ELECTRICAL FUNCTIONS & CONTROLS

MFG: WAVE-TEC
NAME: WAVE POOL
TYPE: ATTRACTION

Indicating Lights Symbols -

1.  "Control Power On" - Indicates power is ready for start-up.

2.  "Wave Time" - Indicates that the wave machinery is in operation; the power is turned on.

3.  "No Wave Time" - Indicates that the system has completed the wave cycle; the waves will start automatically at the end of this count-down time.

4. "A.D.V. Sequencing" - Indicates that power is being supplied to the solenoid at the air directional valve.

5. 

"Remote Stop" - Indicates that all of the lifeguard buttons are extended. If the light is off, one of the lifeguard buttons is depressed.

 "Overload Relay Trip" - Indicates that one of the wave generator overload relays has tripped. Correct the problem and reset the overload relay.

 "Room Temperature Switch" - Indicates that the temperature in the wave generating room is too high. Correct the problem and restart the wave system.

"Key Start" Switch - indicates operation of the wave generating system and the formulation of waves. This push button is identical to the "START" buttons located at the lifeguard stations. A key is required to operate this push button.

"Emergency Stop" Push Button - shuts down the wave generating equipment. This push button is to be used ONLY in an emergency. It must be pulled to reset.

OPERATING INSTRUCTIONS

I. To Start Up

A. Visually inspect all equipment to be sure there are no obvious problems or personnel working on the equipment.

B. Set all motor safety switches, located at the motors, to the "ON" position.

C. At the motor control center set the switches as follows:

1. Set the main motor circuit breaker to the "ON" position.

D. At the electronic control panel door of the motor control center do as follows:

1. If the lifeguards are ready for the waves to commence and at least five minutes have elapsed since the system was shut down, then turn the "START" push button clockwise with a key and depress momentarily. A bell will sound (if applicable) after which the wave generators will commence making waves.

a. Observe that the "CONTROL POWER ON" indicator is lit.

b. Observe that the "REMOTE STOP" indicator is lit. If not lit, check to ensure that all the lifeguard stop buttons and the "EMERGENCY STOP" buttons are in their extended position. This light will remain lit until a lifeguard stop is depressed.

c. Observe that the following indicators will light: "WAVE TIME",

d. The "REMOTE STOP" will remain lit.

The wave generating equipment is now in full automatic operation. The waves will be generated for the length of time set for Wave Time. When Wave Time reaches zero, the system will shut down and Rest Time will begin.

E. At automatic shutdown observe that only the "CONTROL POWER ON", "NO WAVE TIME" and "REMOTE STOP", indicators are lit. All other indicators go out. When the "DIGITAL COUNT-DOWN" time reaches zero the system starts up again, the bell rings, the motors start up and the indicators light as listed in step D.

F. At Pool Side - the system may be started at pool side by turning the "start" push button at the lifeguard chair clockwise with a key and depressing momentarily.

II. To Stop

A. At Pool Side - depress any one of the red "Stop" buttons located at the lifeguard chairs. Pull to reset.

B. At the Electronic Control Panel - depress the "EMERGENCY STOP" button. Pull to reset.

NOTE: After any stop situation, the system must be restarted. The system restarts from the beginning, not from the time when the system was stopped. Wait at least five (5) minutes before restarting the system.

C. At the end of the day - turn "Key" start "OFF" and set the main circuit breaker switch (es) to "OFF".

PNEUMATIC SYSTEM CONTROL AND OPERATION

A. Compressor Assembly and Control

1. The compressor operates with a "start-and-stop" control. The maximum design pressure is 200 PSI. This control utilizes a pressure switch to start and stop the motor. Typically, this upper setting is 195 PSI. The lower setting is 145 PSI. These settings will be established by a WaveTek representative and should not be altered.

B. Air Filter, Regulator, and Lubricator Assembly.

1. The air filters remove both moisture and solids from the air to protect the solenoid valve and cylinder.

2. The regulator sets the pressure for operating the air cylinder. Typically, this pressure setting is 90 PSI ± 10 PSI and should not be altered except by a WaveTek representative. For additional information, see the maintenance bulletin at the rear of this manual.

3. The lubricators provide lubricants to the cylinder and solenoid valve to minimize wear to these moving parts.

4. A quick disconnect coupling is located at each air directional valve to allow the maintenance person to de-activate one air directional valve without affecting the operation of the other valves.

MAINTENANCE INSTRUCTIONS

I. Wave Generator:

A. Initially before start-up, tighten all set screws in the fan wheel hub. Repeat after the first day's operation and check to see that the fan wheel has not moved.

B. Weekly check to ensure that the fan impellor has not moved on the motor shaft. Return it to its initial position and tighten the hub screws if the impellor has moved.

C. Periodically shut down fan and check wheel impeller, examining all surfaces for erosion or excessive wear. Keep fan inlet screen clean.

D. Weekly check and tighten foundation bolts and motor mounting bolts.

II. Wave Generator Motor Maintenance

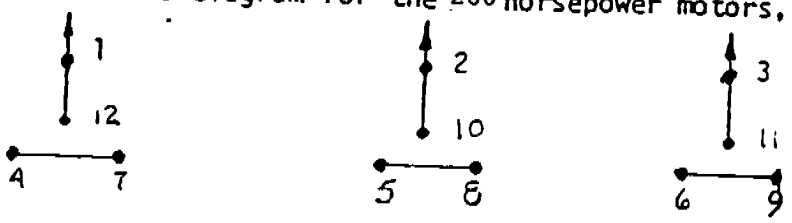
A. Lubricate the motors with one quarter ounce of grease per bearing every twelve months. Use a good quality rust inhibited polyurea based grease such as Chevron SRI. When greasing the bearings, keep all dirt out of the area. Wipe the fittings completely clean and use clean equipment. More bearing failures are caused by dirt introduced during greasing, than from insufficient grease.

B. Periodically inspect the motors for excessive dirt, friction or vibration. Keep the ventilation openings clear to allow free passage of air. Be sure the drain holes in the motors are kept open.

C. The motor nameplate information is:

Horsepower	- 200	RPM	- 3600
Volts	- 230/460	Ampere	-438/219
Hertz	- 60	Phase	- 3

D. Connections diagram for the 200 horsepower motors, 460 volts:



III. Air Directional Valve Maintenance:

A. Lubricate the spherical bearing at the cylinder clevis and oil the rear clevis of the cylinder monthly.

B. Weekly check and tighten foundation bolts, adapter bolts.

IV. Filters, Regulator and Lubricator Assembly Maintenance:

A. Filter (with piggyback Regulator)

1. Monthly, remove the filter bowl and filter element and clean in soapy water only. After washing, blow compressor air from inside the filter element outward. Reassemble, making sure to replace all gaskets in their proper place.

Note: Be sure to shut off the air supply and exhaust pressure before cleaning in Step 2 above.

B. Regulator

1. Daily, check to make sure the pressure setting has not changed. To increase the pressure setting, turn the adjusting handle clockwise; to reduce the setting, turn counter clockwise. When reducing the pressure, a small hissing will occur. This is normal.

C. Filter (Post Filter-Regulator)

1. This filter element cannot be cleaned and should be replaced when a pressure differential of 10 psi is reached. To replace, unscrew the bowl and unscrew the filter element. To install a new filter element; hold the element by the bottom end cap, position the new o-ring over the top threaded cap end, turn the element gently into the body's threaded section and make sure it is screwed tightly into place.

D. Lubricator

1. Daily inspect the oil level; fill if required.

2. To add oil follow this procedure:
Caution: Shut off the air supply and make sure the line pressure is zero.
a. Remove the fill plug.
b. Fill to visible rim of bowl.
c. Use SAE 10 non-detergent oil.
d. Replace the fill plug and seat firmly. DO NOT OVER TORQUE!

3. Daily, check to see that oil is dripping at the sight gage when the cylinder is operating. The drip rate should be that a slight mist is evident at the adv-speed port controls. To adjust the drip rate, use a slotted screwdriver to turn the adjusting screw in the top of the lubricator:

Note: Be sure to shut off the air supply and exhaust pressure before cleaning in step 1 above.

a. Leaner - clockwise

b. Richer - counter-clockwise

V. Compressor Maintenance

Caution: Never service or work around machine without disconnecting main power switch.

A. Daily

1. Check the oil level in the crankcase. High oil level is reached when the oil overflows at the oil filler opening. Low oil level is the bottom thread of the oil filler opening. Keep the oil at the full mark.

2. Drain any condensate from the air tank.

B. Weekly

1. Clean the cylinder fins and those of the intercooler with compressed air.

2. Test all safety devices.

C. Monthly

1. Inspect and clean the suction air filter.

2. Change the crankcase oil; replace with SAE 30 non-detergent oil.

3. Check all screws and nuts for tightness. Tighten to torque values in the compressor maintenance manuals.

4. Check belt tension.

VI. Motor Control Center Maintenance

Caution: Remove all power from the motor control center before performing any maintenance.

A. Monthly check the filters on the ventilation openings and clean if necessary.

B. Annually check incoming line lugs and tighten if required.

C. Annually check for signs of corrosion.

D. Annually check all power lugs and tighten if required.

INSTRUCTIONS FOR OPERATING WITH A MALFUNCTION

Although the system is designed to be trouble free, breakdowns can occur. In order to minimize down time, a procedure for by-passing the problem area has been devised. The quality of the waves will not be as good, but a satisfactory wave will be generated. However, the electrical control can not be by-passed.

I. Air Directional Valve Assembly Malfunction:

A. Put the flaps or doors in the outward position, by using the manual button on one of the cylinders.

B. Uncouple the quick-disconnect from the airline to disenable the cylinder (ADV).

C. Remove air directional valve from anchor bolts and place a piece of plywood, big enough to block off caisson chamber, between air directional valve and caisson opening. Replace air directional valve and plywood to caisson. This prevents air from escaping while the remaining air directional valve is open.

II. Pneumatic Cylinder Malfunction:

A. Shutdown the system and replace with the spare cylinder (approximately 20 minutes).

B. Or if no spare cylinder is available, follow the procedure in Step I. above for the Air Directional Valve Assembly Malfunction.

III. Compressor Malfunction:

A. Lease a portable compressor from a local rental outlet.

B. Hook the portable compressor to the present air line. The outlet valve must remain open; a check valve protects the existing compressor.

C. Correct the malfunction.

SHUTDOWN PROCEDURE FOR EXTENDED TIME PERIOD

During extended shutdown period the following preparations must be made:

Clean all equipment from dirt and dust.

Inflate the innertube of a basketball and plug up the apertures beneath the air directional valves, which leads from the machine room into the caissons. Any other suitable method may be used in order to accomplish the same result.

Provide the pneumatic compressor unit, the fans and their motors and the air directional valves with dust covers.

Cover all bare metal surfaces with a good grade of grease to prevent corrosion -- particularly the pneumatic cylinder piston rods of the air directional valves.

Coat all interior surfaces of the compressor to protect it against rust by draining the frame and refilling it with a rust inhibiting oil. The unit should now be operated for fifteen minutes and the oil should be fogged into the compressor intake, thus coating all internal surfaces. Leave the rust inhibiting oil in the frame. Note: When putting the unit back into service, replace the rust inhibiting oil with compressor lubricating oil. After this operation, tape all openings shut to prevent moisture from entering the unit. Drain the air receiver of all moisture.

Turn off all circuit breakers and the main disconnect switch to the motor control center.

START UP PROCEDURE FOR THE NEW SEASON

NOTE: Before filling the pool, check the screens at the caisson opening for any deterioration and make adjustments as required.

Fill the pool with water. Never run the wave-making machinery without water in the pool reaching the scumgutter level. Permanent damage to the machinery may result.

Remove protective covers.

Grease all motor bearings.

Clean equipment from dust.

Clean pneumatic cylinder piston rods with benzine to remove all grease.

CAUTION: Do not use petroleum cleaner.

Lubricate ALL cylinder pivot pins on the air directional valves.

Lubricate the air directional valve bearings.

Drain the rust inhibiting oil from the compressor and replace with SAE 30 non-detergent oil. Be sure all taped openings are open before starting the compressor.

Replace the compressor inlet filter.

Never disturb the adjustment of the system.

Check for loose screws on any component of the machinery and tighten.

Perform the maintenance listed under the maintenance section of this manual.

Check the pneumatic lines for any leaks and repair as necessary.

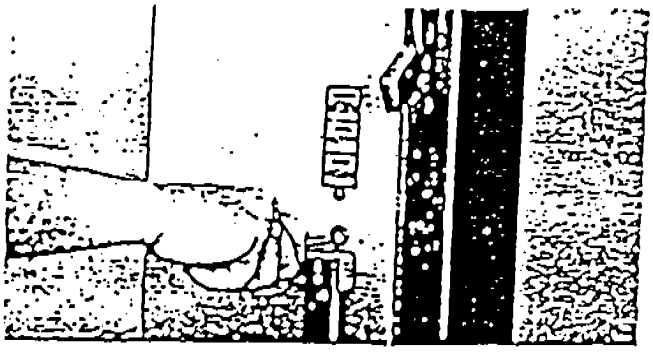
Check all power lugs in the fan motor starter for corrosion and looseness. Clean and tighten as necessary.

LIST OF SPARE PARTS FURNISHED BY WAVETEK

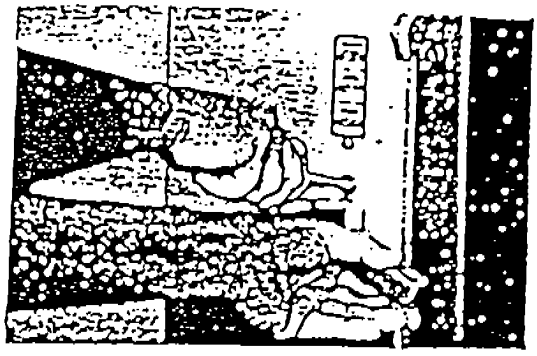
QUANTITY	DESCRIPTION
2	ADV CYLINDER & VALVE (COMPLETE ASS'Y)
1	DAMPER CYLINDER & VALVE (COMPLETE ASS'Y)
1 LOT	MISC. ELECTRICAL CONNECTORS
1 LOT	MISC. FASTENERS
1 LOT	MISC. 18 AWG WIRE
4	28V LAMP #387
2 CANS	RED TOUCH-UP PAINT
1 CAN	BEIGE TOUCH-UP PAINT
2	RELAYS, 4PDT, 24 VDC
2	FLEXIBLE HOSE 16" I.D. x 5' LG.
1	FLEXIBLE HOSE 24" I.D. x 18" LG.
1	FILTER ELEMENT (PRE-REGULATOR)
1	FILTER ELEMENT (POST-REGULATOR)

MOTOR CONTROL CENTER

I. Inspection and Maintenance Procedure:



To open enclosure door with disconnect device in OFF position, turn door-handle latch screw counter-clockwise to stop and hold.



While holding in this position turn enclosure door handle counterclockwise and open. Maintenance and inspection now can be performed.

II. Interlock Defeating Procedure:

Figure 19
Interlock Defeater

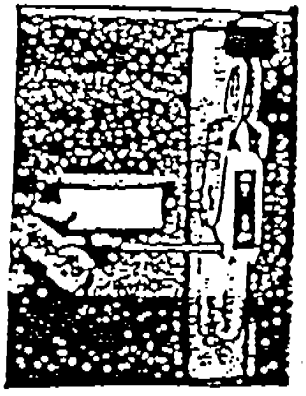


Figure 20
Interlock Defeater

The operating handle cannot unintentionally be thrown on when the unit door is open. This feature gives protection to operating and maintenance personnel. For the purpose of inspecting, adjusting and testing, the electrician can intentionally defeat this interlock by holding down the interlock lever with the left hand while raising the switch handle with the right hand (Shown in Fig. 19). Another interlock (See Figure 20) prevents opening unit door when circuit is on. This interlock can also be intentionally defeated by the use of a screw driver on a slotted screwhead to unlatch door.

INSTALLATION

1. The equipment to which the filter is attached should be internally cleaned to remove all traces of accumulated oil and dirt. Also, new pipe or hose should be installed between the filter and equipment being protected.
2. Blow all upstream pipe work clear of accumulated dirt and liquids.
3. Select a filter location as close as possible to the equipment being protected and downstream of any pressure regulator.
4. A 5 micrometer pre-filter is recommended to protect the high efficiency filter and to prolong the element life.
5. Install filter so that air flows in the direction of arrow on cover.
6. Install filter vertically with the bowl drain mechanism at the bottom. Free moisture will thus drain into the sump (quiet zone) at the bottom of the bowl (automatic drain models are recommended as standard equipment).

OPERATION:

Manual drain filters must be drained regularly before the separated moisture and oil reaches the bottom of the filter element. Automatic drain models will collect and dump the liquids automatically.

Pressure differential gauges should be used to determine when the maximum recommended pressure differential of 10 PSI (0.7 kg/cm²) has been reached.

DO NOT EXCEED THE RATED RECOMMENDED FLOWS. THE MINIMUM RECOMMENDED FLOW IS TEN PERCENT OF THE NOMINAL RATING.

MAINTENANCE:

To replace the element in the filter, first shut off the air supply and relieve pressure within the filter bowl. Unscrew the bowl and unscrew the filter element. This element cannot be cleaned and should be replaced when a pressure differential of 10 PSI (0.7 kg/cm²) is reached. To install a new filter element; hold the element by the bottom end cap, position the new o-ring over the top threaded cap end turn the element gently into the body's threaded section and make sure it is screwed tightly into place.

CAUTION: Touching or handling the element section may cause contamination, spotting or migration of oil.

Automatic drains should be checked to insure they are operating correctly.

CAUTION:

Polycarbonate bowls, being transparent and tough, are ideal for use with Filters and Lubricators. They are suitable for use in normal industrial environments, but should not be located in areas where they could be subjected to direct sunlight, an impact blow, nor temperatures outside of the rated range. As with most plastics, some chemicals can cause damage. Polycarbonate bowls should not be exposed to chlorinated hydro-carbons, ketones, esters and certain alcohols. They should not be used in air systems where compressors are lubricated with fire-resistant fluids such as phosphate ester and di-ester types.

Metal bowls are recommended where ambient and/or media conditions are not compatible with polycarbonate bowls. Metal bowls resist the action of most such solvents but should not be used where strong acids or bases are present or in salt laden atmospheres. Consult the factory for specific recommendations where these conditions exist.

TO CLEAN POLYCARBONATE BOWLS USE MILD SOAP AND WATER ONLY! DO NOT use cleansing agents such as acetone, benzene, carbon tetrachloride, gasoline, toluene, etc., which are damaging to this plastic.

Bowl guards are recommended for added protection of polycarbonate bowls where chemical attack may occasionally occur.

TROUBLESHOOTING:

(If oil aerosol appears downstream from the filter):

1. Examine downstream air lines to determine if they were cleaned out before installation of the filter. Residual oil will contaminate an installation from new pipe work if it is not initially cleaned.
2. Determine if the sealing gasket or o-ring is in place, and that it is not cut or otherwise damaged. (When checking the element, do not touch the element's body. Always handle the element by the bottom end cap.) When reinstalling the element, turn it gently to make sure that it is screwed tightly in place.
3. Check the rate of air being used. The air flow should not exceed the rated capacity of the element, nor be less than 10% of its rated flow.
4. Check the inlet air temperature; this should not exceed 150°F (65°C). Where higher temperatures are used, oil vapor may condense if the air cools downstream of the filter.
5. Check for acid fumes or other harmful gases being drawn into the compressor intake. The element may be attacked by certain chemicals.
6. Determine the type of oil used in the compressor. Some synthetic or high flash point oils are detrimental - contact a Parker Hannifin Representative for advice.

ACCESSORIES CHART

OIL REMOVAL FILTER	10F	11F	12F	13F
Automatic Drain (Includes Seal)		PS506	PS506	PS506
Bowl Guard Kit		PS107	PS207	N/A
Mounting Bracket Kit*		PS109	PS209	PS309
Metal Bowl w/Sight Glass (Manual Drain)		PS108	PS208	PS308C
Polycarbonate Bowl (Automatic Drain)	PS406	PS143	PS243	N/A
Metal Bowl w/Sight Glass (Automatic Drain)		PS144	PS244	PS34C
Metal Bowl (Manual Drain)	PS477			
Metal Bowl (Automatic Drain)	PS448			

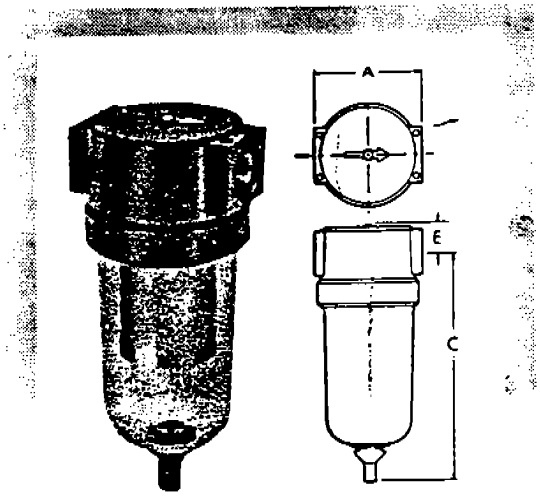
*Not Supplied with units, must be ordered separately.

Form 1C100D

MAINTENANCE BULLETIN
PARTS IDENTIFICATION LIST

OIL REMOVAL FILTER 10F, 11F, 12F, 13F

ISSUED: MAY, 1983
Supersedes: September, 1982



Model	A	C	"C" with Auto. Drain	E
10F	1.50 38mm	3.27 83mm	3.59 91mm	.41 10mm
11F	2.75 70 mm	5.61 142 mm	5.61 142 mm	.76 19 mm
12F	3.24 82 mm	6.96 177 mm	6.96 177 mm	.96 25 mm
13F	5.00 127 mm	9.18 233 mm	9.18 233 mm	1.45 37 mm

ELEMENT ASSEMBLIES: (Includes seal)

MODEL 10F 6 SCFM PS446
MODEL 11F 12 SCFM PS146
MODEL 12F 20 SCFM PS245
MODEL 12F 30 SCFM PS246
MODEL 13F 50 SCFM PS351B
MODEL 13F 100 SCFM PS350

POLYCARBONATE BOWL KIT

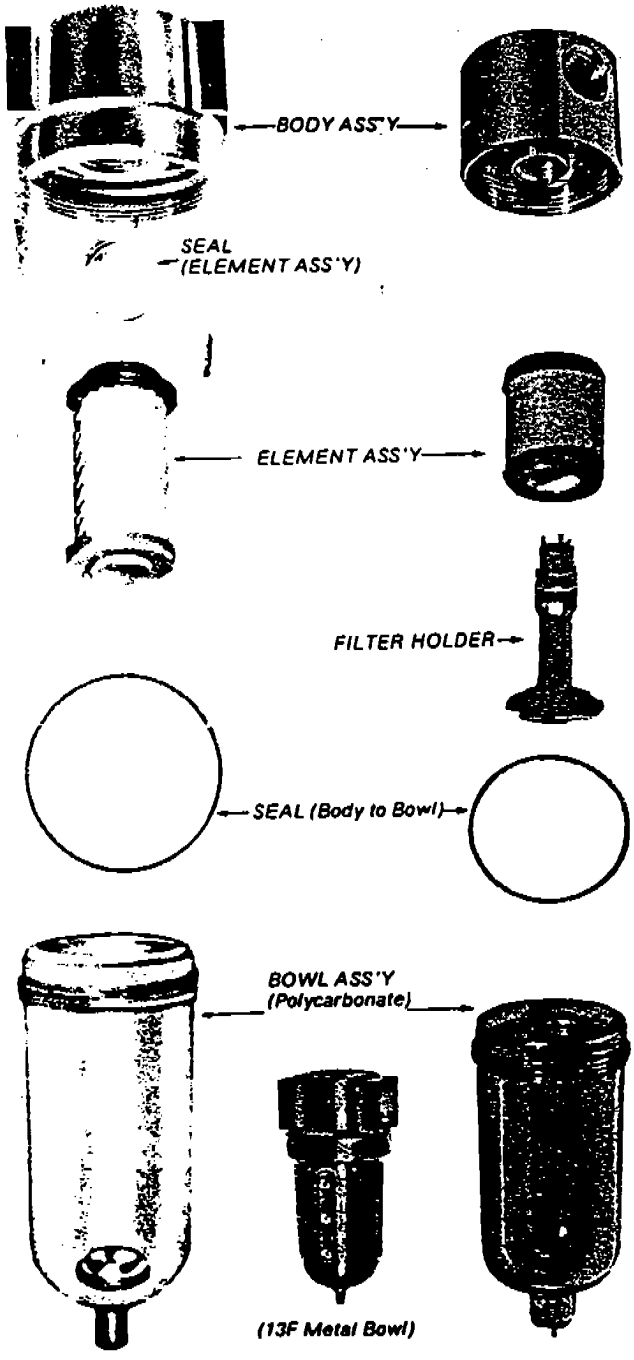
(1) POLYCARBONATE BOWL WITH MANUAL DRAIN
(1) SEAL (BODY TO BOWL)

MODEL 10F1 ..... PS405
MODEL 11F1 ..... PS105
MODEL 12F3 ..... PS205
MODEL 13F5 (Metal Bowl) PS308C

MAXIMUM PRESSURE AND TEMPERATURE

150 psig @ 125°F (10 bar @ 52°C) with Polycarbonate Bowl
250 psig @ 175°F (17 bar @ 80°C) with Metal Bowl
10 psig minimum (0.7 bar with Automatic Drain)

Conversions: 1 bar = 14.5 psig °C = 5/9 (°F-32)



Parker Fluidpower

Pneumatic Division
Otsego, Michigan 49078

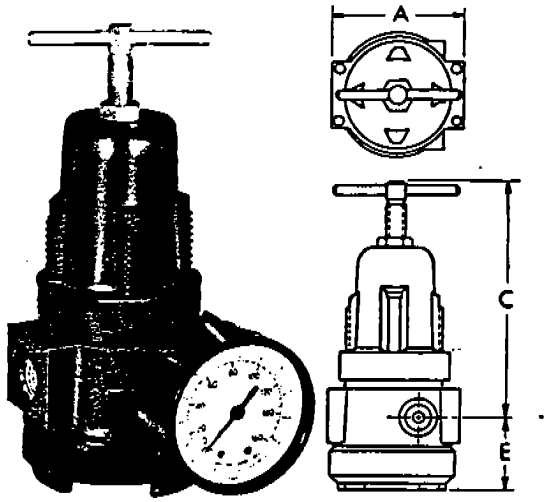
MAINTENANCE BULLETIN
PARTS IDENTIFICATION LIST

Form 1R101 B

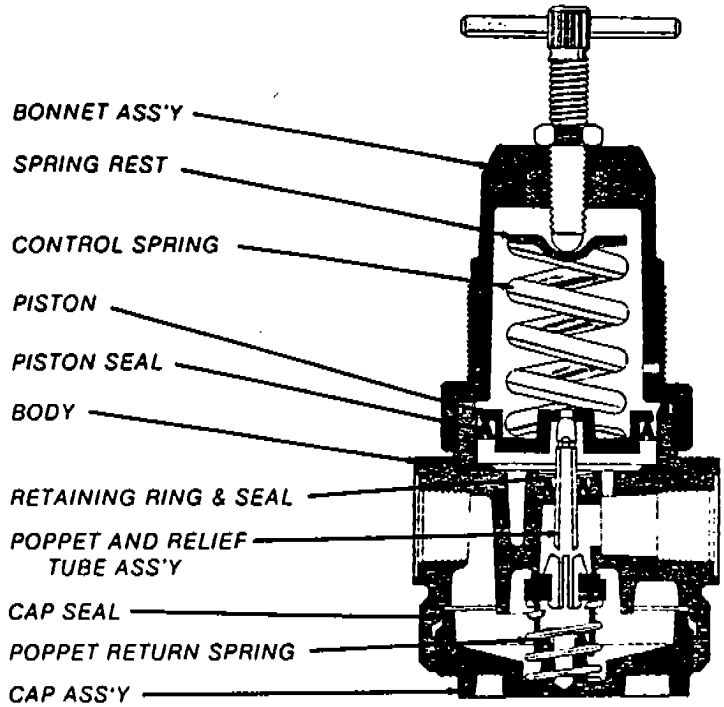
06R, 07R, 08R

REGULATORS

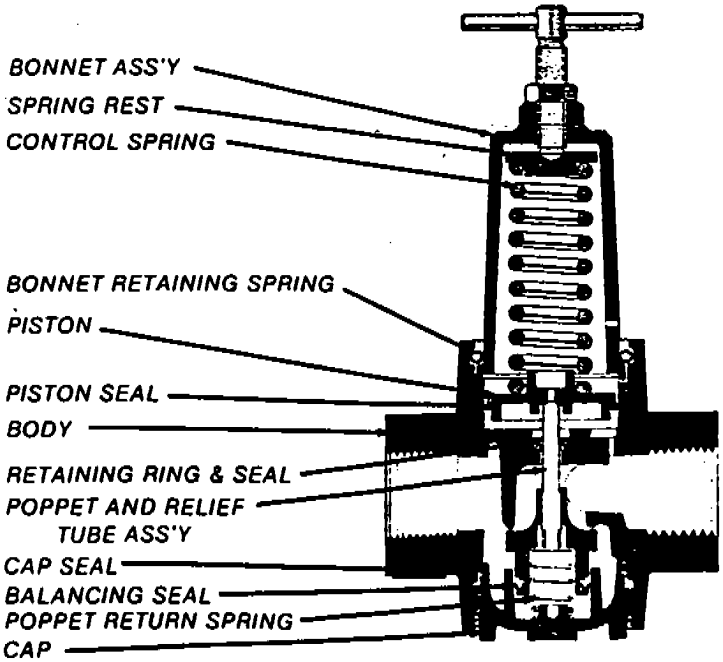
ISSUED: FEBRUARY, 1980
Supersedes: February, 1979



Model	Port Size (NPT)	DIMENSIONS		
		A	C	E
06R	¼"-⅜"	2.75	4.75	1.69
07R	¼"-⅜"-½"-¾"	3.24	5.09	2.17
08R	¾"-1"-1¼"-1½"	5.00	7.81	2.13



REGULATOR MODELS	06R	07R	08R
POPPET KIT (1) POPPET AND RELIEF TUBE ASSY. (1) CAP SEAL	PS112	PS212	PS312B
RELIEVING PISTON KIT (1) SEAL (PISTON) (1) PISTON	PS110	PS110	PS310
GAUGES			
0-60 PSI, 0-4 KG/CM²	P781641	P781641	P781641
0-160 PSI, 0-11 KG/CM²	P781642	P781642	P781642
0-300 PSI, 0-20 KG/CM²	P781643	P781643	P781643
CONTROL SPRING			
1 TO 60 PSI	P78481	P78481	P78695
2 TO 125 PSI (STANDARD)	P78482	P78482	P78696
5 TO 250 PSI	P78483	P78483	P78697
PANEL MOUNT NUT (NOT SHOWN)	P78520	P78520	N/A



Maximum (Primary) Operating Pressure 250 PSIG (17 Bar)
Temperature Range – 10°F to + 175°F (– 24.5°C to + 80°C)

INSTALLATION:

1. Install regulator so that air flow is in the direction of arrow. Installation must be upstream from the devices it is to service (Lubricator, Valve, Cylinder, or tool, and mounted closely to the other devices). Mounting may be in any position.
2. Gauge ports (¼" NPTF) are located on both sides of the regulator body for convenience. it is necessary to install gauges or pipe plugs into each port during installation.
3. For protection against rust, pipe scale, and other foreign matter, install a FILTER on the upstream (high pressure) side as closely to the REGULATOR as possible.

OPERATION:

1. BEFORE TURNING ON AIR SUPPLY, TURN ADJUSTING HANDLE COUNTER-CLOCKWISE UNTIL COMPRESSION IS RELEASED FROM PRESSURE CONTROL SPRING. Then turn on air supply and adjust to desired secondary pressure by turning adjusting handle clockwise. This permits pressure to build up slowly, preventing any unexpected operation of the valve, cylinders, tools, etc., in the line. Adjustment to desired secondary pressure can be made only with primary pressure applied to the REGULATOR.
2. To lower secondary setting, always reset from a pressure lower than the final setting desired. For example: To lower the secondary pressure from 80 to 60 PSIG, drop the secondary pressure to 50 PSI or less, then adjust upward to 60 PSI.

SERVICING:

NOTE: SHUT OFF AIR SUPPLY AND DE-PRESSURIZE THE UNIT. COMPLETELY VENT THE SUPPLY LINE ALSO.

1. To service the piston or control springs, turn the adjusting handle counter-clockwise until compression is released from pressure control spring.
   a. On the 06 and 07 Series, remove bonnet by unscrewing bonnet from body and removing the control spring, piston, and piston seal.
   b. To remove 08 bonnet, remove retaining spring by lifting out and pulling on the exposed loop.
   c. Clean and carefully inspect parts for wear and/or damage. If replacement is necessary, use parts from the service kits.
   d. Lubricate the piston seal with a mineral base oil or silicone grease. DO NOT use synthetic oils such as esters.
   e. Install piston, piston seal, control spring, and adjusting screw pressure plate. On the 06 and 07 Series, screw bonnet to body. On 08 Series, place bonnet into body, allowing the projecting notches in bonnet to mate with depressions in the body. Then feed retaining spring into the joint groove until it completely encircles the joint.
2. To service poppet and relief tube:
   a. Relieve all pressures as described in above NOTE.
   b. On the 06 and 07 Series, remove cap by unscrewing from body (located opposite from control spring bonnet). Remove poppet relief tube and balancing spring.
   c. To remove 08 cap, pull out the retaining spring securing cap to body using the same procedures as outlined for the bonnet.
   d. Clean and carefully inspect parts for wear and damage. If replacement is necessary, use parts from service kit.
   e. Reassemble poppet relief tube and balancing spring. Lubricate seals with a mineral base oil or silicone grease. DO NOT use synthetic oils such as esters.
   f. For 06 and 07 Series, lubricate cap seal as in step 2.d. above, install in groove of cap and screw cap into body.
   g. To replace the 08 cap, lubricate cap seal as in step 2.d. above, install in groove of cap, press cap with seal, spring and poppet into body and firmly hold in this position by hand. Feed retaining spring into the joint until it completely encircles the joint.
3. Turn on air supply and adjust to desired secondary pressure as described in step 1 in Operation.

ACCESSORIES CHART

Accessories listed below are available in complete Regulator units.

