2144

Cleaning Systems

OPERATING MANUAL - PARTS LIST

MODEL NO. 9644 012 040

SERIAL NO. 9510 2814

VOLT 460V AC

PHASE 3PH

SUNDSTRAND

ADF SYSTEMS, LTD.
P.O. BOX 278
HUMBOLDT, IOWA 50548
TELEPHONE: (515) 332-5400
FAX: (515) 332-4475

OPERATING INSTRUCTIONS AND CAUTIONS

INSTALLATION CAUTIONS

1. This machine must be wired in accordance with the National Electrical Codes and applicable to local codes and ordinances for this type of machinery. Machine must be grounded. Failure to provide proper grounding could result in a severe electrical shock.
2. Unit should be installed in an open area to provide adequate air circulation to keep motors and pumps at normal operating temperature.
3. Unit must be placed on a level surface to function properly during operation.
4. **CAUTION: DO NOT USE FLAMMABLE SOLVENTS** in this washer. **USE ONLY ADF DETERGENTS** or other quality approved chemicals.

INSTALLATION

1. Wire this machine to the correct machine voltage and capacity as specified on the Specification Plate located in the control panel.
2. Make connections on to terminal block supplied with machine.
   NOTE: There is no special pump rotation so machine can be wired either way.
3. Make sure machine is grounded.
4. A fused disconnect box should be used between the machine and the incoming power.

OPERATING PROCEDURES

1. Pour required amount of liquid detergent into spray chamber. For powdered detergent, premix and pour into spray chamber.
2. Add water through spray chamber to fill reservoir tank to within 1 inch of top. (Using hot water will reduce warm up time.)
3. Turn heater switch to "ON" position.
4. When water is to required temperature, place parts on turntable. (Do not drop parts on table.)
5. Turn pump on with timer switch to required cycle time.
6. Machine will shut off after cycle is completed.
7. Remove parts from machine for drying, using protective clothing and eye wear.

IF MACHINE DOES NOT OPERATE

1. Make sure lid is down and latched. Lid safety switch will not allow operation if open.
2. Check liquid level in holding tank. Low level cutoff will not allow operation if level is too low.
3. Make sure machine is plugged into circuit.

DO'S

DO read Instruction Manual thoroughly before operating.
DO clean filters daily or more often as needed.
DO use protective clothing and eye wear.
DO drain and flush tank as required.
DO check oil level in pump daily.

DO NOT'S

DO NOT use flammable materials in this machine.
DO NOT drop material on turntable.
DO NOT perform maintenance while plugged into electrical circuit.

REPLACING THE CLEANING SOLUTION AND CLEANING THE WASHER

The cleaning solution should be changed periodically to maintain clean parts. This will be done by following these steps. NOTE: Changing the solution tank may require more changes or fewer changes, depending on the type of parts being cleaned.

1. Turn off the main electrical switch to the machine. Then disconnect the electrical plug from the outlet. **CAUTION: MAKE SURE ELECTRICAL PLUG AND HANDS ARE DRY AND DO NOT STAND ON WET FLOOR!**
2. For fixed position tank models the drain is located on the bottom of the tank. In removable tank models, the drain is located on the side of the tank. To drain, remove plug on models supplied with gate valve, open and let water drain out. For fixed position tanks remove filter tray and clean inside tank and tray using a scrub brush and clean water. NOTE: Take extra care in cleaning the oils and sediment from the level switch. Close gate valve or replace plug and add cleaning solution to the tank. Refill with clean water about one inch from top of tank.
3. Connect the electrical plug to the outlet, then turn on the main electrical switch located above the outlet. **CAUTION: MAKE SURE ELECTRICAL PLUG AND HANDS ARE DRY AND DO NOT STAND ON WET FLOOR!**
4. For start up, follow steps outlined in the Operating Procedures, Steps 3 through 7.

REPLACING THE FILTERS

The filter should be changed to maintain clean parts. The filters and cleaning solution should be changed at the same time.

1. To change the filter in the tray, first slide out the tray and remove the dirty filter by lifting the filter out. Place new filter in the tray. Then slide the tray in and check that the filter lays flat, straighten if necessary. Corners need to be tucked up and straight to prevent fluid from flowing over.
2. The high pressure filter on the washer will require a 5/8 and 1 - 1/16 inch wrench.
3. Use the 5/8 wrench to remove the drain plug at the bottom of the filter cartridge. Drain into container for proper disposal.
4. Disconnect both hose couplings from the top portion of the cartridge.
5. Use the 1 - 1/16 wrench to remove 2 nuts holding the coupling together at the top of the cartridge. Remove the two havles of the coupling. then pull the top portion of the filter straight up and out of the cylinder.
6. Remove bolt on bottom of filter cartridge and pull cartridge off. Replace with new cartridge and reassemble following the above steps in reverse order.

MAINTENANCE

1. Change the oil in the pump every 6 months. NOTE: Oil needs to be checked daily for proper pump operation.
2. Check the condition of the belt and tighten if necessary.

TROUBLE SHOOTING

PROBLEM	CAUSE	SOLUTION
1.1 Pump Motor will not start	Incomplete Electrical Circuit	a. Check Main Disconnect Switch Fuses, and Wiring to Machine
1.2	Lid Safety Switch is out of Adjustment	a. Reset Adjusting Screw on Lid so switch makes contact when lid is closed.
1.3	No Continuity through Level Switch	a. Check for Proper Water Level in Reservoir Tank (it should be min. 1-2 inches above Level Switch). b. Clean Reed Switch on Float for proper contact. c. Defective Level Switch - Replace.
1.4	Incomplete Circuit through Timer Switch or On-Off Switch	a. Check for continuity through Switch - if no continuity in the "ON" position, switch is defective & should be replaced.
1.5	Defective Motor Relay	a. If Relay will not close, coil in relay is defective, relay should be replaced.
2.1 Machine Cycles ON and OFF	Water Level in Reservoir Tank is too Low	a. Re-fill Tank to proper level.
2.2	Lid Safety Switch out of adjustment	a. Reset adjusting screw.
3.1 Heater does not Heat Water	Heater Relay does not close	a. See 1.3a, 1.3b and 1.3c.
3.2	Temperature Control in Heater is not set	a. Set to desired Temperature by opening cover on heating element and turning dial clockwise to rise temperature and counter clockwise to lower temperature.
3.3	Incomplete Circuit through Heater On-Off Switch	a. See 1.4a.
3.4	Defective Heater Relay	a. If Relay will not close, Coil in Relay is defective - Replace Relay
4.1 Heater does not Shut Down	Temperature Control in Heater is not set	a. See 3.2a
4.2	Defective Heater Relay	a. If Heater Relay Remains closed with On-Off Switch in "OFF" Position; Replace Relay
4.3	Defective Thermostat	a. Replace Heating Element
5.1 Pump Motor Trys to Start but Hums	Incorrect Voltage to Machine	a. Wire Machine to Correct Voltage Load b. Insufficient Wire Size to carry Machine Voltage Load c. Defective Motor
6.1 Turntable does not Rotate	Gear Motor is not Running	a. Incomplete Electrical Circuit to Gear Motor. Check wiring & switch to gear motor. b. Defective motor - replace.
6.2	Gear Motor is Running but turntable does not rotate	a. Bolt which holds turntable to shaft has become loose. b. Sprocket is turning on shaft and should be retightened. c. Gears in gear motor has been stripped out, replace gears.
7.1 Pressure Gauge on Outlet Side of High Pressure Filter reads Higher than Machine Rated Pressure	Plugged Nozzles	a. Remove Nozzle and run a fine wire through to Clean. (NOTE: DO NOT Drill out or the rated pressure of Machine will drop off.)
7.2	Obstruction in Pressure Line	a. Connection Hose between Spray Manifolds has become plugged & needs to be cleaned out.
8.1 Pressure Gauge on Outlet Side of High Pressure Filter reads Lower than Machine Rated Pressure (NOTE: This is only on machines equipped with High Pressure Filter.)	High Pressure Filter Cartridge is becoming plugged.	a. Replace Cartridge in Filter by removing Collar around filter and pulling Head Assembly out,Remove bolt on bottom of Filter Cartridge and pull cartridge off. Replace with new cartridge & reassemble.
8.2	Nozzles are worn	a. Replace with new nozzles
8.3	Relief Valve had Opened up because of plugged nozzle	a. Clean nozzles.
8.4	Belt is worn	a. Replace Pump Drive Belt
8.5	Pump is becoming worn.	a. See section on Pump.
9.1 Poor Cleaning Results	Cleaning Time is too Short	a. Clean for Longer Cycle Time
9.2	Water Temperature is too Low	a. Turn up Temperature
9.3	Detergent concentration too Low	a. Add more Detergent
9.4	Cleaning Solution Contaminated	a. Change Cleaning Solution
9.5	Nozzles are plugged	a. Clean nozzles
9.6	Turntable not turning	a. See 6.1a, 6.1b, 6.2a, 6.2b and 6.2c.

OPERATING PROCEDURES

1. Pour required amount of liquid detergent into spray chamber. For powdered detergent, premix and pour into spray chamber.

2. Add water through spray chamber to fill reservoir tank to within 1 inch of top. (Using hot water will reduce warm up time.)

3. Turn heater switch to the "ON" position.

4. When water is to required temperature, place parts on turntable (Do not drop parts on table).

5. With machines supplied with electronic timers, set the wash timer to your predetermined time. If other optional cycles are on your machine, preset these times also.
   NOTE: With some options, they require a delay timer between cycles. They are preset at the factory and should not require any further adjusting.

6. To begin first cycle, push wash start button. This will allow machine to run through all cycles. If there is more than 1 cycle, there will be an indicator light on the control panel to show what cycle the machine is in.
   NOTE: For machines equipped with air doors, the start button must be held in until the door is completely closed. If the button is released before the door is down, the door will automatically go back up.

7. The cycle can be stopped at any time by pressing the wash off or Emergency Stop Button.

8. Machine will shut off after last cycle is completed.
   A. For machines equipped with air doors, the door will automatically open.
   B. For machines with a signal light, the light will stop flashing at the end of the last cycle.

9. Remove parts from machine using protective clothing and eye wear.
   NOTE: If machine is equipped with a jog button, rotate turntable to desired position.

10. To clean reservoir tank, remove bolts that hold access panels in place and then remove panels.

11. When replacing panels into machine, be sure to use a good quality sealer to seal panels in place.

MACHINE LOCKOUT

1. Push the WASH OFF button on the control panel.
   a) shuts down all cycle timers

2. Turn all selector switches to the OFF position.

3. Pull the disconnect switch on the front of the control panel.

4. Place a lockout padlock through the hole in the handle to lock out the service panel.

5. Apply lockout tags.

6. Follow company procedure for performing maintenance/service.

7. Before removing locks/tags and returning machinery to operation, be sure that...
   a) all safety guards are back in place
   b) work is complete and tools are put away
   c) workers are positioned safely for startup
   d) controls are positioned correctly for startup and machine is operation ready.

8. Follow company sequence for unlocking and untagging the lockout points to return the machine to service.

LUBRICATION

A good program of maintenance will prolong the life of the machine and result in fewer hours of down time.

CAUTION: Extreme care must be taken to prevent harm to either machine or personnel before repairs or disassembly are started.

1. The electrical system should be properly disconnected and lockout.

LUBRICATION: All grease points have been thoroughly lubricated at the factory as part of the original machine start up. A regular lubrication schedule should be set up to keep the machine in proper working order. If there is a lot of grit, sand or dust in the work area, a more frequent lubrication cycle may be required.

PUMP

The pump is sealed in oil for cooling and lubrication. The oil should be changed after the first 100 hours of operation and every 500 hours thereafter. It is recommended to use a 30 weight non-detergent oil, or a 10W-30 synthetic (ie.) Mobil 1 oil.
NOTE: The pump should be inspected for seal wear or damage, and repairs should be made if there is any sign of oil around the outside of the pump.

DOOR CABLE PULLEYS

The pulleys should be lubricated monthly, or as needed, using a mineral or synthetic oil with a minimum viscosity of 100 S.U.S. (Saybolt Universal Second) at the bearing operating temperature. If the viscosity is less than this the life of the pulleys may be reduced.

TURNTABLE BEARINGS (SEE DRAWING TT-A)

The turntable bearing lubrication point should be greased monthly using a high temperature grease with a melting point greater than 400 degrees Fahrenheit. The upper bearing on the turntable (part 3) should be disassembled and repacked yearly.

WASH PUMP MOTOR

The pump motor has been tested and greased at the plant, therefore, lubrication is not necessary for approximately six to eight months. After that, the motor should be greased once a month using a SR1 #2 Chevron ball bearing. Remember, when lubricating ball bearings, too much grease will cause bearings to run hot, so grease bearings sparingly.

Maintenance

DAILY

Check the oil level and the condition of the oil. The oil level should be 1 in. from the top of the fill port – to the line on the oil fill plug's dipstick (28).

Use the appropriate Hydra oil for the application – contact Wanner Engineering if in doubt.

CAUTION: If you are losing oil but don't see any external leakage, or if the oil becomes discolored and contaminated, one of the diaphragms (22) may be damaged. Refer to the Service Section. ***Do not operate*** **the pump with a damaged diaphragm.**

CAUTION: Do not leave contaminated oil in the pump housing or leave the housing empty. Remove contaminated oil as soon as discovered, and replace it with clean oil.

PERIODICALLY

Change the oil after the first 100 hours of operation, and every 500 operating hours thereafter. When changing, remove the drain plug (34) at the bottom of the pump so all oil and accumulated sediment will drain out.

CAUTION: Do not turn the drive shaft while the reservoir is empty.

Check the inlet pressure or vacuum periodically wi gauge.

CAUTION: Protect the pump from freezing. Re **also to the "Shutdown Procedure."**

SHUTDOWN PROCEDURE
During Freezing Temperatures

1. Disconnect the inlet and outlet piping from t pump.
2. Remove the drain plug (4) at the bottom center the manifold.
3. Open any draincocks in the piping.
4. Start the pump, and allow it to run until all fluid removed from the pump head.
5. Stop the pump, and reinstall the drain plug.
6. Fill the pump with antifreeze.

When you put the pump back into service, thorough flush the antifreeze.

Service

This section explains how to disassemble and inspect all easily-serviceable parts of the pump. Repair procedures for the hydraulic end (oil reservoir) of the pump are included in a later section of the manual.

CAUTION: Do not disassemble the hydraulic end unless you are a skilled mechanic. For assis' ance, contact Wanner Engineering (612-332-5681) or the distributor in your area.

CAUTION: The four bolts (26) that screw through the back of the housing into the cylinder casting hold the casting over the hydraulic end of the pump. ***Do not remove*** **them except when repairing the hydraulic end.**

1. Remove Manifold(7) and Valve Plate(18)

a. Remove all nuts (31) and bolts (5) around the manifold. Do not remove the four bolts (26) that are installed through the back of the pump housing.

b. With a 3/8" hex Allen wrench, remove the centerbolt (1) and its washer (2) in the center of the manifold.

CAUTION: Do not turn the pump drive sh while the manifold and valve plate are off t pump, except when removing diaphragms repriming the hydraulic cells.

c. Remove the manifold (7) and valve plate (18)

d. Inspect the manifold for warping or wear arou the inlet and outlet ports. If wear is excessive, r place the manifold or return it to Wanner En neering for resurfacing.

To check if the manifold is warped, remove the rings and place a straightedge across it. warped manifold should be replaced.

e. Inspect the valve plate in the same manner as tr manifold.

2. Inspect Valves (11-17)

The three inlet and three outlet valve assemblies the pump are identical (but face in opposite dire tions). Inspect each valve as follows:

a. Check the spring retainer (16), and replace worn.

b. Check the valve spring (14). If it is shorter than a new spring, replace it (don't just stretch the old spring).

c. Check the valve poppet (13). If worn excessively, replace it.

NOTE: If your pump has *plastic* spring retainers, there is a tetra seal (flat O-ring, 15) between the retainer (16) and valve seat (12).

d. Remove the valve seat (12). A seat remover is included in the Wanner Tool Kit. Be careful not to break the metal ridge around the O-ring groove.

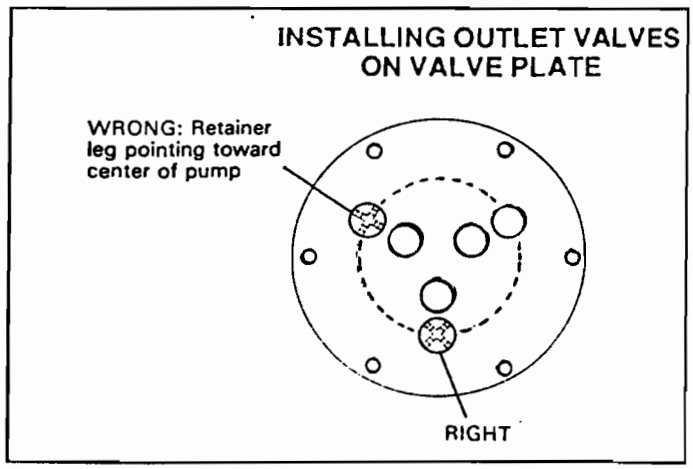
Inspect the valve seat for wear, and replace it if necessary. The seat (except for ceramic ones) can be turned over to use the other surface. However, a new O-ring (11) should be installed.

e. Reinstall the valve assemblies:

- Clean the valve ports and shoulders with emery cloth, and lubricate them with lubricating gel or petroleum jelly.
- Install the O-ring (11) on the valve seat (12).

NOTE: Some pumps use plastic dampening washers (38) between the valve seat (12) and the manifold (7) or valve plate (18). Refer to the drawing on page 12.

- **Inlet (3 center valves).** Insert the spring retainer (16) into the valve plate, then insert the spring, valve, and valve seat (12,13,14). If the pump has **plastic** spring retainers, a flat O-ring (15) goes between the retainer and seat.
- **Outlet (3 outer valves).** Insert the valve seat, valve, and spring, then the retainer. If the pump has **plastic** retainers, install the flat O-ring between the retainer and seat. If the pump has **metal** spring retainers in the outlet-valves, position them so a leg does not point toward the center of the pump (refer to the lustration).



3. Inspect and Replace Diaphragms (22)

a. Lift the diaphragm by one edge, and turn th pump shaft until the diaphragm pulls up. This w expose machined cross-holes in the valv plunger shaft behind the diaphragm.

b. Insert an Allen wrench through one of the hole to hold the diaphragm up. The proper size tool included in the Wanner Tool Kit.

c. Remove the screw (19), O-ring (20), and follows (21) in the center of the diaphragm.

d. Remove the diaphragm, and inspect it carefull A ruptured diaphragm generally indicates pumping system problem, and replacing only th diaphragm will not solve the larger problem. In spect the diaphragm for the following:

- **Half-moon marks.** Usually caused by cavita tion of the pump (refer to "Troubleshooting".
- **Concentric circular marks.** Usually cause by cavitation of the pump (refer to "Trouble shooting").
- **Small puncture.** Usually caused by a shar foreign object in the fluid, or by an ice particle
- **Diaphragm pulled away** from the cente screw or from the cylinder sides. Usuall caused by fluid being frozen in the pump, o by overpressurization of the pump.
- **Diaphragm becoming stiff** and losing flexi bility. Usually caused by pumping a fluic which is incompatible with the diaphragm ma terial.
- **Slice in ridge of diaphragm.** Occurs when diaphragm is operated at temperatures below its rated capability.
- **Diaphragm edge chewed away.** Usually caused by overpressurizing the system.

e. Inspect the plunger (23) for any rough surfaces or edges. **Do not** remove the plunger from the plunger shaft. Smooth the surfaces and edges as necessary with emery cloth or a fine file.

CAUTION: If a diaphragm has ruptured and foreign material or water has entered the oil reservoir, do not operate the pump. Check all diaphragms, then flush the reservoir completely (as outlined below) and refill it with fresh oil. Never let the pump stand with foreign material or water in the reservoir, or with the reservoir empty.

f. Install a new diaphragm (or reinstall the old one, as appropriate), ridge side out.

g. Clean the screw (19) and remove any oil from it. Apply medium-strength threadlocker to the screw. Reinstall the screw, the follower (21), and a new O-ring (20). Tighten to 18 in-lbs.

h. Repeat the above inspection procedure (and replacement, if necessary) with the other two diaphragms.

4. Flush Contaminate from Hydraulic End (only if a diaphragm has ruptured)

a. Remove the oil drain cap (34) and allow all oil and contaminate to drain out.

b. Fill the reservoir with kerosene or solvent, manually turn the pump shaft to circulate the kerosene, and drain.

CAUTION: If you have EPDM diaphragms, or if food grade oil is in the reservoir, do not use kerosene or solvents. Instead, flush with the same lubricant that is in the reservoir. Pumps with EPDM diaphragms have an "E" as the 7th digit of the Model No.

c. Repeat the flushing procedure (step b).

d. Fill the reservoir with fresh oil, manually turn the pump shaft to circulate the oil, and drain once again.

e. Refill the reservoir. If the oil appears milky, there is still contaminate in the reservoir. Repeat the flushing procedure until the oil appears clean.

5. Prime the Hydraulic Cells

a. With the pump **horizontal**, fill the reservoir with the appropriate Hydra oil for the application.

b. All air in the oil within the hydraulic cell (behind the diaphragms) must be forced out by turning the shaft (and thus pumping the piston). A shaft rotator is included in the Wanner Tool Kit. Turn the shaft until a **bubble-free** flow of oil comes from behind all the diaphragms. Watch the oil level in the reservoir: if it gets too low during priming, air will be drawn into the pistons (inside the hydraulic end) and will cause the pump to run rough.

c. Wipe excess oil from the cylinder casting and diaphragms.

6. Reinstall Valve Plate(18) and Manifold(7)

a. Reinstall the valve plate (18), with the valve assemblies installed as outlined above, onto the cylinder casting.

b. **Internal Centerbolt Models.** Install the centerbolt (1), washer (2), and O-ring (3). Temporarily install four bolts around the outer edge of the pump, through the valve plate (18) and cylinder casting (25). Tighten these bolts. Retighten the centerbolt (torque to 45 ft-lbs), then remove the four bolts around the edge.

c. Reinstall the O-rings (8,9,10) between the valve plate and manifold. Use petroleum jelly or lubricating gel to hold them in place.

d. Reinstall the manifold onto the valve plate. Be sure the drain plug (4) is at the bottom of the manifold.

e. Insert all bolts (5) around the edge of the manifold, and alternately tighten opposite bolts until all are secure. Torque to 45 ft-lbs.

f. **External Centerbolt Models.** Install the centerbolt (1), with its washer (2) and O-ring (3), and tighten it. Torque to 45 ft-lbs.

g. Recheck all bolts for tightness.

Service (Hydraulic End)

CAUTION: Do not disassemble the hydraulic end of the pump unless you are a skilled mechanic. For assistance, contact Wanner Engineering (612-332-5681) or the distributor in your area.

CAUTION: The four bolts (26) that screw through the back of the housing into the cylinder casting (25) hold the casting to the pump housing. *Do not remove* them except when repairing the hydraulic end.

NOTE: The following service procedures refer several times to the Wanner Tool Kit. We strongly urge you *not* to try to repair the hydraulic end of the pump without using the tools in this kit (available from Wanner or your local distributor).

1. Remove Pump Housing

a. Remove the head of the pump, and the diaphragms, as outlined in the basic Service Section.

b. Drain the oil from the pump housing by removing the drain plug (34).

c. Set the hydraulic end of the pump face-down on the cylinder casting (25).

d. Check the shaft for sharp burrs. Smooth any burrs, to prevent scarring the housing seals (64) when you disassemble the pump.

e. Remove the bolts (26) which secure the housing to the cylinder casting. The piston return springs (50) will force the cylinder casting and housing apart.

f. Lift off the housing (30).

g. Inspect the cam and bearings (62), and the bearing race in the rear of the housing. If the bearings are pitted or binding, or if the housing race is worn, contact Wanner Engineering.

2. Disassemble Pistons

a. With the pump housing removed (see above), turn the unit over and set it on a flat surface, piston side down.

b. With diagrams removed (see the basic Service Section), reinsert a follower screw (19) into the hole in one of the valve plungers (53). Tap the screw lightly with a hammer: the plunger (23) should slip off the valve plunger (53).

The hydraulic piston assembly (50-59) can now be disassembled. Inspect all parts, and replace all O-rings and any other parts which are worn or damaged.

c. Repeat step b for the remaining pistons.

NOTE: When you reassemble the hydraulic piston, use *new* plungers (23). They are press-fit onto the valve plungers (53) and are generally not reusable.

3. Reassemble Pistons

a. Drop a ball (58) into each opening in the bottom of a piston assembly (59).

b. Insert a retaining washer (57) and O-ring (56) to hold the ball in place.

c. Insert a valve plunger (53) into a valve cylinder (55). Slide a spring (52) over the plunger, inside the valve cylinder.

d. Insert an O-ring (54) into a spring retainer (51).

e. Install two O-rings (54) on the valve cylinder (55).

f. Slide the assembled valve cylinder, plunger, and spring (53-55) into the spring retainer (51).

g. Install an O-ring (56) on the spring retainer (51)

h. Slide the complete cylinder-and-retainer assembly (51-56) into the piston assembly (59).

i. Insert a return spring (50) into the piston assembly.

j. Repeat the above procedure for the other two pistons.

