

6640-01-163-4214



# DYNAC II Centrifuge

Model Nos. 0103  
and 0106

## OPERATORS MANUAL



**Clay Adams**

Division of  
Becton, Dickinson and Company   
Parsippany, N. J. 07054





# DYNAC II

## Centrifuge

**Model No. 0103 (120 volts)**

**Model No. 0106 (220 volts)**

### OPERATORS MANUAL

Read this Manual thoroughly before operating equipment.

## CONTENTS

I.	INTRODUCTION.....	1
A.	Intended Use.....	1
B.	General Description.....	1
II.	OPERATING INSTRUCTIONS.....	2
A.	Installation.....	2
1.	Rotor Installation.....	2
2.	Load Balancing.....	3
3.	Power Requirements.....	3
B.	Operating Controls.....	4
1.	Power Switch.....	4
2.	Run/Brake Switch.....	4
3.	Speed Control.....	4
4.	Timer.....	4
5.	Tachometer.....	4
6.	Cover Safety Latch.....	4
C.	Speeds and Relative Centrifugal Forces.....	5
1.	Maximum Velocities.....	5
2.	Speed Selection.....	6
3.	Calculating RPM.....	6
D.	Performance and Specifications.....	6
E.	Speed Checks.....	6
F.	Operating Precautions.....	6
1.	Basic Procedures.....	6
2.	Operator Training.....	6
G.	Hazards.....	7
H.	Maintenance and Service.....	7
1.	External Fuse Replacement.....	7
2.	Motor Brushes—Inspection and Replacement.....	7
3.	Cleaning.....	8
4.	Transporting Centrifuge.....	8
5.	Spare Parts and Accessories.....	8
6.	Troubleshooting.....	8
APPENDICES:		
A.	Illustrated Parts Breakdown and Spare Parts.....	11
B.	Electrical Schematics.....	12
WARRANTY.....		14

## I. INTRODUCTION

This Manual contains operating instructions for the Clay Adams DYNAC II Centrifuge, Figure 1. The Centrifuge can be used with any of eight interchangeable rotors and has an adjustable electronic speed control and tachometer, permitting the selection of a wide range of speeds. A zero speed switch, positive cover lock and other safety features are incorporated for maximum operator protection.

### A. INTENDED USE

The DYNAC II Centrifuge is a multi-purpose machine, designed for use in clinical laboratories for frequently performed separations in hematology, chemistry, urinalysis, blood banking, micro-biology and cytology. It is equally useful in the physician's and veterinarian's office, particularly where moderate-to-large numbers of Wintrobe hematocrits, urine and fecal sedimentations, and serum/plasma separations are performed. Additional applications for the Centrifuge are in industrial and university laboratories for many general procedures in chemistry, pharmacology, food processing and agriculture that require centrifugation.

Because of its compact size, the Centrifuge will fit into most standard size refrigerators or can be placed in a cold room for low temperature centrifugations.

### B. GENERAL DESCRIPTION

The DYNAC II Centrifuge is a compact, portable machine for laboratory use in separation and sedimentation procedures. It was designed to meet the electrical safety requirements of Underwriters' Laboratories (UL) and Canadian Safety Association (CSA). Other advanced safety features to protect the operator are also incorporated which are intended to fulfill the safety standards of OSHA.

The Centrifuge incorporates a one-piece aluminum guard bowl attached to a stable base assembly. The guard bowl, which is of heavy gauge construction, affords maximum protection to the operator. Finish is baked enamel inside and out to facilitate cleaning.

The Centrifuge motor is attached to a mounting plate which is shock-mounted to the base by means of three vibration isolators. Four rubber feet are bolted to the bottom of the base plate. The motor incorporates permanently lubricated bearings. The cordset is a 6-foot, heavy duty, 3-wire grounded cord.

Any of four swing-out horizontal rotors and four 52° angle rotors (Figure 2) can be used in the Centrifuge. Various shield configurations are available to accommodate tube sizes ranging from 1 ml to 100 ml, which permit the Centrifuge to be used for a variety of micro and semi-micro work. Rotors are easily installed and locked on the Centrifuge shaft by means of a drive pin and thumb screw. Shield positions in all rotors are clearly numbered for positive identification of tubes.

Front panel controls include an illuminated power switch, run-brake switch, automatic timer, adjustable speed control and tachometer. Speed can be continuously adjusted over the range of 500 rpm (minimum) to a specific maximum, depending upon the rotor and shield configuration used, (see Subsection II-C, Page 5).



Figure 1. Multi-Speed DYNAC II Centrifuge.

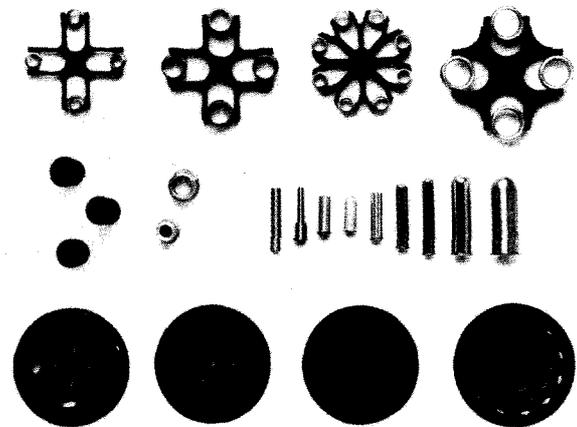


Figure 2. Interchangeable Rotors and Shields for DYNAC II Centrifuge.

Additional safety features on the Centrifuge include a transparent, shatter-proof polycarbonate cover equipped with a positive latch. A latch interlock system prevents the Centrifuge from being operated while the cover is opened. Once the cover is closed and latched and the Centrifuge operating, a zero speed control switch prevents the cover from being opened (unlatched) until the rotor slows to less than 1 revolution per second.

An external fuse, located on the back of the machine, prevents damage to the Centrifuge in the event of external power surges or internal shorts.

## II. OPERATING INSTRUCTIONS

### A. INSTALLATION

After unpackaging, place the Centrifuge on a clean, level working surface. Open the Centrifuge cover and remove the top corrugated motor protector and cylindrical cardboard sleeve surrounding the motor. Save the shipping container and protective pieces for transporting the machine.

#### 1. Rotor Installation

The Centrifuge is shipped completely assembled except for installation of the rotor. Any one of the swing-out Horizontal Rotor configurations or 52° Angle Rotor configurations listed in Tables I and II may be used, depending upon the particular test requirements.

All rotors are installed in an identical manner, as follows:

- Remove the knurled retaining screw from the Centrifuge motor shaft.
- Place the rotor on the shaft so that the drive pin in the motor shaft engages the slot in the rotor.
- Push the rotor down until it seats.
- Replace knurled retaining screw on motor shaft and hand-tighten snugly as shown in Figure 3.
- Insert the desired number of shields in the rotor in a balanced array.

