	VOLTAGE	FLA	FUSE SIZE
AIR STRIPPER BLOWER	7-1/2	460	9.5	15A
DISCHARGE PUMP	1	460	1.6	3A

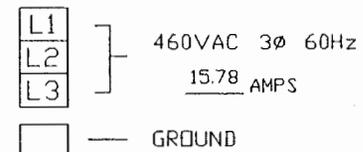
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NOTE 1

FIELD WIRING TERMINALS

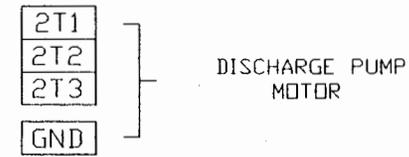
LINE



LOAD (460VAC)

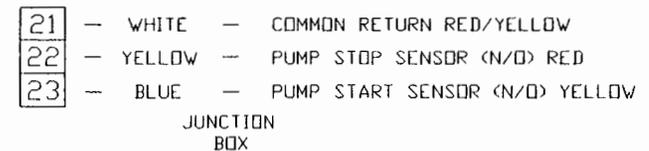


LOAD (460VAC)



AS BUILT

SENSOR (INTRINSICALLY SAFE)



- NOTE: 1. NOT PART OF CONTROLLER.
 2. IF MOTOR THERMALS ARE NOT USED, JUMPER THE THE UNUSED TERMINAL PAIRS (1&2,3&4)
 3. REFERENCE INSTALLATION OF INTRINSICALLY SAFE INSTRUMENT SYSTEMS IN CLASS I HAZARDOUS LOCATIONS, ANSI/ISA-RP 12.6-1987, SECTION 4.5.4
 4. MUST PUSH 'RESET' BUTTON TO START SYSTEM

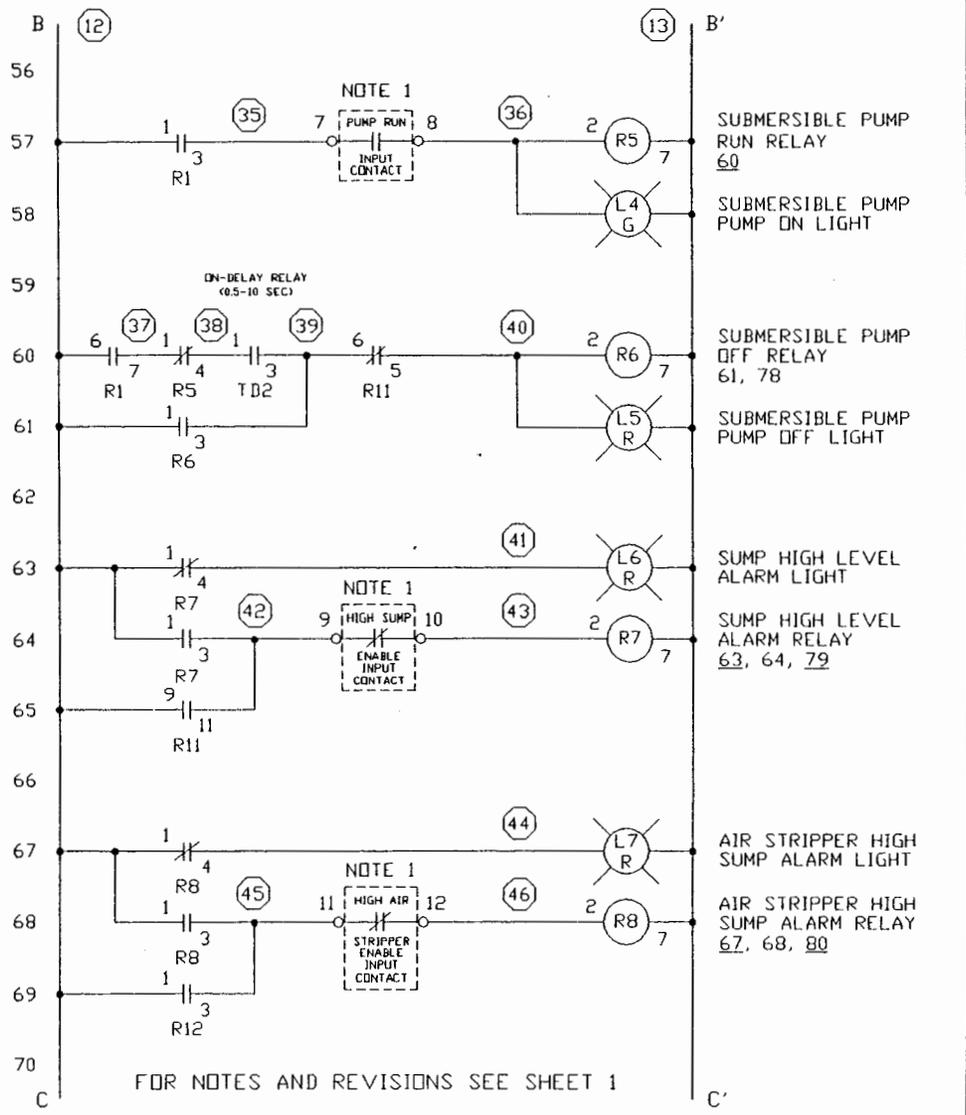
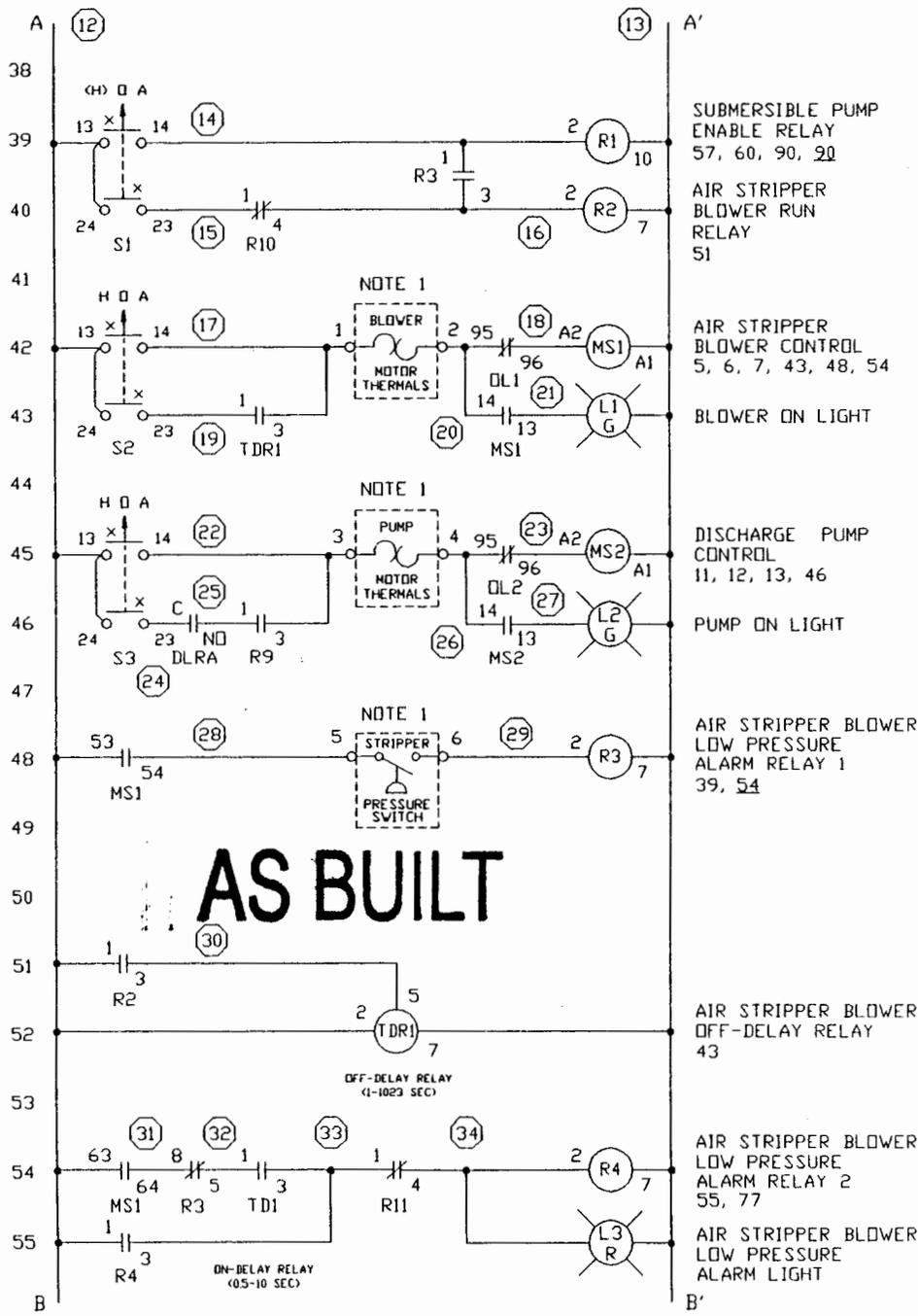
FUSE	TYPE	RATING
F1-F3	LPJ-SP	15
F4-F6	LPJ-SP	3
F7-F8	FNQ	4/10
F9	FNM	1-1/2

33
35
37

JOB No.	01-5296
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TOLERANCES		REVISIONS	
DECIMAL	EXCEPT AS NOTED	NO	DATE
FRACTIONAL		BY	
ANGLE/AP			
EPG COMPANIES		SERIES 1400 CONTROLLER	
460VAC 3Ø SH 1 OF 3		DESIGN	SCALE
RCK		DATE	06-07-01
RCK		DRAWING NO	05346-0100





JOB No. 01-5296

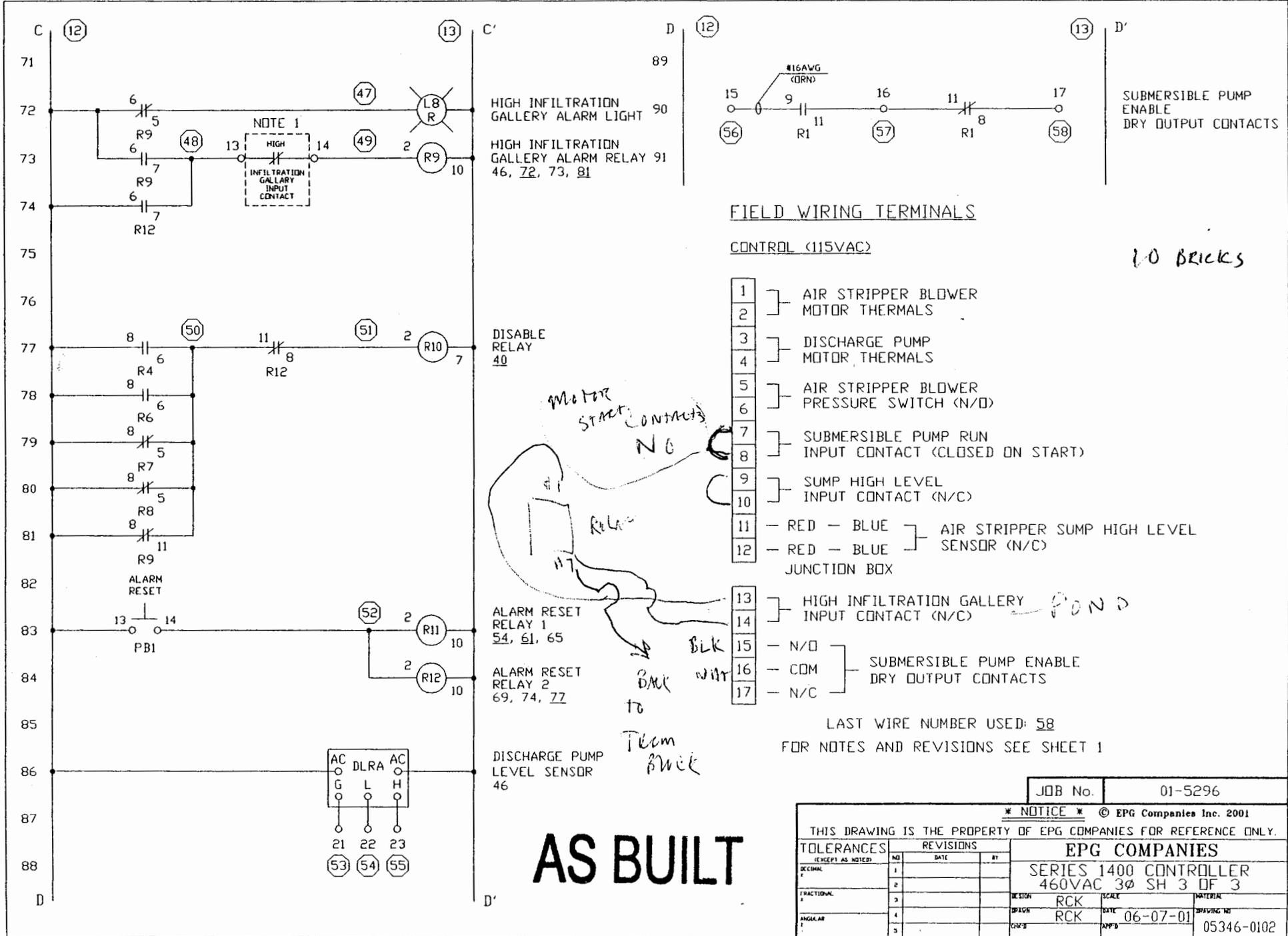
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DECIMAL	(EXCEPT AS NOTED)	NO.	DATE	BY	DESIGN	SCALE	DRAWING NO.	MATERIAL
1		1			RCK		06-07-01	
2		2			RCK			
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4		4						
5		5						

SERIES 1400 CONTROLLER
460VAC 3Ø SH 2 OF 3

DATE: 06-07-01
APP'D: 05346-0101



JOB No. 01-5296

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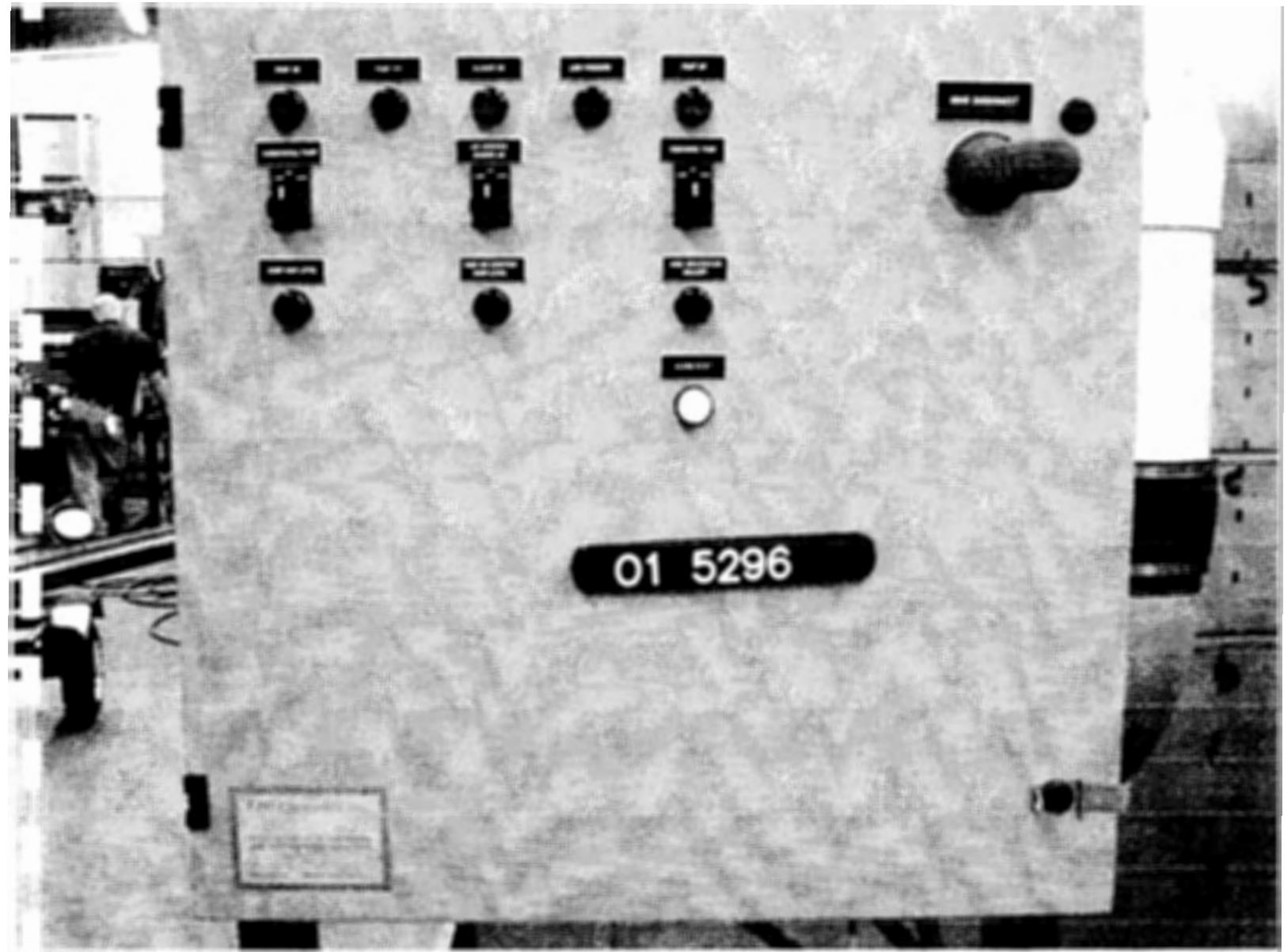
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TOLERANCES (EXCEPT AS NOTED)		REVISIONS		EPG COMPANIES	
DECIMAL	FRACTIONAL	NO.	DATE	BY	
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SERIES 1400 CONTROLLER
460VAC 3Ø SH 3 DF 3

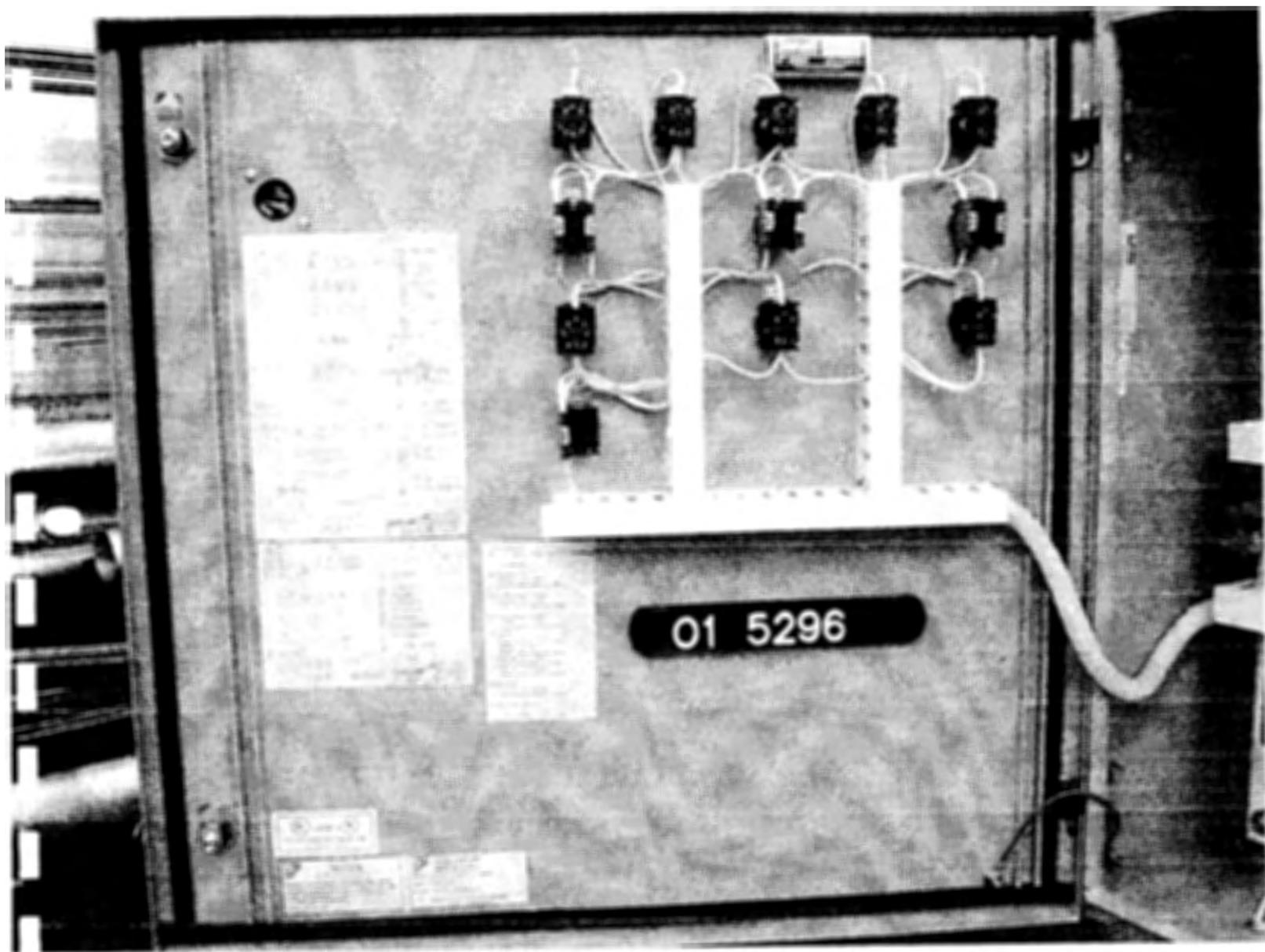
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2	RCK	
DATE	06-07-01	DRAWING NO.
APP'D		05346-0102