Accessory Parts	06R	07R	08R
Plastic knob adjusting handle	P69726	P69726	N/A
Low pressure spring 1 to 60 PSIG	P78481	P78481	P78695
Standard pressure spring 2 to 125 PSIG	P78482	P78482	P78696
High pressure spring 5 to 250 PSIG	P78483	P78483	P78697
Panel mount nut*	P78520	P78520	N/A
Non-relieving piston service kit	PS111	PS111	PS311
Piggyback conversion kit	PS120	PS220	N/A
Mounting bracket kit*	PS109	PS209	PS309
Gauges: Low pressure 0-60 PSI 0-4 Kg/cm²	P781641	P781641	P781641
Standard 0-160 PSI 0-11 Kg/cm²	P781642	P781642	P781642
High pressure 0-300 PSI 0-20 Kg/cm²	P781643	P781643	P781643
Pilot control operator assembly	PS121	PS121	N/A

*Not supplied with units, must be ordered separately

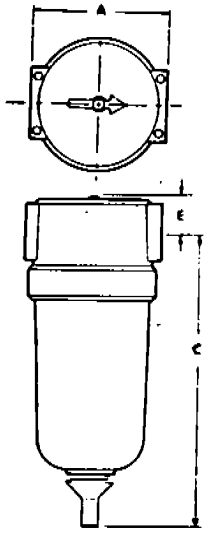
Parker Fluidpower

Pneumatic Division
Otsego, Michigan 49078

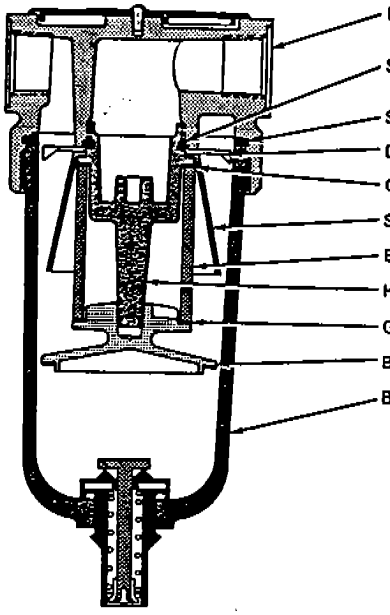
MAINTENANCE BULLETIN
PARTS IDENTIFICATION LIST

FILTERS-06F, 07F, 08F

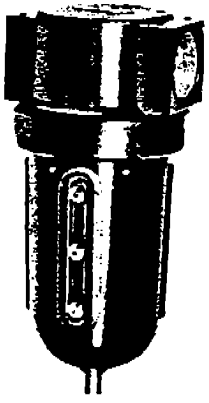
ISSUED: DECEMBER, 1981
Supersedes: July, 1981



Model	Port Size (NPT)	DIMENSIONS			
		A	C	"C" with auto. drain	E
06F	¼"-⅜"	2.75	5.61	5.61	.76
07F	¼"-⅜"-½"	3.24	6.96	6.96	.96
07F	¾"	3.50	6.96	6.96	.96
08F	¾"-1"-1¼"-1½"	5.00	9.18	9.23	1.45



FILTER MODELS	06F	07F	08F
ELEMENT KIT, 40 MICROMETER (1) ELEMENT (FILTER) (1) SEAL (BODY TO BOWL) (2) GASKET (ELEMENT)	PS101	PS201	PS301B
ELEMENT CARTRIDGE KIT, 40 MICROMETER (1) HOLDER (ELEMENT) (1) ELEMENT (FILTER) (2) GASKET (ELEMENT) (1) BAFFLE (1) SHROUD (1) DEFLECTOR (1) SEAL (HOLDER) (1) SEAL (BODY TO BOWL)	PS104	PS204	PS304B
REPLACEMENT BOWL KIT (1) POLYCARBONATE BOWL WITH MANUAL DRAIN (METAL BOWL -08F) (1) SEAL (BODY TO BOWL)	PS105	PS205	PS308C



08F
(Metal Bowl)

MAXIMUM PRESSURE AND TEMPERATURE

150 psig @ 125° F (10 bar @ 52° C) with Polycarbonate Bowl
250 psig @ 175° F (17 bar @ 80° C) with Metal Bowl
10 psig minimum (0.68 bar) with Automatic Drain

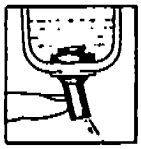
Conversion 1 Bar = 14.5 psi, °C = 5/9 (°F-32)

INSTALLATION

1. The equipment to which the filter is attached should be internally cleaned to remove all traces of accumulated oil and dirt. Also, new pipe or hose should be installed between the filter and equipment being protected.
2. Blow all upstream pipe work clear of accumulated dirt and liquids.
3. Select a filter location as close as possible to the equipment being protected and upstream of any pressure regulator.
4. Install filter so that air flows in the direction of arrow on cover.
5. Install filter vertically with the bowl drain mechanism at the bottom. Both free moisture and solids will thus drain into the sump (quiet zone) at the bottom of the bowl (automatic drain models are recommended as standard equipment.).

OPERATION & SERVICE

1. Both free moisture and solids are removed automatically by the filter. There are no moving parts.
2. Manual drain filters must be drained regularly before the separated moisture and oil reaches the bottom of the lower baffle. Automatic drain models will collect and dump liquids automatically.



3. The filter element should be removed and replaced when the pressure differential across the filter unit is excessive.
4. **To service the filter element; SHUT OFF AIR SUPPLY and depressurize the unit.**
   a. Unscrew threaded bowl.
   b. Unscrew lower baffle and remove filter element and gaskets (2).
   c. Clean all internal parts, bowl and element before reassembling. See polycarbonate bowl cleaning section.
   d. Install element and gaskets (2).
   e. Attach lower baffle and tighten firmly.
   f. Replace bowl seal; lubricate seal to assist in retaining it in position. Use only mineral base oils or grease. Do NOT use synthetic oils such as esters, and do NOT use silicones.
   g. Screw bowl into body.

CAUTION:

Polycarbonate bowls, being transparent and tough, are ideal for use with Filters and Lubricators. They are suitable for use in normal industrial environments, but should not be located in areas where they could be subjected to sunlight, an impact blow, nor temperatures outside of the rated range. As with most plastics, some chemicals can cause damage. Polycarbonate bowls should not be exposed to chlorinated hydro-carbons, ketones, esters and certain alcohols. They should not be used in air systems where compressors are lubricated with fire-resistant fluids such as phosphate ester and di-ester types.

Bowl guards are available for added protection of polycarbonate bowls where chemical attack may occasionally occur.

Metal bowls are recommended where ambient and/or media conditions are not compatible with polycarbonate bowls. Metal bowls resist the action of most such solvents but should not be used where strong acids or bases are present or in salt laden atmospheres. Consult the factory for specific recommendations where these conditions exist.

TO CLEAN POLYCARBONATE BOWLS USE MILD SOAP AND WATER ONLY! DO NOT use cleansing agents such as acetone, benzene, carbon tetrachloride, gasoline, toluene, etc., which are damaging to this plastic.

Bowl guards are recommended for use with polycarbonate bowls.

FILTER ACCESSORIES CHART

Accessories listed below are available in complete Filter units.

FILTER MODELS	06F	07F	08F
Automatic drain	PS506	PS506	PS506
Polycarbonate bowl with automatic drain kit	PS143	PS243	N/A
25 Micrometer element kit	PS102	PS202	PS302B
5 Micrometer element kit	PS103	PS203	PS303B
Bowl guard kit	PS107	PS207	N/A
Metal bowl without sight glass automatic drain kit	PS148	PS248	PS348B
Metal bowl with sight glass (Manual Drain)	PS108	PS208	PS308C
Mounting bracket kit*	PS109	PS209	PS309

*Not supplied with units, must be ordered separately.

Series EJ — 1-1/2" and 2" Bore Single and Double Rod End Styles NFPA Interchangeable Cylinders

MAINTENANCE AND REPAIR PARTS LIST

Proper installation, application and maintenance are most important for the Series EJ cylinder to provide maximum life and trouble-free performance.

OPERATING DATA

Max. Operating Pressure — 250 psig Pneumatic

Ambient temperatures:

-20°F(-35°C) to +200°F(93°C) — Buna-N seals
-20°F(-35°C) to +400°F(204°C) — Viton seals

LUBRICATION

Cylinders are lubricated with a petroleum base, Buna-N compatible lubricant at time of shipment. For maximum cylinder performance, the air supply should be free of moisture; filtered to remove abrasive particles from the air stream, and atomized oil introduced into the system.

Series EJ cylinders are guaranteed for one-year against failure on non-lubricated air applications. However, if the cylinder is required to operate non-lubricated, longer seal life can be attained by occasionally adding a few drops of oil through the cylinder ports.

ROD SEAL AND WIPER KITS

Under normal working conditions, the first area that will require maintenance will be the rod seal and wiper. To replace, unscrew the rod gland with a pipe wrench. With a sharp object remove the worn wiper and seal, and replace with new ones. Once a year replacement of these seals will provide maximum cylinder performance.

NOTE: When replacing the rod seal and wiper, check the oil-filled rod bushing and possible damage incurred to the housing threads during removal. Due to the technique employed in the assembly of the bushing to the rod gland, individual replacement of the oil-filled rod bushing is not recommended. Replace the entire rod gland if the bushing is worn, or damage has occurred to the housing.

Rod Seal and Wiper Kits

Rod Dia.	Buna-N		Viton	
	Kit No.	Price	Kit No.	Price
5/8"	SWK-15	—	VSWK-15	—
1"*	SWK-25	—	VSWK-25	—

Rod Gland Kits

Rod Dia.	Buna-N		Viton	
	Kit No.	Price	Kit No.	Price
5/8"	RBK-15	—	VRWK-15	—
1"*	RBK-25	—	VRWK-25	—

*Not available for 1-1/2" bores.

PISTON SEAL KITS

Depending upon the application, ambient operating conditions or the cycle rate, replacement of the piston seals becomes necessary when the cylinder shows lack of thrust power and the ability to operate to the required specifications. To replace the piston seals it is necessary to disassemble the cylinder. Remove the head and/or cap, whichever is more convenient, by loosening the tie rod nuts. Slide the piston and rod assembly out of the tube and replace the piston seals.

Piston Seal Kits

Cyl. Bore	Buna-N	
	Kit No.	Price
1-1/2"	EJK-15	—
2"	EJK-20	—

CUSHION SEAL KITS

Series EJ cylinders are equipped with non-adjustable cushions (Model 5). Conventional adjustable cushions (Model 7) are optional.

NOTE: Cushion seals are an integral part of the heads and caps. To replace, the cylinder must be disassembled.

Cyl. Bore	Rod Dia.	Buna-N		Viton	
		Kit No.	Price	Kit No.	Price
1-1/2"	5/8"	CSK-15-1	—	VCSK-15-1	—
2"	1"*	CSK-25-1	—	VCSK-25-1	—

*Not available for 1-1/2" bore.

NOTE: Before engaging in the assembly of the cylinder, carefully note any possible damage to the piston and rod assembly. Machine downtime and labor being the major cost of cylinder repair, we recommend simultaneous replacement of all damaged parts.

CAUTION: Extreme care must be taken in reassembling the cylinder. Make certain that the tube gaskets are properly in place and finally that the tie rods are tightened to the proper torque values.

Cylinder Bore	Torque (Ft/lbs)
1-1/2"	8 to 11
2"	12 to 16

ORDERING INFORMATION

To assure prompt and correct shipment, it is important that proper care be taken in the selection of the parts being ordered. Whenever possible the following information should be supplied: Cylinder Series, Mounting Style, Rod Diameter, Bore, Stroke, and Options.

For parts prices, or if assistance is required in the selection of parts consult your local MOSIER Distributor, he is listed below.

Minimum billing for a parts order is $10.00

Viton ® is a registered trade mark of E.I. DuPont DeNemours and Company

Your Distributor is:

REPLACEMENT PARTS LIST — SINGLE ROD END CYLINDERS

Det No	Part Description	No Req'd Per Cyl	Rod Dia	1-1/2" BORE Part No	Unit Price	Adder Per Inch or Fraction of Stroke	Part No with Adj Cushions	Unit Price	2" BORE Part No	Unit Price	Adder Per Inch or Fraction of Stroke	Part No with Adj Cushions	Unit Price
37	Cap — Type 9	1	All	15466	—	—	15485	—	15467	—	—	15488	—
38	Trunnion Block Type 10	1C	All	40682	—	—	—	—	40683	—	—	—	—
39	Cap — Type 12	1	All	15472	—	—	15486	—	15473	—	—	15489	—
40	Cushion Retaining Screw — Head	Opt.	5/8"	51131	—	—	—	—	—	—	—	—	—
			1"	—	—	—	—	—	51131	—	—	—	—
	Cushion Retaining Screw — Cap	Opt.	All	51131	—	—	—	—	—	—	—	—	—
41	Snap Ring — Head	Opt.	5/8"	—	—	—	—	—	60082	—	—	—	—
			1	—	—	—	—	—	—	—	—	—	—
	Snap Ring — Cap	Opt.	All	—	—	—	—	—	60082	—	—	—	—
42	Cushion Retainer — Head and Cap	Opt.	5/8"	58030	—	—	—	—	—	—	—	—	—
			1"	—	—	—	—	—	58030	—	—	—	—
43	Buna-N Cushion O'ring	Opt.	All	60127	—	—	—	—	60127	—	—	—	—
44	Viton Cushion O'ring	Opt.	All	60387	—	—	—	—	60387	—	—	—	—
45	Metering Valve — Head	Opt.	5/8"	20623	—	—	—	—	20624	—	—	—	—
			1"	—	—	—	—	—	20623	—	—	—	—
46	Metering Valve — Cap	Opt.	All	20623	—	—	—	—	20624	—	—	—	—

REPLACEMENT PARTS LIST — DOUBLE ROD END CYLINDERS

(All other parts are similar to Single Rod End Cylinders)

Det No	Part Description	No Req'd Per Cyl	Rod Dia	1-1/2" BORE Part No	Unit Price	Adder Per Inch or Fraction of Stroke	Part No with Adj Cushions	Unit Price	2" BORE Part No	Unit Price	Adder Per Inch or Fraction of Stroke	Part No with Adj Cushions	Unit Price
47	Piston and Rod Assembly Type 1 — Studded Std.	1	5/8"	15585-1	—	—	—	—	15586-1	—	—	—	—
		A	1"	—	—	—	—	—	15587-1	—	—	—	—
	Type 3 — Female	1	5/8"	15585-3	—	—	—	—	15586-3	—	—	—	—
		A	1"	—	—	—	—	—	15587-3	—	—	—	—
	Type 2 — Solid	Opt.	5/8"	15585-2	—	—	—	—	15586-2	—	—	—	—
		Opt.	1"	—	—	—	—	—	15587-2	—	—	—	—

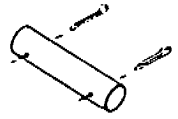
Optional Mounting Accessories

ROD JAM NUT

Rod Dia.	Part No.	Price
5/8"	52025	—
1"	52043	—

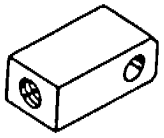
PIN

Cyl. Bore	Part No.	Price
1-1/2"	49006	—
2"		



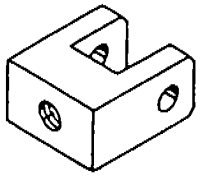
ROD EYE

Rod Dia.	Part No.	Price
5/8"	49015	—
1"	49013	—



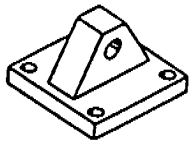
ROD CLEVIS

Rod Dia.	Part No.	Price
5/8"	49028	—
1"	49030	—



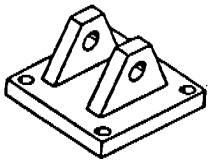
EYE BRACKET

Cyl. Bore	Part No.	Price
1-1/2"	49021	—
2"		



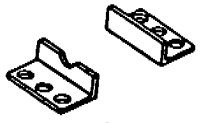
CLEVIS BRACKET

Cyl. Bore	Part No.	Price
1-1/2"	49022	—
2"		



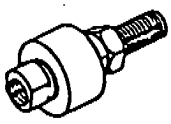
SIDE END ANGLE MOUNTS

Cyl. Bore	Part No.	Price
1-1/2"	40666	—
2"	40667	—



ROD ALIGNERS

Rod Dia.	Part No.	Price
5/8"	RA-44	—
1"	RA-75	—

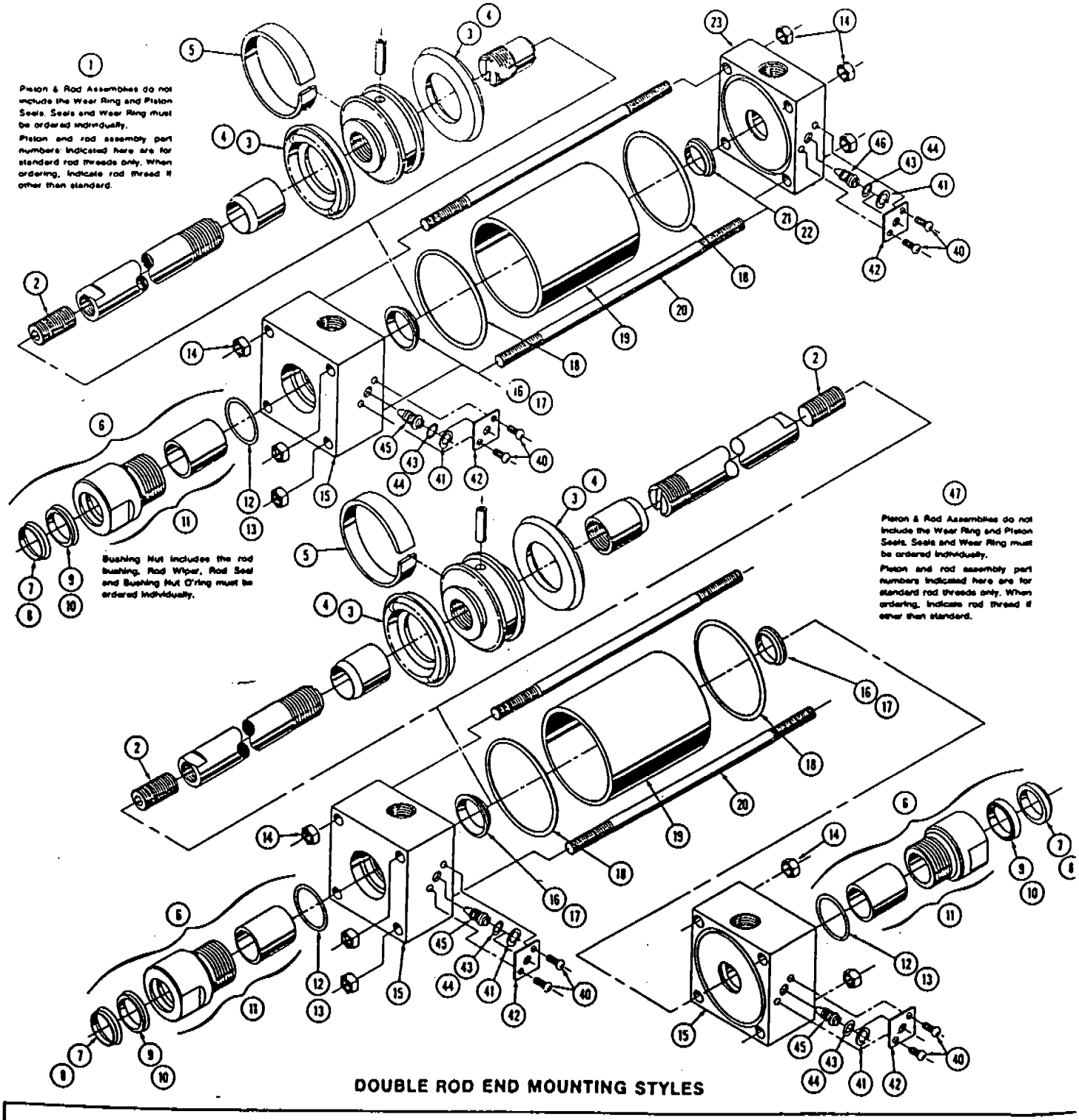


*Not available for 1-1/2" bore.

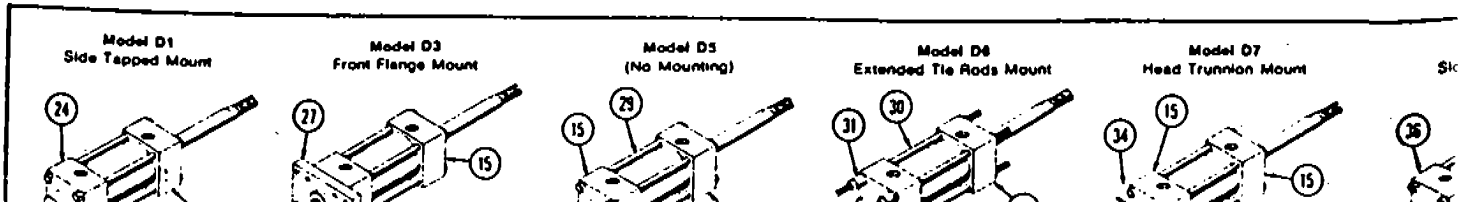
LEGEND TO PARTS LIST

- **A** Type 1 — Studded are standard on 5/8" and 1" rod diameters.
  Type 1 — Solid are optional 5/8" and 1" rod diameters.
  Type 3 — Female are standard on 5/8" and 1" rod diameters. (Does not include the rod stud)
- **B** (4) required on type 2 and 12 up to 4" bores.
  (4) required on type 3 and 4 up to 6" bores.
  (8) required on all others.
- **C** Trunnions are welded on models 7, 8 and 10. Removable trunnions and trunnions screws are offered as optional equipment.
- **D** Specify length of tie rods for type 10 (intermediate fixed trunnion mount).
- **E** 55026 name plate
  (not shown on detail drawing)
- **F** Available on request.

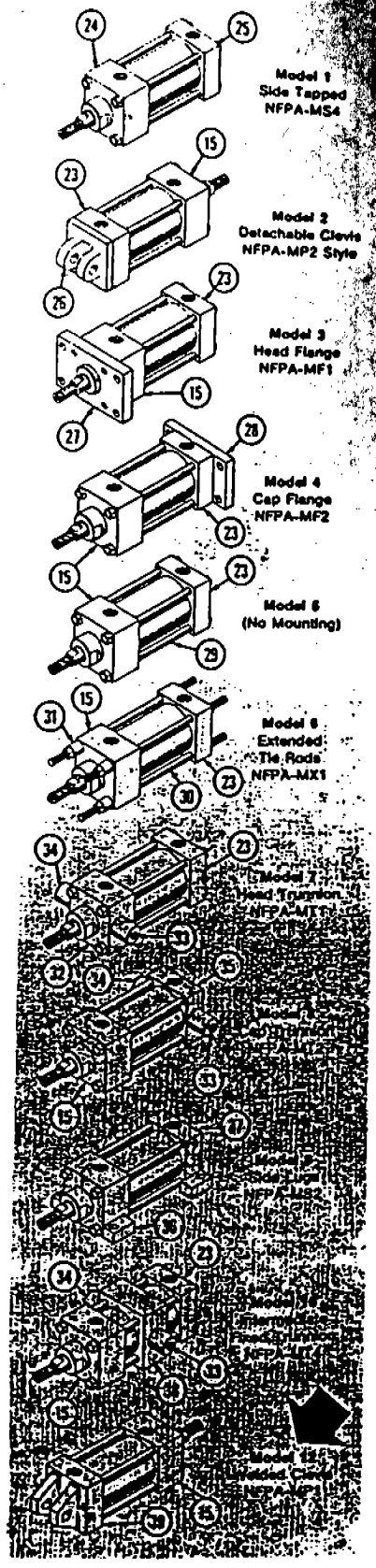
Series EJ — 1-1/2" and 2" Bore
Double Acting — Single and Double Rod End Styles
STANDARD CYLINDER REPLACEMENT PARTS

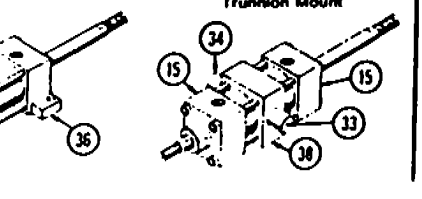


DOUBLE ROD END MOUNTING STYLES



SINGLE ROD END MOUNTING STYLES





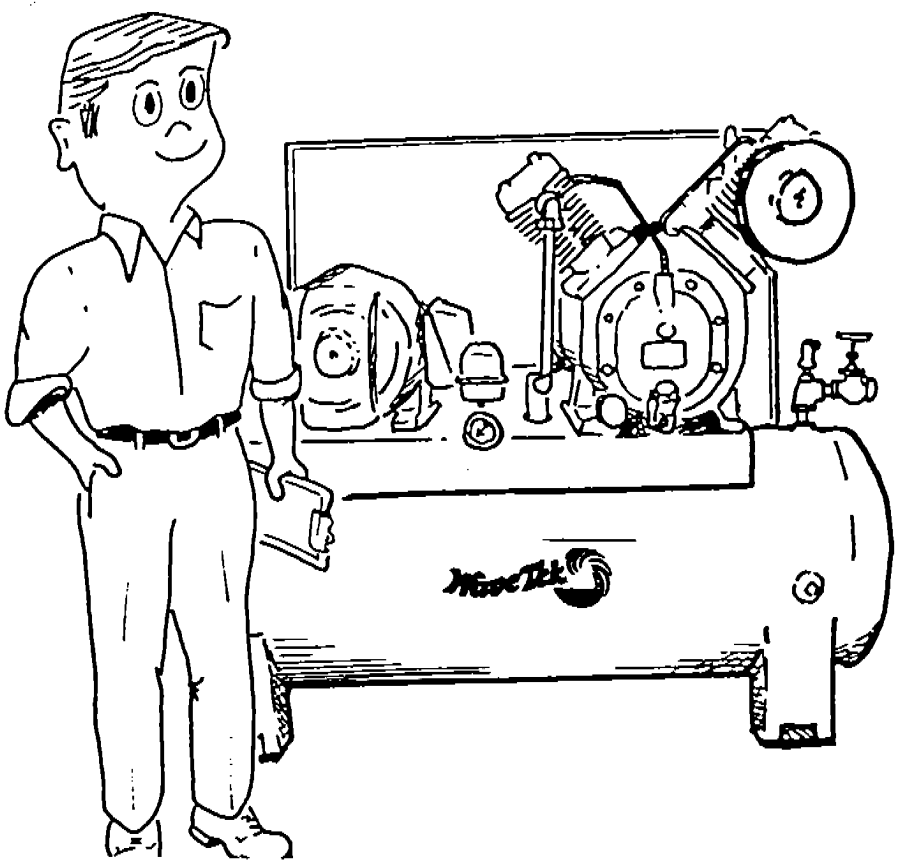
REPLACEMENT PARTS LIST — SINGLE ROD END CYLINDERS

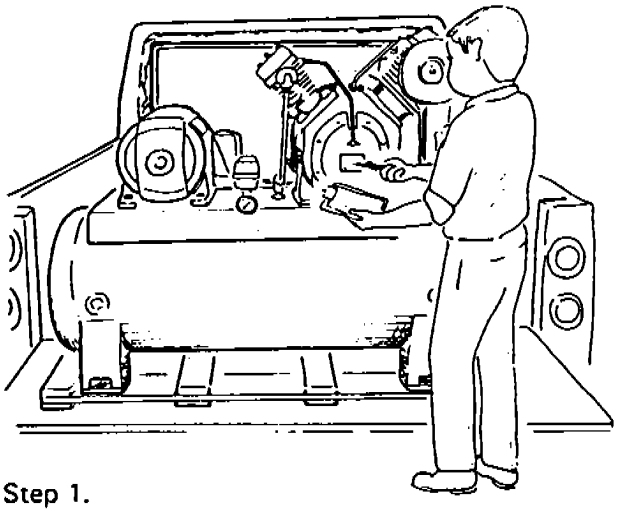
Ref. No.	Part Description	No. Req'd. Per Cyl.	Rod Dia.	1-1 2" BORE					2" BORE				
				Part No.	Unit Price	Adder Per Inch or Fraction of Stroke	Part No. with Adj. Cushions	Unit Price	Part No.	Unit Price	Adder Per Inch or Fraction of Stroke	Part No. with Adj. Cushions	Unit Price
1	Piston and Rod Assembly Type 1 — Studded — Std.	1	5/8"	15503-1	—	—	—	—	15504-1	—	—	—	—
		A	1"	—	—	—	—	—	15511-1	—	—	—	—
1	Type 3 — Female	1	5/8"	15503-3	—	—	—	—	15504-3	—	—	—	—
		A	1"	—	—	—	—	—	15511-3	—	—	—	—
2	Rod Stud	1	5/8"	51054	—	—	—	—	51054	—	—	—	—
		A	1"	—	—	—	—	—	51035	—	—	—	—
3	Buna-N Piston Seals	2	All	60346	—	—	—	—	60335	—	—	—	—
4	Viton Piston Seals	F	All	—	—	—	—	—	—	—	—	—	—
5	Wear Ring	1	All	60362	—	—	—	—	60363	—	—	—	—
6	Rod Gland Assembly	1	5/8"	RBK-15	—	—	—	—	RBK-15	—	—	—	—
		Opt.	1"	—	—	—	—	—	RBK-25	—	—	—	—
7	Rod Wiper (Polyurethane)	1	5/8"	60409	—	—	—	—	60409	—	—	—	—
		Opt.	1"	—	—	—	—	—	60412	—	—	—	—
8	Rod Wiper — Viton	1	5/8"	60384	—	—	—	—	60384	—	—	—	—
		Opt.	1"	—	—	—	—	—	60440	—	—	—	—
9	Piston Rod Seal — Buna-N w/Teflon	1	5/8"	60481	—	—	—	—	60481	—	—	—	—
		Opt.	1"	—	—	—	—	—	60490	—	—	—	—
10	Piston Rod Seal — Viton	Opt.	5/8"	60180	—	—	—	—	60180	—	—	—	—
		Opt.	1"	—	—	—	—	—	60461	—	—	—	—
11	Bushing Nut (Incl. Rod Bushing)	1	5/8"	15429	—	—	—	—	15429	—	—	—	—
		Opt.	1"	—	—	—	—	—	15430	—	—	—	—
12	Bushing Nut O'ring — Buna-N	1	5/8"	60192	—	—	—	—	60192	—	—	—	—
		Opt.	1"	—	—	—	—	—	60254	—	—	—	—
13	Bushing Nut O'ring — Viton	1	5/8"	60315	—	—	—	—	60315	—	—	—	—
		Opt.	1"	—	—	—	—	—	60459	—	—	—	—
14	Tie Rod Nuts	8B	All	52020	—	—	—	—	52021	—	—	—	—
15	Head — Types 2, 3, 4, 5, 6, 8, 10 and 12	1	5/8"	20900	—	—	40774	—	20919	—	—	40781	—
		Opt.	1"	—	—	—	—	—	21020	—	—	40822	—
16	Air Brake Seal Head — (Polyurethane)	1	5/8"	60410	—	—	—	—	60410	—	—	—	—
		Opt.	1"	—	—	—	—	—	60414	—	—	—	—
17	Air Brake Seal Head — Viton	Opt.	5/8"	60448	—	—	—	—	60448	—	—	—	—
		Opt.	1"	—	—	—	—	—	60450	—	—	—	—
18	Cylinder Tube Gaskets	2	All	60174	—	—	—	—	60175	—	—	—	—
19	Cylinder Tube	1	All	20086	—	—	—	—	20087	—	—	—	—
20	Tie Rods — All except type 8 and lower type 5	4	All	20635	—	—	—	—	20638	—	—	—	—
		D											
21	Air Brake Seal Cap — (Polyurethane)	1	All	60408	—	—	—	—	60408	—	—	—	—
22	Air Brake Seal Cap — Viton	Opt.	All	60445	—	—	—	—	60445	—	—	—	—
23	Cap — Type 2, 3, 4, 5, 6, 7, and 10	1	All	20904	—	—	40777	—	20926	—	—	40784	—
24	Head — Type 1	1	5/8"	20902	—	—	40775	—	20921	—	—	40782	—
		Opt.	1"	—	—	—	—	—	21035	—	—	40823	—
25	Cap — Type 1	1	All	20908	—	—	40779	—	20928	—	—	40786	—
26	Detachable Clevis — Type 2	1	All	20495	—	—	—	—	20498	—	—	—	—
27	Front Flange Type 3	1	5/8"	40506	—	—	—	—	40509	—	—	—	—
		Opt.	1"	—	—	—	—	—	40510	—	—	—	—
28	Rear Flange — Type 4	1	All	40505	—	—	—	—	40508	—	—	—	—
29	Tie Rods — Type 5 (lower)	2	All	20639	—	—	—	—	20641	—	—	—	—
30	Tie Rods — Type 8	4	All	20640	—	—	—	—	20642	—	—	—	—
31	Spacers — Front Type 8	4	All	20682	—	—	—	—	20680	—	—	—	—
32	Head Type 7	1C	5/8"	20918	—	—	40778	—	20938	—	—	40783	—
		Opt.	1"	—	—	—	—	—	21036	—	—	40824	—
33	Trunnion Screw Type 7, 8, and 10	2C	All	51118	—	—	—	—	51118	—	—	—	—
34	Trunnion Type 7, 8 and 10	2C	All	20437	—	—	—	—	20437	—	—	—	—
35	Cap — Type 8	1C	All	20917	—	—	40780	—	20937	—	—	40787	—
36	Head — Type 9	1	5/8"	15475	—	—	15484	—	15476	—	—	15487	—
		Opt.	1"	—	—	—	—	—	15538	—	—	15559	—

INSTALLATION AND START-UP RECOMMENDATIONS FOR

TYPE 30

AIR COMPRESSORS





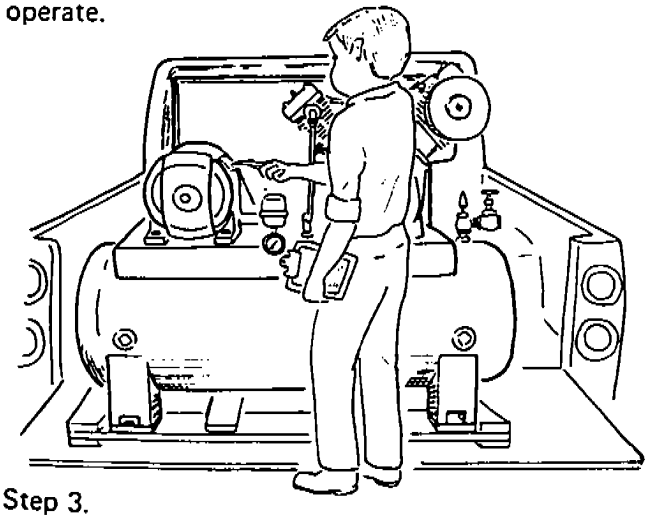
Step 1.

