SEMITOOL EQUIPMENT MANUAL

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RECEIVED
NORTHERN ARIZONA UNIVERSITY
NOV 27 1991
College of Engineering & Technology

ST-270
800 Series (STACKER)
P228 controller
NF-20 N_2 package
Recirc option
Resistance monitor option

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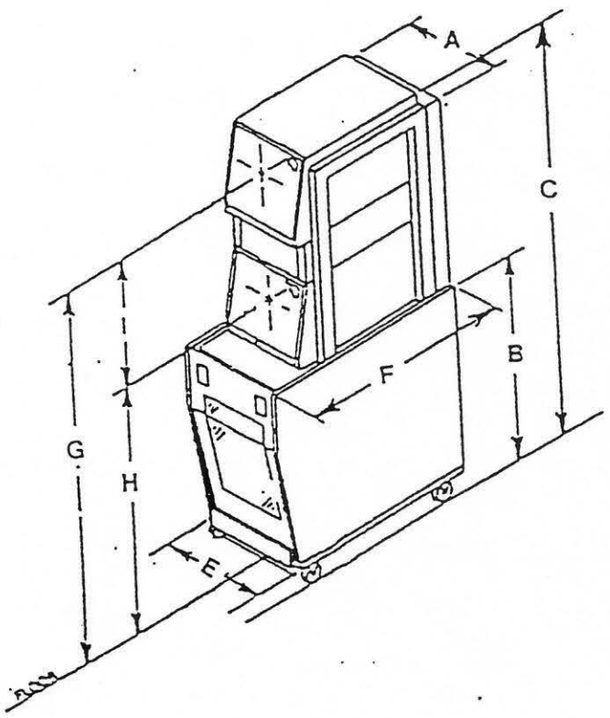
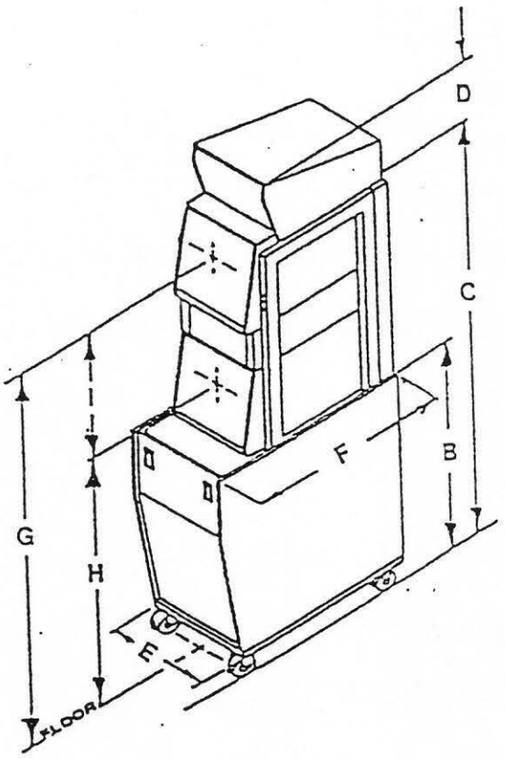
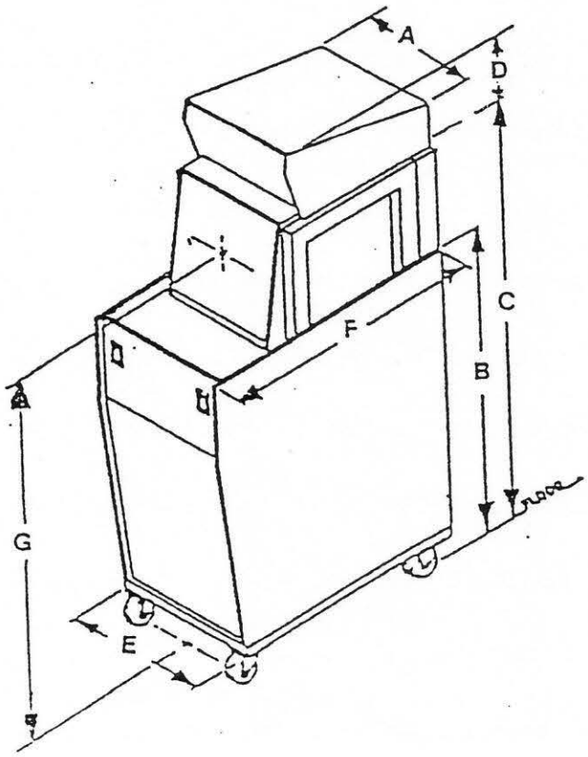
STACKER DIMENSIONS FRONT VIEW





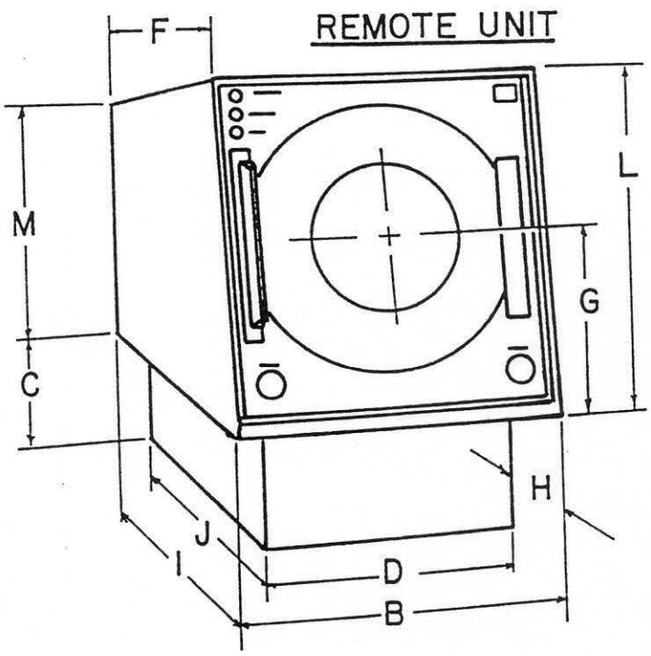


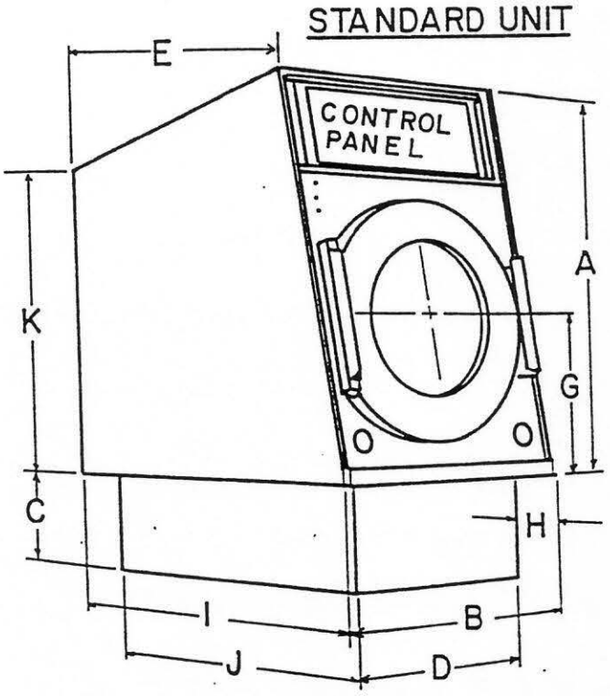
DIMENSION GRAPH

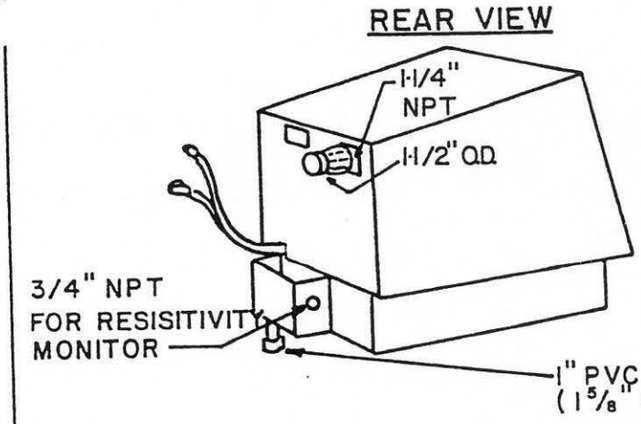
	A	B	C	D	E	F	G	H	I
440	13 1/2	35 7/8	47 29/32	D	14 1/2	27	42 1/2	-	-
460	15	35 1/8	48 29/32	D	16	27	42 1/2	-	-
470	16 1/2	35 7/8	50 19/32	D	17 1/2	27	43 15/32	-	-
480	17	35 7/8	50 19/32	D	18	27	43 15/32	-	-
4300	20 1/16	35 11/16	54 15/16	D	21 1/16	28 5/8	46 3/16	-	-
840	13 1/2	31 3/8	60 11/16	D	14 1/2	27	55 9/32	38	17 9/32
860	15	31 3/8	62 21/32	D	16	27	56 9/32	38	18 9/32
870	16 1/2	31 3/8	66 1/16	D	17 1/2	27	58 15/16	38 21/32	19 21/32
880	17	31 25/64	66 3/4	D	18	27	59 5/8	39 25/64	20 1/4

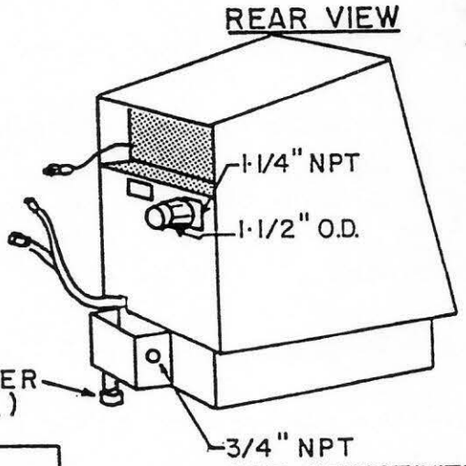
D	7 3/4	5 3/16	2 1/2
DIM	TC-30	TC-30T	UL-30T

BENCH MODEL DIMENSIONS









MODEL	DIMENSIONS												
	A	B	C	D	E	F	G	H	I	J	K	L	M
ST-240	16 21/32	11 1/2	4 3/4	10	17 1/8	17 7/8	7	1 1/4	19 13/16	17 11/16	13 11/16	12 7/32	9 11/32
ST-260	17 5/8	13	4 3/4	10	16 15/16	17 11/16	7	1 1/4	19 13/16	17 11/16	14 11/16	13 3/16	10 3/8
ST-270	19 5/16	14 1/2	4 3/4	10	17 5/16	18 1/16	7 31/32	1 7/8	20 7/16	17 11/16	16 5/16	14 7/8	12
ST-280	19 3/8	15	4 3/4	10	18 5/8	19 3/8	8	2 1/2	21 9/16	17 3/4	11 15/16	14 15/16	11 15/16
ST-300	23 9/16	18	4 3/4	10 1/2	19 11/16	20 3/16	10 1/2	2	23 1/2	20 3/4	20 3/32	19 3/8	15 13/16

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Rinser/Dryer
Facility Requirements

---------- Bench, Console & Stacker Models ----------
Processing Fluid Requirements

Machine Size	Nitrogen (N2) size (OD Tubing)	Nitrogen (N2) flow (SCFM @ PSIG)	DI Water size (OD Tubing)	DI Water flow (GPM @ PSIG)
260 / 270	3/8"	4-6 @ 30-35	3/8"	1.5-2.0 @ 30-40
280	3/8"	4-6 @ 30-35	3/8"	2.5-3.0 @ 30-40
2300	3/8"	4-6 @ 30-35	1/2"	3.5-4.5 @ 30-40

Notes

1) Regulators and pressure gages for 3/8 inch supply lines must have an inside diameter of a least 1/4 inch.

2) Regulators and pressure gages for 1/2 inch supply lines must have an inside diameter of at least 5/16 inch.

3) DI water facility pressures must be maintained during the rinse cycle.

4) Nitrogen facility pressures must be maintained during the dry cycle.

Drain Requirements
For easy installation all bench and console models are provided with 1 inch Sch 40 PVC drain box fittings. Stacker models use 1-1/4 inch Sch 40 PVC drain pipe. Console and stacker models are plumbed with drain traps and atmospheric vents.

Semitool recommends that every bench model Rinser/Dryer be installed with a drain trap to prevent contaminants from back migrating into the bowl. See the recommended drain configuration for more details.

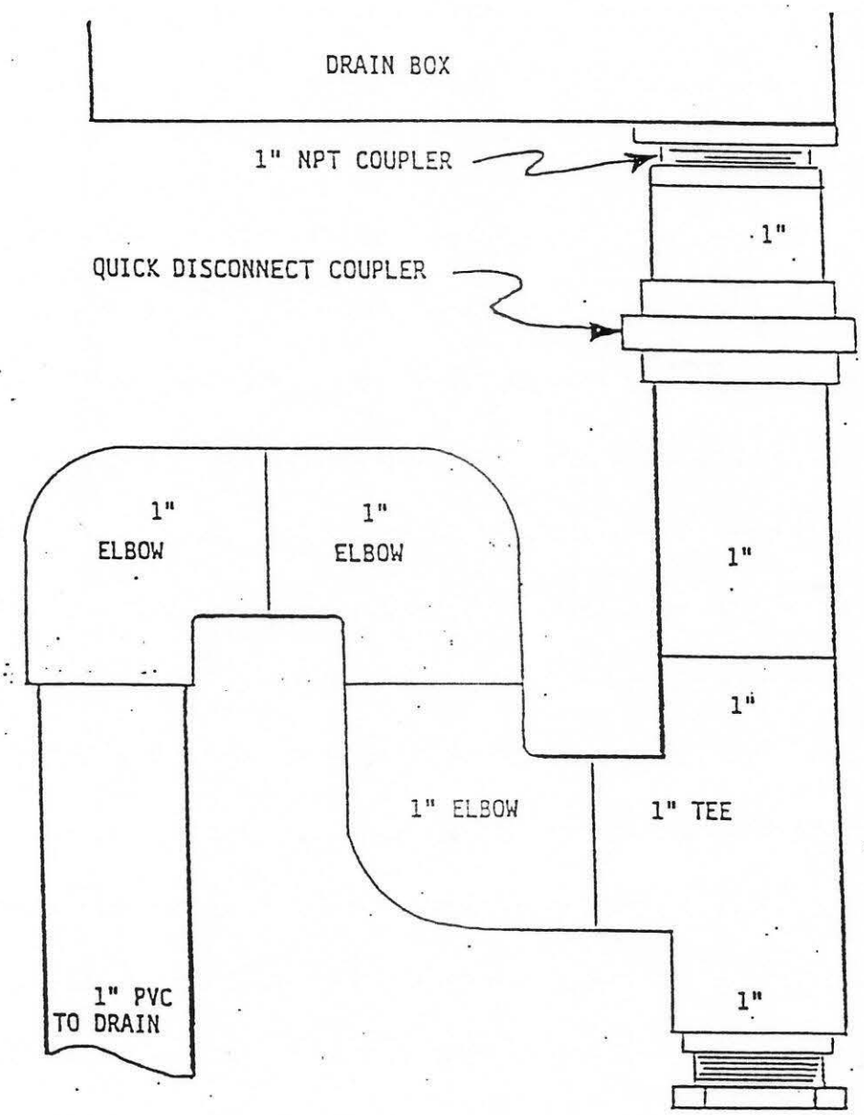
Cabinet Exhaust Requirements
All Semitool Rinser/Dryers are provided with a 1-1/2 inch Sch 40 PVC exhaust fitting. Semitool recommends that an equivalent mass flow rate of 7 SCFM be maintained during all processing.

Power Requirements

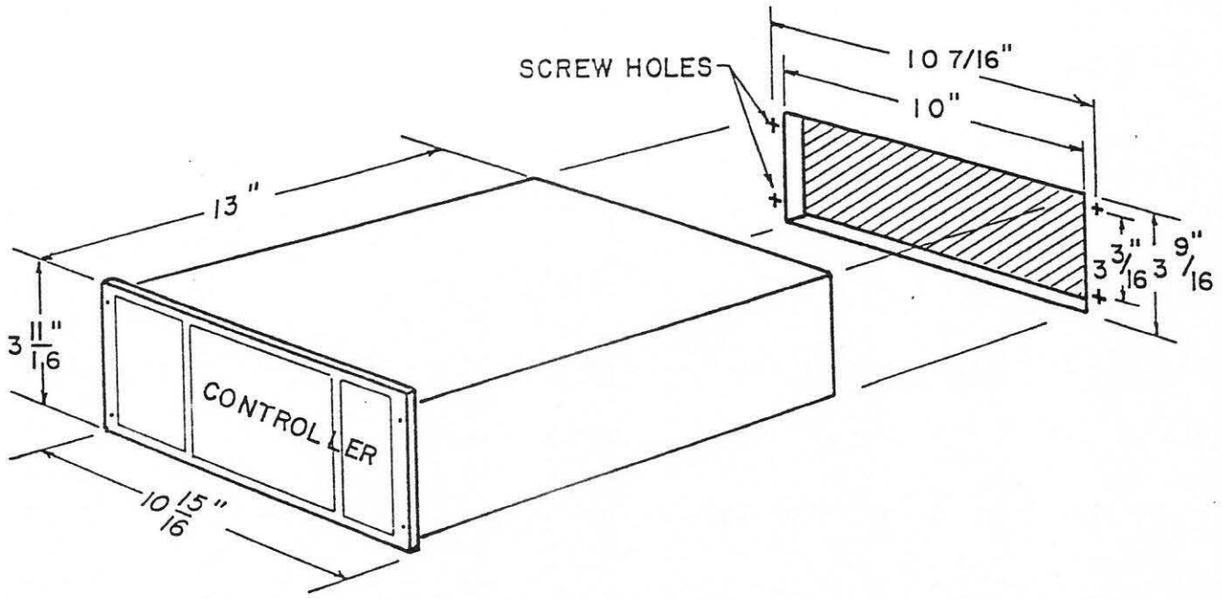
USA	120 VAC, 60 HZ, 15 AMPS
Japan	100 VAC, 50/60 HZ, 18 AMPS
Europe	240 VAC, 50/60 HZ, 7.5 AMPS (requires IS-20 transformer option)

RECOMMENDED DRAIN CONFIGURATION

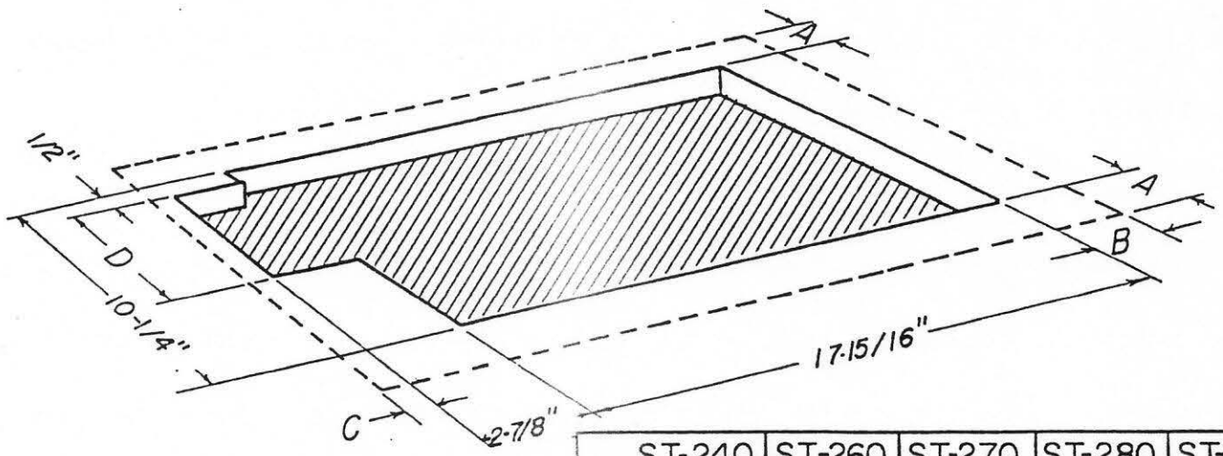
BENCH MODEL SRD



REMOTE CONTROLLERS CUTOUT DIMENSIONS



COUNTER CUTOUT DIMENSIONS

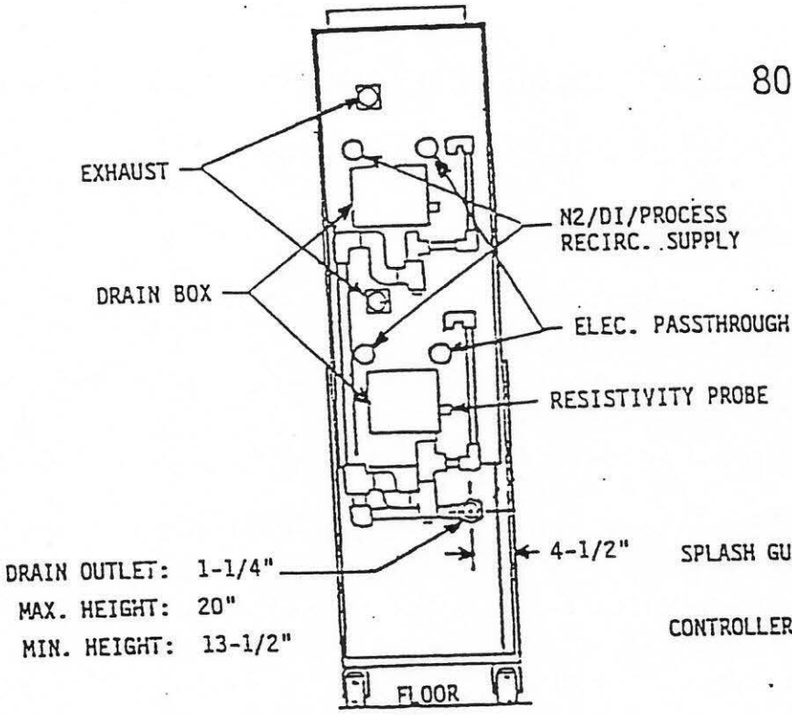


	ST-240	ST-260	ST-270	ST-280	ST-300
A	7/8	1 5/8	2 3/8	2	3 1/2
B	1 1/4	1 1/4	1 7/8	2 1/2	2
C	1	1	1	3/4	3/4
D	5 3/4	5 3/4	5 3/4	5 3/4	6 3/4