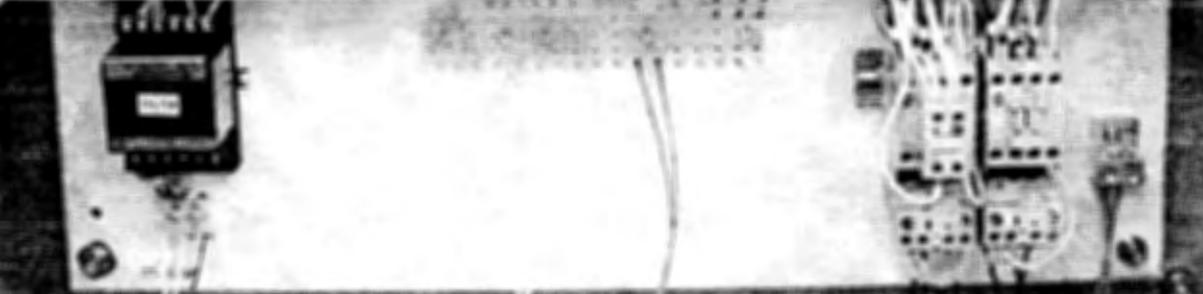
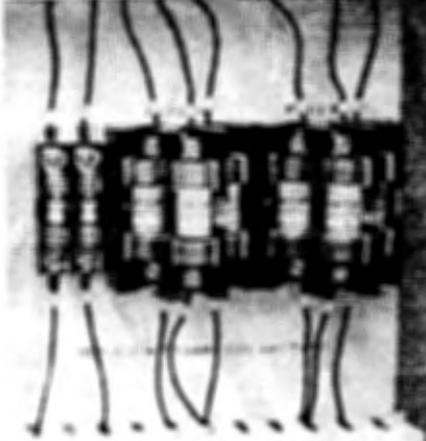
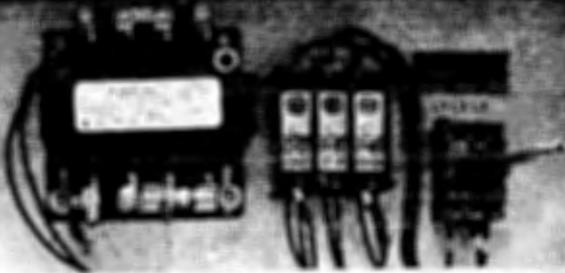
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01 5296





LIMITED WARRANTY

This agreement shall be deemed to have been entered into in the State of Minnesota, and shall be construed in accordance with the laws of the State of Minnesota, including Minnesota's enactment of the Uniform Commercial Code. Buyer hereby stipulates and agrees that Hennepin County, Minnesota shall be the proper jurisdiction for adjudicating all claims and controversies arising from this agreement.

Products manufactured by EPG Companies Inc. are warranted for a period of 12 months from date of installation or eighteen(18) months from date of manufacture* to be free from defects of materials and workmanship. It is expressly agreed that the exclusive remedy under this warranty is limited solely to the repair or replacement, at the sole discretion of EPG, of the part that failed. The cost of labor for any field repairs is not covered by this warranty. EPG Companies will not be liable for any damage or wear due to abnormal conditions or improper installation.

Products not manufactured by EPG Companies Inc. are covered by the original manufacturer's warranty, which EPG Companies passes through to the purchaser. The actual manufacturer will make warranty determination.

To have a defective part repaired or replaced, you must return the defective product to EPG Companies. Please call (800) 443-7426 or (763) 424-2613 to obtain a Return Goods Authorization (RGA) number. Send defective product (freight prepaid) with RGA #, description of installation, installation data and failure date to EPG Companies Inc., 19900 County Rd. 81, Maple Grove, MN 55311.

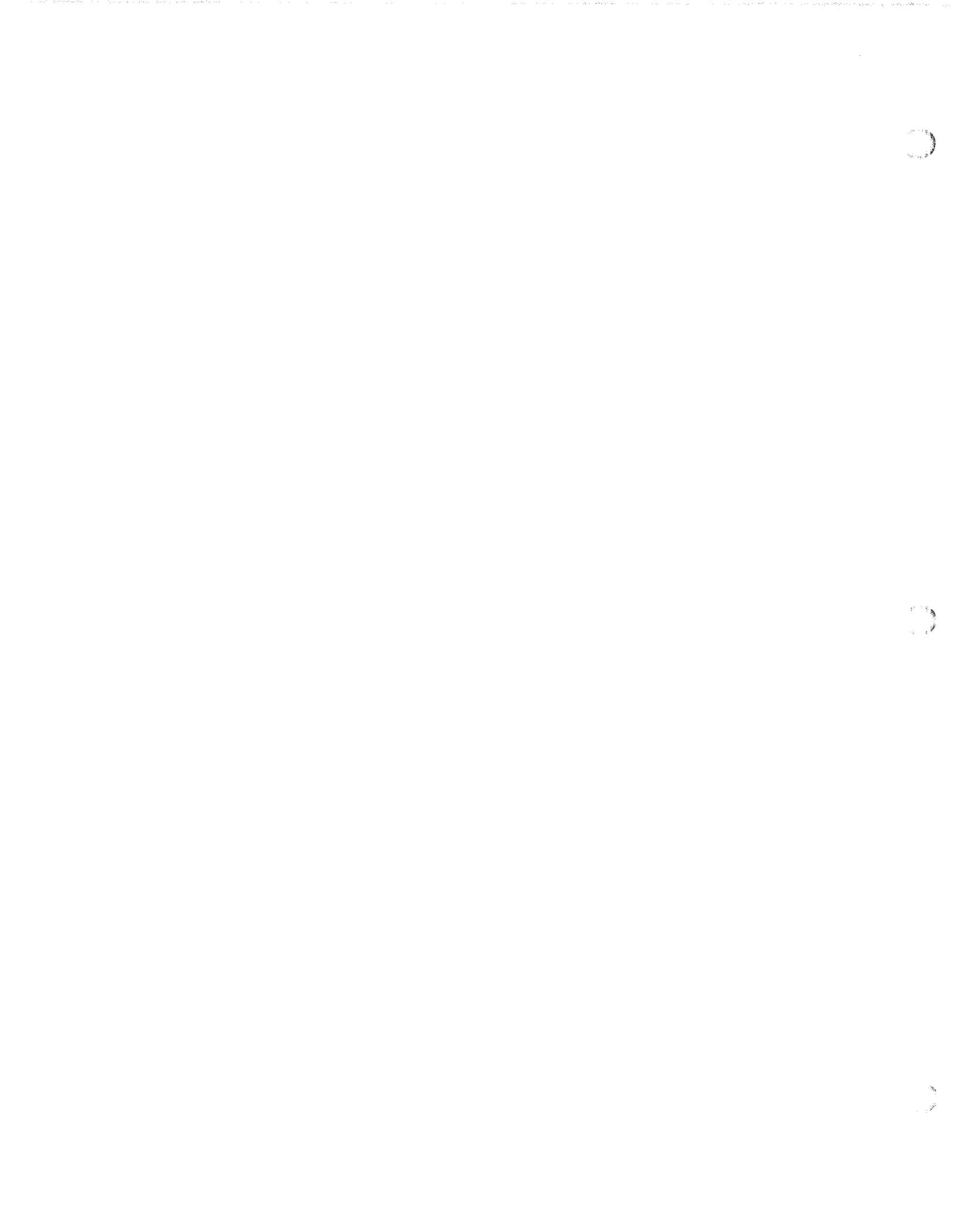
EPG Companies will not be held liable for any incidental or consequential damages, losses or expenses incurred from installation, use or any other reason. **THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF EITHER FITNESS FOR A PARTICULAR PURPOSE OR OF MERCHANTABILITY, WHICH EXTEND BEYOND THOSE SPECIFICALLY LISTED HERE.**

If equipment is to be stored for a period greater than six months, proper storage precautions must be taken if the warranty is to be maintained. Please call EPG Companies for specific requirements regarding product storage.

The following is a partial list of items which will void the warranty:

- Opening the motor for any reason.
- Using undersized electrical wire.
- Making unauthorized circuit changes. Please call EPG Companies before making any changes.
- Operating a three phase submersible motor from single phase power through a phase converter unless 3-leg ambient-compensated quick trip overload protectors are used and complete details are sent in writing to EPG Companies.

* To qualify for the delayed installation warranty you must contact EPG Companies Inc., at (800) 443-7426 or (763) 424-2613 within 60 days of purchase.

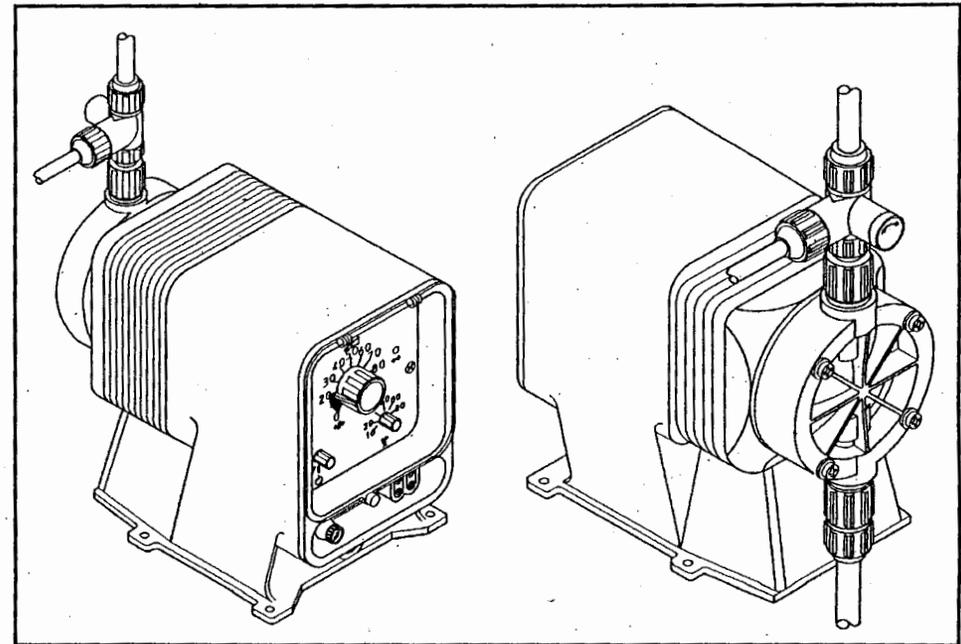


ATTACHMENT D
CHEMICAL FEED PUMP LITERATURE

Electronic Metering Pumps

Series C, C PLUS, A PLUS, E, E-DC and E PLUS

Installation
Operation
Maintenance
Instruction



**READ ALL WARNINGS CAREFULLY
BEFORE INSTALLING**

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1.0 SAFETY INSTRUCTIONS



When using chemical feed pumps, basic safety precautions should always be followed to reduce risk of fire, electric shock, and personal injury. Failure to follow these instructions could result in death or serious injury.



READ ALL INSTRUCTIONS

1.1 GENERAL SAFETY CONSIDERATIONS

- Always wear protective clothing including gloves and safety goggles when working on or near chemical metering pumps.
- Inspect tubing regularly when replenishing chemical solution for cracking or deterioration and replace as necessary. **(Always wear protective clothing and safety glasses when inspecting tubing.)**
- When pump is exposed to direct sunlight use U.V. resistant tubing.
- Follow directions and warnings provided with the chemicals from the chemical manufacturer. User is responsible for determining chemical compatibility with chemical feed pump.
- Secure chemicals and metering pumps, making them inaccessible to children and pets.
- Make sure the voltage on the chemical metering pump matches the voltage at the installation site.
- Do not cut plug or the ground lug off of the electrical cord – consult a licensed electrician for proper installation.
- Pump is **NOT** to be used to handle flammable liquids.

1.2 SAFETY OPERATING PROCEDURES

Each Electronic Metering Pump has been tested to meet prescribed specifications and safety standards.

Proper care in handling, installation and operation will help in ensuring a trouble free installation.

Please read all these cautionary notes prior to installation and start-up of your metering pump.

Important: Pump must be installed and used with supplied back pressure/injection valve. Failure to do so could result in excessive pump output.

- Handle the pump with care. Dropping or heavy impact causes not only external damage to the pump, but also to electrical parts inside.
- Install the pump in a place where the ambient temperature does not exceed 104°F (40°C). The pump is water resistant and dust proof by construction and can be use outdoors, however **do not operate the pump submerged**. To avoid high internal pump temperatures, do not operate in direct sunlight.

CAUTION Solenoid housing, head and pump housing may be hot to touch 160°F (70°C).

- Install the pump in a place convenient for its future maintenance and inspection, and then secure it to prevent vibration.
- Protective caps must be removed prior to installing tubing onto valve assemblies. Use tubing of specified size. Connect the tubing to the suction side securely to prevent the entrance of outside air. Make sure that there is no liquid leakage on the discharge side.
- Be careful to check that the voltage of the installation matches voltage indicated on the pump data label. Most pump models are equipped with a three-prong plug. Always be sure the pump is grounded. To disconnect, do not pull wire but grip the plug with fingers and pull out. Do not use the receptacle in common with heavy electrical equipment, which generates surge voltage. It can cause failure of the electronic circuit inside the pump.
- Tampering with electrical devices can be potentially hazardous. Always place chemicals and pump installation well out of the reach of children.
- Never repair or move the metering pump while operating. Always disconnect electrical power. **For safety, always wear protective clothing (protective gloves and safety glasses) when working on or near chemical metering pumps.**
- An air bleed valve is available for most models with tubing connections. Air purges should be performed when the pump-chamber contains no fluid at the time of start-up. As a safety measure, connect the return tubing to the air bleed valve and bypass fluid back to storage tank or a suitable drain.
- For accurate volume output, the pump must be calibrated under typical operating conditions.

- Chemicals used may be dangerous and should be used carefully and according to warnings on the label. Follow the directions given with each type of chemical. Do not assume chemicals are the same because they look alike. Always store chemicals in a safe location away from children and others. We cannot be responsible for the misuse of chemicals being fed by the pump. Always have the material safety data sheet (MSDS) available for any fluid being pumped.
- All pumps are pretested with water before shipment. Remove head and dry thoroughly if you are pumping a material that will react with water, (i.e. sulfuric acid, polymers). Valve seats, ball checks, gaskets, and diaphragm should also be dried. Before placing pump into service, extreme care should be taken to follow this procedure.
- Valve cartridges are stamped to indicate fluid flow direction. Always install so that markings read from top to bottom, with the arrow pointing in the direction of flow.
- When metering hazardous material **DO NOT** use plastic tubing, strictly use proper rigid pipe. Consult supplier for special adapters or valve assemblies.
- **Pump is NOT to be used to handle or meter flammable liquids or materials.**
- Standard white discharge tubing is not recommended for installations exposed to direct sunlight. Consult supplier for special black tubing.
- Factory will not be held responsible for improper installation of pump, or plumbing. All cautions are to be read thoroughly prior to hookup and plumbing. For all installations a professional plumber should be consulted. Always adhere to local plumbing codes and requirements.
- When using pump with pressurized systems, make sure the pressure of the system does not exceed the maximum pressure rating on the pump data label. Be sure to depressurize system prior to hook up or disconnecting a metering pump.
- Electronic power modules are equipped with automatic reset thermal overload devices and may reset unexpectedly.

2.0 UNPACKING THE PUMP

Check all equipment for completeness against the order and for any evidence of shipping damage. Shortages or damages should be reported immediately to the carrier and to the seller of the equipment.

The carton should contain:

- Metering Pump
- Clear Flexible Suction Tubing*
- Stiff White Discharge Tubing*
- Foot valve/Strainer Assembly
- Backpressure Injection Valve Assembly
- Manual
- Bleed Valve Assembly*
- Strainer Weight*

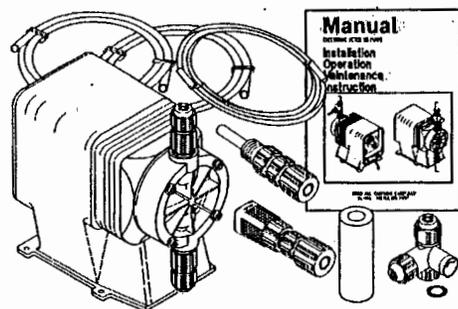


FIGURE 1

*Items may or may not be included depending on model.

Make sure that all items have been removed from the shipping carton before it is discarded.

3.0 INTRODUCTION

These installation, operation and maintenance instructions cover your electronic metering pump. Refer to the pump data label to determine the actual model.

3.1 PRINCIPLE OF OPERATION

Diaphragm metering pumps are used to dispense chemicals or fluids. This is achieved by an electromagnetic drive mechanism (solenoid), which is connected to a diaphragm. When the solenoid is pulsed by the control circuit it displaces the diaphragm, which, through the use of check valves, moves the fluid out the discharge under pressure. When the solenoid is de-energized it returns the diaphragm and pulls more fluid into the pump head and the cycle repeats.

The pump stroke rate is controlled by an internal circuit and is changed by turning the rate knob. The mechanical stroke length is controlled by the stroke length knob. Some models do not allow stroke rate control and do not have the stroke rate knob.

3.2 MATERIALS OF CONSTRUCTION

The wetted materials (those parts that contact the solution being pumped) available for construction are FPP (glass filled polypropylene), PVC, SAN, Hypalon, Viton, Teflon, 316 Stainless Steel, PVDF, Ceramic and Alloy C. These materials are very resistant to most chemicals. However, there are some chemicals, such as strong acids or organic solvents, which cause deterioration of some elastomer and plastic parts, such as the diaphragm, valve seats, or head.

3.2 MATERIALS OF CONSTRUCTION cont'd.

Consult a Chemical Resistance Guide or Supplier for information on chemical compatibility.

Various manufacturers of plastics, elastomers and pumping equipment publish guidelines that aid in the selection of wetted materials for pumping commercially available chemicals and chemical compounds. Two factors must always be considered when using an elastomer or plastic part to pump chemicals. They are:

- The temperature of service: Higher temperatures increase the effect of chemicals on wetted materials. The increase varies with the material and the chemical being used. A material quite stable at room temperature might be affected at higher temperatures.
- Material choice: Materials with similar properties may differ greatly from one another in performance when exposed to certain chemicals.

4.0 INSTALLATION

The metering pump should be located in an area that allows convenient connections to both the chemical storage tank and the point of injection. The pump is water resistant and dust proof by construction and can be used outdoors, however, **do not operate submerged**. Avoid continuous temperatures in excess of 104°F (40°C). To do otherwise could result in damage to the pump.

4.1 MOUNTING

Typical mounting arrangements are shown in Figures 3, 4, and 5.

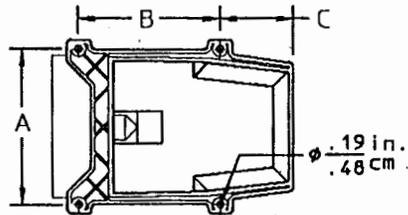
Important: Injection point must be higher than the top of the solution supply tank to prohibit gravity feeding, unless suitable backpressure is always present at the injection point. Installation of an antisiphon valve will prohibit gravity feeding.

- For wall or shelf mounting refer to Figure 3. Connect suction tubing to suction valve of chemical pump. Suction valve is the lower valve. Tubing should be long enough so that the foot valve/strainer assembly hangs about 1-2 inches (2-5 cm) above the bottom of chemical tank. To keep chemical from being contaminated, the tank should have a cover.

- Flooded suction mounting (installing the pump at the base of the chemical storage tank, Figure 4) is the most trouble free type of installation and is recommended for very low output requirements. Since the suction tubing is filled with chemical, priming is accomplished quickly and the chance of losing prime is reduced.

To mount pump, drill four holes of .25" (6 mm) diameter in the shelf as shown in the dimension drawing (Figure 2). Attach pump securely using four #10 (M5) bolts and nuts.

- The pump can be mounted on top of a solution tank as shown in Figure 5. Install chemical pump on the cover. Insert suction tubing through the center hole and cut tubing so foot valve/strainer hangs about 1 or 2 inches (2-5 cm) above the bottom of the tank. Mount the chemical pump rigidly by drilling four .25" (6 mm) holes and using four #10 (M5) screws and nuts.