Unload the compressor from delivering vehicle – the purchaser must arrange for adequate lifting equipment at the job site.

IMPORTANT NOTE: The purchaser assumes title to the compressor equipment at the manufacturers shipping dock. Immediately upon receipt of the equipment, it should be inspected for any damage that may have occurred during shipment. If damage is present, demand an inspection immediately by an inspector from the carrier Ask him how to file a claim for damages.

Step 2.

Check compressor nameplate to be sure the unit is the model and size ordered. Do this before uncrating. Check Receiver Nameplate to be sure the tank is adequate for pressure at which you intend to operate.



Step 3.

Check motor nameplate to be sure motor is suitable for your electrical conditions. (Volts-Phase-Hertz).

Step 4.

Store, protect and assume full liability and responsibility for the compressor(s).

Step 5

"Read the instruction book which accompanies the compressor for detailed operating instructions.

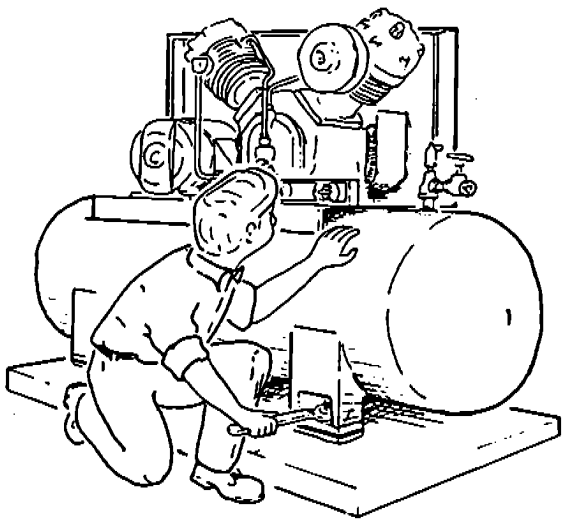
IMPORTANT

DO NOT ATTEMPT TO START THE COMPRESSOR UNTIL THIS STEP HAS BEEN COMPLETED. THE BELT GUARD MUST BE IN PLACE PRIOR TO STARTING.

If the instruction book has been lost, contact the nearest IR distributor."

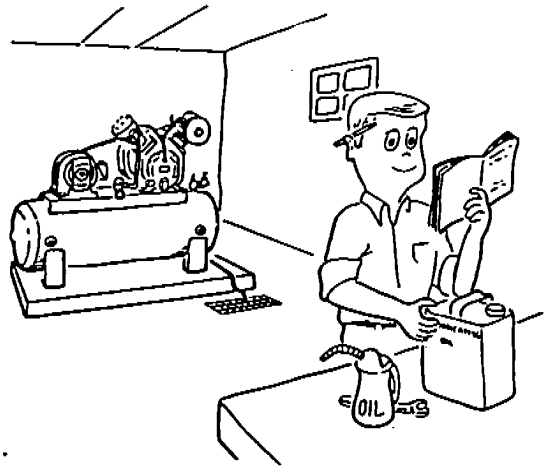
Step 6.

Locate compressor(s) as shown on the general arrangement drawing. In no case locate compressors nearer than 12 inches to any wall or each other.



Step 7.

Mount on concrete pad on floor, making certain that receiver feet are level and there is no stress in legs when foundation bolt nuts are tightened. Shim feet, if necessary. Severe vibration will result when nuts are pulled down tightly and feet are not level. This can lead to welds cracking or fatigue failure of receiver. This is a very important part of installation. Refer to the instruction book for details.



Step 8.

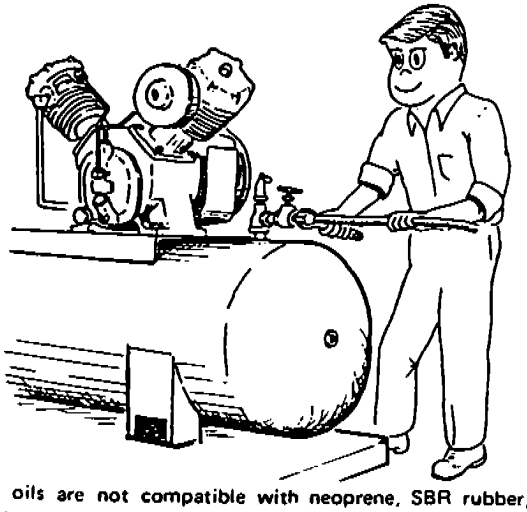
Fill crankcase to proper level with a good grade[1] of non-detergent, naphthenic base oil containing a rust and oxidation inhibitor. The viscosity should be selected for the temperature immediately surrounding the unit when it is in operation.

OIL VISCOSITY TABLE

Temp. Range	Viscosity at 100°F SSU	Centistokes
40°F - 80°F	500	110
80°F - 125°F	750	165

Note: Many automotive oils are not satisfactory. The viscosities given in the table are intended as a general guide only. Refer your specific operating condition to your industrial lubricant supplier for his recommendations.

*[1]ANDEROL 500 or 750 is approved for use in Type 30 Compressors. Anderol 500 is manufactured by Tenneco Chemicals, Inc. and is available from most I-R distributors. Keystone KSL-222 is also approved as an alternate lubricant. KSL-222 is manufactured by Keyston Division of Precision Instruments.



*These oils are not compatible with neoprene, SBR rubber, low nitrile buna N, acrylic paint, lacquer, polystyrene, PVC or ABS.

Step 9.

Connections: Check instruction book and complete the following:

Air line pipe to service valve (use flexible connection).

Condensate trap and/or manual drain valve to drain.

Electricity:

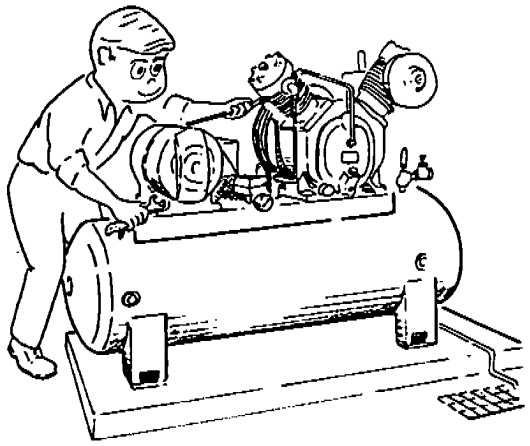
A. Compressor equipped with optional factory mounted and wired motor starter:

Wire motor starter to wall mounted fuseable disconnect switch (disconnect switch not furnished by I-R Co.).

B. Standard Compressor

Wall mount a fuseable disconnect switch and motor starter. Connect the motor power leads to the motor starter. Connect the pressure switch and/or low oil level shutdown switch in series with the motor starter control circuit. Connect the motor starter to the fuseable disconnect switch.

C. All Installations: Install on extra conductor with green insulation from the motor to the starter to the disconnect switch to ground. Wire size to be at least equal or larger than motor power leads. The motor, starter, and disconnect switch should all be grounded with this wire.

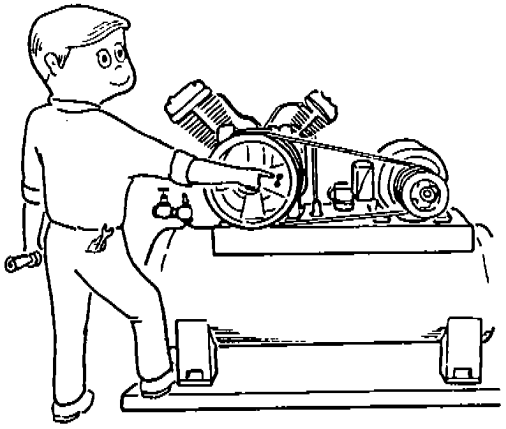


Step 10.

Turn compressor over several times by hand to check free operation.

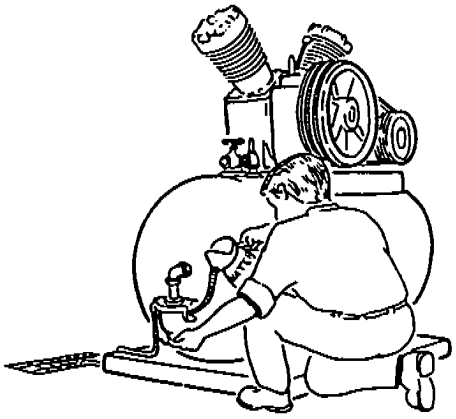
Step 11.

Check belt tension and adjust if necessary.



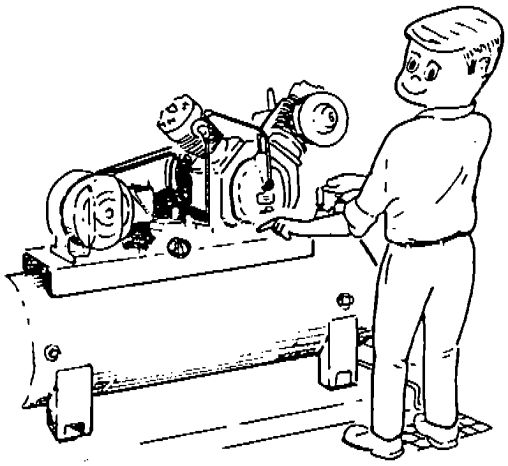
Step 12.

Check compressor rotation by flicking "Start-Stop" switch. Rotation is shown by arrow on flywheel or aftercooler housing. If rotation is incorrect, interchange two connections at starter with disconnect switch open and recheck rotation.



Step 13.

Prime condensate trap (when supplied). New auto drain valve needs no priming.



Step 14.

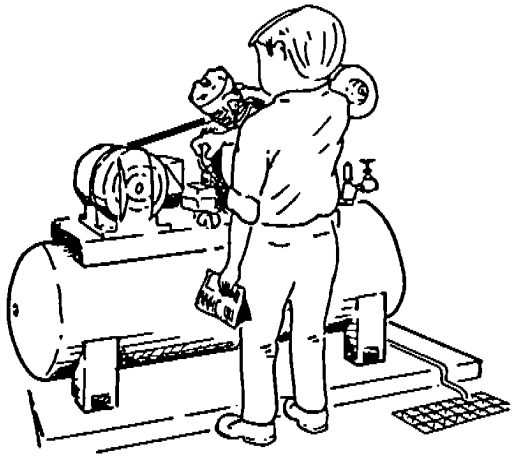
To check operation:

A. Close service valve and start compressor.

B. Allow the receiver (tank) to build up to pressure, for which you ordered the machine. At this pressure, if the unit is equipped with Automatic Start and Stop regulation, the pressure switch should cause the unit to stop. If the unit is equipped with Constant Speed Control, it should unload (run without compressing air). If the unit does not operate properly, shut down immediately.

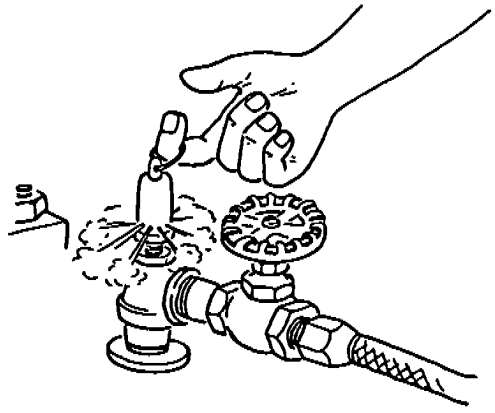
Step 15.

Open service valve and/or drain valve to let pressure in receiver drop. Note the pressure at which compressor starts or reloads.



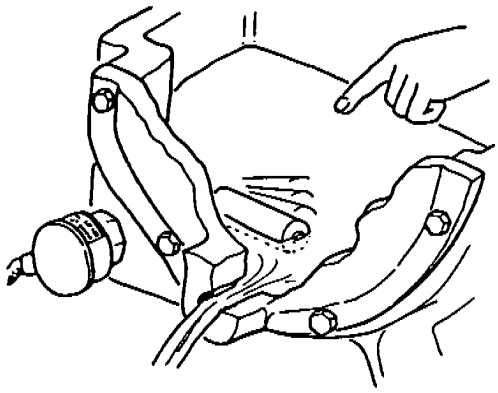
Step 16.

Adjust pressure switch on Automatic Start and Stop or Discharge Line Unloader on Constant Speed Control, if necessary. (If any adjustments are necessary, see manufacturer's instruction book.)



Step 17.

Pull ring on all safety valves to be sure they relieve and reseat. Do this several times.



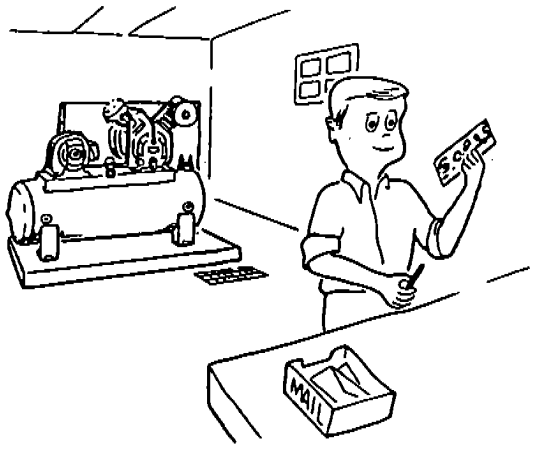
Step 18.

Compressor has been run at factory and break-in is not required. Run for about ten minutes by bleeding air from lines to let unit warm up and observe for excess vibration, any unusual noise, and verify operation of Low Oil Level Switch (if furnished) as explained in step 19 below.

Step 19.

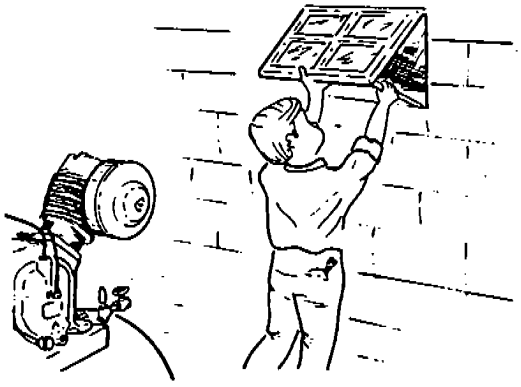
During the initial run, drain oil from crankcase into clean can until Low Oil Level Switch shuts unit down. This is a "float" type switch which sometimes gets cocked in shipping. If cocked or stuck, open disconnect switch, drain remaining oil, remove crankcase cover and then free the float. Reassemble and then reuse the same oil.

Note: If float is cocked in the low position, compressor cannot start.



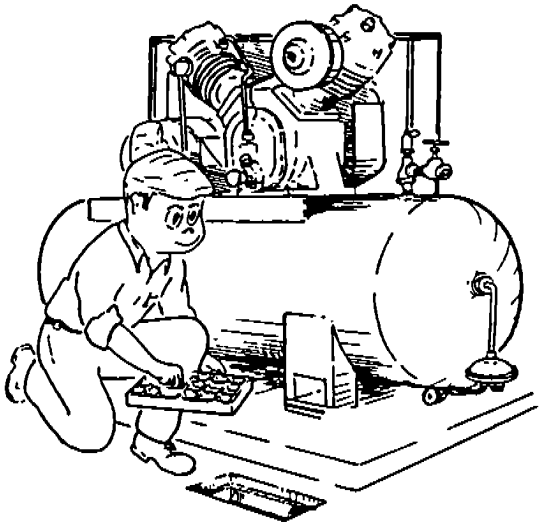
Step 20.

Complete Bonded Warranty Registration. Completion of the registration form indicates satisfactory installation and performance of start-up operations. If any defects are apparent in the equipment; contact the nearest I-R Distributor or Ingersoll-Rand District office. The I-R service literature included with the unit has instructions for minor adjustments. Minor adjustments are not considered warranty.



Step 21.

Provide adequate fresh air and exhaust ventilation from area in which compressors are located. Provide 1,000 cu. ft. fresh air per minute per 5 horsepower. Ventilation by gravity or mechanical means is approved.



Step 22.

Provide a floor drain in a nearby location for condensate drainage. A floor drain is desirable whether the compressor is equipped with an automatic condensate trap or not. All compressors will have water condensed in the receiver tank.

AIR COOLED COMPRESSOR SCHEDULED SERVICE INTERVAL

MAINTENANCE OPERATION	SERVICE INTERVAL Operating Hours/Months - whichever comes first				
	500/3	1000/6	1500/9	2000/12	2500/15
COMPRESSOR					
Air Inlet Filter - Inspect and Clean		X		X	
Frame Oil Level - Check	Weekly				
Frame Oil - Change — Petroleum Lube	X	X	X	X	X
Frame Oil - Change — Keystone or Anderol® 500	EVERY 1500 HOURS OR 12 MONTHS WHICHEVER IS FIRST *(See Note 1)*				
Compressor Valves - Inspect and Clean		X		X	
Intercooler - Clean Exterior		X		X	
Low Oil Level Switch - Check Operation	X	X	X	X	X
Operate Safety Valves	Weekly				
Clean		X		X	
V-BELT DRIVE					
Belt Tension - Check	X	X	X	X	X
MOTOR					
Motor Bearings - Check and Lubricate		X		X	
Clean		X		X	
AFTERCOOLER					
Aircooled: Clean externally Clean air flow internally		X X		X X	
Watercooled: Check discharge water temp. - 120°F max.		X		X	
Check water flow rate		X		X	
RECEIVER					
Drain Condensate - Manual Operate Safety Valves	Weekly				
GENERAL					
Tighten or check all bolts	X	X	X	X	X

Note 1: After the initial change, time between changes may be extended, *if* the condition of *both* the compressor and lubricant so indicate. Periods between changes should be increased by no more than 500 Hours over the preceding interval. The maximum period recommended for a compressor receiving adequate maintenance and located in a clean, cool, location is 8000 hours or 12 months.

Form 1FL101

Maintenance Bulletin
Bowl Kits
ISSUED: AUGUST, 1982

MAINTENANCE BULLETIN FOR BOWL KITS

1. Turn off air supply and depressurize the unit before removing any parts.
   CAUTION: Be certain that pressure is relieved on both sides of any regulator in a system.

2. Lubricators with auto fill devices require oil system shut-off and disconnection

3. Filters with automatic drains require disconnection

4. To remove the bowl, unscrew in a counterclockwise direction, until threads are completely disengaged.

5. Remove the body-to-bowl o-ring seal, and thoroughly clean the sealing surface in the body. Also check for damage in the sealing area and threads; replace the entire unit if this condition exists.

6. Place the new o-ring either onto the end of the bowl or into the groove/ledge of the body. The choice of location depends on the design of the parts. If the bowl has a slight retaining ridge on the groove edge, at the large end, put the new o-ring onto the bowl. If the body has a slight recess above the threads, put the o-ring into that groove, dry. If neither of these conditions are present, the o-ring should be placed, dry, onto the body ledge above the threads.

7. Lubricate the edge of the bowl where it will contact the o-ring before reinstalling.

   NOTE: Use only mineral based oils or grease (package supplied with kit); do not use synthetic lubricants such as esters and do not use silicone

8. Screw the bowl clockwise into the body until it reaches a positive stop; then reverse it about 1/8 turn. Metal bowls with sight gauges can be reversed about 3/4 turn to position the sight gauge as desired

9. Repressurize the assembled unit and check for leaks. If any occur, turn off the air supply, depressurize the system again and correct the leak before resuming operation.

SAFETY: TRANSPARENT BOWLS

CAUTION:

Polycarbonate bowls, being transparent and tough, are ideal for use with Filters and Lubricators. They are suitable for use in normal industrial environments, but should not be located in areas where they could be subjected to direct sunlight, an impact blow, nor temperatures outside of the rated range. As with most plastics, some chemicals can cause damage. Polycarbonate bowls should not be exposed to chlorinated hydro-carbons, ketones, esters and certain alcohols. They should not be used in air systems where compressors are lubricated with fire-resistant fluids such as phosphate ester and di-ester types.

Metal bowls are recommended where ambient and/or media conditions are not compatible with polycarbonate bowls. Metal bowls resist the action of most such solvents but should not be used where strong acids or bases are present or in salt laden atmospheres. Consult the factory for specific recommendations where these conditions exist

TO CLEAN POLYCARBONATE BOWLS USE MILD SOAP AND WATER ONLY! DO NOT USE cleansing agents such as acetone, benzene, carbon tetrachloride, gasoline, toluene, etc., which are damaging to this plastic.

Bowl guards are recommended for added protection of polycarbonate bowls where chemical attack may occasionally occur

Parker Fluidpower

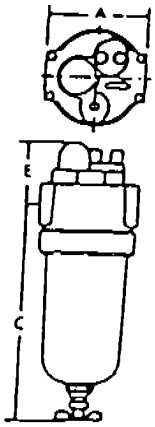
Pneumatic Division
Otsego, Michigan 49078

Form 1L201 B

MAINTENANCE BULLETIN
PARTS IDENTIFICATION LIST

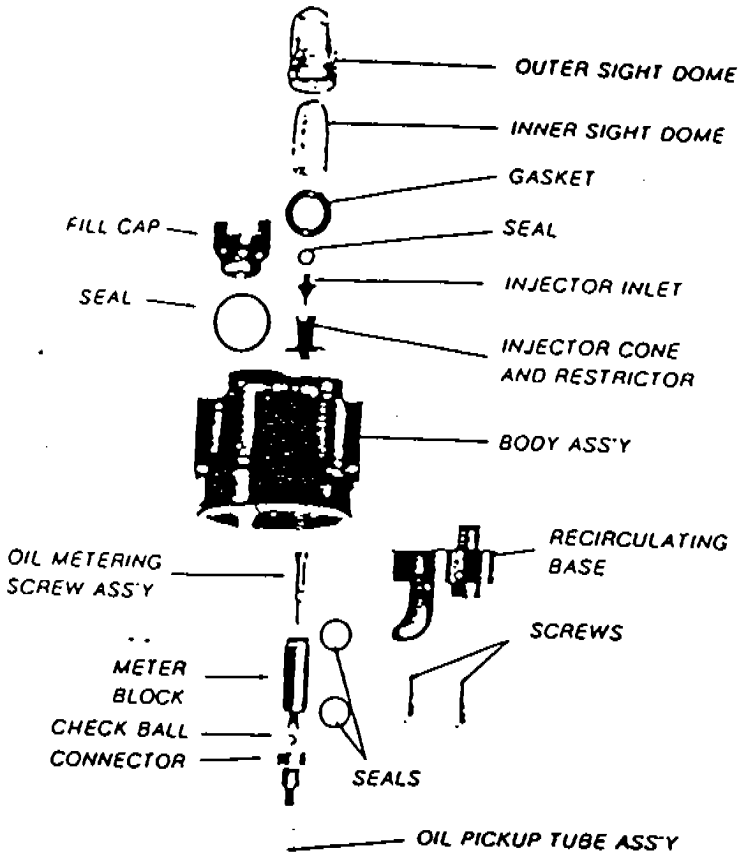
16L, 17L, (18L) MICRO-MIST LUBRICATORS

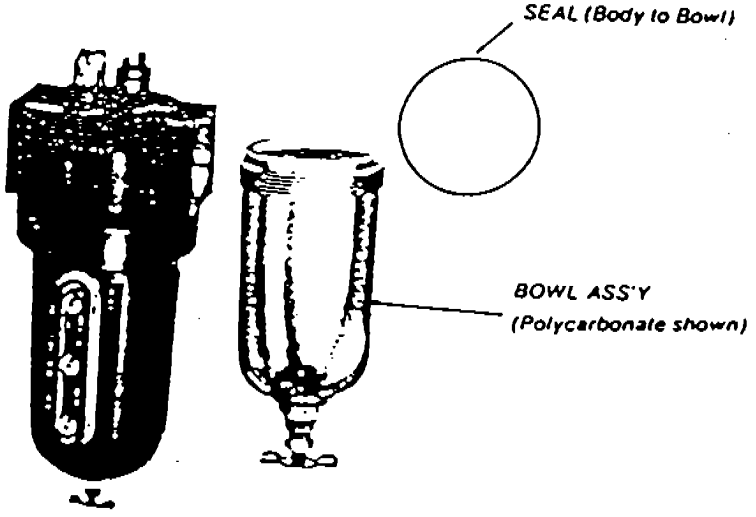
ISSUED: JUNE, 1979
Supersedes: April, 1978



Model	Port Size (NPT)	DIMENSIONS		
		A	C	E
16L	¼" - ⅜"	2.75	5.61	1.79
17L	¼" - ⅜" - ½"	3.24	6.96	1.93
17L	¼"	3.50	6.96	1.93
18L	¼" - 1" - 1 ¼" - 1 ½"	5.00	9.18	2.55

LUBRICATOR MODELS	16L	17L	(18L)
SERVICE KIT (1) SEAL (BODY TO BOWL) (1) SEAL (FILL CAP) (1) RESTRICTOR (1) SEAL (INJECTOR INLET)	PS131	PS231	PS331B
REPLACEMENT BOWL KIT (1) POLYCARBONATE BOWL WITH MANUAL DRAIN (METAL BOWL 18L) (1) SEAL (BODY TO BOWL)	PS153	PS253	PS354B





18L
(Metal Bowl)

MAXIMUM PRESSURE AND TEMPERATURE

150 psig @ 125° F (10 bar @ 52° C) with Polycarbonate Bowl
250 psig @ 175° F (17 bar @ 80° C) with Metal Bowl

Conversion 1 Bar = 14.5 psi, ° C = 5/9 (° F - 32)

INSTALLATION

1. Install LUBRICATOR so Air Flow is in direction of arrows cast on body
2. Installation should be upstream from the device it is to lubricate (valve, cylinders, tool, etc.).

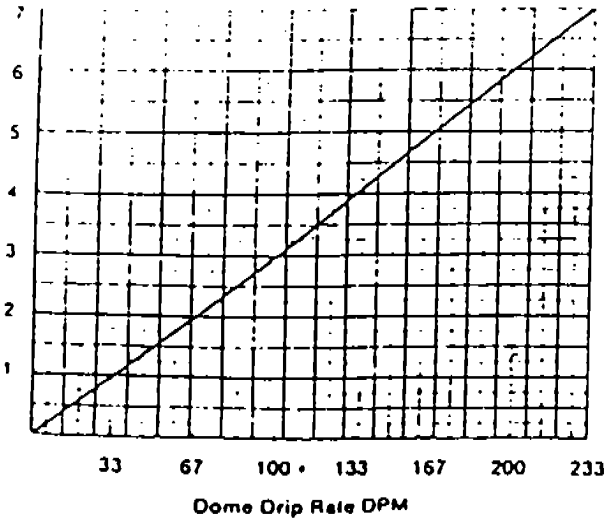
OPERATION AND SERVICE

1. FILLING — Inlet pressure must be eliminated before fill plug is removed. Fill to fill line on the bowl with oil of 100 to 200 SSU viscosity at 100° F and an aniline point greater than 200° F — same as SAE No. 10 (petroleum base hydraulic oils or spindle oils are good examples.) DO NOT USE OILS WITH ADHESIVES OR TACKY ADDITIVES. COMPOUNDED OILS CONTAINING SOLVENTS, GRAPHITE, SOAPS, OR DETERGENTS (automotive oils generally contain detergents) ARE NOT RECOMMENDED.
2. Replace the fill plug and seat firmly — excessive torque is not necessary. The lubricator is now ready for setting. Repressurize the Lubricator.
3. OIL DELIVERY ADJUSTMENT — To adjust oil delivery, use a slotted screwdriver to turn the adjusting screw in the top of the lubricator.
   Leaner — Clockwise
   Richer — Counter-Clockwise
   By counting the number of drops per minute in the sight dome, you can adjust your requirements. Approximately 3% of the drops seen in sight dome go downstream: adjust drip rate accordingly. Consult oil delivery conversion chart below.

   25 drops per minute equals one ounce per hour — Volume of oil passing through sight dome.

   NOTE: This is a constant density type lubricator which delivers a constant ratio of oil to air flow. Therefore, if air flow increases or decreases, oil delivery will be adjusted proportionately. ONLY IF A DIFFERENT RATIO IS DESIRED SHOULD YOUR NEEDLE VALVE SETTING BE CHANGED AFTER YOUR INITIAL SETTING.

Oil Delivery Conversion
3% of Drip Rate to Downstream



REMOTE-FILL LUBRICATOR

Lubricators for remote filling are equipped with a special leak-proof button head fitting for filling under air pressure. To fill the lubricator, slide the adapter over the button head fitting and pump until the oil level reaches the visible fill line. Relieve the pressure in the fill extension before disengaging the adapter to prevent oil spillage.
CAUTION: Do not attempt to disassemble remote fill while line is under pressure.

SAFETY: TRANSPARENT BOWLS

CAUTION:

Polycarbonate bowls, being transparent and tough, are ideal for use with Filters and Lubricators. They are suitable for use in normal industrial environments, but should not be located in areas where they could be subjected to an impact blow, nor temperatures outside of the rated range. As with most plastics, some chemicals can cause damage. Polycarbonate bowls should not be exposed to chlorinated hydro-carbons, ketones, esters, and certain alcohols.

TO CLEAN POLYCARBONATE BOWLS USE MILD SOAP AND WATER ONLY! DO NOT use cleansing agents such as acetone, benzene, carbon tetrachloride, gasoline, toluene, etc., which are damaging to this plastic.

They should not be used in air systems where compressors are lubricated with fire resistant fluids such as phosphate esters and di-ester types. In areas where polycarbonate bowls are exposed to high temperatures or atmospheres containing vapors or fluids which are damaging to plastic, use metal bowls.

Metal bowls resist the action of most such solvents, but should not be used where strong acids or bases are present or in salt laden atmospheres. Consult the factory for specific recommendations where these conditions exist.

Bowl guards are recommended for use with polycarbonate bowls.

ACCESSORIES CHART

Accessories listed below are available in complete units.

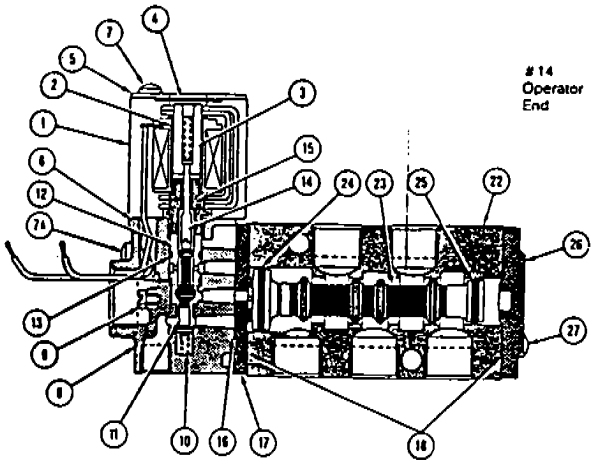
Accessory Parts	16L	17L	(18L)
Tamperproof adjustment cap	P78449	P78449	P78449
Remote pressure fill adapter kit	PS122	PS122	PS122
Bowl guard kit	PS107	PS207	N/A
Fill cap - sight dome kit	PS115	PS115	PS115
Metal bowl with sight glass kit	PS154	PS254	PS354B
Mounting bracket kit*	PS109	PS209	PS309
32 oz metal bowl with sight glass & manual drain conversion kit*	N/A	PS250B	N/A

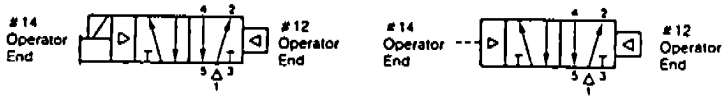
*Not supplied with units. Must be ordered separately.

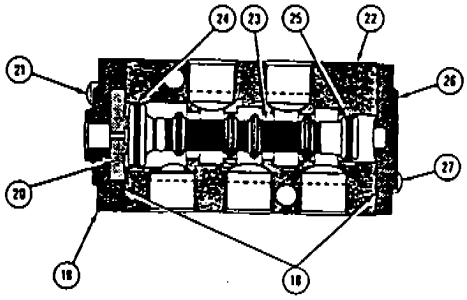
MAINTENANCE BULLETIN
FORM V-291

42 SERIES
SINGLE AIR AND SINGLE SOLENOID
SINGLE PRESSURE/DUAL PRESSURE

ISSUED: JANUARY, 1982
Supersedes: July, 1980







SINGLE OPERATOR VALVE BODY SERVICE KITS CONSISTING OF ITEMS 7A,16,18,21,23,24,25,27	Single Pressure PS2001	Dual Pressure PS2005
SOLENOID SERVICE KIT CONSISTING OF ITEMS 2, 3, 4, 6, 7, 14, 15	PS2013	
PILOT BODY SERVICE KIT CONSISTING OF ITEMS 7A, 10, 11, 12, 13, 16, 18	PS2015	

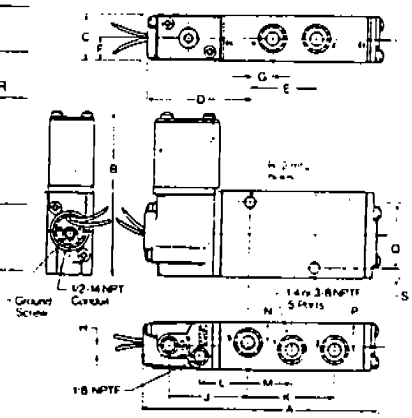
ITEM NO.	DESCRIPTION	QTY.	SINGLE SOLENOID	QTY.	SINGLE REMOTE AIR
1	Solenoid Assembly	1	L00514		
2	Guide Sleeve	1	Kit		
3	Plunger Assembly	1	Kit		
4	Override Seal	1	Kit*		
5	Solenoid Top Plate	1	PW505		
6	Seal (Solenoid to Pilot Body)	1	Kit		
7	Screws (Metric M4 x0.7-50mm)	2	Kit		
7A	Screws (Metric M4 x 0.7-50 mm)	2	Kit		
8	Pilot Body	1	N.S.S.		
9	Ground Screw	1	P202980012		
10	Spring (Poppet Return)	1	Kit		
11	Poppet Assembly	1	Kit		
12	Bore Insert	1	Kit		
13	Seals (Bore Insert)	2	Kit (*2-011)		
14	Plunger Pin	1	Kit		
15	Fixed Pole Assembly	1	Kit		
16	Seal (Pilot Body to Adaptor Plate)	1	Kit		
17	Solenoid Adaptor Plate	1	P00569		
18	Seal (Body End Seal)	2	Kit	2	Kit
19	Remote Pilot Plate			1	P00571
20	End Bumper			1	P00570
21	Screws (Metric M4 x 0.7-16 mm)			2	Kit
22	Valve Body	1	N.S.S.	1	N.S.S.
23	Spool	1	Kit	1	Kit
24	Seal (Spool Piston)	1	Kit (*2-115)	1	Kit (*2-115)
25	Seal (Spool Air Return)	1	Kit (*2-111)	1	Kit (*2-111)
26	End Cap (Air Return)	1	P00568	1	P00568
27	Screws (Metric M4 x 0.7-12mm)	2	Kit	2	Kit

*Parker Seal Size

N.S.S — Not Sold Separately.