4. Reassemble Housing and Casting

NOTE: Inspect the shaft seals (64) before continuing. If they look damaged in any way, replace them (remove by pounding them out from inside the pump housing). Both seals should be replaced at the same time.

a. Place the cylinder casting (25) face-down on a flat surface.

b. Insert the assembled pistons (50-59) into the cylinder casting. The holes on the foot end of the pistons should all point toward the center of the casting.

c. Note the location of the **outer** ring of holes in the cylinder casting and in the pump housing flange (in particular, the holes where bolts 26 will be installed).

Screw threaded studs (from the Wanner Tool Kit) into two of the four threaded holes in the cylinder casting. Use opposite holes.

d. Stand the camshaft assembly (62) on the cylinder casting (25).

CAUTION: The pilot bearing *MUST* be properly nested in the bearing race during assembly. If misaligned, the bearing will be damaged and the pump will fail within the first hours of operation.

e. Install the O-ring (65) and slide the housing (30) down over the shaft and onto the threaded studs (from step c). Be sure the holes in the housing and the cylinder casting are properly aligned.

f. Install washers (6) and nuts (31) on the threaded studs, but don't tighten yet. You may want to insert two or more bolts (5) into the unthreaded holes of the housing and cylinder casting to help align the parts.

g. Alternately tighten the nuts (31) to evenly draw the housing down to the cylinder casting. Be sure the O-ring (65) stays in place.

Also, as you tighten the nuts keep checking the shaft alignment by turning the shaft (use the rotator in the Wanner Tool Kit). If the shaft begins to bind and become difficult to turn, back off the nuts and realign the shaft. When the housing is tight against the cylinder casting, you should be able to turn the shaft smoothly.

h. After all the nuts (31) are tightened, screw cap screws (26) (with washers, 6) into the two unused threaded holes in the housing. Then remove the two threaded studs and replace them with the other two cap screws and washers.

i. Turn the shaft again to check its alignment.

5. Replace Shaft Seals

a. Apply a thin film of grease on the seal protector tool (part of the Wanner Tool Kit). Slide both seals onto the tool, with the spring side of the seals toward the open end of the tool.

Apply a heavier coat of grease between the seals and press them together.

b. Apply a coating of Loctite® High-Performance Pipe Sealant With Teflon, or a comparable product, to the outer surface of both seals and the inside surface of the opening in the pump housing where the seals will rest.

c. Apply a light film of grease to the drive shaft. Slide the seal protector tool (with the two seals) over the end of the shaft.

d. Slide the seal inserter tool (from the Wanner Tool Kit) over the seal protector tool, and press the seals completely into place. Tap the tool with a soft mallet to firmly seat the seals.

6. Adjust Camshaft Endplay

a. If the three set screws (24) are in the cylinder casting (25), remove and clean them.

b. Insert the centerbolt (1) into the hole in the th center of the cylinder casting. Turn it in to mov the bearing adjust;ing plate (61) and cup tigh against the bearing cone.

c. Back out the centerbolt **two** full turns, then turn back in again until it is tight against the adjustin plate (61).

d. Back out the centerbolt **exactly 1/4** of a turn.

e. With a plastic mallet (or a regular mallet an wooden board) to prevent damage to the shaft rap the end of the shaft 3 or 4 times. This wi provide about .006" endplay in the shaft.

f. Apply removable threadlocker to the threads o the three cleaned set screws (24).

Screw the three set screws (24) into the cylinder casting until they contact the bearing adjusting plate (61).

g. Remove the centerbolt (1).

7. Reinstall Plungers

NOTE: If the plungers (23) have been removed from the valve plungers (53), do not reuse them. Install new ones instead.

a. Place a plunger on the exposed screw end of the plunger guide tool from the Wanner Tool Kit. The flat side of the plunger should face the tool.

b. Screw the guide (with the plunger) into the valve plunger (53) until tight.

c. Hold the single bottom handle of the guide, and turn the double top handle to force the plunger to seat on the valve plunger. This is a press-fit – when installed, the plunger should be tight against the shoulder of the valve plunger.

NOTE: Do *not* remove the plunger guide until the diaphragm is installed (see below).

d. Install the diaphragm as outlined below, then repeat the procedure for the other two plungers and diaphragms.

8. Reinstall Diaphragms

a. With the plunger guide tool still screwed into the valve plunger (53), pull the valve plunger up until the cross-holes in the valve plunger are exposed.

b. Insert a diaphragm Allen wrench (from the Wanner Tool Kit), or a similar dowel-type object,

Loctite is a registered trademark of Loctite Corporation.

through the holes – to hold the plunger (23) away from the cylinder casting, and to keep the valve plunger from turning when the diaphragm is being installed.

c. Place the diaphragm (22) onto the plunger (23), ridge-side out.

d. Center the diaphragm follower (21) on the diaphragm.

e. Place the O-ring (20) onto the follower screw (19).

f. Apply a small amount of threadlocker to the threads of the follower screw.

g. Insert the follower screw (with O-ring) throug the diaphragm follower (21) and diaphragm (22 and screw it into the valve plunger (53).

h. Hold the diaphragm Allen wrench, and tighten th follower screw to 18 in.-lbs of torque.

i. Repeat the above procedure for the plungers ar diaphragms of the other two cylinders.

j. Fill the reservoir with fresh oil and prime th pump, as outlined in the basic Service Section.

9. Reassemble Pump Head

Reassemble the pump head as outlined in the basi Service Section.

Troubleshooting

Cavitation

Fluid too hot for inlet suction piping system.
Air entrained in fluid piping system.
Aeration and turbulence in supply tank.
Inlet suction vacuum too high.

SYMPTOMS OF CAVITATION

- Excessive pump valve noise
- Premature failure of spring or retainer (14,16)
- Premature failure of diaphragms (22)
- Volume or pressure drop
- Rough-running pump
- Piston return spring failure (inside hydraulic end).

Drop in Volume or Pressure

Air leak in suction piping.
Clogged suction line or suction strainer.
Suction line inlet above fluid level in tank.
Inadequate fluid supply.
Pump not operating at proper RPM.
Relief valve bypassing fluid.
Worn pump valve parts.
Foreign material in inlet or outlet valves.
Loss of oil prime in cells because of low oil level.
Ruptured diaphragm.
Cavitation.
Warped manifold from overpressurized system.
O-rings forced out of their grooves from overpressurization.
Air leak in suction line strainer or gasket.
Cracked suction hose.
Empty supply tank.
Excessive aeration and turbulence in supply tank.
Worn and slipping drive belt(s).
Worn spray nozzle(s).
Cracked cylinder casting.

Pump Runs Rough

Worn pump valves.
Air lock in outlet system.
Oil level low.
Wrong weight oil for cold operating temperatures (change to lighter weight).
Air in suction line.
Restriction in inlet/suction line.
Cavitation.
Hydraulic cells not primed after changing diaphragms.
Foreign material in inlet or outlet valves.
Damaged diaphragm.
Fatigued or broken valve spring (14).
Broken piston return spring (inside hydraulic end).
Inadequate fluid supply because of:
– Inlet line collapsed or clogged
– Clogged line strainer
– Inlet line too small or too long
– Air leak in inlet line
– Worn or damaged inlet hose
– Suction line too long
– Too many valves and elbows in inlet line.

Premature Failure of Diaphragm

Frozen pump.
Puncture by a foreign object.
Elastomer incompatible with fluid being pumped.
Cavitation.
Pump running too fast.
Broken piston return spring (50).
Excess pressure.

Water in Oil Reservoir

Condensation.
Ruptured diaphragm.
Hydraulic cells not properly primed after diaphragm replacement.
Frozen pump.
Diaphragm screw O-ring (20) missing or cracked.
Cracked cylinder casting.

Water Pulsations

Foreign object lodged in pump valve.
Loss of prime in hydraulic cells because of low oil level.
Air in suction line.
Valve spring (14) broken.
Cavitation.
Aeration or turbulence in supply tank.

Valve Wear

Normal wear.
Cavitation.
Abrasives in the fluid.
Valve incompatible with corrosives in the fluid.
Pump running too fast.

Loss of Oil

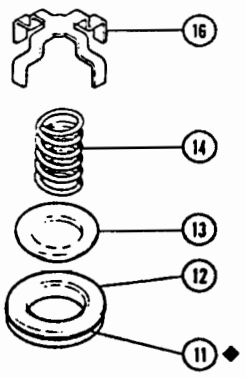
External seepage.
Rupture of diaphragm.
Frozen pump.
Diaphragm screw O-ring (20) missing or cracked.
Worn shaft seal.
Oil drain piping or fill cap loose.
Valve plate and manifold bolts loose.

Premature Failure of Valve Spring or Retainer

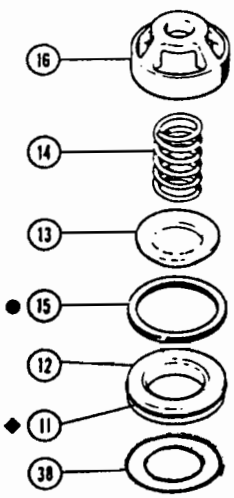
Cavitation.
Foreign object in the pump.
Pump running too fast.
Spring/retainer material incompatible with fluid being pumped.
Excessive inlet pressure.

MODEL D-25 & H-25
VALVE ASSEMBLIES

Valve Assembly
with standard metal spring retainer



Valve Assembly
with Celcon (plastic) spring retainer
and dampening washer (38) ❊



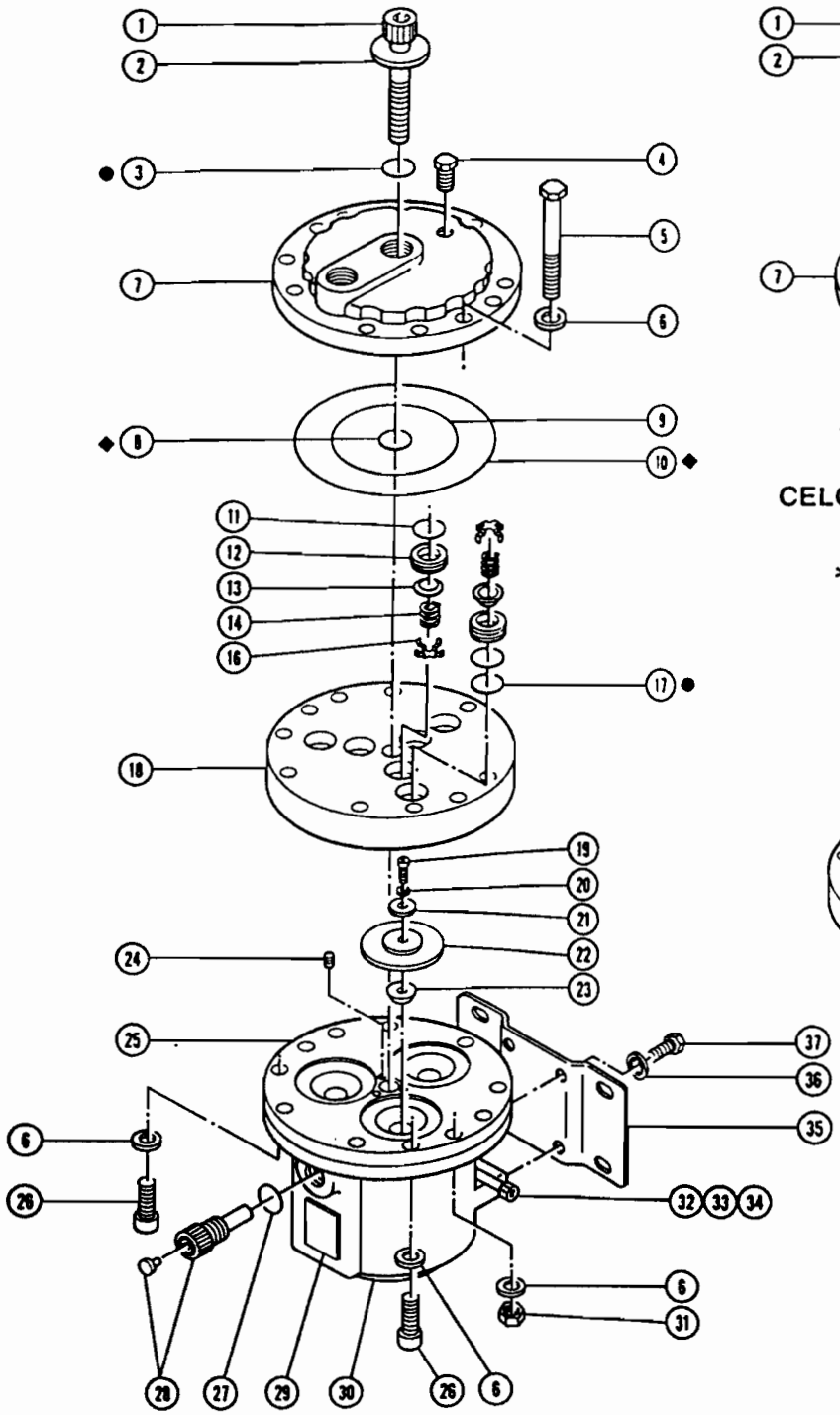
● Tetra seal (15) is used only with plastic retainers.
♦ O-ring (11) is shown installed on valve seat (12).
❊ Not required on all pumps.

● All models other than brass external centerbolt models.

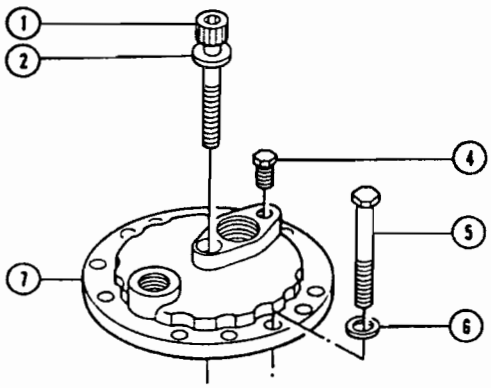
◆ Brass external centerbolt models

* Not required on all pumps.

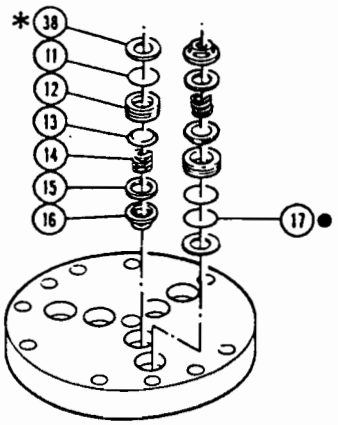
MODEL D-25 & H-25 WITH STANDARD VALVE ASSEMBLIES (Shown with manifold for internal centerbolt models)



MANIFOLD FOR EXTERNAL CENTERBOLT MODELS



VALVE ASSEMBLIES WITH CELCON SPRING RETAINERS



REF. NO.	PART NO.	DESCRIPTION	QTY. PER PUMP
1	D25-081-2010	Cap Screw, socket head, 2-1/4"	1
	D25-081-2011	Cap Screw, socket head, 2-1/2"	1
	D25-081-2012	Cap Screw, socket head, 4-1/2" (External Center Bolt)	1
2	D10-084-2010	Washer, 1/2", flat	1
	D25-084-1011	Washer, support, 1-1/2"	1
3	D25-083-2110	O-Ring, center bolt, Buna	1
	D25-083-2111	O-Ring, center bolt, Viton	1
	D25-083-2112	O-Ring, center bolt, Neoprene	1
	D25-083-2113	O-Ring, center bolt, EPDM	1
4	D25-038-2210	Plug, brass	1
	D25-038-2211	Plug, SST	1
5	D25-024-2011	Bolt, hex-head, 4-3/4"	11
6	D10-048-2010	Washer, 3/8"	29
7	D25-004-1002	Manifold, XL, SST, V4	1
	D25-004-1004	Manifold, XL, aluminum bronze, V2	1
	D25-004-1006	Manifold, XL, cast iron, V2	1
	D25-004-1008	Manifold, XL, brass, V2	1
	D25-004-1010	Manifold, brass (Ext. Center Bolt), V5	1
	D25-004-1012	Manifold, SST, V7	1
	D25-004-1014	Manifold, AB (Ext. Center Bolt), V6	1
	D25-004-1022	Manifold, SST (Ext. Center Bolt), V6	1
	D25-004-1026	Manifold, CI (Ext. Center Bolt), V8	1
8	D10-083-2110	O-ring, center manifold, Buna	1
	D10-083-2111	O-ring, center manifold, Viton	1
	D10-083-2112	O-ring, center manifold, Neoprene	1
	D10-083-2113	O-ring, center manifold, EPDM	1
9	D25-073-2110	O-Ring, inner manifold, Buna	1
	D25-073-2111	O-Ring, inner manifold, Viton	1
	D25-073-2112	O-Ring, inner manifold, Neoprene	1
	D25-073-2113	O-Ring, inner manifold, EPDM	1
10	D25-097-2110	O-Ring, outer manifold, Buna (External Center Bolt)	1
	D25-097-2111	O-Ring, outer manifold, Viton (External Center Bolt)	1
	D25-097-2112	O-Ring, outer manifold, Neoprene (External Center Bolt)	1
	D25-097-2113	O-Ring, outer manifold, EPDM (External Center Bolt)	1
11	D25-035-2110	O-Ring, XL, valve seat, Buna	6
	D25-035-2111	O-Ring, XL, valve seat, Viton	6
	D25-035-2112	O-Ring, XL, valve seat, Neoprene	6
	D25-035-2113	O-Ring, XL, valve seat, EPDM	6
12	D25-020-1010	Valve Seat, XL, 17-4 HT	6
	D25-020-1012	Valve Seat, XL, Nitronic 50	6
	D25-020-3300	Valve Seat, XL, ceramic	6
13	D25-021-1010	Valve, 17-7 HT, stamped	6
	D25-021-1011	Valve, Nitronic 50	6
	D25-021-1015	Valve, 17-4 HT, machined	6
	D25-021-3300	Valve, ceramic	6
14	D25-022-3110	Valve Spring, 17-7 HT	6
	D25-022-3111	Valve Spring, Inconel	6
	D25-022-3112	Valve Spring, Monel	6
	D25-022-3114	Valve Spring, Elgiloy	6
	D25-022-3115	Valve Spring, Hastelloy	6
15	D25-092-2110	Tetra Seal, Buna	6
	D25-092-2111	Tetra Seal, Viton	6
	D25-092-2112	Tetra Seal, Neoprene	6
	D25-092-2113	Tetra Seal, EPDM	6

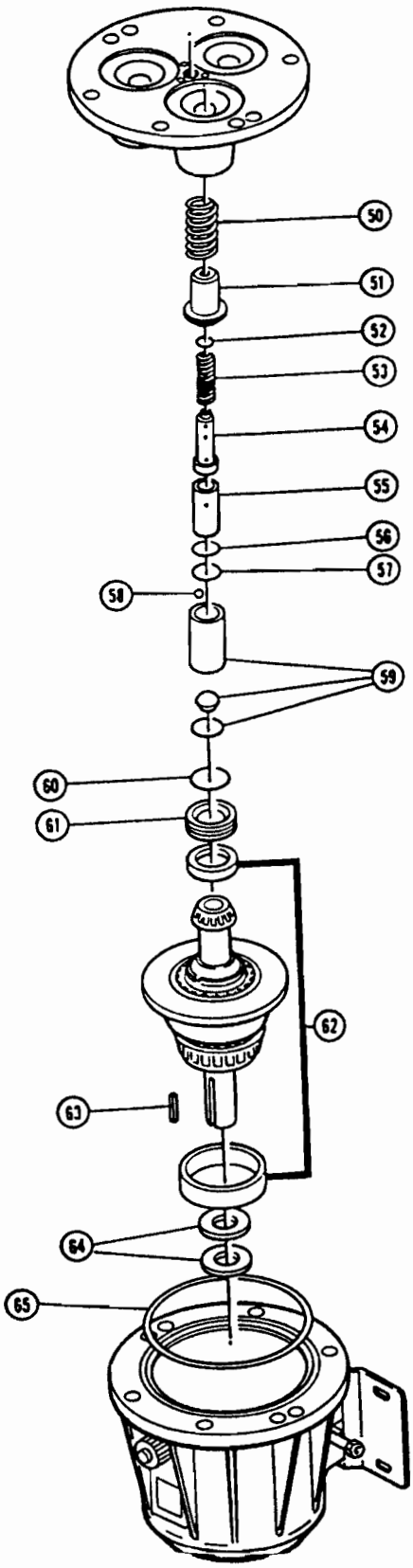
REF. NO.	PART NO.	DESCRIPTION	QTY. PER PUMP
16	D25-023-1010	Retainer, valve spring, XL, 17-7 HT	6
	D25-023-2310	Retainer, valve spring, XL, Celcon	6
17	D25-074-2110	O-ring, XL, outlet valve, Buna	3
	D25-074-2111	O-ring, XL, outlet valve, Viton	3
	D25-074-2112	O-ring, XL, outlet valve, Neoprene	3
	D25-074-2113	O-ring, XL, outlet valve, EPDM	3
18	D25-003-1002	Valve Plate, XL, SST, V2	1
	D25-003-1004	Valve Plate, XL, aluminum bronze, V2	1
	D25-003-1006	Valve Plate, XL, cast iron, V2	1
	D25-003-1008	Valve Plate, XL, brass, V2	1
	D25-003-1010	Valve Plate, brass (Ext. Center Bolt), V3	1
	D25-003-1012	Valve Plate, SST, V5	1
	D25-003-1014	Valve Plate, AB (Ext. Center Bolt), V5	1
	D25-003-1016	Valve Plate, CI (Ext. Center Bolt), V4	1
	D25-003-1022	Valve Plate, SST (Ext. Center Bolt), V5	1
19	D25-030-2010	Screw, flat-head machine, SST, 5/8"	3
20	D25-047-2110	O-Ring, follower, Buna	3
	D25-047-2111	O-Ring, follower, Viton	3
	D25-047-2112	O-Ring, follower, Neoprene	3
	D25-047-2113	O-Ring, follower, EPDM	3
21	D25-017-1010	Follower, SST	3
22	D25-018-2310	Diaphragm, Buna-N	3
	D25-018-2311	Diaphragm, Viton	3
	D25-018-2312	Diaphragm, Neoprene	3
	D25-018-2313	Diaphragm, EPDM	3
	D25-018-2315	Diaphragm, Viton-XT	3
	D25-018-2320	Diaphragm, Buna-N-XS	3
23	D25-016-1010	Plunger	3
24	D25-082-2010	Set Screw, 1/4" x 5/8"	3
	H25-082-2010	Set Screw, 1/4" x 1/2"	3
25	D25-002-1010	Cylinder Housing	1
	D25-002-1210	Cylinder Housing Assembly, Buna [#]	-
	D25-002-1211	Cylinder Housing Assembly, Viton [#]	-
26	D25-029-2010	Cap Screw, hex-head, 1-1/8"	4
27	D10-080-2110	O-Ring, oil fill, Buna	1
	D10-080-2111	O-Ring, oil fill, Viton	1
28	D10-039-1210	Cap, oil fill (includes breather)	1
29	D10-040-2410	Name Plate	1
30	D25-001-1010	Pump Housing	1
	H25-001-1011	Pump Housing	1
	D25-001-1210	Pump Housing Assembly [§]	-
	H25-001-1211	Pump Housing Assembly [§]	-
31	D10-028-2010	Nut, hex, 3/8"	8
32	D25-076-2210	Elbow, 3/8"	1
33	D25-077-2210	Pipe, 3/8"	1
34	D25-078-2210	Cap, 3/8"	1
35	D25-025-1010	Base	1
36	D10-054-2010	Washer, shakeproof, 3/8"	4
37	D25-087-2010	Cap Screw, hex-head, 7/8"	4
38	D25-125-1011	Washer, dampening, 316 SST (not required on all pumps)	6
	D25-125-2310	Washer, dampening, Delrin (not required on all pumps)	6

* For Serial Nos. below 3500, contact Factory.

\# Cylinder Housing Assembly includes bearing cup, adjusting plate (61), O-ring (60), and set screws (24).

§ Pump Housing Assembly includes housing (30), drain plug (32, 33, 34), and bearing cup.

HYDRAULIC END, MODEL D-25 & H-25



REF. NO.	PART NO.	DESCRIPTION	QTY. PER PUMP
50	D25-019-3111	Spring, piston return	3
51	D25-042-1010	Retainer, spring	3
52	D25-046-2110	O-Ring, valve cylinder, Buna	9
	D25-046-2111	O-Ring, valve cylinder, Viton	9
53	D25-045-3110	Spring, sleeve valve	3
	D25-094-3111	Spring, sleeve valve (Type 2)	3
54	D25-044-1010	Valve Plunger	3
	D25-093-1211	Valve Plunger (Type 2)	3
55	D25-043-1010	Cylinder, valve	3
56	D25-034-2110	O-Ring, Buna	6
	D25-034-2111	O-Ring, Viton	6
57	D25-041-1010	Washer, ball retainer	3
58	D25-015-3010	Ball, 1/4"	3
59	D25-014-1209	Piston, with foot and retainer	3
	D25-014-1210	Piston Assembly, Buna [#]	-
	D25-014-1211	Piston Assembly, Viton [#]	-
60	D25-075-2110	O-ring, bearing adjusting plate, Buna	1
	D26-075-2111	O-ring, bearing adjusting plate, Viton	1
61	D25-012-1010	Bearing Adjusting Plate	1
62	D25-007-1210	Cam Assembly, 20 GPM @ 1050 RPM [§]	1
	H25-007-1210	Cam Assembly, 20 GPM @ 1050 RPM [§]	1
	H25-007-1212	Cam Assembly, 20 GPM @ 1200 RPM [§]	1
	H25-007-1213	Cam Assembly, 12 GPM @ 1200 RPM [§]	1
	H25-007-1214	Cam Assembly, 16 GPM @ 1200 RPM [§]	1
63	D25-085-2210	Key, shaft	1
64	D25-031-2110	Seal, Buna	2
	D25-031-2111	Seal, Viton	2
	H25-031-2112	Seal, Buna, 1-1/8"	2
65	D25-037-2110	O-Ring, pump housing, Buna	1
	D25-037-2111	O-Ring, pump housing, Viton	1
—	D25-111-2400	Label, caution	1

Piston Assembly includes cylinder, foot, plunger, O-rings, and springs (50-59).

