

# INSTRUCTIONS

## Centrifugic® Centrifuge Model 228

Cat. No. 04-978-228 (115V)  
04-978-229 (230V)

The Model 228 Centrifugic Centrifuge is a portable, bench-top centrifuge designed for clinical, educational, and industrial applications. The Centrifugic Centrifuge features a 6-place 45° angle nylon rotor and nylon shields which will accommodate tubes ranging in size from 7 to 17mm in diameter and 100 to 133mm in length. This includes 7ml, 10ml, and 15ml Vacutainer\* tubes. Additionally, Tube Adapters 4-978-23 are available to accommodate the smaller 10-13 mm diameter by 75 mm long tubes.

The unit operates at a fixed speed of 3300 rpm and develops an RCF force of 1380 x G. Sedimentation is controlled by centrifugation time. The motor is thermally protected and has permanently lubricated ball bearings. The cast iron base and vibration isolation mounting provide additional stability.

The feet on which the centrifuge rests incorporate suction cups which adhere to smooth benchtops. This serves to reduce the movement of the unit due to vibration. In order to prevent damage to these feet, **never pick the unit straight up off of the benchtop. Always slide the unit off of the edge of the work surface.**

The Centrifugic Centrifuge also features a 15 minute timer with a hold position to give the user the option of continuous operation. The time selector functions as the power switch, engaging the motor when the run time has been set and the lid is closed.

The Model 228 has a lid latch to positively secure the lid closed. The latch is operated by a knob located at the front of the lid. The latch operates through a quarter turn.

**Warning: Always be sure that the lid is latched before operating the unit.**

\*Vacutainer is a registered trademark of Becton-Dickinson Co.

## UNPACKING

Each Fisher Centrifugic Centrifuge is shipped in a single carton. Carefully unpack the carton and check the contents against the packing list below. Should a discrepancy exist, notify your Fisher branch or representative.

*NOTE: If damage is observed, keep the shipment intact -- including the carton and all packing material -- and file a claim with the final carrier. Usually the firm will send an investigator to ascertain liability.*

Qty	Item	Part No.
1	Centrifuge Assembly 04-978-228 (115v) or 04-978-229 (230v)	50775 50867
1	Rotor, Cat.No. 04-978-232	50779
6	Shield, Cat.No. 04-978-233	50780
1	Thumbscrew 04-978-228 (115v) or 04-978-229 (230v)	38816 50864
1	Instruction Manual	70906

## INSTALLATION

To install the Model 228 Centrifugic Centrifuge, perform the following:

1. Place centrifuge base on a flat level surface.
  2. Remove the six shields from their packing and carefully insert them into the six holes in the rotor.
  3. Place rotor on drive shaft. Align flat on drive shaft with hole position "1" on rotor.
  4. Secure rotor (with supplied thumbscrew) onto drive shaft.
- CAUTION: Apply finger-tight pressure only; do not use wrench or other tool.**
5. Be sure that the six shields are in place. Never run the unit without all shields in place.

## CONTROLS

### Lid-Power Interlock

The lid interlock is designed to interrupt power to the motor whenever the lid is opened. This interlock is implemented by a leaf switch. The lid should not be used as an ON/OFF switch.

### Time Control

The time control is the power switch for the motor. To start a run, the time control is simply turned to the desired centrifugation time. During the run, the timer rotates counterclockwise to

indicate the time remaining. The user may also use the "hold" feature to make self-timed runs by placing the time control into its HOLD position.

## OPERATION

Centrifuge operation involves simply loading the rotor, closing and latching the lid, and selecting a centrifugation time. The rotor must be properly loaded to achieve good sedimentation and vibration-free operation. Tubes of the same capacity and load must be placed 180 apart. Use water, if necessary, to balance the load if there is an odd number of tubes. Balance load to within 1.0 gram.

*NOTE: Never use shot, weights, or mercury in tubes or shields.*

## Procedure

To operate the centrifuge, perform the following:

1. Turn the time control to OFF.
2. Connect the unit to an appropriate power source.
3. Unlatch and open lid; place tubes into rotor in a balanced pattern.
4. Close and latch the lid.
5. Rotate the time control CW beyond, then CCW back to, desired setting.
6. When the rotor has stopped spinning, raise the lid and remove the tubes.