WHEN ORDERING PARTS: Be sure to show complete Model Number of Valve involved and give complete information as to Quantity, Part Number and Part Name of items required. If ordering Solenoid Coils, be sure to give Voltage and Frequency. If NO voltage and frequency information is given, 120V - 60 Hz. Coils will be furnished

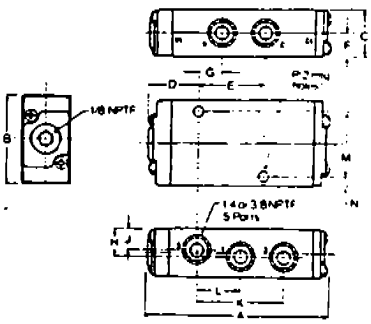
SINGLE SOLENOID



Dimensions:

	inches	mm
A	5.75	146
B	3.97	101
C	1.15	29
D	2.60	66
E	1.58	40
F	.57	14.5
G	.53	13.5
H	.25	6
J	1.96	50
K	2.10	53
L	1.21	31
M	1.05	27
N	.50	13
P	.64	16
Q	1.58	40
R	.27	7
S	.27	7

SINGLE AIR



Dimensions:

	inches	mm
A	4.40	112
B	2.13	54
C	1.15	29
D	1.26	32
E	1.58	40
F	.57	14.5
G	.53	13.5
H	.64	16
J	.50	13
K	2.10	53
L	1.05	27
M	1.58	40
N	.27	7
P	.27	7

SOLENOID COIL IDENTIFICATION AND SPECIFICATION

PART NUMBER	60 Hz	50Hz	D.C.	Class
L0051441	—	—	6VDC	B
*42	24VAC	22VAC	—	B
*45	—	—	12VDC	B
*49	—	—	24VDC	B
*53	120VAC	110VAC	—	B
*57	240VAC	220VAC	—	B
*60	—	—	120VDC	B
*61	480VAC	440VAC	—	B

INSTALLATION:

1. Valve will operate mounted in any position
2. Detailed piping and mounting dimensions are shown.
3. Side by side inline mounting, individually piped, if desired, can be made.
4. Solenoid voltage ratings are described on the nameplate. Your electrical power source must agree with this rating. The coil identification chart indicates the various voltages and hertz ratings available.
5. Check model number on valve against valve model chart. On a single pressure, dual exhaust model, pipe the supply pressure to Port "1". On a dual pressure, common exhaust model, pipe the supply pressure to Port "5" and Port "3".
   NOTE: Port "5" must always have the highest supply pressure.
6. Pilot pressure when separately supplied, should be approximately equal to inlet pressure but not less then 35 psig (2.4 bar) or more than 150 psig (10 bar).
7. Cylinder speed can be controlled by restricting the exhaust port of the valve with flow controls.
   CAUTION: Do not close off exhaust ports.
8. To obtain maximum valve life with a minimum of maintenance, it is necessary that filtered and lubricated air be used.

MAINTENANCE HINTS & TROUBLE SHOOTING:

VALVE NOT SHIFTING COMPLETELY:

1. Be sure supply pressure is 35 psig or greater at the valve during shift.
2. Check for possible restrictions in air supply, such as, sharp bends, and undersized hose fittings.
3. Check spool for smooth movement.
4. Check seals and gaskets for proper installation, dirt, and damage.

SLOW AIR LEAKAGE THROUGH EXHAUST PORTS:

1. Check for internal leakage in the cylinder being operated by the valve.
2. Check condition of seals on spool and the valve body bore.
3. Check condition of seal on poppet assembly and their mating surfaces in the pilot body.
4. Check for missing, damaged, or incorrectly assembled seals and o'rings.

NOISY SOLENOID:

1. Check voltage and pressure.
2. Inspect fixed pole assembly and plunger assembly for nicked and damaged mating surfaces and dirt.
3. Replace damaged fix pole assembly/plunger assembly with new fixed pole assembly/plunger assembly.

VALVE SERVICE PROCEDURES:

CAUTION: Always shut off air supply, and bleed off trapped pressure in the valve. For solenoid operated valves, turn off electrical power source.

PREPARATION: Lightly lubricate all rubber soft goods (o'rings, gaskets, spool seals) found in the service kits. Use a non-detergent hydrocarbon base oil or grease, (preferably grease). This lubrication will retain seals and gaskets in piston for easier reassembly.

CAUTION: DO NOT use synthetic oils such as esters or fire retardant type compressor oils.

SERVICING VALVE BODY:

1. Single Air Pilot Valve: Remove both air pilot operator (item #19), and air return operator (item #26) from valve body by loosening the end mounting screws (item #21 and #27).
2. Solenoid Operated Valve: Remove end mounting screws (item #7A), pilot body (item #8) and solenoid (item #1) as an assembly. The adaptor plate (item #17) and the two gaskets (item #16 and #18) must also be removed.
3. Remove the spool assembly (item #23) and thoroughly clean the valve body internally of all dirt and contamination.
4. Inspect the valve body bore surface for nicks, voids, pits, and deep scratches.
5. Assemble spool o'rings (item #24 and #25) to spool (item #23) found in valve body service kit, and install into valve body bore.
6. Attach air return operator (item #26) to #12 end of valve body with mounting screws (item #27) and tighten to (30 to 40 in. lbs.).
   NOTE: Locate seal and cover to permit pilot hole in body to mate with hole in seal and slot in cover.
7. Air Pilot Valve: Attach air pilot operator (item #19) to #14 end of valve body with mounting screws (item #21), and tighten to (30 to 40 in. lbs.).
8. Solenoid Operated Valve: Insert mounting screws (item #7A) into pilot body. This will assist you in positioning the pilot body to adaptor gasket (item #16), the adaptor plate (item #17), and the adaptor plate to body gasket (item #18), for easier mounting to the valve body.
   NOTE: All four (4) parts must have correct alignment in relationship with the pilot hole
9. Position pilot body assembly to valve body and tighten mounting screws to (30 to 40 in. lbs.)
10. Turn on air supply (For solenoid operated valve; turn on electircal power source). Check valve for proper function and for internal and external air leakage.

SERVICING SOLENOID SECTION:

1. For ease of repair, suggest removing pilot body and solenoid as an assemly, by loosening the two mounting screws (item #7A).
2. Remove solenoid coil by loosening the two top mounting screws (item #7) and lifting solenoid from pilot body. Discard guide sleeve (item #2), plunger assembly (item #3), override seal (item #4), solenoid to pilot body seal (item #6), and mounting screws (item #7).
3. Remove fixed pole assembly (item #15) by turning counter-clockwise until threads are disengaged, and plunger pin (item #14).
4. Replace plunger pin (Item # 14), and reassemble fixed pole assembly (item #15) to pilot body by turning clockwise and torque to (30 to 40 in. lbs.).
   CAUTION: DO NOT exceed torque specifications. This could cause severe damage to the pilot body poppet seating ledge, and valve malfunction.
5. Replace solenoid to pilot body seal (item #6), guide sleeve (item #2) by resting on fixed pole assembly, plunger assembly (item #3) by setting inside guide sleeve.
6. Mount solenoid coil over guide sleeve. Replace override seal (item #4), and attach solenoid top plate (item #5), with mounting screws (item #7) and tighten solenoid to pilot body to (30 to 40 in. lbs.).
7. Before attaching pilot body to valve body, refer to #8 NOTE: under Servicing Valve Body. Insert mounting screw (item #7A) into pilot body. Position pilot body to adaptor gasket (item #16), the adaptor plate (item #17), the adaptor plate to body gasket (item #18), and attach to valve body by turning mounting screws to (30 to 40 in. lbs.).
8. Turn on air supply (for solenoid operated valve; turn on electrical power source). Check valve for proper function and for internal and external air leakage.

SERVICING PILOT BODY:

1. For ease of repair, suggest removing pilot body and solenoid as an assemly, by loosening the two mounting screws (item #7A).
2. Remove solenoid coil by loosening the two top solenoid mounting screws (item #7) and lifting solenoid from pilot body.
   CAUTION: DO NOT drop or damage plunger assembly.
3. Remove fixed pole assembly (item #15). Refer to item #3 for servicing solenoid section. Remove plunger pin (item #14), bore insert (item #12), poppet assembly (item #11), and poppet return spring (item #10).
4. Thoroughly clean pilot body bore surfaces and inspect for nicks, voids, pits, and deep scratches.
5. Install poppet return spring (item #10), poppet assembly (item #11). Assemble bore insert seals (item #13) to bore insert (item #12), then install.
6. Replace plunger pin (item #14), and reassemble fixed pole assembly (item #15) to pilot body by turning clockwise and torque to (30 to 40 in. lbs.).
   CAUTION: DO NOT exceed torque specifications. This could cause severe damage to the pilot body poppet seating ledge, and valve malfunction.
7. Before attaching solenoid, suggest inspecting the guide sleeve (item #2) for excessive wear, and the plunger assembly (item #3) for battered and flared metal conditions. If items appear in this described condition, they should be replaced before reassembly of the solenoid.
8. If conditions are not noted, proceed with mounting solenoid by tightening screws to (30 to 40 in. lbs.).
9. Before attaching pilot body to valve body, refer to #8 NOTE: under Servicing Valve Body. Insert mounting screws (item #7A) into pilot body. Position pilot body to adaptor gasket (item #16), the adaptor plate (item #17), the adaptor plate to body gasket (item #18), and attach to valve body by turning mounting screws to (30 to 40 in. lbs.).
10. Turn on air supply (for solenoid operated valve; turn on electrical power source). Check valve for proper function and for internal and external air leakage.

OPERATING TEMPERATURE & PRESSURE.
Ambient operating temperature, 0°F to 160°F (-18°C to 71°C)
Operating pressure, 35 to 150 psig (2.4 to 10 bar)

900 410

INSTRUCTION MANUAL

FOR

ROBISTAT

SOLID STATE MOTOR STARTERS

I. DESCRIPTION

Robistat is a solid state, reduced voltage starter for induction motors. The mode of operation is current regulation allowing constant accelerating KVA, constant current and stepless accelerating torque. An accelerating current is set with a simple screwdriver adjustment. Factory setting is 300% of full load current. The standard Start/Stop circuit is established with external pushbuttons. Optional field wiring provides the Jog circuit.

Standard Robistat starters also offer a selectable jumper for conversion to a voltage ramp mode of operation. In this mode, the voltage is ramped from 0% to 100% over a selectable time period. Voltage ramp mode provides a soft start, but also insures that the motor can develop full starting torque if required. However, current is not limited in this mode of operation.

II. OPERATION

Each Robistat contains six SCR thyristors in a full wave power circuit, therefore it contains no moving parts to wear out. By automatically advancing the firing angles of the SCR and controlling the inrush current a reduced voltage start is accomplished. Advancement of the firing angles is determined by the motor loading and current limit setting. After completing acceleration, Robistat will supply full load motor running current at a full voltage sine wave. The power amplifier provides maximum torque per amp and also eliminates the potentially damaging DC voltage stresses produced by a 3 SCR, 3 diode starter in the off state.

Basically the six silicon controlled rectifiers in a full wave configuration are phase controlled from 0 to 180 degrees of full sine wave, therefore controlling the power needed to turn on the motor. As shown in Figure 1, the gates of the SCR's are fired from the driver board. In the current limit mode the feedback signal measured by the current sensors is combined with the current limit setting and compared to a reference signal, determining the advancement of the firing angle. In the voltage ramp mode of operation, the advancement of the firing angle is determined by the selectable time setting with no current limit capability.

When the Start pushbutton is depressed, a relay mounted on the driver board picks up, and with the control of the trigger circuit combined with the feedback signal, starts the advancement of the firing angles of the power bridge circuit. As the motor comes up to full running speed the feedback signal falls to a low value, causing the amplifier to saturate, thus applying a full voltage sinewave to the motor.

900 410

ROBISTAT SOLID STATE STARTER

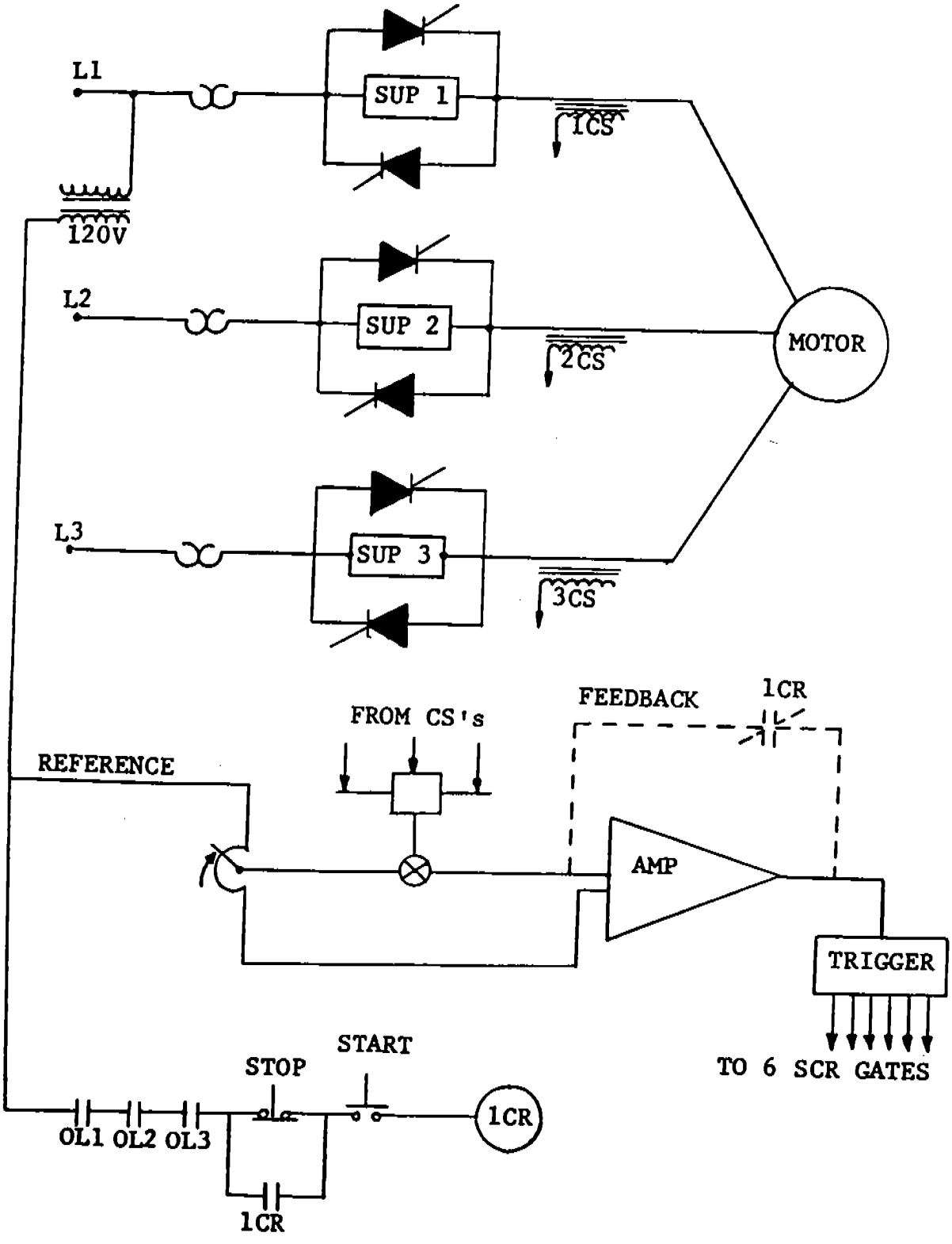


FIG. 1

III. CONSTRUCTION

Robistat solid state motor starters are set up in a manner that enables the user to remove any of the three power modules or driver board quickly and easily. This insures quick replacement with less down time. The driver boards for all size starters are completely interchangeable. All Robistat starters offer optional interlocking to the cabinet door to prevent access to the starter without turning off the power.

IV. OVERLOAD CAPACITY

Every Robistatsolid state starter contains SCR's which are rated at least 2.5 times the line to line voltage. They also contain voltage suppressors to prevent any damage to the SCR's due to line transients. The SCR's are also chosen with very conservative ratings.

A. Operating Overload Capacity (% Full Load Current)

115% continuous

250% for 1 minute

300% for 30 seconds

450% for 5 seconds

IX. PROCEDURE TO CHANGE CURRENT LIMIT SETTING

A. Use either a clamp on RMS ammeter or a current transformer and an RMS ammeter.

B. Clamp the ammeter around one phase of the incoming power line to the starter or around one of the power lines to the motor. If a current transformer is used for the calibration, insert one of the leads to the motor through it and reconnect the lead to the terminal connector. Connect an ammeter across the terminals of the current transformer.

C. Turn the current limit pot fully counterclockwise. Press the start pushbutton and slowly turn the current limit pot clockwise while watching the ammeter. The current shown on the ammeter will increase to a maximum value as the motor accelerates, but as it reaches full running speed the current will decrease to the running current. The maximum value of current reached is the limit setting. To increase the current limit, turn the pot clockwise. Stop and start the motor while observing the ammeter. Set the current limit to the desired value.

CAUTION! Thermal overloads may not protect starter if current limit is set above 300% of rated motor current.

V. STANDARD SPECIFICATIONS FOR ROBISTAT AC STARTERS

A. AC supply voltage 208, 240, 480 volts AC, 3-phase, 60 cycle, ± 10%. (Option 380, 415V AC, 3-phase, 50 Hz)

B. Type of Load - AC induction motor

C. Power Bridge - 6 SCR-full wave control

D. Ambient Temperature - 0° - 40°C operating range
-35° - 65°C storage

E. Control Adjustments - Current Limit - 50% - 450% of FLA
Voltage Ramp - 2 to 8 seconds

F. Transient Voltage Suppression - Suppressor protects against high potential transient voltage spikes.

G. SCR Peak Inverse Voltage:

Line Voltage	SCR Rating
208, 230V	600V
480V	1200V
575V	1500V

H. Overload Capacity:

Continuous - 115% of FLA
1 minute - 250% of FLA
30 seconds - 300% of FLA
5 seconds - 450% of FLA

I. Options Available:

1. Input circuit breaker
2. Isolation contactor
3. By-pass contactor
4. Shorted SCR detector
5. Electronic fuse

B. Overload Ratings

HP Rating	Current Ratings (Amps RMS)				
480V	115%	250%	300%	450%	Part No.
3Ø 60Hz	Continuous	For 1 Min.	For 30 Sec.	For 5 Sec.	430 XXX
5	7	15	18	27	355
7.5	10	23	27	41	357
10	14	30	36	54	301
15	21	45	54	81	365
20	28	60	72	108	365
25	35	75	90	135	375
30	42	90	108	162	303
40	55	138	144	216	304
50	69	150	180	271	305
60	83	180	217	325	306
75	104	226	271	406	307
100	138	300	360	541	310
125	173	376	451	677	312
150	208	451	541	812	315
200	277	601	722	1083	320
250	346	751	902	1353	325
300	415	902	1083	1624	330
400	553	1203	1443	2165	340
450	623	1353	1624	2436	345
500	692	1504	1804	2706	350

CURRENT RATINGS FOR SOLID STATE STARTERS ARE SHOWN. EXCEEDING THESE RATINGS MAY DAMAGE THE STARTER. AT MAXIMUM CURRENT RATINGS, STARTING DUTY SHOULD NOT EXCEED FOUR EQUALLY SPACED STARTS PER HOUR.

X. AC MOTOR STARTERS

A. Maintenance

1. Be sure to leave enough air space on bottom and sides of cabinet so as not to block air from entering and leaving the cabinet interior (for air cooled models).

2. Do not abuse driver board or starter.

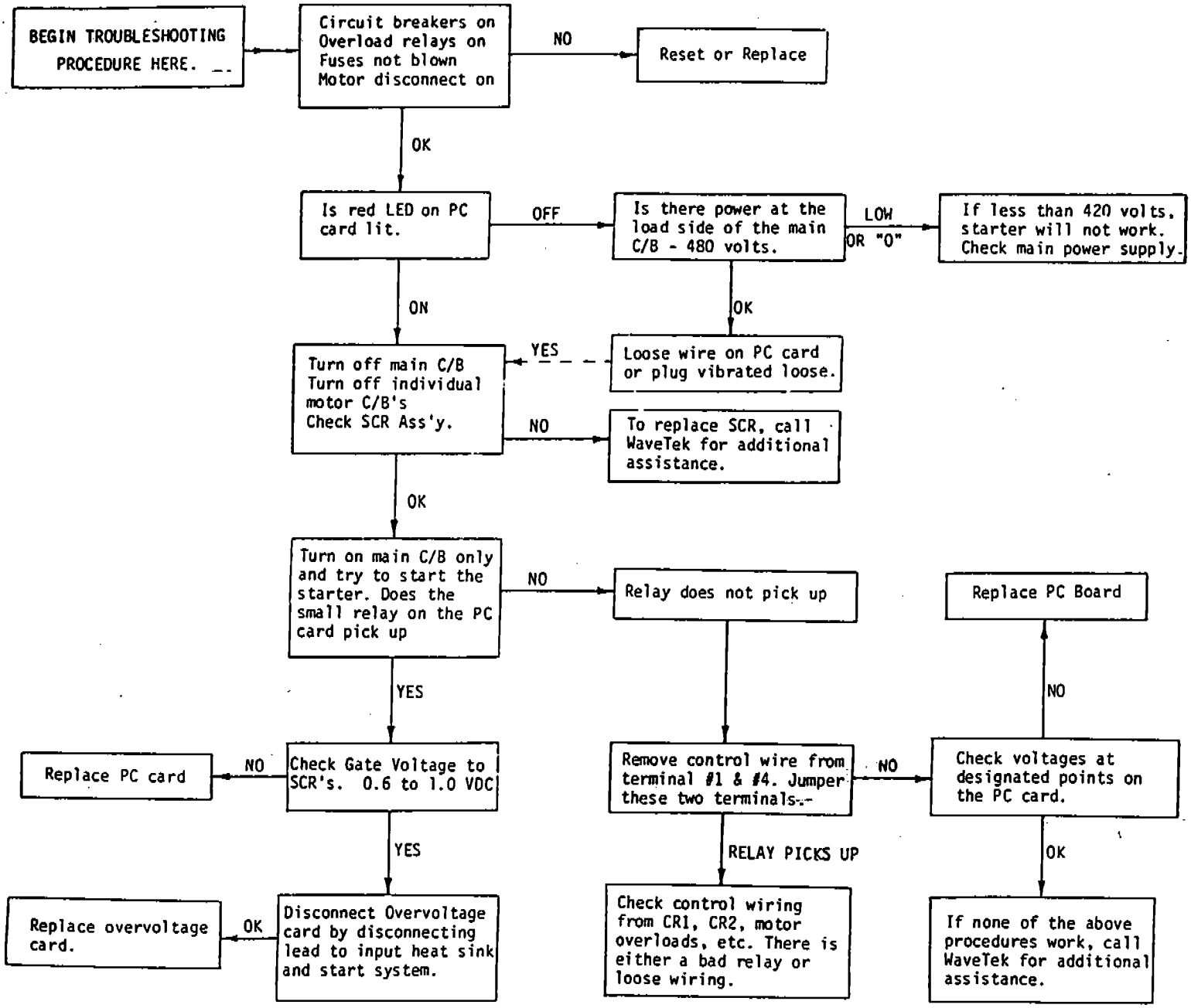
3. Periodically tighten power connections. Through time and vibration they may become loose and cause poor performance.

4. Periodically clean filters (for air cooled models with filters).

5. Keep starter clean. Accumulation of dust and dirt on heat sinks may result in poor heat transfer of the heat sinks.

TROUBLESHOOTING CHECK LIST
MOTORS WILL NOT START OR OVERLOADS TRIP OR MOTORS VIBRATE
(6SCR STARTER)

WARNING: SERVICING SHOULD BE PERFORMED BY ONLY *QUALIFIED* PERSONNEL. TROUBLESHOOTING WITH THE POWER TURNED-ON IS DANGEROUS BECAUSE OF POSSIBLE ELECTRIC ARCING, BURN OR SHOCK. — REMAIN ALERT!



SCR Check

1. Turn off main C/B
2. Turn off each motor C/B
3. Multi-meter on resistance X1 scale.
4. Place leads on input & output of starter.
5. Apply test leads one direction and then in the opposite direction. It should read open in both directions.
6. If the circuit is closed, there is a defective SCR. Call for additional assistance.

SOF-START POWER MODULE AND PC BOARD CHECKOUT PROCEDURE

1. Make sure power is off.

2. Set ohmmeter to R x 1 scale.

3. Remove insulating cover in front of starter. Go to first module. Attach one lead to input on (lower) heat sink.

4. Then attach the other lead to the top heat sink. The circuit should read open. If it reads a short circuit, the SCR should be replaced. (Be sure all circuit breakers are off.)

5. With one lead still on the lower input heat sink, attach the other to the bottom output heat sink. Repeat observations of Step #4.

6. Take the leads of the ohmmeter and place one on the terminal corresponding to the red wire and the other to the terminal corresponding to the green wire. This reading should be between 10 - 40 ohms.

7. Repeat Steps #3 - 6 for the other two modules.

8. Now apply power.

9. Observe on the PC board that the red LED next to the relay should be lit. If it isn't, it indicates an undervoltage or out of phase sequence problem. If red LED comes on, go to Step #13.

10. If red LED does not come on, turn power off and switch any two lines of the incoming power. Turn power on again and check for red LED.

11. If red LED is still off, check for input undervoltage. Do this by setting a voltmeter to read 460V AC. Check all three input lines, across any two at one time.

12. If line reads 410V AC or better, the problem is with the PC board.

13. Attempt to start motor. If motor does not turn, check to see that RY1 is energized by observing the contact pick-up and a small clicking sound as attempts to start or stop are made.

14. If relay does not pick-up, check control wiring for proper connection.

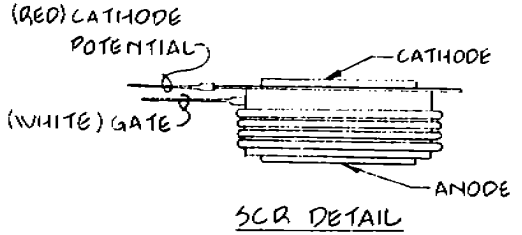
15. If relay picks up, but motor does not start, check voltage ramp (or current) pot setting. Terminal 6 - 7 is jumpered for current limit. Terminal 7 - 8 is jumpered for voltage ramp. It should be about 1/4 of a turn clockwise.

16. If it is already about 1/4 of a turn clockwise, try turning it about halfway clockwise. If motor still does not turn,the problem is problably with the PC board. (Start only one or two motors when making this test.)

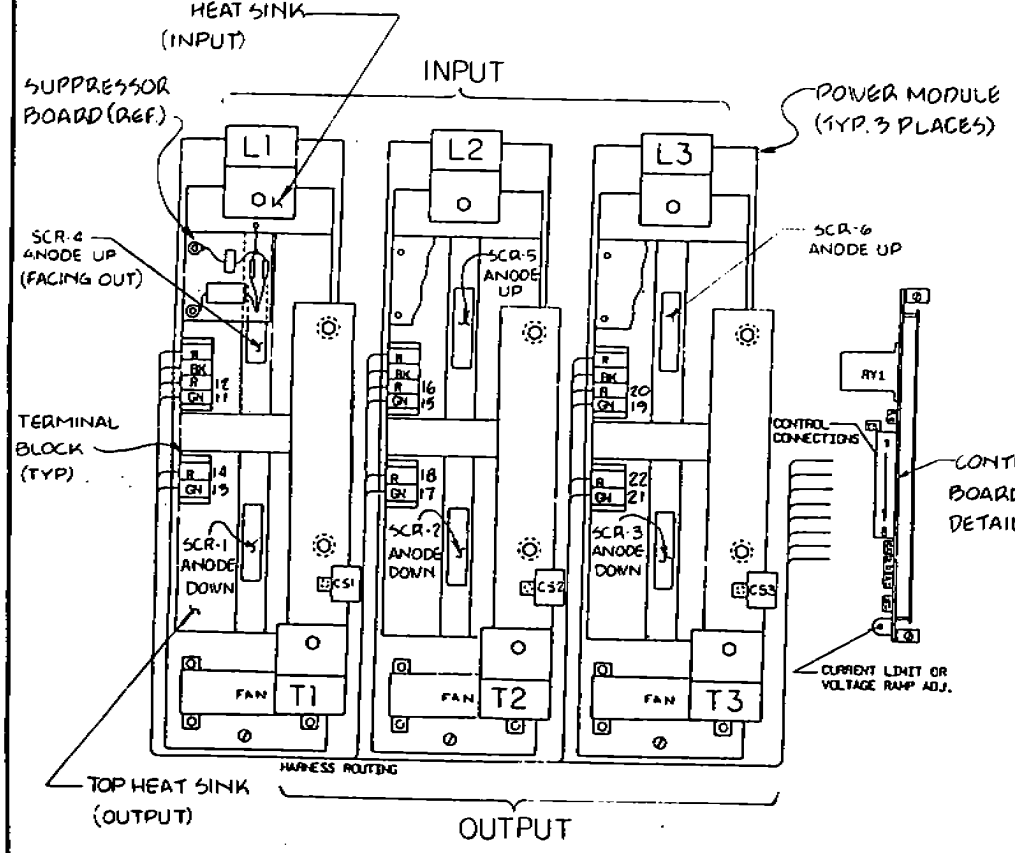
17. One last observation is to check the PC board power supplies. Set voltmeter to read at least 24V DC. Attach common to PC board ground (transformer mounting screw) and then check the +24, +10, -15 points (white dots) by touching the other lead to these corresponding points on the PC board. (Reverse leads to check -15 volts.) The PC cards are coated during manufacture, be sure to scrape the wire leads so that good contact can be made when testing.

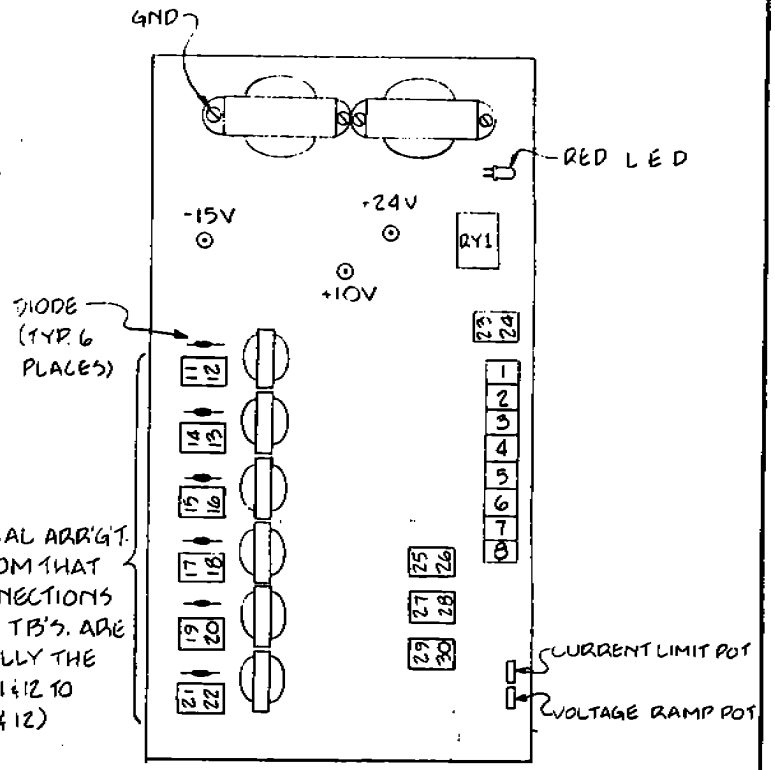
18. Check diode beside SCR gate wires-(Power off). It should read low ohms one direction - 15 to 30 ohms. It should read short circuit in other direction.

19. With power on and relay picked up, the voltage across SCR (red to white) or red to green should read 0.8 to 1.0 volts DC.



SCR DETAIL





DETAIL ~A

NOTE:
IF REPLACING SCR('S), POWER MODULE SHOULD BE REMOVED FROM PANEL & PLACED IN A HORIZONTAL POSITION. CALL WAVETEK FOR SCR TORQUE & REMOUNTING INSTRUCTIONS.

No.	REVISION	DATE	CH.	BY
4				
3				
2				
1				

DESCRIPTION: SOF-START

PROJECT: CHECKOUT PROCEDURE

WaveTek

	BY	DATE
DR.	KP	9/19/89
CH.		

SCALE: NONE

TOL. DEC.± FRACT.±

SK-91483-1

GENERAL INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

SAFETY FIRST

High voltage and rotating parts can cause serious or fatal injury. Safe installation, operation and maintenance must be performed by qualified personnel. Familiarization with and adherence to NEMA MG2, the National Electrical Code, and local codes is recommended. It is important to observe safety precautions to protect personnel from possible injury. Personnel should be instructed to:

1. Avoid contact with energized circuits or rotating parts.
2. Disconnect and lock out all power sources before initiating any maintenance or repair.
3. Act with care in accordance with prescribed procedures in handling and lifting this equipment.
4. Be sure unit is electrically grounded in accordance with code requirements.
5. Be sure equipment is properly enclosed to prevent access by children or other unauthorized personnel in order to prevent possible accidents.
6. Be sure shaft key is fully captive before unit is energized.
7. Avoid contact with capacitors until safe discharge procedures have been completed.
8. Most units are shipped without oil. Always be sure oil lubricated units are filled with correct oil to proper level before operating.
9. Provide proper safeguards for personnel against rotating parts and applications involving high inertia loads which can cause overspeed.
10. Avoid extended exposure to equipment with high noise levels.
11. Be familiar with the equipment and read all instructions thoroughly before installing on equipment.

