



Drucker Diagnostics

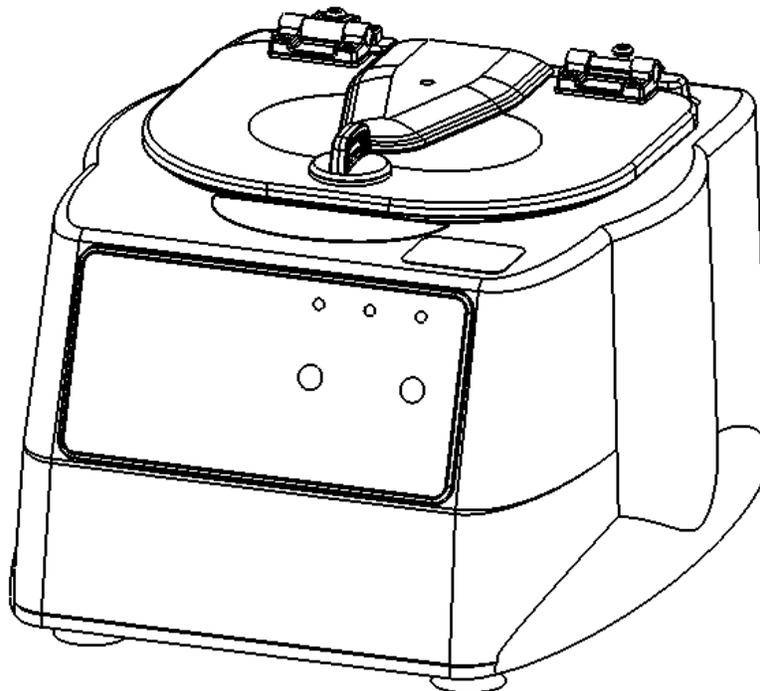
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Service Manual

Model Apex 6 Centrifuge



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1 PREFACE

- 1.1 The purpose of this manual is to provide the service technician with information for troubleshooting, testing, and repair of laboratory centrifuge model Apex 6. Only qualified technically trained personnel should attempt any of the servicing described in this document. Failure to follow the procedures in this document may result in personal injury or instrument damage. Drucker Diagnostics will not be held liable for any injury or damage as a result of improper servicing.
- 1.2 Information contained within this manual is subject to change without notice.

2 GENERAL DESCRIPTION OF MAJOR COMPONENTS

- 2.1 Motor: Brushless DC Motor
- 2.2 Printed Circuit Board: The PCB is the microcontroller based control center of the centrifuge. All control signals are generated in the PCB.
- 2.3 Lid Locking Tray Assembly: The lid tray assembly contains a solenoid and limit switch that are used to determine the state of the lid (Open or Closed) and to keep the lid locked during centrifugation cycles.
- 2.4 Rotor: The centrifuge rotor is the main component that spins in the centrifuge. The rotor is loaded with tube holders, and the samples are placed into the tube holders for processing.

3 WARRANTY INFORMATION

- 3.1 Drucker Diagnostics warrants its centrifuges to be free from defects in workmanship and parts for two years.

4 SPECIFICATIONS

Maximum Speed	5300 RPM
Maximum RCF	4000 xg
Maximum Capacity	6 Tubes (17 x 100mm)
Dimensions (in)	9.0 (H) x 12.0 (W) x 13.75 (L)
Environmental Operating Range	0-38 deg C
Typical Noise Level (At Maximum Speed)	< 62 dB A