MOUNTING HOLE DIMENSIONS

HOUSING SIZE	DIMENSIONS (in./cm.)		
	A	B	C
HSG. #1	4.50/11.4	3.00/7.6	1.75/4.4
HSG. #2	4.81/12.2	4.38/11.1	2.19/5.6
HSG. #3	5.56/14.1	4.38/11.1	2.19/5.6

FIGURE 2

- USE AN ANTI-SIPHON VALVE IN THE DISCHARGE LINE whenever the fluid pressure in the discharge line is below atmospheric pressure. This can occur if the injection point is on the suction side of a water pump or against a "negative" head such as when feeding down into a well.

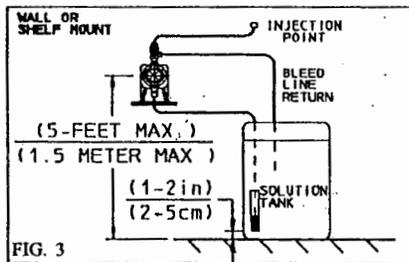


FIG. 3

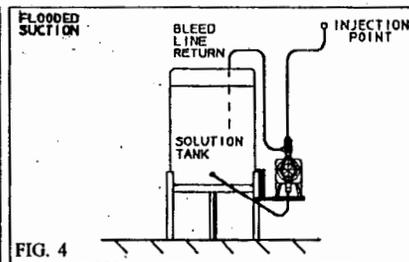


FIG. 4

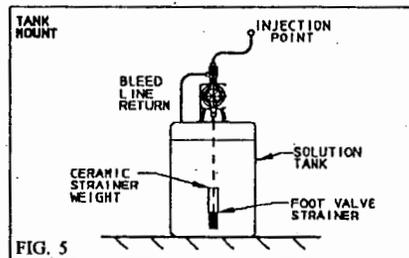


FIG. 5

4.2 PIPING

- Use provided tubing of specified size for connection. Connect tubing securely to prevent leakage of chemical and the entrance of air. Since plastic nuts are used for fittings, they should not be tightened excessively (i.e. hand tighten only). NPT suction and discharge valves must **NOT** be over tightened. Hold fitting in place while adding piping and fittings. NPT suction and discharge valves should only be tightened 25 to 35 in. lbs. (4.5-6.3 kg/cm).
- If the air bleed valve assembly is being used, a return line (tubing) should be securely connected and routed back to the storage tank. **To avoid possible injury from chemicals do not attempt to prime using a bleed valve without installing a return line.**
- When pump is shelf mounted or top mounted on tank, suction tubing should be kept as short as possible.
- To maintain metering performance, a backpressure/injection valve is provided. The spring in the standard injection valve typically adds 17-20 PSI (1.17-1.38 BAR) to the line pressure, with the exception of the H8 pump, which adds 8-10 PSI (.55-.69 BAR). The injection valve must be installed in the discharge line. Best practice is to install the injection valve at the point of chemical injection.
- If the discharge tubing is going to be exposed to direct sunlight, black tubing should be used instead of the standard white translucent tubing supplied with each pump. To obtain, contact supplier.
- To prevent clogging or check valve malfunction always install a strainer assembly to the end of the suction tubing (Figure 5). This foot valve/strainer assembly should always be installed 1 to 2 inches (2-5 cm) above the bottom of the chemical tank. This will help prevent clogging the strainer with any solids that may settle on the tank bottom. The chemical tank and foot valve/strainer should be cleaned regularly, to ensure continuous trouble free operation. If the chemical being pumped regularly precipitates out of solution or does not dissolve easily or completely (e.g. calcium hydroxide), a mixer should be used in the chemical tank. These are readily available in many motor configurations and mounting. To obtain, contact supplier.
- A flooded suction (tank liquid level always at a higher elevation than the pump) is recommended when pumping solutions such as sodium hypochlorite (NaOCl), hydrogen peroxide (H₂O₂), etc., which are likely to produce air bubbles. Maintaining a low liquid temperature will also help eliminate this problem.
- Pipe corrosion can result if dilution at the injection point does not occur rapidly. This problem is easily prevented by observing this simple rule: install injection fitting so that the end is in the center of the flow stream of the line being treated. Trim injector tip as required. See Figure 6. Note: Extended injection assemblies are available for large water lines. Consult your supplier for more information.

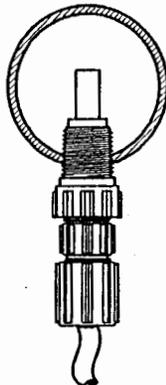


FIGURE 6

4.3 WIRING

-  **WARNING**—Risk of electrical shock. This pump is supplied with a three-prong grounding type power plug. To reduce risk of electric shock, connect only to a properly grounded, grounding type receptacle.
- The metering pump should be wired to an electrical source, which conforms to those on the pump data label. Applying higher voltage than the pump is rated for will damage the internal circuit.
- In the electronic circuit of the control unit, measures for surge voltage are made by means of surge absorbing elements and high voltage semiconductors. Nevertheless, excessive surge voltage may cause failure in some areas. Therefore, the receptacle should not be used in common with heavy electrical equipment, which generates high voltage. If this is unavoidable however, measures should be taken by (a) the installation of a surge-absorbing element (varistor of min. surge resistance 2000A) to the power supply connection of the pump, or (b) the installation of a noise suppression transformer.

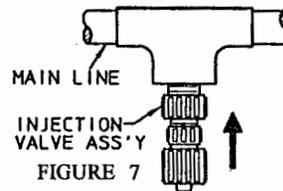


- Signal input to the external pulse signal input terminals ([EXTERNAL], [STOP]) must be a no-voltage signal from relay-contacts etc. and the input of other signals is prohibited. (In the case of relay contacts, 100 ohms or below when ON and 1-meg ohms or above when OFF). The pulse duration of the input signal must be 10 milliseconds or over and the frequency of the input signal must not exceed 125 times per minute. Signal cord is provided with the pump.

4.4 WELL PUMP SYSTEM INSTALLATION

Ensure that the metering pump voltage matches the voltage of the well pump. Typical well pump electrical circuits are shown in Figure 8. All electric wiring should be installed in accordance to local codes by a licensed electrician.

Install the backpressure/injection (Figure 7) on the discharge side of the metering pump into a tee which is installed into the water line going to the pressure tank.



Pumps carrying the or "ETL Sanitation" (tested to NSF Standard-50) marks are listed for swimming pools, spas and hot tubs, and when proper materials are selected, are capable of handling but not limited to the following chemical solutions:

- | | |
|----------------------------|-----------------------|
| 12% ALUMINUM SULPHATE, | 5% SODIUM CARBONATE, |
| 2% CALCIUM HYPOCHLORITE, | 10% SODIUM HYDROXIDE, |
| 12.5% SODIUM HYPOCHLORITE, | 10% HYDROCHLORIC ACID |

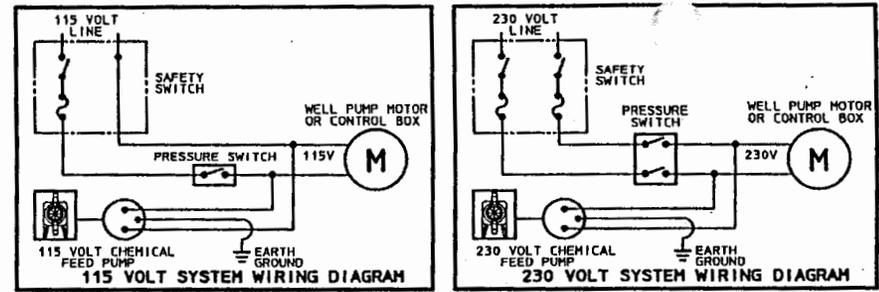


FIGURE 8

5.0 START UP AND OPERATION

5.1 POWER

All metering pumps are available in 115 and 230 volts at 50/60 Hertz, single phase. In addition, certain models are available in 12 volt DC. Prior to start-up always check to insure that the pump voltage/frequency/phase matches that of the power supply.

-  **CAUTION** If pump is fitted with a PVC pump head (7th position of model number is "V" or "W". Note: PVC is gray, not black), uniformly hand tighten the four head screws before use, 18-22 in. lbs. (3.2-3.9 kg/cm). Periodically tighten after installation.

5.2 PRIMING

-  **CAUTION** When working on or around a chemical metering pump installation, protective clothing and gloves and safety glasses should be worn at all times.

All pumps are tested with water. If the chemical to be pumped reacts when mixed with water (e.g. sulfuric acid, polymer) the pump head should be removed and dried thoroughly along with the diaphragm and valve seats.

- Turn on the power to the pump. The green LED (not available on all models) will light up and flash off each time the pump strokes.
- Adjust the stroke rate knob to the 100% setting mark (for more information see Section 5.3, Capacity Control).
- Adjust the stroke length knob to the 100% setting mark if applicable (for more information see Section 5.3, Capacity Controls).
- If the discharge line is connected directly to a pressurized system it should be temporarily bypassed during priming of the pump. A bleed valve will simplify this operation by allowing easy bypass of the discharge fluid. Air must be purged from the pumphead before the pump will operate against pressure. (See Figure 9)

Air Bleed Operation:

- While pump is running, turn adjustment knob counterclockwise.
- Run with valve open until a solid stream of fluid comes out of the bypass tubing with no air bubbles.
- Close air bleed valve by turning adjustment screw clockwise.

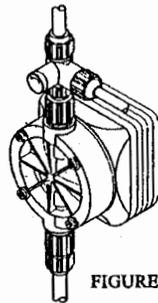


FIGURE 9

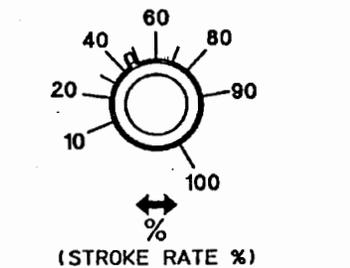
- Chemical should reach the pump head after a few minutes of operation. If not, remove the discharge fitting and moisten the discharge valve area (ball check and valve seats) with a few drops of *chemical being fed to the metering pump*. For safety, always use protective clothing and gloves, wear safety glasses and use a proper container to hold the chemical.
- If the pump continues not to prime, refer to Section 7.0, Troubleshooting, of these instructions.
- Once the pump has been primed and is pumping the chemical through the head, turn off the power, reconnect the discharge tubing (if it had been removed) and immediately clean any spilled chemical that is on the pump housing or head.
- Turn the power on once more and adjust the pump flow to the desired rate (see Section 5.3.3, Controlling Procedure).
- Always check the calibration of the pump after start-up. It's best to calibrate the pump under your typical use conditions.

5.3 CAPACITY CONTROL

Capacity can be controlled by means of the stroke length adjusting knob and/or stroke rate adjusting knob (except model C pumps). Control knobs provide coarse adjustment; use a calibration column for accurate calibration. Contact your pump supplier for proper calibration equipment.

5.3.1 Stroke Frequency Adjustment (E, E-DC, E Plus, A Plus & C Plus only)

- Stroke frequency can be controlled from 10 to 100% (12 to 125 strokes per minute) by means of the electronic circuit.
- Stroke frequency can be set by means of the stroke rate adjusting knob even while the pump is in operation. (See Figure 10)



5.3.2 Stroke Length Adjustment

- Stroke length can be controlled within 0 to 100% of the diaphragm displacement. It should be controlled within 20 to 100% for practical use.
- Stroke length can be set by means of the stroke length adjusting knob while the pump is in operation. **Do not turn the knob while the pump is stopped.**

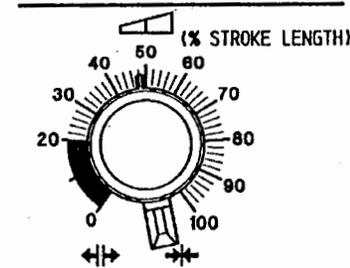


FIGURE 10

5.3.3 Controlling Procedure

Proper set points for stroke length and stroke frequency should be determined after consideration of the pump and characteristics of the fluid. The following procedure is recommended from the viewpoint of pump performance. **Note: The closer the stroke length is to 100%, the better the pump performance will be.**

- Set the stroke length to 100% then adjust the stroke frequency for coarse capacity control.
- Measure the capacity.
- When the measured capacity is less than the required value, increase the stroke frequency and measure the capacity again.
- Then, adjust the stroke length for fine capacity control.
- Finally, measure the capacity and make sure that the required value is obtained.

5.3.3 C Rolling Procedure cont'd.

Example	Selected Model	=	LPD4
	Set Stroke Length	=	100%
	Set Stroke Rate	=	100%
	Output Capacity (Rated Pressure)	=	21 gallons per day (GPD)*
	Desired Flow	=	15 GPD
	Adjust Stroke Rate to 80%		
	Output Capacity	=	$0.80 \times 21 = 16.8 \text{ GPD}^*$
	Stroke Length Setting	=	$\frac{15}{16.8} \times 100 = 90\%$ approximate
			16.8

Thus to obtain the desired flow; stroke length is set at 90% and stroke rate is set at 80% i.e. output capacity = $0.90 \times 0.80 \times 21 = 15.12 \text{ GPD}^*$

***IMPORTANT!**

Check these values by measurement. Output capacity is higher when feeding against less than rated pressure

5.4 CONTROL PANEL SYMBOLS.

The pumps come with universally accepted symbols, the following is provided for your convenience.

	- MANUAL CONTROL (FOR 'LB' & 'LD' MODEL PUMPS ONLY)
	- AUTO CONTROL (EXTERNAL INPUT)
	- STROKE RATE PERCENT (FOR MANUAL OPERATION ONLY)
	- PERCENT STROKE LENGTH
	- STAND-BY (PUMP WILL NOT OPERATE)
	- LOCK
	- UNLOCK
	- STOP
	- STROKE
	- 4-20 MA (4-MILLIAMPERE TO 20-MILLIAMPERE CONTROL CIRCUIT INPUT)
	- HOLD TO RUN (OPERATES PUMP AT 125-OPM (STROKES PER MINUTE) (FOR 'LC' MODEL PUMPS ONLY))

	TAGS:		STOP/EXTERNAL SIGNAL SOCKET ID. LABEL
	4-20 MA		STOP/EXTERNAL SIGNAL SOCKET ID. LABEL

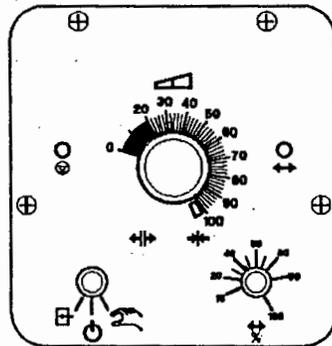


FIGURE 11

5.5 OPERATION BY EXTERNAL INPUT SIGNALS (Options):

The pump can be controlled by three types of input signals. All are fully isolated from AC input and from earth ground. The input socket connections are located at the bottom of the control panel face and the signal cords are provided with the pump. Remove rubber plugs to access plug sockets.

5.5.1 STOP FUNCTION (E Plus, A Plus, C Plus & C only)

Operation of the pump can be stopped by an external signal input. When the external signal is input to the terminal marked which is provided at the bottom of the control panel, the lamp (red) lights up and operation of the pump is stopped. The stop function overrides both manual settings and external input.



Operation of more than one pump from the same contact closure will damage the pump circuits. When such operation is required, the pump circuits must be electrically isolated from one another by means of a multicontact control relay or similar means.

- The input signal must be in the form of closure of a mechanical relay or other mechanical switching device, or solid-state relay or other solid-state switching device. Voltage signals are prohibited. The switching resistance of either mechanical or solid-state devices must be 100 ohms or below when ON and 1 megohm or above when OFF. If any type of solid-state device is employed, it must be installed with the proper polarity, if required for the device; and leakage current must not exceed 200 microamperes to prevent false triggering in the OFF state.

The stop function is commonly used in conjunction with a tank float switch. The float switch contacts are normally open but when the tank level falls past a certain point the contacts close and the pump stops.

5.5.2 EXTERNAL PACING FUNCTION (E Plus, A Plus, C Plus & C only)

The pump's stroke rate can be controlled by an external signal input. When the input signal line is connected and the EXTERNAL /OFF /MANUAL switch is in the external position and a contact signal is input to the terminal marked , the pump makes one discharge stroke.



Operation of more than one pump from the same contact closure will damage the pump circuits. When such operation is required, the pump circuits must be electrically isolated from one another by means of a multicontact control relay or similar means.

- When the "ON" signal pulse is input, the pump operates one stroke and the fluid is discharged. In addition, the pump can be operated continuously at a rate of up to 125 strokes/min. by repeated input of "ON" and "OFF" signals.
- After receiving an input signal, the pump generates the necessary power pulse to actuate the solenoid. The external signal input is debounced by the pump circuit. The pump will not stroke in response to a spurious or erratic input signal that follows at a rate greater than 125 spm. If the external signal rate exceeds 125 spm, the pump will stroke at half the external signal rate to prevent overdosing and to protect the pump from overheating.
- The input signal must be in the form of closure of a mechanical relay, other mechanical switching device, or of a solid-state switching device. Voltage signals are prohibited. The switching resistance of either mechanical or solid-state devices must be 100 ohms or below when ON and 1 megohm or above when OFF. If any type of solid-state device is employed, it must be installed with proper polarity, if required for the device; and leakage current must not exceed 200 microamperes to prevent false triggering in the OFF state.
- Cycle rate of the input signal should not exceed 125 times per minute.
- Typical wiring is shown at right for use with switch closure flowmeters. (Figure 12)
- 10 millisecond contact time required for each "ON" input signal.

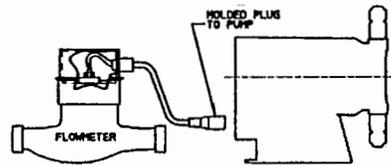


FIGURE 12

5.5.3 4-20mA DC INPUT FUNCTION (E Plus only)

The pump's stroke rate can also be controlled by a 4-20 mA DC signal to the terminal marked [4-20 mA].

- For the 4-20 mA input to have any effect on the pump output rate, the AUTO/OFF/MANUAL switch must be in the AUTO position.
- The 4-20 mA input signal affects the pump's outputs as per the graph below:

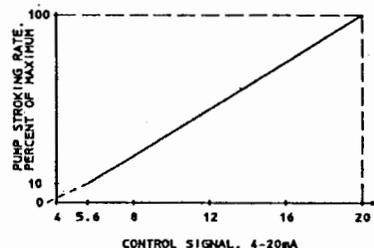


FIGURE 13

5.5.3 4-20mA DC INPUT FUNCTION cont'd.

- The signal cord polarity is:
Black = Common
White = Positive
Wrong polarity can result in excess flow.
- Signal input impedance is 124 ohms.
- Remove cap from pump socket labeled 4-20 mA, use polarized cord supplied with pump to connect control circuit to pump. Plug cord into pump socket labeled 4-20 mA.

6.0 MAINTENANCE



Before performing any maintenance or repairs on chemical metering pumps, be sure to disconnect all electrical connections, insure that all pressure valves are shut off and pressure in the pump and lines has been bled off.

Always wear protective clothing, gloves and safety glasses when performing any maintenance or repairs on chemical metering pumps.

6.1 ROUTINE MAINTENANCE

- Routinely check the physical operating condition of the pump. Look for the presence of any abnormal noise, excessive vibration, low flow and pressure output or high temperatures [when running constantly at maximum stroke rate, the pump housing temperature can be up to 160°F (70°C)].
- For optimum performance, cartridge valves should be changed every 6-12 months. Depending on the application, more frequent changes may be required. Actual operating experience is the best guide in this situation.
- Repeated short-term deterioration of valve seats and balls usually indicates a need to review the suitability of wetted materials selected for the application. Contact the supplier for guidance.
- Check for leaks around fitting or as a result of deteriorating tubing e.g. when standard white translucent discharge tubing is exposed to direct sunlight. Take appropriate action to correct leak by tightening fittings or replacing components.
- Keep the pump free of dirt and debris as this provides insulation and can lead to excessive pump temperatures.

- If the pump has been out of service for a month or longer, clear the pump head valve assemblies by pumping fresh water for approximately 30 minutes. If the pump does not operate normally after this “purging run”, replace cartridge valve assemblies.

6.2 DISASSEMBLY AND ASSEMBLY DIAPHRAGM REMOVAL

Flush pump head and valve assemblies out by running pump with water or other suitable neutralizing solution. Wash outside of pump if chemical has dripped on pump. Set stroke length knob of pump to 0% and unplug pump.

Depressurize the system and disconnect tubing or piping from the pump. Remove the four pump head screws and then remove the pump head assembly.

Remove the diaphragm by grasping it at the outer edge and turning it counter clockwise until it unscrews from the electronic power module (EPM). Don't lose the deflector plate or diaphragm shims which are behind the diaphragm, they are needed for re-assembly. Note shim quantity may be from 0 to 2.

Inspect diaphragm, if it is intended to be used again look for indications of the Teflon face being overstretched, (localized white areas) or the elastomer on the back of the diaphragm being worn. Excessive amounts of either condition require diaphragm replacement.

6.3 DIAPHRAGM REPLACEMENT

- When replacing the diaphragm, it is always a good idea to replace the valve cartridges and other worn parts. A kit is available from your supplier with all parts necessary to completely rebuild your pump's wet end. All your supplier needs to know is the “KOPkit No.” on your pump's data label to supply this kit.
- Set pump stroke length at 50% and unplug the pump.
- If you kept the shims from the original diaphragm or know the original quantity you can avoid the next step for shimming the diaphragm.