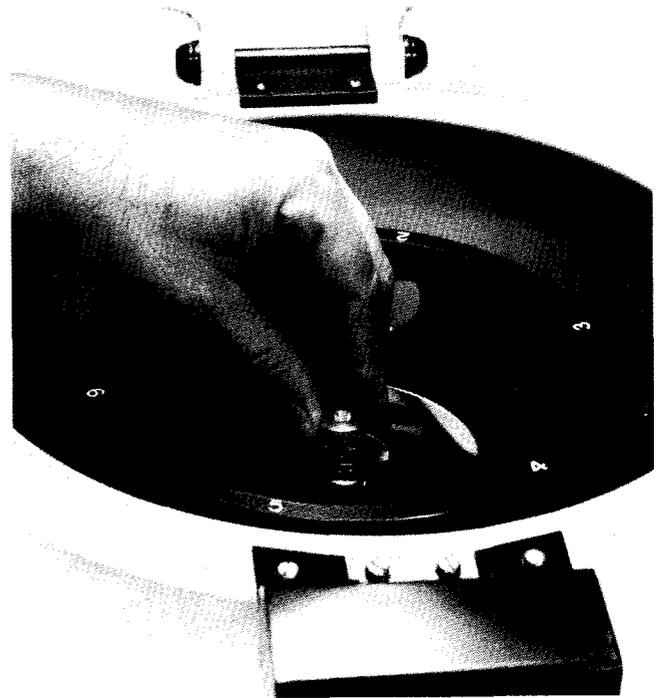
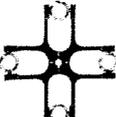
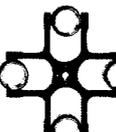


Figure 3. Installing Rotor Retaining Screw on Drive Shaft.

TABLE I  
Horizontal Rotor Configurations For DYNAC II Centrifuge

<p><b>0261: For four 15 ml tubes with:</b> Horizontal Rotor #0107 Four 15 ml #0901 stainless steel shields with cushions Two graduated 15 ml #0968 taper bottom glass tubes Two plain 15 ml #0972 taper bottom glass tubes</p>		<p><b>0107: Horizontal Rotor</b> For four 15 ml tubes, use #0901 shields. For other tubes, use #0902, #0903, #0904 and #0905 shields.</p>
<p><b>0263: For four 50 ml tubes with:</b> Horizontal Rotor #0108 Four 50 ml #0900 shields with cushions Two graduated 40 ml #0964 taper bottom glass tubes Two plain 40 ml #0965 taper bottom glass tubes</p>		<p><b>0108: Horizontal Rotor</b> For four 50 ml tubes, use #0900 shields.</p>
<p><b>0265: For eight 15 ml tubes with:</b> Horizontal Rotor #0109 Eight 15 ml #0901 stainless steel shields with cushions, without glassware</p>		<p><b>0109: Horizontal Rotor</b> For eight 15 ml tubes, use #0901 shields. For other tubes, use #0902, #0903, #0904 and #0905 shields.</p>
<p><b>0267: For four 100 ml tubes with:</b> Horizontal Rotor #0110 Four 100 ml #0908 stainless steel shields with cushions Six 100 ml #0959 plain round bottom glass tubes</p> <p><b>0269: For thirty-six 10 x 75 mm tubes with:</b> Horizontal Rotor #0110 Four aluminum #0920 multiple carriers, each for nine 10 x 75 mm tubes without glassware</p> <p><b>0271: For twenty-eight 12 x 75 mm tubes with:</b> Horizontal Rotor #0110 Four aluminum #0921 multiple carriers, each for seven 12 x 75 mm tubes, without glassware</p> <p><b>0273: For twenty 13 x 100 mm tubes with:</b> Horizontal Rotor #0110 Four aluminum #0922 multiple carriers, each for five 13 x 100 mm tubes, without glassware</p>		<p><b>0110: Horizontal Rotor</b> For four 100 ml tubes, use #0908 shields. For other tubes, use #0920, #0921, #0922, and #0923 multiple carriers.</p>

## 2. Load Balancing

For smooth Centrifuge operation and extended equipment life, it is essential that loads be balanced as equally as possible. For best results, the use of a balance is recommended to obtain loads of equal weight.

The angular distribution of material to be centrifuged is critical where loads are not of equal weight. If the amount of fluid in opposite tubes cannot be equalized, fill the shield around the lighter tube with water until the loads are balanced. NOTE: Never attempt to balance by adding weights, mercury or shot to the bottom of a tube or shield.

## 3. Power Requirements

Connect the Centrifuge only to a 3-wire grounded receptacle rated as follows:

- Model 0103: 120 VAC, 60 Hz, 15 amps
- Model 0106: 220 VAC, 50 Hz, 7.5 amps

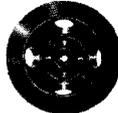
NOTE: The Model 0103 Centrifuge may be operated between 105 volts and 130 volts; the Model 0106 Centrifuge, between 190 volts and 250 volts. Prolonged operation at either of these extreme voltage limits, however, is not recommended due to reduced motor life.

If an extension cord is required, use only a 3-wire grounded cord rated for 120 VAC/15 amp service for the Model 0103 Centrifuge, and 220 VAC/7.5 amp service for the Model 0106 Centrifuge.

### CAUTION:

Connect only to an approved power source having a 3-wire grounded receptacle. Where a 2-wire receptacle is encountered, have it replaced with a properly grounded 3-wire receptacle in accordance with the National Electrical Code. Do not, under any circumstances, remove the grounding prong from the power plug.

TABLE II  
Angle Rotor Configurations For DYNAC II Centrifuge

<p><b>0281: For six 15 ml tubes with:</b> Angle Rotor #0111 Six 15 ml #0901 stainless steel shields with cushions Three graduated #0969 taper bottom glass tubes Three plain #0973 12 ml taper bottom glass tubes</p>		<p><b>0111: Angle Rotor</b> For six 15 ml tubes, use #0901 shields. For other tubes, use #0903, #0904 and #0905 shields.</p>
<p><b>0283: For four 50 ml tubes with:</b> Angle Rotor #0112 Four 50 ml #0900 shields with cushions Two graduated 40 ml #0964 taper bottom glass tubes Two plain 40 ml #0965 taper bottom glass tubes</p>		<p><b>0112: Angle Rotor</b> For four 50 ml tubes, use #0900 shields.</p>
<p><b>0285: For twelve 13 x 100 mm tubes, (7 and 10 ml VACUTAINER Blood Collecting Tubes), twelve 5 ml tubes or six 15 ml and six 13 x 100 mm tubes with:</b> Angle Rotor #0113 Twelve 15 ml #0902 stainless steel short shields with cushions, without glassware</p> <p><b>0287: For twelve 15 ml tubes with:</b> Angle Rotor #0113 Twelve 15 ml #0901 long stainless steel shields with cushions, without glassware</p>		<p><b>0113: Angle Rotor</b> For twelve 15 ml tubes, use #0901 shields. For other tubes, use #0903, #0904 and #0905 shields.</p>
<p><b>0289: For twenty-four 13 x 100 mm tubes, (7 and 10 ml VACUTAINER Blood Collecting Tubes) or 5 ml tubes, or eighteen 15 ml and six 13 x 100 mm tubes with:</b> Angle Rotor #0114 Twenty-four 15 ml #0902 stainless steel short shields with cushions, without glassware</p> <p><b>0291: For twenty-four 15 ml tubes, with:</b> Angle Rotor #0114 Twenty-four #0901 15 ml stainless steel long shields with cushions, without glassware</p> <p><b>0293: For twenty-four 10 x 75 mm or 12 x 75 mm tubes, with:</b> Angle Rotor #0114 Twenty-four #0904 shields with cushions, without glassware</p>		<p><b>0114: Angle Rotor</b> For twenty-four 15 ml tubes, use #0901 shields. For other tubes use #0903, #0904 and #0905 shields.</p>

## B. OPERATING CONTROLS (See Figure 4)

### 1. Power Switch

The illuminated Power Switch on the left side of the console applies power to the Centrifuge. The Switch remains lighted while in the ON position.

