

--WARNING--

THIS EQUIPMENT IS TO BE USED WITH 115 VOLT, 50/60 Hz
POWER ONLY. IF A STEPDOWN TRANSFORMER IS USED, DO NOT
USE AN AUTO TRANSFORMER. PHASE NEUTRAL OF POWER APPLIED
TO THIS EQUIPMENT MUST BE WITHIN 30 VOLTS OF EARTH
GROUND.

NOTICE

THESE INSTRUCTIONS MUST BE FOLLOWED TO INSURE NORMAL FUNCTIONING AND LIFE OF THIS EQUIPMENT.

CLEANING INSTRUCTIONS

R485 Bowl Configuration

1. Spray a solvent compatible with the Photo Resist being used on a SPINNING substrate several times a day.
2. Remove the bowl/drain assembly and splash deflector ring (Items 11 and 12, Dwg 4-20313) and clean with solvent daily. (Do not use hot trichlorethylene.) Keep solvent level below edge of shaft protector cup.
3. Replace bowl/drain assembly and splash deflector (Items 11 and 12, Dwg 4-20313) as required.
4. Clean the interior of the fume box (Item 14, Dwg 4-20313) at least once a week or more often if the build-up of materials touches the shaft protector cup (Item 7, Dwg 4-20313). Keep solvents away from this cup and the motor shaft.
5. Never pour solvents down center of motor shaft.

R790 Bowl Configuration

1. Spray a solvent compatible with the photo resist being used on a SPINNING substrate several times a day.
2. Remove the bowl/drain assembly and splash deflector ring (Items 15, 21 and 18, Dwg 4-20313) and clean with solvent daily. (Do not use hot trichlorethylene). Keep solvent level below edge of shaft protector cup.
3. Replace bowl/drain assembly and splash deflector, mentioned above, after cleaning.
4. Clean the interior of the fume box (Item 17, Dwg 4-20313).
5. Never pour solvents down center of motor shaft.

CB15 Bowl Configuration

1. Spray a solvent compatible with the Photo Resist being used on a SPINNING substrate several times a day.
2. Clean the interior of the CB15 bowl at least once a week, more often if the build-up of materials touches the shaft protector cup. Keep solvents away from this cup and the motor shaft.
3. Never pour solvents down center of motor shaft.

INITIAL WARMUP

It is highly recommended that the main power switch on the controller be turned on at least 5 minutes prior to operation of the motor(s). This will allow sensitive elements in the controller to reach and maintain thermal equilibrium, and thus process repeatability will be enhanced.

INSTRUCTION MANUAL
FOR
THE EC101DT & PM101DT SERIES
PHOTO RESIST SPINNERS

Property of:

Model No.:

Serial No.:

Local Representative:

LIST OF ILLUSTRATIONS

1.	KEY, SPINR, EC/PM, DGTLTMR	4-20313
2.	FOOTSWITCH, EC101, ASSY	2-03041
3.	SCHEMATIC, CONT, EC/PM, DT	3-19564
4.	CONTR, EC/PM101D, W/DTGLTMR	4-20344
5.	PCB, CONT, EC, ASSY	3-19493
6.	PCB, FILTERS, EC, ASSY	3-19492
7.	PCB, CONT, MOT, SUBASSY	3-13247
8.	PCB, CONT, MOT, DT, ASSY	2-19441
9.	PKG-MTR, PM, W/O-PLENUM, DT	3-19526
10.	PKG-MTR, EC, W/O-PLENUM, DT	3-19528
11.	MOTOR, EC, W/VAC-SEAL, ASSY	3-19517
12.	PLATE, CONT, VAC, EC101, ASSY	3-19531
13.	PLENUM, EP-CB15, SST, ASSY	2-18350
14.	CABLE, INTFC, MTR, EC	2-19532
15.	CUT-OUT, MOT-PKG, R485, DT	2-20174
16.	CUT-OUT, MOT-PKG, CB-15	3-11216
17.	CUT-OUT, MOT-PKG, R790-DT	3-20630

TABLE OF CONTENTS

SECTION 1	GENERAL
SECTION 2	SPECIAL FEATURES
SECTION 3	WARNINGS
SECTION 4	OPERATING PROCEDURE
	4.1 Initial Start
	4.2 Vacuum Control
SECTION 5	ACCELERATION AND CONTROL
SECTION 6	SPIN TIMER
SECTION 7	FUME VENTING AND "COBWEB" SUPPRESSION
SECTION 8	VACUUM CHUCKS
SECTION 9	MAINTENANCE AND REPAIRS
	9.1 Bowls
	9.2 Vacuum Line
	9.3 Vacuum Interlock
	9.4 Spinner Controller Assembly
	9.4.1 Tachometer Calibration
	9.4.2 Vacuum Line
	9.4.3 Jumper Schedule
	9.4.4 Disassembly
	9.5 Motor/Tachometer Generator Assembly
	9.5.1 Motor/Tachometer Generator
	9.5.2 Vacuum Interlock Setting
	9.5.3 Vacuum Seal
	9.5.4 Vacuum Seal Replacement
	9.5.5 Brush Replacement
	9.6 Parts
SECTION 10	INSTALLATION
	10.1 General
	10.2 Hook-up Check List
SECTION 11	REPLACEABLE PARTS LIST
	WARRANTY AND ILLUSTRATIONS