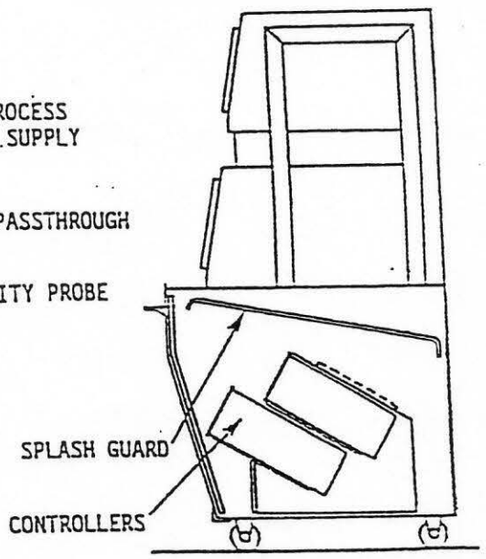
SRD 124 mn 1/87

STACKER DIMENSIONS

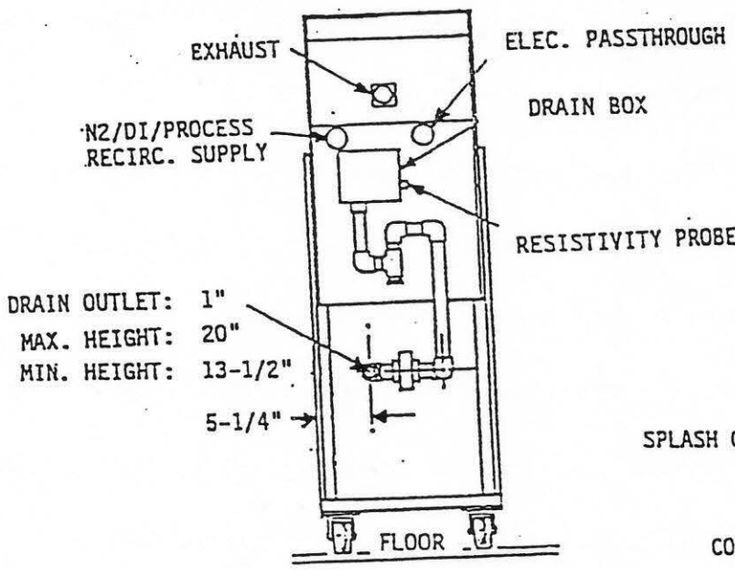
800 SERIES REAR VIEW



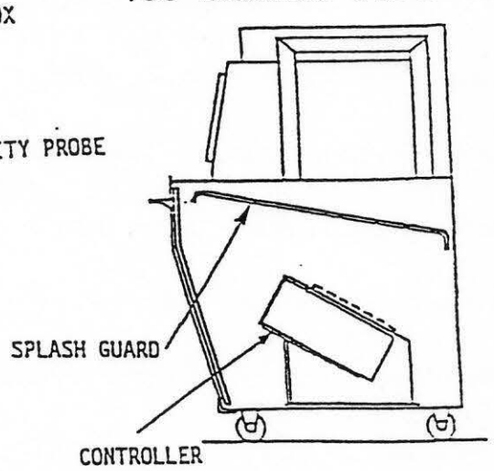
800 SERIES SIDE VIEW



400 SERIES REAR VIEW

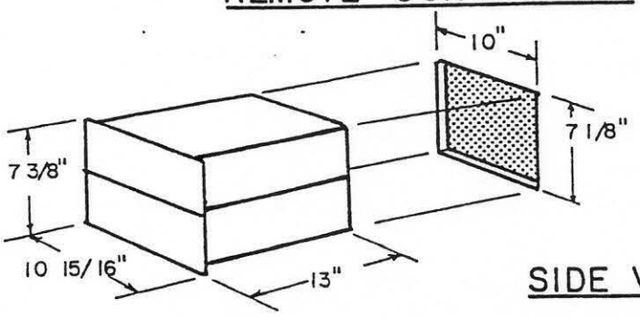


400 SERIES SIDE VIEW

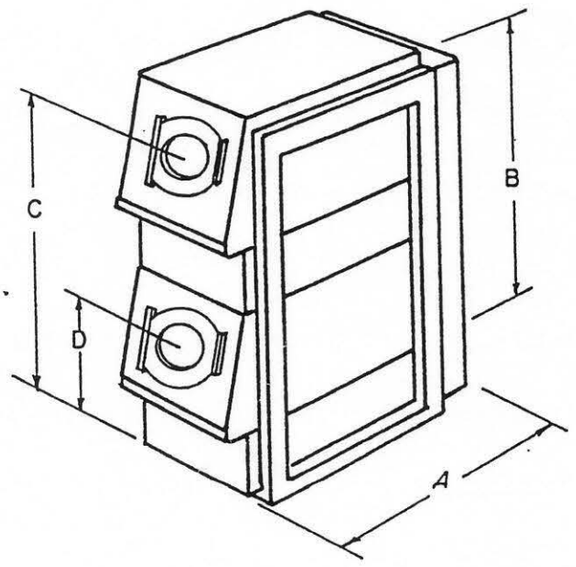


DOUBLE STACKER BENCH MODEL

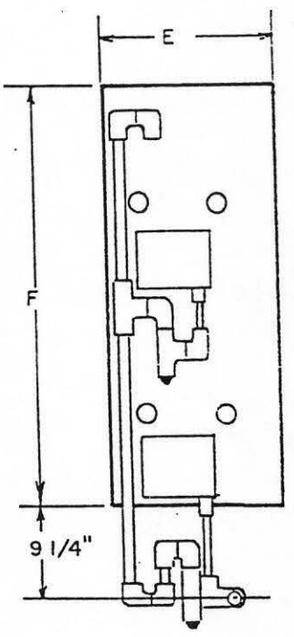
REMOTE CONTROLLER



SIDE VIEW



REAR VIEW



MODEL	A	B	C	D	E	F	WT. LB.
240	24"	30"	30"	11"	15"	36"	270
260	24"	32"	32"	13"	15"	38"	280
270	24"	34"	34"	15"	18"	39"	290
280	24"	36"	36"	17"	19"	42"	300
300	24"	38"	38"	19"	21"	44"	310

GENERAL INSTALLATION WIRING PRACTICES

These guidelines should be followed in the installation of Semitool equipment. Each installation will differ, and more care should be taken as installations become longer. Special attention should be given to wires that are used for the transmission of data.

1. Locate electrical equipment, controls, and components away from water, humidity, heat, and dust sources, or provide a suitable enclosure to protect equipment from these elements.

2. Locate equipment, controls, and components away from SCRs, Triacs, buzzers, heavy motors, contractors, heavy current relays, or other electrical noise generating equipment.

3. Use a metal enclosure to protect the electronic components from radiated electrical noise or other electrostatic or magnetic noise.

4. Low level signal and control wiring should be separate from wiring for switching and power. Cabinet and panel wiring should be planned with the power and relay wiring dressed to one side and low level signals dressed to the other side. Wiring to barrier strips, connectors , and relay contacts should be planned for maximum separation.

5. The length of signal and control wiring should be minimized and in twisted pairs. Lines for tachometers and other pulse or frequency devices should be run in separate 2-wire shielded cables.

6. Shield connections for shielded cables should be connected so that no current flows in the shield. Care should be taken not to ground the shield at any point except where it is connected to the equipment or instrument ground. The case of the equipment or instrument should be connected to earth ground.

7. Provide power that is noise-free and free of interruption. In some cases this may require constant voltage sources, isolation transformers and/or noise filters.

8. DC power busses should operate within the limits provided in the equipment specifications. Special care to isolate DC relay contact wiring from signal and control wiring should be taken.

9. Electrical noise may be most easily reduced at the source. The installation of snubber networks or noise suppressors across relay contact, relays and switches may be helpful.

#13

RESISTIVITY MONITOR CHECKOUT

What is Res Mon set pt? ——— Troubleshoot says level is selectable. where is adj.?

After the initial checkout of the SRD and controller is completed, the next step is to checkout the resistivity monitor, should the particular SRD be equipped with this option.

1. Leave all controls preset as above.

2. Turn the resistivity monitor switch to the **AUTOMATIC** position. The SRD rinses to a quality base if the resistivity monitor switch is in the **AUTO** position. In the **MANUAL** position, the SRD rinses to a time base determined by the time entered in the rinse cycle thumbwheels.

3. With the monitor switch in the **AUTO** position, push the **<START>** button on the SRD front panel. If the preset resistivity level is not reached after completion of the rinse time, the controller will step into an **AUTO** rinse cycle. At this time, the display on the controller front panel will flash **999**.

If the SRD switches to the DRY mode without going into the **999** cycle, check the following:

A. Is the setpoint too low? Increase the setpoint.*

B. Is the monitor switch in the **AUTO** position?

C. Are resistivity monitor cables connected?

D. Is a continuous supply of DI running over the probe in the drain box?

To manually advance the SRD into the dry cycle, turn the resistivity monitor switch to the **MANUAL** or **OFF** position.

Note: All Semitool supplied monitors have a preset setpoint of ten (10) megohm. To change this setpoint, refer to the options section for the necessary procedure.

Should problems persist in the operation of the SRD after applying the above checks, contact your maintenance department of the Semitool Customer Service Department.

① ResMon SW to AUTO
② Meter Legend Bar To SET POINT (USE MODE BUTTON)
③ Press/Hold CONTROL Button ~~AND~~ THEN PRESS MODE BUTTON
Keep CONTROL BUTTON DOWN TO DECREASE SET PT
RELEASE CONTROL Button TO INCREASE SET PT

RECOMMENDED PRE-CLEAN RINSE

Before shipment, each machine has a hydrogen peroxide purge to reduce the bacterial build-up in the SRD. Unpacking and set-up procedures may contaminate the SRD and produce poor particle counts. A pre-clean rinse is recommended before a product is introduced to the SRD for processing. Should you require additional information or assistance, please contact your local Semitool Customer Service Office.

PRE-OPERATION CLEANING RINSE

The SRD should be rinsed thoroughly before any production material is introduced into the chamber. The following procedure provides guidelines for performing a pre-operation cleaning rinse.

1. Set the rinse thumbwheels to 999 seconds.
2. Set resmon switch to the **AUTO** position (optional equipment).
3. Set the resistivity monitor to 20 megohm.
4. If a resistivity monitor option is not installed on your SRD, a manual restart is required after 999 seconds have elapsed. This should be done before advancing to the next step.
5. Set dry time to 240 seconds.
6. Push the **<START>** button and let the SRD rinse for 4 to 8 hours.

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Section II - Operation

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GLOSSARY OF TERMS

The following glossary of terms has been included to ensure that no error in understanding occurs due to unfamiliar terminology. The terms listed and the associated definition are those commonly used by Semitool throughout our manuals and communications.

SRD: An acronym for Spin Rinser Dryer.

Cassette / Boat / Carrier: The device used to contain wafers both during processing and while being transported between different process stations.

Bowl: The cylindrical bowl shaped process chamber that provides a controlled environment for wafer fabrication processes.

Rotor: In a Semitool Rinser/Dryer, the metal circular cage which receives the boat and holds it in place during processing. The rotor is fastened to the rotor drive plate with either four cap screws or a quick change nut. See option section for information regarding the "Quick Change" rotor. Each rotor is spin balanced for a specified load consisting of boat and wafers.

RSP: An acronym for Rotor Stop Positioner, which is an air actuated piston used to position the rotor in an upright fashion after a process is completed. This will prevent the wafers from being damaged during loading and unloading.

Stacker: Refers to a Semitool double SRD cabinet, where two units are stacked vertically on a common console.

Cycle: Commonly used to describe a functionally specific part of an overall process. A "Rinse Cycle" would refer to that segment of time when the wafer rinse is performed.

Resistivity: As used in wafer fabrication industry, resistivity refers to the resistance of DI water as a measure of purity.

RESMON: An acronym for resistivity monitor.

Quality Base: This term is most commonly used in reference to a rinse cycle, in which the successful completion of the cycle is determined when the DI water in the drain box obtains a specified resistivity.

Time Base: Most commonly used in reference to a rinse cycle, in which completion of a rinse is determined by the predesignated period of time.

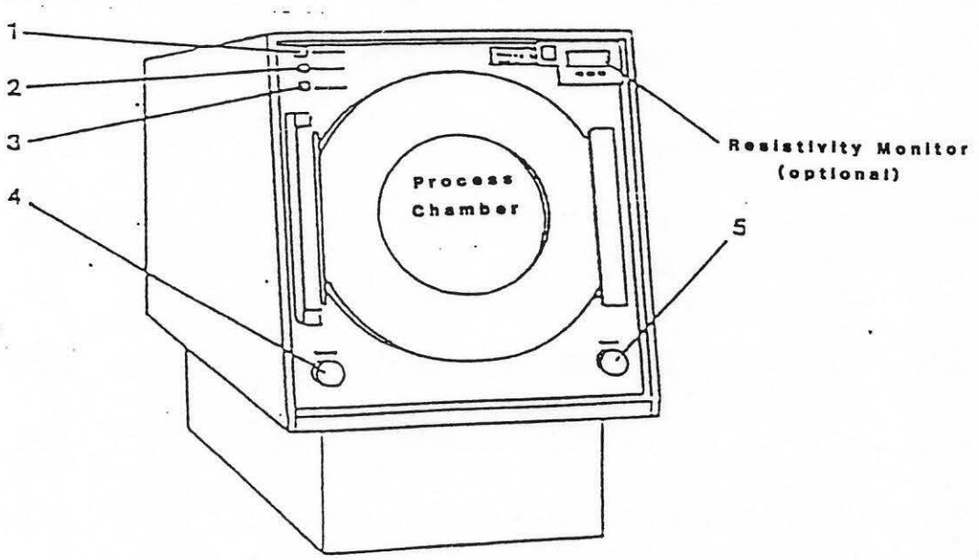
Trap: Refers to a standard drain configuration which physically captures a portion of the drain liquid within a loop. This prevents the possibility of residual contaminates, present in the main facilities drain, from migrating back into the Rinser/Dryer.

CDA : CLEAN DRY AIR
ISA : ISOPROPOL Alcohol

SRD CONTROLS AND INDICATORS

The table below gives descriptions of the controls and indicator lights located on the front panel of the SRD. The drawing below can be used to find the specific location of each control or indicator.

Drawing Reference #	Label	Definition
1	Heater	Amber LED which becomes illuminated when the heaters are on during the dry cycle.
2	System Power	Red LED which becomes illuminated when the AC power is turned on.
3	Door Seal	Green LED which becomes illuminated to indicate when the door seal valve has been energized.
4	Start	Green, push button switch, which is used to start a process. Note that the door must be closed before a process can be started.
5	Stop	Red, push button switch, which is used to stop a cycle. Note that the controller is reset to the beginning of the cycle.



SRD START-UP
P-~~328~~ 228 CONTROLLER

Push the **<START>** button located on the SRD front panel

RINSE CYCLE OPERATION

During the rinse cycle, the following conditions should be observed.

SRD

1. The rotor is spinning counter-clockwise.
2. DI water is flowing over the wafers.
3. The **POWER** light is illuminated.
4. The **DOOR SEAL** light is illuminated.
5. To verify that the door is sealed properly, pull on door lightly. The door should not open.

Rinse RPM = 400-600RPM Acceptable

CONTROLLER

1. The rinse cycle LED above the controller rinse thumbwheel should be illuminated. This allows the operator to verify the status of the SRD.
2. Adjust the Rinse RPM potentiometer for approximately 500 RPM. The measured RPM is shown on the RPM meter. 400-600 acceptable
3. When the SRD switches into the dry cycle, a water manifold purge is energized for approximately 10 seconds. This permits the DI manifold to be purged of all existing DI fluids. After 10 seconds, the purge valve will close with a high N_2 flow continuing in the dry cycle.

SRD START-UP CHECKLIST
P-~~328~~ 328 CONTROLLER

Carefully read and understand the Operations Section before initial start-up of the SRD.

1. Verify that main power cord is disconnected.
2. Verify that all control cables are connected between the SRD and controller.
3. Verify N_2 and DI pressures are set to factory recommendations.
4. Visually check all tubing connections for leaks.
5. Turn controller power switch to **<OFF>** position.
6. Connect the main power cord to an appropriately rated receptacle.

Set the controller front panel as follows:

1. **RINSE RPM** and **DRY 1** and ~~**DRY 2 RPM**~~ potentiometers to mid-rotation positions.
2. Thumbwheel **RINSE** time to 60 seconds.
3. Thumbwheel both **DRY** times to 90 seconds.
4. Resistivity monitor switch to **<MANUAL>** position.
5. Power switch to the **<ON>** position. A **<9>** will appear on the controller display for approximately 30 seconds during initialization. Wait for a **<0>** to appear on the display. If an error code appears, the error condition must be corrected before operation can begin. Refer to Error Code chart.
6. Open the door to the SRD and install the rotor.
7. Insert the cassette into the rotor.

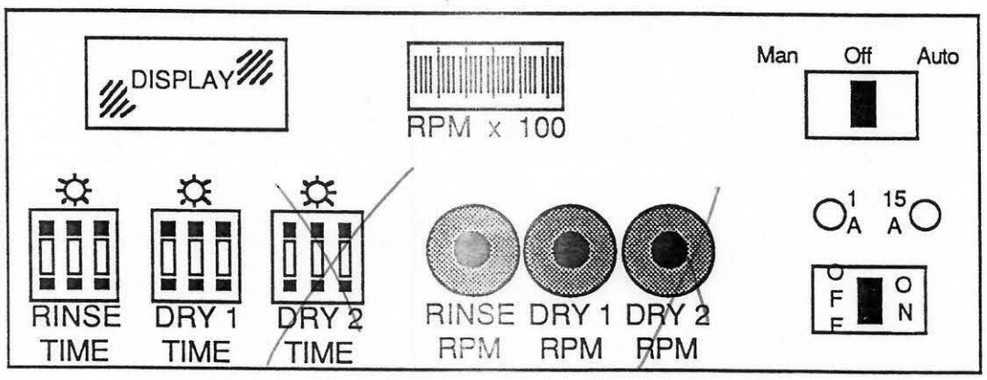
error codes p? some site P-328 controller description

NOTE: EACH ROTOR IS BALANCED FOR PARTIALLY OR FULLY LOADED CASSETTES PER THE CUSTOMER'S SPECIFICATIONS. ALWAYS SPIN UP THE ROTOR WITH THE PROPER LOAD.

AML System

P-328 CONTROLLER

CONTROL	FUNCTION
Rinse Time	Enters the amount of time in seconds for rinse cycle.
Dry 1 Time	Enters the amount of time in seconds for the high RPM dry cycle.
Dry 2 Time	Enters the amount of time in seconds for the low RPM dry cycle.
LED Indicators	These lights indicate which cycle the SRD is currently running. For example, if the SRD is currently running a rinse cycle the light above the rinse time will be illuminated.
Digital Display	Shows error codes and the time remaining in each cycle.
RPM Controls	These potentiometers are used to adjust the rotor speed for the different cycles. The DRY1 POT is used for high RPM dry cycles and the DRY2 POT is used for low RPM dry cycles.
RPM Meter	Displays the rotor rotational speed in rev./min.. Note that the value indicated must be multiplied by a factor of 100.
Resistivity Monitor Switch (optional)	This three position toggle switch controls the resistivity monitor. In the Manual mode the resistance is only displayed. Auto mode allows the resistivity monitor to control when a process will be advanced to the next step.
Power Switch	Controls the power to the spin rinser dryer.
Fuses	A 15 Amp fuse guards AC power components and a 1 Amp fuse guards the DC power components.



P328

P-328 CONTROLLER DESCRIPTION

The Semitool P-328 controller is a three stage device used to control the SRD. One rinse cycle and two dry cycles are standard with this controller. Extensive laboratory testing has shown that a significant decrease in particle counts can be achieved by using a two stage dry cycle. A short duration, high speed dry cycle followed by a longer duration, low speed dry cycle, was found to produce the best results.

The P-328 controller utilizes microprocessor controlled logic and monitors each stage of the Rinser/Dryer operation. Special display codes indicating system status are presented to the operator. Controls are accessible and easy to use.

A chart listing normal operating parameters is provided below. These settings are suggested as an initial starting point. The time and RPM settings can vary depending on carrier style, wafer size and process objectives.

OPERATING PARAMETERS

	ST-260/ST-270		ST-280	
Cycle	RPM	TIME	RPM	TIME
RINSE	400-600	As Required	400-600	As Required
HI SPEED DRY	1400-1800	25-30 Sec.	1800-2000	30-35 Sec.
LOW SPEED DRY	500-600	155 Sec.	750-850	150 Sec.

DISPLAY CODES

The following display codes relate important system status information to the operator. The codes can indicate either an error condition or preset operational status.

0	Ready for start input
1	Manual stop input - door not closed
3	Loss of N_2 pressure
9	Power up / rotor spin down delay
999	Rinsing to resistivity

BALANCING INFORMATION AND OPERATING REQUIREMENTS

Each rotor Semitool builds is spin balanced with a load (cassette and wafers) to ensure smooth, vibration free operation over the specified RPM operating range. Any excess vibration of the Semitool is related to an unbalanced operating condition of the rotor. Several factors are important in maintaining balance and should be carefully observed by the operator.

1. Each rotor is balanced for and operated with a specific cassette. The cassette type is etched on the front plate of the rotor. Be aware of the casette fit. It is possible that carriers of the same type (number) have different dimensions due to variations in their manufacturers molds. Contact Semitool if you should encounter any problems.