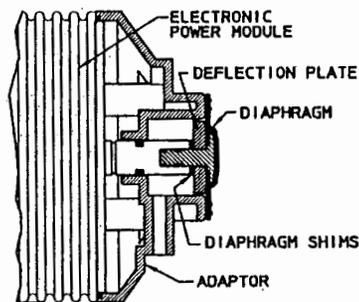


FIGURE 14

6.3 DIAPHRAGM REPLACEMENT cont'd.

- Apply grease to areas of the diaphragm that contact the deflection plate.
- Slide the diaphragm deflection plate onto the back of the diaphragm stud, radius side towards the diaphragm. Next slide two shims onto the diaphragm threaded stud and screw the diaphragm into the EPM unit. Refer to Figure 14. Turn diaphragm clockwise until deflection plate and shims are tight against solenoid shaft and the diaphragm stops turning. If there is a gap between the adaptor and diaphragm, repeat the procedure removing one shim each time until the diaphragm just touches the adaptor or is slightly recessed.
- If not already done, adjust stroke length to 50%. Place the pump head onto the adaptor with valve flow arrows pointing up and install and tighten pump head screws. Tighten screws until pump head pulls up against adaptor.

NOTE: Adjust stroke length only when pump is running!

- Adjust stroke length back to 100% for easier priming and place pump back into service.

6.4 VALVE REPLACEMENT

- Flush pump to clean any chemical from pump head.
- Unplug pump, release system pressure, and disconnect tubing or piping.
- Unscrew valve cartridges and discard. Also remove o-rings down inside the pump head.
- Install new valve cartridges with stamped letters reading from top to bottom, and the arrow pointing in the direction of flow. Hand tighten only, do not use wrenches or pliers. This is especially important when the pump head is made of SAN material.
- Reconnect tubing or piping and reinstall the pump.
- Check for leaks around newly installed fittings.

7.0 TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
FAILURE TO PUMP	1. Leak in suction side of pump.	1. Examine suction tubing. If worn at the end ; cut approximately one inch (2.5 cm) off and reconnect.
	2. Valve seats not sealing.	2. Clean valve seats if dirty or replace with alternate material if deterioration is noted.
	3. Low setting on pump.	3. When pumping against pressure, the dial should be set above 20% capacity for a reliable feed rate.
	4. Low suction level.	4. Solution must be above foot valve strainer.
	5. Diaphragm ruptured.	5. Replace diaphragm as shown in 6.0 "Maintenance Section". Check for pressure above rated maximum at the injection point. NOTE: Chemical incompatibility with diaphragm material can cause diaphragm rupture and leakage around the pump head.
	6. Pump head cracked or broken.	6. Replace pump head as shown in 6.0 "Maintenance Section". Make sure fittings are hand tight only. Using pliers and wrench can crack pump head. Also, chemical incompatibility can cause cracking and subsequent leakage.
	7. Pump head contains air or chlorine gas.	7. Bleed pump head, see 5.0 "Start-up and Operation".
	8. Breakdown or disconnection of wiring.	8. Connect wiring properly. Check fuse or circuit breaker.
	9. Voltage drop.	9. Take measures after investigation of cause.
	10. Malfunction of electronic control board.	10. Contact supplier.

7.0 TROUBLESHOOTING cont'd.

PROBLEM	PROBABLE CAUSE	REMEDY
LOSS OF CHEMICAL RESIDUAL	1. Pump setting too low.	1. Adjust to higher setting (pump must be operating to adjust stroke length knob).
	2. Scale at injection point.	2. Clean injection parts with 8% muriatic acid or undiluted vinegar. (Also, see Maintenance Section).
	3. Solution container allowed to run dry	3. Refill the tank with solution and prime. (See Start-up and Operation Section).
TOO MUCH CHEMICAL	1. Pump setting too high.	1. Lower pump setting (pump must be operating to adjust stroke length knob).
	2. Chemical in solution tank too rich.	2. Dilute chemical solution. NOTE: For chemical that reacts with water, it may be necessary to purchase a more dilute grade of chemical direct from chemical supplier.
	3. Siphoning of chemical into well or main line.	3. Test for suction or vacuum at the injection point. If suction exists, install an anti-siphon valve.
LEAKAGE AT TUBING CONNECTIONS	1. Worn tube ends.	1. Cut off end of tubing (about 1 in/2.5 cm) and then reconnect as before.
	2. Chemical attack.	2. Consult your seller for alternate material.
LEAKAGE AT FITTING	1. Loose fittings.	1. Tighten hand tight. Replace gasket if hand tightening does not stop leakage.
	2. Broken or twisted gasket.	2. Check gaskets and replace if broken or damaged.
	3. Chemical attack.	3. Consult your pump supplier for alternate material.

7.0 TROUBLESHOOTING cont'd.

PROBLEM	PROBABLE CAUSE	REMEDY
PUMP LOSES PRIME	1. Dirty check valve.	1. Remove and replace or clean off any scale or sediment.
	2. Ball checks not seating or not sealing properly.	2. Check seat and ball checks for chips, clean gently. If deformity or deterioration is noted, replace part with proper material. Resulting crystals can hold check valves open, therefore, the valves must be disassembled and cleaned.
	3. Solution container allowed to run dry.	3. Refill the tank with solution and prime. See 5.0 (Start-Up and Operation Section).
	4. Chemical Outgassing.	4. Bleed gas, use flooded suction and maintain chemical at room temperature (approx. 20°F) to minimize outgassing.
PUMP WILL NOT PRIME	1. Too much pressure at discharge.	1. Turn off all pressure valves, relieve system pressure then loosen outlet tubing connection at discharge point. Remove discharge valve cartridge. Dampen ball check and valve seats with a few drops of solution. Set pump dial to maximum rate. When pump is primed, reconnect all tubing connectors.
	2. Check valves not sealing.	2. Disassemble, clean & check for deterioration, damage or swelling. Reassemble and wet the valve assembly, then prime. See 5.0 (Start-Up & Operating Section).
	3. Output dials not set at maximum.	3. Always prime pump with output dial set at maximum rated capacity.
	4. Suction lift height too much. Maximum 5' ft (1.5 m)	4. Decrease suction lift or pull vacuum on pump discharge until pump is primed.
	5. Pump equipped with spring loaded high viscosity valves.	5. Loosen discharge valve to aid in priming, take necessary safety precautions for spills, or apply vacuum to pump discharge.

8.0 POLICIES AND PROCEDURES

8.1 MANUFACTURERS PRODUCT WARRANTY

The manufacturer warrants its equipment of its manufacture to be free of defect in material or workmanship. Liability under this policy extends for eighteen (18) months from the date of purchase or one (1) year from date of installation or whichever comes first. The manufacturer's liability is limited to repair or replacement of any device or part, which is returned, prepaid, to the factory and which is proven defective upon examination. This warranty does not include installation or repair cost and in no event shall the manufacturer's liability exceed its selling price of such part.

The manufacturer disclaims all liability for damage to its products through improper installation, maintenance, use or attempts to operate such products beyond their functional capacity, intentionally or otherwise, or any unauthorized repair. Replaceable elastomeric parts are expendable and are not covered by any warranty either expressed or implied. The manufacturer is not responsible for consequential or other damages, injuries or expense incurred through use of its products.

The above warranty is in lieu of any other warranty, either expressed or implied. The manufacturer makes no warranty of fitness or merchantability. No agent of ours is authorized to make any warranty other than the above.

For warranty and service matters within the European Union, contact the seller first or:

Fagotpad 2
3822 CN Amersfoort
The Netherlands

8.2 EUROPEAN TECHNICAL FILE LOCATION

P.O. Box 91
Washington
NE371YH
United Kingdom

8.3 RETURNS

The Customer Service Department will issue a Return Authorization (RA) number for all returns. The following information will be required:

1. Billing and a ship-to address.
2. Model and serial number.
3. Contact name and phone number.
4. Reason for return.
5. Purchase order (where applicable).
6. RA number on outside of the carton.

All material must be returned freight prepaid. All merchandise must be properly packaged and free of any corrosive, toxic or otherwise hazardous chemical. All items returned must reference Return Authorization.

8.4 CREDITS

No equipment will be accepted beyond six months after date of shipment from the factory. Only unused and undamaged equipment will be accepted for return to stock. All credits are based on acceptance of materials as new and unused by our inspection personnel. A restocking fee will apply. All equipment returned for credit must have a RA number and be returned freight prepaid.

ATTACHMENT E
RAPID INFILTRATION PONDS
AND AS-BUILT GRADING PLANS
AS-BUILT PLANS

ATTACHMENT F
SPARTON 5354 MONITORING SYSTEM

MICRO MONITORING SYSTEM (MIMS)

Model 5354



- Modular design expands to as many as 24 inputs including mixes of binary, analog (4-20mA/0-5VDC) and voltage inputs.
- Incorporates Bellcore algorithm for battery reserve predictions.
- Monitors facility alarms, and ambient and battery temperatures that could lead to thermal runaway conditions.
- Includes internal 2400 baud modem for remote access and front panel connector for local terminal or TL-1 messaging.
- User defines alarm limits.
- System generates battery plant statistics and logs last 300 events of alarm history.
- Two Form C contact closures and LED displays for major and minor alarms.
- Less than 5 watts operating power.

THE SPARTON 5354 MICRO MONITORING SYSTEM provides the most cost-effective method for maintenance and monitoring of backup power systems. It is a stand-alone, microprocessor-based system that is modular in construction, with plug-in boards available for voltage inputs (0-60VDC, 0-75mV and 4-20mA), battery case and ambient temperatures, and binary and analog inputs. The 5354 also provides capabilities for monitoring voltages on individual 12V monoblocks.

The 5354 is ideally suited for remote locations where space is at a premium, such as in CEVs, CDOs, huts, cabinets, and cellular and PCS sites. It is a compact unit that fits in either a 17" or 19" rack and is 1-3/4" in height.

The 5354 provides information about battery conditions and potential failures including thermal runaway. When a discharge is detected, the system estimates reserve time in hours/minutes. These reserve time estimates are determined by using the Bellcore algorithm, refined for use by Sparton Technology.

An "I" (Information) report lists detailed information about the last discharge. The system also generates status, alarm history, and statistical reports. Statistics include three high hourly voltage averages, and peak and minimum values for each analog point. The 5354 logs the last 300 alarm events of alarm history within the unit.

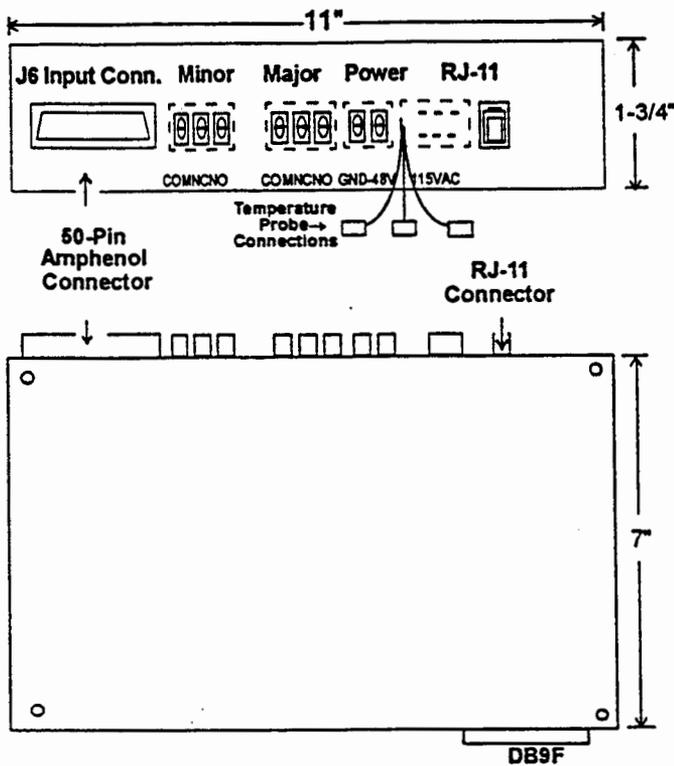
The system can be programmed locally through the front panel connector, or remotely via modem. Alarms can be sent to as many as 4 telephone numbers, and 10 schedules are easily defined by the user. User-designated alarms can be given a "NAG" status to call out alarms every 15 minutes until the alarm condition is cleared.



SPARTON TECHNOLOGY, INC.

subsidiary of SPARTON CORPORATION

4901 Rockaway Blvd. NE • Rio Rancho, NM 87124 • (505) 892-5300 • FAX (505) 892-5515



SPECIFICATIONS

CAPACITY: 2 control outputs
24 inputs, 3 plug-in boards of 8 inputs each (see board options at right)

POWER INPUT: -48VDC, -24VDC, 115VAC

BATTERY BACKUP: 10 year battery backed up RAM and real time clock

OPERATING ENVIRONMENT: Temperature: -40°F to +150°F (-40°C to +65°C)
Humidity: 0 to 95% RH, non-condensing

SIZE: 7"x11"x1-3/4"

COMMUNICATION: 300/2400 baud modem, Bell or CCITT, for remote communication. Standard RJ11 connector.
TL1, NMA compatible
Connector for local terminal.
RS232 DB9 connector.

Available plug-in boards:

Battery Board - The 5354 monitors current and voltages through a special 8-input battery board. 3 points are 0-60VDC inputs. 1 point is a 75mV shunt input for measuring plant current. 3 4-20mA analog inputs can be used with Sparton's Model 751 Remote Differential Temperature Transducer.

Binary Board - accepts up to 8 binary inputs of either wet or dry contacts.

Analog Board - monitors up to 8 4-20mA inputs.

Temperature Board - consists of 3 temperature sensors (2 battery and 1 ambient) which provide 2 user-defined differential temperature alarms.

12V Monoblock Board - measures voltages on up to 8 individual 12V monoblocks.

Typical Display Reserve Time Estimated Reserve Time Displayed in Hours:Minutes

Sparton 5354 Power Monitoring System			
Monday 3/9/98	3:27 AM	Present temp	85.2 DEGF Max temp 94.7 DEGF
PLANT VOLTAGE	54.41 VDC	-48V PLT LOAD	15.65 AMPS
Plant capacity	1257 AMP-HRS	Maximum hourly average	16.20 AMPS
Plant Discharge detected at	1:02 AM		
Estimated reserve time:	Present load	Maximum Load	
	8:05	7:40	

Specifications subject to change without notice.

ATTACHMENT G
NEW MEXICO STATE ENGINEER OFFICE
PERMIT RG-73531-T



**STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER
ALBUQUERQUE**

THOMAS C. TURNEY
STATE ENGINEER

DISTRICT 1
121 TIJERAS, NE. STE. 2000
ALBUQUERQUE, NM 87102-3400
(505) 841-9480

July 13, 2000

FILE: RG-73531

Sparton Technology, Inc.
4901 Rockaway Blvd., NE
Rio Rancho, NM 87124

Greetings:

Enclosed is your copy of the above-numbered Permit to Divert the Underground Waters of the State of New Mexico for Pollution Plume Control and Recovery and to Offset Surface Water Depletions which has been approved subject to the conditions set forth on the reverse side thereof.

No water shall be diverted from Well RG-73531-T except for pollution plume control and recovery purposes. This permit shall expire at the completion of the remedial operation or on May 31, 2030, whichever occurs first. Well RG-73531-T shall then be capped or plugged and a written report of the action shall be filed with this office of the State Engineer.

Please read the Conditions of Approval carefully.

Very truly yours,

Andrew L. Lieuwen
Water Resource Master

ALL:sjr
Enclosure as stated
cc: Santa Fe SEO

CONDITIONS OF APPROVAL

1. This application is approved as follows:

Permittee: Sparton Technology, Inc.

Permit No. RG-73531-T

Priority: Not Applicable

Source: Ground Water

Point of Diversion: Well RG-73531-T located within 745 feet of a point where X=376,788 feet and Y=1,524,463 feet, NMCS Central Zone; also located within the SW1/4 of SE1/4 of Section 7, Township 11 North, Range 3 East, NMPM, projected, in Town of Alameda Grant; also located approximately 1/2 mile southwest of the Cottonwood Mall on Tract B-2, Adobe Wells Subdivision, Bernalillo County, New Mexico.

Purpose of Use: Pollution plume control and recovery

Place of Use: Sparton Technology, Inc. facility located in the Town of Alameda Grant at 9621 Coors Blvd. NW, Albuquerque, New Mexico.

Amount of Water:

Diversion: 121 acre-feet per annum

Consumptive use: 15 acre-feet per annum

2. The total diversion of water from well RG-73531-T shall not exceed 121 acre-feet per annum and consumptive use shall not exceed 15 acre-feet per annum.
3. Well RG-73531-T and the point of discharge into the infiltration gallery shall be equipped with a totalizing meter, or meters, of a type and at a location(s) approved by and installed in a manner acceptable to the State Engineer.
4. Records of the total amount of water diverted from well RG-73531-T and the discharge into the infiltration gallery shall be submitted in writing to the State Engineer District 1 Office on or before the 10th day of each month for the preceding calendar month.
5. On or before October 1 of each year the permittee shall provide the State Engineer evidence of the amount of San Juan/Chama contract water purchased from the Village of Los Lunas for the following year in the consumptive use amount shown under Condition number 2 to offset the depletion to the Rio Grande stream system caused by the exercise of this permit, including transportation losses. The diversion of water shall be subject to the agreement with the Village of Los Lunas and to the amount of water purchased annually.

CONDITIONS OF APPROVAL (continued)

6. No water shall be diverted under this permit unless the permittee has submitted documentation satisfactory to the State Engineer demonstrating that the permittee has secured water rights equal to or exceeding the annual consumptive use.
7. No water shall be diverted from well RG-73531-T except for pollution plume control and recovery purposes. This permit shall expire at the completion of the remedial operation or on May 31, 2030, whichever occurs first. Well RG-73531-T shall then be capped or plugged and a written report of the action shall be filed with this office of the State Engineer.
8. The permittee shall utilize the highest and best technology available to ensure conservation of water to the maximum extent practical.

Witness my hand and seal this 13th day of July, A.D., 2000

Thomas C. Turney
State Engineer

By:

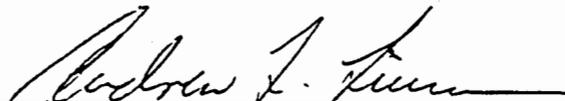

Andrew L. Lieuwen, District 1

Exhibit A

3. The well is to be located approximately ½ mile southwest of the Cottonwood Mall on Tract B-2, Adobe Wells Subdivision, Bernalillo County, New Mexico, which tract adjoins the Sparton Technology, Inc. facility located at 9621 Coors Blvd., NW, Albuquerque, NM. The well will be located within the SW1/4 of SE1/4 of Section 7, Township 11 North, Range 3 East, NMPM, projected, in Town of Alameda Grant. Alternatively, the well is to be located within a radius of 745 feet of a point having New Mexico Coordinate System (Central Zone) coordinates X = 376,788 feet east and Y = 1,524,463 feet north. See also Exhibit A-1 attached hereto.

5. The maximum quantity of water to be diverted and beneficially used is 75 GPM, or 121 AFY diversion. No consumptive use will result if this application is granted, with the exception of the evaporation that will occur as part of the process of recharging the groundwater by use of rapid infiltration ponds, as described in paragraph 7.c), below.

- a) The consumptive use of the evaporation is calculated to be 4.70 AFY. See Exhibit A-2, attached hereto. In the event that the rapid infiltration process causes a greater annual consumptive use, the Applicant requests approval to consume up to 15 AFY.
- b) The applicant proposes to offset the effects of its consumptive use by transferring to the proposed well up to 15 AFY of San Juan/Chama Water under contract with the Village of Los Lunas, through the year 2015, after which time the Applicant will seek extension of the contract. Because Applicant proposes to operate the containment well for remediation purposes through 2030, Applicant requests the following condition of approval: "No water shall be diverted under this permit unless the Applicant has submitted documentation satisfactory to the State Engineer demonstrating Applicant has secured water equal to its annual consumptive use, up to 15 AFY, to offset the effects of pumping and remediation under this permit."

7. Additional statements or explanations:

- a) Need for pollution control and recovery: Groundwater impacted by chlorinated solvents exists at or near Applicant's Coors Road facility, 9621 Coors Blvd., NW, Albuquerque, New Mexico. Applicant proposes to use the applied for containment well to prevent movement of material amounts of solvents off of the Coors Road facility property.
- b) Underground water source: Rio Grande underground basin.
- c) Return to aquifer of cleaned water and place of discharge: Once the contaminated water is pumped, it will be treated through an air stripper at the Coors Road facility site, transported through a discharge pipeline located on the site, and then returned to the aquifer by discharge to rapid infiltration ponds also located on the Coors Road

File No. _____

STATE ENGINEER C
ALBUQUERQUE, NEW MEXICO
10 FEB -7 PM 2:24

facility site. See Exhibit A-1 for a diagram of the containment well's location, air stripper and discharge locations. The rapid infiltration ponds, where discharge will occur, will be located on the northeastern portion of the Sparton Coors Road facility site, on approximately three acres, within the SE1/4, Section 7, Township 11 North, Range 3 East, projected, in Town of Alameda Grant. See Exhibit A-1.