### 2. Run/Brake Switch

The Run/Brake Switch on the right side of the console is spring-loaded to remain in the RUN position. In this position, with the Power Switch ON and the Timer set to the desired spinning time, the motor is actuated to begin the centrifuge cycle.

When manually held down in the BRAKE position, the Switch actuates an electric brake which will bring the rotor to a gentle stop in less than 30 seconds. To actuate the Brake:

- Press and hold the Switch down. The brake will be activated as long as the Switch is held down.
- Release the Switch as soon as the rotor comes to a stop. **NOTE:** For delicate sedimentations, release the Switch *just before* the rotor comes to a stop and let the rotor coast gently to a stop.
- DO NOT HOLD THE BRAKE SWITCH DOWN AFTER THE ROTOR HAS STOPPED.** If held down too long, the rotor will automatically begin accelerating in the opposite direction.
- Unless the Timer runs out or is turned to "0", the rotor will regain speed when the Switch is released.

### 3. Speed Control

A solid-state Speed Control provides smooth control over a wide range of rpm.

**NOTE:** Before operating the Centrifuge, the Speed Control should always be set at "0". Depending on the rotor configuration and load, the Centrifuge will rotate at less than 500 rpm with the Speed Control set at "0".

With the Timer set, the Power Switch in the ON position, and the Centrifuge rotating at minimum speed:

- Gradually turn the Speed Control Knob clockwise from "0" until the desired speed is indicated on the Tachometer.
- At the end of the centrifugation cycle, return the Speed Control Knob counterclockwise to "0".
- Any speed may be selected, from minimum ("0"), to the maximum velocities indicated in Table III (opposite) for each of the fourteen rotor/shield configurations.

### 4. Timer

Spinning time is controlled by a 30-minute Timer with a "HOLD" position for continuous operation. Operating the Timer automatically turns the Centrifuge ON, provided the Power Switch is ON and the cover is securely latched.

- To set the Timer, turn the knob *clockwise* to the desired setting. The Centrifuge will now operate to the end of the timed cycle, then shut off automatically.
- For continuous operation, turn the knob *clockwise*, to the "HOLD" position. The Centrifuge will now operate continuously until it is manually shut off. To shut off, turn the knob *counterclockwise* to "0".

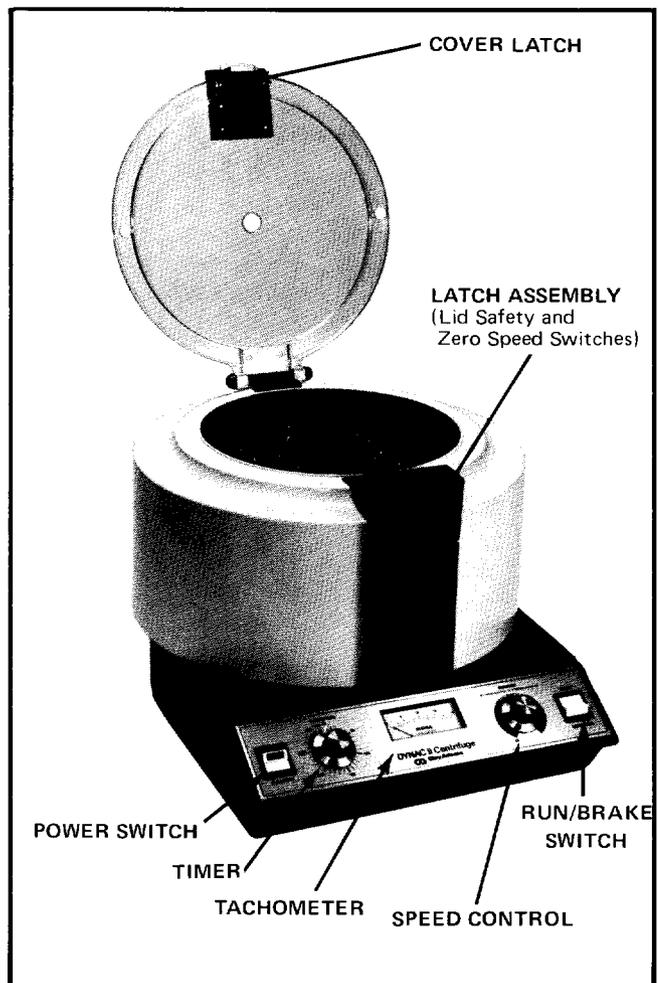


Figure 4. Operating Controls of DYNAC II Centrifuge.

### 5. Tachometer

The Tachometer meter indicates the angular velocity of the Centrifuge rotor in thousands of rpm. The meter scale is graduated from "0" to 4,000 rpm in increments of 100 rpm. When the centrifuge cycle is started, the Tachometer needle may not immediately move off the "0" point on the meter scale until the rotor speed reaches approximately 500 rpm.

**NOTE:** THE TACHOMETER IS ACCURATE TO WITHIN  $\pm 5\%$  OVER THE RANGE OF 500 RPM—4,000 RPM.

**CAUTION:**  
NEVER OPERATE THE CENTRIFUGE WITHOUT A ROTOR INSTALLED, SINCE DAMAGE TO THE TACHOMETER MAY RESULT.

### 6. Cover Safety Latch Assembly

The Centrifuge cover is held closed by a lever-type lid latch which is spring-actuated to release when depressed. In addition, the latch assembly on the Centrifuge bowl incorporates the following safety features:

- **Safety Switch**—When the cover is closed and latched, an electrical interlock is engaged and power is supplied to the motor. *The Centrifuge cannot be started while the cover is open.*

- **Zero Speed Switch**—Once the Centrifuge is running, a zero speed switch prevents the cover from being opened (unlatched). The cover cannot be opened until the rotor slows to less than 1 revolution per second (50 rpm).

To lock the cover, press down on the latch and cover until an audible click is heard. To open the cover, wait until the rotor has stopped spinning, then depress the latch as shown in Figure 5.

### C. SPEEDS AND RELATIVE CENTRIFUGAL FORCES

#### 1. Maximum Velocities

Table III lists the maximum angular velocities and relative centrifugal forces obtainable with each of fourteen interchangeable rotor and shield configurations. Tip Radius for each configuration is also listed.

The maximum velocities and centrifugal forces in Table III were derived by operation of the Model 0103 Centrifuge at 120 VAC, 60 Hz and the Model 0106 Centrifuge at 220 VAC, 50 Hz. These maximum velocities, however, can vary significantly with changes in line voltage and frequency, and with load, age and condition of the Centrifuge. (See Sub-section E, Page 6, Speed Checks).

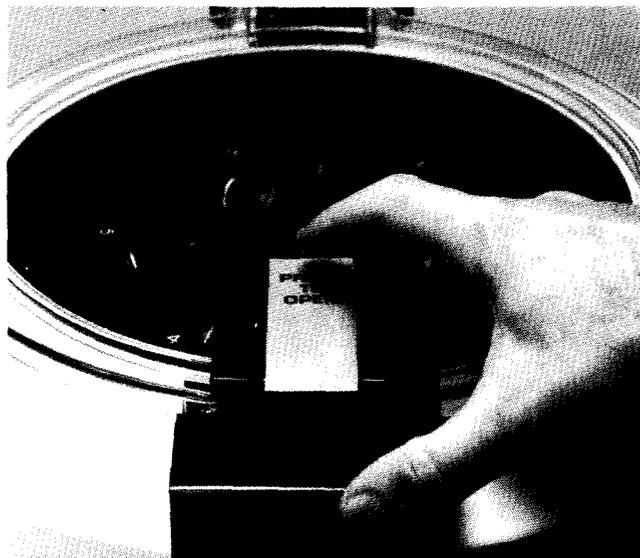


Figure 5. Cover is Opened by Pressing Cover Latch Down.