§ Cam Assembly includes cam, shaft, wobble plate, and bearings. This is only available as an assembly.

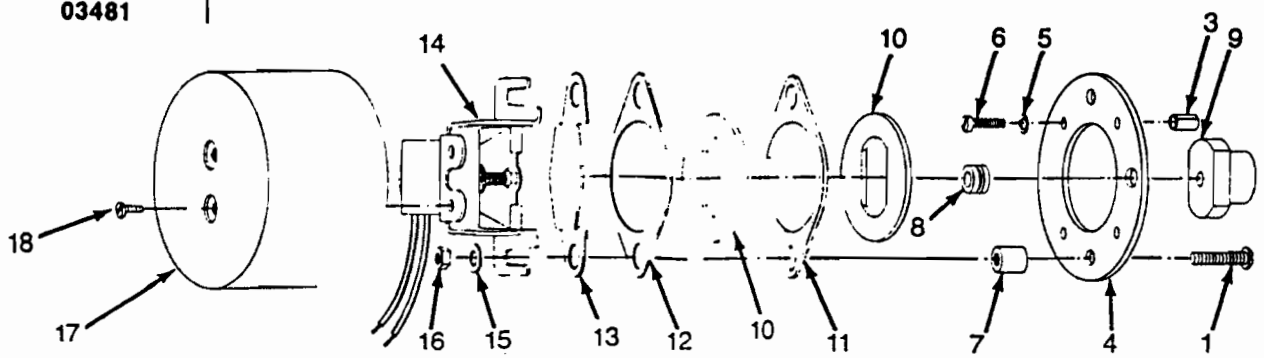


Figure 3 — Brake Assembly Components

Replacement Parts for Brake Assembly

(See Figure 3)

REF NO.	DESCRIPTION	PART NO.	QTY.	REF NO.	DESCRIPTION	PART NO.	QTY.
1	Round head screw	W001002-105	2	11	Stationary disc (inner)	G040044-001	1
3	Spacer	G040032-001	4	12	Stationary disc (outer)	G040042-001	1
4	Bracket	G040029-001	1	13	Pressure plate	H040024-001	1
5	Lockwasher	W004006-003	4	14	Operator assembly (115V, 60Hz)	K040021-001	1
6	Fillister head screw	W001009-026	4				
7	Spacer	G040040-001	2	15	Washer	W004003-022	2
8	Grommet	W027001-002	1	16	Locknut	W003001-013	2
9	Hub w/set screws	G040046-001	1	17	Cover	H040025-001	1
10	Rotating disc	G040041-001	2	18	Pan head screw	W001025-023	2

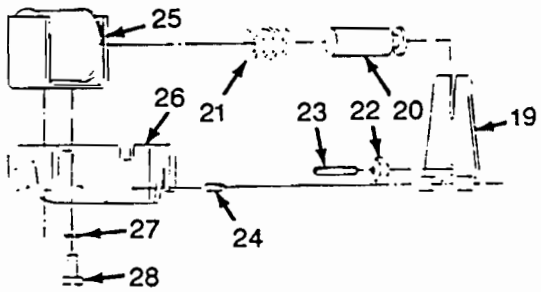


Figure 4 — Operator Assembly Components

Reference only — order operator assembly (Ref. No. 14).

Replacement Parts for Operator Assembly

(For reference only — See Ref. No. 14)

REF NO.	DESCRIPTION	PART NO.	QTY.
19	Lever assembly includes Clinch nut (Ref. No. 22)		1
20	Solenoid plunger		1
21	Torque spring	FOR REFER-	1
22	Clinch nut #10-32	ENCE ONLY.	1
23	Set screw #10-32 x 3/4	MUST ORDER	1
24	Hinge pin 1/8 x 5/8	COMPLETE	2
25	Solenoid includes plunger Ref. No. 20 (115V.-60 Hz)	OPERATOR ASSEMBLY	1
26	Mounting bracket	(REF. NO. 14).	1
27	Lockwasher #10		2
28	Screw fillister head #10-32 x 0.375		2

(†) Optional operator assembly:
110V, 50 Hz — order Part No. K040021-003
230V, 60 Hz — order Part No. K040021-002
230V, 50 Hz — order Part No. K040021-004

Maintenance

WARNING: MAKE CERTAIN THAT THE POWER SUPPLY IS DISCONNECTED BEFORE ATTEMPTING TO SERVICE OR REMOVE ANY COMPONENTS! IF THE POWER DISCONNECT POINT IS OUT-OF-SIGHT, LOCK IT IN THE OPEN POSITION AND TAG TO PREVENT UNEXPECTED APPLICATION OF POWER.

LUBRICATION

This unit is lubricated for life at the factory and periodic relubrication should not be required under normal conditions, regardless of mounting position.

PARTS REPLACEMENT DISASSEMBLY

1. Remove the five (5) Torx® head screws from the output side face of the unit. Suitable Torx® key wrenches may be ordered, Stock No. 2A276.
2. Place the unit shaft down and pry off the motor and cover assembly. This will destroy the gasket. Watch so that thrust balls (Ref. 13) are not dropped and lost. Do not damage seal bead on cover.
3. With housing disassembled, remove gears.
4. Motor can be dismounted by removing four (4) No. 8 screws (Ref. 10) which pass through the cover and into the motor face. These are special #8-32 x 5/8" long screws with plastic seals under the head, to prevent lubricant leakage around the screw heads. New, exact duplicate replacements should be used.
5. Oil seals can be removed by prying out with a screwdriver. Clean the cavity and press new seal squarely in place, lip edge inward towards gear cavity until seal bottoms.

REASSEMBLY

1. Care must be taken that the 1/4" diameter thrust balls remain in place during assembly. This can be accomplished with a small dab of grease.
2. After all gears are in place, refill the gear case with Hodson 4111 or Gulf Harmony #121 heavy gear oil. About four ounces (by weight) will be required. Clean gearbox and replace with new lubricant.

CAUTION: Do not mix lubricants.

3. Install new gasket and place motor cover assembly on back end of housing. Hold firmly together and replace the five (5) Torx® head screws in face of gear box.
4. Start and stop motor. Gearing should turn freely without binding and coast slightly as motor comes to stop.

CLEANING

Periodically clean dirt accumulations from motors, especially in and around vent openings, preferably by vacuuming. At the same time, check that electrical connections are tight.

Troubleshooting Chart

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Unit fails to operate.	1. Blown fuse or open circuit breaker 2. No power 3. Defective motor 4. Defective manual or magnetic control switch 5. Defective start relay (split phase only)	1. Replace fuse or reset circuit breaker 2. Contact power 3. Repair or replace 4. Repair or replace 5. Replace
Unit operational, but no output	1. Defective gear(s) 2. Gear loose on shaft	1. Check and replace if necessary 2. Check and replace if necessary
Intermittent rotation of output shaft	Damaged intermediate gear assembly possibly caused by shock load	Replace gear and if possible, avoid shock load
Excessive noise	1. Bearings worn 2. Belt too tight 3. Overhund load — exceeds rating and causes bearings wear 4. Defective or overloaded gears or bearings	1. Replace 2. Adjust tension 3. Correct load and/or replace bearing 4. Replace

FRICTION DISC PLACEMENT

⚠ CAUTION

Load to be removed or blocked. Brake will be inoperative during this procedure.

Use Figures 2 and 3 for reference. When total wear on Rotating Discs (Ref. No. 10) reaches 0.04", replace discs as follows:

1. Disconnect Solenoid (Ref. No. 25) from circuit and remove cover (Ref. No. 17).
2. Remove Locknuts (Ref. No. 16); Washers (Ref. No. 15); Operator Assembly (Ref. No. 14); Pressure Plate (Ref. No. 13); Stationary Disc (Ref. No. 12); Friction Disc (Ref. No. 10); Stationary Disc (Ref. No. 11); and Friction Disc (Ref. No. 10).
3. Replace worn discs and assemble in reverse order. Discs must slide freely on Hub (Ref. No. 9).

NOTE: Stationary Disc (Ref. No. 11) is 0.060 in. thick, and must be in the location shown in Figure 3. Stationary Disc (Ref. No. 12) is 0.030 in. thick, and must be located as shown.

4. Before installing Operator Assembly (Ref. No. 14) turn Adjusting Screw (Ref. No. 23) counter clockwise 4 or 5 turns to allow Operator to be bolted down without interference.
5. Readjust Air Gap "A" (See Wear Adjustment).

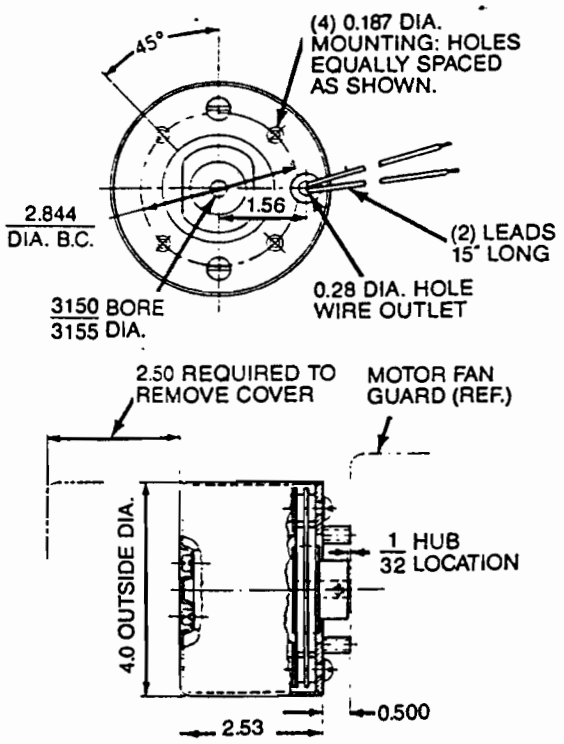


Figure 1 — Dimensions

Maintenance (Continued)

SOLENOID REPLACEMENT

⚠ CAUTION

Load to be removed or blocked. Brake will be inoperative during this procedure.

Use Figure 2 for reference.

1. Disconnect Solenoid (Ref. No. 25) from circuit, and remove Cover (Rev. No. 17).
2. Remove Solenoid Assembly (Ref. No. 25) and Torque Spring (Ref. No. 21) by removing Fillister Head Screws (Ref. No. 28) and Split Lockwashers (Ref. No. 27).
3. Insert new solenoid assembly by sliding plunger (Ref. No. 20) into slot of Operator Assembly Lever (Ref. No. 19), keeping torque spring around plunger.
4. Fasten solenoid assembly to mounting bracket (Ref. No. 26) with Fillister Head Screws (Ref. No. 28) and split Lockwashers (Ref. No. 27).
5. Adjust air gap "A" (See Wear Adjustment).

TORQUE SELECTION

The brake is designed so that the torque can be changed from 3/4 lb. ft. to 3/8 lb. ft.

Before installing, select the proper torque for your gear motor, in the following manner:

HP 1/40 to 1/15 HP	3/8 lb. ft
HP 1/12 to 1/6 HP	3/4 lb. ft

The brake as furnished has two Rotating Discs (Ref. No. 10), and will have a nominal static torque rating of 3/4 lb. ft. To reduce torque to 3/8 lb. ft. a rotating disc must be removed and the solenoid air gap has to be readjusted. Proceed as follows:

Depress solenoid plunger and remove the Rotating Disc (Ref. No. 10) which is closest to the solenoid. Release plunger. Set air gap (A) at 11/32 inches by turning Set Screw (Ref. No. 23) clockwise. Depress solenoid plunger several times and recheck air gap (A).

WEAR ADJUSTMENT

Use Figure 2 for reference.

As friction discs wear, magnet air gap "A" increases, thereby increasing stopping time of brake. Before air gap "A" reaches 7/16" maximum (measured on center line of plunger) adjustment for wear is requried. Any delay in adjusting air gap will result in a loss of torque and/or coil burn out.

To adjust brake proceed as follows:

1. Remove cover (Ref. No. 17).
2. Insert allen wrench into adjusting screw (Ref. No. 23) and turn clockwise until solenoid air gap is approximately 11/32. Gap is measured between Operator Assembly Lever (Ref. No. 19) and solenoid (Ref. No. 25) "C" frame, at center line of plunger (Ref. No. 20).

NOTE: The 11/32 dimension for the air gap is a nominal position. On low horsepower units, the gap may have to be slightly larger. Observe motor starting characteristics after adjusting gap. Motor should start quickly. If not, increase air gap by turning adjusting Set Screw (Ref. No. 23) 1/8 turn counter clockwise.

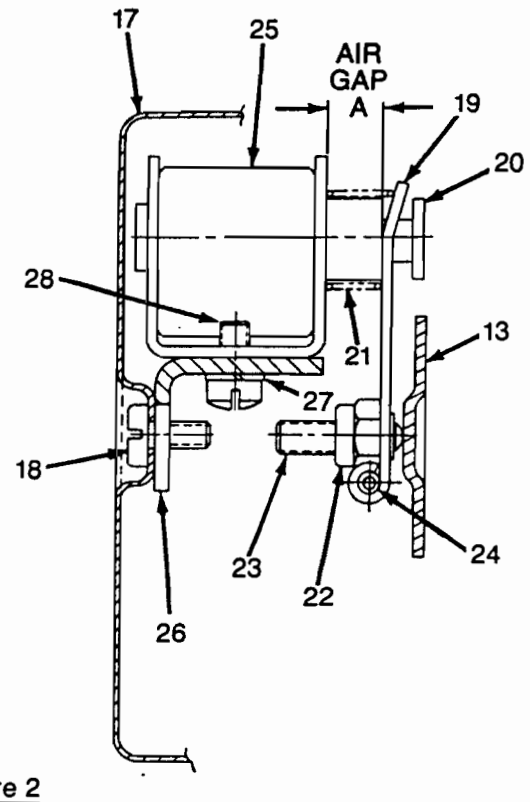
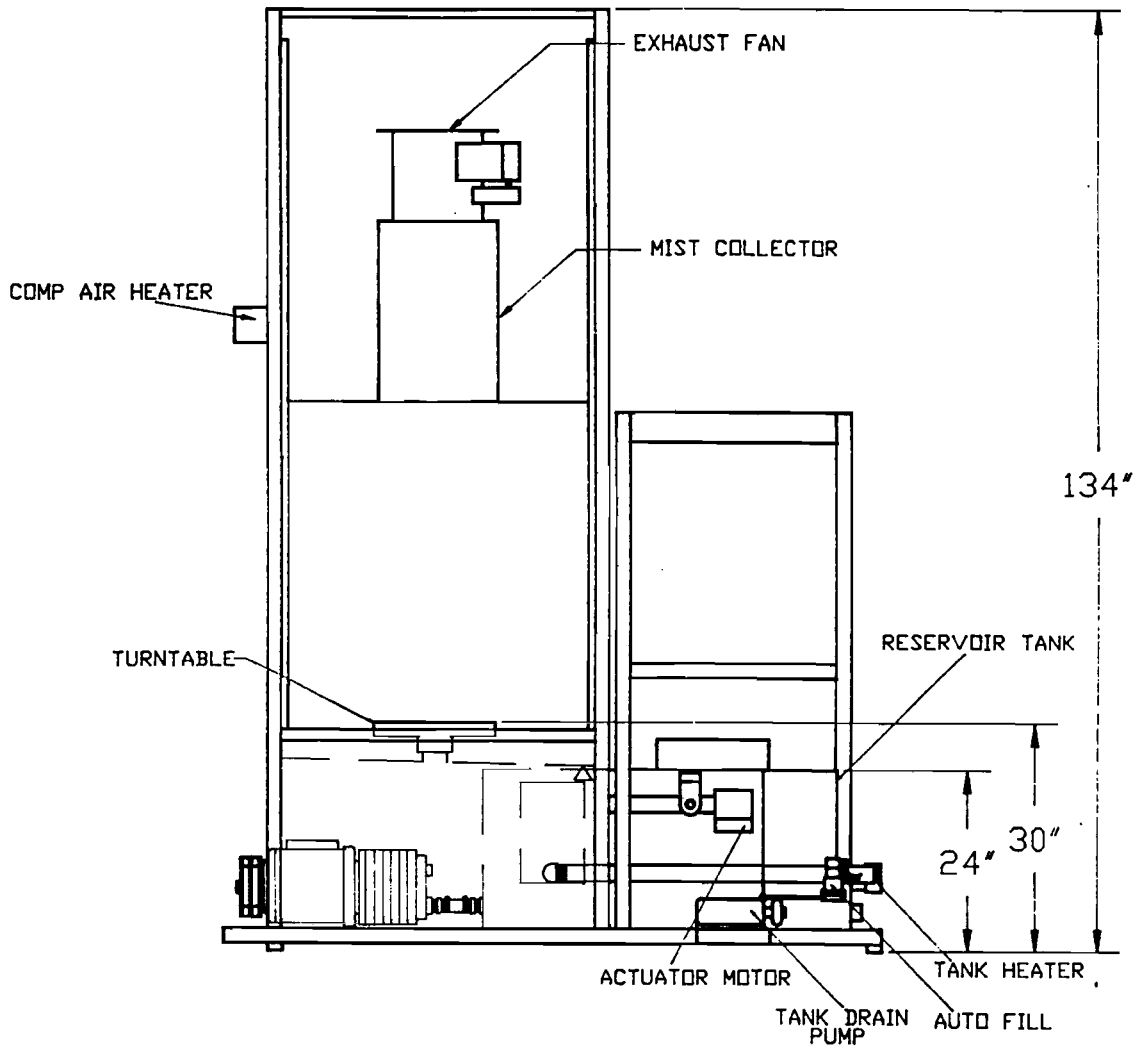


Figure 2

Troubleshooting Chart

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Brake does not release	1. Broken or damaged parts	1. Replace
	2. Wrong voltage	2. Check voltage, voltage must not vary more than ±10% rated voltage
	3. Burned out coil	3. Replace solenoid assembly (Ref. No. 25)
	4. Incorrect wiring connections or broken wires	4. Check for bad electrical or incorrect connections or broken wires
	5. Plunger binding due to worn parts	5. De-burr plunger (Ref. No. 20) or replace solenoid (Ref. No. 25)
Brake does not stop properly	1. Broken or damaged parts	1. Replace
	2. Worn friction discs	2. Replace if worn. Refer to section on Friction Disc Replacement
	3. HUB positioned incorrectly	3. Refer to section on Friction Disc Replacement
	4. Incorrect alignment between brake and motor shaft	4. Correct alignment. Refer to section on Installation Procedures
	5. Air gap excessive	5. Refer to section on wear adjustment
Brake chatters or hums	1. Wrong voltage supply for coil	1. Replace coil with correct voltage rating
	2. Solenoid air gap excessive	2. Adjust air gap. Refer to section on wear adjustment
	3. Loose or broken shading pole. Part or solenoid assembly	3. Clean or replace solenoid assembly (Ref. No. 25)
	4. Wrong size lead wires	4. Disconnect or rewire source voltage to brake



NOTICE TO PERSONS RECEIVING THIS DRAWING AND/OR TECHNICAL INFORMATION:

ABF SYSTEMS, LTD. CLAIMS PROPRIETY RIGHTS IN THE MATERIAL DISCLOSED HEREIN. THIS DRAWING AND/OR TECHNICAL INFORMATION IS ISSUED IN CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND MAY NOT BE REPRODUCED OR USED TO MANUFACTURE ANYTHING SHOWN OR REFERRED TO HEREIN WITHOUT DIRECT PERMISSION FROM ABF SYSTEMS, LTD. THIS DRAWING AND/OR TECHNICAL INFORMATION IS LOANED FOR MUTUAL ASSISTANCE AND IS SUBJECT TO RECALL BY ABF SYSTEMS, LTD. AT ANY TIME.

THIS DRAWING AND/OR TECHNICAL INFORMATION IS THE PROPERTY OF ABF SYSTEMS, LTD., HUMBOLDT, IA., USA

SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 5/21/94		

TITLE M960
SAUER-SUNDSTRAND
BACK VIEW

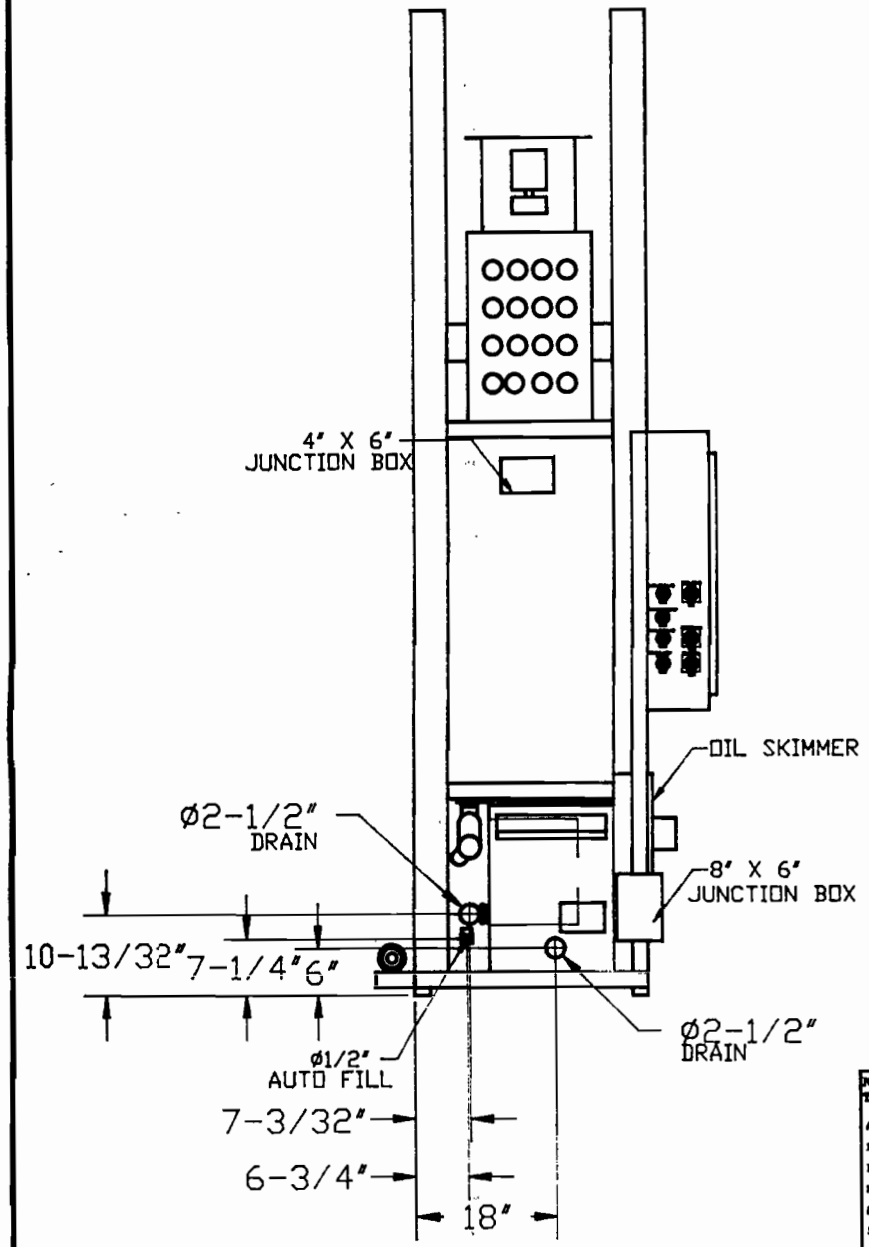
DRAWING NO. FP

SHEET 1 OF 4

TOLERANCE UNLESS OTHERWISE SPECIFIED

X	± .1
XX	± .02
XXX	± .004
X/X	± 1/32
ANGULAR, DEGREE	± 1/2°
SURFACES √ MICRONCH	± 3

DO NOT SCALE DRAWING



SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 5/21/94		

TITLE M960
SAUER-SUNDSTRAND
LEFT SIDE VIEW

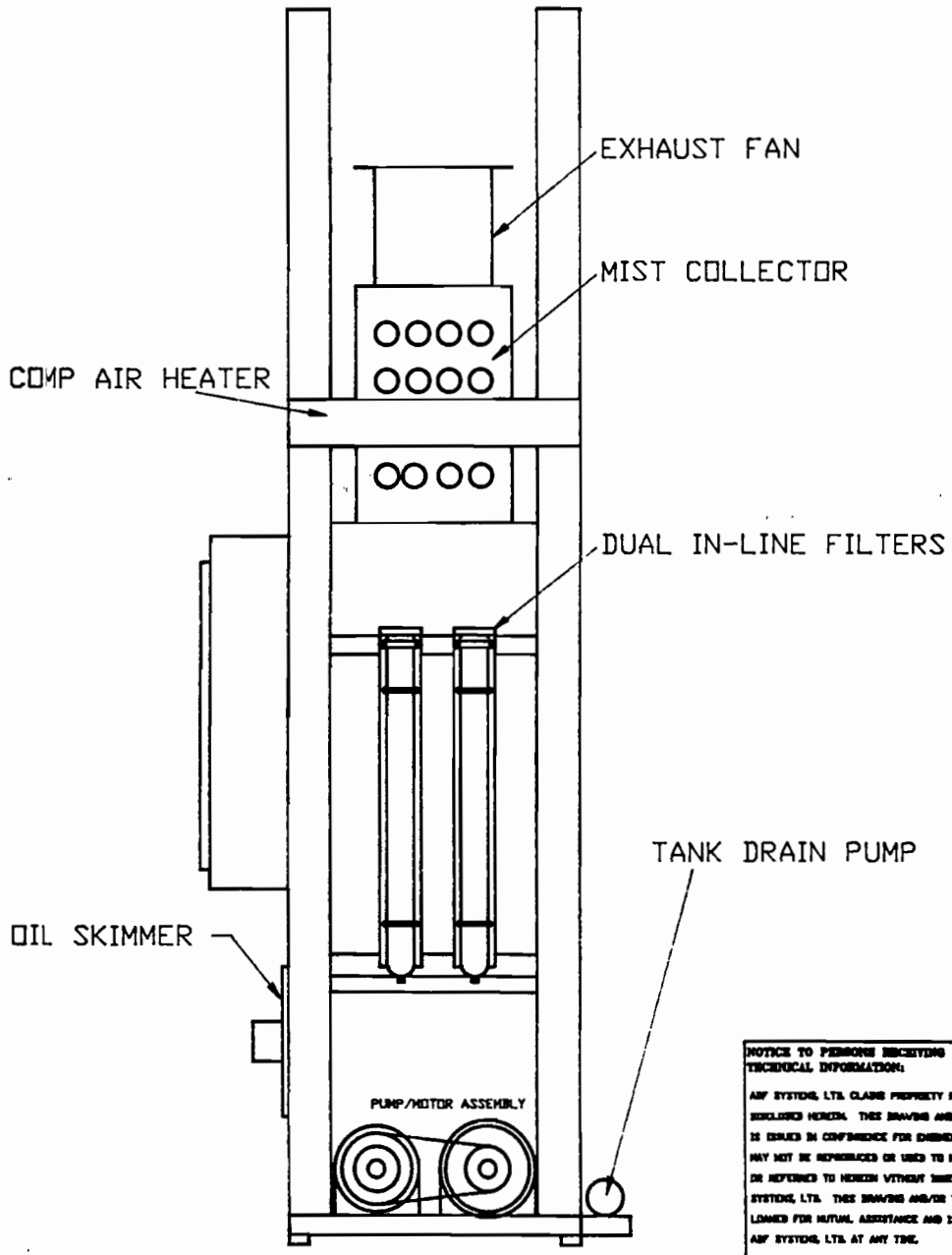
DRAWING NO.
FP

SHEET 2 OF 4

TOLERANCE UNLESS OTHERWISE SPECIFIED

.X	± .1
.XX	± .02
.XXX	± .004
X/X	± 1/32
ANGULAR, DEGREE	± 1/2°
SURFACES √	
MICRONS	± 5

DO NOT SCALE DRAWING



NOTICE TO PERSONS RECEIVING THIS DRAWING AND/OR TECHNICAL INFORMATION:

ADF SYSTEMS, LTD. CLAIMS PROPRIETY RIGHTS IN THE MATERIAL DISCLOSED HEREIN. THIS DRAWING AND/OR TECHNICAL INFORMATION IS ISSUED IN CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND MAY NOT BE REPRODUCED OR USED TO MANUFACTURE ANYTHING SHOWN OR REFERRED TO HEREIN WITHOUT DIRECT PERMISSION FROM ADF SYSTEMS, LTD. THIS DRAWING AND/OR TECHNICAL INFORMATION IS LOANED FOR MUTUAL ASSISTANCE AND IS SUBJECT TO RECALL BY ADF SYSTEMS, LTD. AT ANY TIME.

THIS DRAWING AND/OR TECHNICAL INFORMATION IS THE PROPERTY OF ADF SYSTEMS, LTD., HUMBOLDT, IA., USA

SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 5/21/94		

TITLE M960
SAUER-SUNDSTRAND
RIGHT SIDE VIEW

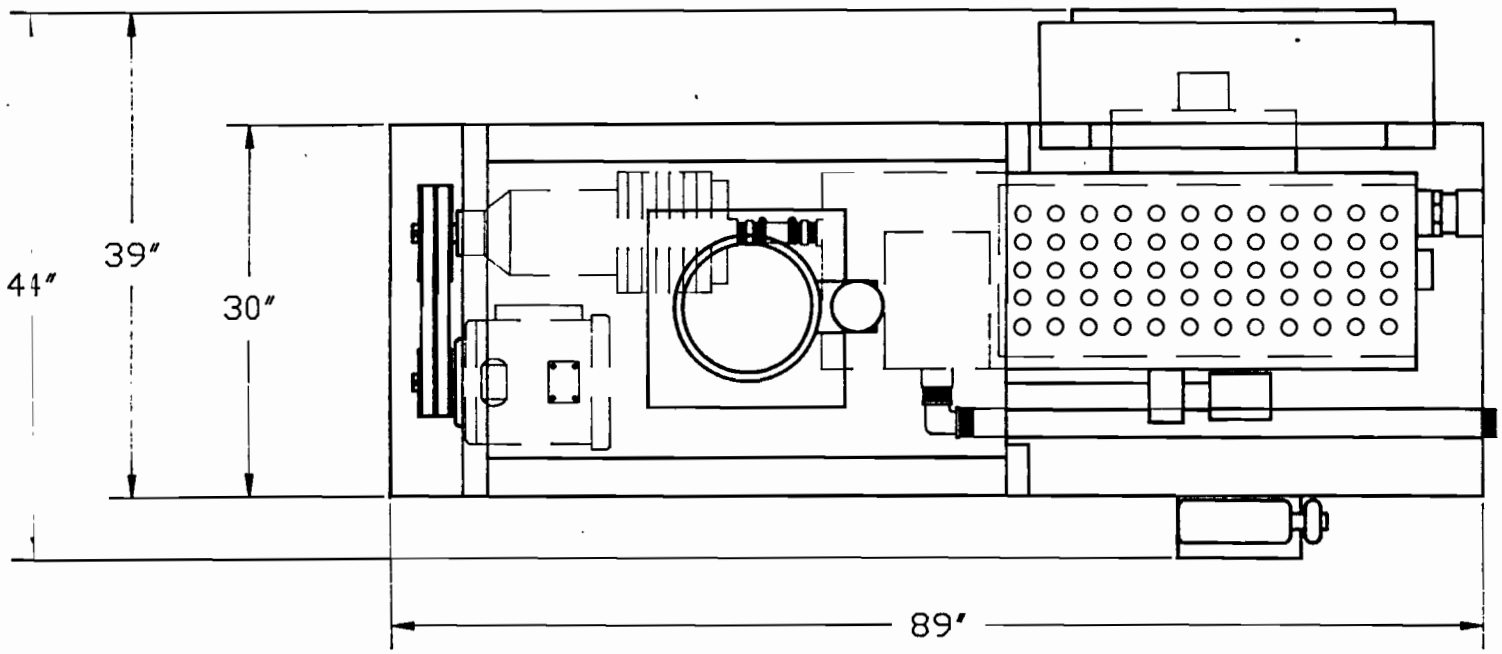
DRAWING NO. FP

SHEET 3 OF 4

TOLERANCE UNLESS OTHERWISE SPECIFIED

.X	± .1
.XX	± .02
.XXX	± .004
X/X	± 1/32
ANGULAR, DEGREE	± 1/2°
SURFACES √ MICRONCH	± 5

DO NOT SCALE DRAWING



SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 5/21/94		

TITLE M960
SAUER-SUNDSTRAND
TOP VIEW

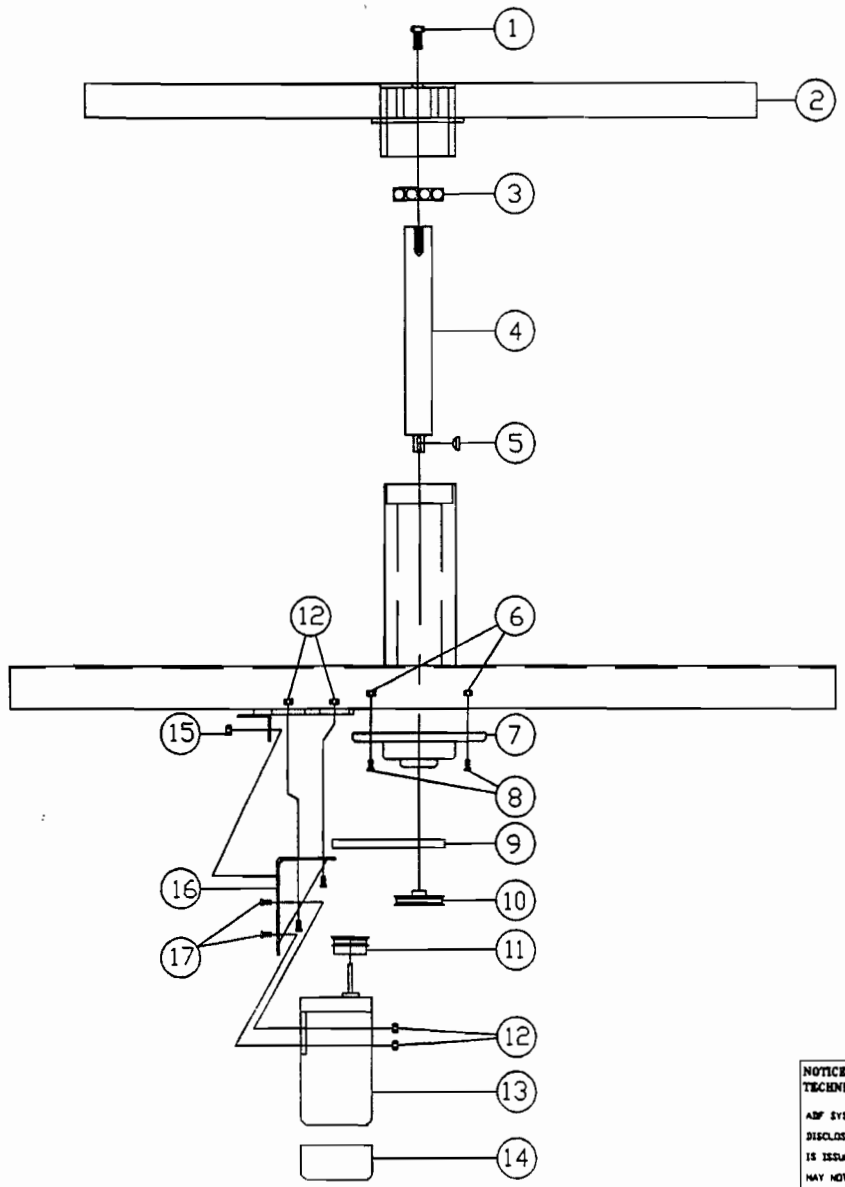
DRAWING NO.
FP

SHEET 4 OF 4

TOLERANCE UNLESS OTHERWISE SPECIFIED

.X	± .1
.XX	± .02
.XXX	± .004
X/X	± 1/32
ANGULAR, MINIMUM	± 1/2°
SURFACES	√
MICROFINCH	± 5

DO NOT SCALE DRAWING



BILL OF MATERIAL

ITEM	PART #	QTY	DESCRIPTION
1	529276	1	BOLT, HHCS, 1/2-13 X 1" SS
2		1	TURNTABLE, Ø12"
3	523023	1	BEARING, BALL, THRUST, 1-5/8"
4	397005	1	SHAFT, CENTER, TURNTABLE, SS (M850/900)
5	704500	1	KEY, WOODRUFF, 3/16" X 3/4"
6	788123	2	NUT, HEX, 1/2" PLATED
7	523005	1	BEARING, BALL, RADIAL, 1-5/8"
8	529437	2	BOLT, HHCS, 3/8"-16 X 1-1/2", GR 5, PLATED
9	523500	1	BELT, 4L70
10	828860	1	PULLEY, AK34, 5/8" BORE
11	828850	1	PULLEY, AK20, 5/8" BORE
12	788104	8	NUT, FLANGE WHIZ, 1/4-20 PLATED
13	3M327A	1	MOTOR, GEAR, 1/40 HO, 6RPM
14	5X400	1	BRAKE, MAGNETIC DISC
15	788105	1	NUT, FLANGE WHIZ, 5/16"-18, PLATED
16	134001	1	BRACKET, GEAR MOTOR MOUNT
17	529397	8	BOLT, 1/4-20 X 1-1/4", GR5 PLATED

SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 1/3/96		

TITLE M960 (Ø12'TT/40"WH)
SAUER-SUNDSTRAND
TURNTABLE ASSY

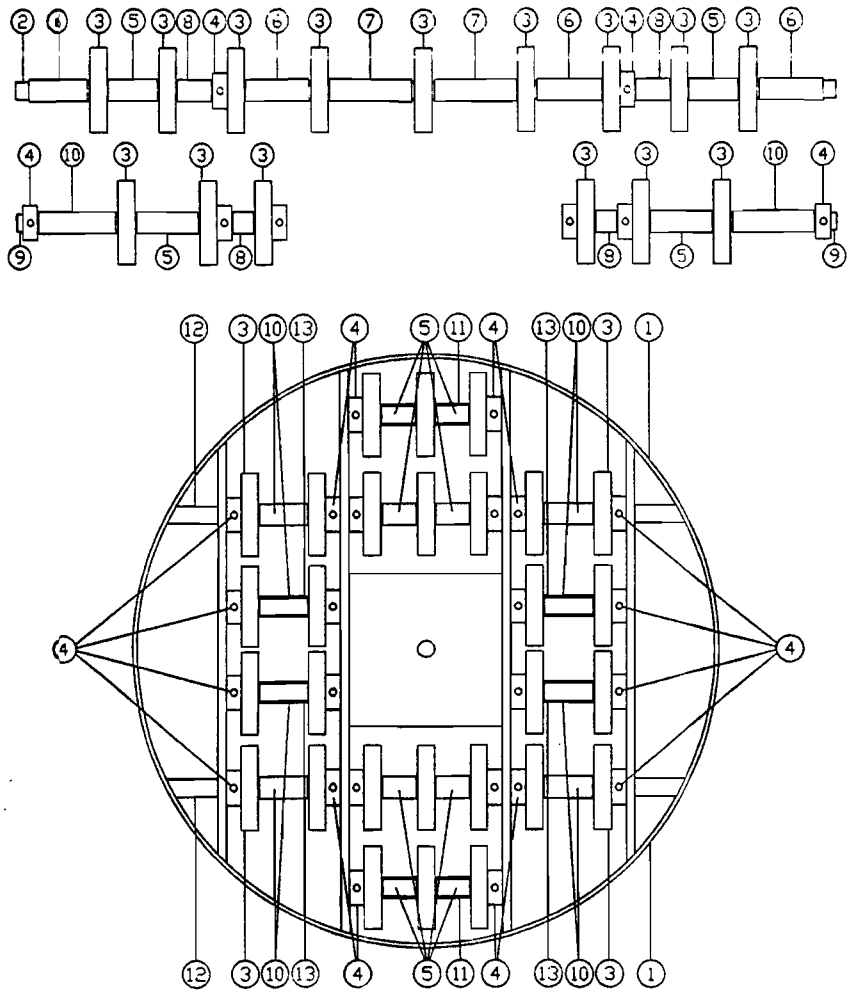
DRAWING NO. TT-A

SHEET 1 OF 1

TOLERANCE UNLESS OTHERWISE SPECIFIED

.X	± .1
.XX	± .02
.XXX	± .004
X/X	± 1/32
ANGULAR, DEGREE	± 1/2°
SURFACES √ MICRO/INCH	± 5

DO NOT SCALE DRAWING



BILL OF MATERIAL

ITEM	PART #	QTY	DESCRIPTION
1		1	TURNTABLE, ø12'
2		2	SHAFT, 20-1/2" X ø1/2"SS
3	945-2292T15	58	ROLLER, ø2"OD X 1"WIDE X ø9/16"BORE
4	932-CLC50	38	COLLAR, ø1/2"SS
5		16	SPACER, 1" X ø1/2"SS PIPE
6		8	SPACER, 1-1/2" X ø1/2"SS PIPE
7		4	SPACER, 2" X ø1/2"SS PIPE
8		8	SPACER, 3/4" X ø1/2"SS PIPE
9		2	SHAFT, 7-1/2" X ø1/2"SS PIPE
10		12	SPACER, 1-3/4" X ø1/2"SS PIPE
11		2	SHAFT, 5-1/2" X ø1/2"SS
12		2	SHAFT, 15" X ø1/2"SS
13		4	SHAFT, 6-1/2" X ø1/2"SS

ABP SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 1/8/96		

TITLE: SAUER-SUNDSTRAND TURNTABLE

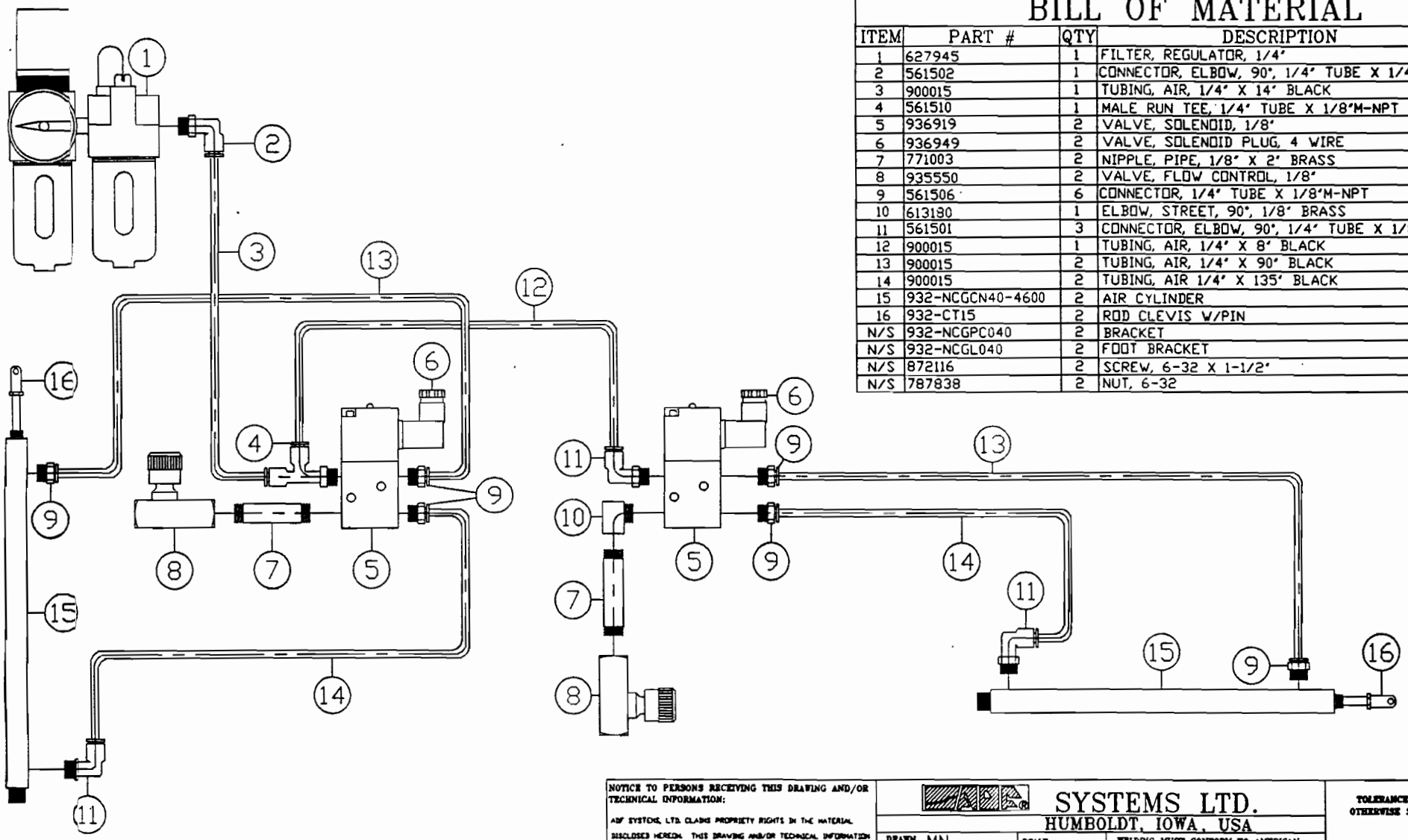
DRAWING NO.: TT-A2

SHEET 1 OF 1

TOLERANCE UNLESS OTHERWISE SPECIFIED

.X	± .1
.XX	± .02
.XXX	± .004
1/2	± 1/32
ANGULAR, MACH	± 1/2°
SURFACE FINISH	
MICROINCH	± 5

DO NOT SCALE DRAWING



BILL OF MATERIAL

ITEM	PART #	QTY	DESCRIPTION
1	627945	1	FILTER, REGULATOR, 1/4"
2	561502	1	CONNECTOR, ELBOW, 90°, 1/4" TUBE X 1/4"M-NPT
3	900015	1	TUBING, AIR, 1/4" X 14" BLACK
4	561510	1	MALE RUN TEE, 1/4" TUBE X 1/8"M-NPT
5	936919	2	VALVE, SOLENOID, 1/8"
6	936949	2	VALVE, SOLENOID PLUG, 4 WIRE
7	771003	2	NIPPLE, PIPE, 1/8" X 2" BRASS
8	935550	2	VALVE, FLOW CONTROL, 1/8"
9	561506	6	CONNECTOR, 1/4" TUBE X 1/8"M-NPT
10	613180	1	ELBOW, STREET, 90°, 1/8" BRASS
11	561501	3	CONNECTOR, ELBOW, 90°, 1/4" TUBE X 1/8"M-NP
12	900015	1	TUBING, AIR, 1/4" X 8" BLACK
13	900015	2	TUBING, AIR, 1/4" X 90" BLACK
14	900015	2	TUBING, AIR 1/4" X 135" BLACK
15	932-NCGCN40-4600	2	AIR CYLINDER
16	932-CT15	2	ROD CLEVIS W/PIN
N/S	932-NCGPC040	2	BRACKET
N/S	932-NCGL040	2	FOOT BRACKET
N/S	872116	2	SCREW, 6-32 X 1-1/2"
N/S	787838	2	NUT, 6-32

SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 1/3/96		

TITLE
SAUER-SUNDSTRAND
AIR OPERATED DOOR

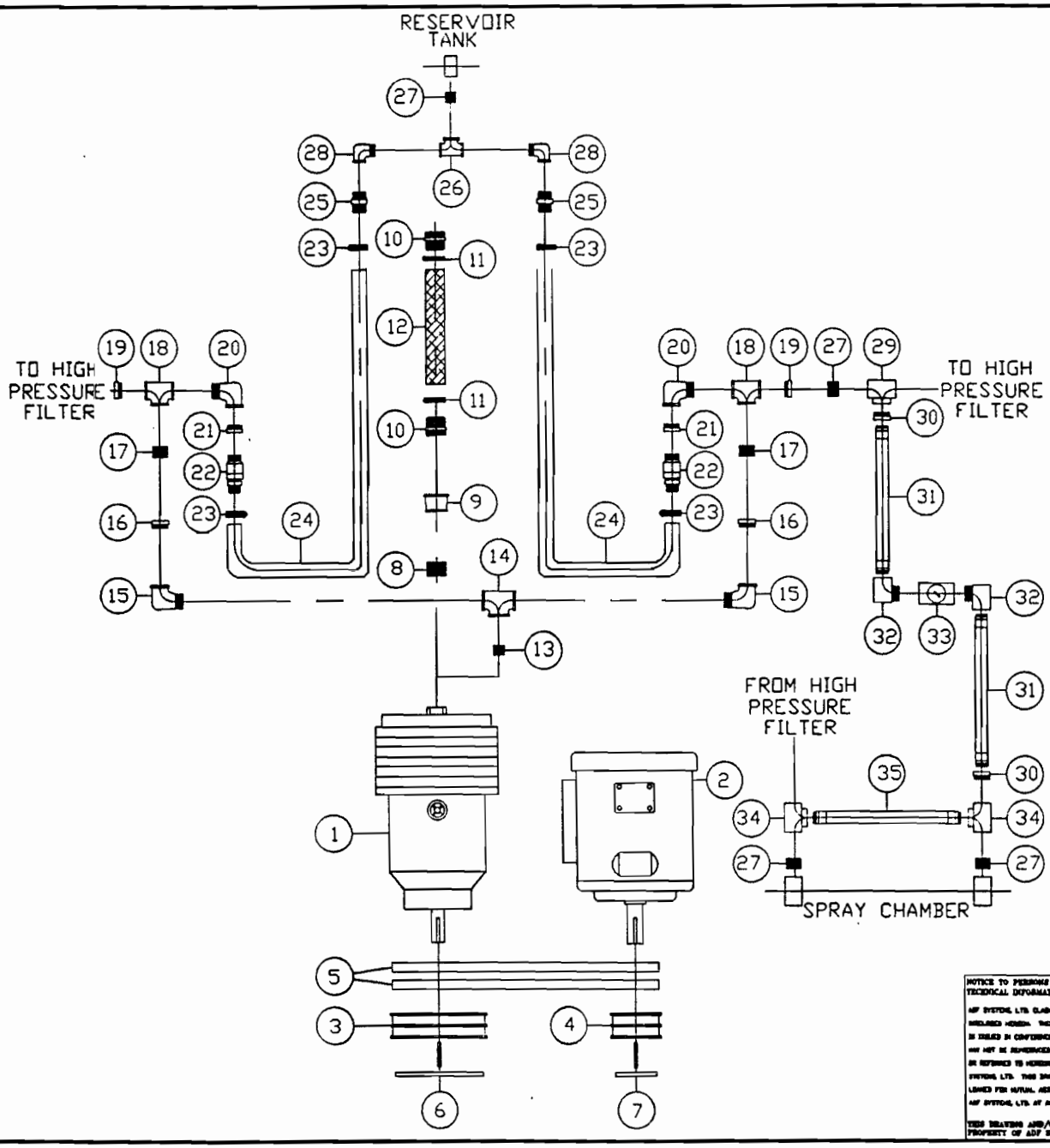
DRAWING NO.
AIRDR-A

SHEET 1 OF 1

TOLERANCE UNLESS OTHERWISE SPECIFIED

X	± .1
XX	± .02
XXX	± .004
X/X	± 1/32
ANGULAR, DEGREE	± 1/2°
SURFACES √ MICRODNCH	± 5

DO NOT SCALE DRAWING



BILL OF MATERIAL

ITEM	PART#	QTY	DESCRIPTION
1	830750	1	PUMP, HYDRA-CELL D-25
2	751185	1	MOTOR, ELECTRIC, 230V/460V/3PH, 10HP
3	829290	1	PULLEY, 2Q5V90
4	829249	1	PULLEY, 2Q5V49
5	B40	2	BELT, B40
6	829313	1	PULLEY, BUSHING Q1-1-3/8"
7	829310	1	PULLEY, BUSHING, Q1-1"
8	772340	1	NIPPLE, CLOSE, 1-1/2" PLATED
9	571339	1	COUPLING, REDUCER, 1-1/2" X 2" PLATED
10	668634	2	HOSE BARB, 2"HOSE X 2"M-NPT, STEEL
11	559010	2	CLAMP, HOSE, 1-1/2" - 2"
12	669103	1	HOSE, 1 WIRE, ø2" X 12"
13	772300	1	NIPPLE, CLOSE, 1" PLATED
14	890305	1	TEE, 1" FORGED
15		2	ELBOW, STREET, 90°, 1" FORGED
16	542522	2	BUSHING, REDUCER, 1" X 3/4" PLATED
17	772280	2	NIPPLE, CLOSE, 3/4" PLATED
18	890304	2	TEE, 3/4" FORGED
19	542515	2	BUSHING, REDUCER, 3/4" X 1/2" PLATED
20		2	ELBOW, STREET, 90°, 3/4" FORGED
21	542514	2	BUSHING, REDUCER, 3/4" X 3/8" PLATED
22	936120	2	VALVE, RELIEF
23	559004	4	CLAMP, HOSE
24	669000	2	HOSE, GENERAL PURPOSE, ø3/8" X 24"
25	668015	2	HOSE BARB, 3/8"HOSE X 1/2"M-NPT, STEEL
26	890093	1	TEE, 1/2" PLATED
27	772260	4	NIPPLE, CLOSE, 1/2" PLATED
28	613363	2	ELBOW, STREET, 90°, 1/2" PLATED
29	890303	1	TEE, 1/2" FORGED
30	542506	2	BUSHING, REDUCER, 1/2" X 1/4" PLATED
31		2	HOSE ASSY, 1/4" X 32" W/SWIVEL END
32	613181	2	ELBOW, STREET, 90°, 1/4" BRASS
33	1201PGS-1A-2L-1	1	PRESSURE SWITCH
34	890003	2	TEE, 1/2" BRASS
35	666520	1	HOSE ASSY, 1/2" X 20" W/SWIVEL END
N/S	613182	1	ELBOW, STREET, 90°, 3/8" BRASS
N/S	772244	1	NIPPLE, PIPE, 3/8" X 3" PLATED
N/S	613102	1	ELBOW, 90°, 3/8" BRASS
N/S		1	PIPE, 3/8" X 11" PLATED
N/S	890002	1	TEE, 3/8" BRASS
N/S	945-1141K45	1	SIGHT GLASS
N/S	816703	1	PLUG, PIPE, SQ HD, 3/8" PLATED

ADF SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 1/4/96		

TITLE: SAUER-SUNDSTRAND PUMP/MOTOR ASSY

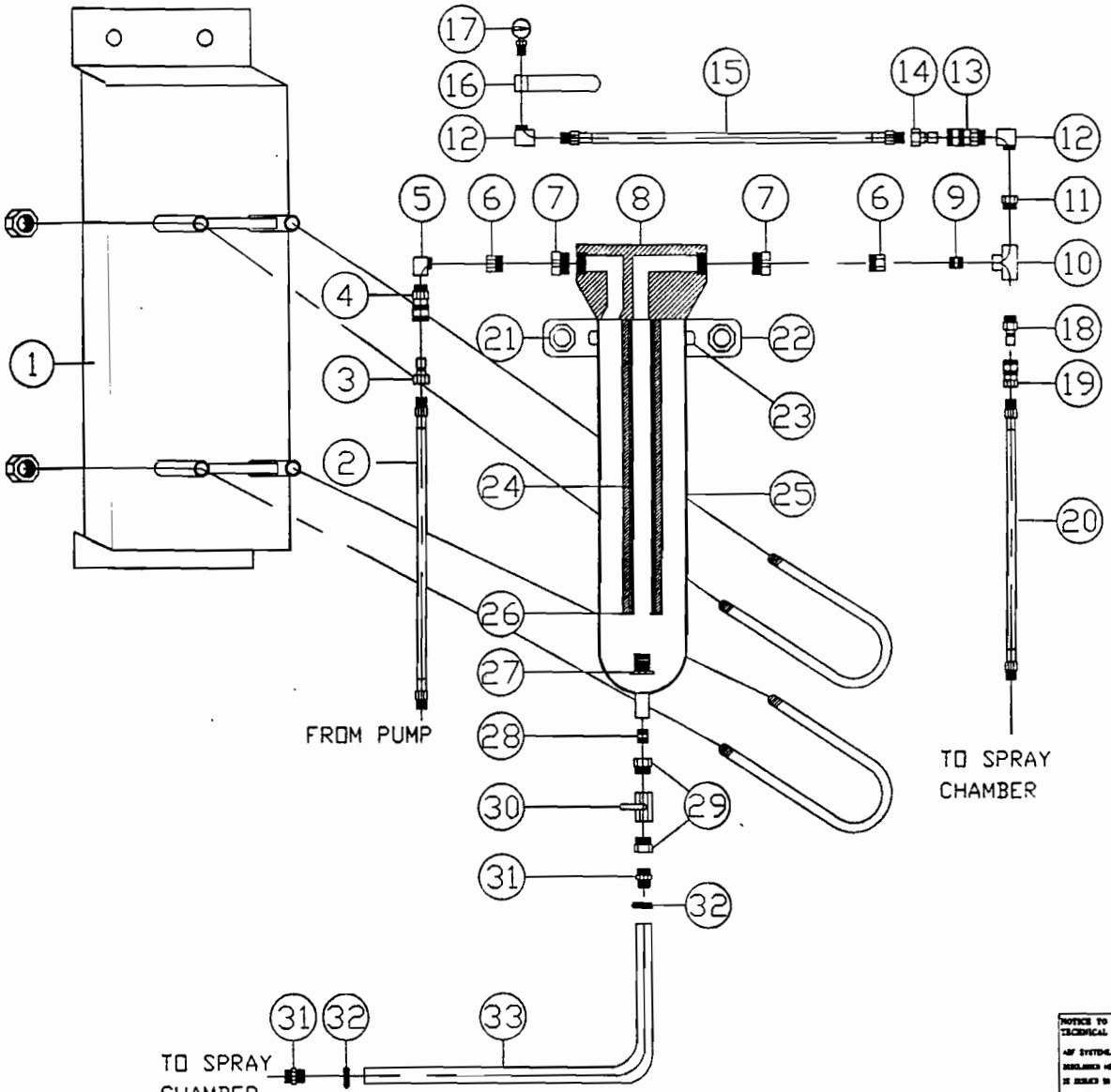
DRAWING NO. PM-A

SHEET 1 OF 1

TOLERANCE UNLESS OTHERWISE SPECIFIED

.X	± .1
.XX	± .02
.XXX	± .004
1/2	± 1/32
ANGULAR, MACH	± 1/2°
SURFACE FINISH	± 1
MICROINCH	

DO NOT SCALE DRAWING



BILL OF MATERIAL

ITEM	PART #	QTY	DESCRIPTION
1		1	BRACKET, FILTER, W/MOUNTING HARDWARE
2	666565	1	HOSE ASSY, 1/2" X 65" W/SWIVEL END
3	571014	1	COUPLER, QUICK DISC, PLUG, 1/2"F-NPT, BRASS
4	571012	1	COUPLER, QUICK DISC, SOCKET, 1/2"M-NPT, BRASS
5	613183	1	ELBOW, STREET, 90°, 1/2" BRASS
6	542515	2	BUSHING, REDUCER, 3/4" X 1/2" PLATED
7	542522	2	BUSHING, REDUCER, 1" X 3/4" PLATED
8	950-P1	1	HEAD
9	772260	1	NIPPLE, CLOSE, 1/2" PLATED
10	890003	1	TEE, 1/2" BRASS
11	542506	1	BUSHING, REDUCER, 1/2" X 1/4" PLATED
12	613181	2	ELBOW, STREET, 90°, 1/4" BRASS
13	570998	1	COUPLER, QUICK DISC, SOCKET, 1/4"M-NPT, BRASS
14	570999	1	COUPLER, QUICK DISC, PLUG, 1/4"F-NPT, BRASS
15	666110	1	HOSE ASSY, 1/4" X 18" W/SWIVEL END
16		1	BRACKET, 1/4" FULL COUPLER
17	643500	1	GAUGE, LIQUID FILLED, 2000PSI
18	571015	1	COUPLER, QUICK DISC, PLUG, 1/2"M-NPT, BRASS
19	571011	1	COUPLER, QUICK DISC, SOCKET, 1/2"F-NPT, BRASS
20	666555	1	HOSE ASSY, 1/2" X 55" W/SWIVEL END
21	950-P8	2	COUPLING, BOLT & NUT
22	950-P6	1	COUPLING, GROOVED
23	643190	1	GASKET, FILTER
24	950-P33	1	TUBE, BRASS
25	950-P23T	1	BODY, 2000PSI W/DRAIN
26	950-P5	1	WASHER, BRASS
27	950-P4	1	SCREW, BRASS
28	772220	1	NIPPLE, CLOSE, 1/4" PLATED
29	542504	2	BUSHING, REDUCER, 3/8" X 1/4" PLATED
30	935202	1	VALVE, BALL, 3/8"F-NPT, LOW PRESSURE, BRASS
31	668013	2	HOSE BARB, 3/8" HOSE X 1/4"M-NPT, BRASS
32	559004	2	HOSE CLAMP
33	669000	24"	HOSE, GENERAL PURPOSE, Ø3/8"
34	668014	1	HOSE BARB, 3/8" HOSE X 3/8"M-NPT, BRASS

SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST COMPORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 1/4/96		

TITLE: SAUER-SUNDSTRAND HIGH PRESSURE FILTER

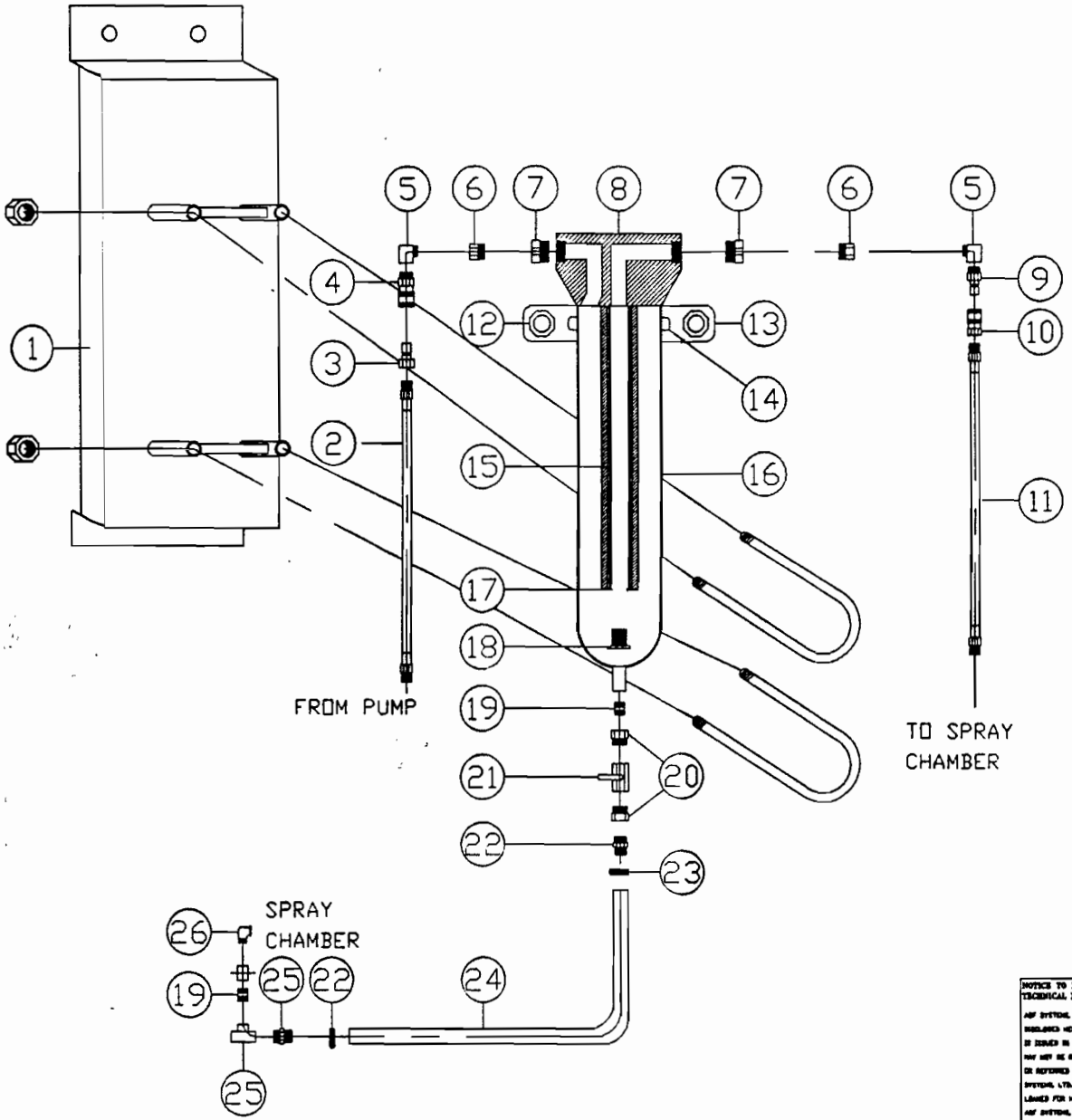
DRAWING NO.: HPF-A

SHEET 1 OF 2

TOLERANCE UNLESS OTHERWISE SPECIFIED

.X	± .1
.XX	± .02
.XXX	± .004
1/2	± 1/32
ANGULAR, MACH SURFACES	± 1/2°
MACHINED	± 1

DO NOT SCALE DRAWING



BILL OF MATERIAL

ITEM	PART #	QTY	DESCRIPTION
1		1	BRACKET, FILTER, W/MOUNTING HARDWARE
2	666565	1	HOSE ASSY, 1/2" X 65' W/SWIVEL END
3	571014	1	COUPLER, QUICK DISC, PLUG, 1/2"F-NPT, BRASS
4	571012	1	COUPLER, QUICK DISC, SOCKET, 1/2"M-NPT, BRASS
5	613183	2	ELBOW, STREET, 90°, 1/2" BRASS
6	542515	2	BUSHING, REDUCER, 3/4" X 1/2" PLATED
7	542522	2	BUSHING, REDUCER, 1" X 3/4" PLATED
8	950-P1	1	HEAD
9	571015	1	COUPLER, QUICK DISC, PLUG, 1/2"M-NPT, BRASS
10	571011	1	COUPLER, QUICK DISC, SOCKET, 1/2"F-NPT, BRASS
11	666555	1	HOSE ASSY, 1/2" X 55' W/SWIVEL END
12	950-P8	2	COUPLING, BOLT & NUT
13	950-P6	1	COUPLING, GROOVED
14	643190	1	GASKET, FILTER
15	950-P33	1	TUBE, BRASS
16	950-P23T	1	BODY, 2000PSI W/DRAIN
17	950-P5	1	WASHER, BRASS
18	950-P4	1	SCREW, BRASS
19	772220	2	NIPPLE, CLOSE, 1/4" PLATED
20	542504	2	BUSHING, REDUCER, 3/8" X 1/4" PLATED
21	935202	1	VALVE, BALL, 3/8"F-NPT, LOW PRESSURE, BRASS
22	668013	2	HOSE BARB, 3/8" HOSE X 1/4"M-NPT, BRASS
23	559004	2	HOSE CLAMP
24	669000	24'	HOSE, GENERAL PURPOSE, ø3/8"
25	890001	1	TEE, 1/4" BRASS
26	613360	1	ELBOW, STREET, 1/4" PLATED

ASF SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 1/4/96		

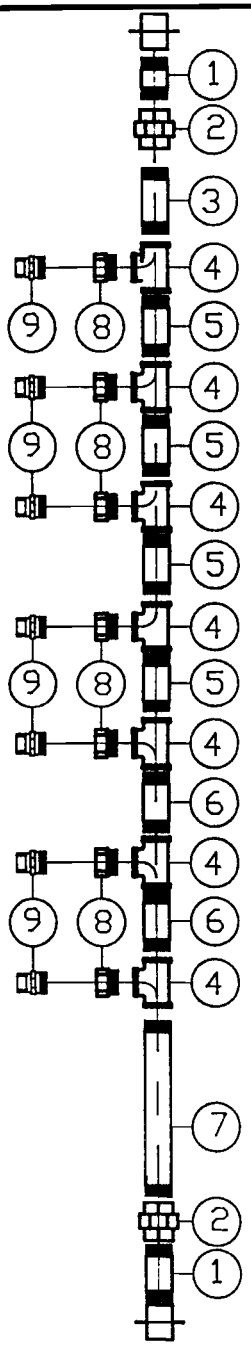
TITLE: SAUER-SUNDSTRAND HIGH PRESSURE FILTER

DRAWING NO. HPF-A

SHEET 2 OF 2

TOLERANCE UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DRAWING



BILL OF MATERIAL

ITEM	PART#	QTY	DESCRIPTION
1	772263	2	NIPPLE, PIPE, 1/2" X 2-1/2" PLATED
2	922004	2	UNION, 1/2" PLATED
3	772268	1	NIPPLE, PIPE, 1/2" X 5" PLATED
4	890093	7	TEE, 1/2" PLATED
5	772266	4	NIPPLE, PIPE, 1/2" X 4" PLATED
6	772264	2	NIPPLE, PIPE, 1/2" X 3" PLATED
7	772274	1	NIPPLE, PIPE, 1/2" X 10" PLATED
8	542506	7	BUSHING, REDUCER, 1/2" X 1/4" PLATED
9	782945	7	NOZZLE, 1/4" MEG, 1504

SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 1/9/95		

TITLE M960 (Ø12"TT/40"WH)
SAUER-SUNDSTRAND
WASH NOZZLE ASSY

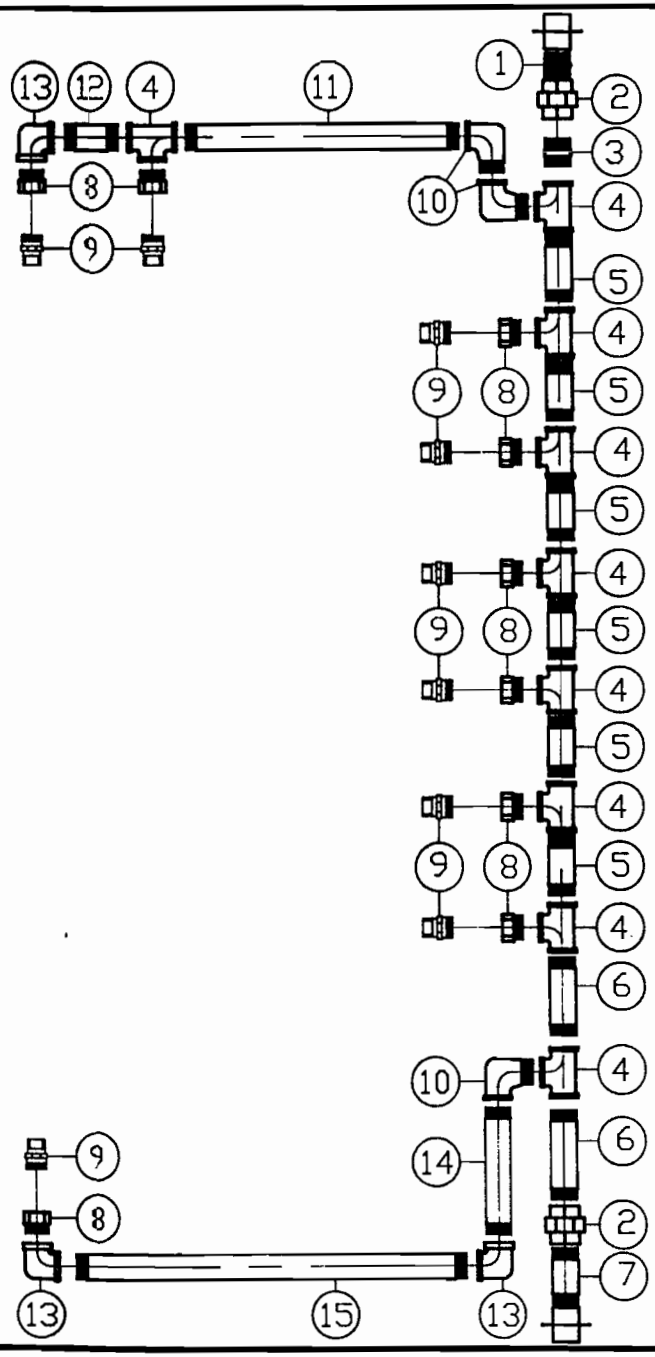
DRAWING NO. WN

SHEET 1 OF 2

TOLERANCE UNLESS OTHERWISE SPECIFIED

X	± .1
XX	± .02
XXX	± .004
X/X	± 1/32
ANGULAR, MACHINE	± 1/2°
SURFACES √ MICROINCH	± 3

DO NOT SCALE DRAWING



BILL OF MATERIAL

ITEM	PART#	QTY	DESCRIPTION
1	772260	1	NIPPLE, CLOSE, 1/2" PLATED
2	922004	2	UNION, 1/2" PLATED
3	772261	1	NIPPLE, PIPE, 1/2" X 1-1/2" PLATED
4	890093	9	TEE, 1/2" PLATED
5	772266	6	NIPPLE, PIPE, 1/2" X 4" PLATED
6	772268	2	NIPPLE, PIPE, 1/2" X 5 PLATED
7	772262	1	NIPPLE, PIPE, 1/2" X 2" PLATED
8	542506	9	BUSHING, REDUCER, 1/2" X 1/4" PLATED
9	782945	9	NOZZLE, 1/4" MEG, 1504
10	613363	3	ELBOW, STREET, 90°, 1/2" PLATED
11	772275	1	NIPPLE, PIPE, 1/2" X 11" PLATED
12	772264	1	NIPPLE, PIPE, 1/2" X 3" PLATED
13	613303	3	ELBOW, 90°, 1/2" PLATED
14	772271	1	NIPPLE, PIPE, 1/2" X 7" PLATED
15	772276	1	NIPPLE, PIPE, 1/2" X 13" PLATED

SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN
CHECKED
APPROVED
DATE 1/9/95

SCALE
WEIGHT
MATERIAL

WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.