**INSTRUCTION MANUAL
FOR
THE EC101DT & PM101DT PHOTO RESIST SPINNERS**

SECTION 1 GENERAL (See Installation Instructions in Section 10)

1.1 The EC101DT and PM101DT Series of Photo Resist Spinners provides versatile equipment to meet a complete range of spinner requirements in the semiconductor industry. By proper selection of compatible equipment within the EC101DT and PM101DT Spinner series and the EC102 Photo Resist Dispenser series, it is possible to coat substrates with adjustable spinning speeds from 500 to 10,000 RPM on the EC101DT and heavier loads from 500 to 5,000 RPM on the PM101DT (the PM101DT is capable of spinning 7,500 RPM, but it is highly recommended that speeds above 5,000 RPM be avoided except for short periods of time to insure long life of the motor). The modular design and accessory connector permits adapting the equipment to many installations and processes. Currently, several compatible accessories are available, with others contemplated in the future.

1.2 This Instruction Manual gives the general description, instructions for installation, principles of operation, and repair instructions for the EC101DT and PM101DT series of Photo Resist Spinners. Please become familiarized with this manual and properly instruct the operators in the use of this equipment.

1.3 If basic difficulties are encountered with the equipment especially during the warranty period, please contact the nearest Headway Representative. If necessary, the home office may be contacted directly for immediate assistance at 214/272-5431.

1.4 The EC101DT and PM101DT Photo Resist Spinners are high quality machines. If properly operated and maintained, they will give long and reliable service.

SECTION 2 SPECIAL FEATURES

2.1 Adjustable Vacuum Interlock/Trouble Indicating Buzzer
(See Section 9.3)

2.1.1 The operator and the substrate are protected by sensing the vacuum that is applied to the substrate. If the substrate is not properly seated on the chuck, or if the vacuum source is inadequate, the spinner WILL NOT OPERATE. The Trouble Indicating Buzzer, located inside the master controller, will warn of either condition when the "START" switch is depressed. If the applied vacuum drops below a safe level during a spin cycle, the spinner will automatically stop before the substrate can be thrown.

2.1.2 The Vacuum Interlock is normally set at the factory to operate between 16 and 18 inches of mercury. This setting can easily be changed in the field (see Section 9.3).

2.2 Foot Switch (See Dwg 2-3041)

The EC101DT/PM101DT is equipped with a dual function foot switch as standard equipment, freeing the operator's hands for proper substrate handling. The main pedal of the foot switch initiates the spin cycle. The opposite pedal stops the cycle if desired. (The automatic cycle timer normally stops the machine at the end of a preset cycle). When the foot switch is used, the application of the vacuum to the chuck is automatic and cannot be manually controlled. If manual control is required, refer to the optional remote control switch panel which can be obtained as an accessory.

The EC101DT/PM101DT system is especially designed for high acceleration. The motor is a DC servo-type, controlled by a closed loop electronic feedback system. The output of an electrical tachometer which is directly proportional to motor RPM, is compared to a DC reference voltage, and an electronic control circuit forces the motor speed to follow an adjustable acceleration ramp and to rapidly lock on to the speed represented by the reference voltage. External programming of the speed is possible. (See Section 5).

2.3 Indicating Tachometer

A digital tachometer is standard equipment with the EC101DT/PM101DT Photo Resist Spinner. It indicates the spinner speed directly, in thousands of RPM.

The tachometer generator is electronically a part of the DC control loop. The standard tachometer is calibrated 0-10,000 RPM full scale for EC101DT, and 0-7,500 RPM full scale for PM101DT.

2.4 Speed Control

The spin speed is set by using the 10-turn potentiometer with dial indicator. Note that when accessories such as dispensers, two speed or four speed controllers are used, the accessory's speed control takes precedence, and the control panel speed pot controls the final speed only.

2.5 Spin Time Control

The spin time (in seconds) is set by using a 4-digit thumbwheel switch. At the start of the cycle, the spin time as percentage is loaded into the display located above the thumbwheel switches. The spin timer begins to count down when the spinner latches and the motor starts spinning. Note: The spin time is independent of accel and decel time. The standard spin time range is 1-999 seconds, but with using the fourth thumbwheel switch on the timer, the time unit can be changed to 0.1 Second, 1 Second, .1 Minute, 1 Minute, .1 Hour, 1 Hour,

10 Hour. When an accessory such as a dispenser, or two or four speed controller is used, the accessory's time control takes precedence, and the Control Panel time controls the final spin time only.