**TABLE III**  
Maximum Angular Velocities and Relative Centrifugal Forces  
for DYNAC II Centrifuge Rotors  
(Model 0103 @ 120 VAC, 60 Hz and Model 0106 @ 220 VAC, 50 Hz)

<p>Cat. No. 0261 4-place 15 ml Horizontal Rotor with 4-0901 shields</p> <table border="1"> <thead> <tr> <th>TIP RADIUS</th> <th>MAX. SPEED</th> <th>RCF</th> </tr> </thead> <tbody> <tr> <td>6.8 in.</td> <td>2690 rpm</td> <td>1397</td> </tr> </tbody> </table>	TIP RADIUS	MAX. SPEED	RCF	6.8 in.	2690 rpm	1397	<p>Cat. No. 0281 6-place 15 ml Angle Rotor with 6-0901 shields</p> <table border="1"> <thead> <tr> <th>TIP RADIUS</th> <th>MAX. SPEED</th> <th>RCF</th> </tr> </thead> <tbody> <tr> <td>6.37 in.</td> <td>2760 rpm</td> <td>1378</td> </tr> </tbody> </table>	TIP RADIUS	MAX. SPEED	RCF	6.37 in.	2760 rpm	1378
TIP RADIUS	MAX. SPEED	RCF											
6.8 in.	2690 rpm	1397											
TIP RADIUS	MAX. SPEED	RCF											
6.37 in.	2760 rpm	1378											
<p>Cat. No. 0263 4-place 50 ml Horizontal Rotor with 4-0900 shields</p> <table border="1"> <thead> <tr> <th>TIP RADIUS</th> <th>MAX. SPEED</th> <th>RCF</th> </tr> </thead> <tbody> <tr> <td>6.94 in.</td> <td>2560 rpm</td> <td>1292</td> </tr> </tbody> </table>	TIP RADIUS	MAX. SPEED	RCF	6.94 in.	2560 rpm	1292	<p>Cat. No. 0283 4-place 50 ml Angle Rotor with 4-0900 shields</p> <table border="1"> <thead> <tr> <th>TIP RADIUS</th> <th>MAX. SPEED</th> <th>RCF</th> </tr> </thead> <tbody> <tr> <td>6.49 in.</td> <td>2860 rpm</td> <td>1508</td> </tr> </tbody> </table>	TIP RADIUS	MAX. SPEED	RCF	6.49 in.	2860 rpm	1508
TIP RADIUS	MAX. SPEED	RCF											
6.94 in.	2560 rpm	1292											
TIP RADIUS	MAX. SPEED	RCF											
6.49 in.	2860 rpm	1508											
<p>Cat. No. 0265 8-place 15 ml Horizontal Rotor with 8-0901 shields</p> <table border="1"> <thead> <tr> <th>TIP RADIUS</th> <th>MAX. SPEED</th> <th>RCF</th> </tr> </thead> <tbody> <tr> <td>7.03 in.</td> <td>2340 rpm</td> <td>1093</td> </tr> </tbody> </table>	TIP RADIUS	MAX. SPEED	RCF	7.03 in.	2340 rpm	1093	<p>Cat. No. 0285 12-place 15 ml Angle Rotor with 12-0902 shields</p> <table border="1"> <thead> <tr> <th>TIP RADIUS</th> <th>MAX. SPEED</th> <th>RCF</th> </tr> </thead> <tbody> <tr> <td>5.75 in.</td> <td>2890 rpm</td> <td>1364</td> </tr> </tbody> </table>	TIP RADIUS	MAX. SPEED	RCF	5.75 in.	2890 rpm	1364
TIP RADIUS	MAX. SPEED	RCF											
7.03 in.	2340 rpm	1093											
TIP RADIUS	MAX. SPEED	RCF											
5.75 in.	2890 rpm	1364											
<p>Cat. No. 0267 4-place 100 ml Horizontal Rotor with 4-0908 shields</p> <table border="1"> <thead> <tr> <th>TIP RADIUS</th> <th>MAX. SPEED</th> <th>RCF</th> </tr> </thead> <tbody> <tr> <td>7.13 in.</td> <td>2450 rpm</td> <td>1215</td> </tr> </tbody> </table>	TIP RADIUS	MAX. SPEED	RCF	7.13 in.	2450 rpm	1215	<p>Cat. No. 0287 12-place 15 ml Angle Rotor with 12-0901 shields</p> <table border="1"> <thead> <tr> <th>TIP RADIUS</th> <th>MAX. SPEED</th> <th>RCF</th> </tr> </thead> <tbody> <tr> <td>6.37 in.</td> <td>2610 rpm</td> <td>1232</td> </tr> </tbody> </table>	TIP RADIUS	MAX. SPEED	RCF	6.37 in.	2610 rpm	1232
TIP RADIUS	MAX. SPEED	RCF											
7.13 in.	2450 rpm	1215											
TIP RADIUS	MAX. SPEED	RCF											
6.37 in.	2610 rpm	1232											
<p>Cat. No. 0269 and 0271 4-place Horizontal Rotor with 4 multiple carriers for 36-10 x 75mm tubes or 28-12 x 75mm tubes (0920 &amp; 0921)</p> <table border="1"> <thead> <tr> <th>TIP RADIUS</th> <th>MAX. SPEED</th> <th>RCF</th> </tr> </thead> <tbody> <tr> <td>5.0 in.</td> <td>3600 rpm</td> <td>1840</td> </tr> </tbody> </table>	TIP RADIUS	MAX. SPEED	RCF	5.0 in.	3600 rpm	1840	<p>Cat. No. 0289 24-place 15 ml Angle Rotor with 24-0902 shields</p> <table border="1"> <thead> <tr> <th>TIP RADIUS</th> <th>MAX. SPEED</th> <th>RCF</th> </tr> </thead> <tbody> <tr> <td>5.75 in.</td> <td>2760 rpm</td> <td>1244</td> </tr> </tbody> </table>	TIP RADIUS	MAX. SPEED	RCF	5.75 in.	2760 rpm	1244
TIP RADIUS	MAX. SPEED	RCF											
5.0 in.	3600 rpm	1840											
TIP RADIUS	MAX. SPEED	RCF											
5.75 in.	2760 rpm	1244											
<p>Cat. No. 0273 4-place Horizontal Rotor with 4 multiple carriers for 20-13 x 100mm tubes (0922)</p> <table border="1"> <thead> <tr> <th>TIP RADIUS</th> <th>MAX. SPEED</th> <th>RCF</th> </tr> </thead> <tbody> <tr> <td>6.0 in.</td> <td>2650 rpm</td> <td>1197</td> </tr> </tbody> </table>	TIP RADIUS	MAX. SPEED	RCF	6.0 in.	2650 rpm	1197	<p>Cat. No. 0291 24-place 15 ml Angle Rotor with 24-0901 shields</p> <table border="1"> <thead> <tr> <th>TIP RADIUS</th> <th>MAX. SPEED</th> <th>RCF</th> </tr> </thead> <tbody> <tr> <td>6.37 in.</td> <td>2500 rpm</td> <td>1131</td> </tr> </tbody> </table>	TIP RADIUS	MAX. SPEED	RCF	6.37 in.	2500 rpm	1131
TIP RADIUS	MAX. SPEED	RCF											
6.0 in.	2650 rpm	1197											
TIP RADIUS	MAX. SPEED	RCF											
6.37 in.	2500 rpm	1131											
	<p>Cat. No. 0293 24-place Angle Rotor with 24-0904 shields</p> <table border="1"> <thead> <tr> <th>TIP RADIUS</th> <th>MAX. SPEED</th> <th>RCF</th> </tr> </thead> <tbody> <tr> <td>5.0 in.</td> <td>3400 rpm</td> <td>1641</td> </tr> </tbody> </table>	TIP RADIUS	MAX. SPEED	RCF	5.0 in.	3400 rpm	1641						
TIP RADIUS	MAX. SPEED	RCF											
5.0 in.	3400 rpm	1641											

## 2. Speed Selection

Many tests require centrifugation at an intermediate rpm between the minimum ("0") and maximum Speed Control settings. To obtain the desired speed, turn the Speed Control Knob clockwise from "0" until the Tachometer needle stabilizes at the required rpm. NOTE: Always return the knob to the "0" position after completion of a cycle.

