Instruction For Use

GH-3.8 Swinging Bucket Rotor

In Beckman Coulter Allegra 6 Series, GS-6 Series, Spinchron Series, and GP Series Centrifuges

PN GS6-TB-003MD
June 2018

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BECKMAN COULTER

GH-3.8 Swinging Bucket Rotor
In Beckman Coulter Allegra 6 Series, GS-6 Series, Spinchron Series, and GP Series Centrifuges
PN GS6-TB-003MD (June 2018)

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Original Instructions

Safety Notice

This safety notice summarizes information basic to the safe use of the equipment described in this publication. The international symbol displayed above is a reminder to the user that all safety instructions should be read and understood before operation or maintenance of this equipment is attempted. When you see the symbol on other pages of this publication, pay special attention to the specific safety information presented. Observance of safety precautions will also help to avoid actions that could damage or adversely affect the performance of the rotor system.

Safety Notice

- This rotor is warranted for 7 years (see the warranty at the back of this publication). Beckman Coulter recommends that you retire the rotor from use at the end of the 7-year warranty period to prevent the possibility of a rotor mishap resulting from material fatigue.
- Handle body fluids with care because they can transmit disease. No known test offers complete assurance that they are free of micro-organisms. Some of the most virulent—Hepatitis (B and C) and HIV (I–V) viruses, atypical mycobacteria, and certain systemic fungi— further emphasize the need for aerosol protection. Handle other infectious samples according to good laboratory procedures and methods to prevent spread of disease. Because spills may generate aerosols, observe proper safety precautions for aerosol containment. Do not run toxic, pathogenic, or radioactive materials in this rotor without taking appropriate safety precautions. Biosafe containment should be used when Risk Group II materials (as identified in the *World Health Organization Laboratory Biosafety Manual*) are handled; materials of a higher group require more than one level of protection.
- Dispose of all waste solutions according to appropriate environmental health and safety guidelines.
- The rotor and accessories are not designed for use with materials capable of developing flammable or explosive vapors. Do not centrifuge such materials (such as chloroform or ethyl alcohol) in or handle or store them near the centrifuge.
- If glass tubes break, remove the glass very carefully from the adapter, bucket, or cavity. If all the glass particles are not contained in the bucket or cavity, be careful when examining or cleaning the centrifuge gasket and chamber as glass particles may be embedded in their surfaces.
- Inspect the rotor once a month, especially inside cavities, for rough spots or pitting, white powder deposits—frequently aluminum oxide—or heavy discoloration. If any of these signs are evident, do not run the rotor. Contact your Beckman Coulter representative for information bout the Field Rotor Inspection Program and the rotor repair center. To reduce the potential for corrosion, clean buckets or carriers thoroughly immediately following a tube or well plate breakage. Be sure to remove all glass particles from buckets or carriers.

- Components or accessories designed for other rotors may cause rotor mishap if used in this rotor. Use only components and accessories that have been designed for use in this rotor. *The safety of rotor components and accessories made by other manufacturers cannot be ascertained by Beckman Coulter. Use of other manufacturers' components or accessories in the rotors may void the rotor warranty and should be prohibited by your laboratory safety officer.* If tubes, microplates, or other labware made by manufacturers other than Beckman Coulter are used, reduce rotor speed to prevent breakage. The strength of glass and plastic tubes can vary between lots, and will depend on handling and usage; we highly recommend that you pretest labware in the rotor using water samples to determine optimal operating conditions. Scratches (even microscopic ones) significantly weaken glass tubes.
- Do not substitute a metal fastener for the plastic tiedown nut supplied with the rotor. If a tie down nut comes off the shaft during centrifugation, the *plastic* nut furnished will break apart in the chamber, causing minimal damage to the instrument. A loose *metal* object could substantially damage the rotor, chamber, and lid, and could potentially escape the chamber into the laboratory, causing personal injury or property damage.
- The rotor must be run with a full complement of buckets and/or multiwell plate carriers attached to the yoke. You can run four buckets, four multiwell plate carriers, or two buckets and two carriers (with like components loaded opposite each other). If only two buckets are loaded with blood bags, bottles, or modular disk adapters, the other two buckets should contain at least a minimal "blank" load (e.g., empty modular disk adapters) to achieve optimal results and to avoid rotor imbalance.
- The maximum allowable run speed (3750 rpm) listed in the rotor specifications is for operation when all conditions are within the standard specifications (using buckets). Maximum allowable run speed when using Micro Plus multiwell plate carriers is 3250 rpm. Do not overload the rotor without reducing the speed (see SPEED DERATING). Failure to derate will reduce the safe useful life of the rotor.
- If disassembly reveals evidence of leakage, you should assume that some fluid escaped the rotor. Apply appropriate decontamination procedures should be applied to the centrifuge and accessories.