## Determining Relative Centrifuge Force

To determine the relative centrifugal force (RCF), RPM and tube tip radius must be known. Different rotor loads, tubes, line voltage, and condition of the centrifuge will affect the RPM. An access hole for a phototachometer is provided in the lid. The tube tip radius is defined as the distance from the center of the shaft to the farthest end of the tube. When installed in the rotor on the Model 228, this distance is fixed at 11.32cm with shields installed, but with no tube adapters or cushions.

RCF is defined as the force acting on a sample being centrifuged relative to the force, due to gravity, that normally acts on it. Such force must take into account the tip radius of the installed tube and the RPM at which it's spinning. Assuming that the normal gravitational force is at sea level, the following formula expresses the strength of the gravity field to which a sample is subjected.

$$RCF = 1.12 \times 10^{-5} \times R \times RPM^2$$

where;

R = tip radius in cm (11.32cm)

RPM= speed in revolutions per min.

$1.12 \times 10^{-5}$  = universal constant for sea level installation

## SAFETY

When the unit is properly operated, it does not present any safety hazard. However, the following safety precautions should be observed:

### Lid Latch

Be certain that lid is securely latched before operating unit.

### Lid-Power Interlock

Do not attempt to defeat the interlock. Do not operate the centrifuge if the interlock has failed.

### Balancing Load

Always load the rotor in a balanced pattern. If excessive vibration or noise develops during a run, discontinue operation. Never use shot, mercury, or weights to balance the load.

### Electrical Shock Hazard

Disconnect the unit from its power source before cleaning or disassembling it.

### Potential Biohazard

If spills and or tube breakage occurs, there may be a biological hazard present. Clean using approved laboratory procedures.

## Damage

Do not operate the unit if it shows signs of chemical or mechanical damage.

## MAINTENANCE

The centrifuge requires no other maintenance other than routine cleaning with a damp cloth and a mild detergent. Because of the potential biohazard, any spills should be cleaned immediately. To clean the bowl, lid, rotor, and shields, perform the following:

**NOTE: Do not use ketones, aromatic hydrocarbons, chlorinated hydrocarbons, or mineral acids on lid, bowl, rotor or shields.**

1. Disconnect the unit from its power source.
2. Wipe the bowl and lid with a mild detergent-soaked cloth.
3. Remove the rotor and shields and wash in a mild detergent solution.

**NOTE: Visually inspect rotor and shields for evidence of damage and replace if necessary.**

## SERVICE

Disconnect the unit from power source before servicing it. Service should be performed by factory trained personnel. To repair or replace the motor, timer, or the leaf switch, follow the instructions below for gaining access.

1. Disconnect the line cord from the power source.
2. Remove rotor.
3. Place unit upside down and remove four outer screws or bolts

securing bowl to base.

4. Remove front panel knob.
5. With unit still upside down, peel down the bottom edge of the front panel overlay to expose two small screws. Remove the two outer screws only.
6. Turn unit right side up. Carefully lift up and remove the plastic housing.
7. Remove four screws holding two parts of chassis together.
8. All internal parts are now exposed for servicing.