## 3. Calculating RPM

Certain tests call for centrifugation at a specified relative centrifugal force (RCF). RCF is defined as the force acting on the sample being centrifuged, relative to the force acting on the sample in the earth's gravitational field.

The operator can calculate the correct Tachometer Speed (RPM in thousands) corresponding to the required RCF specified for a test, using the following formula:

$$\text{RPM in thousands (Tach. Speed)} = \sqrt{\frac{\text{RCF}}{28.4R}}$$

Where: RCF = Relative Centrifugal Force specified for the particular centrifugation procedure.

R = Tip Radius of shield (in inches) obtained from Table III for the rotor centrifugation being used.

## D. PERFORMANCE AND SPECIFICATIONS

- Equipment Identification: Clay Adams DYNAC II Centrifuges
  - Model 0103 (120 volts)
  - Model 0106 (220 volts)
- Rated Speed (both Models):
  - Continuously Adjustable From Minimum Speed—500 rpm
  - Maximum Speed—See Table III for speeds of fourteen different rotor/shield configurations.
- Electrical:
  - Model 0103: 120 VAC/60 Hz/2.5 amps
  - Model 0106: 220 VAC/50 Hz/1.3 amps
  - U.L.-approved, both Models.
- Tachometer
  - Range: 0 to 4,000 rpm
  - Accuracy: ±5% over 500 rpm to 4,000 rpm
- Dimensions and Weights (Closed Machine)
  - Height: 31.75 cm (12.5')
  - Width: 40.64 cm (15')
  - Depth: 48.26 cm (19')
  - Net Weight: 11.34 kg (25 lbs.)—Centrifuge without rotor

## E. SPEED CHECKS

The DYNAC II Centrifuge is a variable speed machine. Maximum speeds that should be obtained with each rotor configuration are listed in Table III. These speeds can be used to check for proper operation of the Centrifuge motor and tachometer.

To perform a speed check an external tachometer, such as the Model 5205 ADAMS Photo Electric Tachometer, is recommended. Mechanical-type tachometers that contact the rotor should be avoided. NOTE: Maximum specified speeds are obtained by operation of the Model 0103 Centrifuge at 120 VAC, 60 Hz and the Model 0106 Centrifuge at 220 VAC, 50 Hz.

**To check motor operation:** Install a complete rotor and shield assembly. With the Centrifuge operating at the maximum speed setting, the external tachometer reading should be within ±10% of the maximum speed listed in Table III for the rotor/shield configuration in use.

**To check accuracy of the Centrifuge tachometer:** Use the external tachometer reading obtained above and operate the Centrifuge at maximum speed setting with the same rotor and shield assembly. The Centrifuge tachometer reading should be within ±5% of the rpm reading obtained with the external tachometer.

Large deviations in line voltage and frequency will affect maximum obtainable operating speed. If supply voltage and frequency are correct, and the Centrifuge motor speed or tachometer reading is outside the specified tolerance, contact your nearest Clay Adams equipment dealer for service, or call Clay Adams Technical Service Department.

## F. OPERATING PRECAUTIONS

### 1. Basic Procedures

In order to obtain properly centrifuged specimens and to prevent damage to the machine, the following basic operating precautions should be carefully observed.

- **Electrical:** Operate the DYNAC II Centrifuge only from an A.C. power source approved for each model.
- **Rotor Installation:** Never attempt to operate the Centrifuge without first installing a complete rotor and shield assembly.
- **Zero Speed Setting:** Before turning the Centrifuge ON, always turn the Speed Control Knob to "0".
- **Load Balancing:** For smooth operation and long service life, tubes must be placed in a balanced array.
- **Timing and Speed:** For accurate results, follow the timing and speed specified for the particular centrifugation procedure.
- **Cleanliness:** Keep the Centrifuge clean and dust-free in accordance with Maintenance and Service Instructions supplied in this Manual. Avoid spilling liquids into the Centrifuge bowl. If the interior of the Centrifuge contains dust, glass particles or other foreign matter, it is possible for these contaminants to be stirred into the air and deposited into specimen tubes. Keep the Centrifuge interior clean to prevent contamination of samples.

### 2. Operator Training

The DYNAC II Centrifuge is an electrical instrument designed, in certain procedures, to produce specimens for medical diagnostic purposes. Use of the Centrifuge for patient medical evaluation places a responsibility upon administrative personnel for adequate training of operators in its safe and effective use.

Administrative personnel should make certain that all operators and technologists receive adequate training before being allowed to operate the Centrifuge. Such training should include a thorough working knowledge of:

- Centrifuge set-up and power requirements,
- Handling and preparation of samples,
- Equipment service and maintenance.

## G. HAZARDS

Basic safety precautions must be observed when operating the Centrifuge in order to avoid the hazards of electrical shock or other physical injury.

The DYNAC II Centrifuge is not to be used in a Class 1, Division 1, Group C hazardous location defined by the National Fire Protection Association, Bulletin No. 56A (Inhalation Anesthetics), as extending upward to a level of 5 feet above the floor where flammable anesthetics are used.

### To Avoid Electrical Shock:

- Plug the power cord only into a grounded 3-wire receptacle.
- Never remove the grounding prong from the power plug.
- Always unplug the power cord before attempting to service the Centrifuge.
- Immediately have worn or damaged power cord or plug replaced by an authorized serviceman.

### To Avoid Physical Injury:

- Never attempt to override the cover switch and lock while the rotor is spinning.

## H. MAINTENANCE AND SERVICE

The DYNAC II Centrifuge is warranted by Clay Adams against defective workmanship and materials for a period of one year from the date of shipment. A Warranty Card is enclosed with the machine.

Required maintenance and authorized service that can be performed by laboratory personnel are described below. **DO NOT ATTEMPT TO DISASSEMBLE THE CENTRIFUGE BEYOND ANY POINT DESCRIBED IN THIS MANUAL.**

Except for replacement of a defective external fuse and inspection and replacement of motor brushes, refer all service problems to your nearest Clay Adams equipment dealer, or call Clay Adams Technical Service Department.

**NOTE:** Motors in both Models of the DYNAC II Centrifuge incorporate permanently lubricated bearings. No lubrication is required for the life of the machine.

### 1. External Fuse Replacement

If found to be defective, the external fuse located in the back of the Centrifuge should be replaced only with a fuse of the following rating:

Model 0103 – Type 3AG, 4 amp, 250 volt fuse,

Model 0106 – Type 3AG, 2.5 amp, 250 volt fuse.