Electrical Ratings	115/230VAC (+/- 10V) power supply input (48VDC output)
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5 TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
The lid does not open.	No Power	Check line cord.
	No Power	Check external power supply.
	No Power	Check wall outlet.
	Lid knob is ajar	Rotate the lid knob fully clockwise before pressing the 'OPEN' button.
	Lid lock is active (Unlock timed out)	Press the 'OPEN' button to de-activate the lid.
	Lid tray is unplugged from PCB or defective	Requires service.
	PCB is damaged	Requires service.
		To gain access to the rotor - Remove the 'OPEN/CLOSE' sticker and slide the lid latch lever toward the front of the centrifuge. This will unlock the lid.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Excessive vibration	Rotor improperly loaded	Load equally filled tubes symmetrically in the rotor. All carriers and/or tube holders must be present in the rotor, whether loaded, or empty.
	Debris lodged within the rotor or tube carriers	Carefully inspect all rotor pockets, tube holders and crevasses for debris.
	Centrifuge housing is loose	Requires service.
	Missing/damaged feet	Requires service.
	Motor failure	Requires service.
	Rotor windshield damage	Requires service.
	Rotor damaged	Replacement required.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Rotor does not spin	No Power	Check line cord.
	No Power	Check external power supply.
	No Power	Check wall outlet.
	Lid not properly latched	Press down firmly on lid and rotate lid knob clockwise until the 'Locked' light illuminates.
	Internal connection failure	Requires service.
	PCB failure	Requires service.
	Motor Failure	Requires service.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Clicking noise during braking	Rotor is loose	Tighten rotor screw.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Whistling noise while running	Debris in air intake / exhaust ports	Remove power before clearing debris.
	Gasket failure	Requires service.
	Gasket failure	Requires service.

6 SERVICE INSTRUCTIONS

6.1 Cleaning

- a) Use appropriate Personal Protective Equipment (PPE)
- b) The cabinet, rotor top and accessories shall be thoroughly cleaned using soap and water, isopropyl alcohol, or a mild bleach solution.
- c) Under no circumstances should any of the following be used: Fully/Partially Halogenated Hydrocarbons, Ketones and Esters.
- d) Use of any chemicals not prescribed by the manufacturer may cause damage to the rotor and tube carriers / holders and shall not be used.

6.2 Removing the Rotor Core

- a) Use a 1/8" hex driver to loosen the center rotor screw (turn counter-clockwise).
- b) Lift the rotor core straight up and out of the rotor chamber.
- c) To install the rotor core reverse steps A and B above.
- d) Take care to align the hub spines with the rotor cone and the tube numberings 1 through 6 with the windshield cover.
- e) Tighten the rotor screw with a 1/8" hex driver to 2.0 Nm.

6.3 Maintaining the Rotor

- a) Keep the rotor clean; any corrosive materials must not be allowed contact with the rotor and should be cleaned immediately.
- b) The rotor should be checked periodically for signs of wear.
- c) Remove the rotor from service if any of the following are found: cracks, deep scratches, corrosion or discoloring.

6.4 Rotor Screw

- a) If the rotor screw needs to be tightened, use a 1/8" hex driver and tighten to 2.0 Nm.

6.5 Speed Calibration

- a) Check the centrifuge speed periodically, at least every two years.
- b) Important: When verifying rotor speed, make certain that all tube holders are installed in the rotor.
- c) No calibration adjustment of speed can be made, only a verification of rotor speed.

6.6 Removing the Cabinet (Upper Housing)

- a) There are six screws that fasten the centrifuge cabinet to the base.
- b) Begin by unplugging the centrifuge and waiting 10 minutes for internal voltages to dissipate.

- c) Use a #2 Phillips screwdriver to remove the cabinet screws (three on the back, six on the underside).
- d) The centrifuge control panel is attached to the base internally with cable harnesses. Be careful not to stress the cables when removing the cabinet.
- e) Stand directly in front of the centrifuge and lift the cabinet straight up and off the base, setting it down on its right side.
- f) Gently remove the motor harness from the PCB.
- g) Gently remove the power supply harness from the PCB.
- h) Disconnect the PCB grounding strap from the base panel using a 11/32" nut driver.