- d) Estimated maximum period of time for completion of the pollution control and recovery operations: Pumping of the containment well and discharges are expected to last at least 30 years. Applicant will periodically assess the continued need for the well.
- e) Method of Measurement: Totalizing meters acceptable to the State Engineer.
- f) Disposition of well after completion of pumping related to remediation program: Applicant intends to either plug this well or to maintain it as a monitor well.
- g) Statement of non-impairment of existing rights: The proposed containment of groundwater will result in a minimal consumptive use of water which will be entirely offset by retiring surface water and, therefore, will not impair existing water rights.

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STATE ENGINEER OFFICE
ALBUQUERQUE, NEW MEXICO

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ALBUQUERQUE, NEW MEXICO

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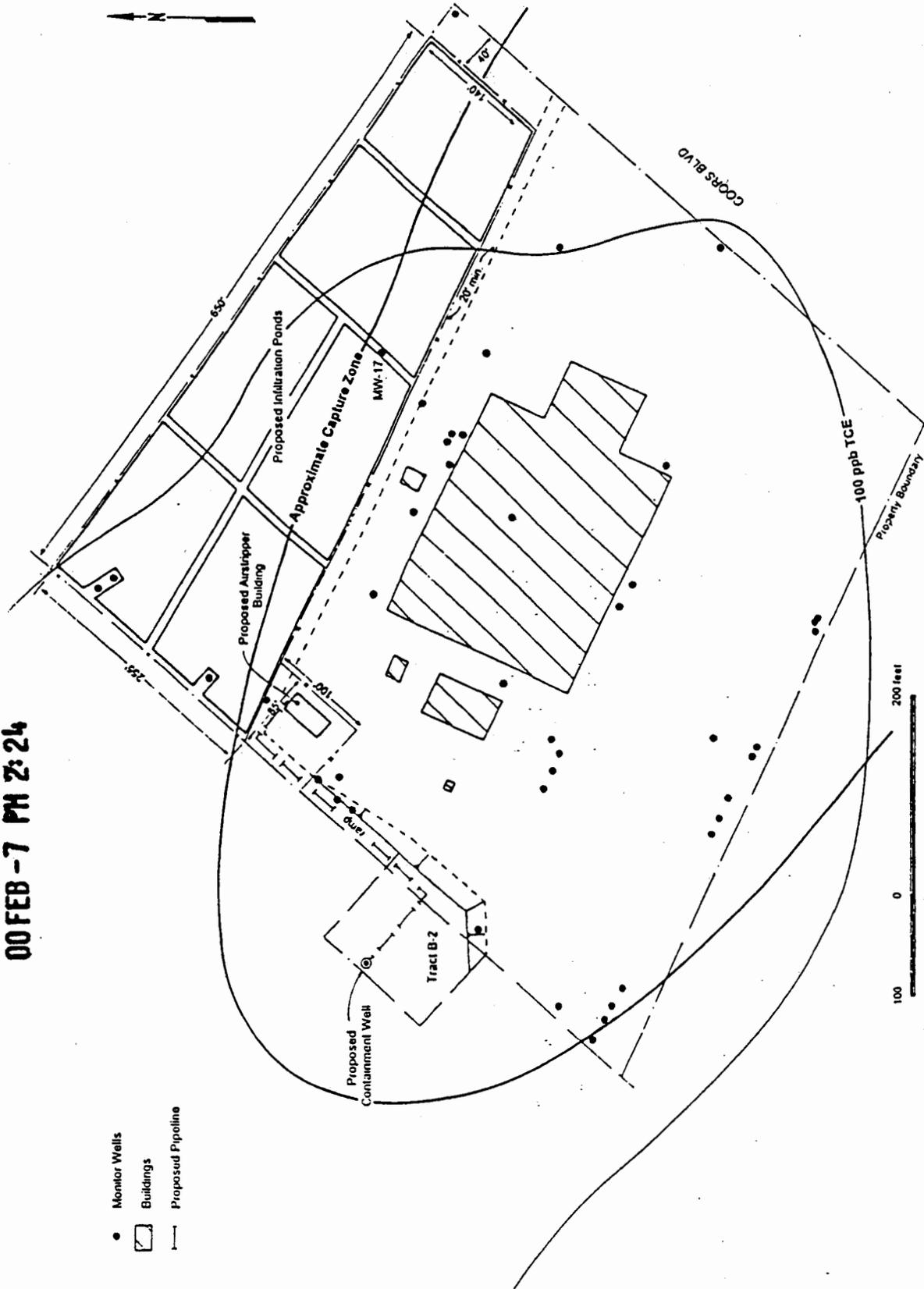


EXHIBIT A-1

SOURCE CONTAINMENT WELL AND
INFILTRATION PONDS LOCATIONS
SPARTON TECHNOLOGY, INC.

CONSUMPTIVE USE CALCULATIONS

EXHIBIT A-2

TO
SPARTON TECHNOLOGY, INC.
APPLICATION FOR PERMIT
TO DIVERT GROUNDWATER
(75 gpm)
FOR
GROUNDWATER REMEDIATION

PREPARED BY
METRIC CORPORATION
ALBUQUERQUE, NEW MEXICO

STATE ENGINEER OFFICE
ALBUQUERQUE, NEW MEXICO

00 FEB -7 PM 2:24

NOVEMBER 1999

Assumptions:

Maximum Diversion: 75 gpm = 120.98 AFY
Discharge Location: Rapid Infiltration Ponds on north side of Sparton's Coors Road property.
Estimated Exposed Water Surface: 1.1 ac ⁽¹⁾
Average Annual Evaporation = Rate 73.18 in/yr = 6.09 ft/yr ⁽²⁾

According to Linsley, 1958

Lake Evaporation = 0.70
Pan Evaporation

Lake Evaporation at Sparton =

$$73.18 \frac{\text{in}}{\text{yr}} \times \frac{1 \text{ ft}}{12 \text{ in}} \times 0.7 = 4.27 \frac{\text{ft}}{\text{yr}}$$

Consumptive Use: 1.1 ac x 4.27 ft/yr = 4.70 AFY

Recommendation:

It is recommended that the application be made for consumptive use of 6.00 AFY to account for additional water surface during change over periods when the water is switched from one set of ponds to another.

$$\text{Maximum Evaporative Loss} = \frac{6.00 \text{ AFY C.U.}}{120.98 \text{ AFY Div.}} \times 100\% = 5\%$$

STATE ENGINEER OFFICE
ALBUQUERQUE, NEW MEXICO
00 FEB -7 PM 2:24

- (1) Based on 2.2 acre pond area with one half of the area receiving water at any time.
(2) Based on Pan Evaporation from 1962 - 1996 at Los Lunas, New Mexico Experiment Station, (see TABLE 1).

TN 174506

IMPORTANT-READ INSTRUCTIONS ON BACK BEFORE FILLING OUT THIS FORM

APPLICATION FOR PERMIT

~~TO CHANGE POINT OF DIVERSION AND PLACE AND/OR PURPOSE OF USE FROM SURFACE TO~~
~~GROUNDWATER AND TO DIVERT THE UNDERGROUND WATERS OF THE STATE OF NEW~~
MEXICO FOR POLLUTION PLUME CONTROL AND RECOVERY AND TO OFFSET
SURFACE WATER DEPLETIONS

JW
JW

Date Received February 7, 2000 File No. RG-73531

1. Name of applicant Sparton Technology, Inc.
Mailing address 4901 Rockaway Blvd. NE
City and State Rio Rancho, NM 87124

2. Source of water supply shallow water aquifer, located in Rio Grande Basin
(artesian or shallow water aquifer) (name of underground basin)

3. The well is to be located in the SEE EXHIBIT A
Range _____ N.M.P.M., or Tract No. _____ of Map No. _____ of the _____ District,
on land owned by Applicant

4. Description of well: name of driller Rodgers & Company;
Outside Diameter of casing 6 7/8 inches; Approximate depth to be drilled 150 feet;

5. Quantity of water to be appropriated and beneficially used See Exhibit A acre feet,
(consumptive use, diversion)
for pollution control and recovery (See Exhibit A) purposes.

6. Acreage to be irrigated or place of use See Exhibit A acres.

Subdivision	Section	Township	Range	Acres	Owner

7. Additional statements or explanations See Exhibit A

STATE ENGINEER OFFICE
SARASOTA, FLORIDA
PH 2:24
SPARTON
By: [Signature]
Subscribed and sworn to
My commission expires 05

Number of this permit _____

RG-73531

ACTION OF STATE ENGINEER

~~After notice pursuant to statute and by authority vested in me, this application is approved provided it is not exercised to the detriment of any others having existing rights; is not contrary to conservation of water within the state and is not detrimental to the public welfare of the state; further provided that all Rules and Regulations of the State Engineer pertaining to the drilling of shallow wells be complied with; and further subject to the following conditions:~~

After notice pursuant to statute and by authority vested in me, this application is approved provided it is not exercised to the detriment of any others having existing rights; is not contrary to conservation of water within the state and is not detrimental to the public welfare of the state; further provided that all Rules and Regulations of the State Engineer pertaining to the drilling of shallow wells be complied with; and further subject to the following conditions:

(SEE ATTACHED CONDITIONS OF APPROVAL)

Proof of completion of well shall be filed on or before _____, 19____

Proof of application of water to beneficial use shall be filed on or before _____, 19____

Witness my hand and seal this 13th day of July, A.D. ~~19~~ 2000

Thomas C. Turney, State Engineer
~~BY: Thomas C. Turney, State Engineer~~

By: *Andrew L. Lieuwen*
Andrew L. Lieuwen, District I

INSTRUCTIONS

This form shall be executed, preferably typewritten, in triplicate and shall be accompanied by a filing fee of \$5.00. Each of triplicate copies must be properly signed and attested. A separate application for permit must be filed for each well used.

REC'D - JUL 14 2000
STATE ENGINEER
OFFICE

ATTACHMENT H
ALBUQUERQUE/BERNALILLO COUNTY
AUTHORITY-TO-CONSTRUCT PERMIT NO. 1203

Post-It® Fax Note	7671	Date	5/7/99	# of pages	7
To	Gary Richardson	From	George Dingman		
Co./Dept.	Metric Corp	Co.			
Phone #		Phone #	768-1955		
Fax #	828-2803	Fax #	768-1977		



May 6, 1999

Richard D. Mico
 Vice President/General Manager
 Sparton Technology Inc.
 4901 Rockaway Blvd.
 Rio Rancho, New Mexico 87124

Certified Mail #Z 290 103 304
 Return Receipt Requested

Subject: Authority-to-Construct Permit #1203

Dear Mr. Mico:

Enclosed please find Authority-to-Construct Permit #1203 for the Sparton Technology Inc. remediation facility located at 9621 Coors Road NW, Albuquerque, New Mexico. Please review this document carefully, as Sparton Technology Inc. is responsible for complying with all terms and conditions of this Permit. Additionally, a copy of this Permit #1203 must be provided to the Facility Managers and kept on site at all times.

Please note that pursuant to 20 NMAC 11.02 & 11.41 you will be billed a \$500.00 Permit review fee and an annual \$108.50 Permit fee. If you have any questions regarding this registration or require any additional information, please feel free to contact me at (505) 768-1955, or contact the Air Quality Section at (505) 768-1930.

Sincerely,

George Dingman

George L. Dingman, Environmental Specialist II
 Air Quality Services
 Air Quality Division
 Environmental Health Department

Fax 768-1977

cc: Mr. Gary Richardson, Metric Corp, via FAX



AIR QUALITY AUTHORITY-TO-CONSTRUCT PERMIT #1203
Facility #NM/001/00442

Issued to: Richard D. Mico
Vice President/General Manager
Sparton Technology Inc.
4901 Rockaway Blvd.
Rio Rancho, New Mexico 87124

Certified Mail #Z 290 103 304
Return Receipt Requested

Pursuant to the New Mexico Air Quality Control Act, Chapter 74, Article 2 New Mexico Statutes Annotated 1978 (1996 REPL); the Joint Air Quality Control Board Ordinance, 9-5-1 to 9-5-99 ROA 1994; the Bernalillo County Joint Air Quality Control Board Ordinance, Bernalillo County Ordinance 94-5; the Albuquerque/Bernalillo County Air Quality Control Board (A/BCAQCB) Regulation Title 20, New Mexico Administrative Code (20 NMAC), Chapter 11, Part 40 (20 NMAC 11.40), Air Contaminant Source Registration; and A/BCAQCB Regulation Title 20, NMAC, Chapter 11, Part 41 (20 NMAC 11.41), Authority-To-Construct; the **Sparton Technology Inc. (Company)** is hereby issued this **AUTHORITY-TO- CONSTRUCT PERMIT** and authorized to operate the following equipment at:

Location	Process Description	SIC	NAICS
9621 Coors Road NW	Soil Vapor extraction system with up to 500 cfm capacity	NA	NA
Albuquerque, New Mexico	Air Stripper with up to 75 gpm capacity	NA	NA

This **AUTHORITY-TO-CONSTRUCT** Permit No. 1203 has been issued based on the review of the application received by the Albuquerque Environmental Health Department (Department), Air Quality Division (Division) on March 29, 1999, which was deemed complete on April 7, 1999, and on the National Ambient Air Quality, New Mexico Ambient Air Quality Standards, and Air Quality Control Regulations for Albuquerque/Bernalillo County, as amended. As these standards and regulations are updated or amended, the applicable changes will be incorporated into Permit #1203 and will apply to the Facility.

Issued on the 7th day of MAY, 1999



Isreal Tavarez, Supervisor
Air Quality Services Section
Air Quality Division
Environmental Health Department
City of Albuquerque

I. **CONDITIONS**--Conditions have been imposed in this permit to assure continued compliance. 20 NMAC 11.41.11.7.3, states that any term or condition imposed by the Division on a permit or permit modification is enforceable to the same extent as a regulation of the Board. Pursuant to 20 NMAC 11.41, the facility is subject to the following conditions:

1. **Construction and Operation**-- Compliance will be based on Division inspections of the facility, compliance with the NSPS Subpart A - **General Provisions**, reviews of project records, submission of appropriate permit applications for modification, and timely notification to the Department regarding equipment substitutions and relocations.

a) This permit authorizes the installation and operation of the following equipment:

Unit Number	Manufacturer	Model Number	Serial Number	Date of Mfg. Equipment	Rated Process Rate (tpy, hp, gal/hr, etc.)	Unit Subject To NSPS
1	Roots Dresser Positive Displacement Blower	3SURAI	NA	New	200 cfm	No
2	Roots Dresser Positive Displacement Blower	3SURAI	NA	New	200 cfm	No
3	Roots Dresser Positive Displacement Blower	24URAI	NA	New	100 cfm	No
4	EPG Air Stripper	STAT 180	NA	New	75 gpm	No

All equipment shall be maintained as per manufacturer specifications to ensure the emissions remain at or below the permitted levels.

b) This facility shall be constructed and operated in accordance with information provided on the permit application dated March 25, 1999 and received March 29, 1999 and in accordance with the legal authority specified above and the conditions of this permit.

c) No National Emissions Standards for Hazardous Air Pollutants (NESHAP) apply to this facility. However, during any asbestos demolition or renovation work, the Division must be notified and proper permits shall be obtained and CFR Title 40, Part 61 Subpart M would apply.

d) Substitution of equipment is authorized provided the equipment has the same or lower process capacity as the piece of equipment being substituted. The Department shall be notified in writing within fifteen (15) days of equipment substitutions. Equipment that is substituted shall comply with the requirements in Condition 2.

e) Changes in plans, specifications, and other representations proposed in the application documents shall not be made if they will increase the potential to emit or cause a change in the method of control of emissions or in the character of emissions. Any such proposed changes shall be submitted as a modification to this permit. No modification shall begin prior to issuance of a permit.

2. **Unit Emission Limits**—Condition 2 Unit Emission Limits has been placed in the permit in accordance with 20 NMAC 11.41.11.7.2, to allow the Division to determine compliance with the terms and conditions of the permit. These were the emission rates stated in the permit application and are the basis of the Division's review. Compliance will be based on Division inspections of the facility.

Criteria Air Pollutants

Unit Number	VOC lb/hr	VOC tpy	Percent Opacity	Record Keeping Requirements	Monitoring Requirements	Reporting Requirements	Compliance Testing
1	0.224	0.98	NA	Operating Hrs.	NA	NA	NA
2	0.224	0.98	NA	Operating Hrs.	NA	NA	NA
3	0.112	0.49	NA	Operating Hrs.	NA	NA	NA
4	0.22	0.99	NA	Operating Hrs.	NA	NA	NA

**Toxic and Hazardous Air Pollutants
(mg/m³)**

Unit Number	Trichloroethylene	1,1,1-Trichloroethane	1,1-Dichloroethylene	1,1,2,2-Tetrachloroethane	Xylenes
1	200	50	15	10	25
2	200	50	15	10	25
3	200	50	15	10	25
4	77	8	8	--	--

3. **Record keeping**--Condition 3 has been placed in the permit in accordance with 20 NMAC 11.41.II.7.2.H, to allow the Division to determine compliance with the terms and conditions of the permit. Compliance will be based on Division inspection of records and logs.
Daily records of the hours and days of operation, the daily production rates, and any control measures taken shall be maintained. This information shall be retained at the plant site for the most recent two year period and shall be made available to Division personnel upon request.
4. **Monitoring**--Condition 4 has been placed in the permit in accordance with 20 NMAC 11.41.II.7.2.D, F and G, to allow the Division to determine compliance with the terms and conditions of the permit. Compliance will be based on Division inspection of equipment and logs.
5. **Reporting**-- Condition 5 has been placed in the permit in accordance with 20 NMAC 11.41.9 and 20 NMAC 11.90.II, to allow the Division to determine compliance with the terms and conditions of the permit. Compliance will be based on timely submittal of the reports (Initial, quarterly, annually)

The permittee shall notify the Division in writing of:

- a) the actual date of initial startup of the source within fifteen (15) days after the startup date;
- b) any change in control or ownership within fifteen (15) days of the change in control or ownership; the permit and conditions apply in the event of any change in control or ownership of the facility. No permit modification is required in such case; however, in the event of any such change in control or ownership, the permittee shall notify the succeeding owner of the permit and the conditions.
- c) an updated emissions inventory for the source together with descriptions of any reconfiguration of process technology and air pollution equipment March 15 every year. If no change has occurred, a letter indicating that no change has occurred shall be sufficient.
- d) any breakdown of equipment or air pollution control devices or apparatus so as to cause emissions of air contaminants in excess of limits set by permit conditions. Any breakdown or abnormal operating conditions shall be reported within two hours of occurrence to (505) 224-6977 and via facsimile to (505) 768-1977.

The reports and notifications shall contain the required information and shall be made in accordance with CFR Title 40, Part 60, Subpart A - General Provisions and 20 NMAC 11.41.9.

6. **Modifications**-- Condition 6 has been placed in the permit in accordance with 20 NMAC 20 NMAC 11.41.I.7.8., to enable the Division to review proposed changes to the facility which may constitute a permit modification prior to such changes. Compliance will be based on Division inspections and the submittal of a new permit application for any modification.

Any future physical changes or changes in the method of operation which results in an increase in the pre-controlled emission rate may constitute a modification as defined by 20 NMAC 11.41.I.7.8. No modification shall begin prior to issuance of a permit. Modifications or revisions to this permit shall be processed in accordance with 20 NMAC 11.41.

7. **Compliance Assurance/Enforcement**-- All air pollution emitting facilities within Bernalillo County are subject to all applicable Albuquerque/Bernalillo County Air Quality Control Regulations, whether listed in this registration/permit or not.
 - a) The issuance of a permit or registration does not relieve the Facility from responsibility of complying with the provisions of the Air Quality Control Act, and the laws and regulations in force pursuant to the Act. (20 NMAC 11. 41.II.6)
 - b) Any conditions imposed upon the Facility as the result of an Authority-To-Construct Permit or any other permit issued by the Division shall be enforceable to the same extent as a regulation of the Board. (20 NMAC 11.41.II.7.3)
 - c) Whenever two or more parts of the Air Quality Control Act, or the laws and regulations in force pursuant to the Act, limit, control or regulate the emissions of a particular air contaminant, the more restrictive or stringent shall govern. (20 NMAC 11.01.II.3.1)

- d) The Division is authorized to issue a compliance order requiring compliance and assessing a civil penalty not to exceed Fifteen Thousand and no/100 Dollars (\$15,000) per day of noncompliance for each violation, commence a civil action in district court for appropriate relief, including a temporary and permanent injunction. (74-2-12 NMSA)
- e) Scheduled and Unscheduled Inspection (74-2-13 NMSA) – The Division will conduct scheduled and unscheduled inspections to insure compliance with the Air Quality Control Act, and the laws and regulations in force pursuant to the Act, and this Permit, and, upon presentation of credentials:
 - i. Shall have a right of entry to, upon, or through any premises on which an emission source is located or on which any records required to be maintained by regulations of the Board or by any permit condition are located;
 - ii. May at any reasonable time have access to and copy any records required to be established and maintained by Regulations of the Board, or any permit condition;
 - iii. May inspect any monitoring equipment and method required by Regulations of the Board or by any permit condition, and;
 - iv. Sample any emissions that are required to be sampled pursuant to Regulation of the Board, or any permit condition.
- f. Any credible evidence may be used to establish whether the Facility has violated or is in violation of any regulation of the Board, or any other provision of law. Credible evidence and testing shall include, but is not limited to (20 NMAC 11.41.II.15.1-2):
 - i. A monitoring method approved for the source pursuant to 20 NMAC 11.42 Operating Permits and incorporated into an operating permit;
 - ii. Compliance methods specified in the Regulations, conditions in a permit issued to the Facility, or other provision of law;
 - iii. Federally enforceable monitoring or testing methods, including methods in 40 CFR parts 51, 60, 61, and 75; and,
 - iv. Other testing, monitoring or information-gathering methods that produce information comparable to that produced by any CFR method and approved by the Division and EPA.