To replace the fuse, press the spring-load fuse holder to release, as shown in Figure 6. Install new fuse in holder and push holder into fuse receptacle until it locks into position.

### 2. Motor Brushes—Inspection and Replacement

Motor brushes in both Models of the DYNAC II Centrifuge must be inspected for wear (length) every six months. Brushes should be replaced when they are less than 6.3 mm ( $\frac{1}{4}$ " ) long. Use only genuine Clay Adams replacement brushes, Catalog No. 0101-600-001.

**CAUTION:**  
Disconnect power cord from wall receptacle  
before inspecting motor brushes.

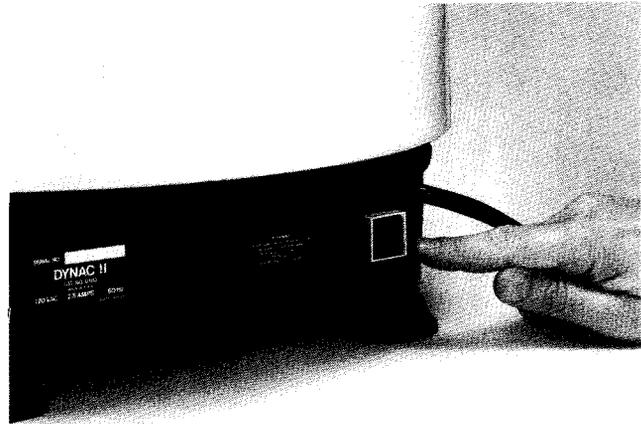


Figure 6. Fuse Is Removed by Pressing Fuse Holder In.

To inspect and replace the motor brushes, proceed as follows:

- Remove line cord from power outlet.
- Remove rotor assembly and close and latch Centrifuge cover.
- Rest Centrifuge on edge of front console and cover.
- Remove the 4 screws and rubber feet which secure the bottom cover to the centrifuge base. Remove bottom cover and drip pan plate (see Addendum on Page 9).
- Locate the brush cap on the left side of the motor housing.
- Unscrew the brush cap and remove spring and brush assembly (Figure 7), *carefully noting* the orientation of the curved brush surface.

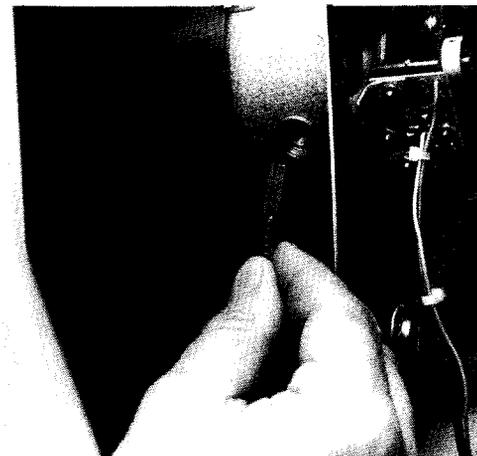


Figure 7. Spring and Brush Removed from Left Side of Motor

- Inspect brush and replace if worn to a length of 6.3 mm ( $\frac{1}{4}$ " ). **NOTE:** If brush is not worn, replace it **EXACTLY AS YOU FOUND IT.**
- To install new brushes, insert the spring and brush assembly into the receptacle. **BE SURE THE CURVED SURFACE OF EACH BRUSH IS ORIENTED TO MATCH THE CURVED SURFACE OF THE MOTOR HOUSING BEFORE INSERTION.** Replace brush cap and screw down tightly.



Figure 8. Removing Leads from Terminal Block On Right Side of Centrifuge for Access to Brush Assembly.

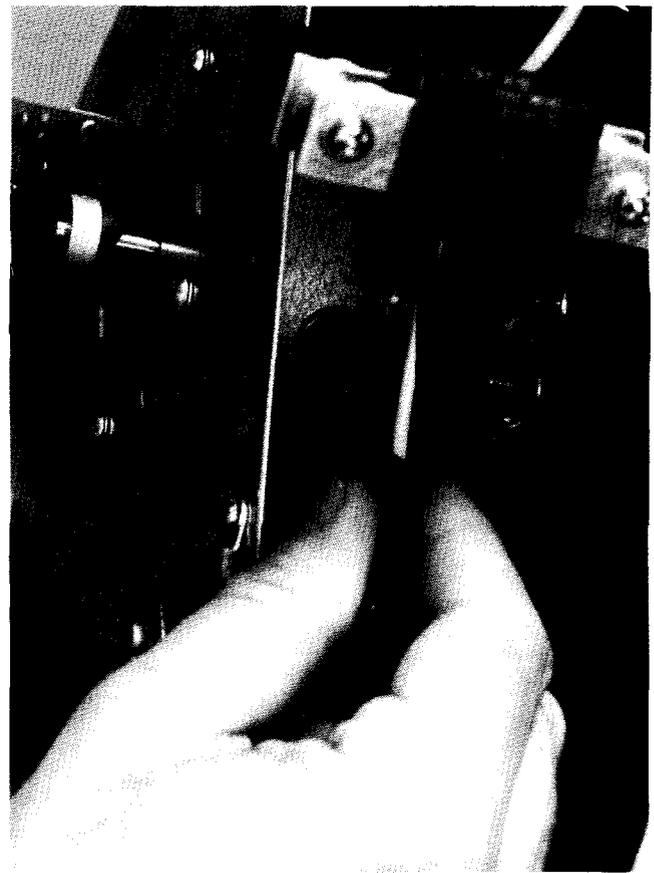


Figure 9. Removing Brush Cap from Right Side of Centrifuge Motor.

- (i) Locate brush cap on right side of motor. NOTE: If the electrical leads on the right side of the motor interfere with removal of the brush, disconnect the leads from their pin terminals as shown in Figure 8, marking each lead for re-connection to the proper terminal.
- (j) Remove brush cap (Figure 9), and brush assembly. Inspect and replace brush if worn, as described above. Re-connect wire leads and install drip plate, bottom cover, rubber feet and screws.

NOTE: Always run-in new brushes. Proper performance may not occur until the Centrifuge is operated for several hours with a rotor installed.

### 3. Cleaning

It is recommended that interior and exterior surfaces of the Centrifuge bowl and rotor be wiped occasionally with a damp cloth. A mild detergent may be used to remove stains. Keeping these parts clean will prolong the life of the Centrifuge.

The transparent cover of the Centrifuge is made of a shatterproof polycarbonate resin, resistant to a wide range of laboratory chemicals. It is recommended, however, that the cover be kept clean and that spillage be wiped off as soon as possible. A mild detergent should be used. Do not use carbon tetrachloride, chloroform, gasoline or acetone. Other chemicals, such as aromatic hydrocarbons (benzene, toluene, xylene) and strong alkalis (sodium and ammonium hydroxide), can damage the cover.

### 4. Transporting Centrifuge

Though the DYNAC II Centrifuge can withstand the rigors of normal laboratory use, it can be damaged by dropping or by excessive abuse in handling. If the Centrifuge must be shipped, re-install the cylindrical cardboard sleeve and corrugated cover to protect the motor. Package the machine carefully in a strong, shock-proof container to prevent damage from vibration and impact.

### 5. Spare Parts and Accessories

Catalog numbers of spare parts for the DYNAC II Centrifuge are listed in Appendix A. Catalog numbers of interchangeable rotors and shields for use with the Centrifuge are listed in Tables I and II. Tubes and glassware can also be obtained from your nearest Clay Adams dealer.