2. All rotors are balanced for a full cassette of wafers unless a different load is specifically requested by the customer. Some rotors balanced full load will have a minimum load specification etched on the front plate of the rotor. This offers offers a min/max loading window to the operator. Any rotors balanced for other than a full cassette will have the specific balance criteria etched on the front of the rotor.

3. All rotors are balanced with the casette "H" bar, or in the case of symmetrical cassettes, wafer slot one, to the inside of the rotor unless otherwise stated on the front plate of the rotor.

4. Rotors are balanced to operate across the full RPM range unless otherwise stated. Rotors with RPM limitations will have specific RPM criteria etched on the front plate of the rotor.

5. Prolonged operation of an unbalanced rotor, a rotor with an incorrect casette, or improperly loaded cassette, will cause premature failures of the rotor, rotor drive plate, shaft assembly, rear seal and motor. Prolonged operation of an improperly loaded rotor will cause the rotor itself to become unbalanced.

6. Semitool offers a rotor rebalancing service at the manufacturing facility in Kalispell , Montana. Contact the service department at (406) 752-2107 for details.

?
eg 1-14
DOES THIS MEAN
1) SLOTS 1-14 MUST BE FULL
or
2) 1-14 WAFERS IN ANY LOCATIONS
or
3) ONLY USE SLOTS 1-14 FOR ANY # OF WAFERS

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PREVENTIVE MAINTENANCE

Good performance can only be achieved if the Semitool Spin Rinser Dryer (SRD) and surrounding areas are kept clean. Most regular machine cleaning procedures can be performed with Isopropyl Alcohol (IPA) and a clean, lint-free, cloth or swab. However, for components that are excessively dirty the following sequence of either baths or wipe-downs can be performed.

1. Liquid Freon or Peroxide for removal of residue build-up.
2. Isopropyl Alcohol (IPA) for bacteriological decontamination.
3. Deionized (DI) Water for a final rinse.
4. Blow dry with a Nitrogen (N_2) or Clean Dry Air (CDA) supply.

The use of ultrasonic or agitated bath cleaning methods is preferred over scrubbing. To eliminate the need for valve disassembly, purge and flush with cleaning fluids (IPA, H_2O_2, ect.).

Some components are damaged by certain cleaning fluids. The table below list these components and presents the cleaning fluids which may be used.

Component	**Acceptable Cleaning Fluid**
Manifold Gasket	DI Water Only
Resistivity Monitor Probe	IPA and/or DI Water
N2 Cartridge Heater	IPA and/or DI Water
Ferrofluidic Seal	DI Water Only
Electrical Components	Blow Clean With CDA

NOTE: Any personnel servicing Semitool equipment should be skilled in maintenance practices. Use clean tools, wear adequate protective gear and be conscious of maintaining a clean environment. Work should be performed in a clean, well ventilated area with adequate space and facilities.

PREVENTIVE MAINTENANCE

Weekly Cleaning Procedure

1. Rotor should be removed and cleaned. While the rotor is out of the bowl clean the bowl and inspect the drain tube. If necessary remove shroud (cover) and disassemble and clean drain tube.

NOTE: Do not wipe the Ferrofluidic Seal at the rear of the bowl with cleaning fluids or IPA. This seal can be damaged as a result of improper maintenance.

2. Inspect the drain box and trap for any broken wafers or residue. Remove any foreign matter and wipe out the drain box with cloth soaked in IPA.

3. Clean the resistivity monitor probe located in the drain box. This probe should only be cleaned with IPA and/or DI water. Some tools may not be equipped with this option.

4. Carefully remove the door seal with a thin tool. Then clean the seal, it's channel and all surfaces of the door. Replace the seal and reinstall the rotor.

5. Clean the machine shroud and all areas surrounding the SRD.

6. Run the SRD through 4 cycles to verify correct operation.

Weekly Maintenance Procedure

Maintenance routines presented in this manual do not give a specific time schedule for replacing N_2 filters. Filter life will depend on many factors, such as, the quality of N_2 being supplied and the amount of use that the machine experiences. Semitool recommends that filters are inspected regularly until the user develops a routine time schedule for the replacement of N_2 filters.

1. Inspect all facility supply lines and fittings for any evidence of leaks or deterioration and perform any necessary repairs.

2. Adjust gas facility supply pressures to the specified values found in the facilities requirements section of this manual.

Note: An extended rinse cycle should be run after any cleaning or maintenance is performed. This should ensure that the machine is free of any possible contaminants before it is used for processing.

PREVENTIVE MAINTENANCE

Monthly Cleaning Procedure

The usual weekly cleaning procedure should be performed. However, after the rotor has been removed, the rotor drive plate should also be disassembled. The drive plate and area behind the drive plate can now be cleaned in addition to the rotor and bowl. See Servicing the Rinser/Dryer (Access and Removal) for information on rotor drive plate assembly procedures.

NOTE: Do not wipe the Ferrofluidic Seal at the rear of the bowl with cleaning fluids or IPA. This seal can be damaged as a result of improper maintenance.

Monthly Maintenance Procedure

Perform the following maintenance steps in addition to the weekly maintenance procedure.

1. While the drive plate is off check the rear boot seal and ferrofluidic seal for any signs of wear or damage, replace or repair any parts if required.

2. Inspect the rotor stop positioner for damage, especially the cam and follower. Clean and lubricate all pivot points and bearings. Check the rotor stop positioner for correct operation.

3. Adjust the door if necessary. The height of the door can be changed by unlocking the jam nut on the lower hinge pin. Then the hinge pin may be raised or lowered by turning it with an "Allen" wrench. Be sure to re-lock the jam nut on the lower hinge pin.

4. Inspect machine for loose components and tighten as necessary.

5. Check five-volt power supply inside SRD controller unit. Power supply unit should provide 5.1 +/- 0.5 volts. This voltage should be measured on the CPU board. Make any necessary adjustments using the method described in power supply calibration procedure.

6. Check for any loose components inside controller and tighten as required. Visually inspect all wiring.

Note: An extended rinse cycle should be run after any cleaning or maintenance is performed. This should ensure that the machine is free of any possible contaminants before it is used for processing.

PREVENTIVE MAINTENANCE

Quarterly Cleaning Procedure

The following steps should be added to the weekly and monthly cleaning procedures.

1. To eliminate the need for disassembling valves, they can be cleaned by back flushing them with a cleaning product.
2. Remove and clean DI water manifold.
3. Remove, disassemble and clean all nozzles. Before disassembling the nozzles note the original spray angles. Try to achieve the same angle when the spray systems are re-assembled.
4. Remove and clean all tubes and fittings.
5. Remove, inspect and clean N_2 cartridge heater. Some tools may not be equipped with this option.

Quarterly Maintenance Procedure

The following three items should be checked in addition to all of the weekly and monthly maintenance procedures.

1. Inspect the shock mounts for deterioration or damage and replace them if necessary.
2. Check N_2 pressure switches. One switch is used for the system pressure. A second switch is used as a safety for the N_2 cartridge heater.
3. Verify tachometer readings.

Note: An extended rinse cycle should be run after any cleaning or maintenance is performed. This should ensure that the machine is free of any possible contaminants before it is used for processing.

SERVICING THE SEMITOOL RINSER/DRYER (ACCESS AND REMOVAL)

Disassembly of equipment parts should be done in an orderly manner to facilitate reassembly. Note and/or label any tube and wire connections before disassembling.

MECHANICAL COMPONENTS

Rotor Removal

Rotors are removed by unscrewing the four cap screws and simply lifting the rotor off of the drive plate. To assure uniform clamping pressure, the cap screws should be tightened in a cross pattern. Be careful not to over-tighten the rotor retaining screws. The rotor must be reinstalled so that it is in the upright position when the RSP is actuated.

Refer to the options section for information regarding the Quick Change rotor.

Rotor Drive Plate Removal

After the rotor has been removed, the drive plate and shaft can be removed by unscrewing it's retaining nut. The drive plate must be held from inside while the retaining nut is unscrewed from behind the motor at the rear of the machine. Once this nut is removed, carefully pull the drive plate and shaft forward out of the bowl.

A removable thread securing compound should be applied to the threads of the retaining nut before reinstalling the rotor drive plate. The drive plate retaining nut should be torqued to 25 ft-lbs.

Shroud Removal

BENCH MODELS

Control cables must be disconnected prior to shroud removal. The shroud is fastened to the frame with six screws. Once these screws have been removed, lift the shroud off of the tool. If desired the rear panel may also be removed. Four screws are used to fasten the rear panel to the frame. These screws become visible after the shroud has been removed.

STACKER MODELS

Control cables must be disconnected prior to pulling the SRD from the stacker console. Once the machine is out of the console, the shroud is removed in the same manner as a bench model. However, the stacker SRDs do not have rear panels.

SERVICING THE SEMITOOL RINSER/DRYER (ACCESS AND REMOVAL)

MECHANICAL COMPONENTS

Semitool Valve Removal

All inlet and outlet tubes as well as the 1/16 inch valve control lines must be disconnected. It is imperative to label and note the tubes and tube end locations before disconnecting any of these lines. The valve system can then be removed by unscrewing the bolts which are used to attach the assembly to it's mount. Semitool does not supply valve parts and each valve assembly is unique, therefore, valves should **not** be taken apart.

Solenoid Valve Removal

Humphrey solenoid valves are removed by unscrewing the bolts securing the unit to the manifold. The Humphrey has three ports, the one in the center is the supply port. The other two ports are the normally open (NO) and normally closed (NC) ports. These ports are plumbed to Semitool valves. The central inlet on the side of the Semitool valve is used to open the valve and initiate flow. While the inlet near the top of the Semitool valve stops fluid from flowing. N_2 or CDA flow is through the NO port of the Humphrey valve when it is in the unenergized state. All Humphrey valves are activated by 110 volts.

SERVICING THE SEMITOOL RINSER/DRYER (ACCESS AND REMOVAL)

ELECTRONIC COMPONENTS

The control module is removed from it's housing by first unscrewing the four mounting screws from the face plate of the controller. Then gently pull on the face plate of the control module. After the module slides forward and out of the housing, remove the cage cover to expose the unit for servicing.

CPU Card Removal

To remove the CPU board loosen the card hold-downs securing the board and then pull the board from it's receptacle. Replace the damaged board with a new one. Always make sure that you are grounded. Static charges can destroy certain components of the board.

I/O Board Removal

This board is located beneath the motor control board, however, the motor control board does not need to be removed. Simply disconnect the wire harness, loosen the card hold-downs and pull the board from it's receptacle. Replace the board with a new one following the same precautions mentioned above.

Relay Removal

Remove the relay hold-down clip and pull the relay from it's socket. Replace the relay with a new one and reset the hold-down clip.

Motor Control Board Removal

Disconnect all spade connectors from the board. Be sure to note the locations of the spade connectors prior to disconnecting them. Remove the screws that secure the board to it's mounting plate. Replace the board with a new one.

Power Supply Board Removal

The power supply board is located beneath the CPU board. Therefore, the CPU board and it's mounting plate must be removed. Note that some of the screws holding the CPU mounting plate may be located under CPU board receptacle.

Once the power supply board is exposed, disconnect the two wire harnesses. This can be accomplished by prying back the retaining clip and pulling the harness up. The harness toward the rear of the controller must be reinstalled on the same two pins from which it was removed. While looking at the controller from the front, the central and right pins are used for 110 volt supplies while the central and left pins are used for 220 volt supplies.

Remove the bolds securing the power supply board and replace the board with a new one. After reinstalling a new board., follow the set-up procedure described in the Power General Power Supply Calibration section in this manual.

SRD VALVES

Valving Locations and Interconnect

Semitool rinser/dryers use Humphrey valves for pneumatic switching of air or N_2 between two ports normally open and normally closed (N.O. & N.C.) by use of 110 VAC power. Humphreys that are unenergized are N.O. letting CDA or N_2 pass through the N.O. port. Energized Humphreys have CDA or N_2 passing through the N.C. port. Humphreys can be mechanically operated by pressing down the red button located on top of the valve.

The CDA or N_2 supplied by some of the Humphrey solenoid valves control the operation of all Semitool process valves. All process rinse/dry valves located on the machine are manufactured by Semitool. Valves are constructed of PVC and Teflon parts. Lines coming into the center of the side of Semitool valves are used for opening the valve while lines coming into the top are used for closing the valve.

Solenoid Valve Principles

The basic solenoid valve is an electromagnet so arranged that when current is applied to the coil (valve is energized), the plunger either opens or seals an orifice, thereby controlling the flow of fluid. The simplest valve has two basic functional parts: a solenoid and a plunger or armature. The coil surrounds the plunger which has a soft synthetic seal at one end. The valve body has an orifice which is sealed by the insert in the plunger. The orifice is opened or closed by movement of the plunger. When the coil is de-energized, the plunger is returned to its original position by means of a spring.

When the current flows through a coil of wire, it produces a uniform magnetic field around it. The strength of this magnetic flux depends on the wire size, amount of current flowing, and number of turns in the wire.

ROTOR STOP POSITIONER (RSP)

At the end of each process (rinse and dry), the Semitool rotor will stop in an upright position preventing wafer breakage as the carrier is removed.

The RSP is an aluminum body that has been anodized (a process to keep the aluminum cleaner for a longer period of time).

Upon power up, the RSP will extend and upright the rotor. At the end of a cycle, the RSP will extend, uprighting the the rotor and the door seal will deflate. After engaging the start command, the RSP will retract from the cam until the end of the process or a manual stop is entered. Programmable machines have a time delay built into the software to permit the rotor to stop before the RSP extends.

RSP extended then upright? Assume yes from model

Rotor YES

OPERATIONAL TROUBLE-SHOOTING

Optimizing the performance of a Semitool Spin Rinser/Dryer requires a thorough understanding of various characteristics of operation. The following information is intended to serve as a guide to optimizing performance and aid in trouble-shooting to resolve performance problems

1. High Rinse RPM: If the SRD is to perform well, the rinse RPM must be slow enough to allow the DI water to thoroughly coat and wash the wafers. An acceptable setting for the rinse is approximately 600 RPM. Anywhere within the range of 500-800 RPM is appropriate and should not create any haze on the wafers.

2. Insufficient DI Water Flow: If an inadequate supply of DI water is being used, it is possible that the wafers are not being rinsed properly. See the facility requirements for more information.

3. Short Rinse Cycle: If the rinse cycle duration is too short, there will be an insufficient wash of the wafers. The optimum rinse time is usually determined by trial and error. A setting of 180 seconds could be selected as a starting point. If the rinse is acceptable, the time could be reduced and further tests made. If the test rinse time produces an unacceptable wash, the time should be increased.

4. Contaminated DI Water: If the DI water has become contaminated in any manner, the result would be a poor rinse or possible reaction the wafer or chemicals on the wafer. This is not likely to happen but should be considered. Use of a good resistivity monitor will give a good indication of the DI water quality since contaminants could significantly reduce the resistivity.

5. Low Dry RPM: If the RPM selected for drying is too low, the residual DI water will not be spun off the wafer. Ideally the rotor RPM during the dry cycle should remove approximately 95% of the residual water left on the wafers after the rinse cycle. The remaining water on the wafer will be removed as a result of evaporation. Since the majority of the residual water is removed due to the spinning motion, it becomes important that the RPM be high enough to accomplish this task.

   A nominal setting for the dry cycle is 2400 RPM. Anywhere between 2000-3000 is acceptable. However, as a rule, the setting should be kept at the lowest point within the range that provides a consistent dry wafer.

6. Short Dry Time: If the dry time duration is insufficient, the wafers will not be completely dried. Enough time is required to spin off as much water as possible and to allow the remaining water to evaporate. If too much water is allowed to remain and subsequently evaporate on the wafer, a hazy not-cleaned wafer will result. Nominal setting for dry time is 240 seconds with a range of 180-300 seconds being common. Actual time required for drying wafers is directly proportional to the wafer size, SRD bowl size and the number of wafers being dried at one time.

7. Contaminated Nitrogen Supply: The N_2 supplied to the N_2 manifold comes in contact with the wafers during the dry cycle. If this supply is contaminated or is less than instrumentation grade (99.995% pure N_2), then it is possible that poor rinsing and drying will result. The impurities can mix with the residual water on the wafer and cause spotting or haze. The N_2 used must be "dry pumped". An in-line filter for the supply is recommended in addition to those supplied with the SRD.

8. Contaminated Nitrogen Filter: Filters of the incorrect type or filters which have been in service beyond their expected life act as restrictors and particle generators. A necessary part of routine maintenance procedures on the SRD is the replacement of filters. No specific interval is given for the useable life of a filter due to the extremes of performance required from user to user. It is therefore recommended that each user monitor his particular operation to determine replacement frequency. It should be noted that the filter life is related to the cleanliness of the N_2 being supplied.

9. Contaminated Rinse/Dryer: A routine maintenance schedule is necessary to keep the SRD clean and decontaminated. Refer to the preventive maintenance section for further details.

10. Improper Drain Line Connections: The SRD is equipped with a gravity drain system. Stacker models are equipped with a trapped drain for each SRD while bench models do not have an integral trap. When connected to a facilities drain, it is possible for residual fumes to travel from the facilities drain back up the bench model drain to the SRD bowl area. This cross contamination can produce haze, spotting and many other problems. To prevent these problems, it is recommended that each SRD be equipped with a separate drain trap which will prevent any external fumes from reaching the bowl. If the drain is to be vented to the atmosphere, the vent should be located on the discharge side of the trap.

OPERATIONAL TROUBLE-SHOOTING

11. SRD Bowl Passivation: All SRD bowls are passivated using an acid etch technique. This acid etch removes the first few molecular layers of metal as well as the process contaminants induced into these layers during the manufacturing process. If the internal surface of a bowl becomes scratched (or after many hours of normal use) it is possible for the bowl to lose its passivated cleanliness. Note that even routine cleaning can not produce a surface as chemically clean as passivation. In cases where all other trouble-shooting techniques and attempts have failed to reduce contamination, it may be necessary to completely re-passivate the bowl. All metal manifolds such as N_2 and DI water are also passivated and are subject to becoming contaminated. It should be noted that normal maintenance cleaning procedures will maintain a sufficiently clean surface for most applications.

12. Rotor Balance: Maintaining a balanced rotor is important to routine operation. It is possible for a rotor to be knocked out of balance or out of true due to rough handling or by being operated with a different load than was used for original balance. Unless specifically requested or otherwise specified, Semitool balances all rotors with a fully loaded boat. Continued or frequent operation with a different load will cause the rotor to become out of balance producing excessive vibration and potential wafer damage.

13. Rinsing to a Quality Base: Some Semitool rinser/dryers are equipped with a resistivity monitor. When the controller is placed in auto operation mode, the wafers will be rinsed to a selectable preset quality. The resistivity monitor can be preset to a value of DI water resistivity and the controller will continue the rinse cycle until the SRD drain water reaches the preset point. If the controller rinse time setting has been reached or exceeded, the dry cycle will be started. The controller will not start the dry cycle until the set time has been reached.

    If the rinse time setting has been completed and the preset quality of DI drain water has not been achieved, The controller will automatically reset the rinse time. The rinse cycle will continue until the preset rinse quality is obtained and then the dry cycle will be started.

14. Rinsing to a Time Base: If the SRD controller is being used in the manual operating mode, the quality of the rinse will be determined only by the rinse time setting. When the rinse time setting is reached, the controller will start the dry cycle. In the manual mode of operation, a resistivity monitor does not control rinse quality but simply displays the resistivity of the DI drain water at any time.

#13 eg Rinse time set to 60 sec
1) Preset Resistance reached before 60 sec
   - continue to 60 sec
2) Preset Resistance not reached at 60 sec
   - keep Rinse on until Resistance reached, then Dry cycle start
   * Display flash 999 after 60 sec to indicate Rinsing to Resist. level

TROUBLE-SHOOTING TIPS

SYMPTOM	CHECK/CORRECT
Machine won't advance to dry cycle with resistivity monitor on	Check resistivity of facilities DI water. Provide Cleaner DI water or reduce setpoint on resistivity monitor.
	Check for contaminants being leached out of old carriers. Clean rinser/dryer.
	Check and clean monitor probe.
	Check for lack of N_2 purge during rinse cycle.
	Check drain tube, box and trap for foreign matter or possible sources of contamination. Clean tube, box and drain trap.
Door will not seal	Check door seal. Remove seal and clean. Reassemble seal and verify proper fit.
	Check door hinge and adjust if necessary.
	Set facilities N_2 supply for factory specifications. See installation section.
	Check tubing and barbs. Replace damaged tubing or barbs.
Rotor stop positioner won't upright	Verify correct facility pressure. Set correct pressure if necessary. Check Humphrey valve labeled "RSP" for proper operation.
	Check tubing and barbs. See FLOW DIAGRAM for N_2 routing. Replace punctured or damaged tubing or barbs.
	Replace RSP unit if required.
Rotor positioner 180 degrees out of position	Check rotor orientation on shaft and rotate rotor 180 degrees.

TROUBLE-SHOOTING TIPS

No heat	Test continuity of N_2 heater wires. Blanket heaters normally have 30-70 ohms resistance. Replace heater if necessary.
	Check N_2 control relay in the programmable control module
Machine stays in holding mode	Verify thermostat closure, check relay. Replace if necessary.
Motor won't run or rotor runs at incorrect speed	Adjust motor speed controls as described in the KBIC motor control calibration procedures.
	Check motor control relay for contact closure. Replace relay if necessary.
	Check contact closure on RPM control relays, located on I/O board, (check each while motor is running). Replace relays if necessary.
	Check motor by adjusting motor potentiometer to maximum RPM. Then check voltage across motor terminals. Replace motor if 90 VDC is present across armature and motor is still not operating. Motor continuity could also be checked.
	Check for interlock failure (low N_2 pressure, door open, ect.). Correct failure condition.
Rotor appears to be out of balance	Check rotor at high RPM for excessive vibration with a properly loaded cassette of wafers. Return unbalanced rotor to factory for rebalancing.
Water overflows	Check for blocked drain or atmospheric vent. Clean drain or vent.