TITLE M960 (Ø12'TT/40'WH)
SAUER-SUNDSTRAND
WASH NOZZLE ASSY

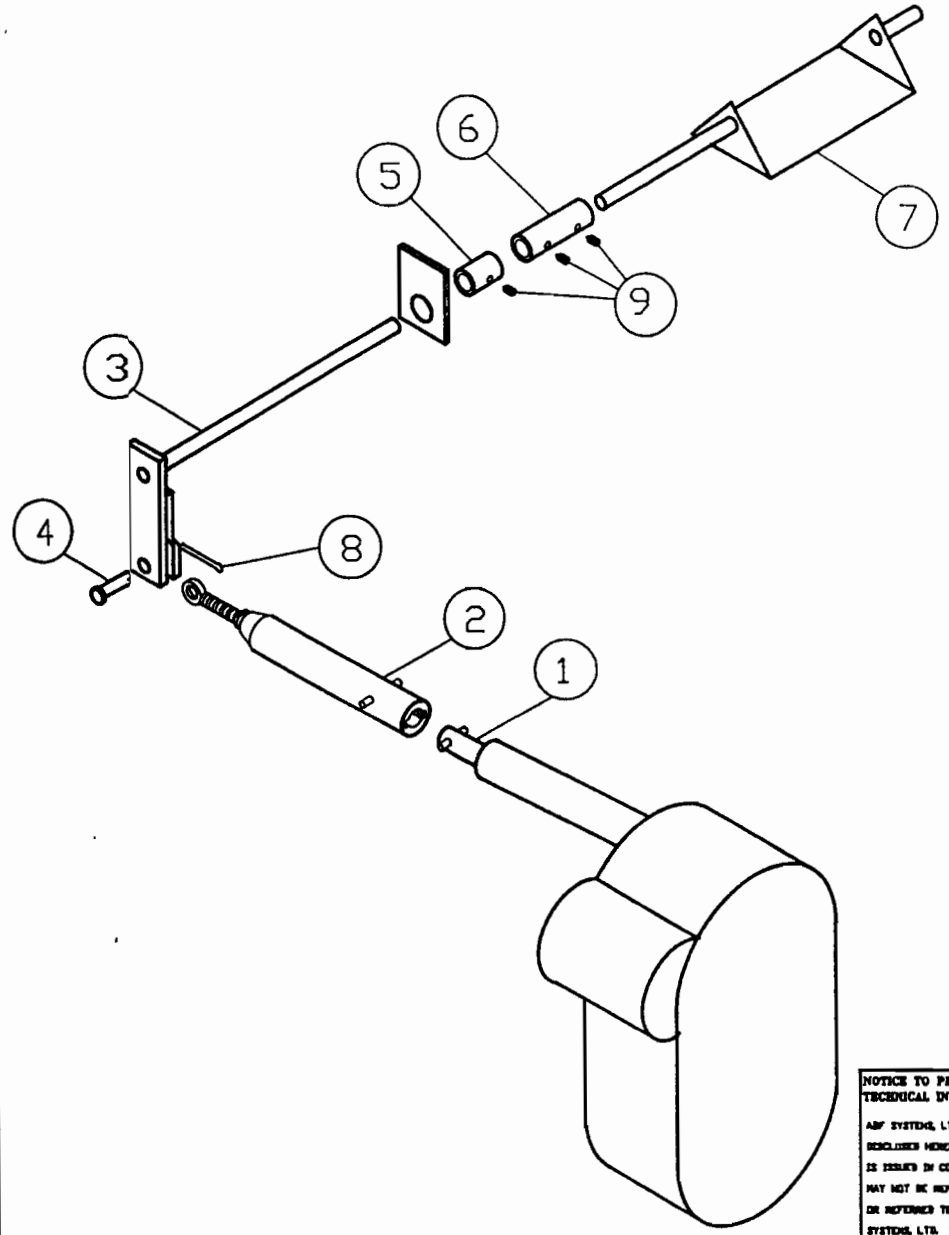
DRAWING NO. WN

SHEET 2 OF 2

TOLERANCE UNLESS OTHERWISE SPECIFIED

X	± .1
XX	± .02
XXX	± .004
X/X	± 1/32
ANGULAR, BROKEN SURFACES √	± 1/2°
MICRODUCH	± 5

DO NOT SCALE DRAWING



BILL OF MATERIAL

ITEM	PART#	QTY	DESCRIPTION
1	501050	1	ACTUATOR, GEAR MOTOR, 115V, 600LB (SEE BREAKDOWN NEXT PAGE)
2	501065	1	ACTUATOR, TUBE ASSY., 13.5" TRAVEL
3	204502	1	SHAFT FORK
4	350081	1	LOCK PIN
5	402220	1	SINGLE SPLICE
6	402221	1	DOUBLE SPLICE
7	422092	1	TRAY, DIVERTER (M800/M860 (ø32" TT ONLY))
	422093	1	TRAY, DIVERTER (M850/M860/M900/M990)
8	569200	1	COTTER PIN
9	875034	3	SCREW, SOCKET, 1/4" X 20THR X 1/4"

NOTE: BRACKET IS WELDED ONTO THE CHASSIS.
USE LOCKTITE WHEN TIGHTENING SOCKET SCREWS.

SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 8/25/94		

TITLE
ADF
ACTUATOR MOTOR ASSY

DRAWING NO.
464100

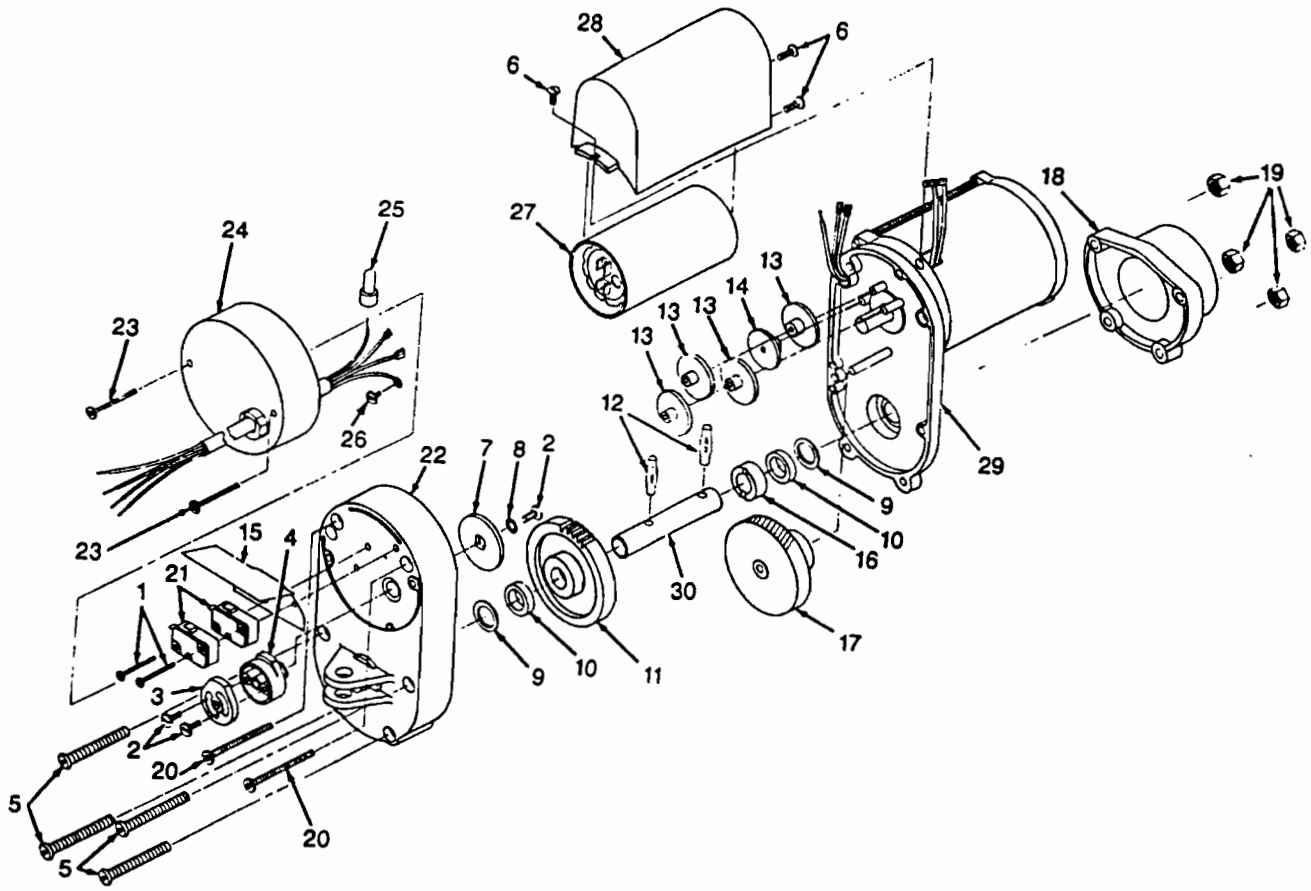
SHEET 1 OF 1

TOLERANCE UNLESS OTHERWISE SPECIFIED

X	± .1
XX	± .02
XXX	± .004
X/X	± 1/32
ANGULAR, BROKEN	± 1/2°
SURFACES	√
MICRONCH	± 3

DO NOT SCALE DRAWING

ACTUATOR MOTOR BREAKDOWN



Replacement Parts List

REF. NO.	DESCRIPTION	PART NO.	QTY.	REF. NO.	DESCRIPTION	PART NO.	QTY
1	4 - 40 x 1 Screw	R12131-0003	2	16	Thrust bushing	P11962-0001	1
2	7 - 18 x .37 Screw	R12229-0001	3	17	#2 gear assembly	A10969-0002	1
3	Upper cam	P06343-0003	1	18	Tube adapter	G11349-0002	1
4	Lower cam	P06344-0003	1	19	10 - 32 Nut	R01116-0001	4
5	10 - 32 x 2 Screw	R12022-0100	4	20	10 - 32 x 1.2 Screw	R11256-0001	2
6	6 - 32 x .37 Screw	R12132-0001	3	21	AC limit switch	P04214-0007	2
7	Cam gear	H03988-0001	1	22	Cover assembly	D12461-0002	1
8	Lock washer	R03429-0001	1	23	6 - 32 x 1.2 screw	R12132-0011	2
9	Output washer	P01600-0025	2	24	Switch box cover	G05148-0004	1
10	Output spacer	P12415-0001	2	25	Pigtail connector	P00920-0001	3
11	Output gear	H10970-0001	1	26	6 - 32 x .18 Screw	R12132-0010	1
12	Cross pin	P10429-0003	2	27	Capacitor	K04206-0002	1
13	Timing gear	A03312-0001	4	28	Capacitor cover	G05645-0005	1
14	Timing gear	A10055-0002	1	29	Motor assembly	C12275-0003	1
15	Insulator	P05366-0001	1	30	Output shaft	J12081-0005	1

Troubleshooting Chart

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Actuator fails to operate	1. Automatic thermal protector tripped (115V AC unit only) 2. Blown fuse or open circuit breaker 3. Improper electrical connections. 4. No power 5. Defective limit switch or reversing switch Models 6Z086 & 6Z088 only 6. Defective capacitor (115 VAC units only) 7. Actuator drive tube jammed against stop 8. Defective actuator	1. Disconnect power, fan cool motor, and reduce duty cycle. 2. Replace fuse or reset circuit breaker 3. Re-connect properly 4. Contact power company 5. Repair or replace. 6. Replace capacitor. 7. Readjust drive tube position or re-adjust limit switch cam setting (as applicable) 8. Repair or replace
Actuator runs continuously to stall condition.	1. Defective limit switches or diodes 2. Improper limit switch cam adjustment.	1. Replace limit switches and/or diodes 2. Readjust cam setting.
Actuator operates but with reduced thrust capacity	1. Low voltage 2. Defective acme screw 3. Defective capacitor (115 VAC unit only) 4. Defective actuator 5. Side load on acme screw due to misalignment 6. Defective clutch	1. Disconnect and check voltage 2. Replace tube assembly 3. Replace capacitor 4. Repair or replace 5. Remove side load and align actuator mounting 6. Replace clutch
Motor shaft rotates, acme screw remains stationary or rotates intermittently	1. Defective gear assembly, possibly caused by shock load or excessive thrust load. 2. Sheared pins on output shaft	1. Replace gear assembly and avoid shock load or reduce thrust load. 2. Replace pins
Acme screw rotates but no linear motion of drive tube	1. Acme nut separated from drive tube	1. Replace tube assembly
Excessive noise	1. Loose bolts, screws on actuator and clevis connection 2. Thrust load exceeds rating 3. Defective acme screw 4. Defective or worn gearing 5. Side load on acme shaft due to misalignment	1. Re-tighten screws and bolts 2. Reduce load 3. Replace tube assembly 4. Replace 5. Remove side load and align actuator mounting

PERIODIC INSPECTION

The actuator should be inspected on a periodic basis with attention being given to the following items:

1. Clevis ends for wear, cracks, distortion, or other damage.
2. Loose bolts, screws on actuator and clevis or drive tube connections.
3. Limit switches for proper setting and operation.
4. Drive tube for excessive wear or lack of lubrication.
5. Electrical wiring and power supply cord for frayed insulation or loose connections.
6. Excessive or unusual noises.
7. Dirt or dust from interfering with proper ventilation or clogging of moving parts.

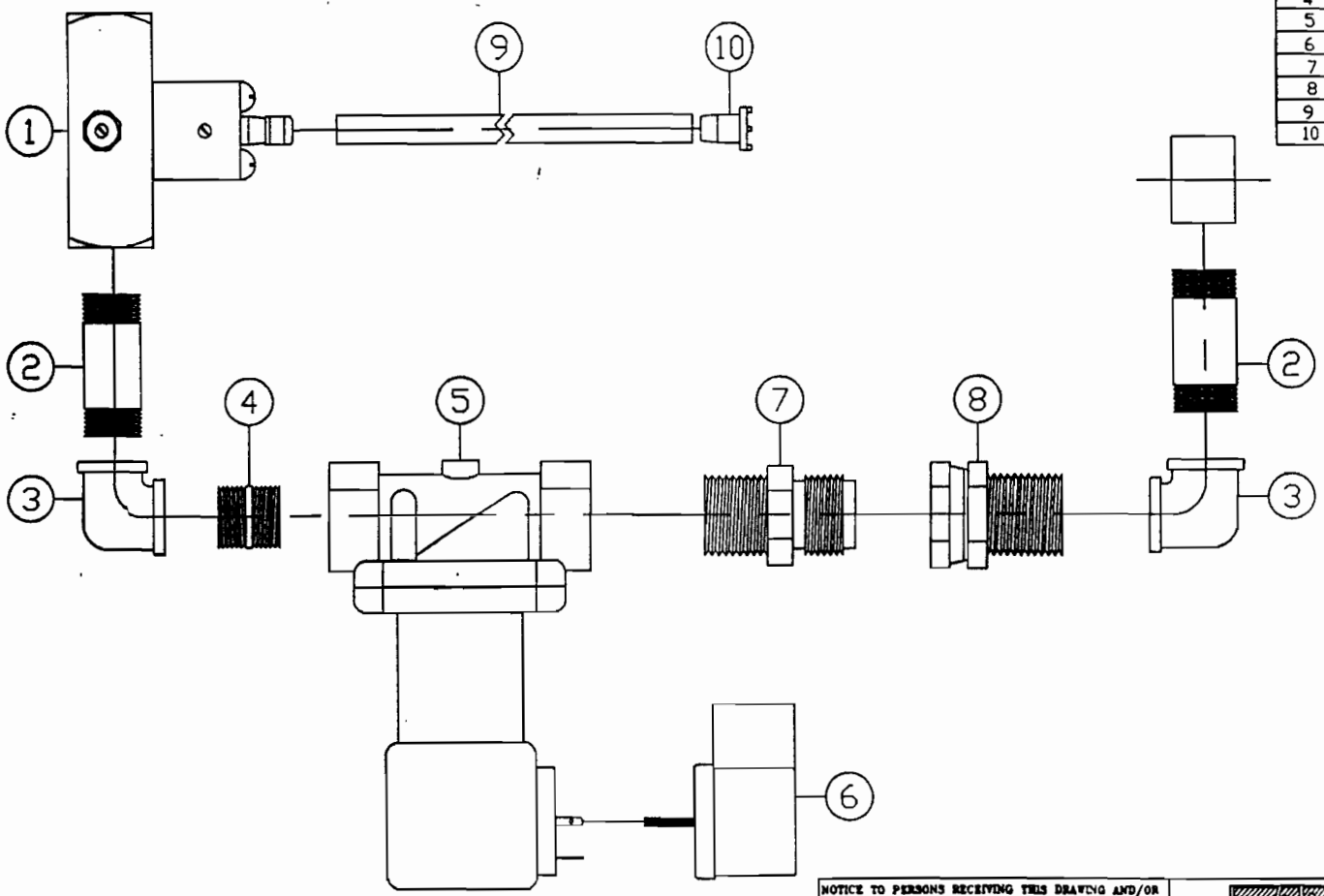
LUBRICATION

The actuator is lubricated for design life at the factory. While slight oil or grease leakage around drive tube may be observed, no field relubrication should be necessary.

Mounting Pins: Periodically, a few drips of oil or grease should be applied to the mounting pins at the pivot points.

Any of the above deficiencies should be repaired or corrected before restoring the actuator to service.

The exact period for inspection of the actuator cannot be predetermined due to the many variables involved such as frequency of operation, type and size of loading, or operational environment. Determination should be based on the user's experience. It is recommended that the user begin a weekly inspection, extending that to monthly, quarterly, or annually as conditions dictate.



BILL OF MATERIAL

ITEM	PART#	QTY	DESCRIPTION
1	689100	1	INJECTOR, CHEMICAL, 1300 SERIES, 203BSP
2	772261	2	NIPPLE, PIPE, 1/2" X 1-1/2" PLATED
3	613303	2	ELBOW, 90°, 1/2" PLATED
4	772260	1	NIPPLE, CLOSE, 1/2" PLATED
5	936920	1	VALVE, SOLENOID, 1/2"
6	936950	1	VALVE, SOLENOID PLUG, 3 WIRE
7	503082	1	ADAPTER, BALL SEAT, 1/2" X 1/2"
8	503227	1	ADAPTER, SWIVEL, STRAIGHT, 1/2"
9	900400	8'	TUBE, CLEAR PLASTIC, 1/4"
10	876500	1	SRAINER, CHEMICAL SUCTION, LINE, PLASTIC

SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 5/21/94		

TITLE M960
SAUER-SUNDSTRAND
SOAP/RINSE SOLENOID

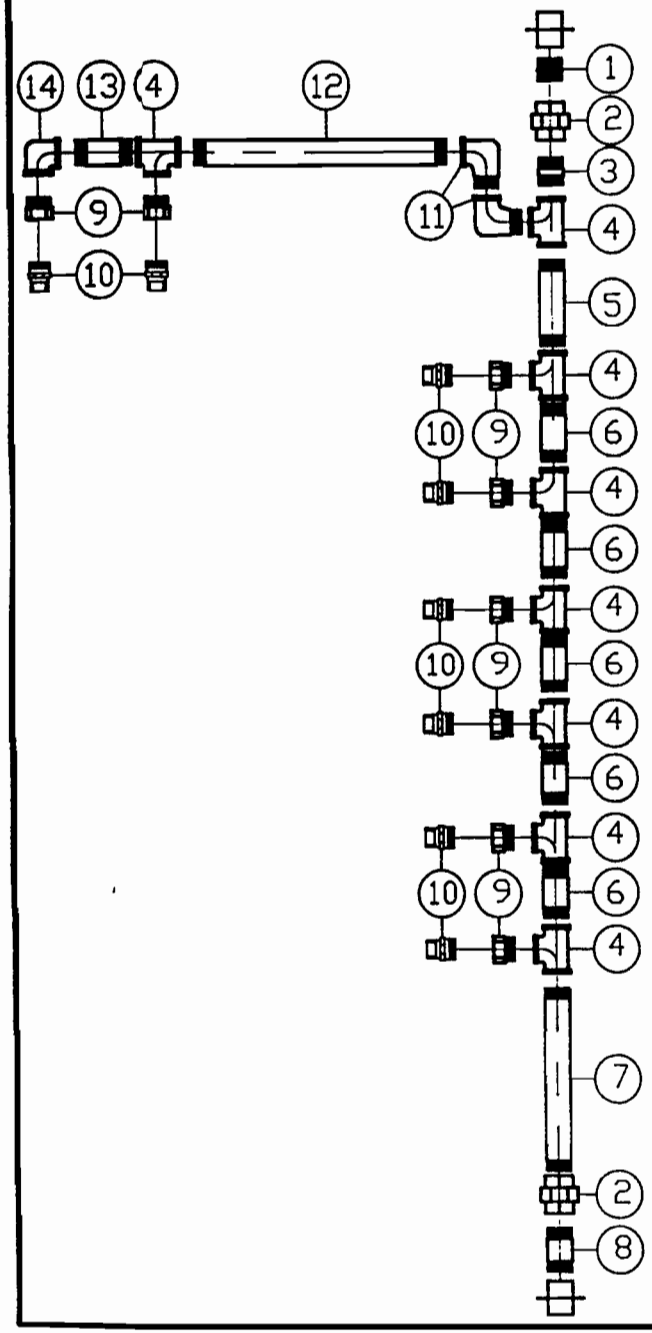
DRAWING NO. SI

SHEET 1 OF 1

TOLERANCE UNLESS OTHERWISE SPECIFIED

X	± 1
XX	± .02
XXX	± .004
X/X	± 1/32
ANGULAR, DEGREES	± 1/2°
SURFACES √	
MICRODINCH	± 5

DO NOT SCALE DRAWING



BILL OF MATERIAL

ITEM	PART#	QTY	DESCRIPTION
1	772260	1	NIPPLE, CLOSE, 1/2" PLATED
2	922004	2	UNION, 1/2" PLATED
3	772261	1	NIPPLE, PIPE, 1/2" X 1-1/2" PLATED
4	890093	8	TEE, 1/2" PLATED
5	772270	1	NIPPLE, PIPE, 1/2" X 6" PLATED
6	772266	5	NIPPLE, PIPE, 1/2" X 4" PLATED
7	772275	1	NIPPLE, PIPE, 1/2" X 11" PLATED
8	772262	1	NIPPLE, PIPE, 1/2" X 2" PLATED
9	542506	8	BUSHING, REDUCER, 1/2" X 1/4" PLATED
10	782969	8	NOZZLE, 1/4" MEG, 1506
11	613363	2	ELBOW, STREET, 90°, 1/2" PLATED
12	772272	1	NIPPLE, PIPE, 1/2" X 8" PLATED
13	772264	1	NIPPLE, PIPE, 1/2" X 3" PLATED
14	613303	1	ELBOW, 90°, 1/2" PLATED

SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 5/19/94		

TITLE M960
SAUER-SUNDSTRAND
RINSE NOZZLE ASSY

DRAWING NO. RN

SHEET 1 OF 1

TOLERANCE UNLESS OTHERWISE SPECIFIED

.X	± .1
.XX	± .02
.XXX	± .004
X/X	± 1/32
ANGULAR, DEGREES	± 1/2°
SURFACES √	
MICRODUCE	± 5

DO NOT SCALE DRAWING

DEMA ADJUSTABLE SINGLE STAGE INJECTORS MODELS 202B, 202BP, 203B, 203BP, 204B, 204BP, 206B, 206BP

INSTALLATION INSTRUCTIONS

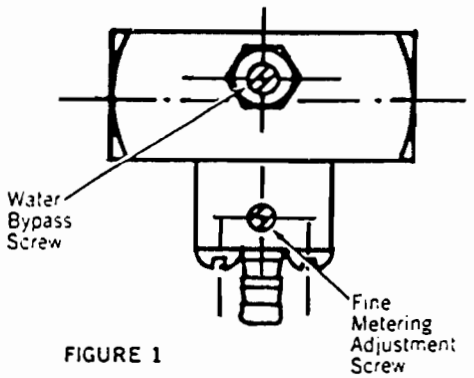


FIGURE 1

1. PARTS
   A. Injector.
   B Drum Protector Disc.
   C Plastic Tubing 8' long with Foot Strainer.

2. INSTALLATION
   The injector may be installed in any position in the water line with the arrow in the direction of flow. Drop end of plastic tubing with strainer into fluid product container. Cut tubing to convenient length, and slip open end over injector fitting. Cover container by slipping metal disc over tubing. Disc may be twisted at the slit for easy application.

3. OPERATION
   Warning: Use care when handling hazardous chemicals.

   See Fig. 1 for location of water bypass screw and fine metering adjustment screw. Turn on water supply valve. The injector may draw momentarily as the system is filling but normally will stop as the system builds up to full pressure. To actuate the injector, turn the bypass screw clockwise until product begins to be drawn from the container. After the fluid reaches the injector, the feed rate may be adjusted to the desired rate by turning the bypass screw. The maximum injection rates are shown in Table 2. For low injection rates, it is advisable to set the bypass screw for more injection than required; then turn the fine metering screw clockwise to reduce injection to the desired rate.

   Table 1 shows the operation range of the injector. If the injector will not draw with the bypass screw full in, then the water flow is below the range of the injector. If the injector draws with the screw full out but pressure loss is excessive then flow is above the range of the injector.