2.6 Automatic Dynamic Braking

At the end of the spin cycle, automatic dynamic braking stops the spinner quickly. In the event of a vacuum failure, the dynamic brake will normally stop the spinner before the substrate can be thrown.

2.7 Fume Exhaust/Downdraft Bowls (Cotton Candy Suppression)

The EC101DT/PM101DT Fume Boxes are designed with a special exhaust attachment for connection to your laboratory exhaust system. When attached to an exhaust system, air is drawn down through the bowl around the spinner shaft. This downward flow of air serves two purposes:

- (a) It removes the fumes from the laboratory.
- (b) It draws fine threads or "cobwebs" to the sides or bottom of the bowl, assuming adequate exhaust downdraft is supplied (see Section 7).

2.8 N₂

As a safety feature N₂ connection is provided at the bottom of the motor packages to purge out the motor package casing in the situation which highly flammable solvents are used. This prevents of any accumulation of highly flammable fumes inside the motor package which could cause an explosion.

A plug is installed in the N₂ Purge Connector during shipment. If N₂ purge is required, remove plug and install barb supplied with motor package.

2.9 LC21 Heat Lamp Kit (Optional)

A heat lamp is sometimes used to accelerate drying when spinning large substrates at low speeds using relatively viscous resist material.

2.9.1 The LC21 Heat Lamp Controller is designed to automatically apply line voltage to an AC outlet for a preset time following the initiation of a spin cycle. The heat lamp (or other appliance) plugs into this outlet. The power remains applied to the standard AC outlet for the remainder of the spin cycle.

2.10 EC102-NRD Photo Resist Dispenser (Optional)

The EC102 family of dispensers was designed to operate automatically in conjunction with the EC101DT/PM101DT series spinners. With an EC102-NRD attached to an EC101DT/PM101DT, the operator merely presses the START switch as usual. An automatic sequence, which may consist of an N₂ Blow-off,

a Solvent Spray, or a Resist Dispense (or a combination), depending on the particular type of dispenser, occurs under control of the dispenser. After the final dispense cycle has ended, control is returned to the EC101DT/PM101DT Controller for the final spin dry cycle. To add a dispenser to an existing EC101DT/PM101DT, jumpers "B" and "C", inside the EC101DT/PM101DT Controller must be cut. Detailed instructions are provided with each type of EC102 dispenser.

SECTION 3 WARNINGS

READ ALL WARNINGS AND OPERATING INSTRUCTIONS BEFORE PROCEEDING.

3.1 Installation

3.1.1 Refer to Instructions, Section 10.

3.2 DO NOT attempt to dismantle the motor. Alignment of the motor and generator end caps is critical and cannot be done without the proper equipment. Motor disassembly voids the warranty on this equipment.

3.3 DO NOT attempt to stall the motor. Exceeding the torque rating may damage the electronic circuitry.

3.4 DO NOT remove the printed circuit board when the main power switch is in the "ON" position or the power cord plugged in.

3.5 For EXTERNAL PROGRAMMING, use only a FLOATING DC INPUT OF PROPER POLARITY (see Section 5).

3.6 DO NOT attempt to operate controller until all system connectors are mated. The equipment is to be used with 115 volt, 50/60 HZ power only. If a stepdown transformer is used, DO NOT use an auto transformer. Phase neutral of power applied to the equipment must be within 30 volts of earth ground.

3.7 Use polarized and grounded 115V - 50/60 HZ single phase outlet. DO NOT use a 3-prong adaptor without grounding the adaptor ground wire (see Section 4.1).

3.8 DO NOT attempt to remove the vacuum seal housing from the lower end of the motor unless a new seal is to be installed.

3.9 Spinning Large Substrates (See Section 8)

3.9.1 When an object is rotated at a high speed, proper balance becomes important. An off-balance condition can set up high vibratory stresses and unbalanced centrifugal forces. The larger the substrate size and mass to be spun, the more difficult it becomes to visually insure proper positioning

on a vacuum chuck.

3.9.2 When substrates 1 1/2" square or larger are to be spun at speeds in excess of 3,000 RPM, it is recommended that a special chuck be used. This chuck should have mechanical guides to assure proper physical positioning of a substrate on the chuck. This would also be true of asymmetrical substrates for which the center of mass is difficult to visually estimate.

3.10 The PM101DT is adjusted at the factory for a top speed of 7,500 RPM. However, it is highly recommended that the spinner not be operated for extended periods at speeds above 5,000 RPM as this severely reduces motor life. Occasional use for short periods of time will not seriously reduce motor life.

NOTE: Properly INSTRUCT operators concerning the special features and use of this spinner. The function of the vacuum interlock should especially be taught. Failure to understand the purpose of the vacuum interlock will cause operators to blame the equipment for their poor use habits or vacuum problems. Excessive claims of down time may result even though the equipment is functioning as designed.