TROUBLE-SHOOTING TIPS

Water continues to spray when in dry cycle	Check DI water valve for proper operation. Replace if necessary.
	DI water pressure may be too high. Set to factory specifications.
	Check solenoid valve operation. Replace if necessary.
Machine won't start	Check for interlock failures (low N_2 pressure, open door, ect.). Correct failure condition.
	Check start stop switches. Replace if necessary.
Display on controller stops counting or shows erratic display	Check CPU board and replace if necessary.

PARTICLE CONTROL

Particle control in your Semitool Spin Rinser Dryer is dependent upon several factors; routine maintenance, bacteria free D.I. water and proper operation. The following information provides guidance in these areas.

The most important item for particle control is a planned preventive maintenance and cleaning schedule for the machine. If this is neglected, an increase in the number of particles generated during a process cycle will be a direct result. See the recommended maintenance and cleaning schedules provided in this manual.

A well maintained machine can still unexpectedly become a source of particles and this section provides guidance to possible causes for excessive generation of particles.

1. Dry time and rotor RPM on the process dry cycle. If wafers are not dried, moisture left on the wafers is seen by the particle counter as particulate matter.

2. Check that the N_2 to the machine is within the specified parameters for pressure and flow. If the N_2 extends outside of these parameters, it can effect the machine performance in two ways.

   a) N_2 pressure and flow too low. the wafers will not be dried within the recommended time and an increase in particles will be seen. A simple check for low flow is to increase the drying time. If the particle problem disappears, then the problem must be the N_2 supply pressure or flow.

   b) Having the N_2 pressure and flow too high may create turbulence within the chamber. This can cause poor drying and the possible displacement of particles that are introduced into the chamber when loading and unloading the wafers.

3. Check that the cartridge heater and/or the bowl heaters are working correctly.

   Feel the inside bottom of the bowl, gloved hand only, it should be warm after a dry cycle has been completed. If this surface does not feel warm there may be a problem with the blanket heater.

   To check the cartridge heater, feel the inside of the bowl under the N2 manifold, gloved hand only. It should feel warm after a dry cycle has been completed.

4. The maintenance schedule can be used to indicate if any regular maintenance or cleaning periods have been missed.

5. Check that there are no broken wafers in the chamber. If a broken wafer is found, the machine must be stripped, i.e., rotor and dive plate removed. The bowl, door , door seal, rotor, drive plate and drain should all be cleaned thoroughly.

6. The wafer carrier should be checked for possible sources of contamination.

7. Check that dummy wafers were not used during the run in question. Dummy wafers have a history of being dirty. Use a full carrier of known clean wafers.

8. Check that the DI water supply is not contaminated, e.g., stagnant, bacterial or dirty. Check the resistivity of the DI water source. If dirty, the lines are suspect. Purge them out using a 3% to 6% peroxide solution. Check the DI water filtration to ensure that the filter is not breaking down, old or contaminated. If in doubt, change the filter and flush the lines to the machine. It is important that the machine is cleaned at the same time to ensure that the water manifold, bowl and rotor were not contaminated at the same time the lines were cleaned.

9. Remove the drain tube from the bowl and clean out or replace if discolored. This can cause particles by back migration into the bowl if not cleaned during routine maintenance.

10. Check the operation of the DI manifold valves by watching the inside of the manifold for leaks. Make sure it is closed fully during the N2 dry cycle.

PARTICLE CONTROL

11. As a final step, remove the seal adapter to expose the Ferrofluidic seal. Clean the seal with a dry cloth only and recharge the seal with 60 ul. of Ferrofluidic fluid. Replace the adapter seal.

12. The following cycle operating speed parameters can be used; however, we recommend that you find what works best for your application.

4 in wafers:	Rinse 400-700 RPM Dry 1000-2800 RPM
5 in wafers:	Rinse 600 RPM Dry 1000 RPM
6 in wafers:	Rinse 200-600 RPM Dry 400-1000 RPM

These parameters are only a guideline and the process will have to be optimized by the user. Higher RPM's tend to generate more particles.

13. Excessive vibration causing particle generation has been found due to using incorrect carrier or incorrect load of wafers in the carrier. The correct type number for the carrier is stamped directly on the face of the rotor to ensure that the wrong casette is not used. The rotor may be balanced for a number of different loads. This is indicated on the front of the rotor. If no number (1/2 load, 3/4 load, 6 wafers, etc.) appears on the rotor, then the rotor must contain a full load at all times. Any modification to the carrier, i.e., cutting away parts of the casette, could cause severe vibration. Under no circumstances should the machine be operated with any type of vibration present.

14. If vibration can not be minimized, then the rotor should be returned to Semitool for re-balancing.

FUNDAMENTALS OF ACCURATE PARTICLE COUNTING

All particle count results should be verified using the following steps.

1. A known clean carrier must be used; either just cleaned (boil off) or just unpacked from a sealed bag.

2. Use known good wafers of relatively low counts (less than 20). If wafers are too dirty, the Rinser/Dryer will remove some particles but leave them in the bowl.

3. Check the wafers to see if they are Hydrophilic or Hydrophobic. This can be done by immersing the wafer in water. If water runs off the wafer, they are hydrophobic. If water is retained on the wafer, it is Hydrophilic. Hydrophilic wafers are what we want..

4. Check the measuring machine (Surfscan, Euronka, ect.) for erratic counts by putting the same wafer through it again. The counts should not vary by more than 2 or 3.

5. Use a control wafer in all experiments to verify that any increase in particles resulted from the process in question. Use the same number of slots and keep an accurate log of the results, noting the parameters changed.

If you follow the recorded steps for particle control, you will achieve counts of less than 10 for 1 micron. Please note that if the machines are in bad state (counts 200 +), a rinse overnight through manifolds may be required.

The more aware you are of how to check particle counts, the more likely you are to achieve good results with the Rinser/Dryer.

SEAL ADAPTER ASSEMBLY

NOTE: CHARGING OF THE FERROFLUIDIC IS UNNECESSARY ON ALL DIRECT DRIVE UNITS UNLESS THE SEAL ADAPTER ASSEMBLY IS REMOVED.

CAUTION: CERTAIN SOLVENTS WILL ADVERSELY AFFECT FERROFLUID. DO NOT USE SOLVENTS DIRECTLY IN CONTACT WITH FERROFLUID OR NEAR COMPLETED ASSEMBLIES.

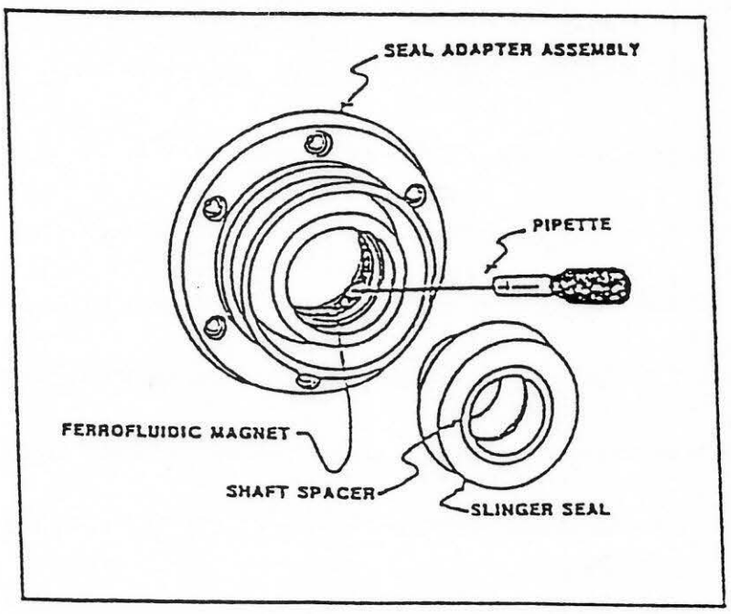
The following procedure should be performed outside the Rinser/Dryer.

1. Seal adapter assembly should be wiped off using only a dry cloth. All excess ferrofluid should be removed from magnet area. (see diagram)

2. Apply fresh ferrofluid directly to the magnet portion of the seal adapter assembly. An amount of 60 ul. should be divided equally between four locations (3, 6, 9 and 12 o'clock).

3. After applying ferrofluid to the seal, it is recommended that the seal be reassembled within 15 minutes of charging. Increased exposure of the ferrofluid to an open environment could degrade the seal.

4. Application Instructions - 60 ul. of fluid is applied by touching the pipette applicator to the magnet at four points around the interior circumference. Do not squeeze the pipette until the last touch point. Capillary action will draw the fluid from the pipette just by touching the magnet. Spinning the rotor drive shaft after reassembly will distribute the fluid evenly around the seal.



KBIC MOTOR CONTROL CALIBRATION PROCEDURES

CAUTION: The following procedures involve operations on electrically "live"equipment and should be performed only by authorized, trained maintenance personnel.

NOTE: KBIC Motor Controllers are used to drive RINSER/DRYER motors, CPC motors and PUMP motors in all product lines. Due to the variety of motors in use, it is important that the horsepower resistor (R2I) located on the KBIC be valued appropriately. Refer to the table printed on the back defining those values. Prolonged operation of a KBIC/motor combination with incorrect R2I values will result in premature failure of these components.

TOOLS REQUIRED:
Insulated alligator jumper leads
DC ammeter .0-I0 amp
Plastic hex adjustment tool

I) Ensure primary power is turned OFF on the tool prior to making any preliminary adjustments/connections.

2) After locating the appropriate KBIC motor control within the electronics enclosure, set the four controls as follows (refer to the KBIC Motor Control Drawing.)

Max = fully CW
Min = fully CCW
IR = fully CCW then I/4 turn CW
CL = Fully CCW then I/4 turn CW

3) Refer to the KBIC motor Control Drawing. Locate the terminal marked A+. Carefully remove the push-on wire connector attached to the A+ terminal. Using the insulated alligator clip, connect the wire removed from the A+ terminal to the negative ammeter lead.

Using the second alligator clip lead, connect the positive ammeter terminal to the A+ terminal on the KBIC. Use caution to ensure no connections are contacting metal or shorting to other components.

4) The next step is to set the CL (Current Limiting) pot on the KBIC. Apply power to the tool. While observing the ammeter, turn on the motor. The maximum start-up current is listed for each motor type. Adjust the CL pot on the KBIC until the maximum start-up current is limited to the value indicated on the chart. This process may take several starts and stops of the motor to accomplish.

5) The maximum RPM will need to be set once the Current Limiting is adjusted. Due to the variety of products, the following assumes knowledge of user RPM selection procedures. Caution should be taken to ensure that the rotor is removed for the Max RPM calibration. Operation of the empty rotor at full RPM can cause the rotor to be knocked out of balance. KBIC MOTOR CONTROL CALIBRATION PROCEDURES

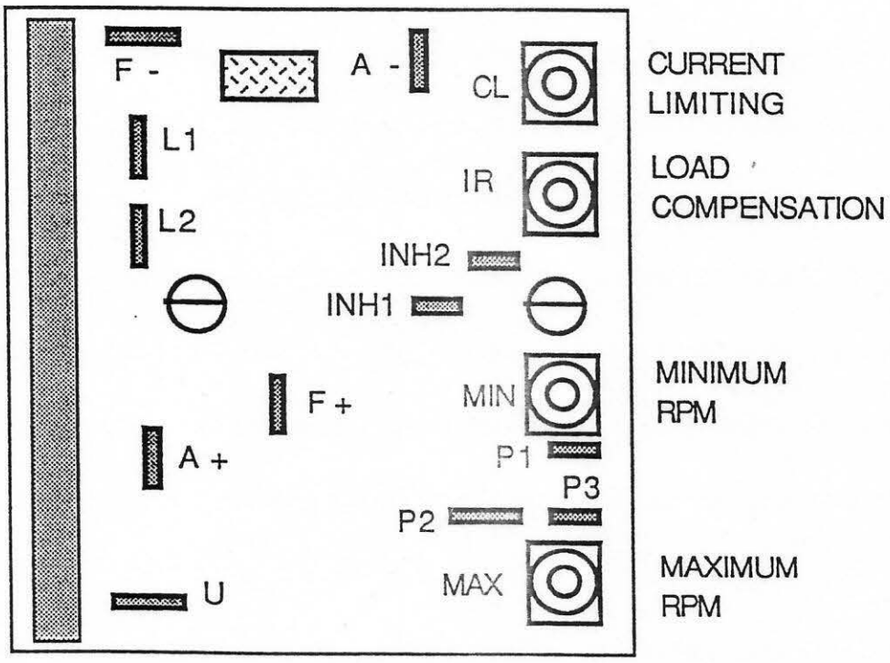
6) By adjusting the Max RPM potentiometer on the KBIC motor controller, set the maximum RPM limitation as follows: Unless specified on the shop order, the following are maximum normal speeds for various rotor types. ("Calibration" speed; the fastest the operator can program in a recipe.) The rotor can actually be driven about 10% faster by the technician to allow for motor drift, etc. **NEVER EXCEED THE MAXIMUM RPM STAMPED ON THE ROTOR.**

(continued from previous page, KBIC CALIBRATION)

ROTOR MAXIMUMS: (SRD'S / WST'S / SST'S all normally use stainless rotors)

SIZE	MAXIMUM RPM	DESCRIPTION
Model 240	2800	(240 = 100mm)
Model 260	2800	(260 = 125mm = 5 inches)
Model 270	2800	(270 = 150mm = 6 inches)
Model 280	2000	(280 = 200mm = 8 inches)
Model 300	2000	(300mm = 12 inches)
Model 2400	1300	(400mm / 12 inch sq.)
Model 2600	1300	(500mm / 15 inch sq.)

Teflon coated stainless, (used in mask tools), maximum RPM 2000.
Solid Teflon rotors, (used in Spray Acid Tools), maximum RPM 300.



R21 TABLE (for motors and pumps)

HORSEPOWER	RESISTOR VALUE	RESISTOR P/N
1/12 HP	.18 OHM	P/N 76001
1/3 HP	.035 OHM	P/N 60701-15
1/2 HP	.025 OHM	P/N 60701-20

POWER GENERAL POWER SUPPLY CALIBRATION

This section deals with the calibration of the power general power supply board.

CAUTION: The following procedures involve operations on electrically live equipment and should only be performed by authorized, trained maintenance personnel.

TOOLS REQUIRED:
- Phillips Head Screwdriver (medium point)
- Flatblade Screwdriver (1/8 inch tip, insulated shaft)
- Digital DC Volt-Meter

Step 1: The control module must be removed from the console and it's cage cover taken off.

Step 2: Connect a DC volt-meter to the CPU edge connector pins, pin 1 (+5.1 VDC) and pin 22 (DC return) as identified in drawing A.

Step 3: Locate power supply output voltage adjustment potentiometer, as identified in drawing B. This adjustment screw can be reached from the side of the board with-out removing the CPU board and base plate.

A. Rotating potentiometer screw clockwise will decrease the voltage.

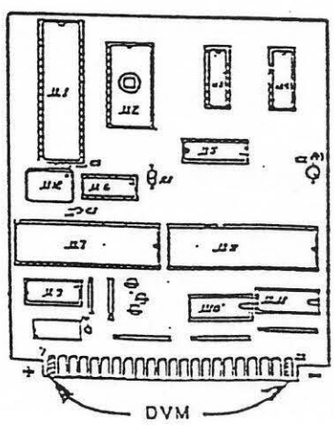
B. Rotating the potentiometer screw counter clockwise will increase the voltage.

Step 4: Restore the primary power.

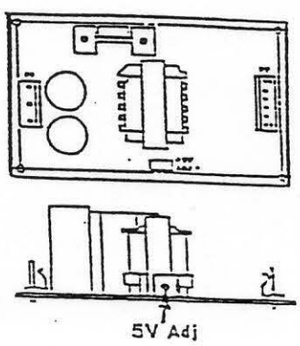
Step 5: While reading the volt-meter adjust the potentiometer screw until 5.1 volts is obtained.

Step 6: Remove primary power, disconnect volt-meter and reinstall control module.

Drawing A



Drawing B



CALLING FOR TECHNICAL SERVICE

When calling the factory for help, it is suggested that a person with machine maintenance responsibilities be present with a copy of the manual to receive instructions.

If data is furnished by letter or telephone, it is essential that the data furnished be complete and accurate in order to avoid unnecessary delays. Listed below is the information that should be provided with your request for help:

1. Date, Customer name, and address.
2. Person to contact (name, title, telephone and extension).
3. Person writing/calling (name and title).
4. Machine model and serial number.
5. Description and part number of replacement parts.
6. Urgency of request, e.g. machine is down.
7. Nature of problem, e.g. broken part, won't respond, etc.
8. Components inoperative (description and part number, if available).
9. Additional information or comments that might be helpful.

RETURN OF GOODS POLICY

Special Shipping Requirements:

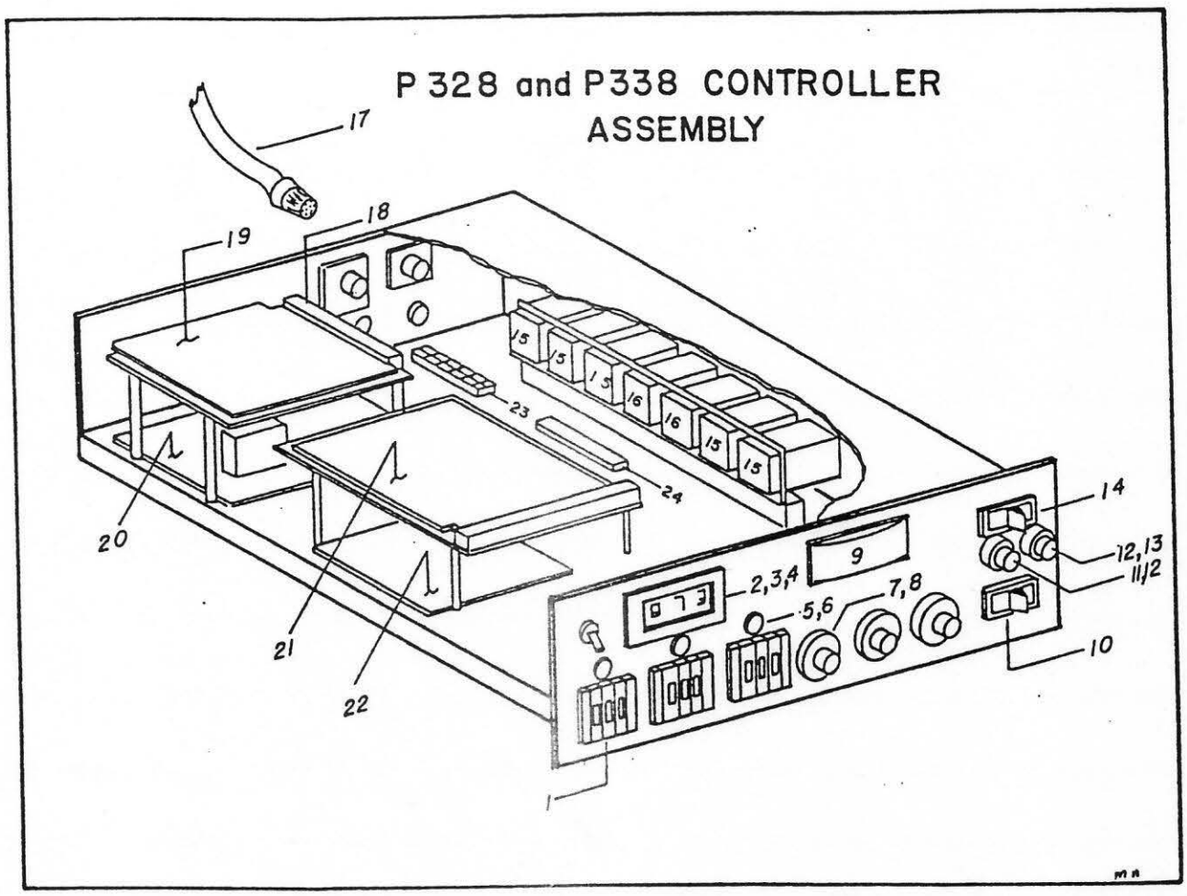
1. Notify Semitool Customer Service prior to return, and request a Return Material Authorization (RMA) number. Please give the machine model and serial number when requesting a RMA.

   Semitool, Inc.
   Customer Service Department
   655 W. Reserve Dr.
   Kalispell, Montana 59901
   (406) - 752-2107

   Note: Return shipments will not be accepted by the Semitool Receiving Department without a RMA number.