8. **Posting of the Permit**– Compliance will be based on Division inspections of the facility which show that a copy of the permit has been posted in a visible location.

A copy of this permit shall be posted in a visible location at the plant site at all times. The permit shall be made available to Division personnel for inspection upon request.

9. **Annual Fees**– Condition 10 has been placed in the permit in accordance with 20 NMAC 11.02.II.2.1, 2.4, to allow the Division to determine compliance with the terms and conditions of the permit. Compliance will be based on the receipt of the annual emissions fee due on July 1 each year to the Division.

Every owner or operator of a source which is required to obtain a source registration, an Authority-to-Construct, an operating permit, or a preconstruction permit shall pay annual emissions fees pursuant to Part 40, 41, 42, 60, 61, or 62. An annual emissions inventory may be submitted for review by the Division for the purpose of annual fee adjustments (20 NMAC 11.02.II.2.4.F).

Regulation	Description	Compliance Requirements			
20 NMAC 11.02	Annual Emissions Fees for Major and Non-Major Sources	Annual fee due on July 1 each year based on \$31.00 per ton for each criteria pollutant.	Non-Methane Hydrocarbons (VOC)	3.5 tpy x \$31.00 =	\$ 108.50
			TOTAL		\$ 108.50

II. ADDITIONAL REQUIREMENTS

1. **Permit Cancellation**-- The Division may cancel any permit if the construction or modification is not commenced within one (1) year from the date of issuance or if, during the construction or modification, work is suspended for a total of one (1) year. (20 NMAC 11.41, Section II.8)

Application for permit modifications, relocation notices and items listed under **ADDITIONAL REQUIREMENTS** shall be submitted to:

Albuquerque Environmental Health Department
Air Quality Services Section
Air Quality Division, Permitting
11850 Sunset Gardens SW
Albuquerque, New Mexico 87121

2. **Division Address**-- Test protocols, compliance tests and all reports shall be submitted to:

Albuquerque Environmental Health Department
Air Quality Services Section
Air Quality Division, Enforcement
11850 Sunset Gardens SW
Albuquerque, New Mexico 87121

ATTACHMENT I
NEW MEXICO ENVIRONMENT DEPARTMENT
DISCHARGE PLAN APPLICATION AND
APPROVAL DP-1184
SPARTON TECHNOLOGY, INC.



State of New Mexico
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau
Harold Runnels Building
1190 St. Francis Drive, P.O. Box 26110
Santa Fe, New Mexico 87502
(505) 827-2918 phone
(505) 827-2965 fax



GARY E. JOHNSON
GOVERNOR

PETER MAGGIORE
SECRETARY

PAUL RITZMA
DEPUTY SECRETARY

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

May 26, 2000

Richard D. Mico
Sparton Technology Inc.
4901 Rockaway Blvd., SE
Albuquerque, NM 87124-4469

RE: Discharge Plan Modification, DP-1184, Sparton Technology Inc.

Dear Mr. Mico:

Pursuant to Water Quality Control Commission (WQCC) Regulation 3109, the application for modification of discharge plan DP-1184, for the discharge of up to 108,000 gallons per day (gpd) of treated ground water is hereby approved, subject to the conditions and requirements listed below. The application for modification was submitted by Gary Richardson of Metric Corp. on behalf of Sparton Technology Inc. (Sparton). The total discharge for the facility after modification is 972,000 gpd, which includes 864,000 gpd from the previously approved off-site treatment system and 108,000 gpd from the new on-site treatment system. The facility is located in northwest Albuquerque in projected Section 7, T11N, R3E, Bernalillo County. In approving this discharge plan, the New Mexico Environment Department (NMED) has determined that the requirements of WQCC Regulation 3109.C have been met.

The original discharge plan approved in a letter dated June 26, 1998 for the off-site Sparton treatment and disposal system is described in part as follows:

Up to 864,000 gpd of contaminated ground water will be pumped from an off-site extraction well (CW-1) to an air stripper to remove chlorinated solvents. Treated ground water will be piped to an infiltration gallery located beneath the Calabacillas Arroyo channel for infiltration. Ground water below the infiltration gallery is at a depth of approximately 119 feet and has a total dissolved solids concentration of approximately 400 to 500 milligrams per liter.

The modification to the Sparton treatment and disposal system is briefly described as follows:

Up to 108,000 gpd of contaminated ground water will be pumped from an on-site extraction well (CW-2) to an air stripper to remove chlorinated solvents. Treated ground water from the on-site treatment system will be discharged to a series of six rapid infiltration ponds adjacent to the Sparton Technology Coors Road facility. In addition, a chromium treatment system will be added to the off-site treatment system. Ground water below the rapid infiltration ponds is at a depth of approximately 69 feet and has a total dissolved solids concentration of approximately 400 to 750 milligrams per liter.

The approved discharge plan modification consists of the materials submitted by Sparton dated December 7, 1999 and April 28, 2000. In addition, the discharge plan includes information and materials submitted as part of the original discharge plan approved on June 26, 1998. The discharge shall be managed in accordance with the approved plan of June 26, 1998 and this plan is subject to the conditions and requirements of this letter as listed below.

However, approval of this discharge plan modification does not relieve Sparton of its responsibility to comply with any conditions or requirements of the June 26, 1998 discharge plan, DP-1184, attached to this letter, the New Mexico Water Quality Act, WQCC Regulations, any other applicable federal, state and/or local laws and regulations, such as zoning requirements and nuisance ordinances.

CONDITIONS FOR APPROVAL

This discharge plan modification incorporates the terms which are Conditions and Specific Requirements in the discharge plan approval letter dated June 26, 1998 attached to this letter, and the additional Conditions listed below:

In addition to the monitoring outlined in Specific Requirement # 3 below, Sparton shall implement the following monitoring plan for the on-site system:

- 1) Sparton shall record the volume of effluent discharged to the rapid infiltration ponds and the volume of Aqua Mag added on a monthly basis and submit reports which include these volumes to NMED on a quarterly basis. Quarterly monitoring shall be submitted to NMED on or before January 31, April 30, July 31, and October 31 of each year.

The reason for this condition is to comply with WQCC Regulation 3107.

In addition to the contingency plan outlined in Specific Requirements # 4 and # 5 below, Sparton shall implement the following contingency plan:

- 2) In the event of a spill or discharge of contaminated water at the CW-2 well head, piping, or rapid infiltration ponds, Sparton shall comply with WQCC Regulation

1203. This includes taking the necessary corrective actions to contain or mitigate the damage caused by any spill or discharge as soon as possible, notification of NMED within 24 hours, and submittal of a corrective action plan for NMED approval within 15 days.

The reason for this condition is to comply with WQCC Regulation 1203.

- 3) If NMED determines that the chromium levels in effluent from CW-2 are a threat to groundwater quality, continued operation of CW-2 while chromium treatment is installed as required in Specific Requirement # 4 below, shall be at the discretion of NMED.

The reason for this condition is to comply with WQCC Regulation 3109.

In addition to the closure plan outlined in Specific Requirement # 6 below, Sparton shall implement the following closure plan:

- 4) Upon completion of post closure monitoring as determined by the Consent Decree, Sparton shall plug and abandon all monitor wells associated with the rapid infiltration ponds in accordance with NMED Monitor Well Construction and Abandonment Guidelines (copy enclosed) and any applicable laws. Notice to NMED shall be provided within a reasonable time prior to plugging and abandoning monitor wells.

The reason for this condition is to comply with WQCC Regulation 3107 and the Consent Decree.

SPECIFIC REQUIREMENTS

This discharge plan modification incorporates the terms which are Conditions and Specific Requirements in the discharge plan approval letter dated June 26, 1998 attached to this letter, and the additional Specific Requirements listed below:

Sparton will implement the following operational plan:

1) On-site (source) containment system:

- a) Sparton will pump up to 108,000 gpd of contaminated ground water from CW-2 to an air stripper to remove chlorinated solvents. Contaminated ground water will be treated to below WQCC standards and discharged to a series of six rapid infiltration ponds located adjacent to the Sparton Technology Coors Road facility.
- b) Sparton will add up to 4 ppm of Aqua Mag at the CW-2 well head to inhibit precipitation of calcium carbonate and other scaling compounds in the air stripper

and rapid infiltration ponds.

- c) Sparton will operate the rapid infiltration ponds as outlined in Attachments E and F of its discharge plan modification application dated December 7, 1999. This includes rotation of the ponds receiving water to allow frequent wet/dry cycles to control mosquito and algae growth, and to inhibit development of a clogging layer.
- d) In the event a chromium treatment system is added to the source containment system as provided for in Specific Requirement # 4 below, Sparton will operate it such that monthly average chromium concentrations in effluent discharged to the rapid infiltration ponds remains at or below 0.044 mg/l.

2) Off-site containment system:

- a) Sparton will provide chromium treatment for a minimum of 50 gpm until the monthly chromium concentration in monitoring wells MW-74, 75, and 76 is at or below 0.044 mg/l for two consecutive months
- b) After monthly chromium concentrations in MW-74, 75, and 76 have been reduced to at or below 0.044 mg/l for two consecutive months, Sparton may reduce the volume of flow that is subject to chromium treatment to a level below 50 gpm while insuring that the chromium concentration in any effluent discharged at any time to the infiltration gallery remains at or below 0.044 mg/l.
- c) Sparton will not reduce the volume of flow subject to chromium treatment by more than 12.5 gpm in any 30 day period.

Sparton will implement the following monitoring plan:

3) Monitoring requirements in addition to those previously required the June 26, 1998 approval:

Sampling Location	Parameters	Frequency
CW-2 Effluent	trichloroethylene (TCE) 1,1,1-trichloroethane (TCA) 1,1-dichloroethylene (DCE) methylene chloride chromium, iron, manganese	Daily the first week of operation, CW-2; Weekly the first month; Monthly after first month
Rapid Infiltration Ponds	Water Levels	Twice per week
MW-17, MW-77, MW-78	trichloroethylene (TCE) 1,1,1-trichloroethane (TCA) 1,1-dichloroethylene (DCE) methylene chloride chromium, iron, manganese	MW-77 and MW-78 twice prior to discharge to rapid infiltration ponds; Quarterly first two years of operation, semi-annually thereafter

Sampling Location	Parameters	Frequency
MW-17, MW-77, MW-78	Water Levels	Prior to each sampling event
CW-1 Effluent	Chromium	Weekly, first two months Monthly thereafter
MW-74, MW-75, MW-76	Chromium	Monthly until chromium concentration below 0.044 for two consecutive months, quarterly thereafter

Sparton will implement the following contingency plan:

4) On-site (source) containment system:

- a) Sparton will install an automatic shutdown switch which will turn off CW-2 in the event the air stripper fails.
- b) The rapid infiltration ponds will be equipped with overflows such that if the water depth exceeds one foot in any pond, it will overflow into the next pond in series. The easternmost (final) pond will be equipped with a high level switch which will turn off CW-2 if the water level in the pond exceeds one foot depth.
- c) Sparton will contain the first 8,000 gallons of water pumped from CW-2 in a portable tank. Water from the tank will be sampled and analyzed prior to discharge to the rapid infiltration ponds for total chromium. If total chromium concentration is greater than the WQCC ground water standard of 0.05 mg/l, no water will be discharged to the rapid infiltration ponds until a chromium treatment system is in place. If total chromium concentration is less than 0.050 mg/l, naturally or as a result of treatment, the on-site source containment system will be placed into operation.
- d) After operation commences, if the initial monthly average chromium concentration, based on four weekly samples as required in Specific Requirement # 3 above exceeds 0.05 mg/l, Sparton will install a chromium treatment process within 90 days of receipt of the analyses which confirm such exceedence.
- e) After the initial month of operation, if a monthly sample indicates chromium concentrations in excess of 0.05 mg/l, Sparton will resume weekly sampling for four consecutive weeks following receipt of the analytical results which indicate chromium concentrations in excess of 0.05 mg/l. If the monthly average chromium concentration exceeds 0.05 mg/l, Sparton will install a chromium treatment process within 90 days of receipt of the analyses which confirm exceedence.

5) Off-site containment system:

- a) In the event that the monthly average chromium concentration in the effluent from CW-1 exceeds 0.044 mg/l during the initial chromium treatment phase (Specific Requirement # 2.a) Sparton will provide additional chromium treatment such that the chromium concentration remains at or below 0.044 mg/l.

Sparton will implement the following closure plan:

6) On-site containment system:

- a) Upon closure of the on-site containment system, Sparton will disassemble the air stripper and dispose of the components properly.
- b) Upon closure of the on-site containment system, Sparton will regrade the rapid infiltration ponds to provide positive drainage.
- c) Upon closure of the on-site containment system, Sparton will sample and analyze MW-17, MW-77, and MW-78 for the constituents defined in Specific Requirement #3 above until eight consecutive quarterly analyses indicate WQCC standards are not being exceeded and provisions of the Consent Decree are met.

GENERAL DISCHARGE PLAN REQUIREMENTS

In addition to any other requirements provided by law, approval of this discharge plan modification, DP-1184, is subject to the General Requirements as specified in the discharge plan approval letter dated June 26, 1998 attached to this modification. Refer to the attached approval for specific information on the following General Requirements:

- Monitoring and Reporting
- Record Keeping
- Inspection and Entry
- Duty to Provide Information
- Spills, Leaks and Other Unauthorized Discharges
- Retention of Records
- Enforcement
- Modification and/or Amendments

OTHER REQUIREMENTS

Please be advised that the modification of this plan does not relieve Sparton of liability should your operation result in actual pollution of surface or ground water which may be actionable under other laws and/or regulations.

RIGHT TO APPEAL

If Sparton is dissatisfied with this action taken by NMED, Sparton may file a petition for hearing

before the WQCC. This petition shall be in writing to the Water Quality Control Commission within thirty (30) days of the receipt of this letter. Unless a timely request for hearing is made, the decision of the NMED shall be final.

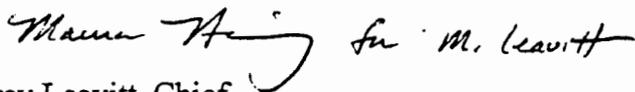
TRANSFER OF DISCHARGE PLAN

Pursuant to WQCC Regulation 3111, prior to any transfer of ownership, the discharger shall provide the transferee a copy of the discharge plan, including a copy of this approval letter and shall document such to the NMED.

PERIOD OF APPROVAL

Pursuant to WQCC Reg. 3109.G.4., this modification approval expires on June 26, 2003, the same day as the expiration of the discharge plan approved June 26, 1998. You must submit an application for renewal for the discharge plan at least 120 days before the expiration date and in accordance with the WQCC Regulations.

Sincerely,



Marcy Leavitt, Chief
Ground Water Quality Bureau

ML:KV

Enclosures: Discharge Plan Renewal Letter, DP-1184, June 26, 1998
Discharge Plan Summary
NMED Monitor Well Construction and Abandonment Guidelines

xc: L. William Bartels, Dist. Manager, NMED Dist. 1
Baird Swanson, NMED Albuquerque Field Office
Ana Marie Ortiz, Assistant General Counsel, NMED Office of General Counsel
Gary Richardson, P. E., Metric Corporation, 8429 Washington Place NE., Albuquerque, NM
Mark Schmidt, City of Albuquerque, Public Works Department, P. O. Box 1293, Abq, NM
Michael A. Hebert (6EN-HX), Compliance Assurance and Enforcement Division, U. S. EPA
Region 6, 1445 Ross Avenue, Dallas, Texas 75202-2733
Carl Will, NMED HRMB

APPENDIX J
CW-2 OPERATION LOG

SPARTON TECHNOLOGY, INC.

CW-2 Operation Log

Monitoring					Infiltration Gallery Monitoring							Aqua Mag Monitoring			
Water System Sensitive	Disch. Rate (Sec/100 gal)	Water Meter Flow** (gal/min)	Discharge Rate (min/in) (2 to 3 min)	Fence Line Gates Locks Security Pond Flow	Pond #1 Meter (gals)	Pond #2	Pond #3	Pond #4	Pond #5	Pond #6	Chemical Feed Tank Volume (gal)	Consumed (gal/day) ***	In Stock (gal)	Tech. Initials	
															Time of Day

Gallons needed to fill tank X 4.1 gal Aqua Mag = Aqua Mag Needed
100 gal solution.

Airstripper Water Meter Flow = 50gal/min

mp), A-2 (Airstripper Sump), A-3 (Pond #6), A-4 (Pump Off), A-5 (Blower Pressure Low)

APPENDIX K
SITE SAFETY AND HEALTH PLAN

**SITE
SAFETY AND HEALTH
PLAN**

**SPARTON TECHNOLOGY, INC.
COORS ROAD PLANT
SOURCE CONTAINMENT SYSTEM
OPERATION**

JANUARY 2002

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1.0 INTRODUCTION

This section of the site health and safety plan defines general applicability and general responsibilities with respect to compliance with health and safety programs.

1.1 Scope and Applicability of the Site Health and Safety Plan

The purpose of this site health and safety plan is to define the requirements and designate protocols to be followed at the site during operation and maintenance of the source containment system, including air stripper influent and effluent sampling and the rapid infiltration pond well sampling. Applicability extends to all contractors, subcontractors, and visitors.

All personnel performing operation and maintenance on site, contractors and subcontractors included, shall be informed of the site emergency response procedures and any potential fire, explosion, health, or safety hazards of the operation. This health and safety plan summarizes those hazards in TABLE 3.1, and defines protective measures planned for the site.

This plan must be reviewed and an agreement to comply with the requirements must be signed by all personnel prior to collecting waste samples or disassembling any equipment for maintenance.

During development of this plan consideration was given to current safety standards as defined by **EPA/OSHA/NIOSH**, health effects and standards for known contaminants, and procedures designed to account for the potential for exposure to unknown substances. Specifically, the following reference sources have been consulted:

- **OSHA 29 CFR 1910.120 and EPA 40 CFR 311**
- **NIOSH Pocket Guide to Chemical Hazards**

- (ACGIH) Threshold Limit Values - 1992
- OSHA 29 CFR 1910.1001 and 1926.58
- PSJA 29 CFR 1910.1200
- AIHA Respiratory Protection - A Manual and Guideline 2nd Ed.
- NIOSH/OSHA/USCG/EPA Occupational Safety and Health Manual for Hazardous Waste Site Activities
- EPA Standard Operating Safety Guides - Office of Emergency and Remedial Response
- State of New Mexico - Hazardous Materials Emergency Response Plan Procedures Manual

1.2 Visitors

All visitors entering the site during performance of maintenance activities (repairing the well or the submersible pump, or cleaning the air stripper) will be required to read and verify compliance with the provisions of this health and safety plan. In addition, visitors will be expected to comply with any applicable **OSHA** requirements. Visitors will also be expected to provide their own protective equipment (if applicable).

In the event that a visitor does not adhere to the provisions of the health and safety plan, he/she will be requested to leave the work area. All non-conformance incidents will be recorded in the site log.

Site security and safety measures for trespassing consist of a 5' high chain link fence posted with signs stating "NO TRESPASSING VIOLATORS WILL BE PROSECUTED". Access gates through the fence are secured with a chain and pad lock. The building's garage door is secured by a bolt which can only be opened from inside the building. The main access door is secured by a deadbolt. Automatic night time exterior lighting is provided.

2.0 KEY PERSONNEL / IDENTIFICATION OF HEALTH AND SAFETY PERSONNEL

2.1 Key Personnel

The following personnel and organizations are critical to the planned activities at the Site. The organizational structure will be reviewed and updated periodically by the Site Supervisor (**SS**). See TABLE 10.2

SPARTON TECHNOLOGY, INC.