### 6. Troubleshooting

If the Centrifuge fails to operate properly, consult the Troubleshooting Guide in Table IV to pinpoint the problem. **DO NOT ATTEMPT TO PERFORM ANY SERVICE OR REPAIR UNLESS AUTHORIZED IN THIS MANUAL.** Refer service problems to your nearest Clay Adams Equipment Dealer, or call Clay Adams Technical Service Department.

NOTE: Appendix B contains a detailed electrical schematic of the Centrifuge for use by *authorized service personnel only*.

**TABLE IV**  
**DYNAC II Centrifuge**  
**Troubleshooting Guide**

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
1. Centrifuge Fails to Operate	a) Power cord not in receptacle b) Power Switch not ON c) Timer set to "0" d) Cover not latched e) External fuse blown f) Motor brushes worn or defective g) Defective internal parts	a) Plug cord into receptacle b) Activate Power Switch c) Set timer to desired spinning time d) Close cover latch securely e) Replace fuse in accordance with instructions in this manual f) Replace brushes in accordance with instructions in this manual g) Request authorized service
2. Brake Switch Fails to Decelerate Rotor	a) Brake system defective	a) Request authorized service
3. Centrifuge Vibrates Excessively	a) Unbalanced load b) Rubber feet worn	a) Balance load according to instructions in this manual b) Replace feet
4. Tachometer Indicates Zero Speed or Incorrect speed.	a) Centrifuge not rotating in excess of 500 rpm b) Defective tachometer, speed control or motor	a) Wait until speed accelerates above above 500 rpm b) Request authorized service
5. Centrifuge Fails to Achieve Maximum Speed Specified for Rotor Configuration	a) Line voltage incorrect b) Defective speed control, tachometer, or motor	a) Check power source with accurate monitor (authorized personnel only) b) Request authorized service

**ADDENDUM TO**  
**SUBSECTION H—MAINTENANCE AND SERVICE**

A Bottom Cover Clamp (see illustration opposite) has been incorporated on the back of the Centrifuge, above the fuse and power cord inlet. This new Clamp which prevents the possibility of access to internal electrical components, firmly secures the flexible edges of the bottom cover to the Centrifuge base.

**NOTE:** The instructions below, concerning the Bottom Cover Clamp, supplement the procedures on Pages 7 and 8 of this Manual on removal and re-assembly of the bottom cover during Inspection of Motor Brushes.

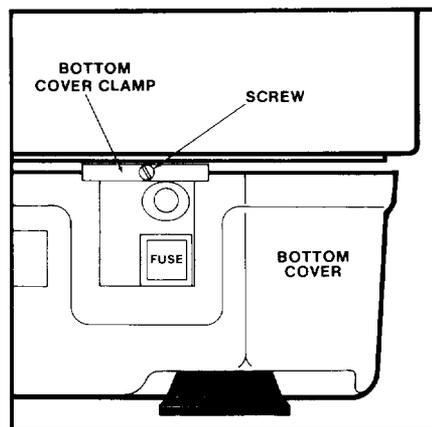
**REMOVING BOTTOM COVER** – Refer to Step 2 (d)

After removing the four (4) screws and rubber feet that secure the cover to the base, unloosen the Cover Clamp Screw until the Clamp is loose. Do not remove Screw and Clamp from base. Remove bottom cover and drip pan plate.

**RE-INSTALLING BOTTOM COVER** – Refer to Step 2 (j)

After replacing the drip pan plate, re-install bottom cover by sliding the top edges on either side of the back cutout

underneath the wings of the Cover Clamp. Retighten Clamp Screw, and replace rubber feet and screws.



**Back View of Centrifuge**  
**Showing Location of Cover Clamp and Screw**



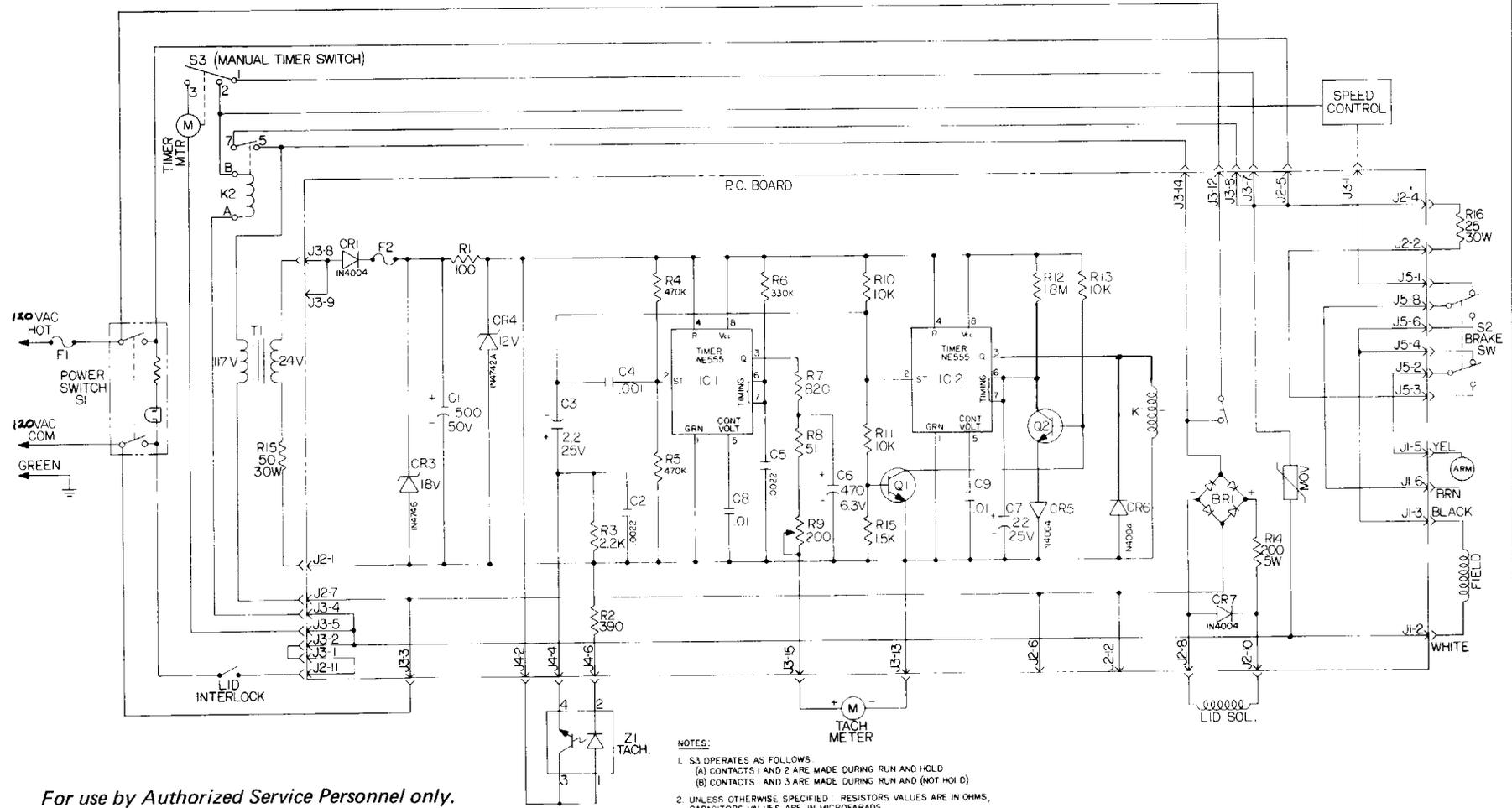
**APPENDIX A**  
**DYNAC II Centrifuge**  
**Illustrated Parts Breakdown and Spare Parts**  
**Model Nos. 0103 (120 volt) and 0106 (220 volt)**