2. Secure goods so that they can not be damaged in transit. Package in original container if possible.

3. Include reason for returning the machine, along with original purchase order and RMA number.



ITEM	DESCRIPTION	QTY	SEMITOOL P/N	OEM	OEM P/N
1	Push Wheel Switch	3	60670-1	IVO Indust'	IVO6EFEC3-2LST-1
2	Displays	3	60452	Gen Instr	MAN-72A
3	Display Bezel	1	60606	IEE	DMH-22463X-03
4	Display Socket	1	60607	IEE	22464-03
5	LED Lens	2	60608	(V) Jameco	R+P280
6	Indicator LED	3	60450		Red Led 3/4, 1.2
7	Knob	3	61550	Nobex	B/27-D
8	RPM Control Potentiometer	3	61521	ETI	MW22-10
9	RPM Meter	1	61530	Modutec	ME-DVV-100
10	Power Switch Assembly	1	60704-10	Microswitch	AML33 FBA 4AC01

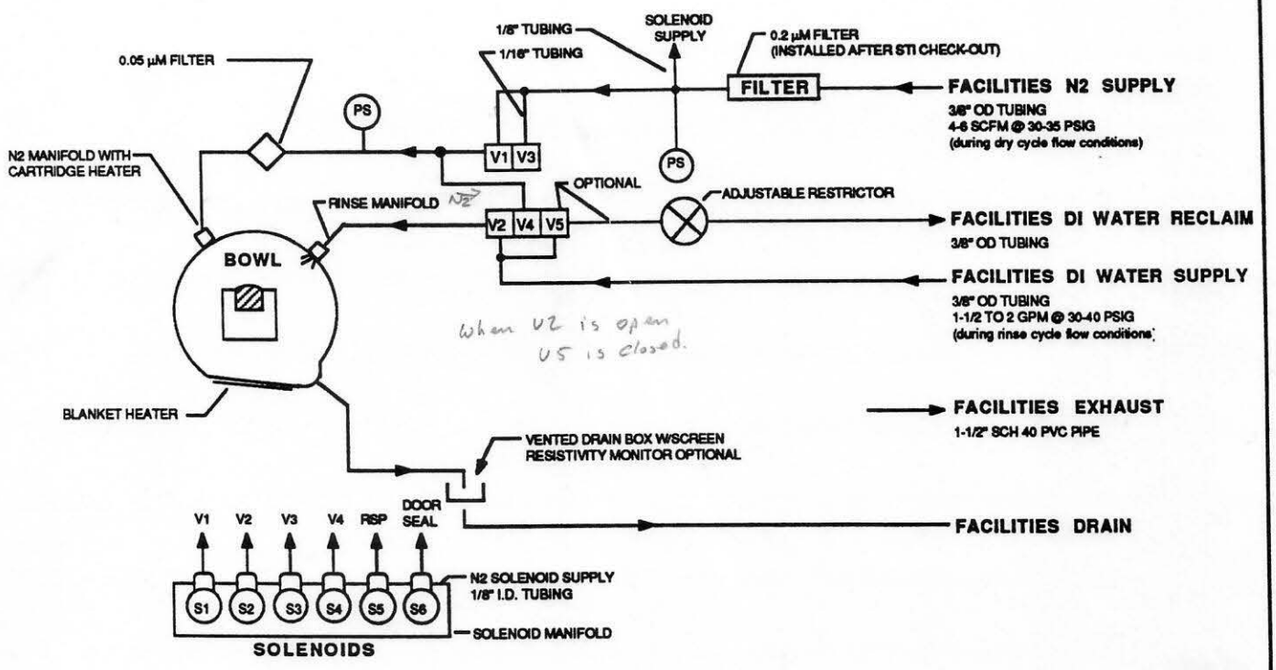
ITEM	DESCRIPTION	QTY	SEMITOOL P/N	OEM	OEM P/N
11	Fuse, 1A	1	61640-2	Littlefuse	312001
12	Fuse Holder	2	61540	Littlefuse	345613
13	Fuse, 15A, SB	1	61640-3	Littlefuse	313010, SB
14	Switch Assembly	1	60705-3	Microswitch	AML23 EBA2A C04
15	Relay	3	60651	Omron	MY4-UA
16	Relay	3	60650	Omron	LY2-USOE 1
17A	Standard Cable Assembly (4')	1	61704-4	Semitool	———
17B	Remote Cable Assembly (7')	1	61704-7	Semitool	———
17C	Remote Cable Assembly (10')	1	61704-10	Semitool	———
18	Board Connector	1	60501-1	T.I.	H411/21-22
19	I/O Card	1	14701-1	Semitool	
20	DC Power Supply Board	1	60801-2	Power General	3045-1
21	CPU Card	1	14817-1	Semitool	
22	Motor Control Board	1	60701-3	KBIC	2251
23	Terminal Strip	1	61708	HH Smith	870
24	Buss Bar	1	12689-1	Semitool	

P-328 RECOMMENDED SPARE PARTS

QTY	DESCRIPTION	SEMITOOL P/N
2	Push Wheel Switch Assembly	60670-1
2	Power Light	60706
1	Power Switch Assembly	60704-10
1	I/O Relay Board	14701-1
1	Power Supply	60801-2
1	CPU Board	14817-501
1	Motor Drive	60701-3
1	Relay 14 Pin 12VDC	60651
1	Relay 8 Pin 12VDC	60650

P338 CONTROLLER

DRAWING #	REV	TITLE
		Flow Diagram
14162	B	Wiring Schematic P-328 Controller
14711		Three Digit Display
14817	E	CPU with System Recovery Assembly
14155	D	CPU with System Recovery Schematic
14701	C	Input-Output Board Assembly
14109	C	Input-Output board Schematic



LEGEND

V1	Dry Valve
V2	Rinse Valve
V3	N2 Bowl Purge Valve
V4	Rinse Manifold Purge Valve
V5	DI Recirc Valve
S1	Dry Valve Solenoid Activator (4 way)
S2	Rinse Valve Solenoid Activator (4 way)
S3	N2 Bowl Purge Valve Solenoid Activator (4 way)
S4	Rinse Manifold Purge Valve Solenoid Activator
S5	Rotor Stop Positioner (RSP) Solenoid Activator (4 way)
S6	Door Seal Solenoid Activator (3 way)
(PS)	Pressure Switch

NOTES:

1) All tubing is 3/8 inch O.D. unless other wise noted.
2) Valves are normally closed, except V5 is normally open.
3) V5 is open when V2 is closed, V5 is closed when V2 is open.
4) WR-20A DI recirc option, DI water is plumbed to drain.

OPTIONS

1) Resistivity Monitor
2) WR-20 or WR20A DI Recirc
3) CY-20 Anti-stat Device
4) OM 115 Millipore Filter

SEMITOOL™			Kalispell, MT	
260/270 FLOW DIAGRAM				
	BY	DATE	DRAWING NUMBER	REV
DRAWN	MB	9/11/87	12772-MD	
CHECKED	MB	9/11/87		
APPROVED	MB	9/11/87	SHEET 1 OF 1	

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4. TC-20: Resistivity Monitor 40
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6. TC-30T: Resistivity Monitor 41
7. RA-10: Rinse Quality Alarm 43

OPTIONS AND SERIAL NUMBERS

A. The machine(s) listed by serial number below is (are) equipped with Programmable Process Controller(s) and also the Rinser/Dryer options noted below.

_____ P-228 Process Controller

_____ P-355 Process Controller *

_____ P-358 Process Controller *

B. Below is a list of SRD options. For more detailed information surrounding each option, see the Options section of this manual. Your machine(s) comes equipped with the option(s) checked:

_____ Antistatic Cell: AS-2Ø

_____ DI Water Recirculation: WR-2Ø

_____ DI Water Recirculation Low Flow Bypass: WR-2ØA

_____ Resistivity Monitor: TC-2Ø

_____ Resistivity Monitor: TC-3Ø

_____ Resistivity Monitor: TC-3ØT

_____ Rinse Quality Alarm: RA-1Ø

C. This manual applies to machines with serial numbers:

_____

_____

_____

INTRODUCTION

This Manual is divided into several specific areas, each important to the task of placing the Semitool into production.

Installation

The Installation section (Pages 2 - 7), provides adequate information to install a Semitool, including bench top dimension cutouts, Facility hook-up requirements, and Controller/SRD interface cable connectors. Fluid and N2 flow diagrams for NF and non NF configurations are presented separately. Refer to Page 6 for a flow diagram reflecting NF type (P228 and P358) configurations; and for the non NF type machine (P355), refer to the Addendum section.

Operation

Each programmable controller has a special set of operating instructions. Note that instructions for the P358 and P355 models are located in the Addendum beginning on Page 44. Operating instructions for the P228 begin on Page 8.

Options

Beginning on Page 31, several Rinser/Dryer options are diagrammed, as they would appear when installed. These options are available as a spare part kit and may be installed in the field. Also, the Resistivity Monitor and Rinse Alarm option instructions are found in this section of the Manual.

Maintenance and Repair

Rinser/Dryer maintenance and trouble-shooting sections serve for all SRD/Controller combinations discussed in the Manual. Mechanical assemblies for NF and non NF type SRD configurations are displayed separately. The non NF unit, P355/SRD, is presented in the Addendum under P355 information. Mechanical assemblies for Rinser/Dryers with P228 or P358 controllers are discussed in the Rinser/Dryer Assembly section, Page 24.

Stacker Information

A Semitool Rinser/Dryer may be packaged in a variety of ways, as depicted on the next page. A single SRD mounted on a bench is referred to as a 200 series. Single units mounted in a portable polypropylene cabinet represent the 400 series. When two SRD's are mounted in the same cabinet, we refer to the package as the 800 series.

In the 800 series machines - N2, water and power must be supplied, as per specification, to each Rinser/Dryer in the cabinet. The water drain in the 800 series cabinets collects spent rinse water from both SRD's, therefore, only one facility drain is required.

GENERAL DESCRIPTION

In 1979, Semitool designed, manufactured, and patented the horizontal Rinser/Dryer. By consistently upgrading our Tools to meet the rapidly changing needs of the Semiconductor Industry, our machines have maintained a leading edge position in Rinser/Dryer technology.

This publication presents installation, operating and service information for standard Spin Rinser/Dryers (SRD), ST-240D, 260D, and 270D, and also for the accompanying programmable controllers P228, P358, and P355.

The SRD model chosen is dependent upon wafer, or other product, size. Controller type used with the SRD is based upon needs as required by the process. First consideration, is an NF option package required, and secondly, are multistage rinsing and drying required?

An NF-20 option package includes an inline Nitrogen filter (.2 micron) and external chamber, blanket type heaters. Also, following the rinse cycle, the water manifold is purged with N2.

A P228 Controller accompanies the SRD when a simple rinse/dry process with a Nitrogen filter package is needed.

A P358 Controller is used when the NF option package is required, but the process calls for a two-stage rinse and a two-stage dry.

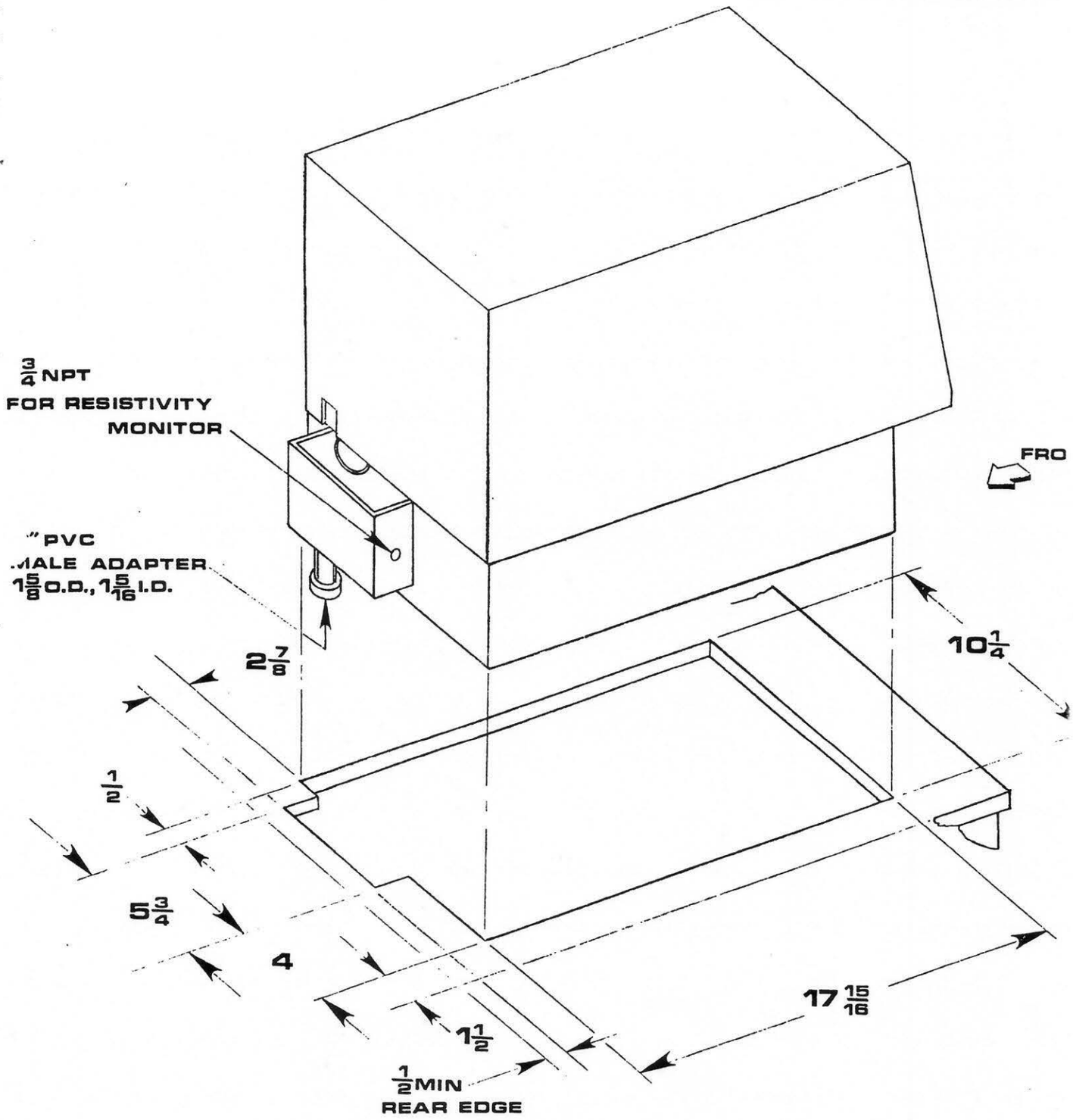
The P355 Controller is supplied when the process requires a two-stage rinse and two-stage dry, but does not require the NF package.

To maintain a consistant chamber atmosphere, Semitools use a continuous, low pressure Nitrogen chamber purge. Nitrogen is continually delivered into the chamber so that the product will always be processed in a known clean, N2 environment.

Operation is simple and above all, safe: load a carrier of wafers into the stainless steel rotor and shut the door tight. Preset the rinse and dry times. Press the start button and, automatically, the Semitool will rinse and dry. At the end of each process, the rotor will always stop in an upright position.

INSTALLATION DETAIL
COUNTER CUTOUT

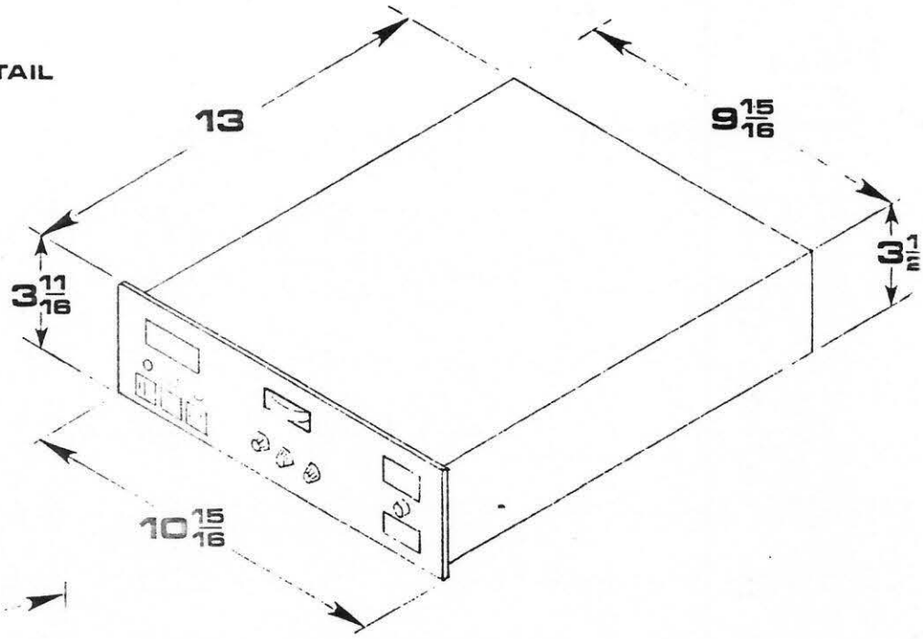
ST240D/260D/270D

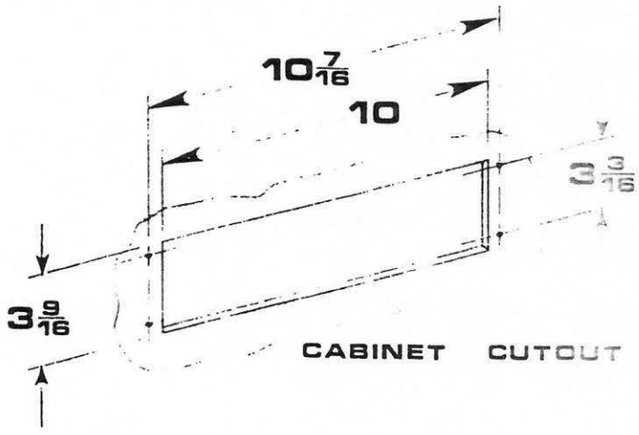


INSTALLATION DETAIL

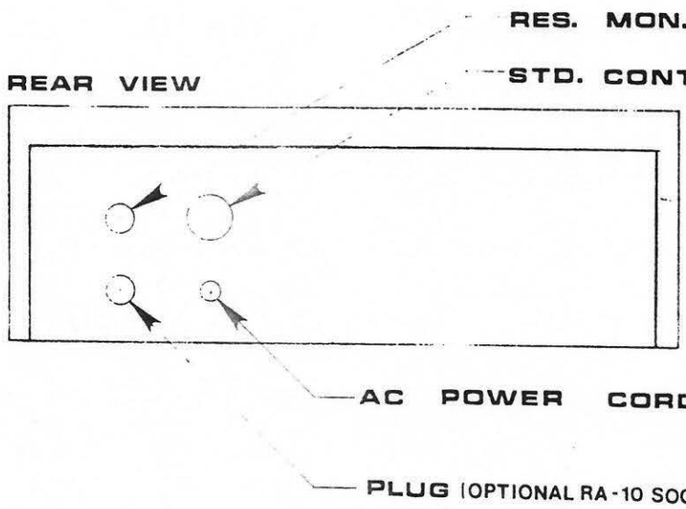
ST-240D/260D/270D

REMOTE INSTALLATION DETAIL

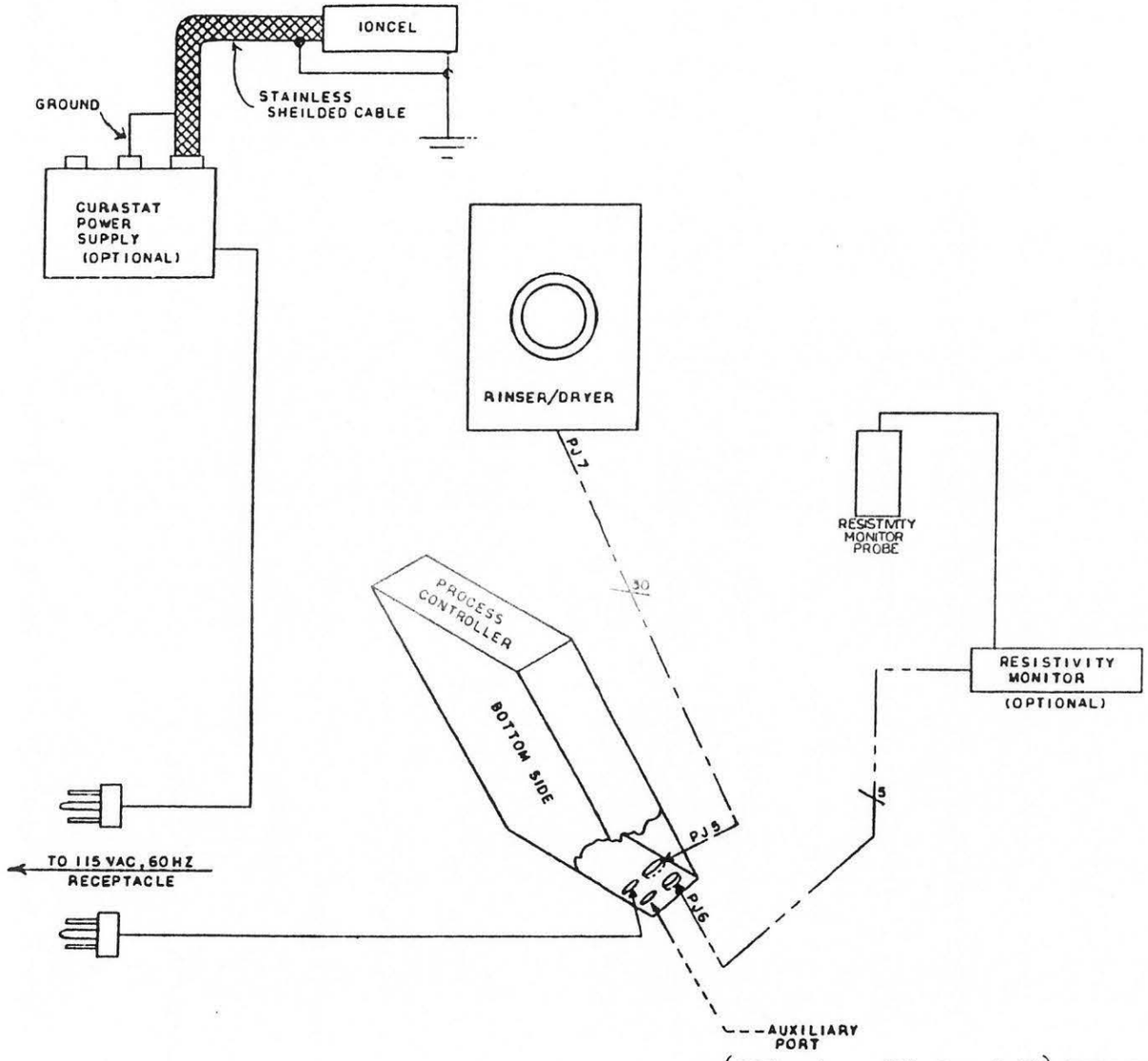




CABINET CUTOUT



LTR.	REVISION	BY	APP'D	DATE



QTY. PER ASSY.	PART NO.	DESCRIPTION	SPECIFICATION
-1			

TOLERANCES UNLESS NOTED
.XX = ± .02
.XXX = ± .010
ANGULARITY = ± ½°
BREAK CORNERS-.010 MAX.
FILLET RADII-.015 MAX.
125√ MACHINED SURFACES
DIMENSIONS ARE IN INCHES UNLESS NOTED
NEXT ASSEMBLY

SEMITOOL KALISPELL, MT.