INSPECTION AND HANDLING

Inspect unit to make sure no damage has occurred during shipment. Check Nameplate for correct speed, horsepower, voltage, Hertz and phase for conformance with power supply and equipment. **WARNING:** Units should be lifted using all eyebolts or lugs if provided. These eyebolts or lugs are provided for lifting this unit only and must not be used to lift any additional weight. Lifting angle must not exceed 15 degrees with shank of eyebolt. If not provided, eyebolts to be used must be per ASTM A489 or equivalent. All eyebolts must be securely tightened. Be careful not to touch overhead power lines with lifting equipment. Failure to observe this warning may result in serious personal injury or property damage.

STORAGE

Units should be stored indoors, in a clean, dry location. Winding should be protected from excessive moisture absorption. **NOTE:** If motors are to be stored for over one year, refer to Motors. If gear and belt transmission units are to be stored for over six months, refer to Motors.

LOCATION

Units should be located in a clean, well-ventilated area for maximum life. **WARNING:** Units should be located in a suitable enclosure to prevent access by children or other unauthorized personnel to prevent possible accidents.

MOUNTING

Mount units on a firm, flat surface sufficiently rigid to prevent vibration.

Drive belts and chains should be within recommended limits of tightness. Couplings should be properly aligned and balanced. For drive recommendations, refer to Motors. For application of drive equipment, refer to NEMA MG1.

Motors have been dynamically balanced using a half key the same length as the full key shipped with the motor. If pulley length is less than this key length, rework long key by removing one-half of excess length between pulley and end of key to maintain balance.

Do not restrict motor ventilation. Unless otherwise specified on Nameplate, motor is designed for operation in 40°C (104°F) maximum ambient temperature. **NOTE:** Motors operating under rated load and ambient conditions may feel hot when touched; this is normal and should not be cause for concern. When in doubt, measure frame temperature and confer with nearest office. Standard grease lubricated units can be operated in minimum ambient of -30°F. Special lubricants are required for temperature outside this range.

If unit has been stored in a damp location, dry out thoroughly before operating.

WARNING: Guards should be provided for all exposed rotating parts to prevent possible personal injury. Keep fingers and foreign objects away from ventilation and other openings. Applications involving HIGH INERTIAL LOADS may damage this equipment due to motor overspeed during shut down. Such application should be referred to Motors.

CAUTION: Do not force drive coupling or other equipment onto shaft, as bearing damage may result.

POWER SUPPLY AND CONNECTIONS

The power supply must agree with values on Nameplate. Terminal voltage should not vary more than ±10% of Nameplate voltage at rated frequency. Unbalanced line voltage, even a small amount, will cause overheating. Do not exceed the continuous rated operating current on the Nameplate. Starting controls and overload protection should be properly sized in accordance with the National Electrical Code and the control manufacturer's recommendations.

Motor connections should be made by following instructions on connection diagram. Determine direction of rotation before connecting driven equipment. Note direction of rotation label if supplied. Rotation may be reversed on three phase motors by interchanging any two line connections. On two phase motors, interchange A-1 and A-2; and on single phase motors interchange leads per connection diagram on motor. Wiring of units, controls and grounding shall be in accordance with local and National Electrical Code requirements. **WARNING:** Failure to properly ground unit may cause serious injury to personnel. Where unexpected starting could be hazardous to personnel, do not use automatic reset starting devices.

OIL LUBRICATION

Most oil lubricated units are shipped without oil. Add oil of the correct viscosity for the ambient temperature, per Nameplate on unit, to proper level.

Make certain an oil with mild EP additives is used on wormgear units.

Refer to Nameplate or Lubrication Instruction Plate for oil viscosity and oil change interval. WARNING: For applications in the food and drug industry (including animal food), consult the petroleum supplier for lubricants that are acceptable to the Food and Drug Administration and other governing bodies.

MAINTENANCE

Inspect units at regular intervals. Keep units clean and ventilation openings clear of dust, dirt or other debris. Lubricate units per this operating instruction folder and instruction plate on unit. Excessive lubrication may damage the unit. Do not over grease! WARNING: Disconnect all power sources to the unit and discharge all parts which may retain an electrical charge before attempting any maintenance or repair. Screens and covers must be maintained in place when unit is in operation. Motor for use in hazardous locations – class I & II Installation: Repairs of these motors must be made by the manufacturer or authorized service station approved by the manufacturer and U.L. to maintain the U.L. Listing. The U.L. Listing applies to the electrical motor only and not to the belt or gear transmissions or other devices that may be connected to the motor.

VARIDRIVE® UNITS

Do not turn control wheel while unit is not operating as this may cause damage to the unit. Handwheel position is a relative speed indication only. Use direct speed sensing accessory for precise speed indication. Units equipped with electric remote speed indicator accessory are not calibrated at the factory and must be calibrated at site. Refer to calibration instructions with meter.

VARIDRIVES equipped with ENDOLUBE® construction do not require lubrication of the sliding Varidiscs and do not require weekly operation through speed range.

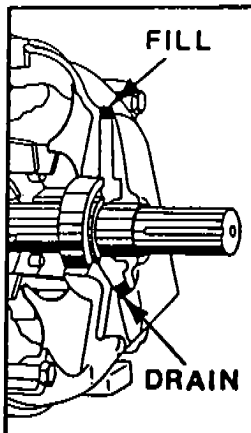
VARIDRIVES equipped with splined shafts require monthly lubrication for 8 hour/day service, and semi-monthly for 24 hour/day service. (For complete instructions for entire drive, refer to the lubrication instruction plate on unit.) Operate VARIDRIVE through its entire speed range weekly. WARNING: Do not force control wheel beyond speed limits shown on Nameplate. The mechanism and belt are designed for the rated speed and horsepower shown on the Nameplate. Operation beyond these limits may result in damage to the belt and mechanism and possible injury to personnel. The covers on the frame case must not be removed or left off while unit is in operation. Do not attempt to disassemble or repair the driven pulley discs as high spring force may be released, causing injury to personnel. Refer to authorized Service Center. Refer to VARIDRIVE Installation and Maintenance Manual for compalete belt changing instructions.

LUBRICATION INSTRUCTIONS

Some small motors have sealed-for-life bearings which require no relubrication. Regreasable bearings are shipped with a high quality, wide temperature-range grease in the bearings.

Motors can be regreased by stopping the motor, removing drain plug and pumping new grease into fillhole. Run motor with drain plug removed to discharge excess grease. Replace drain plug.

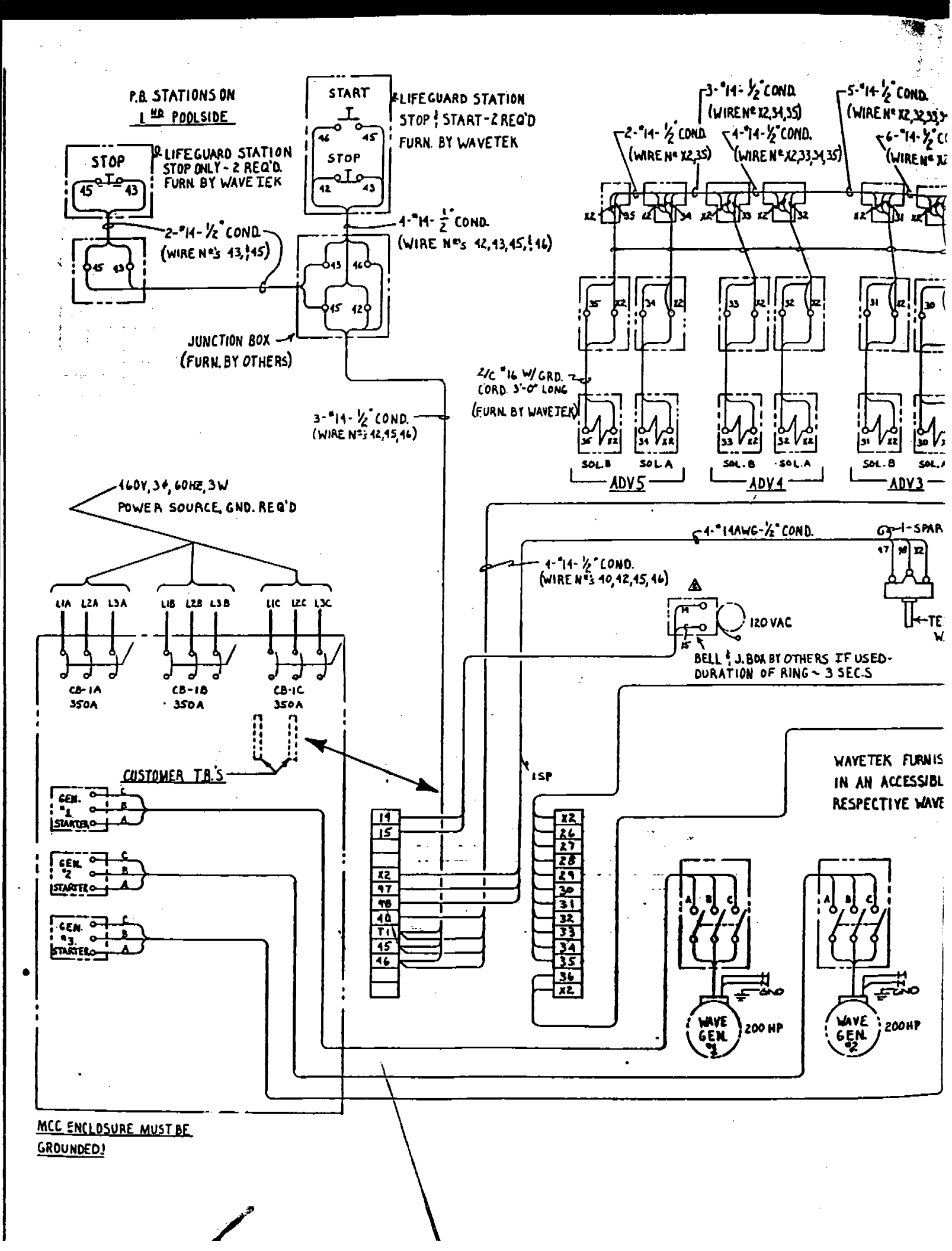
Units that operate at speeds greater than 1800 RPM should be lubricated on a more frequent maintenance schedule depending on duty cycle. Use a low pressure grease gun and avoid overgreasing.

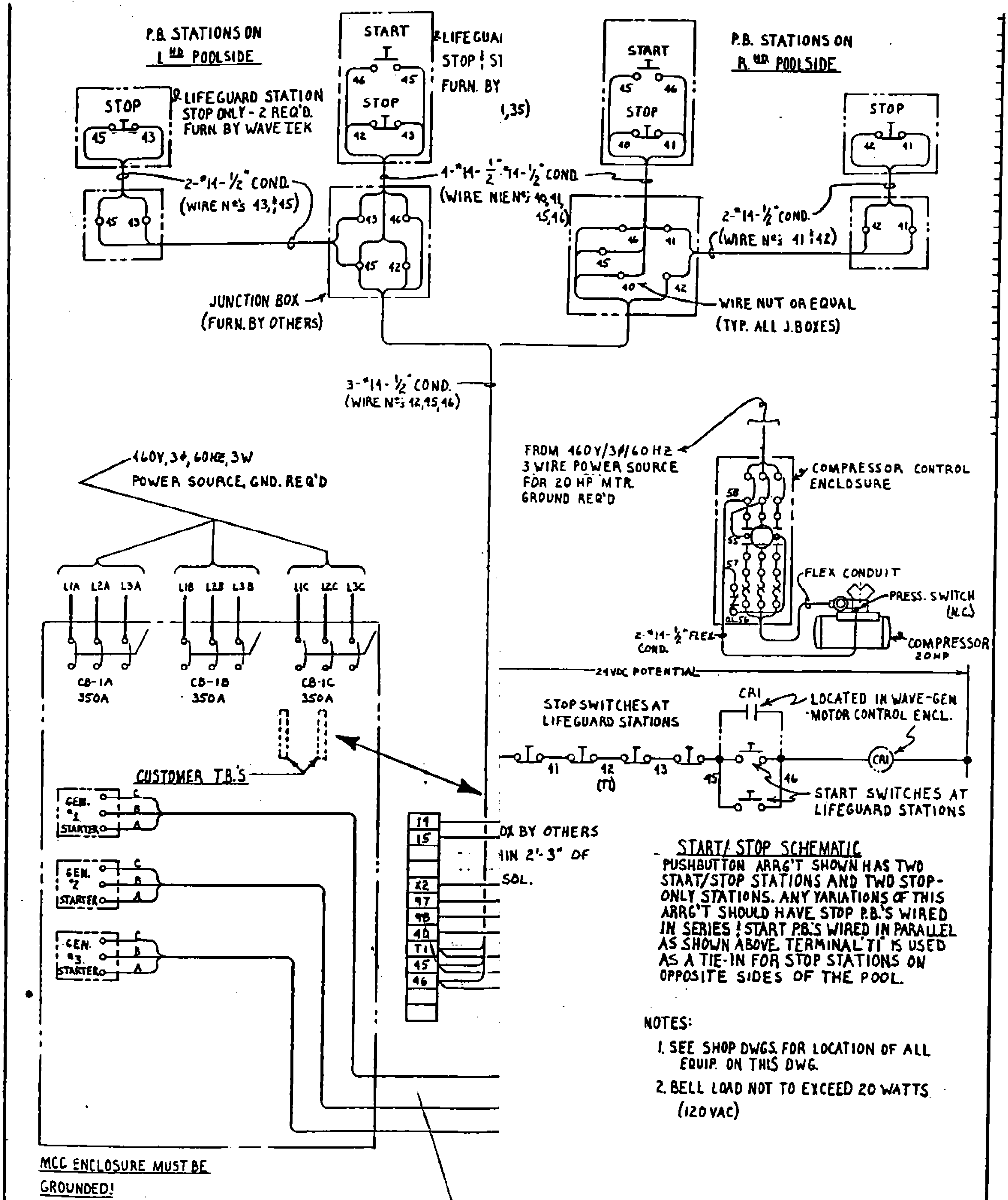


SUGGESTED REGREASING INTERVALS			
SERVICE	MOTOR HORSEPOWER		
	UNDER 50	50-100	100 Up
A	1-2 Yrs.	1-2 Yrs.	1 Yr.
B	1 Yr.	1 Yr.	6 Mos.
C	1 Yr.	6 Mos.	3 Mos.
D	4 Mos.	3 Mos.	3 Mos.

SERVICE SYMBOL	TYPES OF SERVICE
A	Infrequent operation or light duty in clean atmosphere.
B	8-16 Hrs/Day in clean, relatively dry atmosphere.
C	12-24 Hrs/Day, heavy duty, or if moisture is present.
D	Heavy duty in dirty, dusty locations; high ambients; moisture laden atmosphere; vibration.

WaveTek


P.B. STATIONS ON 1ST POOLSIDE
STOP
45
43
LIFEGUARD STATION STOP ONLY - 2 REQ'D. FURN. BY WAVETEK
2-#14-½" COND. (WIRE Nos 43,45)
START
STOP
46
45
42
43
LIFEGUARD STATION STOP & START - 2 REQ'D FURN. BY WAVETEK
4-#14-½" COND. (WIRE Nos 42,43,45,46)
JUNCTION BOX (FURN. BY OTHERS)
3-#14-½" COND. (WIRE Nos 42,45,46)
3-#14-½" COND. (WIRE Nos X2,34,35)
2-#14-½" COND. (WIRE Nos X2,35)
4-#14-½" COND. (WIRE Nos X2,33,34,35)
5-#14-½" COND.
6-#14-½" C
2/C #16 W/GRD. CORD. 3'-0" LONG (FURN. BY WAVETEK)
SOL.B
SOL.A
ADV5
ADV4
ADV3
460V, 3Φ, 60HZ, 3W POWER SOURCE, GND. REQ'D
L1A L2A L3A
L1B L2B L3B
L1C L2C L3C
CB-1A 350A
CB-1B 350A
CB-1C 350A
CUSTOMER T.B.'S
GEN. #1 STARTER
GEN. #2 STARTER
GEN. #3 STARTER
4-#14AWG-½" COND.
4-#14-½" COND. (WIRE Nos 40,42,45,46)
1-SPAR
120 VAC
BELL & J.BOX BY OTHERS IF USED-DURATION OF RING ~ 3 SEC.S
ISP
WAVETEK FURNIS
IN AN ACCESSIBL
RESPECTIVE WAVE
WAVE GEN #2
200 HP
WAVE GEN #2
200HP
MCC ENCLOSURE MUST BE GROUNDED!



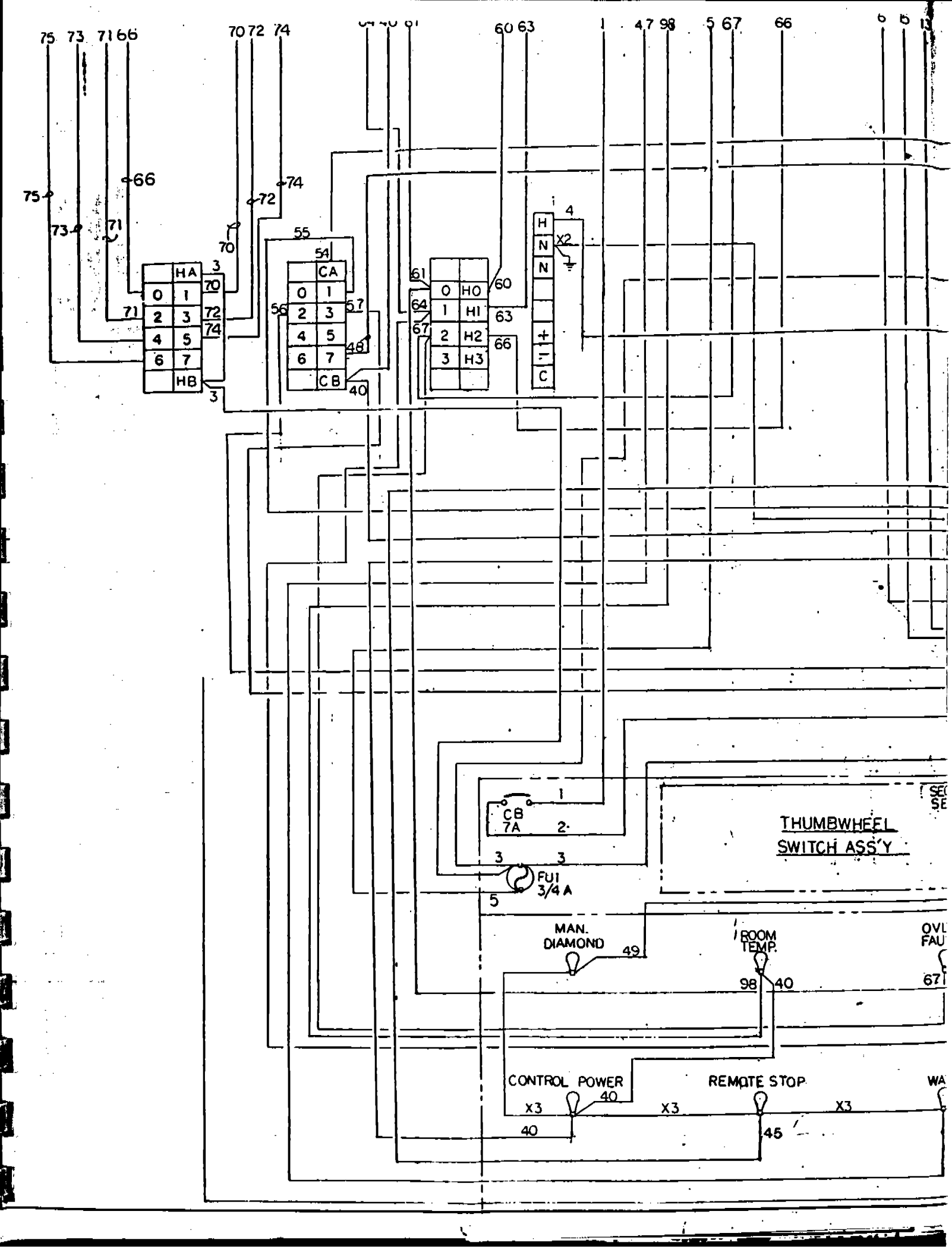
DESCRIPTION: VARAWAVE INTERCONNECTION

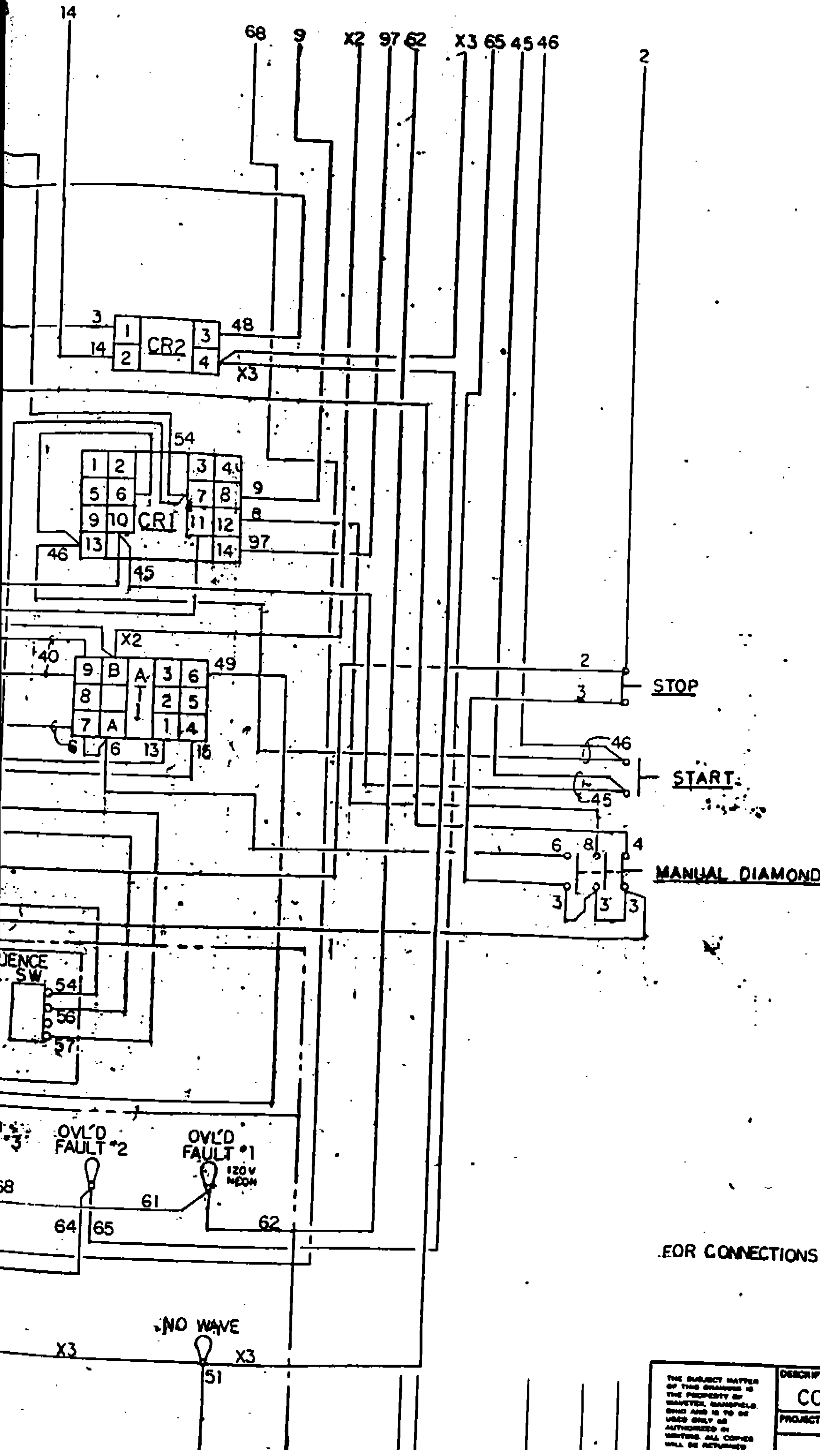
PROJECT: LARSONS

WaveTek

DR. MS. 1/16/86

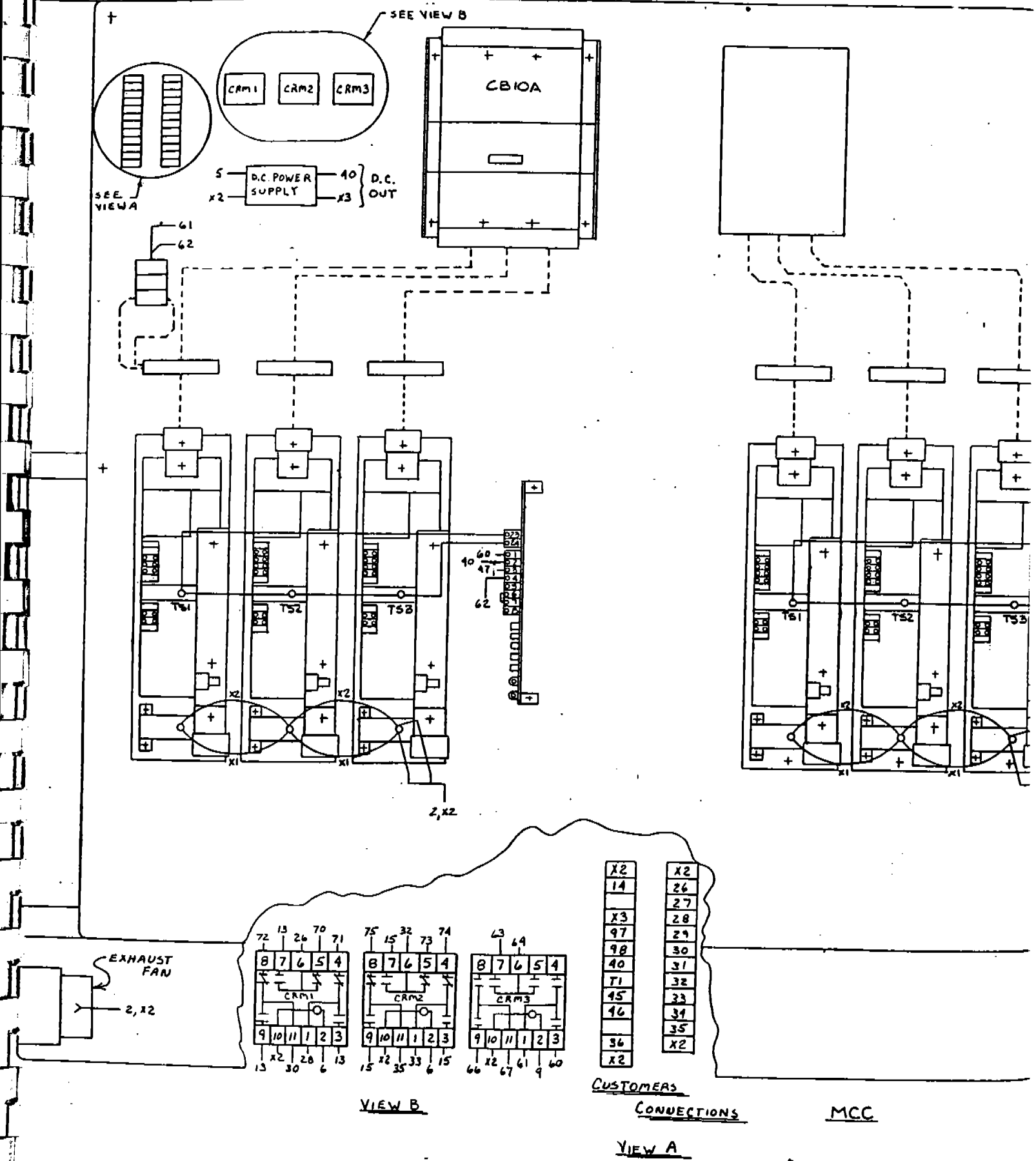
C 4163

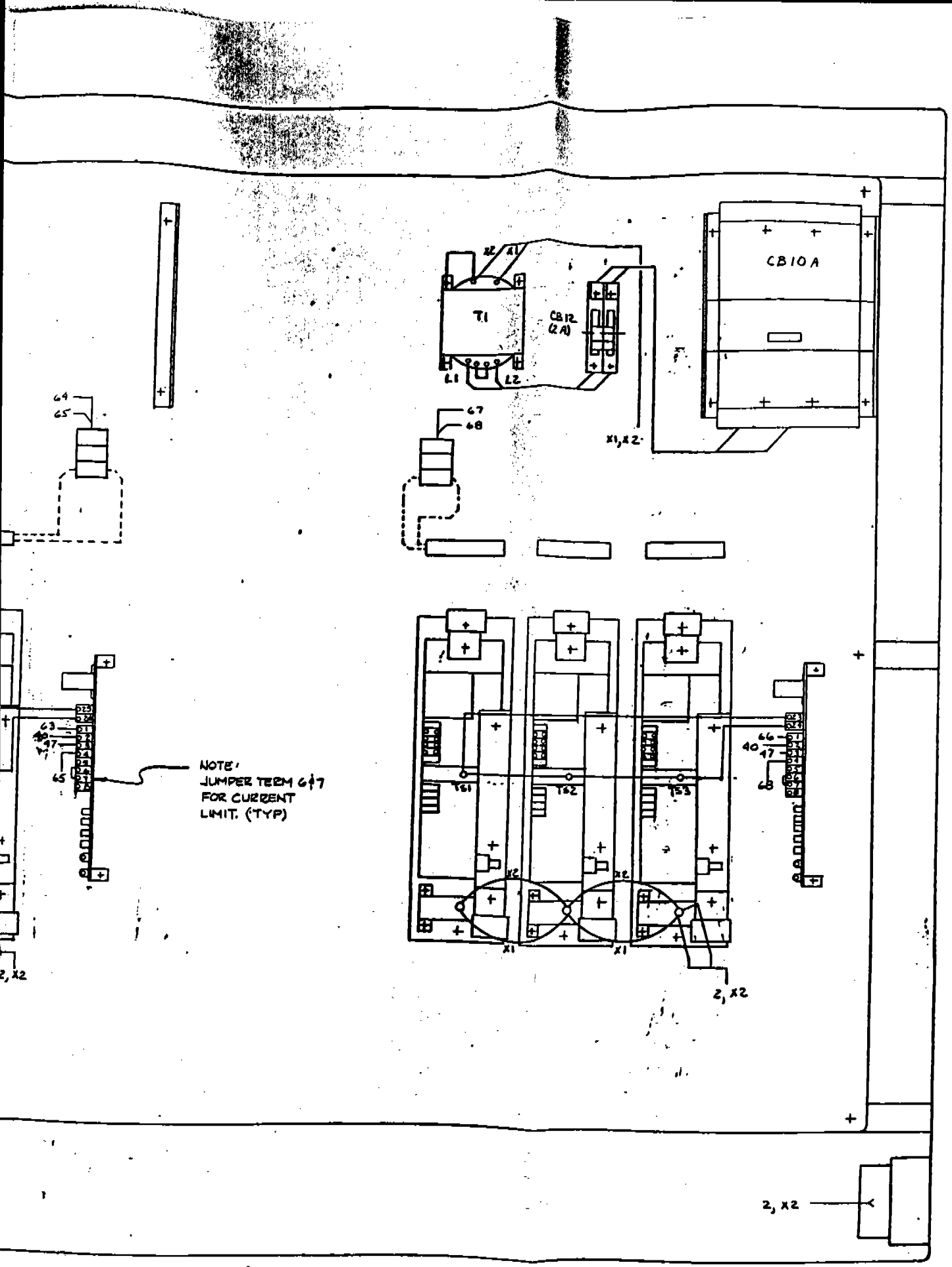

75 73 71 66
70 72 74
60 63
47 98
5 67
66
HA
0 1
2 3
4 5
6 7
HB
CA
CB
HO
HI
H2
H3
H
N
N
X2
+
-
C
THUMBWHEEL
SWITCH ASS'Y
CB
7A
FU1
3/4 A
MAN.
DIAMOND
ROOM
TEMP.
CONTROL POWER
REMOTE STOP
X3



FOR CONNECTIONS TO MCC SEE DWG. NO. C4178

DESCRIPTION:	
CONSOLET WIRING	
PROJECT: VARAWAVE	
DR.	M.S.
CH.	
SCALE	NONE


SEE VIEW B
CRM1
CRM2
CRM3
CB10A
SEE VIEW A
5
X2
D.C. POWER SUPPLY
40
X3
D.C. OUT
61
62
TS1
TS2
TS3
X2
X1
40
60
47
62
2, X2
EXHAUST FAN
2, X2
72 13 26 70 71
75 15 32 73 74
43 69
8 7 6 5 4
9 10 11 1 2 3
13 X2 30 28 6 13
15 X2 35 33 6 15
66 X2 67 61 9 60
X2
14
X3
97
98
40
T1
45
46
36
X2
X2
26
27
28
29
30
31
32
33
34
35
X2
VIEW B
CUSTOMERS CONNECTIONS
MCC
VIEW A



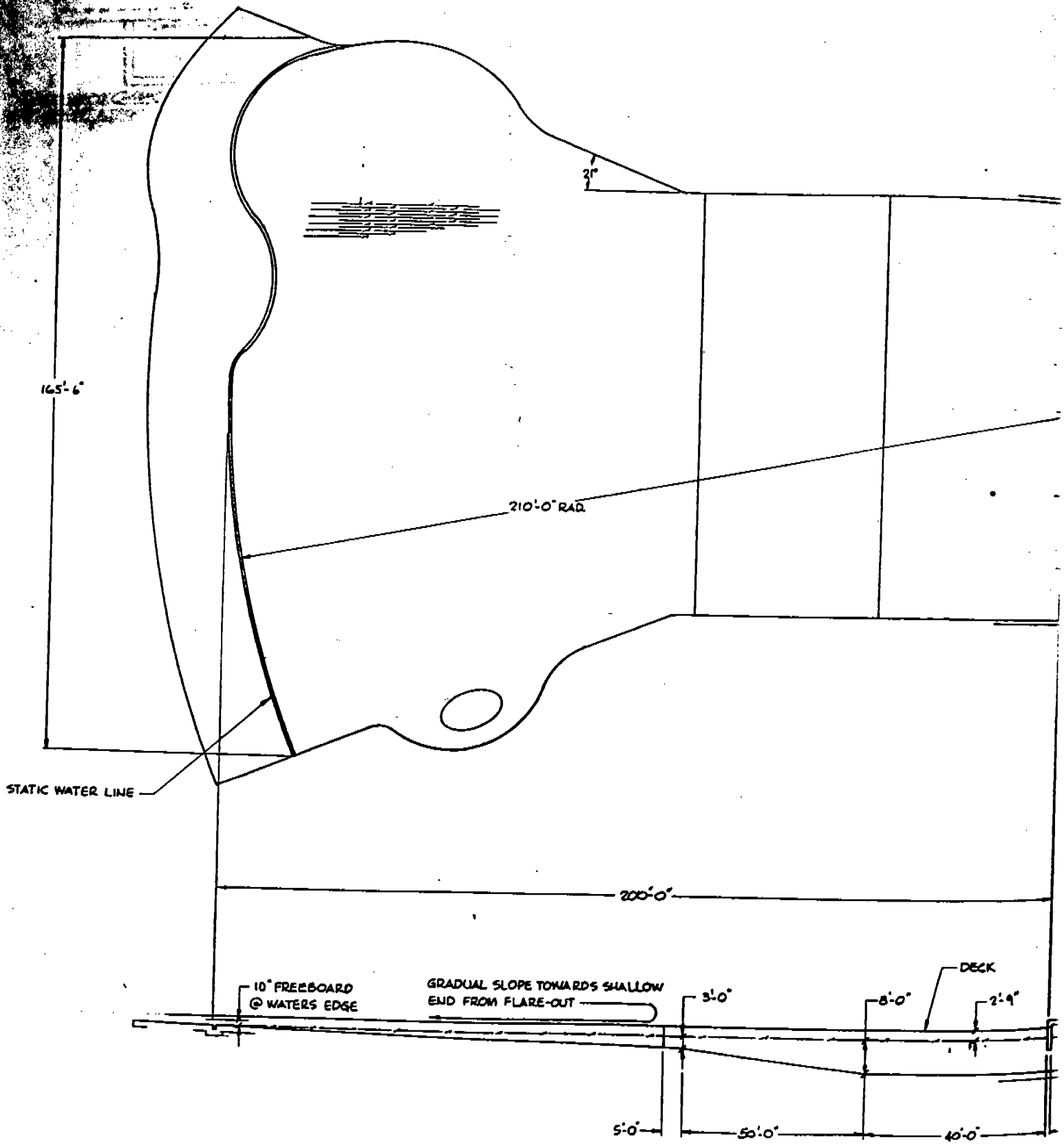
NOTE: SEE DWG #C4194 FOR CONT. TO CONTROL PANEL.