Vice President and General Manager

Environmental/Safety Engineer

METRIC Corporation

Principal - Project Engineer

Engineer

Principal - Project Manager

2.2 Site Specific Health and Safety Personnel

The Site Health and Safety Officer (**HSO**) has total responsibility for ensuring that the provisions of this health and safety plan are adequate and implemented in the field. Changing field conditions may require decisions to be made concerning adequate protection programs. Therefore, it is vital that personnel assigned as **HSO** be experienced and meet the additional training requirements specified by **OSHA** in **29 CFR 1910.120**. The **HSO** is also responsible for conducting site inspections on a regular basis in order to ensure the effectiveness of this plan. See TABLE 10.2

The **HSO** at the site is METRIC Corporation, Principal - Project Engineer

Designated alternates include:

Sparton, Environmental/Safety Engineer

METRIC, Engineer

2.3 Organizational Responsibility

Site Supervisor: The site supervisor is responsible for overall site management and coordination of work performed under this health and safety plan.

SPARTON, either in the capacity as On-Scene Coordinator (**OSC**), or Site Inspection Officer (**SIO**), is responsible for overall project administration and contractor oversight. As a part of that oversight function, **SPARTON**, through the **HSO**, will ensure that project plans meet **OSHA** requirements at a minimum, and that the health and safety of all site personnel is a primary concern.

The Site Supervisor is Sparton, Environmental/Safety Engineer

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS

3.1 Historical Overview of Site

The Sparton Coors Road Plant is sited on an approximate twelve-acre parcel of land located on the northwest side of Albuquerque, on State Highway 448, known locally as Coors Road, approximately 0.75 miles north of the intersection of Coors Road and Paseo del Norte (FIGURE 1, APPENDIX A).

The Sparton facility began operation in 1961. Through 1994, electronic components, including printed circuit boards, were manufactured at the site. From 1995 through 1999, Sparton continued to operate the machine shop at the facility in support of manufacturing conducted at the company's Rio Rancho plant and other locations. Manufacturing process wastes were accumulated on-site originally in a concrete basin and later in lined containment ponds. Since 2000, an automobile dealer has occupied the site.

From 1983 until 1999, investigation of the nature and extent of the contamination has been on-going. Based on groundwater analysis, the primary constituents of concern appear to include trichloroethylene (TCE) and 1,1,1-trichloroethane (TCA), with lesser amounts of methylene chloride (MeCL), acetone, and 1,1-dichloroethylene (DCE). Various metals have also been detected in both soil and groundwater samples. Historically, chromium has the highest frequency of occurrence at elevated concentrations.

The source containment system (Site) (operation and maintenance covered by this plan) is located in the water treatment building located at 9621 Coors Road NW Albuquerque, NM.

3.2 Task by Task Risk Analysis

The evaluation of hazards is based upon the knowledge of site background presented

in Section 3.1, and anticipated risks posed by the specific operation.

The following subsections describe each location/operation in terms of the specific hazards associated with it. In addition, the protective measures to be implemented during completion of those operations are also identified.

The work site consists of the water treatment building location at 9621 Coors Rd. NW (FIGURE 2, APPENDIX A) and the rapid infiltration ponds and well located at the site. The project consists of operating, monitoring and maintaining the Source Containment System.

TABLE 3.1 provides a summary of chemical hazards and safety measures planned for each task at the Site.

TABLE 3.1
TASK ANALYSIS
CHEMICAL HAZARDS OF CONCERN

Source	Routes of Exposure	Contaminant	Hazard Minimization Measures
1. Sampling untreated water	Dermal	TCE TCA Cr DCE	Wear protective gloves when sampling (nitrile or other)
2. Repairing well, submersible pump or air stripperSame as Source 1.....		
3. Mixing AQUA MAG	Dermal	AQUA MAG*	Wear protective gloves when handling (nitrile or other)

* See MSDS sheet APPENDIX B. RCRA status of unused material non-hazardous 40 CFR 116-117.

3.3 Task Hazard Descriptions

3.3.1 Sampling Untreated Water

Hazards encountered during water sampling are as follows:

- Contact with chemical contaminants in the PPB range.
- Exposure to TCE, TCA, DCE, or Cr
- Short term exposure to noise levels of 83 dBA during air stripper sampling. Hearing protection is not required

HAZARD PREVENTION

- Use of protective gloves (nitrile or other) when collecting water samples.

3.3.2 Repairing Well, Submersible Pump, or Air Stripper

Hazards encountered during equipment repair include chemical and physical agents, and are as follow:

- Exposure to TCE, TCA, DCE or Cr while removing the pump from the well or cleaning or repairing the air stripper.
- Back strain, head injuries, falls, foot crushing and other injuries from falling objects associated with submersible pump removal and installation activities.
- Electrical shock from handling electric wiring and equipment.
- Exposure to extreme temperatures while working outdoors.

HAZARD PREVENTION

- Use of personal protective gloves (nitrile or other) and splash aprons when potentially contaminated water must be touched. An emergency eyewash station is provided in the air stripper building.
- Proper lifting (proper positioning, use of legs, multiple personnel) techniques to prevent back strain.
- Hard hats, steel toed boots and safety glasses will be worn by all personnel within 50 feet of the pump service rig.
- A steel pipe guardrail is provided in the air stripper building to prevent falls into the building sump.
- Use of lockout/tagout procedures to prevent electrical shock.
- Use of protective clothing (coats and gloves) for cold temperatures and use of portable shades for hot temperatures for well sampling operations. Temperatures inside the treatment building are moderated by the flow of water through the air stripper system (cooling) and electric heaters.

3.3.3 Mixing AQUA MAG

While the RCRA status of AQUA MAG is non hazardous, good industrial hygiene suggests wearing protective gloves (nitrile or other) when handling the product.

4.0 PERSONNEL TRAINING REQUIREMENTS

Consistent with **OSHA's 29 CFR 1910.120** regulations, **OSHA** 24 hour and **OSHA** 40 hour training are not required of site personnel. In recognition of potential and perceived risks during this activity, at least one person with **OSHA** 40 hour training shall be on-site when maintenance work is conducted. Also, all personnel are required to be informed about the known hazards on site and shall be required to read this health and safety plan, and sign a statement to that affect, prior to commencing maintenance work on this project.

4.1 Training and Briefing Topics

When maintenance activities are being conducted, the following items will be discussed by a qualified individual at the site pre-entry briefing(s), as well as daily or periodic site briefings.

<u>Training</u>	<u>Frequency</u>
Personnel assignments and duties	Daily
Pump Service Rig	Weekly
Personnel protective equipment Sec. 5.0	Daily

5.0 PERSONAL PROTECTIVE EQUIPMENT TO BE USED

This section describes the general requirements of the EPA and OSHA designated Levels of Protection (A-D), and the specific levels of protection required for each task at the Site.

5.1 Levels of Protection

Personnel must wear protective equipment when response activities involve known or suspected atmospheric contamination, when vapors, gases, or particulates may be generated by site activities, or when direct contact with skin-affecting substances may occur. Full facepiece respirators protect lungs, gastrointestinal tract, and eyes against airborne toxicants. Chemical-resistant clothing protects the skin from contact with skin-destructive and absorbable chemicals.

The specific levels of protection and necessary components for each have been divided into four categories according to the degrees of protection afforded:

Level A: Should be worn when the highest level of respiratory, skin, and eye protection is needed.

Level B: Should be worn when the highest level of respiratory protection is needed, but a lesser level of skin protection. Level B is the primary level of choice when encountering unknown environments.

Level C: Should be worn when the criteria for using air-purifying respirators are met, and a lesser level of skin protection is needed.

Level D: Should be worn only as a work uniform and not in any area with respiratory or skin hazards. It provides minimal protection against chemical hazards.

Modifications of these levels are permitted, and routinely employed during site work activities to maximize efficiency. For example, Level C respiratory protection and Level D skin protection may be required for a given task. Likewise the type of chemical protective ensemble (i.e., material, format) will depend upon contaminants and degrees of contact.

The Level of Protection selected is based upon the following:

- Type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity.
- Potential for exposure to substances in air, splashes of liquids, or other direct contact with material due to work being done.
- Knowledge of chemicals on-site along with properties such as toxicity, route of exposure, and contaminant matrix.

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate Level of Protection must be selected based on professional experience and judgment until the hazards can be better identified.

The specific level(s) of protection to be used in this project are described below.

5.2 Personnel Protective Equipment

Level D PPE is required minimum for all personnel within the pump service rig exclusion zone (i.e. within 50 ft. of the rig) when submersible pump maintenance operations are being performed.

- Boots/shoes, leather or chemical-resistant, steel toe
- Safety glasses

- Hard hat
- Nitrile or equivalent inner gloves. Leather outer gloves.

Level D Modified PPE is required for monitor well sampling operations.

- Boots/shoes, leather or chemical-resistant, steel toe
- Nitrile or equivalent gloves

Level D Modified PPE is required for air stripper maintenance and sampling operations.

- Nitrile or equivalent gloves

5.3 Reassessment of Protection Program

The Level of Protection provided by **PPE** selection shall be upgraded or downgraded by the **HSO** based upon a change in site conditions or findings of investigations. When a significant change occurs, the hazards should be reassessed. Some indicators of the need for reassessment are:

- Commencement of a new work phase.
- Change in job tasks during a work phase.
- Change of season/weather.
- When temperature extremes or individual medical considerations limit the effectiveness of PPE.

5.4 Work Mission Duration

Before the workers actually begin work in their PPE ensembles, the anticipated duration

of the work task should be established. Several factors limit the length, workers can work each day including:

- Ambient temperature and weather conditions (heat stress, cold stress).
- Capacity of personnel to work in PPE.

5.5 Chemical Resistance and Integrity of Protective Material

The following specific clothing materials are recommended for the site:

Monitor Well sampling (Level D - Modified)

Gloves - Work: cloth or leather

Sample handling: Nitrile

Boots - Steel Toe

Air Stripper sampling - (Level D - Modified)

Gloves - Nitrile

5.6 Standard Operating Procedures for Personal Protective Clothing

Proper inspection of PPE features several sequences of inspection depending upon specific articles of PPE and its frequency of use. The different levels of inspection are as follows:

Gloves

Before use:

- Visually inspect for:
- imperfect seams
- tears, abrasions
- non-uniform coating

5.7 Specific Levels of Protection Planned for the Site

The following levels of protection will be utilized during activities at the Site.

- Level D - Modified
- Level D

TABLE 5.1 presents the level of protection planned for the completion of individual task assignments and the specific components of each protective ensemble.

TABLE 5.1

**SPECIFIC LEVELS OF PROTECTIVE PLANNED FOR THE
TASK ASSIGNMENTS AT THE SITE**

Level A Tasks
- No activities
Level B Tasks
- No activities
Level C Tasks
- No activities
Level D - Modified Tasks
- Sampling untreated water
- Repairing containment well pump, air stripper
- Mixing Aqua Mag
- Well sampling
Level D Tasks
- Pump service rig exclusion zone

6.0 MEDICAL SURVEILLANCE REQUIREMENTS

Medical monitoring programs are designed to track the physical condition of employees on a regular basis, as well as survey pre-employment or baseline conditions prior to potential exposures.

Because exposure and sampling data do not exceed **OSHA** Permissible Exposure Limits, or action levels (nor are they expected to), a medical surveillance program will not be implemented as part of this project as allowed by **29 CFR 1910,120 (f)(2)**.

6.1 Exposure/Injury/Medical Support

As a follow-up to an injury or possible exposure above established exposure limits, all employees are entitled to and encouraged to seek medical attention and physical testing. Depending upon the type of exposure, it is critical to perform follow-up testing within 24-48 hours. It will be to the employer's medical consultant to advise the type of test required to accurately monitor for exposure effects.

7.0 FREQUENCY AND TYPES OF PERSONAL AIR MONITORING/SAMPLING

This section explains the general concepts of an air monitoring program. No surveillance activities are proposed during maintenance activities at the Site. If, however, in the opinion of the HSO air monitoring becomes warranted, it will be initiated.

The purpose of air monitoring is to identify and quantify airborne contaminants in order to verify and determine the level of worker protection needed. Initial screening for identification is often qualitative, i.e., the contaminant, or the class to which it belongs, is demonstrated to be present but the determination of its concentration (quantification) must await subsequent testing. Two principal approaches are available for identifying and/or quantifying airborne contaminants:

- The on-site use of direct-reading instruments.

- Laboratory analysis of air samples obtained by gas sampling bag, collection media (i.e., filter, sorbent), and/or wet-contaminant collection methods, if needed.

7.1 Direct-Reading Monitoring Instruments

Unlike air sampling devices, which are used to collect samples for subsequent analysis in a laboratory, direct-reading instruments provide information at the time of sampling, enabling rapid decision-making. Data obtained from the real-time monitors are used to assure proper selection of personnel protection equipment, engineering controls, and work practices. Overall, the instruments provide the user the capability to determine if site personnel are being exposed to concentrations which exceed exposure limits or action levels for specific hazardous materials.

Of significance importance, especially during initial entries, is the potential for IDLH conditions or oxygen deficient atmospheres. Real-time monitors can be useful in identifying IDLH conditions, toxic levels of airborne contaminants, flammable atmospheres, or radioactive hazards. Periodic monitoring of conditions is critical, especially if exposures may have increased since initial monitoring or if new site activities have commenced.

TABLE 7.1 excerpted from Occupational Safety and Health Guidelines for Hazardous Waste Site Activities, provides an overview of available monitoring instrumentation and their specific operating parameters.

TABLE 7.1

SOME DIRECT-READING INSTRUMENTS FOR GENERAL SURVEY

Instrument: Ultraviolet (UV) Photoionization Detector (PID) Example: HNU.

Hazard Monitored: Many organic and some inorganic gases and vapors.

Application: Detects total concentration of many organic and some inorganic gases and vapors. Some identification of compounds is possible if more than one eV probe is measured.

Detection Method: Ionizes molecules using UV radiation; produces a current that is proportional to the number of ions.

General Care/Maintenance: Test and recharge or replace weak batteries.

Regularly clean lamp window. Regularly clean and maintain the instrument and accessories.

Typical Operating Time: 10 hours. 5 hours with strip chart recorder.

Instrument: Flame Ionization Detector (FID). Example: OVA

Hazard Measured: Same as PID

Application: Detects total concentration of many organic and some inorganic gases and vapors.

Detection Method: The FID uses ionization as the detection method, much the same as in the HNU, except that the ionization is caused by a hydrogen flame, rather than a UV light. This flame has sufficient energy to ionize any organic species with an IP of 15.4 or less. The ions are then passed between two charged plates. The conductivity change is measured and the current charge is displayed on an external meter, and read in parts per million.

General Care/Maintenance: Test and recharge or replace weak batteries.

Regularly clean and maintain the instrument and accessories.

Typical Operating Time: 16 hours.

8.0 SITE CONTROL MEASURES

The following section defines measures and procedures for maintaining site control. Site control is an essential component in the implementation of the site health and safety program.

8.1 Site Communications Plan

Successful communications between field teams and contact with personnel in the support zone is essential. The following communications systems will be available during activities at the Site.

- Hand Signals

<u>Signal</u>	<u>Definition</u>
Hands clutching throat	Out of air/cannot breath
Hands on top of head	Need assistance
Thumbs up	OK/I am alright/I understand
Thumbs down	No/negative
Arms waving upright	Send backup support
Grip partners wrist	Exit area immediately

8.2 Work zone Definition

The two general work zones established for this project are the Exclusion Zone, and the Support Zone.

The Exclusion Zone is defined as the area where low level contamination is possible or because of activity, will provide a potential to cause harm to personnel due to safety hazards. Entry into the Exclusion Zone requires familiarity with this Health and Safety Plan and the use of any required personnel protective equipment. The Exclusion Zone consists of a 50 ft. radius around the pump service rig and the interior of the treatment

building..

The Support Zone is situated in clean areas where the chance to encounter hazardous materials or conditions is minimal. Personal protective equipment is not required in the Support Zone.

8.3 Nearest Medical Assistance

FIGURE 2 (APPENDIX A) provides a map of the route to the nearest medical facility which can provide emergency care for individuals who may experience an injury or exposure on-site. The need for medical assistance is determined by the **HSO** and the route to the hospital should be verified by the **HSO**. This route should be familiar to all site personnel.

8.4 Safe Work Practices

TABLE 8.1 provides a list of standing orders for the Exclusion Zone.

-	No smoking, eating, or drinking in this zone.
-	No horse play.
-	Implement the communications system.
-	Line of sight must be in position.
-	Wear the appropriate level of protection as defined in the Safety Plan.

8.5 Emergency Alarm Procedures

The warning signals described in section 10.4 "Evacuation Routes and Procedures," will be deployed in the event of an emergency. Communication signals will also be used according to Section 8.2.

9.0 DECONTAMINATION PLAN

TABLE 5.1 lists the tasks and specific levels of protection required for each task. All tasks are to be performed in Level D or Level D (modified) protection, thus exposure to harmful contaminants and subsequent need for decontamination is not anticipated.

9.1 Standard Operating Procedures

Decontamination involves the orderly controlled removal of contaminants. If unanticipated situations occur where exposure to contaminants is possible, all site personnel should minimize contact with contaminants in order to minimize the need for extensive decontamination.

9.2 Levels of Decontamination Protection Required for Personnel

The level of protection required for personnel assisting with decontamination will be Level D.

Modifications include: none.

The Site Safety Officer is responsible for developing and monitoring decontamination procedures and then determining their effectiveness.

9.3 Equipment Decontamination

Any contaminated equipment will be cleaned using high pressure steam cleaning prior to being scrapped or sold for salvage. The only non-dedicated equipment associated with the sampling program, is the electric sounder which will be decontaminated between uses by rinsing the contacted area three times with deionized water. Decon water and well purge water will be treated through the air stripper system and discharged to the rapid infiltration ponds.

10.0 EMERGENCY RESPONSE/CONTINGENCY PLAN

The section describes contingencies and emergency planning procedures to be implemented at the Site.

10.1 Pre-Emergency Planning

During the site briefings held daily during maintenance activities, all employees will be trained in and reminded of provisions of the emergency response plan, communication systems, and evacuation routes. TABLE 10.1 identifies the hazardous conditions associated with specific site activities. The plan will be reviewed and revised if necessary, on a regular basis by the **HSO**. This will ensure that the plan is adequate and consistent with prevailing site conditions.

10.2 Personnel Roles and Lines of Authority

The Site Supervisor or his designated alternate has primary responsibility for responding to and correcting emergency situations. This includes taking appropriate measures to ensure the safety of site personnel and the public. He/she is additionally responsible for ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed. The **HSO** or his designated alternate may be called upon to act on the behalf of the site supervisor, and will direct responses to any medical emergency. The individual contractor organizations are responsible for assisting the Site Supervisor in his/her mission within the parameters of their scope of work.

The Site Supervisor is: Sparton, Environmental/Safety Engineer

The **HSO** is: METRIC, Principal - Project Engineer

Alternates are: METRIC, Principal - Project Engineer

METRIC, Engineer

Sparton, Environmental/Safety Engineer

10.3 Emergency Recognition/Prevention

TABLE 3.1 provides a listing of chemical hazards on-site. Additional hazards as a direct result of site activities are listed in TABLE 10.1, as are prevention and control techniques/mechanisms. Personnel will be familiar with techniques of hazard recognition from pre-assignment training and site specific briefings. The **HSO** is responsible for ensuring that prevention devices or equipment are available to personnel.

10.4 Evacuation Routes/Procedures

In the event of an emergency which necessitates an evacuation of the site, the following alarm procedures will be implemented:

THREE CONSECUTIVE (5 SECOND) BLASTS ON THE AIR HORN

Personnel will be expected to evacuate the area immediately, and move to a safe distance. An electrical fire or a spill of untreated water are the two most likely emergencies. One hundred feet in any direction should be a safe distance for most emergencies. Personnel will remain at a safe distance until the Re-entry alarm (**Three 5 second blasts on an air horn**) is sounded or the **HSO** authorizes or provides further instructions.

TABLE 10.1

EMERGENCY RECOGNITION/CONTROL MEASURES

Specific Condition/ Hazard	Location	Prevention/Control
Fire/Explosion	All Areas	Fire extinguisher Fire Inspections
Spill	Air Stripper	Automatic Controls Building Sump

10.5 Emergency Contact/Notification System

TABLE 10.2 provides names and telephone numbers for emergency contact personnel. In the event of a medical emergency, personnel will take direction from the **HSO** and notify the appropriate emergency organization. In the event of a fire or spill, the site supervisor will notify the appropriate local, state, and federal agencies.

10.6 Emergency Medical Treatment Procedures

No special decontamination procedures are required for emergency medical treatment at this site. Also, special training is not required for medical emergency response personnel needing access to this site.

10.7 Fire or Explosion

In the event of a fire or explosion, the local fire department should be summoned immediately. Upon fire department arrival, the project manager or designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials on-site.

If the **HSO** or Site Supervisor deems it safe to do so, site personnel may:

- Use fire fighting equipment (hand-held fire extinguishers) available on-site to control or extinguish the fire; and,
- Remove or isolate flammable or other hazardous materials which may contribute to the fire.

All emergency equipment must be cleaned and fit for its intended use before operations are resumed.