Alerts for Danger, Warning, Caution, Important, and Note

DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury.

IMPORTANT IMPORTANT is used for comments that add value to the step or procedure being performed. Following the advice in the Important adds benefit to the performance of a piece of equipment or to a process.

NOTE NOTE is used to call attention to notable information that should be followed during installation, use, or servicing of this equipment.

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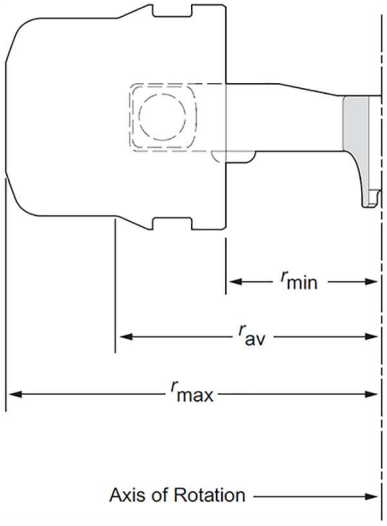
GH-3.8 Rotor

This rotor has been manufactured in a registered ISO 9001 or 13485 facility for use with the specified Beckman Coulter centrifuges.

Specifications



SPECIFICATIONS

Maximum speed (buckets). . . . . 3750 rpm
Maximum speed (Micro Plus carriers) . . . . . 3250 rpm
Critical speed range[a] . . . . . 400 to 1450 rpm
Maximum solution density . . . . . 1.2 g/mL
Relative Centrifugal Fields[b] at maximum speed
(see Table 1 for RCF at other speeds)
using buckets (rmax = 204 mm). . . . . 3210 × g
using Micro Plus carriers (rmax = 163 mm) . . . . . 1924 × g
Conditions requiring speed reduction . . . . . see *Speed Derating*
Number buckets or carriers 4
Available tubes and bottles . . . . . see Table 3
Maximum load allowed in each bucket at rated speed (excluding weight of bucket and cover). . . 1000 grams
Maximum load allowed in each Micro Plus carrier at rated speed (excluding weight of carrier). . . . . 500 grams
Maximum rotor capacity . . . . . 3 liters
Approximate acceleration and deceleration times . . . . . see Table 6 and Table 7
Weight of fully loaded rotor (buckets with covers). . . . . 11.4 kg (25.2 lb)
Rotor yoke material . . . . . stainless steel
Bucket material . . . . . anodized aluminum
Carrier material . . . . . anodized aluminum

[a] The critical speed range is the range of speeds over which the rotor shifts so as to rotate about its center of mass. Passing through the critical speed range is characterized by some vibration.