SECTION 4 OPERATING PROCEDURE

4.1 Initial Start (Follow Proper Installation)

4.1.1 Set up initially as follows before plugging into wall outlet:

- (a) Main power switch off (front panel).
- (b) Spin timer set for 5-10 seconds (front (panel)).
- (c) All connectors mated on the rear panel of the controller.

- (1) Motor Package.
- (2) Foot switch or remote switch panel.
- (3) Any applicable accessories.

(d) Input vacuum hose properly connected to the motor controller .

(e) Connect hose in motor cable to vacuum output and other end to motor package.

(f) Output vacuum hose properly connected to the motor package. Auto/Manual vacuum control switch to "Auto" refers to special remote switch panel installations only.

(g) Drain tubes are properly connected to the bottom of the motor package, via the bulkhead and barb fittings.

4.1.2 Plug the power cord into a polarized and grounded 115V 50- 60 HZ single phase outlet

4.1.3 Turn the main power switch on. The pilot light (front panel) should come on. If not, check the fuses. The fuse size should be in accordance with the fusing instructions on the rear panel of the controller.

4.1.4 Place a substrate on the vacuum chuck or tape the vacuum hole in the chuck.

4.1.5 Press the "START" switch. The spinner should operate automatically. If it does not, due to the vacuum interlock, the trouble indicating buzzer will sound an audible alarm. The CB15 bowl has an additional lid interlock, so that the lid must be closed to operate. If the lid is open, the same audible alarm will sound. If this occurs, check the vacuum level from the source and the seating of the vacuum chuck and substrate. Be sure an O-Ring gasket is inside the hub of the vacuum chuck. Burrs or dents or damaged chucks can also cause problems in the vacuum sealing.

4.2 Vacuum Control

4.2.1 Automatic Vacuum Control During normal operation with the foot switch or when the vacuum control switch on the special remote control panel is in the automatic position, the vacuum is automatically applied to the chuck when the "START" switch is depressed. When a proper vacuum condition is achieved at the substrate, the vacuum sensor switch will automatically start the spin cycle. When the preset time has elapsed, the spinner will stop and the vacuum will be automatically released (see Section 2.1).

4.2.2 Manual Vacuum Control With Special Remote Control Panel

Provision for manual vacuum control is not provided as standard equipment. However, if the foot switch is replaced by the special remote control panel, the vacuum can be applied or removed from the chuck by a convenient rocker switch. When the vacuum control switch is in the "ON" position, the vacuum is applied to the chuck continuously. At the end of the spin cycle, the vacuum must be turned off with the switch. The "ON" switch is needed when the substrate must be blown off with nitrogen prior to manual resist dispensing. Automatic resist dispensing (with nitrogen blow-off) can be provided with the accessory EC102-NRD Photo Resist Dispenser without the remote control panel. Vacuum is automatically applied before blow-off by the dispenser. Also, the "ON" switch may be necessary when massive substrates are spun. The inertia of heavy substrates may prevent the dynamic brake from stopping the spinner before vacuum is released in the automatic mode. The vacuum control switch has an "AUTO" position for fully automatic operation, if desired.

SECTION 5 ACCELERATION AND SPEED PROGRAMMING

5.1 The speed of the EC101DT/PM101DT is determined by a DC reference voltage. The output of a DC tachometer is electronically compared to a DC reference voltage. In the normal mode of operation, the reference voltage is generated within the motor controller and is adjusted by means of the front

panel potentiometer marked "SPIN SPEED". In this INTERNAL REFERENCE mode of operation, the motor accelerates at the preset rate of 20,000 RPM/second for the EC101DT and 15,000 RPM/second for the PM101DT, and locks on to its preset speed.

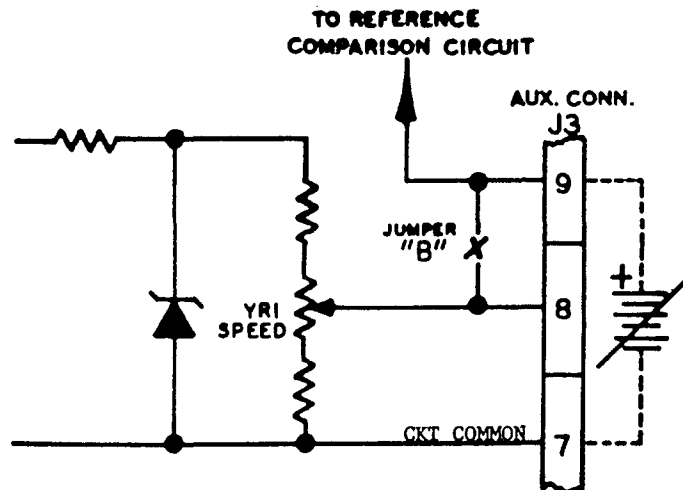
5.2 If a lower or programmed acceleration rate is desired, the acceleration control potentiometer on the front panel may be adjusted.