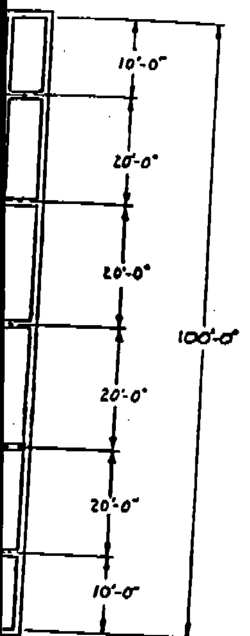
DESCRIPTION: ELECTRONIC CABINET WIRING - 3 FAN

PROJECT: LARSONS

SCALE: N.T.S.

C4170


2"
165'-6"
210'-0" RAD.
STATIC WATER LINE
200'-0"
10" FREEBOARD
@ WATERS EDGE
GRADUAL SLOPE TOWARDS SHALLOW
END FROM FLARE-OUT
3'-0"
8'-0"
DECK
2'-9"
5'-0"
50'-0"
40'-0"



GENERAL INFORMATION:

WAVE TEK FURNISHES:
5-FAN & MOTOR ASSEMBLIES
6-AIR DIRECTIONAL VALVE ASSEMBLIES
1-MOTOR CONTROL CENTER W/LOGIC
2-WEATHERPROOF PUSHBUTTON STATIONS W/KEY STOP/START
2-WEATHERPROOF PUSHBUTTON STATIONS W/STOP ONLY
5-CAISSON SLEEVES
3-SETS ANCHOR BOLTS
1-PNEUMATIC COMPRESSOR W/STARTER
1-SET PNEUMATIC LINES & CLAMPS
1-LOT MISC. SPARE PARTS
1-AMBIENT TEMPERATURE SENSOR
3-FAN TO PLENUM INTERCONNECTIONS

OTHERS FURNISH:
A. INSTALLATION OF ALL WAVE TEK EQUIPMENT
B. PROVIDE CONDUIT, WIRING & MAKE CONNECTIONS TO ALL WAVE TEK EQUIPMENT
C. SET PNEUMATIC COMPRESSOR, HANG PNEUMATING PIPING & WALL ANCHORS & MAKE ALL CONNECTIONS
D. VENTILATION EQUIPMENT
E. PROVIDE OTHER EQUIPMENT AS REQUIRED BY ARCHITECT, LOCAL CODES ETC.

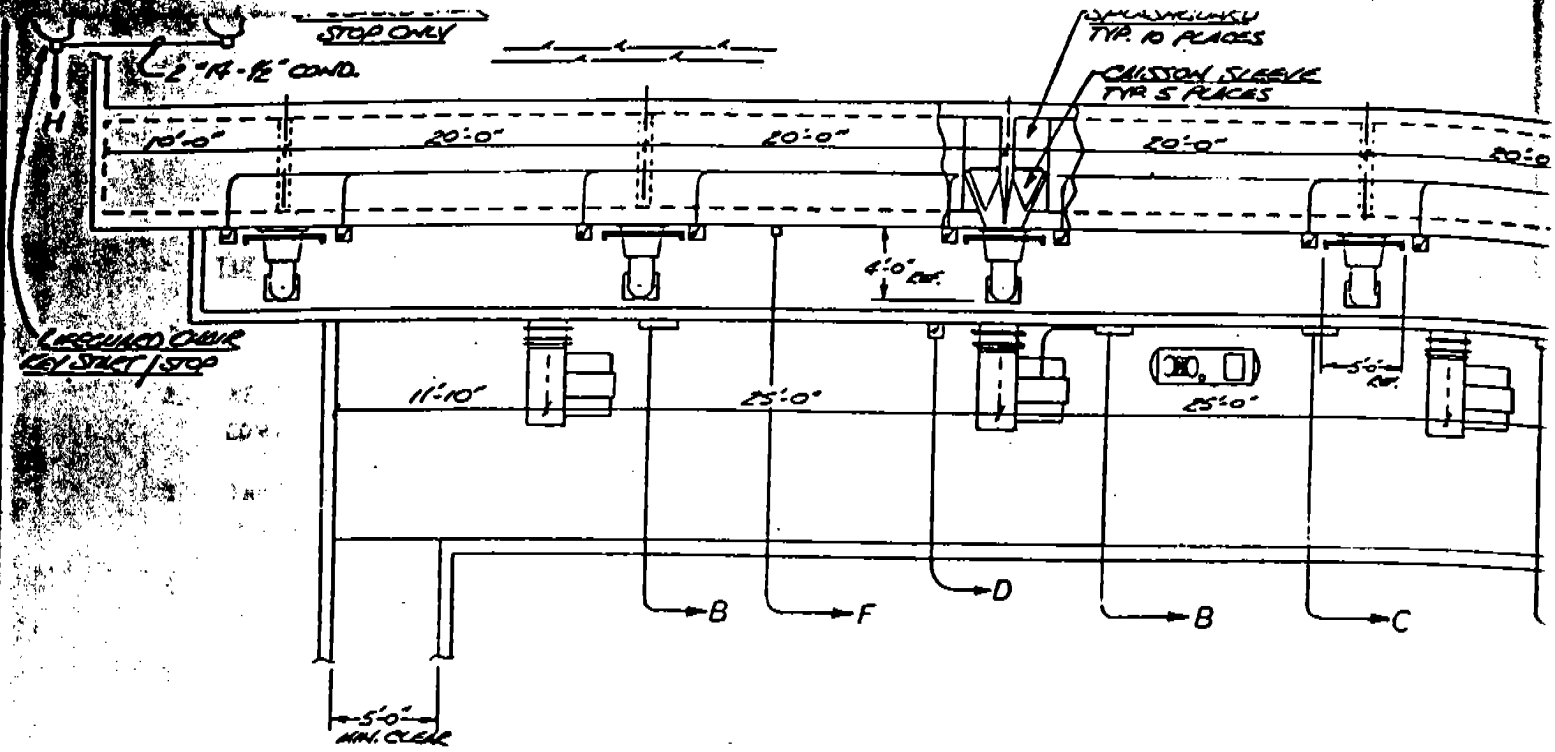
ADDITIONAL DESIGN REQUIREMENTS:
△ A. VENTILATION REQUIREMENTS - 40 CFM/WAVE GENERATING HORSEPOWER @ 3/4" S.P. MINIMUM
B. NOISE SUPPRESSION REQUIREMENTS - PROVIDE ADEQUATE ACCOUSTICAL TREATMENT FOR 110db IN THE EQUIPMENT ROOM & IN CONJUCTION WITH THE VENTILATION OF 'A' ABOVE TO ATTENUATE NOISE TO OUTSIDE
C. MINIMUM DOORWAY SIZE (EXCEPT FOR MCC) IS 5'-0" WIDE
D. FILTRATION TURNOVER RATE SHALL BE 4 HRS. OR LESS

POOL DATA

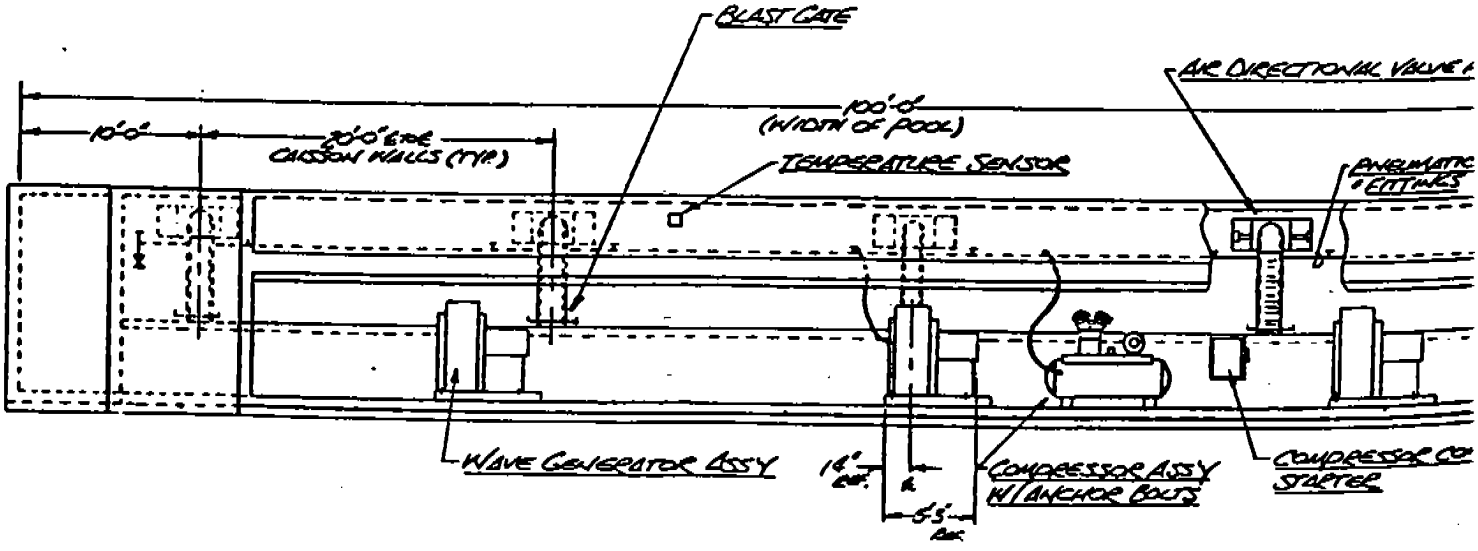
AREA	24,300 SQ. FT.
VOLUME	APPROX. 700,000 GAL.

-5'-6" CAISSON

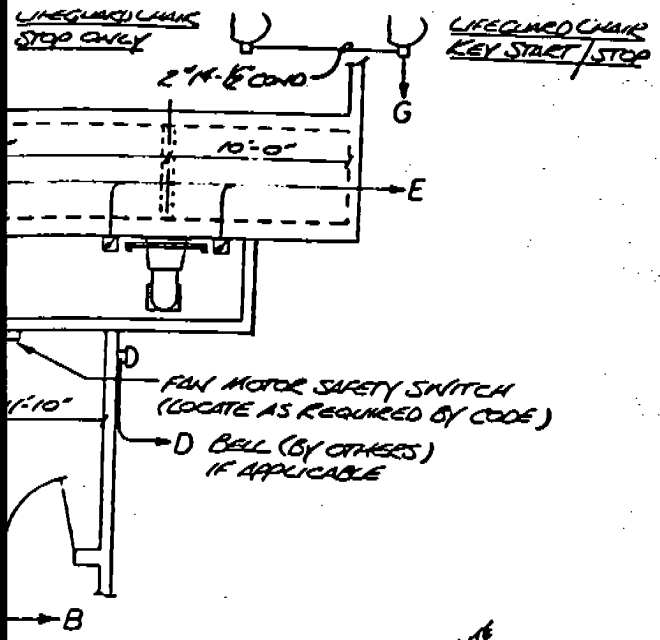
DESCRIPTION: WAVEPOOL SHOP DRAWING /		BY / DATE
PROJECT: LARSON	DR.	[illegible]
	CH.	
	SCALE	[illegible] = 1'-0"

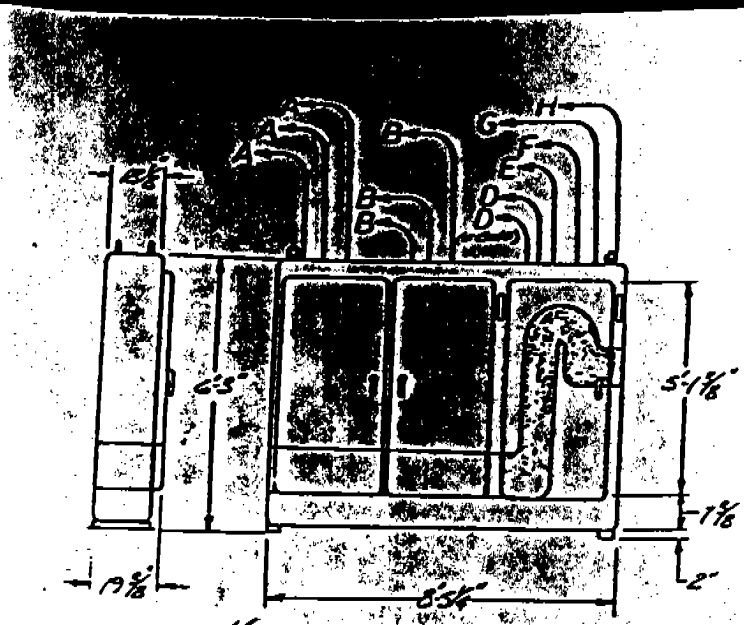


PLAN VIEW



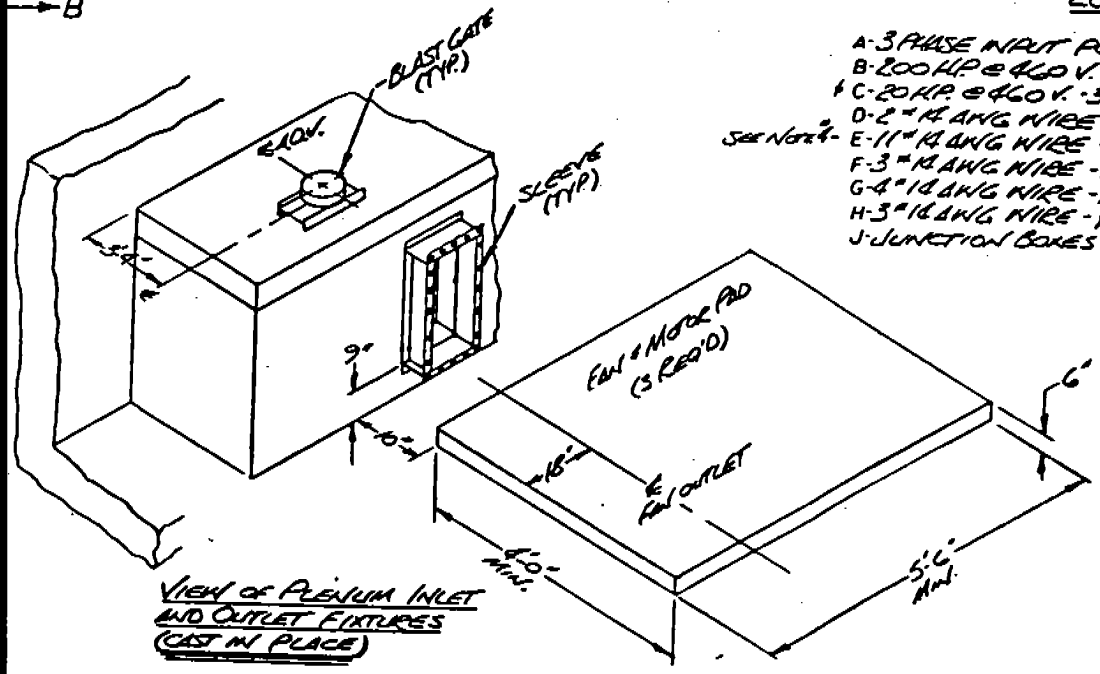
ELEVATION



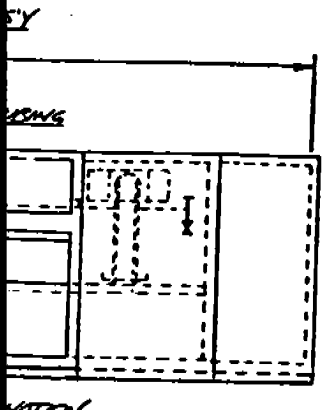


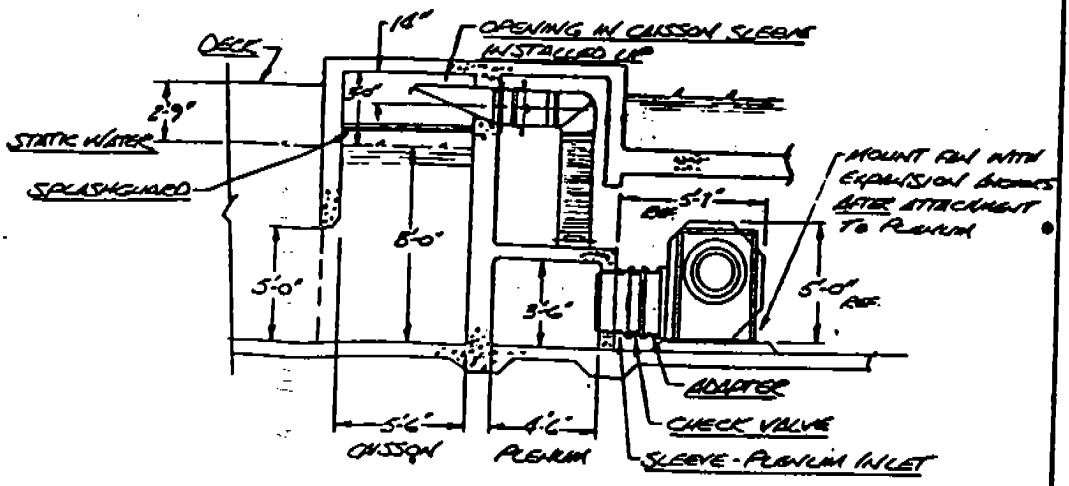
MOTOR CONTROL CENTER
LOCATE AS REQUIRED

A-3 PHASE INPUT POWER-3 REQ'D (3) 200 HP. MOTORS
B-200 H.P. @ 460 V.-3PH-60 HZ-3 REQ'D.
C-20 H.P. @ 460 V.-3PH-60 HZ-1 REQ'D.
D-2"# AWG WIRE-1/2" COND.-2 REQ'D-POWER
See Note 4- E-11"# AWG WIRE-3/4" COND.-1 REQ'D-POWER
F-3"# AWG WIRE-1/2" COND.-1 REQ'D-POWER
G-4"# 12 AWG WIRE-1/2" COND.-1 REQ'D-CONTROL
H-3"# 12 AWG WIRE-1/2" COND.-1 REQ'D-CONTROL
J-JUNCTION BOXES-11 REQ'D



VIEW OF PLENUM INLET AND OUTLET FIXTURES (CAST IN PLACE)





FLOOR ELEVATION - SIDE

TES:
COPPER WIRE SIZES GIVEN
CONDUIT SIZES ARE MINIMUM

THE SUBJECT MATTER OF THIS DRAWING IS THE PROPERTY OF	DESCRIPTION: WAVEPOOL SHOP DRAWING	BY	DATE
		BR	A 1/16

WHEN AN OUTSIDE (EXTERNAL OF FAN ROOM) SOURCE OF AIR IS TO BE SUPPLIED, THE FOLLOWING RULES SHOULD BE OBSERVED:

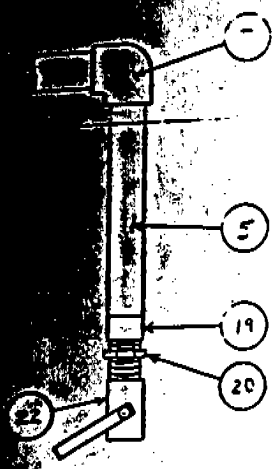
1. PROTECT INTAKE FROM THE WEATHER, RAIN AND SNOW.
2. KEEP INTAKE PIPE AWAY FROM STEAM, GAS, OR ENGINE EXHAUST. VAPORS WILL BE DRAWN INTO THE COMPRESSOR WHETHER THERE IS A FILTER OR NOT
3. TAKE OUTSIDE AIR FROM AT LEAST 6 FEET ABOVE GROUND LEVEL. THIS IS TO MINIMIZE PICKING UP DIRT AND LITTER IN THE INTAKE.
4. IF POSSIBLE, LOCATE THE INTAKE ON THE SHADY (USUALLY NORTH) SIDE OF THE BUILDING AND, IF POSSIBLE, UNDER AN OVERHANG, AS THE AIR IS COOLER IN THESE LOCATIONS.
5. INSTALL THE INTAKE PIPE FROM THE COMPRESSOR OUTWARD. THE PIPING SHOULD BE AT LEAST ONE SIZE LARGER THAN THE COMPRESSOR INTAKE OPENING. MAKE THE LINE AS SHORT AND DIRECT AS POSSIBLE. IF THE LINE IS TO BE LONGER THAN 15 FEET, INCREASE THE PIPE DIAMETER ONE SIZE FOR EVERY 15 FEET.
6. SUPPORT INTAKE LINES WITH HANGERS, CLAMPS AND FLOOR COLUMNS TO KEEP WIEGHT OF LINES OFF COMPRESSOR.
7. MAKE SURE ALL CONNECTIONS ARE SEALED AIR TIGHT.
8. IF ANY INLET PIPING IS ADDED TO WHAT WAVETEK FURNISH, THE INTERIOR OF THE ADDED PIPING MUST BE CORROSION RESISTANT. DO NOT USE RUBBER HOSE.

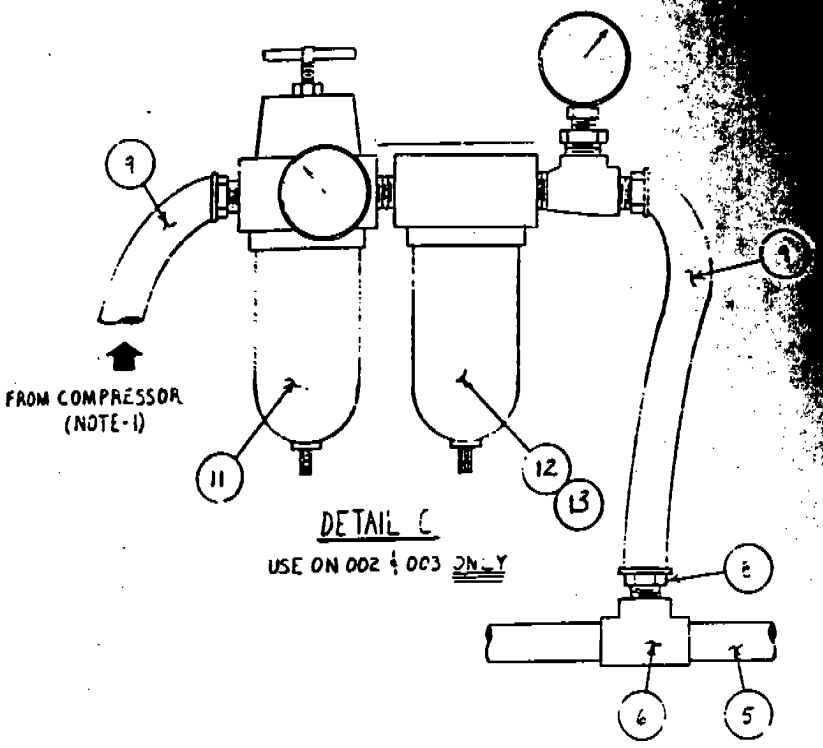
NOTES:
1. THE ARRANGEMENT ON THIS DRAWING SHOWS THE PNEUMATIC HOOKUP FOR A TYPICAL DOWNBLAST AND SIDEBLAST DESIGN. ALL OTHER ARRANGEMENTS SIMILAR.
2. PIPING SYSTEM MUST BE PRESSURE TESTED TO 150PSI; OPERATING PRESSURE IS TYPICALLY 60PSI (AT AIR CYLINDER). DO NOT TEST WITH WAVETEK COMPRESSOR.
3. MAKE HOSE RUNS AS SHORT AS POSSIBLE WITHOUT CREATING SHARP BENDS OR KINKS.
4. USE TEFLON TAPE AT ALL THREADED PIPE CONNECTIONS.
5. SLOPE 3/4" AIR LINE DOWNHILL IN BOTH DIRECTIONS FROM THE COMPRESSOR. SLOPE 1" FOR EVERY 10'-0" OF AIR LINE.

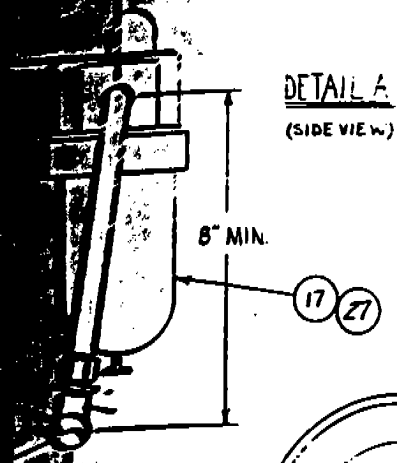
BILL OF MATERIALS

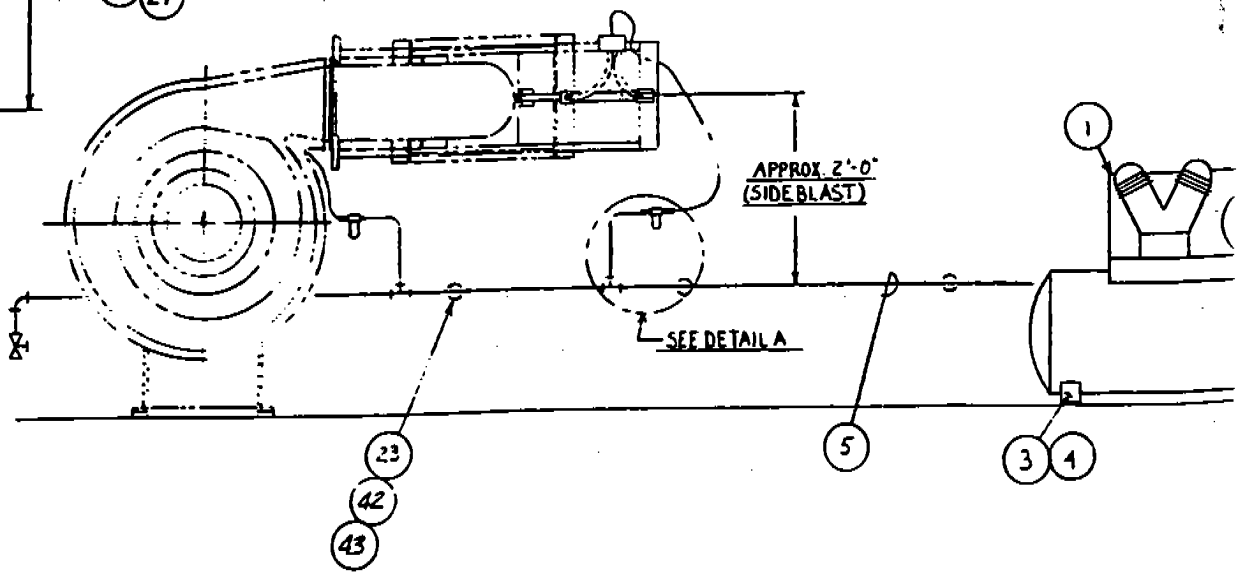
008	007	006	005	004	003	002	ITEM	MAT'L	DESCRIPTION
1	1	1	1	1	1	1	1		COMPRESSOR ASS'Y
1	1	1	1	1	1	1	2		DRAIN LEG ASS'Y
4	4	4	4	4	4	4	3		ANCHOR, SLEEVE ½"
4	4	4	4	4	4	4	4		VIBRATION PADS
140'	120'	100'	80'	60'	40'	20'	5	COPPER	TUBING
—	—	—	—	—	1	1	6		TEE, C-C-NPTF
2	2	2	2	2	2	2	7		ELBOW, C-C-90°
—	—	—	—	—	1	1	8		HOSE BARB-¾"
—	—	—	—	—	5'	5'	9		HOSE, ¾" LOC-ON
8	7	6	5	4	3	2	10		ADV. ASSY
—	—	—	—	—	1	1	11		FILTER-REGULATOR-¾"
—	—	—	—	—	1	1	12		FILTER-COALESCENT-¾"
3	3	3	3	3	1	1	13		MTG. BRACKET
16	14	12	10	8	6	4	14		REDUCER BUSHING
16	14	12	10	8	6	4	15		HOSE FITTING
32'	28'	24'	20'	16'	12'	8'	16		TUBING - NYLON
16	14	12	10	8	6	4	17		LUBRICATOR
16	14	12	10	8	6	4	18		MTG. BRACKET
2	2	2	2	2	2	2	19		COUPLING-C-C-NPT FEMALE
2	2	2	2	2	2	2	20		REDUCER-COUPLING, NPT-NPT
16	14	12	10	8	3	2	21		TEE, C-C-NPTF
2	2	2	2	2	2	2	22	BRONZE	BALL VALVE
39	34	29	24	19	14	9	23		TUBING HANGER W/SCREWS
1 ROLL	1 ROLL	1 ROLL	1 ROLL	1 ROLL	1 ROLL	1 ROLL	24		TEFLON TAPE
11	11	11	11	11	—	—	25		HOSE CLAMP
1	3	5	7	9	11	13	26		COUPLING-¾"
2 QT.	2 QT.	2 QT.	2 QT.	2 QT.	2 QT.	2 QT.	27		OIL, 10 W, NON-DETERGENT
2	2	2	2	2	—	—	28		FILTER, COALESCENT-1½"
1	1	1	1	1	—	—	29		FILTER, REGULATOR-½"
8'	8'	8'	8'	8'	—	—	30		HOSE-1¼"
1	1	1	1	1	—	—	31		TEE, 1¼ NPTF
2	2	2	2	2	—	—	32		ELBOW, 1¼ NPTF-90°
5	5	5	5	5	—	—	33		HOSE BARB 1¼"
—	—	—	—	—	2	2	34		REDUCER BUSHING
1	1	1	1	1	1	1	35		NIPPLE NPT-1½"
							36		
							37		
20'	20'	20'	20'	20'	20'	20'	38		PIPE PVC
5	5	5	5	5	5	5	39		ELBOW HUB-HUB
2	2	2	2	2	2	2	40		COUPLING HUBCAP
6	6	6	6	6	6	6	41		CONDUIT FLANGE
154	154	129	129	104	54	29	42		ANCHOR SHIELDS
154	154	129	129	104	54	29	43		SCREW-¾"x3"
1 CAN	1 CAN	1 CAN	1 CAN	1 CAN	1 CAN	1 CAN	44		PVC CEMENT
							45		
1	1	1	1	1	—	—	46		TEE 1½" NPT

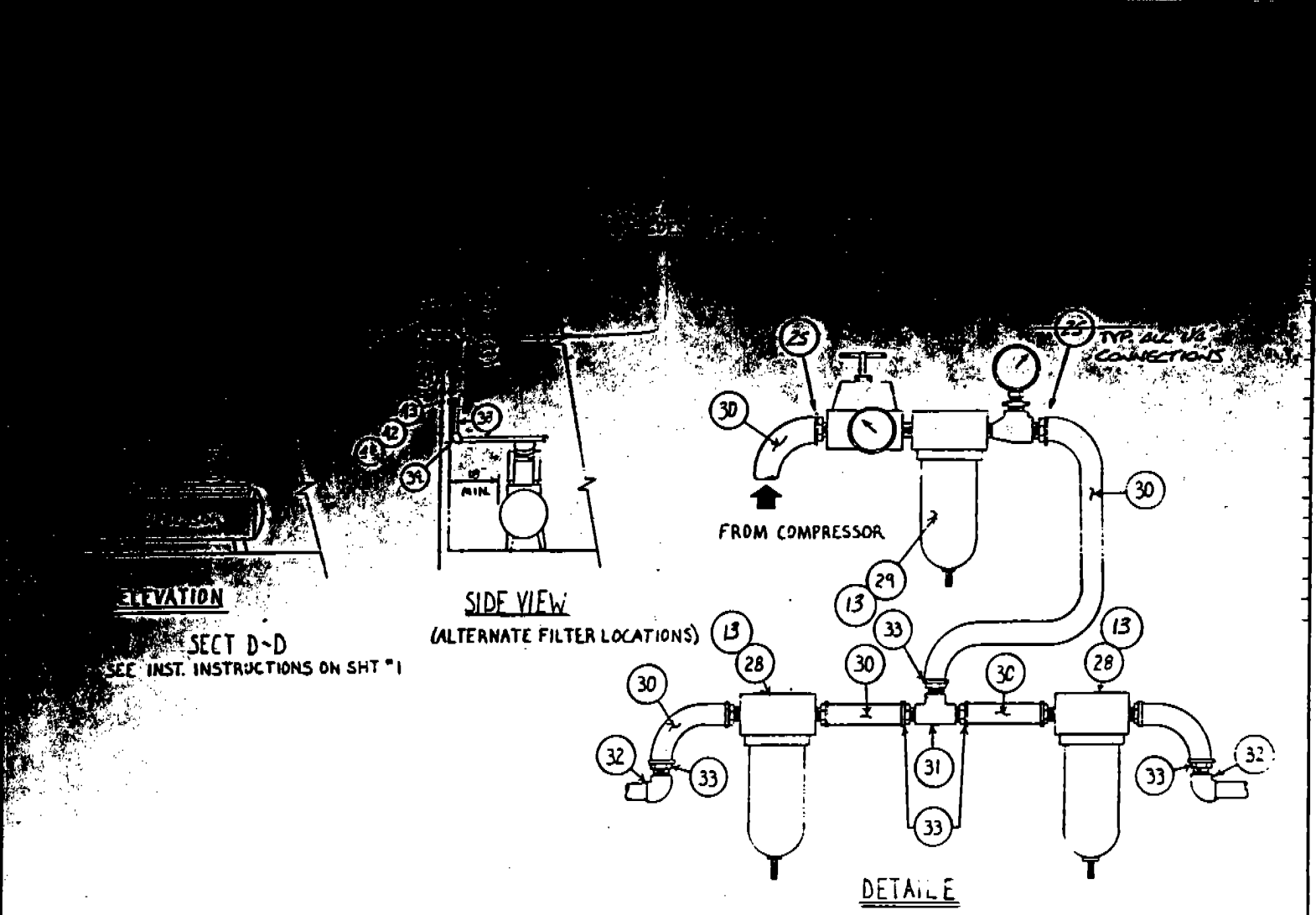
	DESCRIPTION: PNEUMATIC INSTALLATION	BY	DATE
	PROJECT: YARAWAVE		

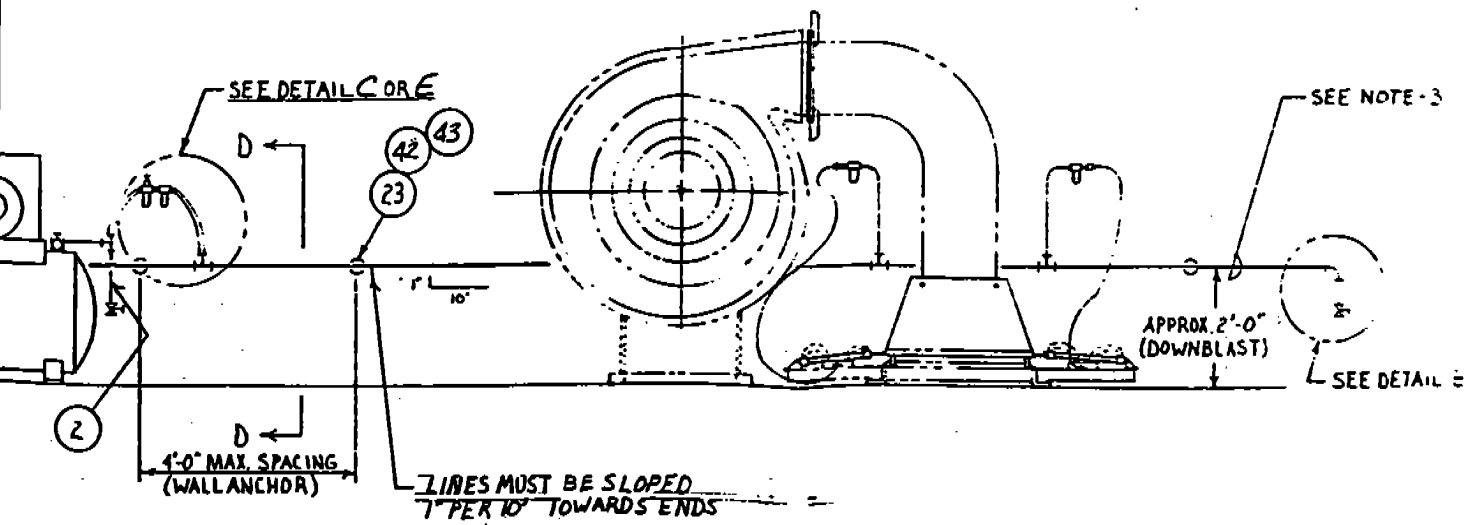

DETAIL B
(TYPICAL EACH END
AT BOTTOM OF SLOPE)


FROM COMPRESSOR
(NOTE-1)
DETAIL C
USE ON 002 & 003 ONLY


DETAIL A
(SIDE VIEW)
8" MIN.