[b] Relative Centrifugal Field (RCF) is the ratio of the centrifugal acceleration at a specified radius and speed ($r\omega^2$) to the standard acceleration of gravity (g) according to the following formula:

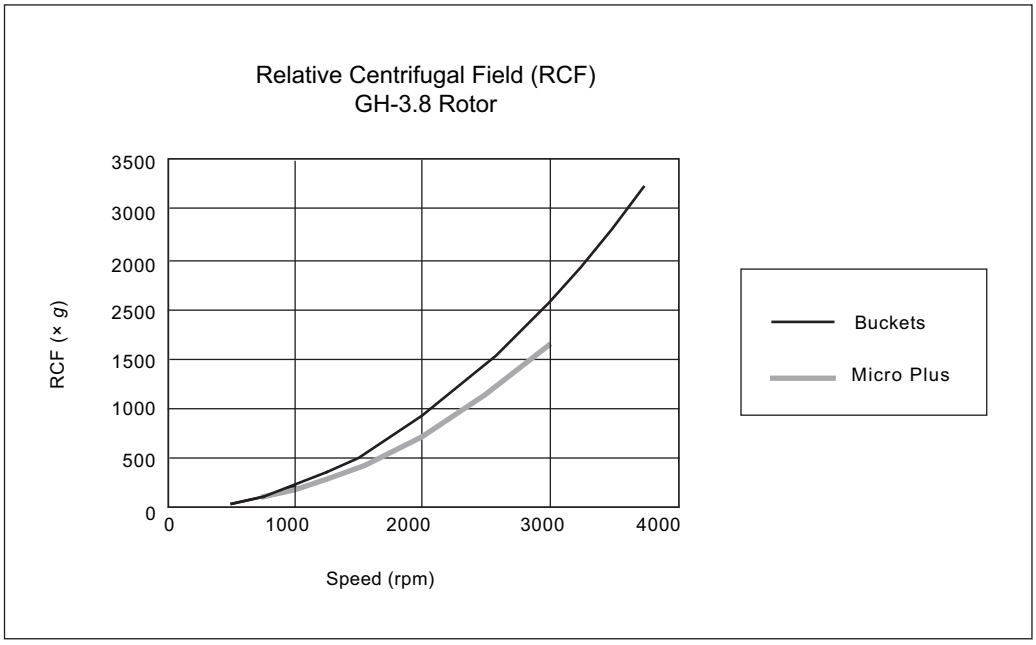
$$\mathrm{RCF} = \frac{r\omega^2}{g}$$

where r is the radius in millimeters, ω is the angular velocity in radians per second (2π RPM /60), and g is the standard acceleration of gravity (9807 mm/s^2). After substitution:

$$\mathrm{RCF} = 1.12r\left(\frac{\mathrm{RPM}}{1000}\right)^2$$

Table 1 Relative Centrifugal Fields for the GH-3.8 Rotor. Entries in the table are calculated from the formula RCF = 1.12 r (RPM/1000)^2 and are then rounded to three significant digits.

Rotor Speed (rpm)	Relative Centrifugal Field (× *g*) at r_{max}	
	Buckets (204 mm)	Micro Plus Carriers (163 mm)
3750	3210	
3500	2800	Don't run above 3250
3250	2400	1928
3000	2060	1643
2750	1730	1381
2500	1430	1141
2250	1160	924
2000	913	730
1750	700	559
1500	514	411
1000	228	183
500	57	46



Description

Specific information about the GH-3.8 rotor is given here. Information about the use and care of centrifuges is contained in the individual instrument instruction manuals, which should be used in combination with this manual for complete centrifuge and rotor operation information.

The Rotor

The GH-3.8 rotor, rated for 3750 rpm, is used in Beckman Coulter Allegra 6 series, GS-6 series, Spinchron series, and GP series centrifuges. This four-place swinging bucket rotor carries a wide range of tube and bottle sizes (from 1.5 to 750 mL) or single- to quad-pack blood bags in buckets, as well as 96-well multiwell plates in specially designed carriers. This rotor rapidly sediments protein precipitates, large particles, cells, and cell debris. It can also be used for binding studies and for separating serum from whole blood.

The rotor yoke is made of stainless steel. Either buckets or multiwell plate carriers, both made of anodized aluminum, may be run by placing them over pivot pins on the arms of the yoke. Both buckets and carriers swing out to a horizontal position during centrifugation.