5.2.1 Acceleration Adjustment Instructions The acceleration control circuit is preset on all motor control P.C. boards shipped from the factory. The acceleration is set to a value of 20,000 RPM/second for the EC101DT and 15,000 RPM/second for the PM101DT, DO NOT vary the acceleration of your spinner unless such a change is required to meet your process requirements. Most wafer, mask and thin film substrate coating is best accomplished at the preset value of acceleration.

If it is determined that variation of the acceleration is necessary, this can be accomplished by adjusting the "ACCEL ADJUST" on the front panel of the controller. Clockwise rotation increases acceleration. For the EC101DT, the maximum acceleration is 50 KRPM/sec. and the minimum acceleration is 5 KRPM/sec. For the PM101DT the maximum acceleration is 37.5 KRPM/sec. and the minimum acceleration is 3.75 KRPM/sec. Acceleration can be set to the desired value or monitored by observing the tachometer output on a Storage Oscilloscope. The oscilloscope must be equipped with a differential input; the scope leads are connected to pins 13 and 14 on the motor control P.C. Board. (Please verify that scope leads are differential inputs, these terminals must not be grounded.)

5.2.2 Speed may be programmed by applying an external reference voltage. The speed/voltage relationship is approximately 1.4 volts per 1,000 RPM for the EC101DT and approximately 1.9 volts per 1,000 RPM for the PM101DT.

NOTE: An offset bias of approximately +6V is necessary so that the voltage range is approximately 6V - 20V.



5.3.1 Open the controller (see Section 9.4.3) and remove jumper "B" located and identified on the main printed circuit board (see Dwg 3-19493).

5.3.2 Apply external programmed reference voltage to pins 9 and 7 with polarity as shown. For EXTERNAL PROGRAMMING use only a FLOATING (ungrounded) DC INPUT OF PROPER POLARITY. The external source should provide a voltage in the range of 0 - 20 VDC with an available capacity of 2 MA. Impedance of the supply used must be at least 2K ohm. The acceleration control circuit on the motor control P.C. board will still be in operation when this type of external speed control is used.

To synchronize the external programmer with the beginning of a spin cycle, 115 VAC is available between pins 11 and 25 (pin 25 is AC low) during the spin cycle time.

WARNING:

DO NOT apply a voltage which will cause the motor to exceed 10,000 RPM for EC101DT, or 7,500 RPM for PM101D. Applying a higher voltage during acceleration than necessary for final speed regulation will not increase acceleration.

SECTION 6 SPIN TIMER

6.1 If set to "O" the front panel digital timer will never "time out", that is, time will become infinity. The shortest time possible is 0.01 seconds. If a timed step is to be skipped it may be necessary to reduce the dispense pressure involved to zero, to avoid a transient pulse of air or fluid at a minimum timed step.

6.2 The time range on each digital timer can be set, by a push button on the front of the timer, to cover one of the following time ranges:

- A. 0.01 - 9.99 seconds, minutes, or hours
- B. 0.10 - 99.9 seconds, minutes, or hours
- C. 1.00 - 999. seconds, minutes, or hours

SECTION 7 FUME VENTILATION AND COTTON CANDY SUPPRESSION

7.1 The two bowl designs for the EC101DT/PM101DT are provided with a fume vent port for the removal of fumes (see Dwg 4-20313). The vent port must be connected to a negative pressure exhaust system (not provided).

7.2 Under various conditions of substrate size and shape, resist viscosity, spinner acceleration and speed, tiny threads of resist material are formed. These are often referred to as "cobwebs" or "cotton candy". If these "cobwebs" are permitted to get on the substrate surface, rejects can result. Headway Research originated the downdraft technique of eliminating "cobweb" damage. By pulling a sufficient flow of air from the fume exhaust port, the downdraft in the bowl will pull the tiny threads away from the substrate, thereby eliminating the problem.

SECTION 8 VACUUM CHUCKS

8.1 General Information

8.1.1 The EC101DT/PM101DT uses a "slip-on" vacuum chuck design in three basic styles (see Accessories - Dwg. 4-20313). Always use the proper chuck for the job at hand. The chuck used should always be smaller than the smallest dimension of the substrate to prevent resist from adhering to the chuck surface. For instance, in spinning broken pieces of silicon slices, the chuck used should be small enough to permit the broken slice to completely cover the surface.

8.1.2 O-rings, both inside the chuck hub, and on the O-ring type chuck and mechanical locating type chuck surfaces should be made of Viton for resistance to solvents.

8.2 O-Ring Type Chuck

8.2.1 The O-ring chuck is normally used with substrates such as glass, quartz, ceramic, metal, etc. This chuck has tremendous holding power, an efficient vacuum seal, and high resistance to the sliding of a substrate.

8.2.2 The o-ring chucks should not be used with thin, brittle substrates such as silicon and germanium, unless the o-ring is removed. Otherwise, the substrate may be pulled down in the center and broken.