APPROX. 2'-0"
(SIDE BLAST)
SEE DETAIL A



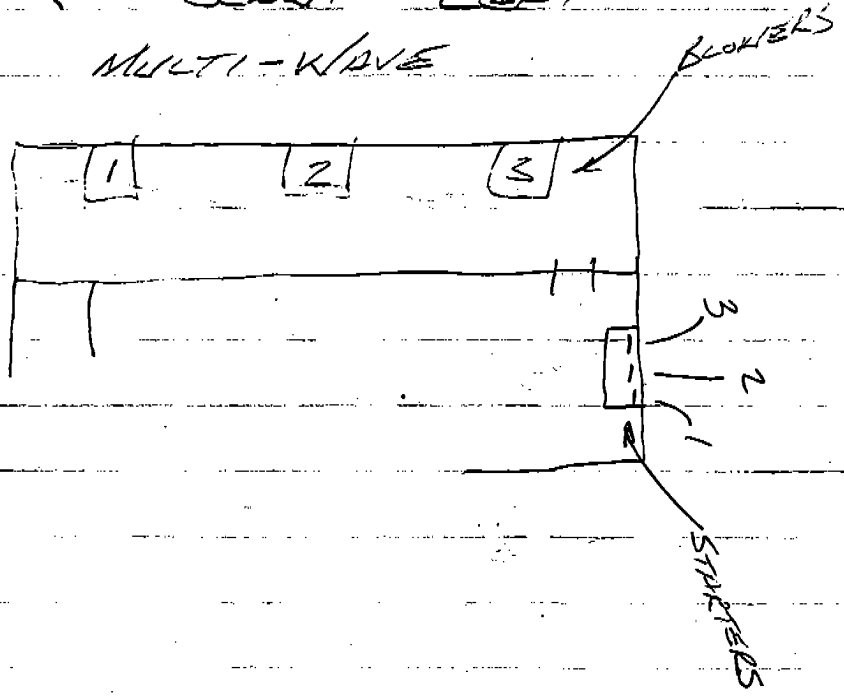


DESCRIPTION: PNEUMATIC TUBING INSTALLATION

PROJECT: VARAWAVE

MovieTek

			1	2	3
0 -	Δ	DIAMOND	X	X	
1 -	V	V PATTERN	X	X	X
2 -	QR	QUASI-RIGHT	X	X	
3 -	//	PARALLEL	X	X	X
4 -	/	SCAMT-RIGHT	X	X	
5 -	Λ	INVERTED V PATTERN	X	X	X
6 -	QL	QUASI-LEFT	X	X	
7 -	\	SCAMT-LEFT	X	X	
		MULTI-WAVE	X	X	



WAVETEK

SERVICE BULLETIN

SB-310
Date 11-31-86

To: All owners/operators of WaveTek Varawave and Varawave Plus systems.

In preparation and release of manuals, the procedure for programmable controller winterization was inadvertently omitted.

The following procedures must be completed to ensure longevity of the controllers memory:

A. Turn off all power to controller.

B. Remove program keyboard by squeezing the snap locks top and bottom (see Figure 1) towards the center and pull keyboard off unit (see Figure 2).

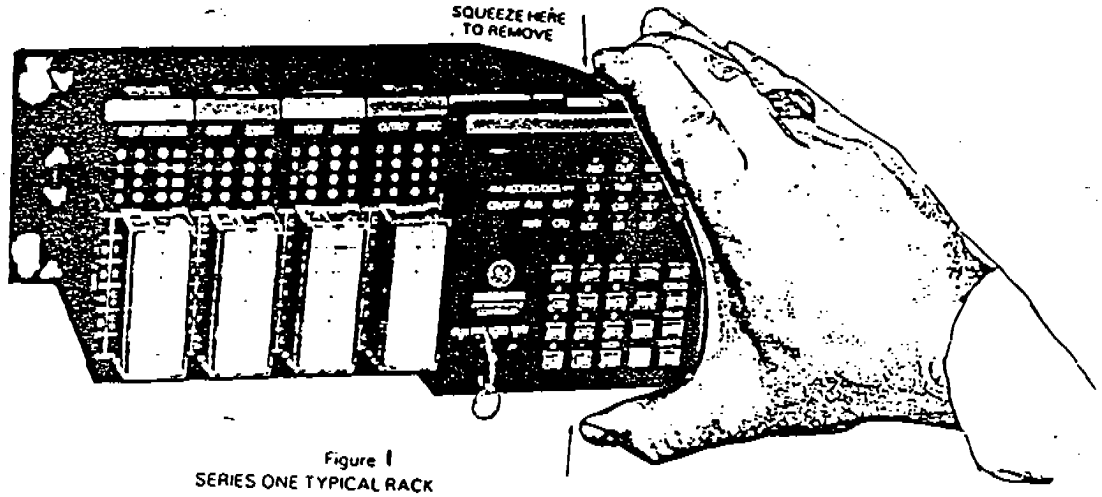


Figure 1
SERIES ONE TYPICAL RACK

C. Remove central processing unit (CPU) which is the module exposed after removing keyboard, the same way as the keyboard and pull CPU out of unit (see Figure 3).

D. Store keyboard and CPU in a temperature range of -10 degrees C to 70 degrees C (14 degrees F to 158 degrees F). Failure to do so will result in loss of memory to CPU.

E. Replace CPU module space with the cover provided.

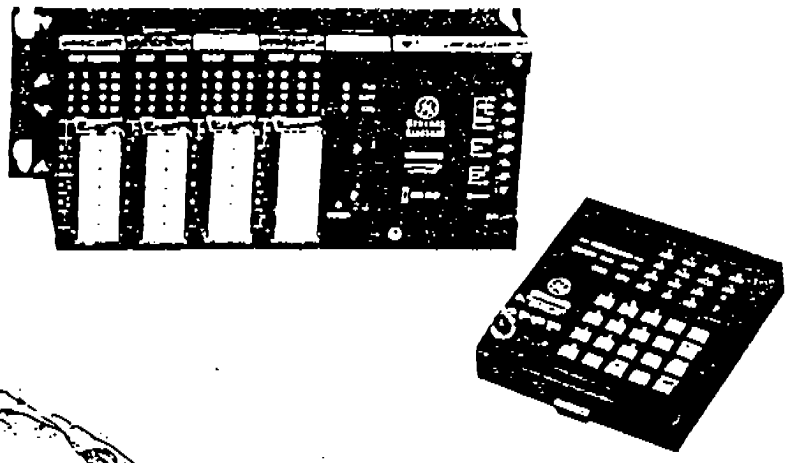


Figure 2

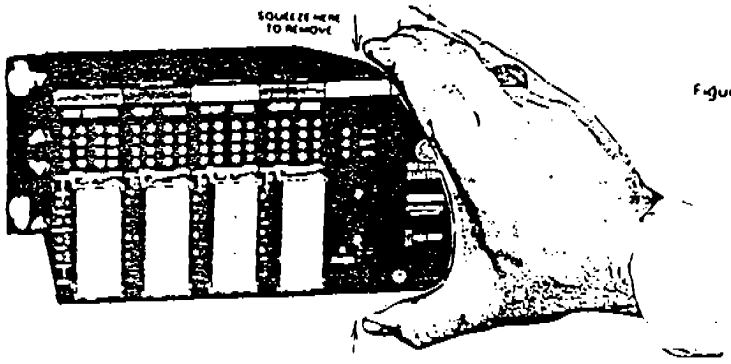


Figure 3

Before starting **the equipment for the new season, follow these procedures:**

A. Reverse order from winterization procedures.

B. When inserting (see Figure 4) tilt the module approximately 10 degrees. Insert bottom of the large printed circuit board into the bottom card slot.

C. When the bottom slot is engaged, rotate the module to engage top slot. Slide module into base unit until it is firmly seated and snap locks, engage.

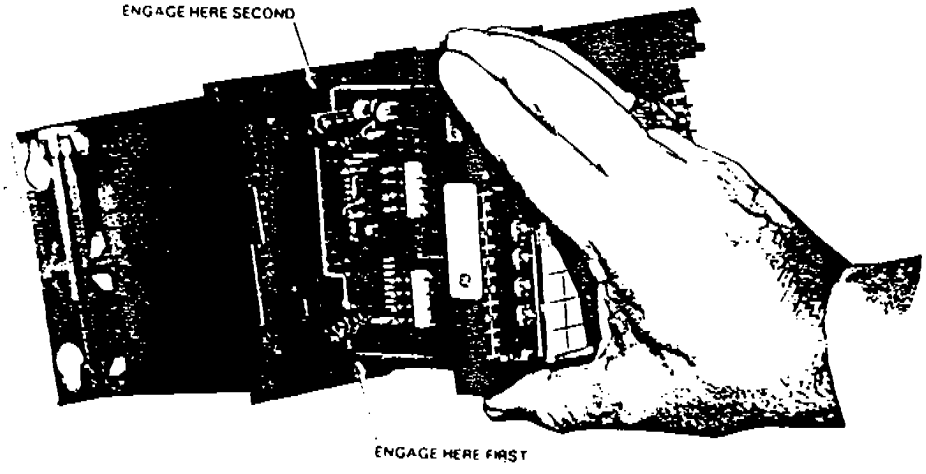
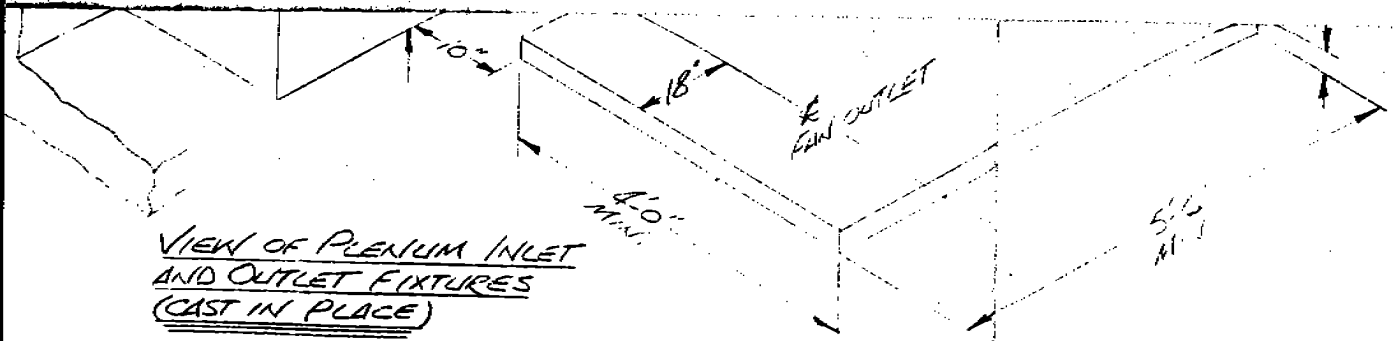
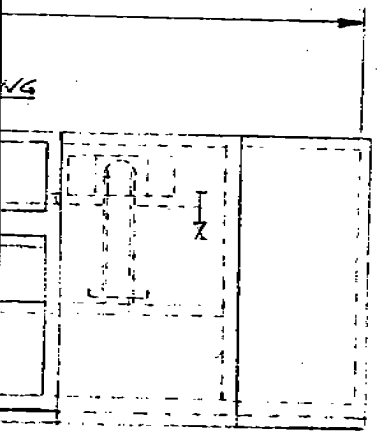


Figure 4
PROPER MODULE INSERTION

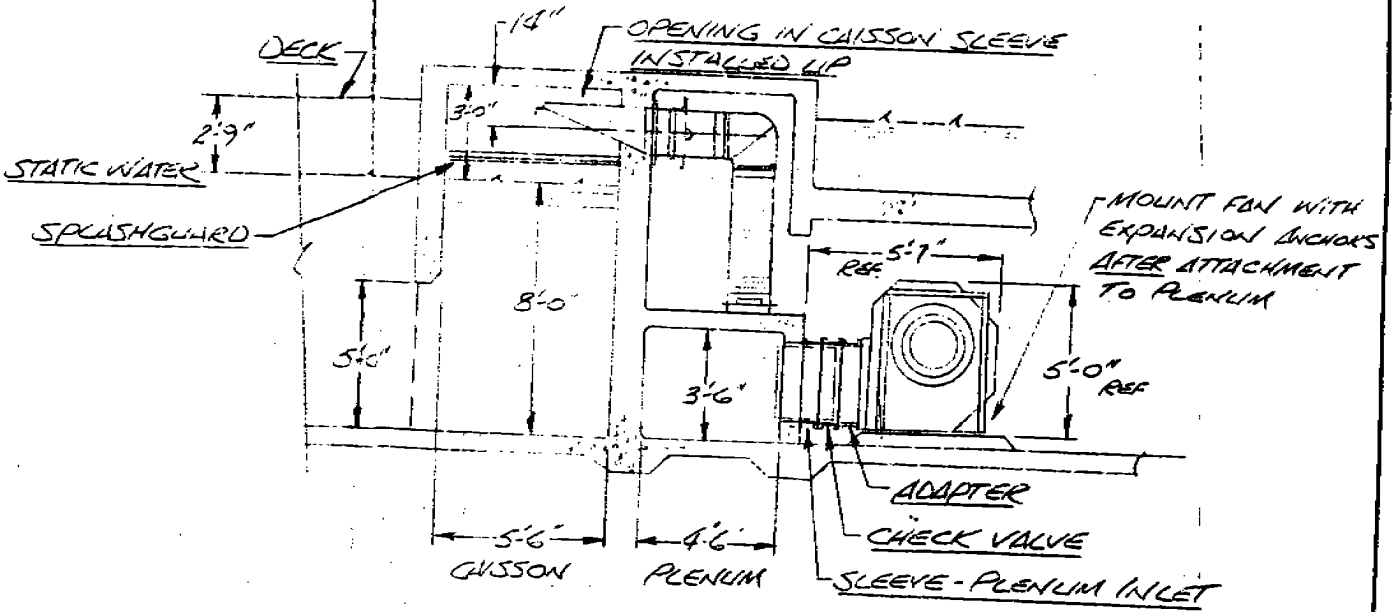
MONTY SEXTON
DRAFTSMAN TECHNICIAN



VIEW OF PLENUM INLET AND OUTLET FIXTURES (CAST IN PLACE)



TION



FLOOR ELEVATION - SIDE

ES:

- PPER WIRE SIZES GIVEN
- NDUIT SIZES ARE MINIMUM
- OUND EQUIPMENT AS REQ'D BY CODE
- F ELECTRICAL INTERCONNECTION FOR
- PPER WIRE DISTRIBUTION
- USTOMER'S POWER DISTRIBUTION PANEL

FEB 07 1983

NO	REVISION	ECN	DATE	BY

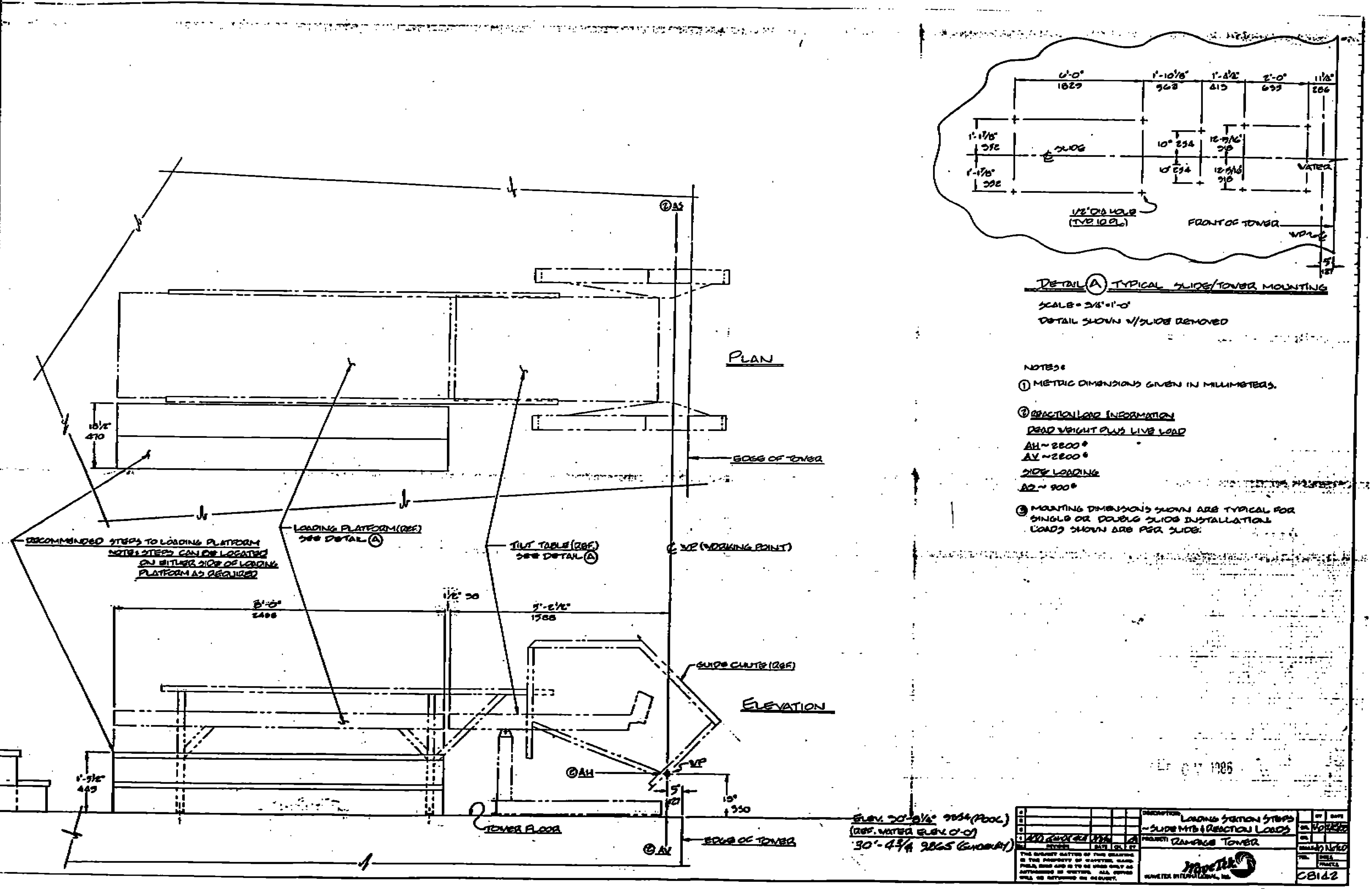
DESCRIPTION: WAVEPOOL SHOP DRAWING

PROJECT: LARSON

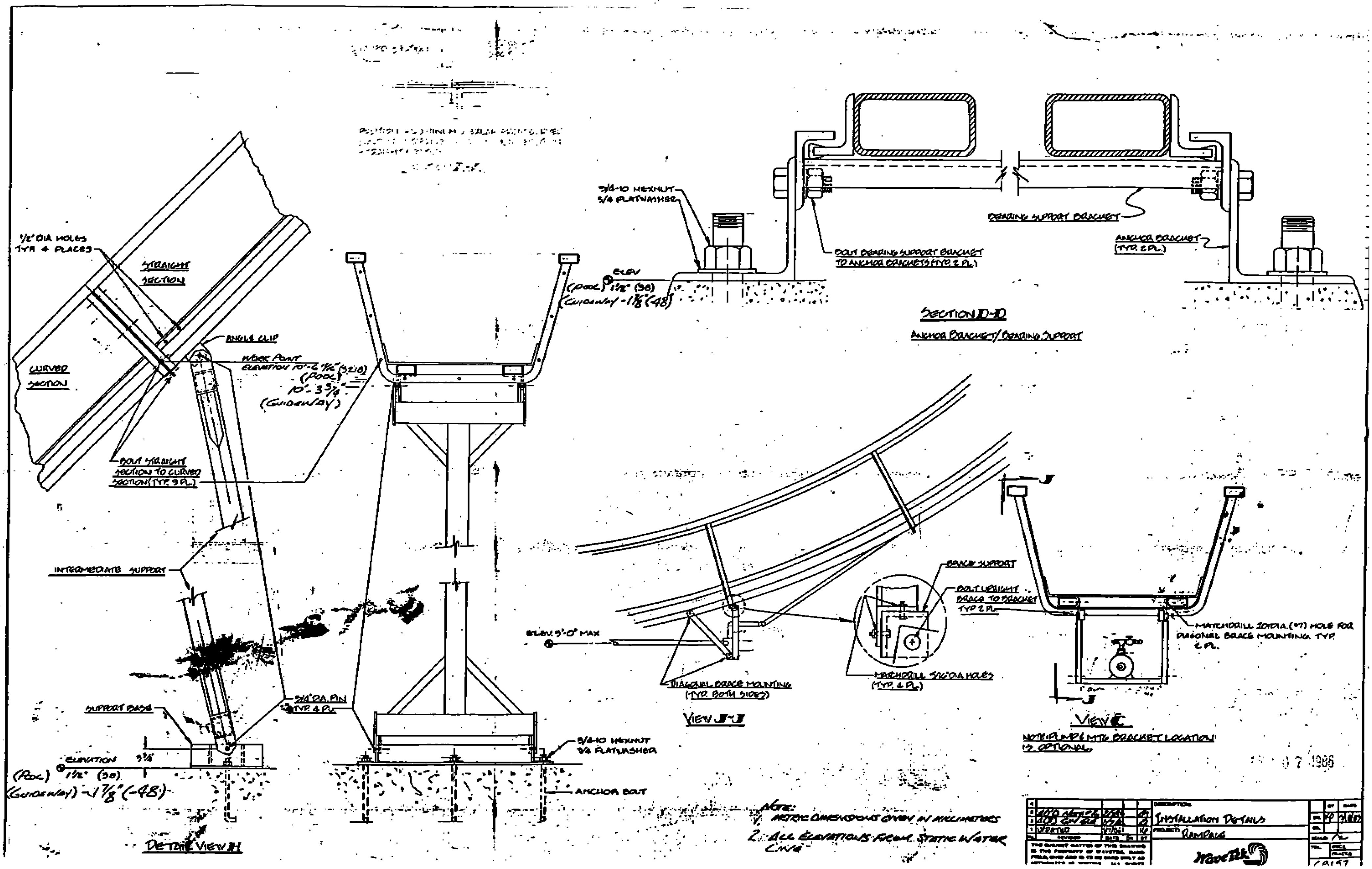
WaveTek

	BY	DATE
DR.	RR	2/4/83
CH.		
SCALE.	NL	
TOL. DEC ±		
FRACT ±		

C-2161



PLAN
ELEVATION
RECOMMENDED STEPS TO LOADING PLATFORM
NOTE: STEPS CAN BE LOCATED ON EITHER SIDE OF LOADING PLATFORM AS REQUIRED
LOADING PLATFORM (REF) SEE DETAIL (A)
TILT TABLE (REF) SEE DETAIL (A)
℄ WP (WORKING POINT)
EDGE OF TOWER
SLIDE CHUTE (REF)
TOWER FLOOR
(2) AH
(2) AV
(2) AS
WP
8'-0" 2438
5'-2 1/2" 1588
1 1/2" 38
1'-5 1/2" 445
1'-4 1/2" 410
5" 127
13" 330
ELEV. 30'-8 1/4" 9354 (POOL)
(REF. WATER ELEV. 0'-0")
30'-4 3/4" 9265 (GUNWAY)
DETAIL (A) TYPICAL SLIDE/TOWER MOUNTING
SCALE = 3/8"=1'-0"
DETAIL SHOWN W/SLIDE REMOVED
6'-0" 1829
1'-10 3/8" 568
1'-4 1/2" 413
2'-0" 635
11 1/4" 286
1'-1 7/8" 352
10" 254
12 3/16" 310
℄ SLIDE
WATER
1/2" DIA HOLE (TYP 10 PL)
FRONT OF TOWER
WP
NOTES:
(1) METRIC DIMENSIONS GIVEN IN MILLIMETERS.
(2) REACTION LOAD INFORMATION
DEAD WEIGHT PLUS LIVE LOAD
AH ~ 2200#
AV ~ 2200#
SIDE LOADING
AZ ~ 900#
(3) MOUNTING DIMENSIONS SHOWN ARE TYPICAL FOR SINGLE OR DOUBLE SLIDE INSTALLATION. LOADS SHOWN ARE PER SLIDE.
DESCRIPTION: LOADING STATION STEPS ~ SLIDE MTG & REACTION LOADS
PROJECT: RAMPAGE TOWER
WaveTek
WAVETEK INTERNATIONAL, INC.
CB142


1/2" DIA HOLES TYP 4 PLACES
STRAIGHT SECTION
CURVED SECTION
ANGLE CLIP
WORK POINT ELEVATION 10'-6 1/16" (3210) (POOL) 10'-3 3/8" (GUIDEWAY)
BOLT STRAIGHT SECTION TO CURVED SECTION (TYP 9 PL.)
INTERMEDIATE SUPPORT
SUPPORT BASE
3/4" DIA. PIN TYP 4 PL.
ELEVATION
3 3/8
(POOL) 1 1/2" (30)
(GUIDEWAY) -1 7/8" (-48)
DETAIL VIEW H
3/4-10 HEXNUT 3/4 FLATWASHER
ANCHOR BOLT
ELEV
(POOL) 1 1/2" (30)
(GUIDEWAY) -1 7/8" (-48)
BEARING SUPPORT BRACKET
BOLT BEARING SUPPORT BRACKET TO ANCHOR BRACKETS (TYP 2 PL.)
ANCHOR BRACKET (TYP 2 PL.)
SECTION D-D
ANCHOR BRACKET/BEARING SUPPORT
ELEV. 5'-0" MAX
DIAGONAL BRACE MOUNTING (TYP. BOTH SIDES)
VIEW J-J
BRACE SUPPORT
BOLT UPRIGHT BRACE TO BRACKET TYP 2 PL.
MATCHDRILL 5/8" DIA HOLES (TYP. 4 PL.)
MATCHDRILL 20 DIA. (#7) HOLE FOR DIAGONAL BRACE MOUNTING TYP 2 PL.
VIEW C
NOTE: PUMP & MTG BRACKET LOCATION IS OPTIONAL
NOTE:
1. METRIC DIMENSIONS GIVEN IN MILLIMETERS
2. ALL ELEVATIONS FROM STATIC WATER LINE
INSTALLATION DETAILS
RAMPAGE
WaveTek

Probably DEC 80

INSTALLATION REQUIREMENTS

The following is given strictly as a guideline for a four engine installation. It is not a guarantee as to the required time for installation. However, it is felt to be a realistic guideline. WaveTek assumes no responsibility for accuracy on these estimates.

LABOR HOURS TO PERFORM INSTALLATION

RESPONSIBILITY	ACTIVITY	PERFORMANCE HOURS
General Contractor	Install Anchor Bolt Assemblies.	12 Hrs.
General Contractor	Install Wall (or floor) Sleeves.	32 Hrs.
General Contractor	Set and align fan units, air directional units and grout.	48 Hrs.
Mechanical Contractor	Hang Pneumatic piping and make connections.	18 Hrs.
Mechanical Contractor	Set Air Compressor.	8 Hrs.
Electrical Contractor	Set Motor Control Center.	16 Hrs.
Electrical Contractor	Make Electrical connections.	16 Hrs.
	TOTAL ESTIMATED HOURS	150 Hrs.

To: WaveTek
Notebook - Installation Requirements

WAVETEK FURNISHED EQUIPMENT

AND

INSTALLATION INSTRUCTIONS

I. DELIVERY, STORAGE AND HANDLING

A. Delivery - WaveTek equipment will be sent to the jobsite in two deliveries.

1. First delivery - the caisson sleeves and anchor bolt assemblies will be shipped as construction requires after award of the contract.

2. Second delivery - the remainder of the equipment will be shipped within a specified time after awarding the contract.

B. Storage - the installation contractor is responsible for storing all equipment from physical damage and from moisture.

C. Handling - the installation contractor is responsible for receiving unloading and checking all WaveTek equipment.

II. WAVETEK FURNISHED EQUIPMENT (Refer to wave pool shop drawings)

A. Caisson Sleeves - these sleeves shall be embedded in concrete when the caisson walls are poured.

B. Fan Anchor Bolt Assemblies - the anchor bolt assemblies shall be set in concrete when the floor and/or the concrete fan base is poured.

C. Fan, Motor and Fan Sub-base Assembly - these assemblies shall be located on their respective bases and anchor bolts. They shall be set, aligned and leveled by the installation contractor.

D. Air Directional Valve Assembly - these assemblies shall be mounted to the anchor bolts protruding from the caisson sleeves by the installation contractor. The inlet adapter shall be connected to the fan outlet by the installation contractor.

E. Pneumatic Compressor - this unit shall be set in place and anchored to the floor with anchor bolts (bolts furnished by WaveTek) by the installation contractor.

F. Pneumatic Lines and Clamps - the pneumatic tubing and tube fittings (furnished by WaveTek) shall be assembled and anchored to the wall (or ceiling) with the supplied wall bracket, clamps and anchor bolts by the installation contractor. The installation contractor

shall also install the furnished pneumatic hoses and fittings from the terminal points of the pneumatic lines to the respective pneumatic cylinders at the Air Directional Valve and at the Pneumatic Power Unit. The installation contractor must make sure that all the pneumatic lines are absolutely clean and free of contaminates.

G. Lifeguard Pushbutton Station - the stations shall be mounted at each lifeguard position as directed by the owner, in such a manner that the lifeguard has easy access to it. The installation contractor shall install these stations, which are furnished by WaveTek.

H. Motor Control Center (MCC) - this electrical enclosure furnished by WaveTek, shall be set, anchored and grounded by the installation contractor. The installation contractor shall furnish and install conduit and wire from the owner's power panel to the main lugs in the MCC. In no case shall power be applied to the MCC without a WaveTek representative present.

1. Fan Motor Electrical Connections - wire and conduit shall be furnished and installed by the installation contractor from the fan motor terminals to the respective terminals in the MCC. All connections shall be made by the installation contractor. Minimum wire sizes and conduit sizes are specified on the Shop Drawings and on the System Interconnection Diagram.

2. Solenoid Valve Junction Boxes - wire, conduit and junction boxes shall be furnished and installed by the installation contractor from the solenoid valve located at each Air Directional Valve Assembly to the MCC and as shown on the Shop Drawings and System Interconnection Diagram.

3. Lifeguard Pushbutton Station - wire and conduit shall be furnished and installed by the installation contractor from each pushbutton station to the MCC as shown on the System Interconnection Diagram and Shop Drawings.

4. Other Electrical Connections - Bell power and control and available from the Motor Control Center. The maximum power available is 20 watts. All wire and conduit shall be furnished by others.