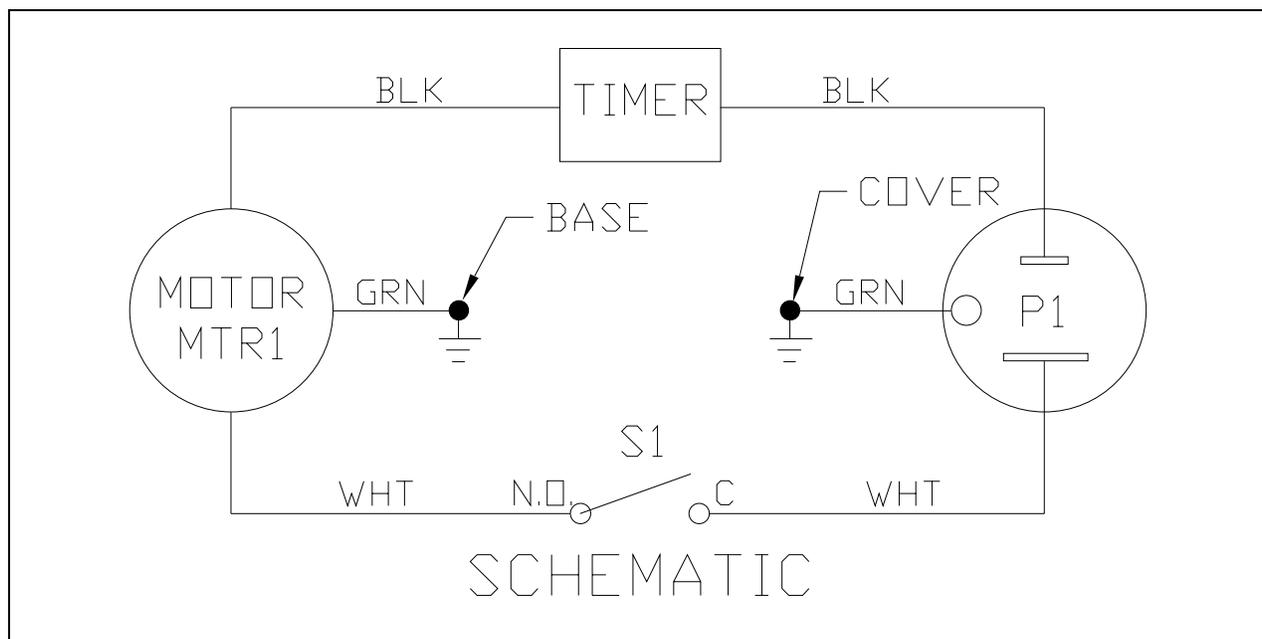
## ACCESSORIES

Item	Cat.No.
Rotor, 6-place angle	04-978-232
Shields (package of 6)	04-978-233
Tube Adapters (pack of 6)	04-978-23
Photoelectric Tachometer	05-028-25
Cushions <sup>2</sup>	
17mm x 7mm thk. (6/pk)	04-978-64

<sup>1</sup>For 10-13mm dia. by 75mm long tubes. <sup>2</sup>May be required to support tubes with certain closures.

## PARTS LIST

Item	115V Part No.	230V Part No.	Schematic Code
Front Panel Overlay	88156	88156	
Motor	50782	50990	MTRI
Timer	106868	106868	TIMER
Line Cord	04538	20865	P1
Bushing (Line cord)	09556	09556	
Spacer	70919	70919	
Nut, Hex (MTR Mount)	07426	07426	
Vacuum Cup Support	09568	09568	
Knob	106869	106869	
Leaf Switch	67516	67516	SI
Rotor Thumb Screw	38816	50864	



### Model 228 Centrifuge User Trouble Shooting Guide

Symptom	Possible Cause	Possible Solution
Unit will not run	No power to unit	Check that unit is plugged in Check that outlet has power
Unit vibrates	Rotor loaded improperly	Check that rotor loading is balanced.
	Rotor not tightened properly.	Check that rotor fits securely on motor shaft and that thumb screw is tight.
	Motor mounting nuts are loose	View bottom of unit and check that the four nuts that hold the motor to the base casting are tight.
Unit is noisy	See "Unit vibrates" section	See "Unit vibrates" section
	Lid not latched securely	Check that lid is latched. If lid is latched but not tight, adjust lid latch pawl.

### Repair Trouble Shooting Guide

Symptom	Possible Cause	Check	Parts
Unit will not run	Wiring	Check wiring connections.	
	Timer	Check for power in and out of timer.	Timer; 106868
	Lid Interlock	Check that lid latch is actuating interlock switch. Check that switch is not jammed. Check switch continuity.	Leaf Switch; 67516
	Motor	Check for power to motor. Check brushes. Check that motor shaft turns freely.	Motor; 50782 (115V), 50990 (230V),
Unit vibrates or is noisy	See User Trouble Shooting Guide		
	Damaged Motor	Check that motor shaft turns freely and does not "wobble". Check for shaft "side play".	Motor; 50782 (115V), 50990 (230V),
	Damaged Rotor	Check that rotor fits securely to shaft and does not "wobble" ..	Rotor; 50779 Rotor with Shields; 04-978-233

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Repair Service: 1-800-395-5442  
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