6.7 Replacing the Lid Tray Assembly

- a) The lid tray assembly is accessible once the cabinet has been removed.
- b) The lid tray assembly is held in place with four screws.
- c) Peel the 'open/close' label off of the cabinet.
- d) Use a #2 Phillips screwdriver to remove the two lid tray screws concealed beneath the label.
- e) Gently remove the lid tray wire harness from the PCB.
- f) Use a #2 Phillips screwdriver to remove the two lid tray screws inside the cabinet
- g) To install the lid tray, reverse steps F through C above
- h) Complete the installation by gently plugging the lid tray wire harness into the PCB header 'J2'.

6.8 Replacing the PCB

- a) The PCB is accessible once the cabinet has been removed. Make certain that all wire harnesses have been disconnected.
- b) The PCB has capacitors that will remain charged for a period after the centrifuge is unplugged. Make certain to use standard precautions for handling potentially charged capacitors when working with the PCB.
- c) The PCB is held in place with nine #6 screws.
- d) Use a #2 screwdriver to remove the PCB screws. The screw on the lower left corner of the PCB also secures the grounding strap.
- e) To install the PCB, align the PCB with the mounting standoffs of the front panel.
- f) Use a #2 screwdriver to install the PCB screws. Ensure the grounding strap is installed at the lower left corner of the PCB.
- g) Important: over tightening the PCB screws can cause malfunction by stripping the screw threads away from the plastic mounting boss.

6.9 Replacing the Rotor

- a) The rotor is accessible once the cabinet has been removed.
- b) The rotor is held in place with the rotor screw and washer.
- c) Use a 1/8" hex driver to remove the center rotor screw and washer (turn counter-clockwise).
- d) Pull up on rotor to remove from guard bowl. Make sure the red rotor hub stays on the motor shaft.
- e) Place new rotor onto rotor hub and fully seat inside the guard bowl.
- f) Place washer onto center of rotor core and insert rotor screw. Use a 1/8" hex driver and tighten to 2.0 Nm.

6.10 Replacing the Motor

- a) Make certain that a new rubber gasket is used on the motor mounting studs when installing a motor.
- b) Position the motor assembly so its wires are adjacent to the notch in the bottom rim of the guard bowl.
- c) Install the motor and gasket into the guard bowl with the wire harness positioned as described above.
- d) Secure the motor to the guard bowl using four #8 washers and four #8 Nylok nuts.
- e) Drive the four #8 Nylok nuts onto the motor studs with an 11/32" nut driver.
- f) Turn the guard bowl assembly upside down.
- g) Place the base assembly onto the guard bowl.
- h) Ensure the motor wires pass through the notch in the bottom rim of the guard bowl.
- i) Ensure the guard bowl and base assembly are oriented such that the motor wires exit the guard bowl closest to the back left corner of the base assembly.
- j) **IMPORTANT: Make certain that no wires are pinched between the guard bowl and base!**
- k) Fasten the guard bowl to the base with six #8 thread cutting screws.
- l) Install the exhaust air cover with three #8 screws and washers.
- m) Secure the wire harnesses to the base assembly with zip ties.
- n) The lower assembly is complete.