I. Pneumatic Compressor Motor Connections - wire and conduit shall be furnished and installed by the installation contractor from the owner's power panel to the combination starter mounted on the wall next to the compressor. Minimum wire sizes and conduit sizes are specified on the Shop Drawings and on the System Interconnection Diagram.

III. ADDITIONAL ITEMS

A. Ventilation - adequate ventilation for the wave machinery shall be furnished by others having a minimum capacity of 3000 CFM at 3/4" S.P. per wave-generating fan. This ventilation provides cooling for the motors to prevent them from overheating.

B. Noise Suppression - adequate attenuating devices shall be furnished by others to reduce the 140 dba level in the wave machinery room to a low and acceptable level outside this room.

1. Attenuator mufflers must be supplied on both the inlet and the outlet of the ventilation system in order to suppress noise transmission through the duct system.

2. Acoustical Tile - sound absorbing material such as glass have proven very effective in reducing room noise.

ATTACHMENT B

SPECIFICATIONS FOR WAVE

GENERATING EQUIPMENT

VARAWAVE PLUS

1. EQUIPMENT

1.1 Mechanical equipment shall be suitable for making waves in a pool of the size, shape and design shown on the accompanying drawings and shall consist of 3 fans, 3 motors, caisson equipment and one pneumatic sub-system.

1.2 The 3 fans shall be high pressure centrifugal blowers with 200 HP induction motors. Caisson equipment shall consist of pneumatic cylinders, pneumatic valves, heavy duty air directional valves, stainless steel caisson deflector sleeves, and anchor bolt assemblies. The pneumatic sub-system shall consist of an air compressor assembly, pneumatic piping and controls to each air directional valve.

1.3 Ducting between fans and plenum and between plenum and air directional valves will be provided.

1.4 The electrical equipment shall be housed in an enclosure manufactured to NEMA-12 standards but modified to provide filtered forced air ventilation. The equipment shall consist of the following:

a) Solid state reduced voltage starting equipment to minimize the electrical surge at start-up.
b) Circuit breakers for each motor with an indicating alarm circuit.
c) A relay with thermal overload protection for each phase will be provided for each motor with an indicating alarm circuit.
d) Solid state timing devices to adjust the wave time and the rest time cycles.
e) A programmable controller shall be used to provide the logic for the waves. This will allow for the selection of cycling different wave patterns between operating periods or any one wave pattern can be selected to repeat itself between operating periods.
f) Solid state digital readout.

g) Solid state timers and drivers to operate the pneumatic control devices.

h) Indicating lights to indicate the status of the system and to help trouble shoot if any problems arise.

i) Operating instructions which are clearly marked as to function.

j) The power equipment is 460 volts, 3 phase, 60 hertz.

k) All equipment shall be heavy duty type industrial equipment designed to withstand continuous operation and/or intermittent operation.

1.5 The air compressor shall consist of a 20 HP electric motor, rated for 100 PSI with a rate of output of 70 SCFM.

1.6 The pneumatic piping shall consist of a main shut-off valve from the air compressor to the air header, type "L" copper tube complete with fittings, wall clamps and a condensate drip leg. The control of each air direction valve shall consist of a solenoid valve with a minimum CV factor of 1.0 complete with a pneumatic muffler and cylinder speed controls, a 125 PSI air pressure regulator and filter and lubricator.

1.7 Lifeguard emergency stop-start stations for emergency stopping and key starting shall be provided at two permanent lifeguard stands. All other permanent lifeguard stands shall be provided with an emergency stop station. These stations shall operate on a 12 volt AC system to eliminate any electrical shock hazard at pool side.

2. DELIVERY AND PROTECTION OF MATERIALS

2.1 The supplier shall be responsible for delivery to the jobsite. Equipment shall be shipped within the specified time after award of the contract. Two separate shipments are anticipated: caisson deflector sleeves and anchor bolts early in the job progress and the remainder of the equipment later in the progress of the job.

2.2 The installation contractor shall be responsible for receiving, unloading, checking, handling and storage from physical damage and moisture for all wave making equipment.

3. INSTALLATION

3.1 The supplier furnishing the equipment shall not be required to make any installations but shall be required to supervise the installation done by others. The supplier shall be available as required to the installation contractor (a) during the installation (b) at the completion of the installation and (c) for placing the equipment into initial use.

4. PERFORMANCE

4.1 Temporary water and power shall be furnished by others. Lubricants and other specialties for initial start-up are to be supplied by this supplier so as to be compatible with the specific requirements of this equipment.

4.2 The system shall be a variable wave system providing eight different wave patterns which are:

1. Diamond
2. Parallel
3. V-Pattern
4. Inverted V-Pattern
5. Diagonal-Left
6. Diagonal-Right
7. Quasi Parallel-Left
8. Quasi Parallel-Right

The system shall be a selector switch that will create the chosen pattern continuously as desired by the owner/operator control and by use of a control console mounted pattern selector switch. Each pattern shall sequentially transition to the next pattern automatically. Pattern controls shall be capable of being set for automatic or manual control as desired by the owner/operator and shall be capable of being preprogrammed.

4.3 At completion of installation the supplier's representative shall start, adjust, balance and otherwise fine tune the equipment to provide the specific results. The installation contractor shall furnish manpower as necessary to assist the supplier's representative in those responsibilities. The supplier shall demonstrate to the Architect and Owner that the equipment will make waves in cycles of 12 minutes on and 12 minutes off for a period of at least four hours.

5. TRAINING

5.1 During the start-up and fine tuning period the supplier shall provide adequate instruction and training in operation and maintenance of the equipment to a person designated by the owner to receive such training. The supplier shall furnish to the Architect a written statement signed by his representative and the Owner's designated maintenance employee stating specific instruction given and received.

5.2 Supplier shall furnish to the Architect/Owner three bound copies of a complete manual of operating and maintenance instructions for all equipment furnished by him.

6. FINAL OPERATIONAL CHECKOUT

6.1 The supplier shall perform a final operational checkout at the jobsite during the first season of operation which is to be defined as 120 days after the initial turn-on of the system. This checkout shall consist of:

a) Inspection, testing and adjustment of all equipment and components.
b) Replacement of any faulty components at no cost to, but to be installed by Owner.
c) Final maintenance-service instructional session with Owner's maintenance man responsible for the equipment.
d) Supervision of or instruction in winter shut down by Owner's maintenance man.

6.2 Upon completion of this inspection the supplier shall submit a report to the Owner advising him of the supplier's evaluation of operation and maintenance performed by the Owner's employees and advising of any spare parts which need to be ordered for the following year's operation.

6.3 The warranty will commence at completion of the final operational checkout and will be for two years duration.

7. WARRANTY

7.1 The supplier shall furnish a written guarantee against all defects in workmanship and material for a period of two years from the date of final operational checkout, as defined in Section 6.1 herein. Therein warranting equipment for a total of two seasons of operation against defects in material and workmanship less normal wear and tear.

7.2 In addition, he shall further guarantee that all equipment furnished, installed and maintained in accordance with manufacturer's written instructions shall produce waves substantially equal to waves in the Aquatic Center at Point Mallard in Decatur, Alabama and Waterford Oaks Pool at Pontiac, Michigan. That is, the waves shall be a diamond shaped pattern with a wave height of approximately 4.0 feet between crest and trough with an interval between waves of not more than three seconds.

8. FINALLY

Should there by anything omitted which is obviously intended by the plans and specifications, same shall be done as if specifically mentioned, without extra compensation.

ATTACHMENT C

MACHINERY LIMITED WARRANTY AGREEMENT

Introduction. The machinery being purchased is warranted to be free from defects in material or workmanship for a period of two years from final operational checkout, subject to the conditions hereinafter set out.

Terms of the Warranty. All machinery, parts and materials provided by WaveTek Products, Inc. is warranted for two years following final operational checkout against any defects in material or workmanship, except for those caused by:

(1) normal wear and tear;

(2) improper installation, improper modification, servicing or operation;

(3) electrical power fluctuations originating outside of the equipment provided by WaveTek Products, Inc. which may be destructive to the equipment.

The Buyer's exclusive right and WaveTek Products, Inc.'s sole obligation under this warranty is to replace any defective machinery by shipping to the Buyer's designated location replacement machinery or parts for any defective found by WaveTek Products, Inc. in accordance with the terms hereof, provided written notice of such defect is delivered to WaveTek Products, Inc. at 1248 West Fourth Street, Mansfield, Ohio, 44906 within the warranty period and within fifteen (15) days after such defect is discovered. This warranty runs in favor of the Buyer hereunder, but does not extend to any other person, firm or entity. Any modification or addition to the original equipment without the express written consent of WaveTek Products, Inc. will void this warranty in its entirety.

Exclusions from Warranty. The parties agree there have been no affirmations, promises or descriptions relating to the machinery other than the warranties herein expressly contained, that WaveTek Products, Inc. is making no warranties of any kind except those set out in this Machinery Limited Warranty Agreement, and that the express warranties herein are in lieu of all warranties, express or implied. The parties further agree that:

(1) there are no warranties which extend beyond the description on the face hereof.

(2) there are no warranties concerning any system, method, operation or design;

(3) all warranties pertain exclusively to defects in material and workmanship of the machinery provided by WaveTek Products, Inc.; and

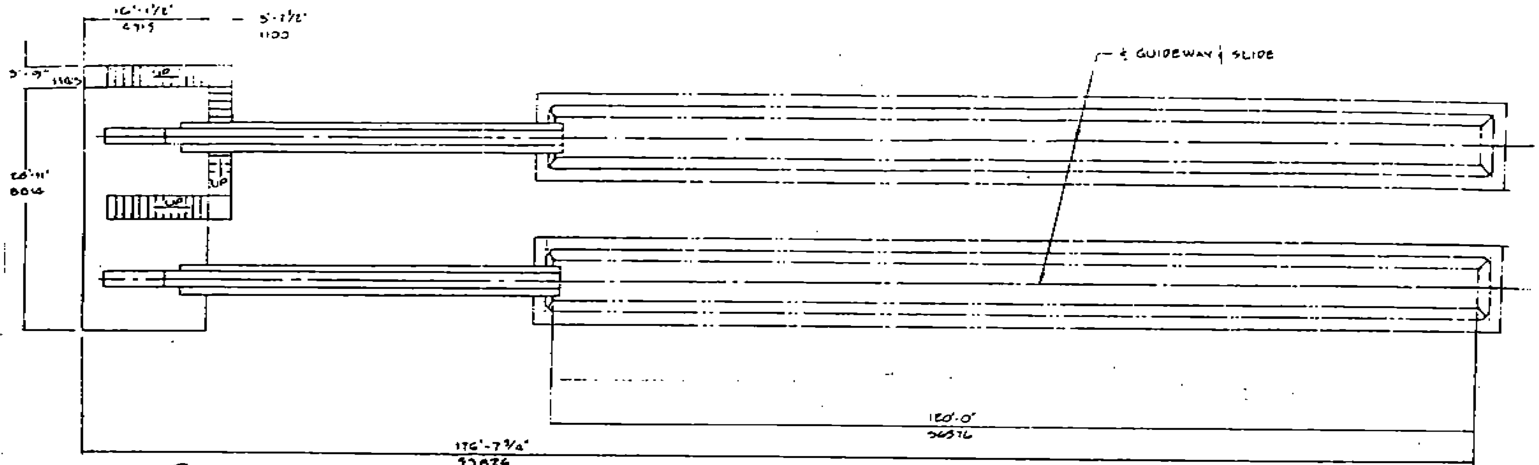
(4) no agent, representative or officer of WaveTek Products, Inc. has the authority to expand, add to, or vary the terms of the warranty herein contained.

Buyer acknowledges that there has been no representation or warranty other than that herein set forth.

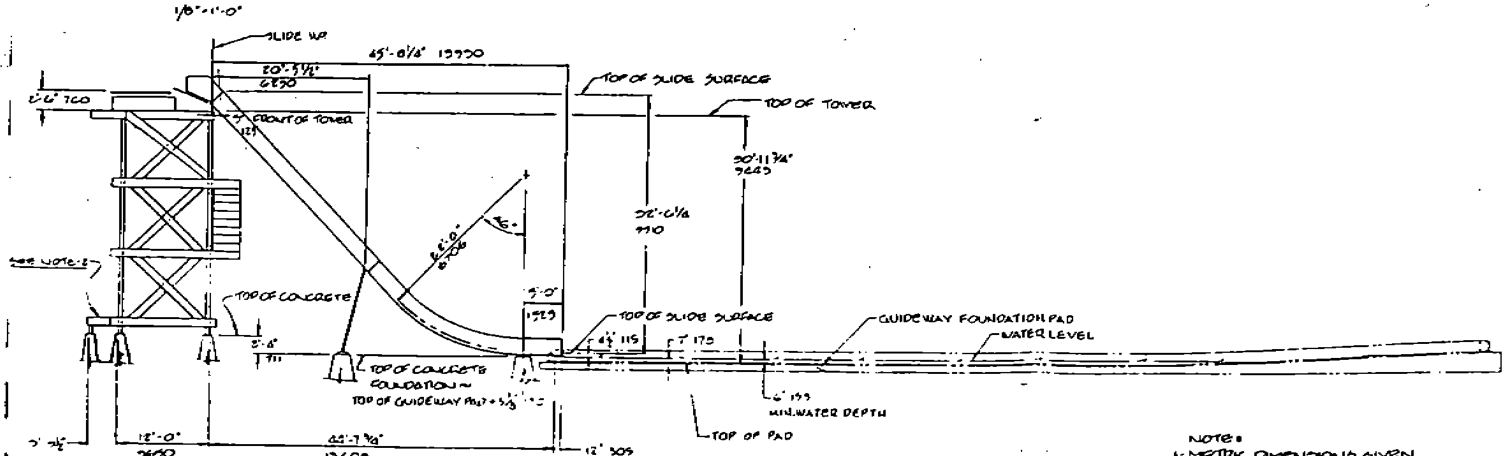
Further Damage Exclusion. In no event will WaveTek Products, Inc. be liable for damages for loss of use, loss of profits, or consequential repair of the machinery sold.

Independent Inspection. Buyer acknowledges that Buyer has had full opportunity to inspect similar machinery in operation and that Buyer's decision to purchase the machinery has been made after a full and independent investigation by Buyer of such machinery, and is not made in reliance on any advertising or promotional activities undertaken on behalf of WaveTek Products, Inc.

Warranty Not Valid Until Contract Accepted In Ohio. It is acknowledged by Buyer that this Machinery Limited Warranty Agreement is not valid or binding until accepted at the home office of WaveTek Products, Inc., 1248 West Fourth Street, Mansfield, Ohio. The terms of this warranty shall be construed according to the laws of the State of Ohio.



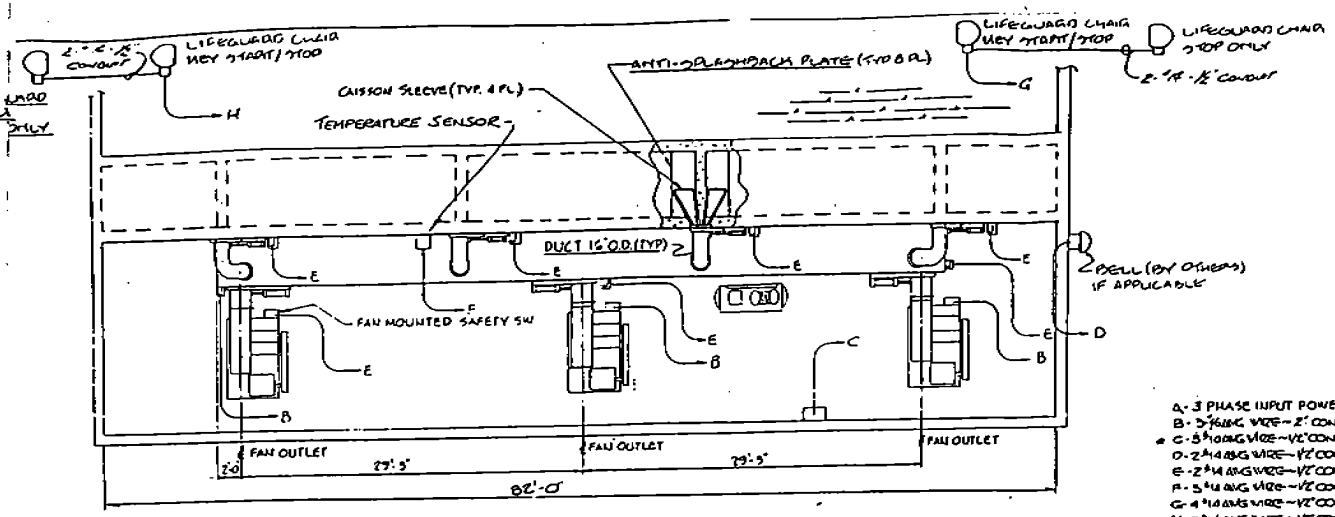
PLAN
1/8"=1'-0"



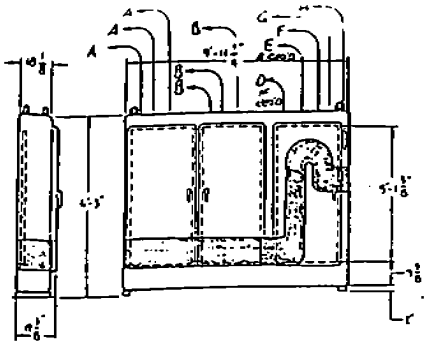
ELEVATION
1/4"=1'-0"

NOTES:
1- METRIC DIMENSIONS GIVEN IN MILLIMETERS.
2- STEPS FROM GROUND LEVEL TO FIRST LANDING

DESCRIPTION	TOWER, SLIDE & GUIDEWAY ARRANGEMENT
PROJECT	DOUBLE RAMPAGE W/GUIDEWAY



PLAN VIEW

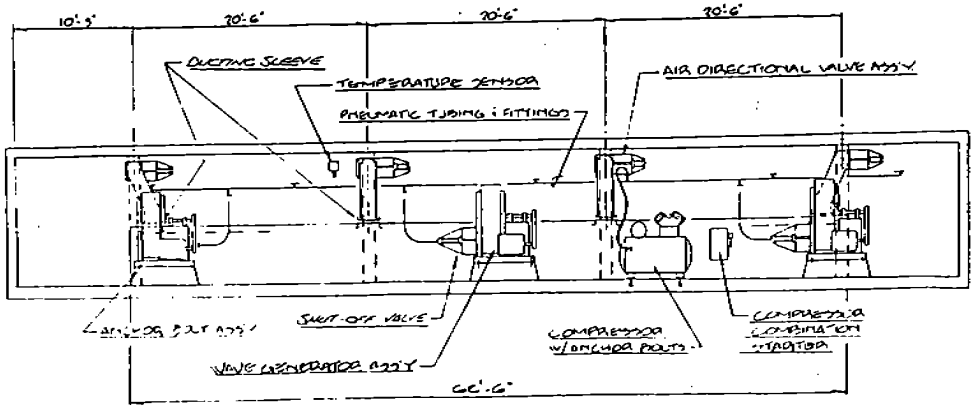


MOTOR CONTROL CENTER
LOCATE AS REQ'D.

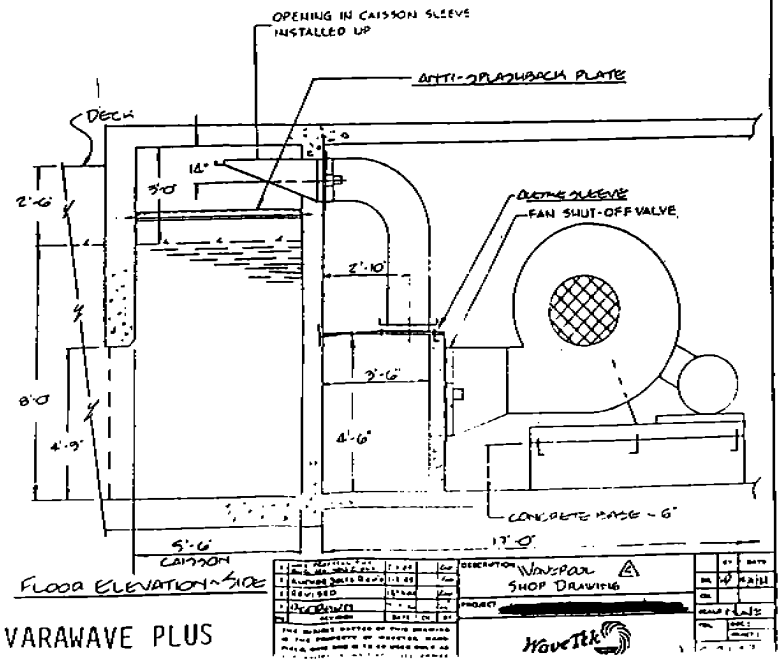
A - 3 PHASE INPUT POWER - SIZED'D - (3) 150 H.P. MOTORS
B - 3#6 AWG WIRE - 2" CONDUIT - SIZED'D - POWER
C - 3#10 AWG WIRE - ½" CONDUIT - SIZED'D - POWER
D - 2#14 AWG WIRE - ½" CONDUIT - SIZED'D - POWER
E - 2#14 AWG WIRE - ½" CONDUIT - SIZED'D - POWER
F - 5#14 AWG WIRE - ½" CONDUIT - SIZED'D - CONTROL
G - 4#14 AWG WIRE - ½" CONDUIT - SIZED'D - CONTROL
H - 3#14 AWG WIRE - ½" CONDUIT - SIZED'D - CONTROL
J - JUNCTION BOXES - SIZED'D.

NOTE:
1. COPPER WIRE SIZES GIVEN
2. CONDUIT SIZES ARE MINIMUMS.
3. LEGEND EQUIPMENT AS REQ'D BY CODE.
* - TO CUSTOMER'S POWER DISTRIBUTION PANEL.

NOTE: POOL WIDTH PROPOSED HERE IS 100' TO 110' RATHER THAN 82' AS ILLUSTRATED IN THESE DRAWINGS. THIS DRAWING IS PROVIDED AS A CONCEPTUAL GUIDELINE RATHER THAN AN ACTUAL.



ELEVATION



FLOOR ELEVATION - SIDE

VARAWAVE PLUS

DESCRIPTION: VARAWAVE A
SHOP DRAWING
PROJECT
WaveTek

THE RAMPAGE WATER COASTER

PURCHASE ORDER

PURCHASER: GARY LARSON

BILLING ADDRESS: The Larson Group
P.O. Box 1647
Kissimmee, FL 32741

SHIPPING ADDRESS: Larson Lodge
Main Gate
Rt 192
Kissimmee, FL

PREFERRED SHIPPING DATE: ______________

DESCRIPTION: Double Rampage, Double Getaway with Rain Drops

PRICE F.O.B. MANSFIELD, OHIO..............................$65,550.00

TAXES: Will be invoiced if applicable.

PAYMENT TERMS: As per Attachment D, [illegible] revised payment schedule [illegible]

~~20% upon purchase order execution $ ______~~
~~20% - 30 days after purchase order execution $ ______~~
~~60% upon notification of shipment ready to be made $ ______~~

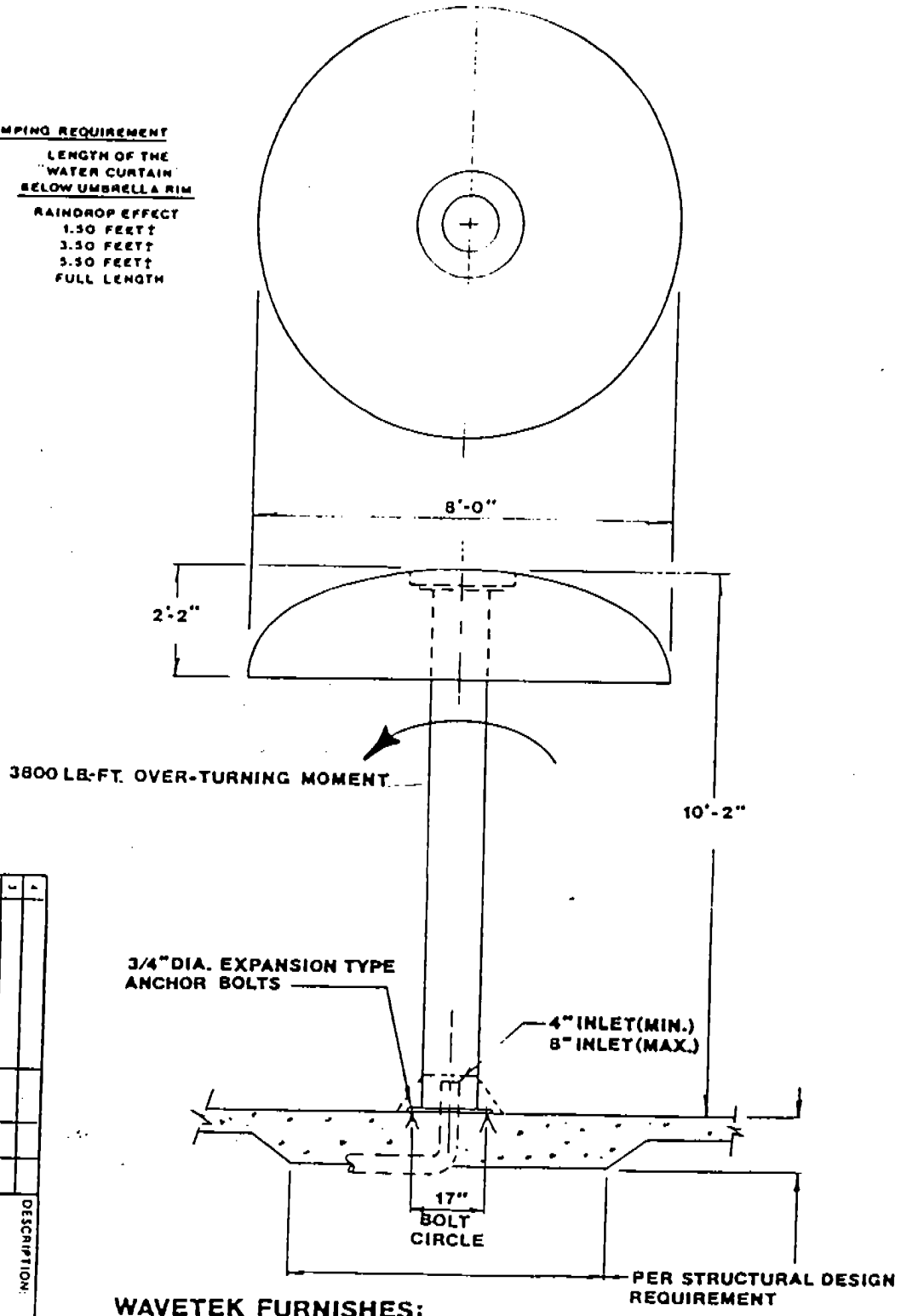
CONDITION OF SALE: In the event of non-payment when and as due WaveTek ~~International~~, Inc., may cease continued manufacturing or shipping until such payments with penalties if any or late payments are made by purchaser with no liability whatsoever on the part of WaveTek ~~International~~, Inc. Should purchaser fail to make subsequent payments as required, WaveTek ~~International~~, Inc. shall be entitled to retain payments previously made as liquidated damages.

WARRANTY: As stated in the standard WaveTek ~~International~~, Inc. warranty attached hereto.

ACCEPTED BY:	ACCEPTED BY PURCHASER:
WaveTek ~~International~~, Inc.	[illegible signature]
Post Office Box 338	
1248 West Fourth Street	[illegible]
Mansfield, OH 44901	
By: [illegible signature]	By:
Title: SALES MANAGER	Title: [illegible]
Date: 11/26/85	Date: [illegible]

PUMPING REQUIREMENT

VOLUME	LENGTH OF THE WATER CURTAIN BELOW UMBRELLA RIM
80 GPM	RAINDROP EFFECT
150 GPM	1.50 FEET†
200 GPM	3.50 FEET†
280 GPM	5.50 FEET†
400 GPM	FULL LENGTH



WAVETEK FURNISHES:

A. UMBRELLA WITH STAINLESS FASTENERS
B. STEM & SKIRT
C. ANCHOR DEVICES
D. GASKETS

OTHERS FURNISH:

A. INSTALLATION OF STEM & UMBRELLA
B. FOUNDATION
C. PIPING TO STEM
D. PUMP & ELECTRICAL SERVICES

SHIPPING WEIGHT: 550 LB.

NO.	REVISION	DATE	CH.	BY
1				
2				
3				
4				

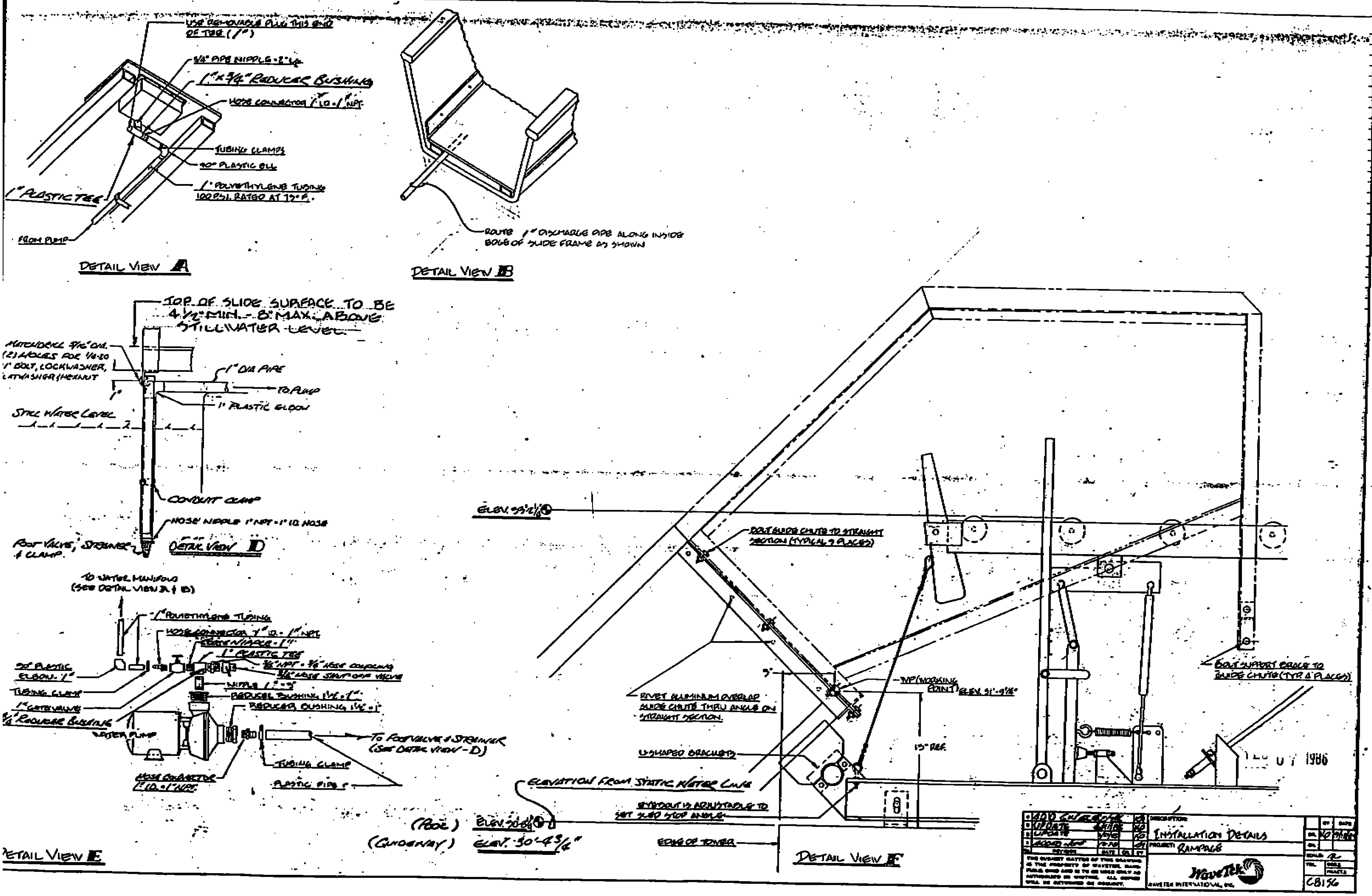
WaveTek AUTOMATED SWIMPOOLS, INC.

PROJECT:

DESCRIPTION: RAINDROP

SCALE	CH.	DR. KP 8/20/85	
TOL. FRACT.: DEC.:		BY	DATE

B1048



1/2 REMOVABLE PLUG THIS END OF TEE (1")
3/4" PIPE NIPPLE
1"x3/4" REDUCER BUSHING
HOSE CONNECTOR
TUBING CLAMPS
90° PLASTIC ELL
1" POLYETHYLENE TUBING 100 PSI RATED AT 73° F.
1" PLASTIC TEE
FROM PUMP
DETAIL VIEW A
ROUTE 1" DISCHARGE PIPE ALONG INSIDE EDGE OF SLIDE FRAME AS SHOWN
DETAIL VIEW B
TOP OF SLIDE SURFACE TO BE 4 1/2" MIN. - 8" MAX. ABOVE STILLWATER LEVEL
1" DIA PIPE
TO PUMP
1" PLASTIC ELBOW
STILL WATER LEVEL
CONDUIT CLAMP
HOSE NIPPLE 1" NPT - 1" ID HOSE
FOOT VALVE, STRAINER & CLAMP
DETAIL VIEW D
TO WATER MANIFOLD (SEE DETAIL VIEW A & B)
1" POLYETHYLENE TUBING
HOSE CONNECTOR 1" ID - 1" NPT
1" PLASTIC TEE
90° PLASTIC ELBOW 1"
TUBING CLAMP
1" GATE VALVE
REDUCER BUSHING
WATER PUMP
TO FOOTVALVE & STRAINER (SEE DETAIL VIEW - D)
TUBING CLAMP
HOSE CONNECTOR
PLASTIC PIPE
DETAIL VIEW E
ELEV.
BOLT SLIDE CHUTE TO STRAIGHT SECTION (TYPICAL 9 PLACES)
RIVET ALUMINUM OVERLAP SLIDE CHUTE THRU ANGLE ON STRAIGHT SECTION
U-SHAPED BRACKETS
ELEVATION FROM STATIC WATER LINE
EDGE OF TOWER
15° REF.
BOLT SUPPORT BRACE TO SLIDE CHUTE (TYP 4 PLACES)
(POOL)
(GUNDRAY)
DETAIL VIEW F
1986
INSTALLATION DETAILS
RAMPAGE
WaveTek
WAVETEK INTERNATIONAL, INC.
CB156