10.8 Spill

In the unlikely event of a spill or release of untreated groundwater containing trichloroethylene (TCE), Sparton must comply with 40 CFR 264.56(d) and (f) through (j). The CERCLA reportable quantity for TCE is 100 lbs. (40 CFR 302). The discharge of

TABLE 10.2
EMERGENCY TELEPHONE NUMBERS

Organization	Contact	Name and Address	Work Phone	Home Phone
Ambulance:			911	
Police:			911	
Fire:			911	
SS	Sparton, Environmental/Safety Engineer	Don Gutierrez 4901 Rockaway Blvd. Rio Rancho, NM 87124	892-5300	550-7764
HSO	METRIC, Principal - Project Engineer	Gary L. Richardson 8429 Washington Pl. NE Albuquerque, NM 87113	828-2801	865-5140
Alternate	METRIC, Engineer	Don Briggs 8429 Washington Pl. NE Albuquerque, NM 87113	828-2801	898-8414
Alternate	METRIC, Principal - Project Manager	Peter H. Metzner 8429 Washington Pl. NE Albuquerque, NM 87113	828-2801	821-6850
State Police:	Albuquerque District Office		841-9256	
Hospital 1:	St. Joseph West Mesa		727-2000	
Hospital 2:	UNM		272-2111	
Poison Control Center			272-2222	
National Response Center			(800) 424-8802	
Center for Disease Control			(404) 633-5313	
Chemtrec			(800) 424-9555	

50 gpm of untreated groundwater from the source containment well for about 6 months would equal a release of 100 lbs. of TCE.

10.9 Incident Reporting

If the emergency coordinator determines that the facility has had a release of a reportable quantity of TCE, or a fire or explosion which could threaten human health, or the environment, outside the facility, he must report his findings as follows:

He must immediately notify either the government official designated as the on-scene coordinator for that geographical area, (in the applicable regional contingency plan under part 1510 of this title) or the National Response Center (using their 24-hour toll free number 800/424-8202). The report must include:

- i) Name and telephone number of reporter;
- ii) Name and address of facility;
- iii) Time and type of incident (e.g., release, fire);
- iv) Name and quantity of material(s) involved, to the extent known;
- v) The extent of injuries, if any; and
- vi) The possible hazards to human health, or the environment, outside the facility.

The owner or operator must note in the operating record the time, date, and details of any incident that requires implementing the contingency plan (i.e., release of a reportable quantity of TCE or a fire or explosion which could threaten human health, or the environment outside the facility). Within 15 days after the incident, he must submit a written report on the incident to the Regional Administrator. The report must include:

- 1) Name, address, and telephone number of the owner or operator;
- 2) Name, address, and telephone number of the facility;
- 3) Date, time, and type of incident (e.g., fire, explosion);
- 4) Name and quantity of material(s) involved;
- 5) the extent of injuries, if any;
- 6) An assessment of actual or potential hazards to human health or the

environment, where this is applicable; and

- 7) Estimated quantity and disposition of recovered material that resulted from the incident.

10.10 Emergency Equipment/Facilities

A fire extinguisher, emergency eye wash station, first aid kit and telephone are maintained in the water treatment building.

11.0 DRUM HANDLING PROGRAM

The procedures defined in this section comprise the drum handling program in place for activities at the Site.

- All drums and containers used during the project shall meet the appropriate **DOT, OSHA, and EPA** regulations for the waste that they will contain.
- Drums and containers shall be inspected and their integrity assured prior to being moved. Drums or containers that cannot be inspected before being moved because of storage conditions, shall be positioned in an accessible location and inspected prior to further handling.
- Operating on site will be organized so as to minimize the amount of drum or container movement.
- Employees involved in the drum or container operations shall be warned of the hazards associated with the containers.
- Drums or containers that cannot be moved without failure, shall be emptied into a sound container.
- Fire extinguishing equipment meeting 29 CFR part 1910. subpart L shall be on hand and ready for use to control fires.
- Drum handling will be conducted using a buddy system or with the use of mechanical assistance.

APPENDIX A
PROJECT MAPS



FIGURE 1
LOCATION MAP
SPARTON

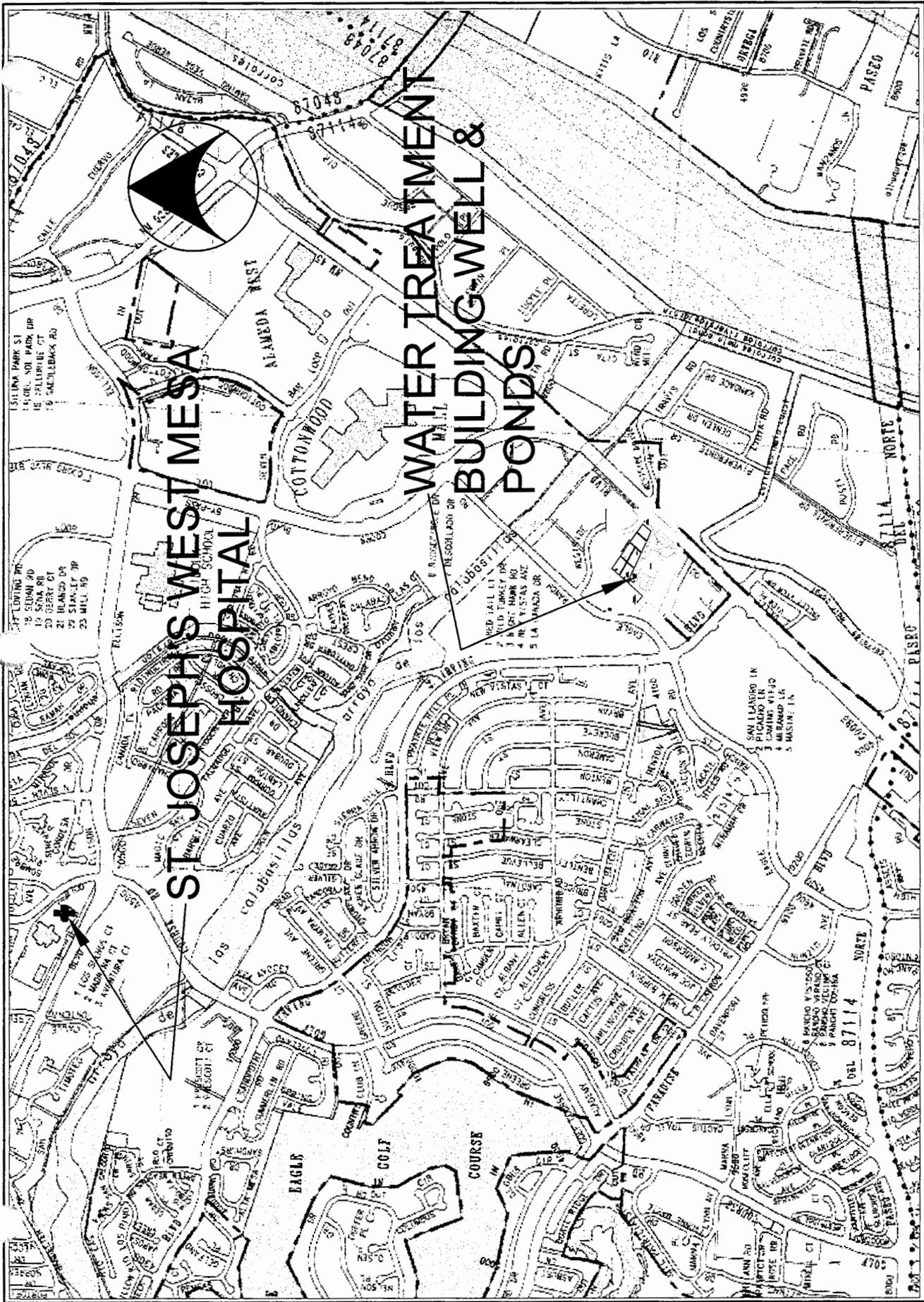


FIGURE 1
LOCATION MAP
SPARTAN

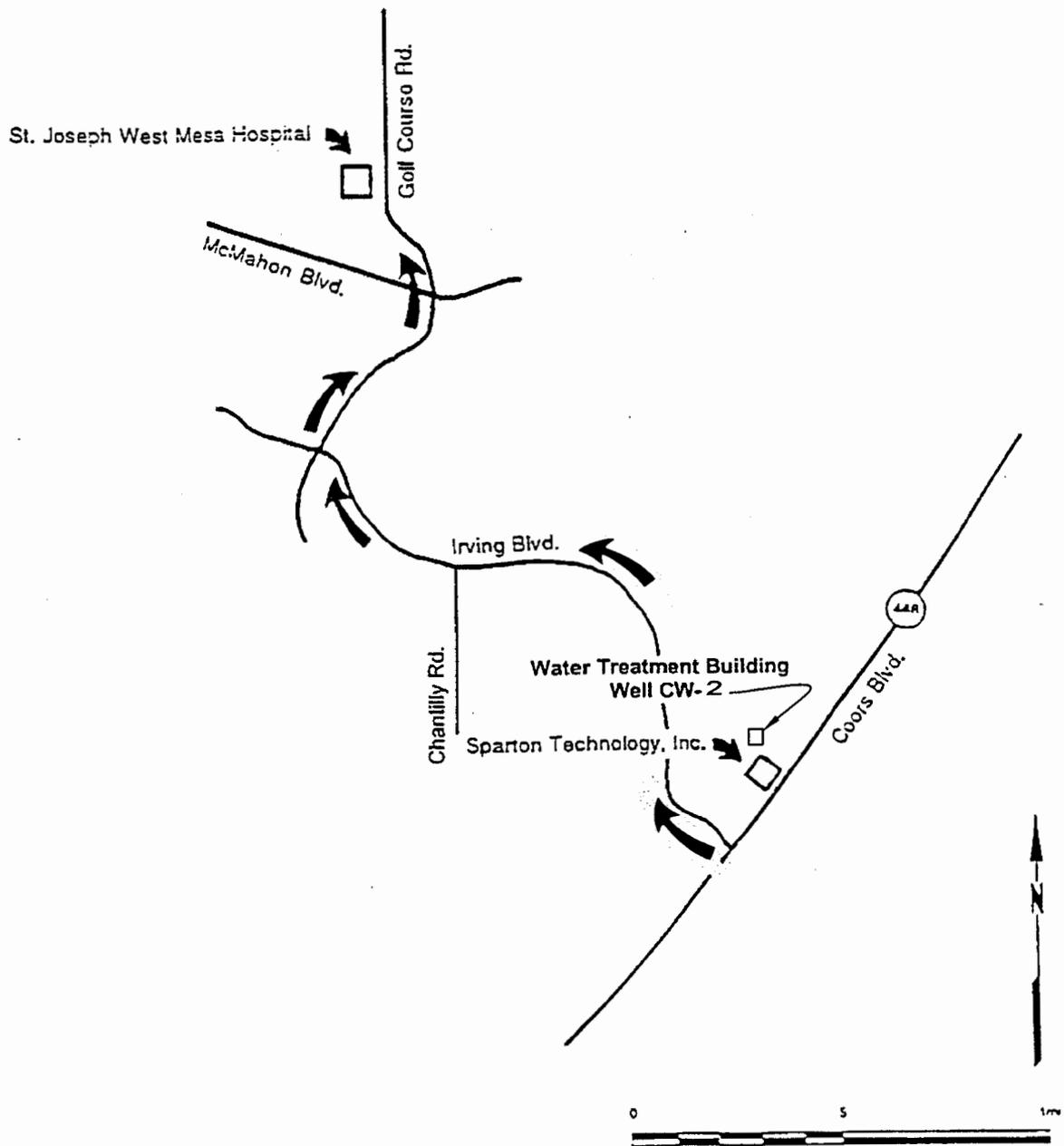


FIGURE 2

MAP DEPICTING FOUTE TO NEAREST HOSPITAL FACILITIES
 (APPROXIMATELY 2 MILES)
 SPARTON TECHNOLOGY, INC.

APPENDIX B
MSDS SHEET FOR AQUA MAG

The Kjell Corporation
P.O. Box 834
Beloit, WI 53512
Phone: 800-356-0422
Fax: 608-755-0538



Kjell Laboratories
5043 Hwy 51 South
Janesville, WI 53546
Phone: 608-755-0422
Fax: 608-755-1339

CORPORATION AQUA MAG

SEQUESTRANT, SCALE, AND CORROSION INHIBITOR

Aqua Mag is a water treatment additive for potable and industrial water treatment. It is produced by thermal reaction of food-grade phosphates into a liquid concentrate of exceptional purity, clarity, and stability. Aqua Mag contains all available species of phosphate compounds, for better sequestration and corrosion control.

SEQUESTRATION

Reduction of:

- Iron and Manganese stains
- Calcium deposits
- Chlorine demand

CORROSION CONTROL

Reduction of:

- Lead and Copper leaching
- Iron tuberculation in distribution pipes
- Microbial Influenced Corrosion (MIC)

CERTIFICATIONS

USEPA, USDA, NSF International, UL, ANSI/NSF Std. 60 and Kosher approved

PROPERTIES

- Clear homogeneous liquid
- Viscosity 1.008 cps at 70°F
- Ratio ortho/complex polyphosphate 30/70
- No heavy metals available
- Freezing point <38°F
- Shelf life (neat) >2 years
- Spec. Gravity 1.367 +/- 0.01
- % Total Phosphate 34.5 +/- 1.0
- pH neat 5.2 +/- 0.5
- Totally soluble and freeze/thaw stable
- 11.4 lbs. per gallon

SHIPPING & HANDLING

Aqua Mag is packaged in 1-5-15-30 & 55 gallon containers and bulk quantities from the manufacturing facility, local warehouses, and bulk terminals. The product is shipped in safety-sealed, food-grade, labeled containers or food-grade certified tankers. Each container is identified by lot number.

APPLICATION RATE

Aqua Mag is applied using a chemical metering pump. In most applications, Aqua Mag is fed as a concentrate without the necessity of dilution. For Aqua Mag dosage rates or answers to technical questions, contact the technical assistance department of The Kjell Corporation.

MATERIAL SAFETY DATA SHEET

THE KJELL CORPORATION
 P.O. BOX 834
 BELOTT, WISCONSIN 53512-0834
 (800) 356-0422 (608) 755-0422

Product Name: **AQUA MAG**

Date Prepared: June 18, 1986

Last Revision: March 5, 1996

PRODUCT INFORMATION

Synonyms: Blended sodium phosphate
 Chemical Family: Liquid phosphate blend
 Formula: Proprietary
 Maximum Use: 23.4 mg/L



Note: Use of an asterisk (*) or other designation indicates that there may be chronic health effects present. See safety file on the product.

HAZARD RATINGS AND PROTECTION INDICES
 APPEAR IN APPROPRIATE BOXES.

HAZARD RATING

0 - MINIMAL HAZARD 1 - SLIGHT HAZARD
 2 - MODERATE HAZARD 3 - SERIOUS HAZARD
 4 - SEVERE HAZARD

PROTECTION INDEX

A - EYES B - HANDS
 C - RESPIRATORY D - BODY

PRECAUTIONARY INFORMATION

Precautionary Statement:
 (As defined by OSHA Hazard
 Communications Standard)

No significant health effects reported from
 manufacturing locations

INGREDIENTS / COMPONENTS

Chemical Identity:	Sodium ortho/polyphosphate blend
OSHA PEL:	Not listed
ACGIH TLV:	Not listed
CAS #:	68915-31-1
Hazard Class:	None

PHYSICAL DATA

Boiling Point:	Above 100° C.
Melting Point:	Not applicable
Vapor Pressure:	Not applicable
Vapor Density (Air = 1):	Not applicable
Specific Gravity (H ₂ O = 1):	1.367 ± 0.01
Evaporation Rate (Butyl Acetate = 1):	Non-volatile
Solubility in Water by Weight:	Complete
pH (neat):	5.2 ± 0.5
Appearance:	Clear liquid
Odor:	Slight

FIRE AND EXPLOSION DATA

Flash Point:	Non-combustible
Flammable Limits	
Upper:	Not applicable
Lower:	Not applicable
Extinguishing Media:	Not applicable
Special Fire Fighting Procedures:	Not applicable
Unusual Fire & Explosion Hazards:	None

REACTIVITY DATA

Stability:	Stable
Incompatibility:	Concentrated chlorine and concentrated mineral acids
Hazardous Polymerization:	Will not occur
Conditions to Avoid:	Direct mixing of concentrates of chlorine and mineral acids
Hazardous Decomposition By-products:	Heat, chlorine, and sulfur dioxide

HEALTH HAZARD DATA

Routes of Exposure	
Eyes:	No published data
Skin Contact:	No published data
Skin Absorption:	No published data
Inhalation:	No published data
Ingestion:	No published data

Effects of Overexposure	
Acute Exposure:	No published data
Chronic Exposure:	When good industrial hygiene practices are followed, no significant inhalation hazard or skin irritation.

Other Health Effects	
Medical Conditions:	
Aggravated by Exposure:	None known
Carcinogenic Potential:	
NTP Annual Report:	Not listed
IARC Monographs:	Not listed
OSHA 29CFR Part 1910 Sub z:	Not listed

Additional Regulatory Information	
FDA:	GRAS list permitted in food
USDA:	Listed as acceptable if followed by a potable water rinse
NSF International:	Certified to meet ANSI/NSF Standard 60
Underwriters Laboratories:	Certified to meet ANSI/NSF Standard 60

Emergency and First-Aid Procedures

Eyes:

Flush with water. If irritation occurs seek medical attention.

Skin:

Wash with water. If irritation occurs seek medical attention.

Inhalation:

Remove from exposure.

Ingestion:

Rinse mouth and dilute stomach contents with water or milk if available.

Decontamination Procedure:

Wash with water.

Notes to Physician:

Large doses may cause nausea and diarrhea.

STORAGE AND HANDLING

Spill or Leak Procedures:

Material should be wiped up for salvage or disposal. Flush with water.

Waste Disposal Method:

If not salvaged, dispose in a landfill in accordance with local, state, and federal regulations.

Precautions in Storing:

Should be stored in clean area for quality assurance. Keep container closed when not in use. Protect from freezing and extreme heat.

SPECIAL PROTECTION

Respiratory:

None required

Eyes:

Not mandatory

Protective Gloves:

Not mandatory

Clothing & Equipment:

No special requirements

Ventilation Requirements:

No special requirements

Work/Hygiene Practices:

No special requirements. Follow good industrial hygiene practices.

TRANSPORTATION DATA

DOT Proper Shipping Name:

Sodium phosphate solution

DOT Classification:

Not regulated

DOT Labels:

Not required

DOT Placards:

Not required

Emergency Accident Precautions & Procedures:

Not hazardous. See instructions above for release or spill.

MANUFACTURER'S DISCLAIMER

While The Kjetl Corporation will make every effort to insure the validity of this information, we must rely on the information given to us by our suppliers, and thus make no warranty, express or implied, as to the validity of this data.

Any use of this product or method of application which is not described in the Product Data Sheet is the responsibility of the user.

Environmental:**Degradability/Aquatic Toxicity**

Aqua Mag constituents have been tested to be barely to non-toxic according to current classification levels.

< 1 ppm	Highly or strongly toxic
1-10 ppm	Toxic
10-100 ppm	Moderately toxic
100-1000 ppm	Slightly toxic
> 1000 ppm	Barely toxic to non-toxic

48-hr LC 50%	Daphna magna	3580 ppm*	
48-hr LC 50%	Lymnaea sp	2954 ppm*	
48-hr LC 50%	Fish	1650 ppm (n.n. orfe)	10,000 ppm @ pH 7**
25-hr/50-HR LC 50%	Daphne magna	1154 ppm/1089 ppm**	
0.5-hr EC 50%	Pseudomonas putida	1000-1500 ppm**	

EPA hazardous substance? No 40CFR116-117

Waste Disposal Methods: Must comply with all federal, state, and local disposal/discharge laws

RCRA Status of Unused Material: Non-hazardous 40CFR261

* Dowden, B.F., Bennett, H.J., "Toxicity of Selected Chemicals to Certain Animals," Journal WPCF, Sept. 1965, pp. 1308-1316.

**Schoeber, I.P., Huber, L., "Ecologically Relevant Data of Nonsurfactant Components of Detergents and Cleaners," Tenside Surfactants Detergents, 25, 99-107, (1988).

Appendix B

STORAGE AND COMPATIBLE MATERIALS**Minimum Tank Ratings:**

Holds liquid weighing 12 lb/gal (1.44 kg/L) minimum

Handles liquid temperatures up to 130° F (49° C)

Storage temperature range in container of 45° - 75° F (7° - 24° C)

Temperature regulates the indoor storage of drums/bulk tanks, or insulate and heat outdoor tanks.

Prevent indoor drum/tank exposure to cold flooring by elevating with pallets or insulation.

Compatible Storage/Plumbing/Pumping Materials:

High-medium density polyethylene, cross-linked polyethylene, fiberglass, reinforced plastic, 316 Stainless Steel, glass lined/epoxy lined steel tanks; Schedule 80 PVC/CPVC piping, clear PVC and white polyethylene tubing; Ceramic, teflon, viton, hypalon, and PVC liquid end pump materials.

Materials to Avoid in storage/plumbing:

Black iron, mild steel, galvanized, aluminum, zinc, copper, lead, brass, bronze, and tin.

Metering equipment:

Diaphragm, and peristaltic type metering pumps.