SRD SYSTEM
CABLE CONNECTION DIAGRAM

	BY	DATE
DRAWN	TSM	5-16-84
CHECKED		

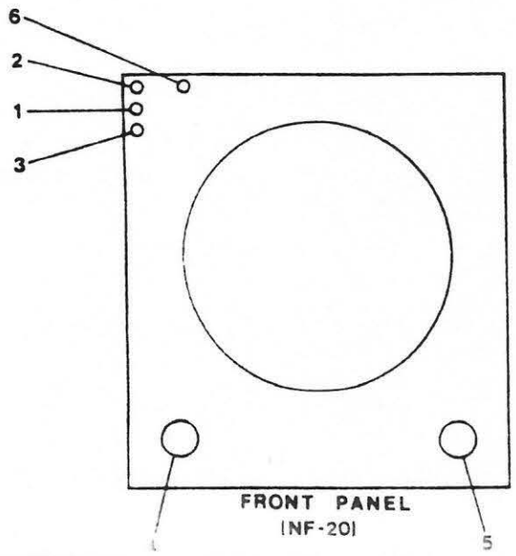
DRAWING NUMBER 14009

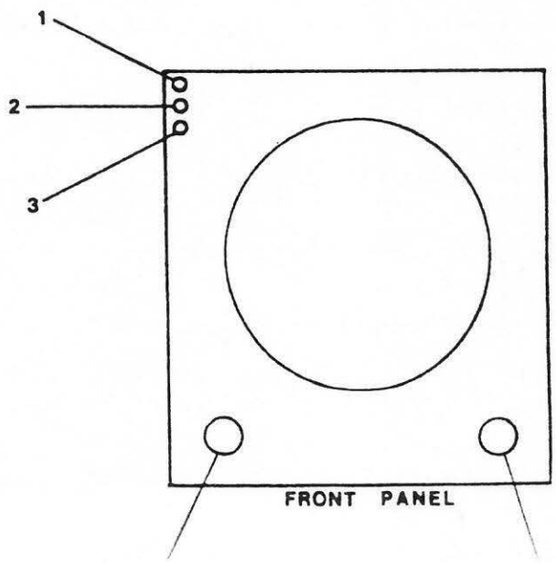
SCALE

NOTE: Engineering changes may have been made after publication date. Any departure from this drawing should be checked with the factory

RINSER DRYER FRONT PANEL (refer to illustration below)

Indicator	Definition
1. Power Indicator	Red Lamp - glows when AC Power is turned on.
2. N2 Heater	Amber Lamp - glows when Nitrogen Heater has been turned on in the Dry Cycle.
3. Door Sealed	Green Lamp - Glows when valve has been energized to seal and lock door.
4. Push-Button Start Switch	Green Switch - Starts the cycle. The door must be completely closed before the cycle can start.
5. Push-Button Stop Switch	Red Switch - Stops the cycle, if necessary, and resets Controller to beginning of cycle.
6. Hold (Heater)	Green Lamp - Lights when Bowl Heaters reach maximum allowed temperature. Heater lamp will simultaneously go off: NF-20 machines only.





PRIMARY CONNECTIONS

1. Verify that the main power cord is disconnected.
2. Connect the water line and nitrogen line to the facility source.
3. Verify that the water drain is connected.
4. Cable Connections (refer to Page 9):
   a. Connect the control cable from the Spin Rinser/Dryer (SRD) to the P-228 Process Controller (PCM) rear panel.
   b. Connect the optional resistivity monitor cable to the PCM rear panel.
   c. Plug the PCM main power cord into a 240VAC 7.5A or 120VAC 15A receptacle depending on the power option for your machine.

PRESETTING CONTROLS

Set the PCM Front Panel Controls as follows:

1. Rinse and dry RPM potentiometers to mid-rotation positions.
2. "Rinse Time" pushwheel to 30 seconds.
3. "Dry Time" pushwheel to 120 seconds.
4. Resistivity monitor switch to OFF position.
5. Power Switch to OFF position.

NOTE: Each rotor purchased with a Semitool is specifically balanced per the customer's specifications; e.g., for partial or fully loaded cassette. Always spin-up the rotor with the proper load. Never spin-up the rotor without a cassette.

DISPLAY CODES

Ø	Ready for Start input
1	Manual Stop input - Door not closed.
2	Door not closed (Auto Door only)
3	Loss of N2 pressure
4	Low N2 Bowl Purge (dynamic pressure)
9	Power up/rotor spin down delay
666	Resistivity Set Point not reached (RA-1Ø option only)
999	Rinsing to resistivity

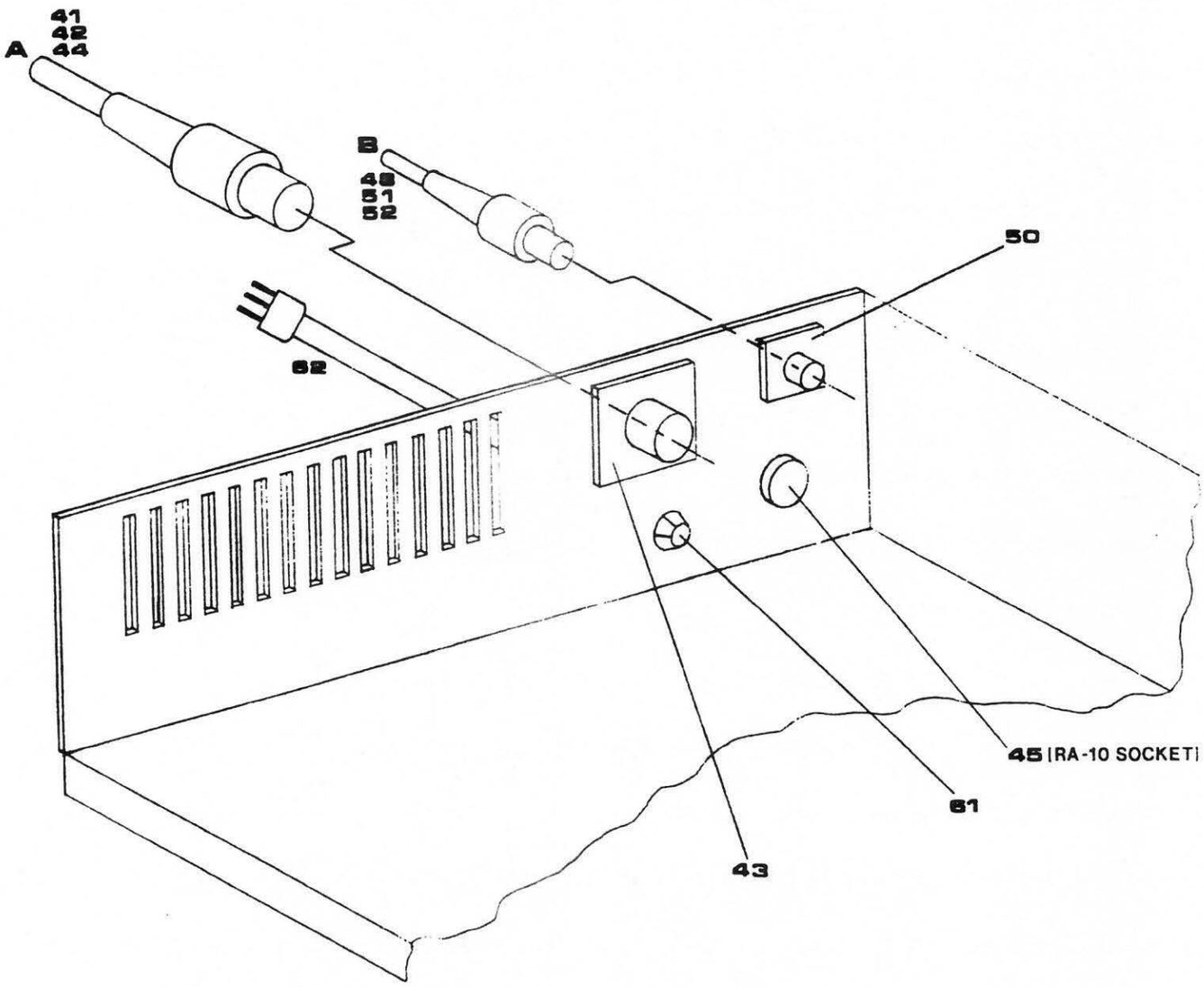
RINSE AND DRY RPM RECOMMENDATIONS

Rinse:	4ØØ - 6ØØ RPM
Dry:	25ØØ - 275Ø RPM

These recommendations are based upon customer feedback. However, STI suggests finding the optimum speeds for any particular process.

A - STANDARD CONTROL CONNECTOR

B - INDICATES OPTIONAL RESISTIVITY MONITOR CONNECTOR



CONTROLLER REAR PANEL CONNECTIONS

ITEM	DESCRIPTION	QTY	STI P/N	MANUFC.	MANUFC.P/N
33	1A Fuse	1	61640-02	Littlefuse	312001
34	15A Fuse, SB	1	61640-1	Littlefuse	314015
35	Post	8	91193	HH Smith	8351
36	Standoff, 3/16	4	91287-1	HH Smith	8501
37*	DC Power Supply	1	60801-2	PowerGenrl	3045-1
38*	Bulb	1	60706	Gen Instr	10-CM73 14V.08A
40	Enclosure	1	10592-3	STI	-----
41	Cable, Remote, 10' (SRD) Cable, Std., 3'	1	61704-1	STI	-----
42	Strain Relief (SRD)	1	61714	AMP	206070-1
43	Panel Socket (SRD)	1	61719	Am Pamcor	205840-3
44	Plug (SRD)	1	61739	AMP	205839-3
45	Cap, 3/4"	1	61762	Heyman	DP-750
48	Cable, 10' (ResMon)	1	61703	STI	-----
50	Panel Socket (ResMon)	1	61738	AMP	206486-1
51	Plug (ResMon)	1	61741	Am Pamcor	206485-1
52	Plug Strain Relief (ResMon)	1	61742	Am Pamcor	20606-2-1
61	Strain Relief	1	61715	Heyco	6N3-4
62	Power Cord	1	61702-1	Minarek	M1305
63	DPDT Toggle Switch	1	61312	Sprague	QSB-1118
64*	CPU Board (Exp.)	1	14703-1	STI	-----
67	Plate/Card/CPU	1	12008-1	STI	-----
68	Plate/Card/I/O	1	12007-1	STI	-----
69	1/4" Hole Plug	1	61309	Typical	1/4"

NOTE: Refer to Assembly Drawing, page 19.

* Recommended Spare Parts

IR COMPENSATION ADJUSTMENT (Set at the Factory - Minimum)

MINIMUM SPEED ADJUSTMENT

If a speed greater than zero is intended, readjust the minimum speed by first turning the main speed potentiometer to minimum speed (full counterclockwise direction). Then adjust the minimum speed trimpot to the desired setting.

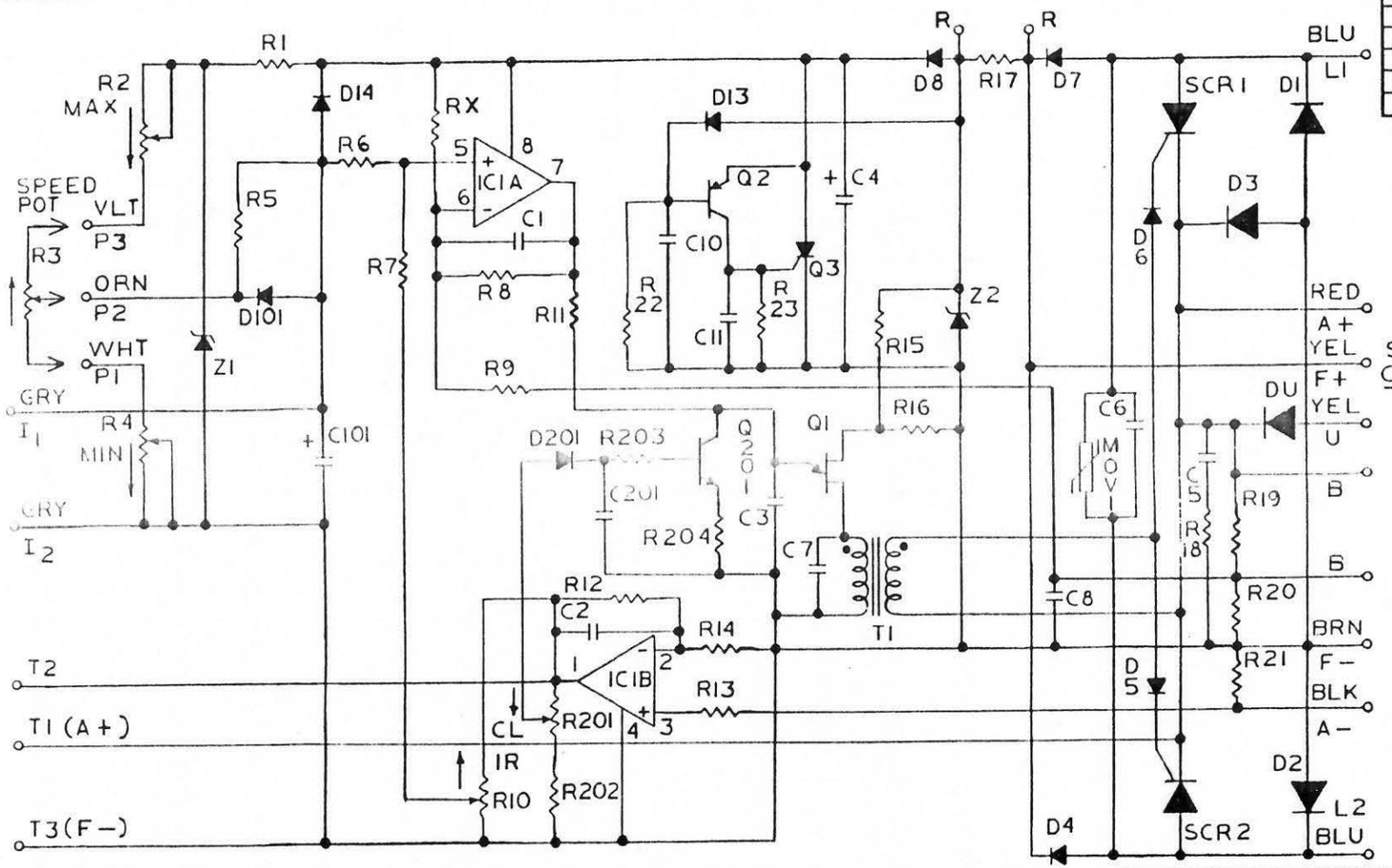
NOTE: The minimum speed adjustment will affect the maximum speed setting. Therefore, it is necessary to readjust the maximum speed after the minimum speed; and it may be necessary to repeat the operations until both the minimum and maximum speeds are set to the desired levels.

MAXIMUM SPEED ADJUSTMENT

Turn main speed potentiometer to full speed (maximum clockwise direction). Adjust maximum speed trimpot to 3800 RPM.

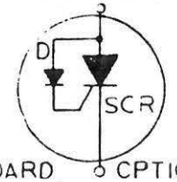
For moderate changes in the maximum speed, there will be a slight effect on the minium speed setting when the minimum speed is set at zero. There will be significant variation in the minimum speed setting if the minimum speed is set at a higher than zero setting.

KBIC MOTOR CONTROL BOARD



DATE	SYM	REVISION RECORD	AUTH	DR	CK

D1 D2 D3 MAY BE REPLACED WITH THE FOLLOWING CIRCUIT.



STANDARD COMPONENT	OPTIONAL COMPONENTS
D1	SCR3, D10
D2	SCR4, D11
D3	SCR5, D12

RATING OF SCR'S 3,4 AND 5 ARE EQUAL TO OR GREATER THAN SCR'S 1 AND 2. D10, D11, D12 ARE RATED 1A-600V (IN4005).

NOTES
1. THIS SCHEMATIC APPLIES TO THE FOLLOWING MODELS: KBIC-19, KBIC-115 KBIC-118, KBIC-120, KBIC-29, KBIC-215, KBIC-218 AND KBIC-240 WITH ONE OR MORE OF THE FOLLOWING SUFFIXES A, T, U, S AND PM.
2. ARROWS INDICATE DIRECTION OF POT FUNCTION INCREASE.

TOLERANCES (EXCEPT AS NOTED)	KB ELECTRONICS INC		
DECIMAL ±		SCALE	DRAWN BY WWC
			APPROVED BY
FRACTIONAL ±	TITLE KBIC SERIES SCHEMATIC 9,15 AND 18 AMP MODELS ONLY		
ANGULAR ±	DATE 12-15-82	DRAWING NUMBER B2212017	

MADE IN U.S.A.

ELECTRICAL

QUARTERLY	Check internal Motor Control Adjustments
	Check for loose components
	Check RPM Meter operation
	Check LED read-outs, all digits
	Visually inspect relay contacts
	Visually inspect relay socket wiring
	Check N2 pressure switch

ASSEMBLY
ST-240D/260D/270D

ITEM	DESCRIPTION	QTY	STI P/N	MANUFC.	MANUFC.P/N
1	Bracket, N2 Manifold	1	10153-501	STI	-----
2*	Bracket, H2O Manifold	1	10767-1	STI	-----
3*	Nozzles 240/260/270	8	10168-503	STI	-----
4	240D Frt.Panel, LH	1	10854-507	STI	-----
	240D Frt.Panel, RH	1	10854-2	STI	-----
	240D Frt.Panel, Japan	1	10854-501	STI	-----
	260D Frt.Panel, LH	1	10855-507	STI	-----
	260D Frt.Panel, RH	1	10855-2	STI	-----
	260D Frt.Panel, Japan	1	10855-501	STI	-----
	270D Frt.Panel, LH	1	10966-507	STI	-----
	270D Frt.Panel, RH	1	10966-2	STI	-----
5	240D Bowl Assy	1	12306-1	STI	-----
	260D Bowl Assy	1	12306-501	STI	-----
	270D Bowl Assy	1	12306-503	STI	-----
6	240D Bowl Support LH	1	10765-501	STI	-----
	260D/270D Bowl Support LH	1	10765-1	STI	-----
7	240D Bowl Support RH	1	10765-502	STI	-----
	260D/270D Bowl Support RH	1	10765-2	STI	-----
8	Base Plate	1	10766-1	STI	-----
9*	240D Door Seal	1	10771-1	STI	-----
*	260D Door Seal	1	10772-1	STI	-----
*	270D Door Seal	1	10929-1	STI	-----
10*	Rear Bowl Seal	1	10777-1	STI	-----
11	Door Hinge Plate	1	10785-1	STI	-----
12	Humphrey Pilot Manifold	1	61581-1	Humphrey	MM7
13	AMP Conn. Bracket	1	12201-1	STI	-----
14	Door Switch Bracket	1	10820-1	STI	-----
15	H2O Manifold	1	10967-1	STI	-----
16*	Brake Resistor	1	60272	Dale	RH-50 50W 8ohm 1%
17	Sleeve, H20 Manifold	1	10225-7	STI	-----
18*	Green Heater Hold Light	1	61553	United Radio	2152-QAS
20*	Rotor Stop Pos. Assy.	1	10503-1	STI	-----
21	Front Bearing Support	1	12241-1	STI	-----
22	Rear Bearing Support	1	12242-1	STI	-----
23	Nipple, S.S.	3	12021-1	STI	-----
24	N2 Manifold	1	12518-1	STI	-----
25	Thermocouple, Bowl	1	62805	STI	-----
26	Adapt. Seal, Shaft, Bowl	1	10774-3	STI	-----
27	Slinger, Shaft Seal	1	10776-1	STI	-----
28	Shaft Spacer	1	12226-1	STI	-----
29	Clamp Ring, Bowl Seal	1	10778-1	STI	-----
30	Spacers HT-270 only	4	10960-1	STI	-----
31	240D Door, LH	1	10781-1	STI	-----
	240D Door, RH	1	10781-2	STI	-----
	260D Door, LH	1	10782-501	STI	-----
	260D Door, RH	1	10782-502	STI	-----
	270D Door, LH	1	10961-501	STI	-----

ITEM	DESCRIPTION	QTY	STI P/N	MANUFC.	MANUFC.P/N
51 *	Gromet, Front Panel	1	61206	Nason	2185
52 *	Pressure Switch	2	61510	Nason	G1A-8F-QC
54 *	Red Power Light, Assy	1	61554-1	IDI	2150QA1
55 *	Amber N2 Heater Light Assy	1	61552-1	IDI	2150QA3
56 *	Green Door Seal Lt. Assy	1	61553-1	IDI	2152QA5
57 *	Start Switch	1	61561	Refac E.	IC1/583G/BLK
58 *	Stop Switch	1	61562	Refac E.	IC1/583R/BLK
59 *	Door Safety Switch	1	61567-1	MicroSwitch	V3L-1124-D8
60 *	Teflon H2O Valve	1	12020-505	STI	-----
	Teflon N2 Valve	1	12020-501	STI	-----
61 *	Humphrey Valve	6	61581	Humphrey	N439
64	Hose Clamp, Drain	1	62719	Parker Hannifin	6824
65 *	O-Ring, Door Air Port	1	62721	MN Rubber	4010-514AD
66	O-Ring, Collar Spacer	1	62723	Parker	2022N674-70
67	Key, Rotor Drive	1	12206-1	STI	-----
68 *	Vibration Dampers	4	62730-1	Barry Controls	A23-041
69	Drain Tube 12"	1	70706	STI	-----
70	Ultipor N2 Filter	1	70003	Pall	DFA4001-NAEY
71	Tee, S.S.	1	70782	STI	-----
72	Elbow, S.S.	1	70785	STI	-----
73	Reducing Adaptor, S.S.	1	70001	Esco	85013
74	Nipple, Reducer	1	70876	Esco	850719
75	Elbow, Plastic	2	70002	Harrington	P6FEY
76	Nut, Drive Shaft	1	91312	Esna	79NTE-080
77	Washer, Drive Shaft	1	91310	STI	-----
78	Pin, Cam	1	91303	STI	-----
80	Rotor	1	Customer Specified	STI	-----

* Recommended Spare Parts

Machine stays in holding mode	Thermostat	Verify thermostat closure; check relay 9CR; replace if necessary.
. Motor control RPM hunts	I.R. Comp	Adjust I.R. Comp as directed in Motor Control Sec.
RPM won't come up to max. 3200 RPM	Motor Control	Adjust max. motor speed as directed in Motor Control section.
Motor won't run	Motor Control relay #3CR (P-228, P-358, P-355) for contact closure	Replace if necessary.
	Contact closure on Motor control relays on I/O Board 20 CR (not used on P228), 21 CR, or 22 CR (check each while motor runs)	Replace relays as necessary.
	Voltage present on motor terminals	Replace motor.
	Check for interlock failure (low N2 pressure door open, etc.)	Correct failure condition.
3. Rotor appears to be out of balance	Rotor at high RPM for excessive vibration with a full cassette of wafers. Compare to a known good rotor.	Return unbalanced rotor to factory for rebalancing.
	Rotor shaft and drive plate for square.	Return to factory if out of square or suspect damage.
9. Water overflows	Blocked drain, vent	Clear the drain. Drain must be properly vented. Provide proper ventilation.
0. Water continues to spray when in dry cycle.	D.I. water valve for proper operation	Replace if necessary.
	D.I. water pressure	D.I. water pressure may be too high adjust to 1.5 - 2.0 gpm @ 30 psi.
	Solenoid valve operation	Replace if necessary.