ITEM NO. (FIGURE 10)	CATALOG NO.	DESCRIPTION
1	0103-600-000	Motor Assembly (120 volt)
2	0101-600-001	Motor Brush Kit (set of 2)
3	0103-600-002	Gasket, Motor
4	0103-601-001	Timer Assembly (120 volt)
5	0103-601-002	Knob, Timer or Speed Control
6	0103-602-001	Power Switch (120 volt)
7	0103-602-002	Brake Switch
8	0103-603-000	Cordset Assembly
9	0103-604-000	Cover Assembly
10	0101-608-000	Bumpers, Lid (set of 2)
11	0103-604-001	Latch Assembly
12	0103-604-002	Lid Cushion
13	0103-606-000	Latch Plate
14	0103-607-000	Solenoid Assembly
15	0103-617-101	Safety Switch
16	0103-607-002	Cover, Solenoid
17*	0103-618-100	Resistor, 50Ω, 30W
18	0103-609-000	Brake Resistor, 25Ω, 30W
19	0103-610-000	Meter Assembly
20	0103-605-000	Speed Control Assembly (120 volt)
21	0103-611-000	Front Panel
22	0103-612-000	Vibration Isolators (set of 3)
23	0101-609-001	Feet, Rubber (set of 4)
24**	0103-619-100	P.C. Board Assembly (120 volt)
25	0103-614-000	Tachometer P.C. Board
26	0103-615-000	Fuse Holder
27	0103-620-100	Transformer (120 volt)
28	0103-621-100	Relay K2 (120 volt)
29	0106-600-000	Motor Assembly (220 volt)
30	0106-619-100	P.C. Board (220 volt)
31	0106-601-001	Timer Assembly (220 volt)
32	0106-602-001	Power Switch (220 volt)
33	0106-605-000	Speed Control Assembly (220 volt)
34	0106-621-100	Relay K2 (220 volt)
35	0106-622-100	Resistor, 1500Ω, 30W (220 volt)
36	0106-620-100	Transformer (220 volt)

\*Item No. 17 – For Centrifuges with serial numbers below  
S/N 17000, use Catalog No. 0103-608-000 Resistor (500Ω, 30W).

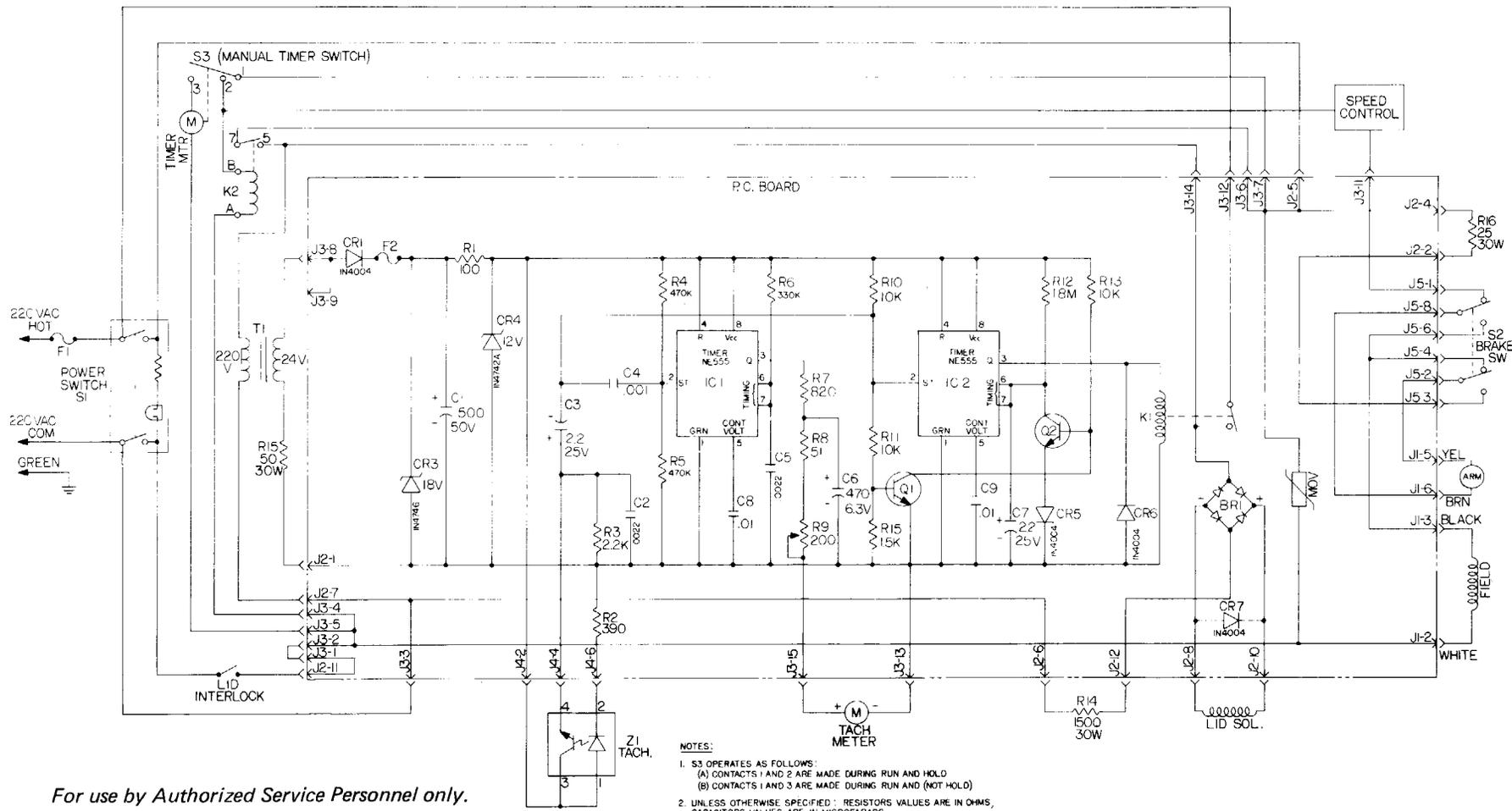
\*\*Item No. 24 – For Centrifuges with serial numbers below  
S/N 17000, use Catalog No. 0103-613-000 P.C. Board Assembly.

### DYNAC II Centrifuge Model 0103 (120 volt)



*For use by Authorized Service Personnel only.*

### DYNAC II Centrifuge Model 0106 (220 volt)



*For use by Authorized Service Personnel only.*

## **WARRANTY**

*The DYNAC II Centrifuge is guaranteed against defective workmanship and material for a period of one (1) year from the date of purchase.*

*Clay Adams and its authorized dealers agree to replace or repair any parts which, in their judgment, are found to be defective, provided the unit has not been subjected to misuse or abuse.*

*Clay Adams makes no other warranties, expressed or implied, except as stated above.*

*To validate your guarantee, the Warranty Card must be returned to Clay Adams, Division of Becton, Dickinson and Company, within fifteen (15) days from date of purchase.*

### **IMPORTANT:**

*For service, contact your authorized Clay Adams Dealer, providing him with Model and Serial Number before returning this product for repair.*



**Clay Adams**

Division of  
Becton, Dickinson and Company   
Parsippany, N. J. 07054