8.3 Mechanical Type Locating Chuck

8.3.1 The mechanical type locating chuck is an O-ring chuck with mechanical guide fingers added. This type is recommended for spinning relatively heavy, large, or unsymmetrical substrates at speeds above 3,000 rpm. (Refer to warning note in the WARNINGS Section 3.9). The guide fingers are set to provide proper positioning for the substrate, eliminating operator technique. If a substrate is improperly positioned on the chuck, one edge of the substrate will be held up by a guide finger so that a vacuum seal cannot be made. The vacuum interlock will not permit the spinner to operate. This provides protection from badly unbalanced loads. This type of chuck is available for substrates having a dimension of 1-3/4 inches or greater.

8.4 Flat Surface Type Chuck

8.4.1 The flat surface type chuck is used for thin, brittle substrates which must be well-supported and held flat. This chuck style is normally used for silicon and germanium wafers. The surface of the flat surface chuck has a shallow scroll and cross machined into the face for distribution of the vacuum. Various sizes of all chucks are available.

SECTION 9 MAINTENANCE AND REPAIR

9.1 Bowls

9.1.1 The R485 bowls (4.85" maximum substrate diagonal) used for semiconductor size work can be kept fairly clean with a minimum of time if the operator will occasionally put resist thinner on a spinning substrate. This excess thinner, if used regularly, will help keep the resist collection washed down the drain. Occasionally, the bowls may have to be removed for a thorough cleaning in thinner. DO NOT USE HOT TRICHLOROETHYLENE. Extra bowls should be kept on hand.

9.1.2 The CB15 circular stainless steel bowls are electro-polished, and to insure ease of cleanup, they have a removable/replaceable polyethylene inner liner (HRI #2-21604). This liner may be left in the bowl and periodically cleaned or the liner may be replaced. The liner has two drain ports in the bottom (approximately 3/4" diameter each) which are closed if the liner is dumped and cleaned or replaced. Also, the ports may be cut open so that waste may drain off into a waste container.

9.1.3 The CB15 SST bowl is relatively easy to cleanup. The bowls may be cleaned using a resist thinner such as Xylene in the case of KTFR or KMER.

9.1.4 The R790 is an intermediate size bowl between our R485 and CB15. This bowl differs from earlier arrangements in that it is constructed in two separate pieces. Such construction aids in better flow which HRI feels is vastly improved in the R790. After testing, it has been determined that air moves to the outer edge of the bowl and out rather than being directed out under the substrate. To better facilitate proper draining of resists and cleaning solvents, the drain system has been modified. The intermediate R790 is the solution when space is too limited for the CB15.

Inside capability of the R790 (with splash deflector in place) is 7.25" although the inside bowl measures 7.928". The bowl arrangement is suitable for plates as large as 5" x 5". It consists of a rectangular box with polished stainless cover, two piece stainless steel bowl insert and deflector ring. An angled stainless steel catch pan with drain encircles the inner bowl. The base of the inner bowl has exhaust ports on the outside

edge which direct resist into the catch pan and air flow into the exhaust system. As in previous models, the plenum is easily detached from the motor by the removal of four screws. Optional Teflon coating to aid clean-up is available.

9.2 Vacuum Line

Vacuum line should be 3/16" I.D. minimum and connected to a vacuum source capable of pumping 1.25 cfm per head on the spinner and capable of a minimum blank-off vacuum of 23" Hg.

9.3 Vacuum Interlock

The vacuum interlock switch is mounted in the controller (see Dwg. 3-19493). This switch is operated by a metal bellows and the "operate" point is adjustable over a wide range using the following procedure:

- (a) Turn motor controller on.
- (b) Connect vacuum gauge by means of a "T" connection into vacuum hose leading from controller to spinner package.
- (c) Pinch vacuum hose with pliers between pump and the controller, shutting off vacuum to spinner head.
- (d) Holding operate switch depressed, slowly release hose, applying vacuum to spinner head. Note the vacuum level on the gauge at which the head begins to spin. This is the "pull-in" level at which the interlock operates. Repeat reading several times.
- (e) With vacuum on and spinner head running slowly, pinch vacuum line closed and observe vacuum level on the gauge, at which the spinner head quits operating. This is the "drop-out" level of the interlock. Repeat reading several times.
- (f) With a small screw driver, turn the screw which operates microswitch plunger in the interlock switch. Adjust through the SST shell of the controller until the desired set point is reached.

The "operate" point is usually set at the factory for 16 to 18 inches of mercury. The differential between "pull-in" and "drop-out" should be no more than 2 1/2 inches of mercury.

9.4 Motor Controller

9.4.1 Tachometer Calibration

Strobe the spinner with an accurately calibrated strobe light. Adjust the meter calibrate potentiometer (rear of chassis) for the correct meter indication.