TABLE 1

WATER PRESSURE PSI	OPERATING RANGE-GALLONS PER MINUTE			
	MODEL 202B	MODEL 203B	MODEL 204B	MODEL 206B
10	.25-2.0	.50-3.5	2.0-6.4	3.6-11
20	.30-2.3	.55-4.4	2.3-7.5	4.2-13
40	.37-2.9	.70-5.4	2.9-9.5	5.3-17
60	.43-3.4	.80-6.4	3.4-11	6.2-19
100	.54-4.2	1.0-8.0	4.2-14	7.7-24
200	.73-5.7	1.4-11	5.7-19	11-33
400	1.0-7.9	1.9-15	7.9-26	15-46
500	1.2-8.9	2.1-17	8.9-29	17-51
700	1.4-11	2.5-20	11-35	20-60
1000	1.6-13	3.0-23	13-41	23-70
1500	2.0-16	3.5-28	16-50	28-87
2000	2.2-18	4.7-37	18-58	33-100

TABLE 2

FLUID VISCOSITY CPS	MAXIMUM INJECTION OUNCES PER MINUTE			
	MODEL 202B	MODEL 203B	MODEL 204B	MODEL 206B
1	8	16	36	42
75	4	8	13	18
220	2	4	5	8

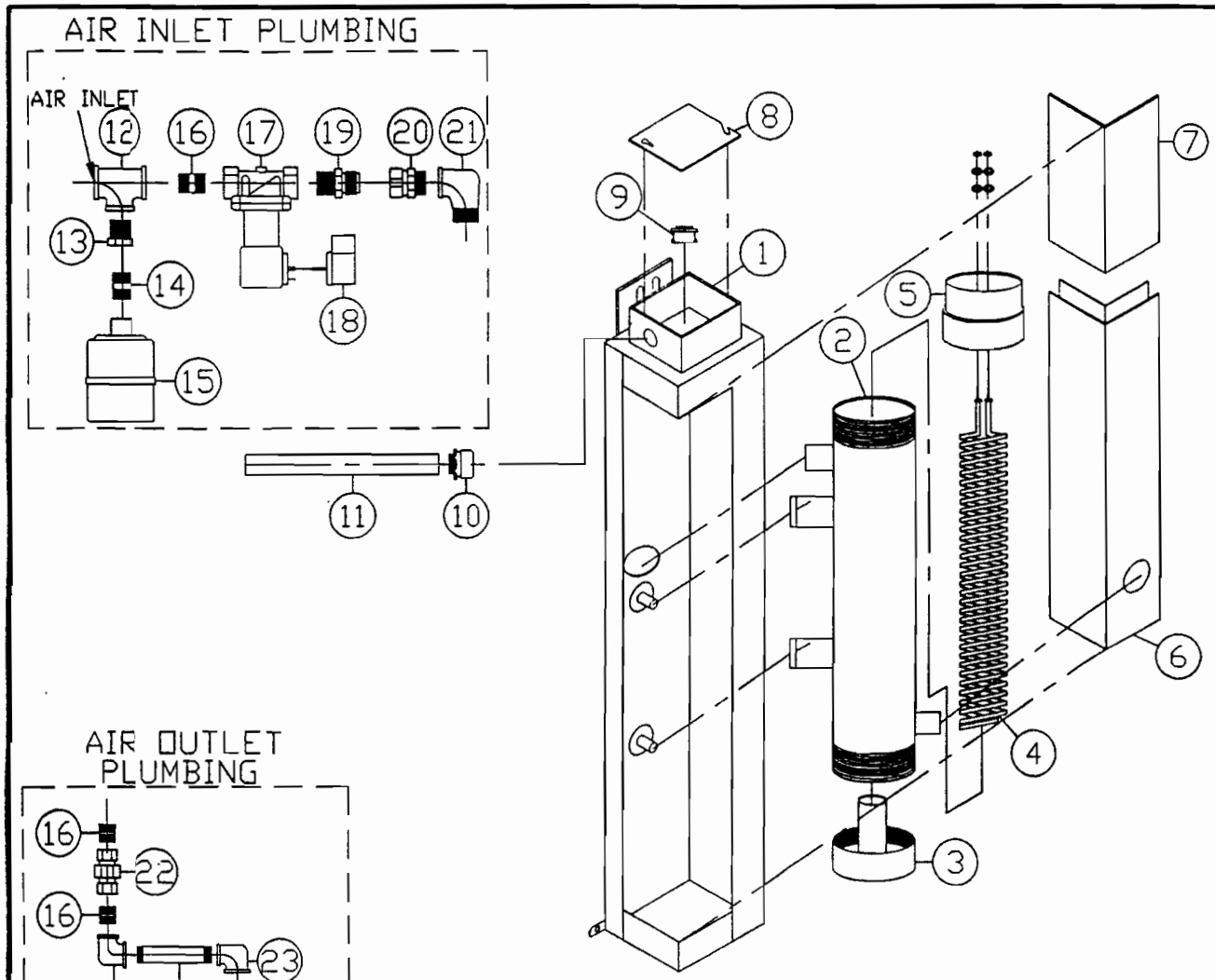
TABLE 3

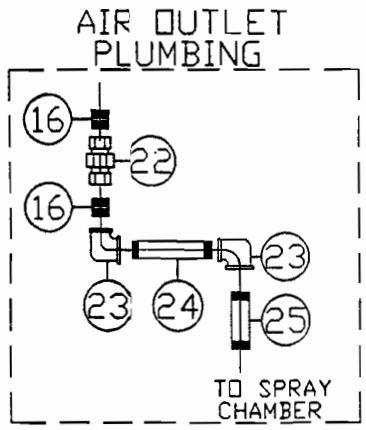
MODEL	PIPE SIZE
202B	3/8 NPT
203B	3/8 NPT
204B	1/2 NPT
206B	3/4 NPT

4. SERVICING
   Caution: Turn off water supply before servicing.

   The check valve parts are in the metering knob and can be cleaned by removing the four screws. The knob may be rotated if it is more convenient to have the adjusting screw on another side of the injector. As with any injector, if spray jets become clogged or downstream restriction increases in any manner, the injector will stop drawing fluid. If it is inconvenient to remove the restriction immediately, the injector may be put back into operation by turning the water bypass screw further clockwise; this adjusts the injector to the lower flow rate. The bypass screw should be reset once the restriction is removed.

   CAUTION; When servicing unit be sure that replacement parts have been installed according to drawing. Be certain check valve parts are in place.





BILL OF MATERIAL

ITEM	PART #	QTY	DESCRIPTION
1	128515	1	BODY
2	432050	1	TUBE, HEATER
3	143652	1	CAP, BOTTOM
4	663984	1	HEATER, PLUG, 5KW, 480V, SPIRAL
5	143650	1	CAP, TOP
6	155705	1	COVER
7	155706	1	COVER, ELECTRICAL
8	537864	1	BOX, CONDUIT COVER
9	562202	1	CONNECTOR, ROMAX, 3/8"
10	562241	1	CONNECTOR, 1/2" LIQUID TIGHT
11	561400	1	CONDUIT, LIQUID TIGHT, 1/2"
12	890093	1	TEE, PLATED 1/2"
13	542506	1	REDUCER, BUSHING, 1/2" X 1/4" PLATED
14	772220	1	NIPPLE, PIPE CLOSE, 1/4" PLATED
15	883912	1	PRESSURE SWITCH
16	772260	3	NIPPLE, CLOSE, 1/2" PLATED
17	936920	1	VALVE, SOLENOID 1/2"
18	932950	1	VALVE, SOLENOID PLUG 3 WIRE
19	503082	1	ADAPTER, 1/2" SEAT X 1/2" MALE
20	503227	1	ADAPTER, SWIVEL, STRAIGHT, 1/2"
21	613363	1	ELBOW, STREET, 90°, 1/2" PLATED
22	921983	1	UNION, 1/2" BLACK
23	613303	1	ELBOW, 90°, 1/2" PLATED
24	772273	1	NIPPLE, PIPE, 1/2" X 9" PLATED
25	772266	1	NIPPLE, PIPE, 1/2" X 4" PLATED
N/S	690102	3'	INSULATION, ROLL, 24" X 1"
N/S		3	CARDBOARD, ELECTRICAL

ADF SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 1/3/96		

TITLE
SAUER-SUNDSTRAND
HEATED COMP AIR ASSY

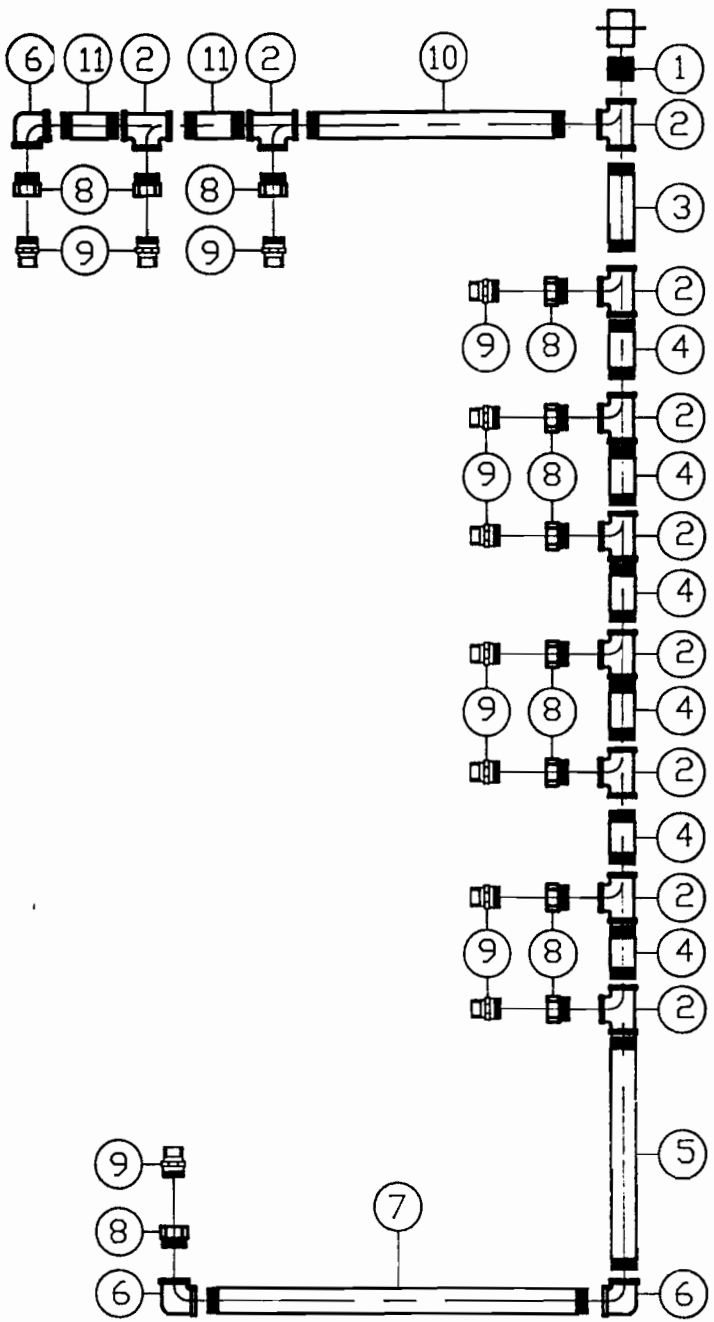
DRAWING NO.
CA-A

SHEET 1 OF 1

TOLERANCE UNLESS OTHERWISE SPECIFIED

.X	± .1
.XX	± .02
.XXX	± .004
X/X	± 1/32
ANGULAR, DEGREE	± 1/2°
SURFACES √	
MICROINCH	± 5

DO NOT SCALE DRAWING



BILL OF MATERIAL

ITEM	PART#	QTY	DESCRIPTION
1	772260	1	NIPPLE, CLOSE, 1/2" PLATED
2	890093	10	TEE, 1/2" PLATED
3	772268	1	NIPPLE, PIPE, 1/2" X 5" PLATED
4	772266	6	NIPPLE, PIPE, 1/2" X 4" PLATED
5	772274	1	NIPPLE, PIPE, 1/2" X 10" PLATED
6	613303	3	ELBOW, 90°, 1/2" PLATED
7	772276	1	NIPPLE, PIPE, 1/2" X 13" PLATED
8	542506	11	BUSHING, REDUCER, 1/2" X 1/4" PLATED
9	783023	11	NOZZLE, 1/4" MEG, 1512
10	772271	1	NIPPLE, PIPE, 1/2" X 7" PLATED
11	772264	2	NIPPLE, PIPE, 1/2" X 3" PLATED

ASF SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 5/19/94		

TITLE M960
SAUER-SUNDSTRAND
HCA NOZZLE ASSY

DRAWING NO. HCA

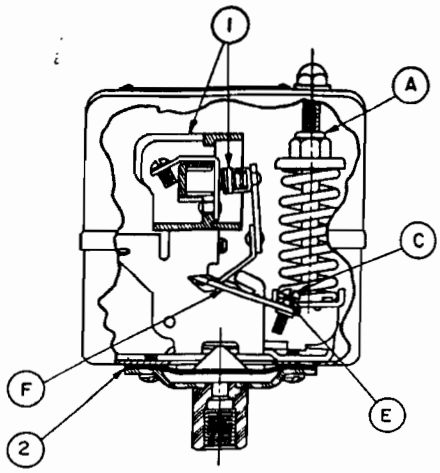
SHEET 1 OF 1

TOLERANCE UNLESS OTHERWISE SPECIFIED

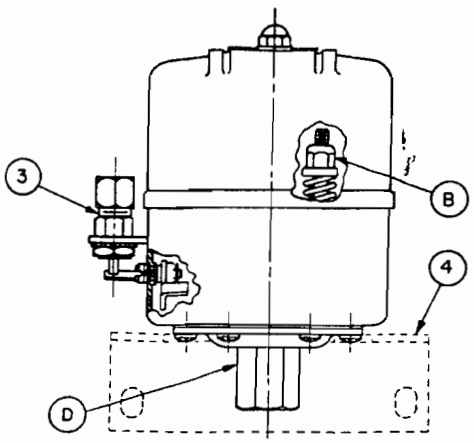
.X	± .1
.XX	± .02
.XXX	± .004
X/X	± 1/32
ANGULAR, MACHINE SURFACES √	± 1/2°
MICROINCH	± 5

DO NOT SCALE DRAWING

Class 9013 Types GHB, GHG, GSB, GSG Series C
PRESSURE SWITCHES



65016-009-08



(3/4 HEX) 1/8-27NPSF (GSG-1, GHG-1, AND 4)
(3/4 HEX) 1/4-18NPSF (GSB-2, GSG-2, GHB-2 AND 5, GHG-2, AND 5)
(7/8 HEX) 3/8-18NPSF (GSG-3, GHG-3, AND 6)

This service bulletin applies to all Class 9013 Series C Types GHB 2,5, GHG, 1, 2, 3, 4, 5, 6, GSB 2, and GSG 1, 2, 3.

APPLICATIONS — Class 9013 Type G pressure switches are two pole devices for controlling electrically driven water pumps and air compressors. Based on their pressure ranges, Types GHB, GHG, are generally applied to air compressor applications and GSB, GSG to water pumps.

CAUTION — Do not use these devices on pressure media which would be detrimental to the NBR Elastomeric Diaphragm or zinc plated steel flange.

MOUNTING — Under conditions of moderate vibration and if connected to a short length of rigid steel pressure pipe, this switch may be mounted and supported by its pressure connector (D). For added mounting support use the flange mounted bracket (4). (Order separately as Class 9049 Type A-52, mounting bracket kit).

CAUTION — The GHB and GSB pressure switches have NEMA Type 3R enclosure ratings and must be mounted so that the pressure connector (D) is oriented down as shown above.

TWO POLE ELECTRICAL RATINGS

Voltage	Single Phase AC	Polyphase AC	DC
115	2 HP	3 HP	1 HP
230	3 HP	5 HP	1 HP
460-575	5 HP	5 HP	—
32	—	—	1/2 HP

FORM H
SINGLE POLE ELECTRICAL RATINGS

Voltage	Single Phase AC	DC
115	1 HP	1/2 HP
230	2 HP	1/2 HP
460-575	2 HP	—

MAXIMUM ALLOWABLE RATINGS

Max. Pressure w/o Leakage	Max. Pressure w/o Damage	Max. Temp.
300 PSI	450 PSI	225°F (107°C)

ENCLOSURE RATING

NEMA TYPE 1 ENCLOSURES ARE INTENDED FOR INDOOR USE PRIMARILY TO PROVIDE A DEGREE OF PROTECTION AGAINST CONTACT WITH THE ENCLOSED EQUIPMENT IN LOCATIONS WHERE UNUSUAL SERVICE CONDITIONS DO NOT EXIST. TYPES GHG AND GSG HAVE NEMA TYPE 1 ENCLOSURES.

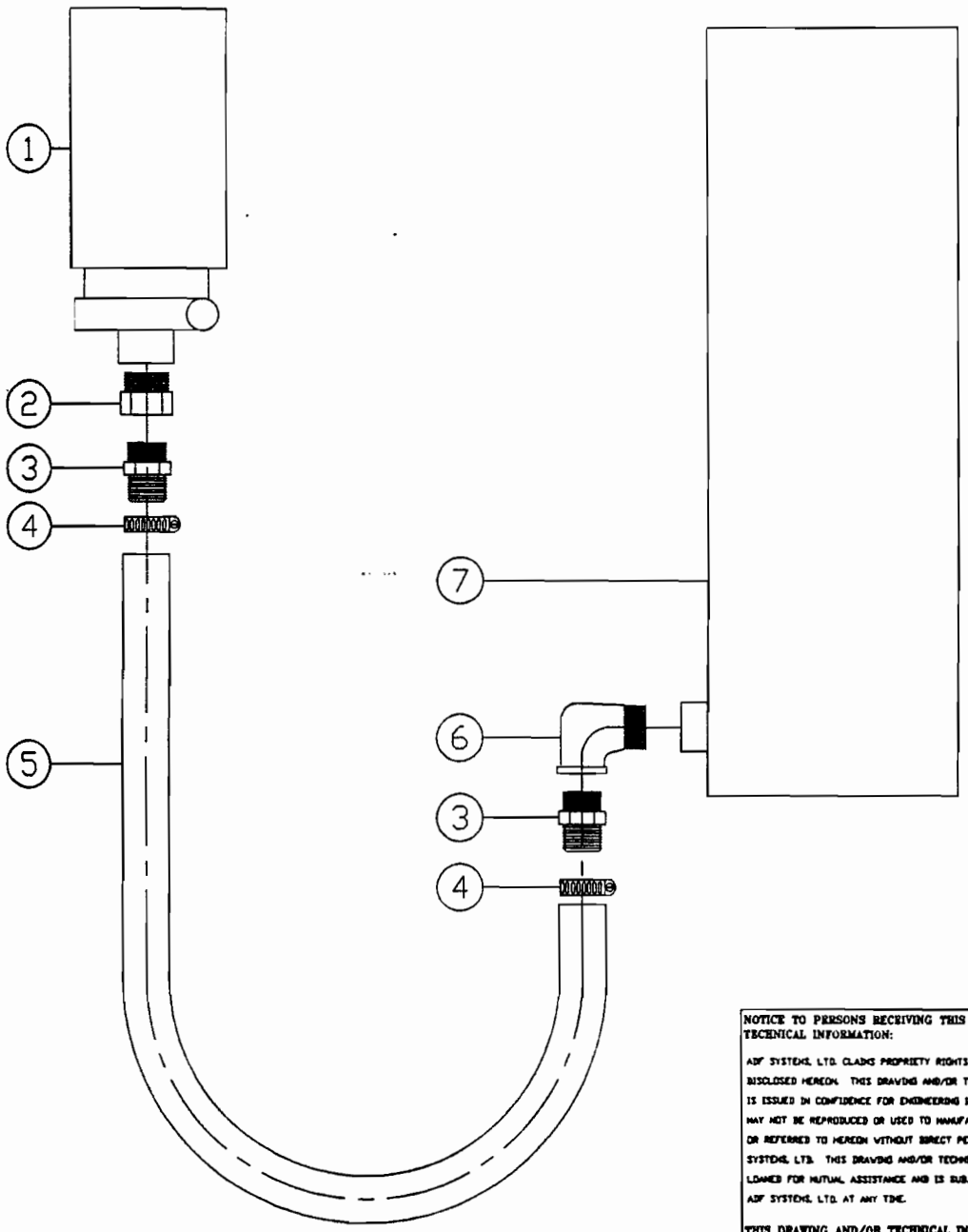
NEMA TYPE 3R ENCLOSURES ARE INTENDED FOR OUTDOOR USE TO PROVIDE A DEGREE OF PROTECTION FOR THE ENCLOSED EQUIPMENT AGAINST FALLING RAIN. TYPES GHB AND GSB HAVE NEMA TYPE 3R ENCLOSURES.

WARNING:

1. **TO AVOID PERSONAL INJURY FROM HIGH PRESSURE, BE CERTAIN PRESSURE IS AT ZERO BEFORE DISCONNECTING DEVICE FROM PRESSURE SOURCE.**
2. **TO AVOID SHOCK HAZARD, DISCONNECT ALL POWER BEFORE INSTALLING OR SERVICING DEVICE.**

REPLACEMENT PARTS LIST

Item	Description	Class and Type No.	Qty.	Used on Class 9013 Type
1	Replacement Contact Kits	9998 PC-205	1	All except Forms H & R
	Includes Moveable Contacts and Stationary	9998 PC-206	1	(Form H Only)
	Contact Blocks	9998 PC-207	1	(Form R Only)
2	Diaphragm Ass'y	9998 PC-208	1	All Types except Form D50
		9998 PC-252	1	Form D50 Only
3	Replacement Valve Kit	9049 A-12	1	All Types Form X
4	Mounting Bracket Kit (Not Furnished w/Switch)	9049 A-52	1	All GHG and GSG Only



BILL OF MATERIAL

ITEM	PART #	QTY	DESCRIPTION
1	1P837	1	PUMP, CENTRIFUGAL, 1-1/2 HP
2	542528	1	BUSHING, REDUCER, 1-1/4" X 1" PLATED
3	668030	2	HOSE BARB, 1" HOSE X 1"M-NPT, BRASS
4	559007	2	HOSE CLAMP
5	669100	36'	HOSE, 1 WIRE, 1"
6	613365	1	ELBOW, STREET, 90°, 1" PLATED
7		1	TANK, RESERVOIR, 48"L X 16"W X 19"H

ADF SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 1/3/96		

TITLE M960
SAUER-SUNDSTRAND
TANK DRAIN PUMP

DRAWING NO. TDP-A

SHEET 1 OF 1

TOLERANCE UNLESS OTHERWISE SPECIFIED

X	± .1
XX	± .02
XXX	± .004
X/X	± 1/32
ANGULAR, DEGREE	± 1/2°
SURFACES √ MICROINCH	± 5

DO NOT SCALE DRAWING

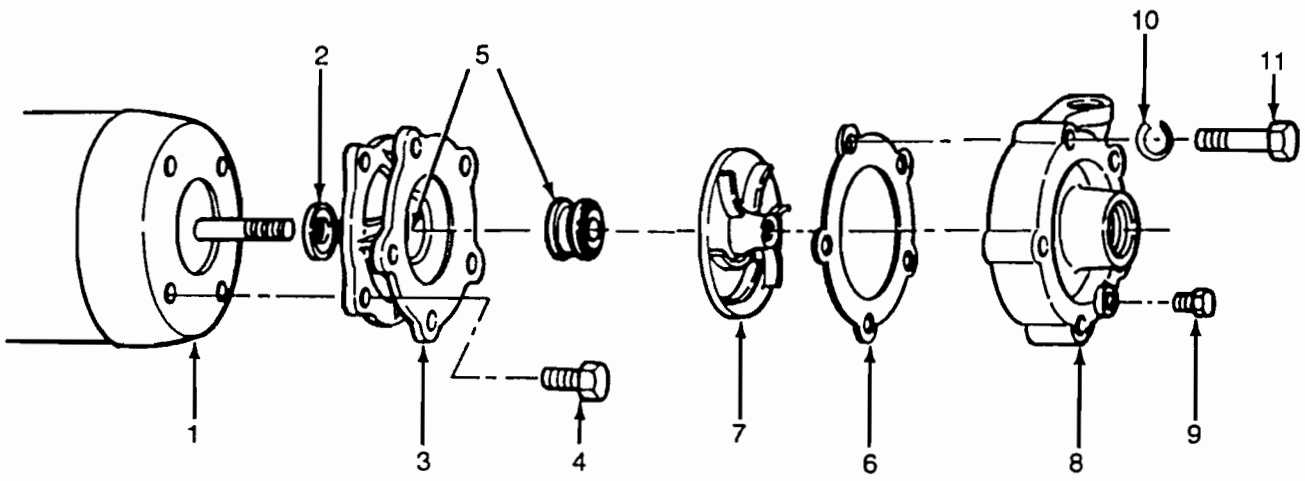


Figure 5 — Replacement Parts Illustration

Replacement Parts List

REF. NO.	DESCRIPTION	1P837	QTY.
1	Motor	3N090	1
2	Slinger	6150	1
3	Pump body	11969	1
4	3/8-16 x 3/4" Hex head bolt	*	4
5	Buna N. mech. seal & seat assembly	IR306	1
	Viton mech. seal & seat assembly	IR324	1
6	Gasket	11618	1
7	Impeller	11974	1
8	Centrifugal housing	11967	1
9	1/8" Pipe plug	*	1
10	1/4" Light lockwasher	—	5
	5/16" Light lockwasher	*	5
11	1/4-20 x 1-1/4" Hex head bolt	—	5
	5/16-18 x 1-1/4" Hex head bolt	—	5
	5/16-18 x 1-3/4" Hex head bolt	*	5

(*) Standard hardware item, available locally.