RINSER/DRYER OPTIONS

DI Water Recirculation Kit WR-20

Beginning on Pages 34 and 36 are assembly diagrams depicting WR-20 DI Water Recirculation Kits as they would appear after installation, on either an NF or non NF type SRD. The Kit diagram, called "STD KIT", applies to the non NF type machines. The diagrams are intended to assist the installation of WR-20 options, in the field.

The WR-20 option provides the purchaser with the opportunity to re-circulate DI water that is being plumbed to the SRD water manifold. When the water spray manifold is not in use (closed), the DI supply may be diverted back to the facility DI water system by virtue of an STI Teflon/PVC modublock valve.

Antistatic Cell AS-20

The Static eliminator or Ion Cell may also be installed in the field. This device is placed in the N2 supply line just ahead of the N2 manifold. It may be installed on NF machines as per Assy Dwg. 12490-501, or on non NF machines (Assy Dwg. 12490-1). Also note the GROUNDING NOTICE in this section, as proper grounding during installation is necessary to prevent a cell or transformer failure.

Resistivity Monitors

To maximize the process efficiency of a Semitool, Resistivity Monitors should be installed. Rinsing your product to a quality standard rather than a time standard ensures that each lot processed through the SRD was rinsed to a consistant water quality level.

Our monitors will allow the SRD to rinse to an 18 megohm value and at the same time, yield a substantial water savings. When the RESMON is in the AUTO mode, it overrides the "cycle advance to dry" signal until set point is reached, (and rinse time expires), before switching to the dry cycle. In the MANUAL mode, the RESMON simply monitors and displays megohm value. No control over the rinse period is achieved.

The operating instructions for the three models of monitors are provided along with a manufacturer's manual supplied with each SRD (so long as a RESMON was ordered).

Rinse Quality Alarm

The Rinse Quality Alarm option is a modified version of the normal AUTO mode of the RESMON. A full explanation is given on Page 45.

WR-20 D.I. WATER CIRCULATION KIT

STD KIT PARTS LIST

Note: Components are in addition to STD SRD components.

ITEM	DESCRIPTION	QTY	STI P/N	VENDOR	VENDOR P/N
1	3/8" Tee (Tube)	1	70993	Jack Ogle	P6MR4
2	3/8" O.D. Tubing	2'	70703	Amfac	66P
3	Single-Stg. 1/4" Valve w/10224-1 Adapter	1	12020-509	STI	-----
4	1/8" Barb Tee	2	70854	Industrial Specialists	NITUBI
5	1/8" O.D. Tubing	1'	70885	" "	
6	Valve Plate	1	12391	STI	-----
7	3/8" Tube x 1/4" NPT (M) Connector	2	70749	Hose and Fittings	D6MC4
8	3/8" Tube x 3/8" Tube Connector		70770	Hose and Fittings	P6UC6
9	Valve Adapter	1	70920-1	STI	-----
10	10-32 x 1/8" Barb	2	70851	-------	------

Dwg: 12353-1

Production Notice - In Plant

The following components must be deleted from STD ST-240D/260D/270D machines:

3/8" tube connector (1) 70787 (-2, -3)

Existing valve (P/N 12020-509) must have 10224-1 valve adapter replacing 10224-505 valve adapter.

WR-20 D.I. WATER CIRCULATION
NF-20 KIT

Note: Components are in addition to NF-20 ST-260D/270D components.

ITEM	DESCRIPTION	QTY	STI P/N	VENDOR	VENDOR P/N
1	3/8" O.D. Tubing	2'	70703	Amfac	66P
2	3/8" Tube x 1/4" NPT Tee	1	70993	Jack Ogle	P6TU6
3	3/8" Tube Connector	1	70787(-2,-3)	------	-----
4	Valve Plate	1	12391	STI	-----
5	Single-Stg.STI Valve w/10224-505 Adapter	1	12020-509	STI	-----
6	3/8" Tube x 1/4" NPT (M) Connector	1	70749	Hose and Fittings	D6MC4
7	Adapter	1	10224-1	STI	-----
8	1/8" Barb Tee	2	70854		
9	1/8" O.D. Tubing	1'	70785	-------	-----
10	3/8" Tube x 3/8" Tube Connector	1	70770	Hose and Fittings	P6UC6
11	10-32 x 1/8" Barb	1	70851	---------	-------

Production Notice (In Plant): Existing STI valve requiers 10224-1 valve adapter replacing 10224-505.

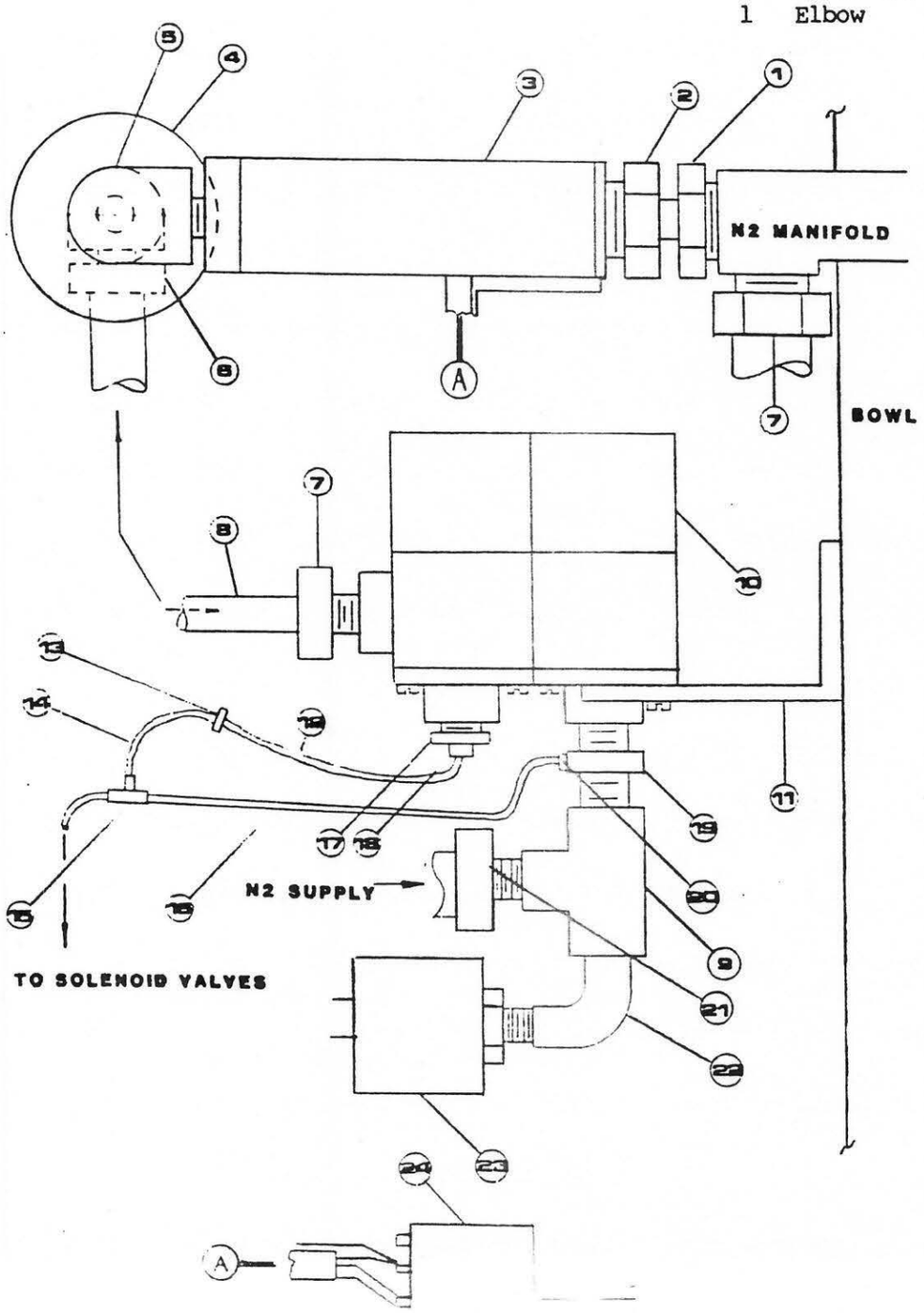
APPLICATION: This AS-20 Option involves modifications to the N2 supply of NF-20 ST-260D/270D SRD'S. The Schematic depicts a complete N2 Manifold modification and Pg. 3 of 3 lists a complete Parts List. The remaining SRD assemblies are not altered.

PARTS LIST

The following components are required in addition to NF-20 SRD components:
(see Schematic for mounting locations)

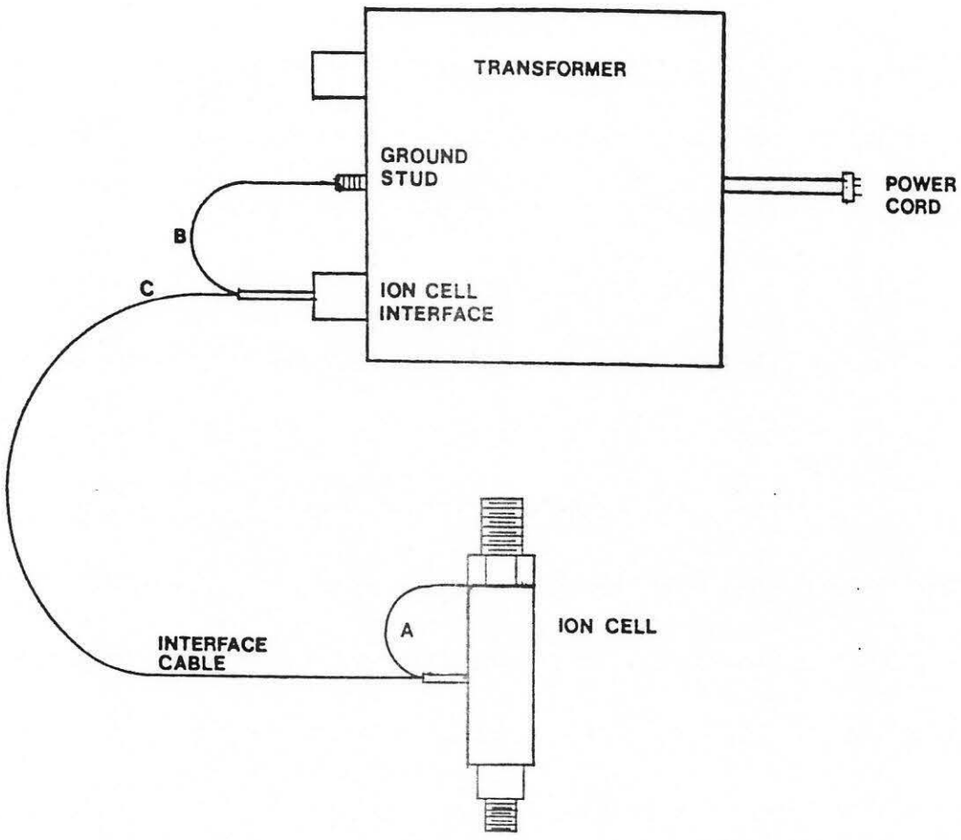
QTY	ITEM	P/N
1	AS-20 Probe	12489-501
1	AS-20 Transformer	60906
1	AS-20 Connector	12221-1
1	Elbow	70918

SIDE VIEW OF N2 MANIFOLD



IMPORTANT NOTICE

AS-20 GROUNDING INFORMATION



A - Ion Cell Interface Cable Ground Strap to Ion Cell.

B - Ion Cell Interface Cable Ground Strap to Ground Stud (Transformer).

C - Ion Cell Interface Cable to Transformer.

* IMPROPER GROUNDING WILL CAUSE BURNOUT OF TRANSFORMER OR ION CELL OR BOTH.

6. When Set Point is reached, the machine will automatically switch into Dry Cycle. NOTE: if Set Point is reached prior to Rinse Timer Cycle expiration, auto switch to Dry Cycle will not offer until Rinse time has expired. A MINIMUM OF 5 SECONDS MUST BE INSERTED ON THE RINSE TIMER TO ENABLE THE NEEDLE TO DROP BELOW SET POINT.

7. NOTE: When the resistivity point is below the adjusted Set Point, the display will flash several times per second. Further, the display will flash when the resistivity level is above a normal range. The display will not flash when resistivity is over Set Point, but under normal range.

3. TC-30T RESISTIVITY MONITOR (Note Manufacturers Manual)

1. Connect Patch Cord from Resistivity Monitor (Res.Mon.) to the Process Controller. Then connect Patch Cord to probe.

2. Adjust the cycle times and the RPM on the Process Controller for a normal process cycle.

3. MODE: This switch, when depressed alone, indexes the legend bars from top to bottom. The top position indicates megohm value. The middle position indicates C and the bottom position indicates Set Point.

   CONTROL: Operation of this switch depends upon the status of the "bar position" and the MODE switch.

4. To enter a Set Point value, first move the Res. Mon. switch on the Process Controller to the AUTO position. Using the MODE switch, index the legend bar to the Set Point position (bottom). Now, press and hold the Control switch - while holding, press the MODE switch. The displayed value will be decreasing. If the Control switch is released, the displayed value increases. When a particular Set Point value has been reached, release the MODE switch. The value appearing on the display has now been set. Should a power interruption occur, the Set Point value will be lost and must be reset.

   A 10 megohm minimum value was preset at the factory. After a power interruption, the Monitor will use the 10 meg. value if no other value is entered. If a 10 meg. value is satisfactory for a particular operation, simply move the ResMon switch to "AUTO" and operate as normal. The 10 megohm value will automatically be used. To change this value, refer to Page 6 Section 2.2 in the TC-30T Manufacturer's Manual.

5. Start the Rinse Cycle.

RINSE QUALITY ALARM RA-1Ø

The rinse quality alarm option consists of an audio alarm and warning light located on the Process Controller front panel. The rinse quality alarm alerts the operator that resistivity (set point) was not met during the normal rinse period. After a 6Ø second delay following the rinse, the audio alarm sounds and the light appears. Automatically the Rinser/Dryer will begin rinsing and will switch to dry when set point is reached, or after 3ØØ seconds elapses - whichever occurs first. If resistivity was not met after 3ØØ seconds, the machine will advance to the dry cycle. A "666" code will appear on the Process Controller display.

If, during the initial rinse period, the resistivity set point is reached, the rinse will continue until the programmed rinse time has expired before advancing to the dry cycle.

An Alarm Silence/Cycle Advance switch is provided that allows the operator to manually advance the machine to the dry cycle during the rinse cycle or to silence the alarm and reset the rinse cycle.

PROCESS CONTROLLER P-355

The Semitool P-355 Controller is used to operate Rinser/Dryers that use the five cycle process: two-stage rinse, delay, and two-stage dry. This controller is not designed to support the NF type Rinser/Dryers. The P-355 uses a Z-80 microprocessor with 2K eprom and 1K ram. Its microprocessor based design allows flexibility in customer operation and monitors each mode of Rinser/Dryer operation. Special display codes for each mode are described in this section. The configuration of the P355 can easily be changed by replacing the onboard eprom. Consult the factory for details.

P-355 CONTROLLER INSTRUCTIONS

PRIMARY CONNECTIONS

Follow the instructions called "Primary Connections" for initial installation, Page 13 of this manual.

PRESETTING THE CONTROLS AND INITIAL OPERATION

1. Verify that the N2 and H2O water supplies are turned on.

2. Turn the power switch to "ON"; a "9" will appear on the display during the initialization period approximately 3Ø seconds (refer to Display Codes).

3. Wait for the "C1" to appear on the display. If an error code appears on the display, the error condition must be corrected before operation can begin.

4. When "C1" appears, enter Rinse Time A, Dry Time A, and Delay, in seconds using the thumbwheel switches. When the three times have been set, toggle the A/B Load switch to A and release. This enters the particular times. Delay time may only be entered in the "C1" mode.

5. When the "C2" appears, the controller is ready to accept Rinse B and Dry B times. Using the same thumbwheel switches, enter Rinse B, Dry B times.

6. Toggle the A/B Load Switch to B and release.

7. The display should now show "Ø" or "ready to start".

8. Open the door and insert a properly loaded cassette into the rotor. Close the door.

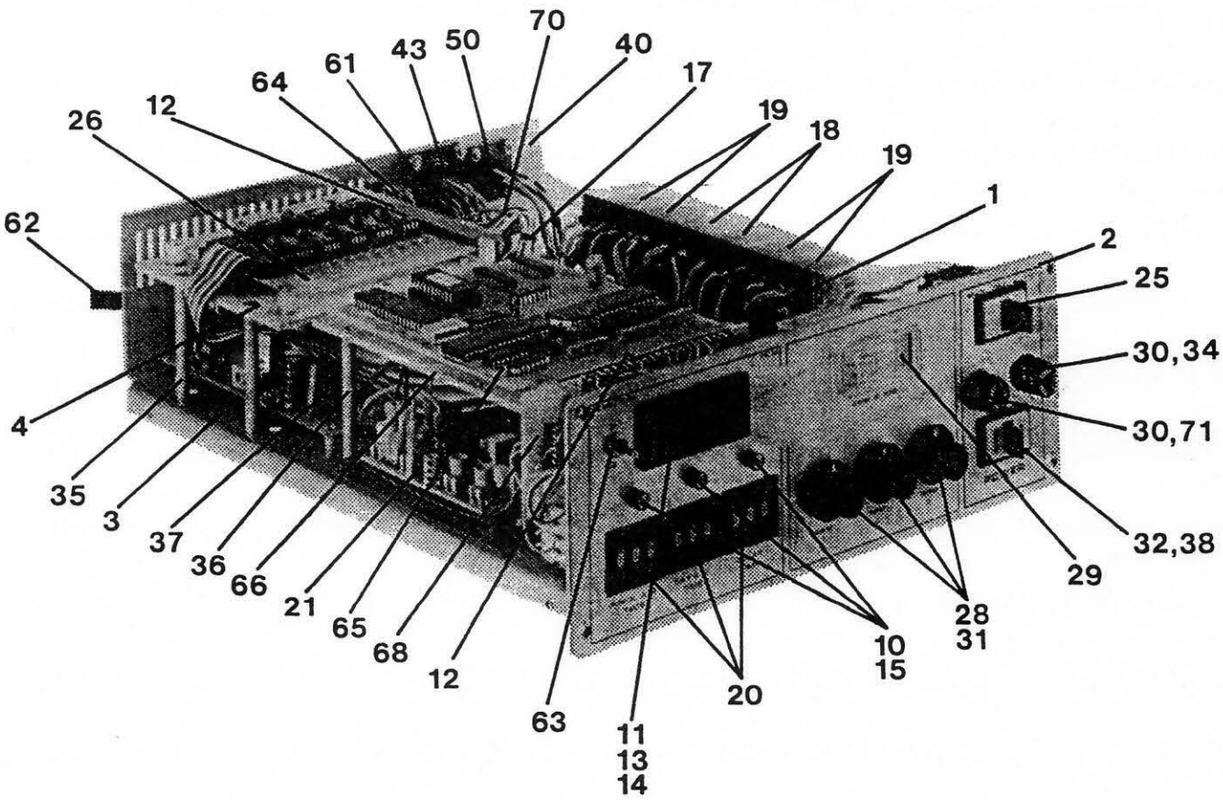
9. Press the Start button.

10. Adjust the RPM for each particular process cycle using the RPM 1, RPM 2, and RPM 3 potentiometers:

    RPM 1, which controls RPM during the first rinse, is limited to 12ØØ RPM.

    RPM 2, which controls the speed of Dry B, is limited to 38ØØ RPM.

    RPM 3, which controls the speed of Rinse B, Dry A, and Delay, is limited also to 38ØØ RPM.