9.4.2 Electrical

Using the schematic enclosed (Dwg. 4-19564), use conventional electronic trouble-shooting techniques to isolate the problem or return the unit to the factory for repair. Fusing must be in accordance to instructions on the rear panel. Changing plug-in components will solve virtually all controller problems. Spares should be kept on hand. Refer to recommended spare parts list, Section 11.

9.4.3 Jumper Cutting Schedule

The following table refers to the jumper wires which must be cut in order to utilize the various optional features of the EC101DT/PM101DT Photo Resist Spinner (see Dwg 3-19493).

JUMPERS TO BE CUT

<u>Bowl Style</u>	<u>Master Controller</u>
R790 or R485 Bowl	None
CB15 Bowl	D
<u>Accessories</u>	
EC102-NRD Photo Resist	
Dispenser Accessory/2 Speed Cont.	B, C
LC21 Heat Lamp Controller	None

9.4.4 Disassembly

The Motor Controller must be disconnected from its power source before disassembly. The steps below refer to Dwg 4-20344.

- (a) Disconnect all cables from the connectors at the rear of the controller. Loosen the two captive thumb screws on the rear panel (Item 1) freeing the panel from the rest of the controller until it is free of the power cord.
- (b) Keeping the controller shell (Item 35) flat on a table, well away from the edges of the table, gently push on the fuse holding strap at the rear of the controller until the front panel has moved forward, clear of the shell. Grasp the front panel and gently remove the front panel frame assembly (Item 16) from the shell.
- (c) Reverse the above procedure to assemble. See Section 4.1 for proper start-up.

9.5 Motor/Tachometer Generator Assembly

9.5.1 The motor armature and tachometer generator are built as an integral unit. All bearings are permanently lubricated, and therefore, requires no maintenance under normal service conditions. The motor and

tachometer brushes may require periodic replacement according to conditions of use. DO NOT attempt to dismantle the motor. Alignment of the motor end caps is critical and cannot be done without the proper equipment. Dismantling of the motor voids warranty.

9.5.2 Vacuum Seal - General

- (a) The motor shaft extends through both ends of the motor and is bored through to provide the vacuum access to the chuck. The vacuum seal to the rotating shaft is mounted to the lower housing end cap (see Dwgs 3-19517 & 3-19516). **DO NOT** attempt to remove the vacuum seal housing unless a new seal is to be installed.
- (b) This vacuum seal is very effective and should give long, trouble-free service. Check all vacuum connections, chucks, hoses, etc., for leakage or plugging before suspecting or changing a vacuum seal. If it becomes necessary to replace the seal, follow the procedure in Section 9.5.4.

9.5.4 Vacuum Seal Replacement Procedure

(See Drawing # 3-19526 and 3-19517)

- (a) Remove the screws holding the seal housing, and remove the seal housing from the motor.
- (b) Install the new seal housing assembly onto the motor shaft (without lubrication) and replace the two mounting screws. Remove the brass fittings from the seal housing which was removed and installed on the new housing using thread seal on threads. Use care to avoid putting any sideload on the seal by uneven tightening of the housing. After assembly, rotate the shaft. It should turn freely without binding.
- (c) A vacuum check should be completed prior to installing the motor back into the spinner. This is accomplished by applying a 25 Hg vacuum source to the motor. (The chuck end of the shaft should be sealed to properly evaluate the vacuum loss of the seal and not possible chuck leakage). Turn the vacuum to the "OFF" position and observe vacuum loss. Vacuum loss from 25 Hg to 10 Hg should not be faster than 4 seconds or slower than 14 seconds. If this check is satisfactory, proceed to next step. If unsatisfactory, check the seal for improper installation, sideload or possible damage. Replace as required.
- (d) Install the motor and operate spinner for two minutes. Repeat the test in 9.5.4(c) again. If satisfactory, return to normal operation. If unsatisfactory, recheck for improper installation or leaks at vacuum chuck.

9.5.5 Brush Replacement - EC101DT (See Dwg 3-19517)

- (a) Remove lug screws from motor brush caps and unscrew motor brush caps. Remove motor brushes and springs. Insert new brushes and springs into brush guides. Reverse above procedure to reassemble.

Warning: Use Caution when removing tachometer caps, due to spring tension.

- (b) Remove tachometer brush cap retaining screws (2 per side), and remove cap and springs. Remove brushes (2 per side), by turning motor-tach assembly on side and allowing to fall out. Insert new brushes into brush guides. Reverse above procedure to reassemble.

Brush Replacement - PM101DT (See Dwg 3-19526)

- (a) Remove motor brushes (4 each) by prying rubber retainer from motor housing with a screwdriver, making note of the location of the "A" and "B" designated brushes. Remove brush from guides.

Install new brushes by inserting brush into guide and prying rubber retainer into motor housing with screwdriver, insuring that "A" and "B" brushes are in proper guides.

