Centrifuge Procedure

Section 1: Investigating Normal Operation

Section 2: Determining Cause of Malfunction

Appendices

A: Using a multimeter

B: Using a tachometer

Warnings

Always use proper size and shape of screw driver

Note: screws attached to vibrating components might turn in opposite direction.

STOP if screwdriver turns and screw does not. Screw will strip and be unusable.
Section 1: Investigating Normal Operation

In this section you will observe and familiarize yourself with the operation of a working centrifuge in order to better locate broken parts of malfunctioning machines.

Getting started

a. Gather Necessary tools
   a. Operation and/or service manuals
   b. Screwdriver set
   c. Multimeter
   d. Tachometer
   e. Stop watch
b. Locate and Identify Major Components Shown in Pictures Below

Note: you can ID components in picture below during step 4
Step 1: Overall Function

In this step you will determine if the centrifuge spins when turned on.

a. Plug power cord into wall and centrifuge
b. Close lid
c. Turn timer past one minute
d. Ensure:
   a. Motor can be heard
   b. Power Indicator LED is on
c. Rotor is spinning
d. Timer is ticking

Step 2: Checking the Rotor speed

In this step you will determine if the centrifuge is spinning at 11,000 rpm which will indicate if there are additional problems with the device.

a. Plug power cord into wall and centrifuge
b. Close lid
c. Turn timer past one minute
d. Measure RPM with tachometer (Appendix B)
   a. ±10% marked speed

Step 3: Checking the Timer

In this step you will determine if the timer is properly keeping time.

a. Start timer and stop watch at the same time
b. Stop timer at bell not when timer stops ticking
c. Ensure timer and stop watch read roughly the same amount of time
   a. ±10 seconds

Step 4: Checking the power

In this step you will check if any circuits are not properly closed or grounded to ensure they are not the cause of power failures or single component failure.

a. External power is reaching the centrifuge
   a. Inspect power cord for wire damage
   b. Inspect base of input and output plugs for damage
c. Check that wall outlet is functioning
b. Power is reaching motor
   a. Motor spins when centrifuge is on
c. Power is continuous through entire circuit (Appendix A)
   a. UNPLUG CENTRIFUGE
   b. Remove cover plate on bottom on centrifuge
i. Four screws
   c. Test Electrical Connections (make sure timer is on)

   i. Ensure all connections for circuit completion
      1. Ensure power can flow through entire circuit
      2. Make sure to check connections around
         a. Timer
         b. Motor
         c. Power LED
         d. Safety switch
         e. Power source
   ii. Check connection of resistors
      1. That there is none for resistors above 100ohms
      2. That there is a connection for resistors less than 100 ohms
   iii. Check connection of capacitors (that there is none)
   iv. Check connection of diodes (that there is none)

**Step 5: Checking the motor**

In this step you will check the motor’s function to ensure this is not a cause of abnormal rotor speeds.

   a. Connect centrifuge to power (only if not done in step 1)
   b. Turn centrifuge on (only if not done in step 1)
      a. Ensure motor can be heard
   c. UNPLUG CENTRIFUGE
   d. Remove cover plate on bottom on centrifuge
   e. Ensure white motor cover sites securely on top of motor
a. If it does not:
   i. Make sure brushes on underside of white cover sit on either side of motor pin
      1. Use Allen wrenches to push the brushes out of the way
      2. Align motor pin with whole in white motor cover and push motor cover all the way down
      3. Align small metal hooks with gaps in white motor cover
      4. Push hooks down to secure white motor cover

Step 6: Checking the safety switch

In this step you will determine if the safety switch is properly closing the circuit when lid is closed and opening the circuit when the lid is open.

a. Turn centrifuge on with lid open
   a. Ensure motor does not start
b. Turn centrifuge on with lid closed
   a. While motor is spinning open lid
      i. CAUTION: do not touch spinning rotor with fingers or any other object
   b. Ensure:
      i. Motor shuts off
      ii. Power indicator LED turns off
   c. Visually check if safety switch is stuck in the closed circuit position
Section 2: Determining Cause of Malfunction

In this section you will troubleshoot and fix malfunctioning devices. Using what was collected from Section 1 and the 5 steps of troubleshooting, determine the damaged part(s) of the device. You will rotate between three machines with different problems.

Instructions:

- Read background of the device
- Go through 5 steps of troubleshooting
- Locate damaged part(s)
- Confirm choice with TA
- Replace damaged part(s)
- Reconnect machine
- Check overall function (step 1)
- Check rotor speed (step 2)

Appendix

A. Using a Multimeter
   a. To test connectivity

   i. Set dial to alarm setting
   ii. Meter will beep if circuit is complete
   iii. Test by touching the red and black probes together
b. To test voltage

i. Set meter to AC or DC setting
ii. Touch probes to opposite sides of voltage being tested

c. To test Resistance

i. Set meter to ohms
ii. Touch probes to either side of capacitance being measured
iii. Note the units if applicable

B. Using a Tachometer

a. Place small piece of reflective tape on rotor
   i. Do not place next to a number
b. Connect centrifuge to power and turn on
c. Using window on the lid point tachometer to the reflective tape  
   i. If tape is on angled part of rotor hold meter at an angle  

d. Press power button on tachometer  
e. Record RPM reading