6.11 Power Connections and Final Assembly

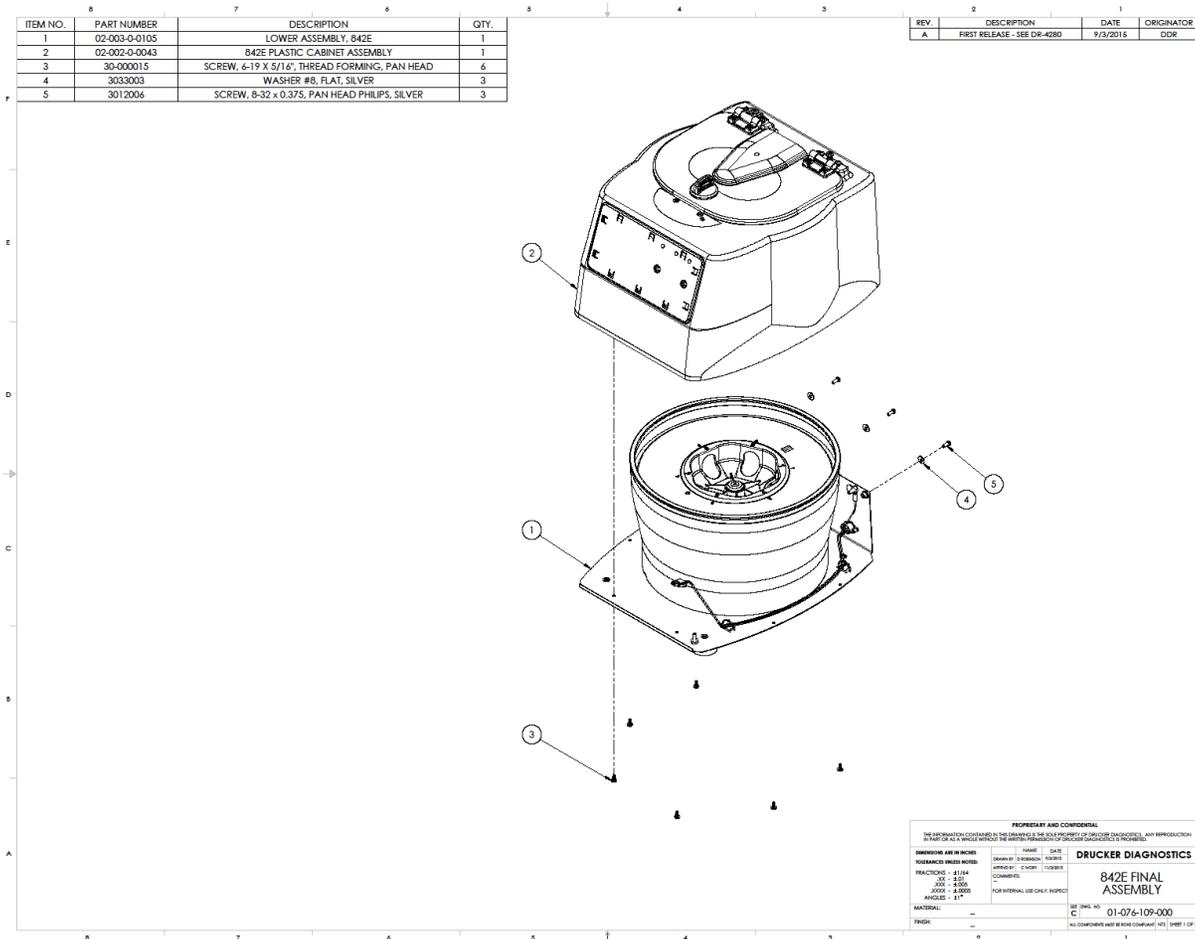
- a) Make certain that the lower assembly is unplugged from the external power supply.
- b) Connect the motor/power connector to J14 on the PCB.

- c) Connect the motor/hall sensor connector to J10 on the PCB.
- d) Connect the power supply harness connector to J17.
- e) Connect the grounding strap to the base assembly using a 11/16" nut driver.
- f) Carefully place the cabinet onto the base taking care not to pinch any wires between the two.
- g) Complete the assembly by replacing the nine screws and three washers using a #2 Phillips screwdriver.