SECTION 10 INSTALLATION

10.1 General

10.1.1 The EC101DT/PM101DT bowls are designed to be flush mounted in a table. The flange at the top of the fume box/plenum rests on top of the table top with the motor/tach assembly hanging beneath the table.

10.1.2 Three different bowl styles are available with EC101DT/PM101DT spinners. Select the installation template which is applicable to your machine and make cutouts in the table as shown (see Dwg 3-20174, 3-11216 & 3-15037). Lower the spinner through the appropriate cutouts.

Since larger substrates are generally used with the CB15 bowl. Bowl is secured to the bench top with flat head, stainless steel, wood screws. Holes are located on both sides of the bowl. The R485 and R790 bowls do not need to be secured.

10.1.3 If the special remote control panel is used, it may be used sitting freely on the bench top or it may be mounted recessed in the table top. If mounted, recessed, a hole 3-1/4" X 5-1/8" must be cut in the table top. It will be necessary to drill mounting holes at the edges of the switch plate to secure the unit to the table top, if permanent installation is required.

10.2 Hook-Up Check List

10.2.1 Connect all cables, vacuum lines and drains to the master controller and the motor package. (See Dwg 4-20313)

10.2.2 Connect a flexible exhaust line to the fume vent port if the fume exhaust feature is to be utilized. This exhaust feature is to be utilized. This exhaust line must be connected to your own laboratory exhaust system. No blower is provided with the machine for this purpose (see Dwg 4-20313). Flexible exhaust line inside diameter should be 1-3/4".

SECTION 11 RECOMMENDED SPARE PARTS LIST FOR EC101DT

PART NO.	QTY.	DESCRIPTION
9-03085	1	Relay, 4PDT, 115V. 60 Hz.
9-11634	1	Resistor, 5 ohm, 100 W
9-13698	1	Transistor, Delco DTS 423, Tested
9-05338	1 Set	Brushes, Motor/Tachometer
9-16333	6 Ft.	Tubing, Plyeth, 1/4 X .04, GRN
9-07063	6	Diodes, 1N5404
9-12633	5	Fuse, 4A, MDX
9-01062	5	Fuse, 1/2A, MDL
9-10472	1	Housing, Seal Assembly
9-01496	1	Bearing Seal

FOR CRITICAL APPLICATIONS REQUIRING MINIMUM DOWNTIME:

3-19517	1	Motor, EC, W/Vac-Seal, Assy.
2-19441	1	PCB, Cont, Mot, DT, Assy

RECOMMENDED SPARE PARTS LIST FOR PM101DT

9-03085	1	Relay, 4PDT, 115V, 60 Hz.
9-11634	1	Resistor, 5 ohm, 100 W
9-13698	1	Transistor, Delco DTS 423, Tested
9-11212	1 Set	Brushes, Motor, PM101
9-16333	6 Ft.	Tubing, Plyeth, 1/4 X .04, GRN
9-07063	6	Diodes, 1N5404
9-12633	5	Fuse, 4A, MDX
9-01062	5	Fuse, 1/2A, MDL
9-11421	1	Housing, Seal, PM101, Assembly

FOR CRITICAL APPLICATIONS REQUIRING MINIMUM DOWNTIME:

9-19516	1	Motor, PM W/Vac-Seal, Assy.
2-19441	1	P.C. Motor Control Board

WARRANTY

Headway Research, Inc. warrants each spinner that it manufactures to be free from defects in material and workmanship. Under this warranty the obligation of Headway Research, Inc., is limited to repairing the instrument when it is returned to the factory with transportation charges prepaid. This warranty excludes any parts which carry their own manufacturer's warranty, fuses, and parts which require replacement due to normal wear. This warranty is effective for 90 days after delivery of the instrument to the original purchaser. Damage caused by improper operating conditions, misuse, negligence, or the alteration or removal of the nameplate will void this warranty. Headway Research, Inc. shall in no way be liable for any direct or consequential loss or damage of any nature resulting from the malfunction of the instrument. This warranty is effective in lieu of any or all other obligations or liabilities on the part of Headway Research, Inc., its agents, or its representatives.

MOTOR WARRANTY

These motors are guaranteed according to percentages listed below against failures due to defects in materials or workmanship unless the failure has been caused by mechanical or electrical abuse. Motors returned to Headway for warranty replacement are inspected at our factory and replaced at the then current price of a new motor, less allowance. Allowances on motors are as follows: First six months - 100%, motor is replaced free of charge. Subsequent three months - 50%. Last three months - 25%. Disassembly of a motor for any reason voids this guarantee. The remainder of any spinner equipped with these motors is covered under our usual warranty against defects in materials or workmanship for 90 days. Under this warranty the obligation of Headway Research, Inc., is limited to repairing motors when returned to the factory with transportation charges prepaid. Motors replaced or repaired by HRI under this warranty does not extend the original warranty. HRI will not be liable for any loss of production or consequential damage related to any failure or disability of this equipment.