PROCESS CONTROLLER

P-355

ASSEMBLY P-355 CONTROLLER (Refer to P-355 Assembly Drawing)

ITEM	DESCRIPTION	QTY	STI P/N	OEM	OEM P/N
1	Relay Bracket	1	10650-1	STI	-----
2	Front Panel	1	12319-509	STI	-----
3	Base	1	10592-5	STI	-----
4	Plate, Card I/O	1	12007-1	STI	-----
10	Indicator LED	3	60454	---	Red,LED 1 3/4,1.2V
11	Displays	3	60452	---	Man-72
12	Board Connector	2	60502-1	TI	H-411/21-22
13	Display Bezel	1	60606	IEE	DMH-22463X-03
14	Display Socket	1	60607	IEE	22464-03
15	LED Lens	3	60608	Typical	ClipLite, T-1 3/4
17	Terminal Strip	1	61708	HH Smith	870
18	Relay	2	60650	Omron	LY2-USOE1
19	Relay	4	60651	Omron	MY4-UA
20	PushWheel Switch	3	60670-1	IVO Indust'	IVO6EFEC3-2LST-1
21	Motor Control Board	1	60701-3	KBIC	2251
25	Switch	1	60705	Microswitch	AML23 EBA2A C04
26	I/O Card	1	14701-1	STI	-----
28	Speed Control Pot	3	61520	Minarik	M1210
29	RPM Meter	1	61530	Modutec	ME-DVV-100
30	Fuse Holder	2	61540	Littlefuse	345613
31	Knob	3	61550	Nobex	B/27-D
32	Power Switch	1	60704	Microswitch	AML33 FBA 4AC01
34	Fuse, 10A, SB	1	61640-1	Littlefuse	313010, SB
35	Post	8	91193	HH Smith	8351
36	Stand Off, 3/16	4	91287-1	HH Smith	8501
37	DC Power Supply Board	1	60801-2	PowerGeneral	3045-1
38	Bulb	1	60706	Gen Instru	10-CM7314V-08A
40	Enclosure	1	10592-3	STI	-----
41	Cable, 10 ' (Remote) SRD	1	61704	STI	-----
	Cable, 3' (Std) SRD	1	61704	STI	-----
42	Strain Relief SRD	1	61714	AMP	206070-1
43	Panel Socket SRD	1	61719	Am Pamcor	205840-3
44	Plug SRD	1	61739	AMP	205839-3
48	Cable, 10' (ResMon)	1	61703	STI	-----
50	Panel Socket (ResMon)	1	61738	AMP	206486-1
51	Plug (ResMon)	1	61741	Am Pamcor	206485-1
52	Strain Relief (ResMon)	1	61742	Am Pamcor	20606-2-1
61	Strain Relief	1	61715	Heyco	6N3-4
62	Power Cord	1	61702	Minarek	M1305
63	Switch, Load	1	61316	Sprague	U21 P3 Y2Q
64 *	Switch, Test	1	61312	Sprague	7205 SYZQE
65 *	CPU Card	1	14703-1	STI	-----
66	Plate/Card/CPU	1	12008-1	STI	-----
68	Display Cycle (Board)	1	14719-1	STI	-----
70	Plug, 3/4"	1	61762	Typical	3/4"
71	Fuse, 1A	1	61640-2	Littlefuse	1 AMP

* Recommended Spare Parts

ITEM	DESCRIPTION	QTY	STI P/N	MANUFC.	MANUFC.P/N
1	Bracket, N2 Manifold	1	10153-501	STI	-----
2	Bracket, H20 Manifold	1	10767-1	STI	-----
3 *	Nozzles 240/260/270	8	10168-503	STI	-----
4	240D Frt.Panel, LH	1	10854-507	STI	-----
	240D Frt.Panel, RH	1	10854-2	STI	-----
	240D Frt.Panel, Japan	1	10854-501	STI	-----
	260D Frt.Panel, LH	1	10855-507	STI	-----
	260D Frt.Panel, RH	1	10855-2	STI	-----
	260D Frt.Panel, Japan	1	10855-501	STI	-----
	270D Frt.Panel, LH	1	10966-507	STI	-----
	270D Frt.Panel, RH	1	10966-2	STI	-----
5	240D Bowl Assy	1	12306-1	STI	-----
	260D Bowl Assy	1	12306-501	STI	-----
	270D Bowl Assy	1	12306-503	STI	-----
6	240D Bowl Support LH	1	10765-501	STI	-----
	260D/270D Bowl Support LH	1	10765-1	STI	-----
7	240D Bowl Support RH	1	10765-502	STI	-----
	260D/270D Bowl Support RH	1	10765-2	STI	-----
8	Base Plate	1	10766-1	STI	-----
9 *	240D Door Seal	1	10771-1	STI	-----
*	260D Door Seal	1	10772-1	STI	-----
*	270D Door Seal	1	10929-1	STI	-----
10 *	Rear Bowl Seal	1	10777-1	STI	-----
11	Door Hinge Plate	1	10785-1	STI	-----
13	AMP Conn. Bracket	1	12201-1	STI	-----
14	Door Switch Bracket	1	10820-1	STI	-----
15	H20 Manifold	1	10967-1	STI	-----
16 *	Brake Resistor	1	60272	Dale	RH-50 50W 8ohm 1%
17	Sleeve, H20 Manifold	1	10225-7	STI	-----
18	Hole Plug, Front Panel	1	61309	STI	-----
20 *	Rotor Stop Pos. Assy.	1	10503-1	STI	-----
21	Front Bearing Support	1	12241-1	STI	-----
22	Rear Bearing Support	1	12242-1	STI	-----
23	Nipple, S.S.	2	12021-1	STI	-----
24	N2 Manifold	1	12518-1	STI	-----
26	Adapt. Seal, Shaft, Bowl	1	10774-3	STI	-----
27	Slinger, Shaft Seal	1	10776-1	STI	-----
28	Shaft Spacer	1	12226-1	STI	-----
29	Clamp Ring, Bowl Seal	1	10778-1	STI	-----
30	Spacers HT-270 only	4	10960-1	STI	-----
31	240D Door, LH	1	10781-1	STI	-----
	240D Door, RH	1	10781-2	STI	-----
	260D Door, LH	1	10782-501	STI	-----
	260D Door, RH	1	10782-502	STI	-----
	270D Door, LH	1	10961-501	STI	-----

ITEM	DESCRIPTION	QTY	STI P/N	MANUFG.	MANUFG. P/N
64	Hose Clamp, Drain Port	1	62719	Ideal	6824
65 *	O-Ring, Door Air Port	1	62721	MN Rubber	4010-514AD
66	O-Ring, Collar Spacer	1	62723	Parker	2022N674-70
67	Key, Rotor Drive	1	12206-1	STI	-----
68 *	Vibration Dampers	4	62730-1	Barry Controls	A23-041
69	Drain Tube 12"	1	70706	STI	-----
71	Tee, S.S.	2	70782	STI	-----
72	Elbow, S.S.	1	70785	STI	-----
73 *	Skinner Valve	1	70711	Honeywell	MBD-002
76 *	Nut, Drive Shaft	1	91312	Esna	79NTE-080
77 *	Washer, Drive Shaft	1	91310	STI	-----
78 *	Pin, Cam	1	91303	STI	-----
80	Rotor	1	Customer Specified	STI	-----

* Recommended Spare Parts

PROCESS CONTROLLER P-358

The Semitool P-358 Controller is used to operate Rinser/Dryers that use the five cycle process: two-stage rinse, manifold purge, and two-stage dry on NF type Rinser/Dryers. The P-358 uses a Z-80 microprocessor with 2K eprom and 1K ram. Its microprocessor based design allows flexibility in customer operation and monitors each mode of Rinser/Dryer operation. Special display codes for each mode are described in this section. The configuration of the P358 can easily be changed by replacing the onboard eprom. Consult the factory for details.

P-358 CONTROLLER INSTRUCTIONS

PRIMARY CONNECTIONS

Follow the instructions called "Primary Connections" for initial installation, Page 13 of this manual.

PRESETTING THE CONTROLS AND INITIAL OPERATION

1. Verify that the N2 and H2O water supplies are turned on.

2. Turn the power switch to "ON"; a "9" will appear on the display during the initialization period approximately 30 seconds (refer to Display Codes).

3. Wait for the "C1" to appear on the display. If an error code appears on the display, the error condition must be corrected before operation can begin.

4. When "C1" appears, enter Rinse Time A, Dry Time A, and Delay, in seconds using the thumbwheel switches. When the three times have been set, toggle the A/B Load switch to A and release. This enters the particular times. Delay time may only be entered in the "C1" mode.

5. When the "C2" appears, the controller is ready to accept Rinse B and Dry B times. Using the same thumbwheel switches, enter Rinse B, Dry B times.

6. Toggle the A/B Load Switch to B and release.

7. The display should now show "Ø" or "ready to start".

8. Open the door and insert a properly loaded cassette into the rotor; Close the door.

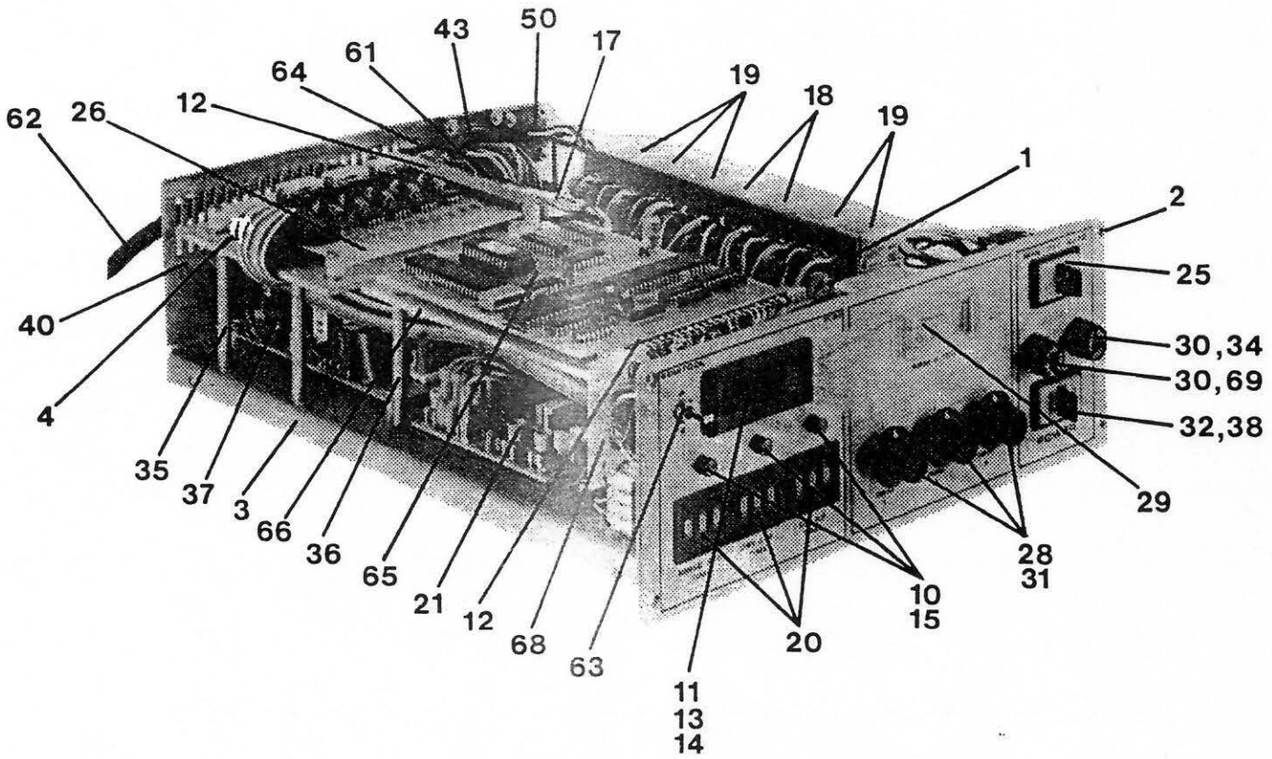
9. Press the Start button.

10. Adjust the RPM for each particular process cycle using the RPM 1, RPM 2, and RPM 3 potentiometers:

    RPM 1, which controls RPM during the first rinse, is limited to 1200 RPM.

    RPM 2, which controls the speed of Dry B, is limited to 3800 RPM.

    RPM 3, which controls the speed of Rinse B, Dry A, and Delay, is limited also to 3800 RPM.



PROCESS CONTROLLER

P-358

ASSEMBLY P-358 CONTROLLER (Refer to P-358 Assembly Drawing)

ITEM	DESCRIPTION	QTY	STI P/N	MANUFC.	MANUFC.P/N
1	Relay Bracket	1	12253-1	STI	-----
2	Front Panel	1	12319-509	STI	-----
3	Base	1	10592-5	STI	-----
10	Indicator LED	3	60454	---	Red LED, T 1 3/4, 1.2V
11	Displays	3	60452	Gen Instru	Man-72A
12	Board Connector	2	60502-1	T.I.	H411/21-22
13	Display Bezel	1	60606	IEE	DMH-22463X-03
14	Display Socket	1	60607	IEE	22464-03
15	LED Lens	3	60608	Typical	ClipLite, T 1 3/4
17	Terminal Strip	1	61708	HH Smith	870
18 *	Relay	2	60650	Omron	LY2-USOE1
19 *	Relay	5	60651	Omron	MY4-UA
20 *	Pushwheel Switch	3	60670-1	IVO Indus	IVO6EFEC3-2LST-1
21 *	Motor Control Board	1	60701-3	KBIC	2251
25 *	Switch	1	60705	MicroSwitch	AML23EBA2AC04
26 *	I/O Card	1	14701-1	STI	-----
28 *	Speed Control Pot	3	61520	Minarik	M1210
29 *	RPM Meter	1	61530	Modutec	ME-DVV-100
30	Fuse Holder	2	61540	Littlefuse	345613
31	Knob	3	61550	Nobex	B/27-D
32 *	Power Switch	1	60704	MicroSwitch	AML33FBA4AC01
34	Fuse, 15A, SB	1	61640-3	Littlefuse	313010, SB
35	Post	8	91193	HH Smith	8351
36	Standoff, 3/16	4	91287-1	HH Smith	8501
37 *	DC Power Supply Board	1	60801-2	PowerGenrl	3045-1
38 *	Bulb	1	60706	Gen Instr	10-CM73 14V.08A
40	Enclosure	1	10592-3	STI	-----
41	Cable, 10' Remote (SRD)	1	61704	STI	-----
	Cable, 3' Std. (SRD)	1	61704	STI	-----
42	Strain Relief (SRD)	1	61714	AMP	206070-1
43	Panel Socket (SRD)	1	61719	Am Pamcor	205840-3
44	Plug (SRD)	1	61739	AMP	205839-3
48	Cable, 10' (ResMon)	1	61703	STI	-----
50	Panel Socket (ResMon)	1	61738-1	AMP	206486-1
51	Plug (ResMon)	1	61741	Am Pamcor	206485-1
52	Srain Relief (ResMon)	1	61742	Am Pamcor	20606-2-1
61	Strain Relief	1	61715	Heyco	6N3-4
62	Power Cord	1	61702-1	Minarek	M1305
63	Switch, Load	1	61316	Sprague	U21 P3Y 2Q
64	Switch, Test	1	61312	Sprague	7205 SYZQE
65 *	CPU Card	1	14703-1	STI	-----
66	Plate/Card/CPU	1	12008-1	STI	-----
68	Display Cycle (Board)	1	14719-1	STI	-----
69	Fuse, 1A	1	61640-2	Littlefuse	312001
70	Plug, 3/4"	1	61762	Typical	3/4"

* Recommended Spare Parts

SEMITOOL™ Kalispell, MT			
PCM CPU BOARD			
	BY DATE	DRAWING NUMBER	REV
DRAWN	JME 9/02/87	14817	E
CHECKED			
APPROVED	CA 9/3/87	SHEET 2A OF 6	

-503 = SR MACHINES
-501 = WATCHDOG
-1 = STANDARD

REF	DESCRIPTION	PART NO.	ASSY -1	ASSY -501	ASSY -503	UNIT
C1	1 MF, 50V, MONOBLOC	60253-01	1	1	1	EA
C2	.1 MF, 35V, TANTALUM	60202	1	1	1	EA
C3	.33 MF, 35V, TANTALUM	60204	1	1	1	EA
C4	.1 MF, 35V, TANTALUM	60202	1	1	1	EA
C5	.1 MF, 35V, TANTALUM	60202	1	1	1	EA
C6	47 MF, 16V, ELECTROLYTIC	60621	1	1	1	EA
C7	1 MF, 50V, MONOBLOC	60253-01	1	1	1	EA
C8	470 PF, 50V, CERAMIC	73009-07	1	1	1	EA
C9	.1 MF, 35V, TANTALUM	60202	1	1	1	EA
C10	.1 MF, 35V, TANTALUM	60202	1	1	1	EA
C11	Q CAP	60297	1	1	1	EA
C12	Q CAP	60295	1	1	1	EA
C13	Q CAP	60295	1	1	1	EA
C14	Q CAP	60295	1	1	1	EA
C15	Q CAP	60294	1	1	1	EA
C16	Q CAP	60294	1	1	1	EA
C17	Q CAP	60294	1	1	1	EA
C18	Q CAP	60296	1	1	1	EA
C19	Q CAP	60296	1	1	1	EA
Q1	2N4401 TRANSISTOR	73041-01	1	1	1	EA
Q2	2N4401 TRANSISTOR	73041-01	1	1	1	EA
Q3	2N6725 TRANSISTOR	60410	1	1	1	EA
Q4	2N6725 TRANSISTOR	60410	1	1	1	EA
Q5	2N6725 TRANSISTOR	60410	1	1	1	EA
R1	3300 OHM, SIP, 5 RES NETWORK	60118	1	1	1	EA
R2	3300 OHM, 1/4W RES	60115	1	1	1	EA
R3	1M, 1/4W RES	60107	1	1	1	EA
R4	10K 1/4W RES	60104	1	1	1	EA
R5	47K, 1/4W RES	60110	1	1	1	EA
R6	2200 OHM, 1/4W RES	60103	1	1	1	EA
R7	1000 OHM, 1/4W RES	60112	1	1	1	EA
R8	2200 OHM, 1/4W RES	60103	1	1	1	EA
R9	30K, 1/4 W RES	60115-02	1	1	1	EA
R10	150 OHM, DIP, 7 RES NETWORK	60117	1	1	1	EA
R11	22K SIP, 5 RESISTOR NETWORK	60119	1	1	1	EA
R12	10K SIP, 5 RESISTOR NETWORK	60121	1	1	1	EA
R13	1K SIP, 7 RESISTOR NETWORK	73008-16	1	1	1	EA
R14	10K SIP, 7 RESISTOR NETWORK	60120	1	0	0	EA
R15	10K SIP, 7 RESISTOR NETWORK	60120	1	0	0	EA
S1	40 PIN SOCKET	60513	1	1	1	EA
S2	28 PIN SOCKET	60506	1	1	1	EA
S3	28 PIN SOCKET	60506	1	1	1	EA
S4	28 PIN SOCKET	60506	1	1	1	EA

SEMITOOL KALISPELL, MT

PCM CPU BOARD

BY	DATE	DRAWING NUMBER	REV
DRAWN JME	9/2/87	14817	E
CHECKED			
APPROVED CAC	9/3/87	SHEET 2B OF 6	

S5	40 PIN SOCKET	60513	1	1	1 EA
S6	40 PIN SOCKET	60513	1	1	1 EA
U1	CPU TMPZ84C00	60320-01	1	1	1 EA
U2	2716 EPROM	60315	1	1	1 EA
U3	HM6116	60274	1	1	1 EA
U4	HM6116	60274	1	1	1 EA
U5	74LS14 INVERTER	60288	1	1	1 EA
U6	74LS138 DECODER	60318	1	1	1 EA
U7	74LS138 DECODER	60318	1	1	1 EA
U8	4047 MONOSTABLE	60290	1	1	1 EA
U9	74121 MONOSTABLE	60323	1	1	1 EA
U10	ULN-2003 DRIVER	60313	1	1	1 EA
U11	ULN-2003 DRIVER	60313	1	1	1 EA
U12	7447 DISPLAY DRIVER	60319	1	1	1 EA
U13	8255 PPI	60316	1	1	1 EA
U14	8255 PPI	60316	1	1	1 EA
X1	HEADER PINS	60283	3/40	3/40	3/40 40EA
X1	SHORTING JUMPER	60282	1	1	1 EA
X2	HEADER PINS	60283	6/40	6/40	6/40 40EA
X2	SHORTING JUMPER	60282	1	1	1 EA
X3	HEADER PINS	60283	3/40	3/40	3/40 40EA
X3	SHORTING JUMPER	60282	1	1	1 EA
X4	HEADER PINS	60283	6/40	6/40	6/40 40EA
X4	SHORTING JUMPER	60282	1	1	1 EA
X5	HEADER PINS	60283	3/40	3/40	3/40 40EA
X5	SHORTING JUMPER	60282	1	1	1 EA
X6	HEADER PINS	60283	6/40	6/40	6/40 40EA
X6	SHORTING JUMPER	60282	1	1	1 EA
X7	HEADER PINS	60283	3/40	3/40	3/40 40EA
X7	SHORTING JUMPER	60282	1	1	1 EA
X8	HEADER PINS	60283	3/40	3/40	3/40 40EA
X8	SHORTING JUMPER	60282	1	1	1 EA
X9	HEADER PINS	60283	2/40	2/40	2/40 40EA
X9	SHORTING JUMPER	60282	1	1	1 EA
X10	HEADER PINS	60283	2/40	2/40	2/40 40EA
X10	SHORTING JUMPER	60282	1	1	1 EA
X11	HEADER PINS	60283	2/40	2/40	2/40 40EA
X11	SHORTING JUMPER	60282	0	1	0 EA
Y1	1.0 MHZ OSCILLATOR	60122	1	1	1 EA
	SCHEMATIC	14155	1	1	1 EA
	PRINTED CIRCUIT BOARD	14817-B	1	1	1 EA