7 ASSEMBLY DRAWINGS

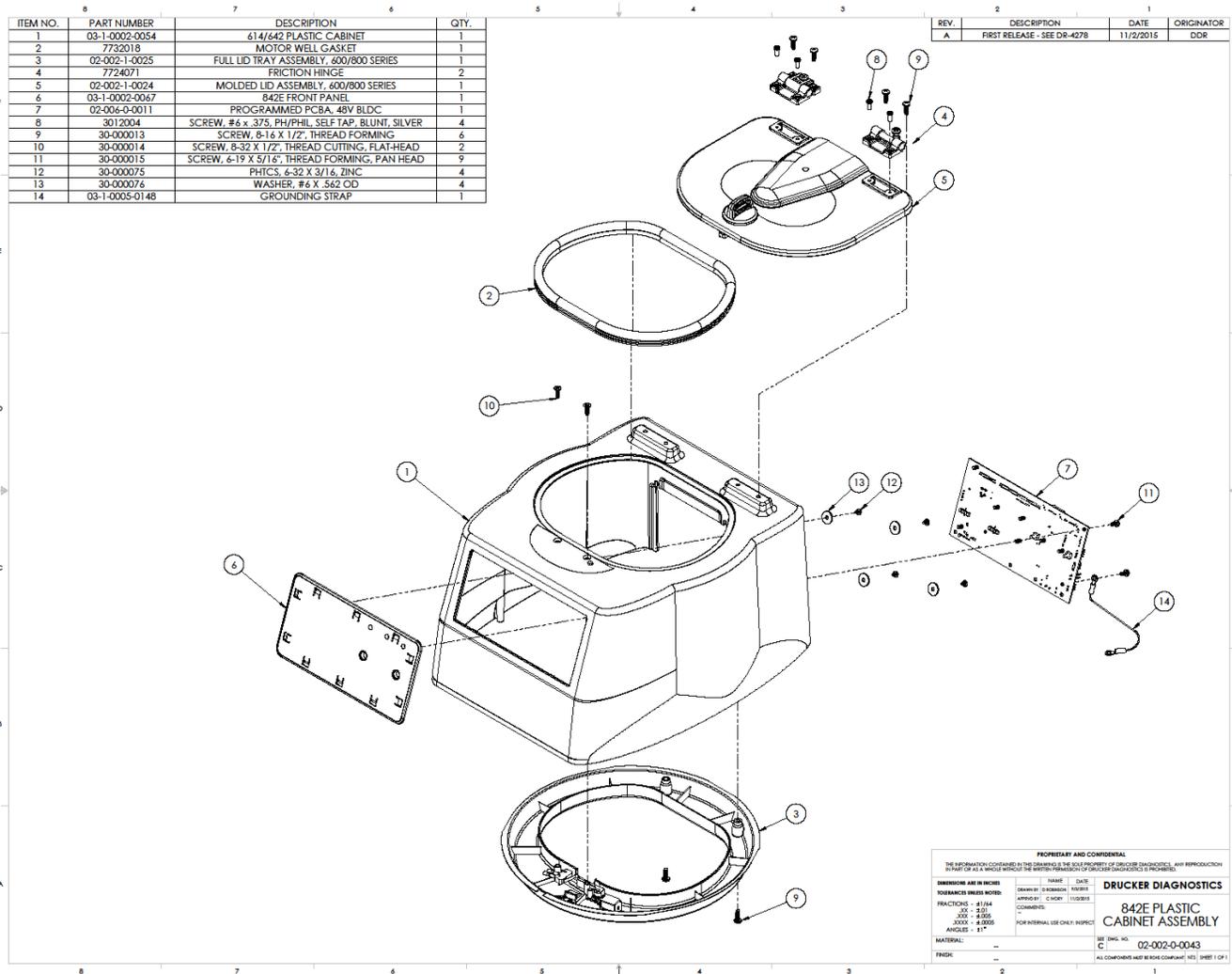
7.1 FINAL CENTRIFUGE ASSEMBLY

7.1.1 Reference drawing 01-076-109-000



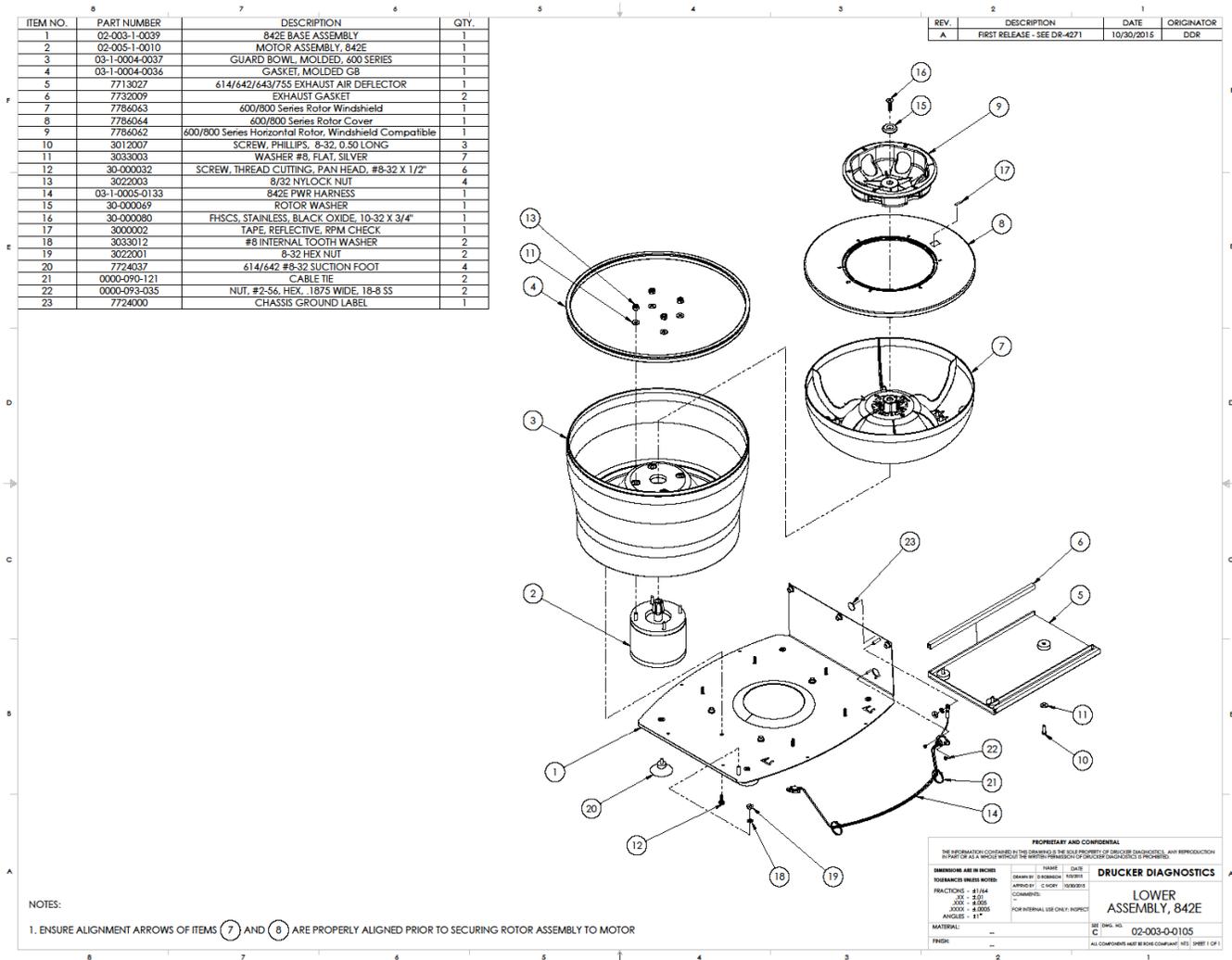
7.2 CABINET ASSEMBLY

7.2.1 Reference drawing 02-002-0-0043



7.3 LOWER ASSEMBLY

7.3.1 Reference drawing 02-003-0-0105



7.4 MOTOR ASSEMBLY

7.4.1 Reference drawing 02-005-1-0010