Maintenance (Continued)

5. Remove the seal with carbon washer (Ref. No. 5) by pushing from the direction of the pump body mounting flange. Care must be exercised with pushing tool so as not to damage the seal cavity area.

INSTALLATION OF REPLACEMENT SEAL

1. Clean the centrifugal body seal cavity before inserting a new seal.

NOTE: If removed, slide the rubber shaft slinger washer (Ref. No. 2) on the shaft until it is located about 1/8" from the face of the motor bearing hub.

2. Using a clean cloth wipe the shaft and make sure that it is perfectly clean.
3. Lightly coat the centrifugal body seal cavity with a sealant, such as Permatex. The sealant seals the brass cap to the bronze casting. Clean off excess.
4. Press the brass cap, bellows, and spring squarely into the cavity in the casing cover. Do not distort the brass cap. Press uniformly around its flange.
5. Carefully wipe the surface of the metal wall of ceramic seat with a clean cloth.
6. Wet the bore in rubber portion of the ceramic seat with a light coating of soapy water.
7. Mount the pump body (Ref. No. 3) on the motor mounting face. Carefully guide motor shaft through seal.
8. After the seal is in place, ensure that it is clean and has not been scratched or cracked.

⚠ CAUTION

DO NOT install seat with rubber cup flange facing carbon seat washer. a) Care must be exercised so as not to roll back rubber seat cup of ceramic seal, or leakage will develop during pumping cycle. b) Should rubber seat cup be separated during assembly, reinsertion from either end is acceptable since ceramic ring is lapped on both sides. c) Final seal-seat positioning is accomplished when impeller is screwed to shoulder of motor shaft.

9. Apply a light coating of soapy water on the motor shaft. Slide the seal seat onto the shaft (with the sealing face first). Use a 5/8" I.D. tube, or 1/2" drive socket to aid in pushing the rubber portion onto the shaft.
10. Apply thread lock to back side of impeller internal threads. Install impeller on shaft and tighten until it is tight against the shaft shoulder.
11. Use new gasket and install centrifugal housing (Ref. No. 8).

Troubleshooting Chart

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Pump will not prime or retain prime after operating	1. Air leak in suction line 2. Clogged strainer 3. Leaky foot valve	1. Repair or replace suction line 2. Clean or replace strainer 3. Repair or replace foot valve
Flow rate is low	1. Piping is fouled or damaged 2. Clogged impeller or worn impeller 3. Discharge line restricted or undersized 4. Plumbing restrictions	1. Clean or replace piping 2. Clean or replace impeller 3. Flush out piping or replace 4. Remove restrictions
Pump runs but no fluid is pumped	1. Faulty suction piping 2. Pump located too far from fluid source 3. Gate valve closed 4. Clogged strainer 5. Fouled foot valve 6. Discharge height too great or too long	1. Replace piping 2. Relocate pump 3. Open valve 4. Clean or replace strainer 5. Clean or replace valve 6. Lower the height or shorten pipe
Liquid drips from point where shaft enters the pump casing, when pump is full of liquid	1. Damaged mechanical seal 2. Liquid not compatible with Buna N seal	1. Replace mechanical seal 2. Replace with viton seal, if compatible
Excessive noise while pump is in operation	1. Pump not secured to firm foundation 2. Piping not supported to relieve any strain on pump assembly 3. Restricted suction line	1. Secure pump properly 2. Make necessary adjustments 3. Clean or correct suction line

Operation

⚠ WARNING ⚠

THE MOTOR IS DESIGNED TO RUN ON 60 HZ ONLY!

1. Fill pump and suction piping with water. Your centrifugal pump must be satisfactorily primed before it will pump. Satisfactory priming requires that all air must be removed from the pump and suction lines and that these areas be completely filled with liquid. This must be accomplished with the pump at a standstill. a priming cup installed in the discharge line just above the pump is recommended.

⚠ CAUTION

Unit must be full of liquid to be pumped in order to cool and lubricate the seal surfaces. Do not run pump dry as permanent damage to mechanical seal will result.

2. Activate the unit.

IMPORTANT: POWER SHOULD BE APPLIED MOMENTARILY TO THE PUMP AT FIRST AND THE DIRECTION OF ROTATION CHECKED. WHEN VIEWING UNIT FROM THE FRONT OF THE PUMP HOUSING IMPELLER ROTATION SHOULD BE COUNTERCLOCKWISE. IF IT IS NOT, DISCONNECT POWER AND RECHECK WIRING TO MOTOR. (SEE "INSTALLATION").

3. On initial start up, check power consumption to be sure motor is not overloaded.
4. If the motor is overloaded, a valve must be installed in the discharge line to increase the back pressure and reduce motor overloading.

⚠ CAUTION

Never shut off discharge or restrict suction flow while unit is operating.

Maintenance

ROUTINE

Pump should be drained if subjected to freezing temperatures. A drain plug is provided on the pump casing.

Clean the suction line strainer at regular intervals.

Periodically clean dirt accumulations from open-type motors, especially in and around vent openings, preferably by vacuuming (avoids imbedding dirt in windings).

Pump motor is provided with sealed ball bearings. Normal relubrication of the bearings is not required.

Periodically check that electrical connections are tight.

MECHANICAL SEAL

Teel pumps are furnished with a precision mechanical seal. This seal is installed and checked at the factory and should require no adjustment at time of installation of pump. Running pump without water will result in rapid seal failure.

After pump has been in service for a long period of time, or if pump has seen severe service on abrasive materials, it may be necessary to replace this seal (the seal may leak). Leakage can be detected by a dripping or flow of liquid from the area around the motor shaft.

⚠ CAUTION

The precision lapped faces on the mechanical seal are easily damaged. Handle your replacement seal carefully and read these instructions before attempting to replace the seal.

Pump should be checked daily, weekly, monthly, etc. for proper operation. If anything has changed since unit was new, unit should be removed and repaired or replaced. Only qualified electricians or servicemen should attempt to repair this unit. Improper repair and/or assembly can cause an electrical shock hazard.

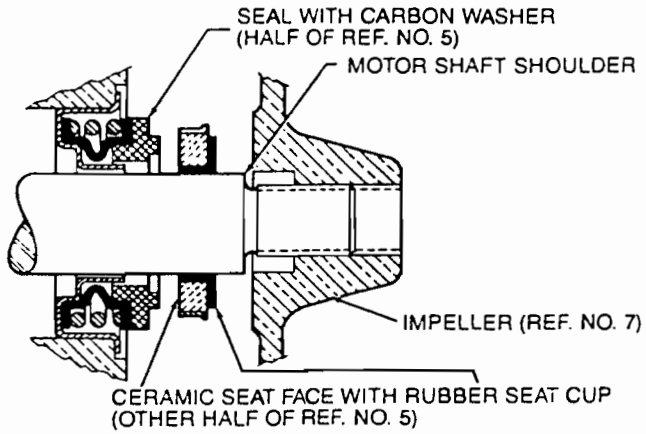


Figure 4 — Seal Arrangement

REMOVAL OF OLD SEAL

1. Disassemble the centrifugal housing from the pump by removing the five hex head capscrews. (Refer to Figure 5.)

2. Unscrew the impeller.

IMPORTANT: NOTE HOW OLD SEAL IS ASSEMBLED. REMOVE OLD SEAL PARTS. BE SURE REPLACEMENT SEAL IS INSTALLED IN IDENTICAL MANNER (See Figure 4).

NOTE: A screwdriver slot is provided in the rear end of the motor shaft (remove bearing cap for access). To hold the shaft from turning, insert a large screwdriver blade into the slot. Thread is standard right hand thread. Turn the impeller counterclockwise to remove.

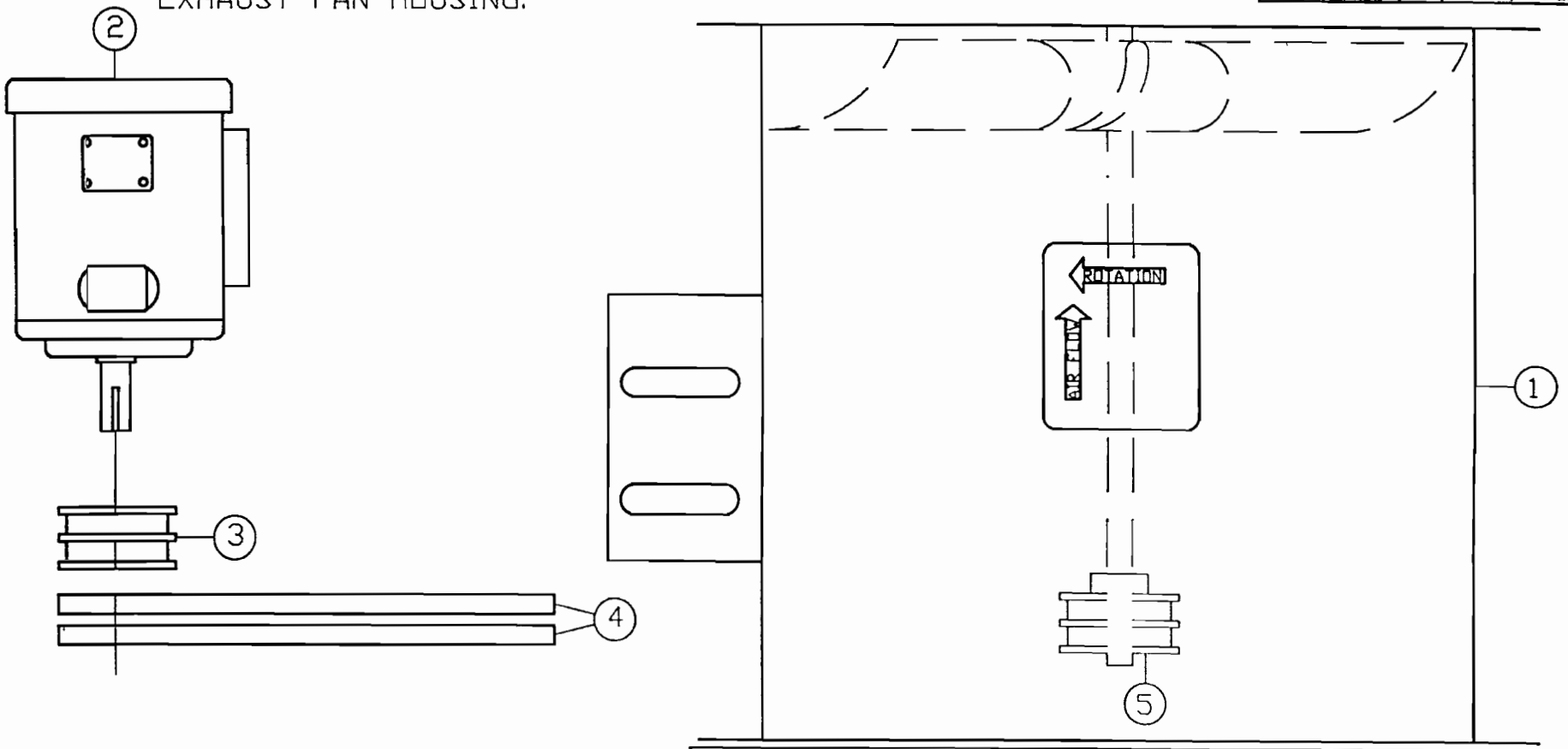
3. Grasp the metal wall of ceramic seat (Ref. No. 5) and slip from the motor shaft.

4. Remove the pump body from the motor by removing the four hex head capscrews (Ref. No. 4).

NOTE: ENSURE FAN IS ROTATING IN THE PROPER DIRECTION AS PER ARROW DECAL ON EXHAUST FAN HOUSING.

BILL OF MATERIAL

ITEM	PART#	QTY	DESCRIPTION
1	4C659	1	FAN, TUBEAXIAL, 12"
2	M3538	1	MOTOR, ELECTRIC, 1/2 HP
3	2BK27	1	PULLEY, 2BK27 X 5/8"
4	4L290	1	BELT, PULLEY
5	2AK22	1	PULLEY, 2AK22 X 7/8"



SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 1/12/95		

TITLE
ADF
EXHAUST FAN

DRAWING NO.
EXHAUST

SHEET 1 OF 1

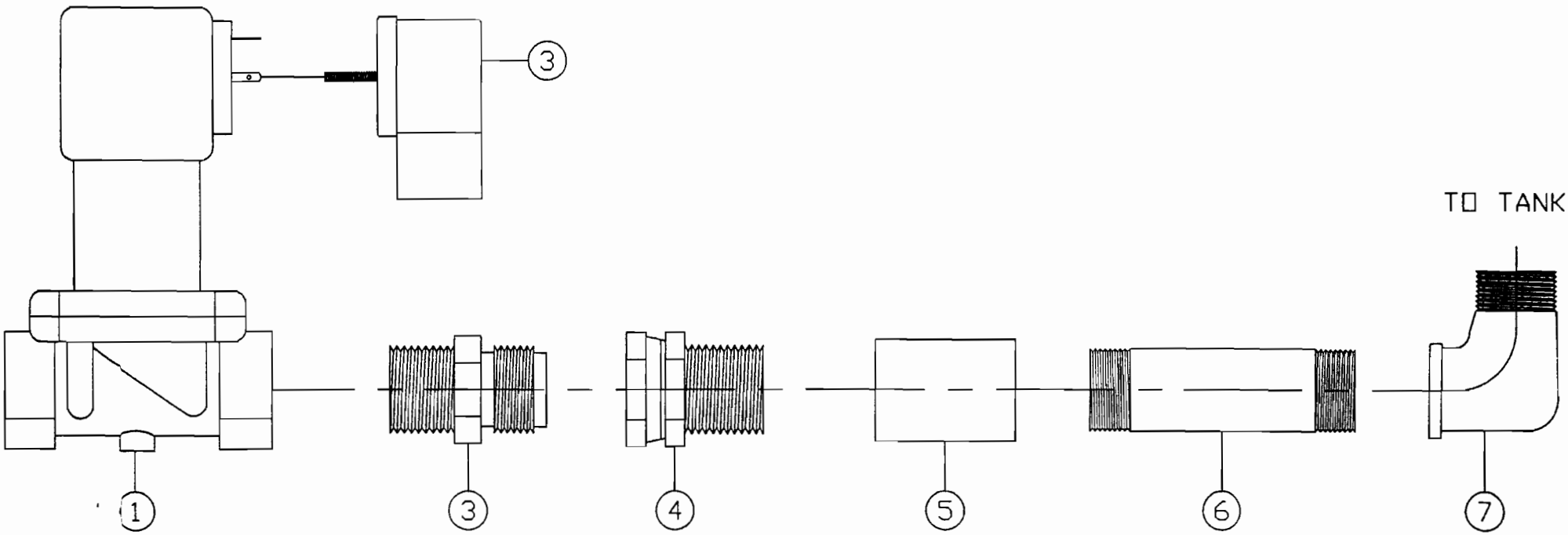
TOLERANCE UNLESS OTHERWISE SPECIFIED

.X	± .1
.XX	± .02
.XXX	± .004
X/X	± 1/32
ANGULAR, DECIMAL	± 1/2°
SURFACES √	
MICROINCH	± 5

DO NOT SCALE DRAWING

BILL OF MATERIAL

ITEM	PART#	QTY	DESCRIPTION
1	936920	1	VALVE, SOLENOID, 1/2"
2	936950	1	VALVE, SOLENOID PLUG, 3 WIRE
3	503082	1	ADAPTER, 1/2" X 1/2"
4	503227	1	ADAPTER, SWIVEL, STRAIGHT, 1/2"
5	571123	1	COPUPLER, FULL, 1/2" PLATED
6	772267	1	NIPPLE, PIPE, 1/2" X 4-1/2" PLATED
7	513363	1	ELBOW, STREET, 90°, 1/2" PLATED



SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN	SCALE	WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.
CHECKED	WEIGHT	
APPROVED	MATERIAL	
DATE 5/20/94		

TITLE M960
SAUER-SUNDSTRAND
AUTO FILL

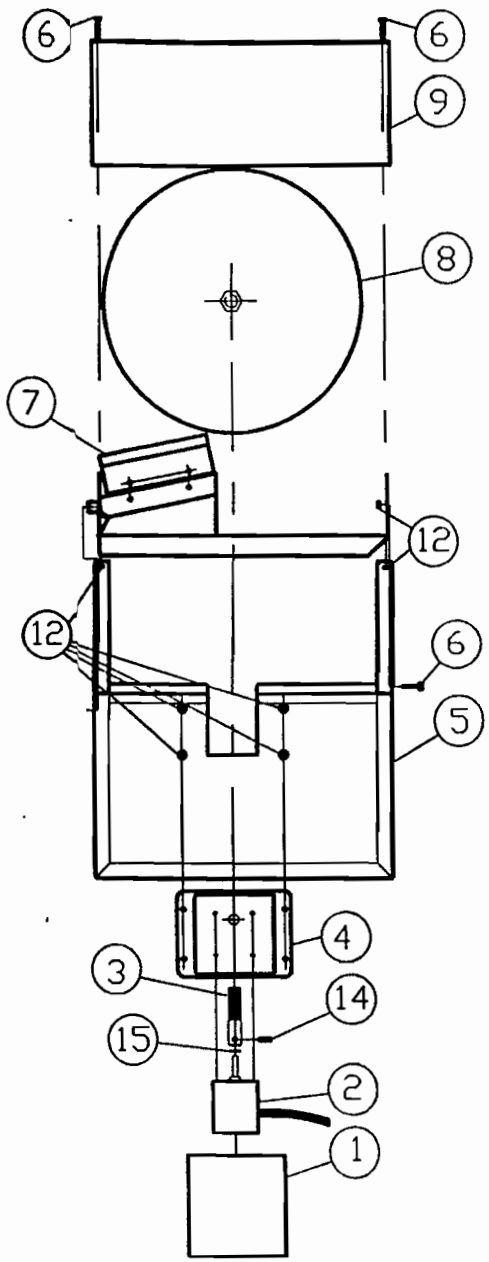
DRAWING NO. ATF

SHEET 1 OF 1

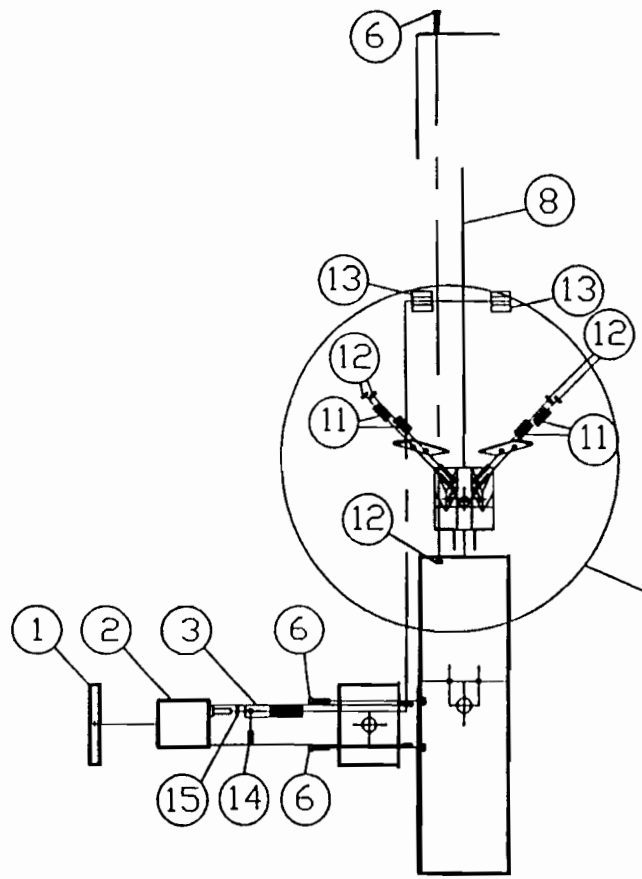
TOLERANCE UNLESS OTHERWISE SPECIFIED

X	± .1
XX	± .02
XXX	± .004
X/X	± 1/32
ANGULAR, DEGREE	± 1/2°
SURFACES √ MICROINCH	± 5

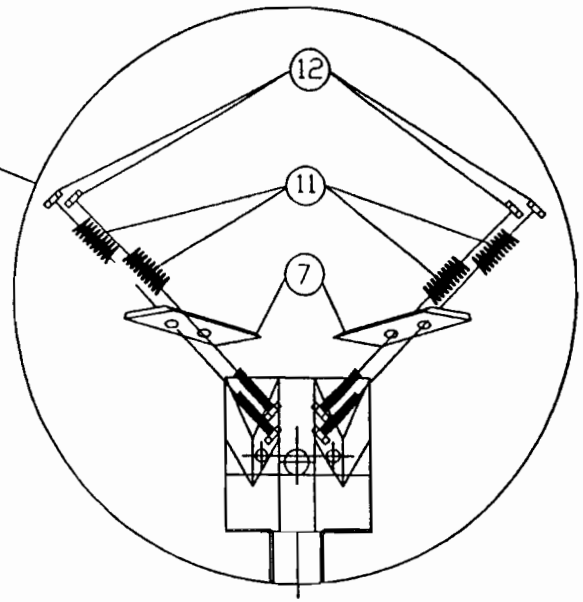
DO NOT SCALE DRAWING



FRONT VIEW



SIDE VIEW



BILL OF MATERIAL

REF.#	PART#	QTY	DESCRIPTION
1	155701	1	COVER, MOTOR BOX, OIL SKIMMER
2	751206	1	MOTOR, GEAR, 4RPM, AC SYNCH
3	397095	1	SHAFT, 5/8" FINE THREAD
4	130494	1	BOX, MOTOR, OIL SKIMMER
5	128529	1	BODY, OIL SKIMMER
6	529197	8	BOLT, HHCS, 1/4"-20 X 1/2" SS
7	118000	2	BLADE, OIL SKIMMER
8	469513	1	WHEEL, ø13", OIL SKIMMER
9	155702	1	COVER, OIL SKIMMER
10	208010	1	FRAME, OIL SKIMMER
11	875245	4	SPRING, ø.048 X 1/2" LONG
12	788090	12	NUT, FLANGE, WHIZ, 1/4"-20 SS
13	787846	2	NUT, UNF, HEX 5/8"-18
14	875034	1	SCREW, SOCKET 1/4" X 20 X 1/4"
15	570793	1	O-RING 1/4"
N/S	900404	18"	TUBING, CLEAR 1/2"
N/S		1	HOSE BARB, 90°, 3/8" X 1/2"HOSE, 90°

ADF SYSTEMS LTD.
HUMBOLDT, IOWA, USA

DRAWN MN
CHECKED
APPROVED
DATE 6/29/94

SCALE
WEIGHT
MATERIAL

WELDING MUST CONFORM TO AMERICAN WELDING SOCIETY SPECIFICATIONS.

TITLE
ADF
OIL SKIMMER ASSY

DRAWING NO.
334100

SHEET 1 OF 1

TOLERANCE UNLESS OTHERWISE SPECIFIED

X	± 1
XX	± .02
XXX	± .004
X/X	± 1/32
ANGULAR, DEGREE	± 1/2°
SURFACES √	
MICRONINCH	± 5

DO NOT SCALE DRAWING

ACCESSORIES

FELT FILTER, REPLACEMENT FOR TRAY FILTER:

204100 Filter, felt for tray, M700/M710/M550
203965 Filter, felt for tray, Pkg 12, M700/M710/M550

204102 Filter, felt for tray, M800/M850/M860/M900
203966 Filter, felt for tray, Pkg 12, M800/M850/M860/M900

204215 Filter, felt for tray, 200 micron, M300
203985 Filter, felt for tray, 200 micron, Pkg 12, M300

FILTER, CARTRIDGE, REPLACEMENTS FOR HIGH PRESSURE FILTER:

628103 Filter, cartridge, 3 micron
203940 Filter, cartridge pack, 3 micron, Pkg 10

628105 Filter, cartridge, 5 micron
203941 Filter, cartridge pack, 5 micron, Pkg 10

628110 Filter, cartridge, 10 micron
203942 Filter, cartridge pack, 10 micron, Pkg 10

628125 Filter, cartridge, 25 micron
203943 Filter, cartridge pack, 25 micron, Pkg 10

628150 Filter, cartridge, 50 micron
203944 Filter, cartridge pack, 50 micron, Pkg 10

DETERGENTS

552066 NutraClean 9, Case of 4 - 1 gallon containers
552068 NutraClean 9, 5 gallon pail
552069 NutraClean 9, 55 gallon drum

552102 PC Extra, 20 lb. pail
552103 PC Extra, 45 lb. pail
552105 PC Extra, 450 lb. drum

552106 Power Clean LD, Case of 4 - 1 gallon containers
552108 Power Clean LD, 5 gallon pail
552109 Power Clean LD, 55 gallon drum

552110 PWC, 10 lb. box
552111 PWC, Case of 4 - 10 lb. boxes

552115 Defoamer - 1 pint
552116 Defoamer - 1/2 gallon
552117 Defoamer - 1 gallon

552169 Rinse Clean, Case of 4 - 1 gallon containers
552171 Rinse Clean, 5 gallon pail
552172 Rinse Clean, 55 gallon drum

552174 Rust Inhibitor, Case of 4 - 1 gallon containers
552176 Rust Inhibitor, 5 gallon pail
552177 Rust Inhibitor, 55 gallon drum