⚠ CAUTION

Although rotor components and accessories made by other manufacturers may fit in the GH-3.8 rotor, their safety in this rotor cannot be ascertained by Beckman Coulter. Use of other manufacturers' components or accessories in the GH-3.8 rotor may void the rotor warranty and should be prohibited by your laboratory safety officer. Only the components and accessories listed in this publication should be used in this rotor.

Buckets and Accessories

Several types of labware can be placed in the buckets, depending upon your application: modular disk adapters (for tubes of various sizes), bottle adapters, blood bag cups, and Aerosolve cannisters (when aerosol containment is required). Bucket covers are also available as an aid toward containment.

Modular Disk Adapters

Tubes are supported in modular disk adapters, which can also serve as tube racks in the laboratory. The adapter disks are color coded by the tube size they accommodate (see Table 2); the number of disks used in an adapter assembly depends upon the length of tubes used. A tube decanter is available to hold either 10-mm or 12-mm tubes securely in the blue adapter, allowing all the tubes to be decanted at once. Additionally, 1.5-mL Microfuge tubes can be run using a special plate that fits on top of the blue adapter. Both of these accessories are described in Table 2. Beckman Coulter tubes and bottles available for use in the GH-3.8 rotor buckets are described in Table 3.

Bottle Adapters

Bottles are supported in polypropylene adapters that fit inside the rotor buckets. The adapters are ribbed for strength and accommodate three bottle sizes, including one conical bottle (see Table 2).

Blood Bag Cups

Polypropylene cups provide support for blood bags in the rotor buckets. Blood bag cups are available in two sizes: one for single- or double-pack bags, and one for triple- or quadpack bags (see Table 2).

Bucket Covers

Transparent covers made of a high-impact plastic are available for the GH-3.8 rotor buckets. Each cover requires an O-ring (made of ethylene propylene) that seats on a ledge inside the bucket. The covers are held in place by attached latches. Although the covers *are not designed to contain aerosols* that may result from tube breakage, they will contain most liquids and broken tube particles, reducing the need to clean the centrifuge chamber, and allowing you to take appropriate precautions before opening the covers in the event of tube breakage.

Aerosolve Cannisters

Aerosolve cannisters, designed to minimize aerosol leakage and liquid spills, can be used in the GH 3.8 buckets when this type of containment is required. The cannister was tested* to demonstrate containment of microbiological aerosols under normal operating conditions of the associated Beckman Coulter centrifuge, when used and maintained as instructed. Aerosolve cannisters hold a variety of tube sizes in racks, or they can be used as 500-mL wide-mouth bottles.

* Validation of microbiological containment was done at an independent third-party testing facility (CAMR, Porton Down, UK, or USAMRIID, Ft. Detrick, MD, U.S.A.). Improper use or maintenance may affect seal integrity and thus containment.

Table 2 Modular Disk Adapters, Bottle Adapters, and Cups Available for the GH-3.8 Rotor

MODULAR DISK ADAPTERS (polypropylene)									
Color Code	**Nom. tube Vol. (mL)**	**Nom. Tube Dia. (mm)**	**Max. No. Tubes per Adapter**	**Max. No. tubes in Rotor**	**r_{max} at Adapter Bottom (mm)**	**RCF at maximum Speed (x *g*)**	**No. Disks per Adapter**	**Adapter Part No.**	
								Set of Two	**Set of Four**
blue	3 5	10 12	37	148	184.7	2910	5	359469	359148
tan	3 & 5	13	30	120	184.7	2910	5	359478	359157
orange	7 & 10	14	24	96	184.7	2910	6	359470	359149
purple	12	16	19	76	184.7	2910	7	359471	359150
green (conical)	15	18	14	56	194.7	3070	6	359472	359151
green	15 & 20	18	14	56	184.7	2910	7	359473	359152
lit. green (conical)	30 & 50	30	4	16	191	3010	5	359475	359154
yellow	50	29	7	28	184.7	2910	6	359474	359153
dk. blue	50	35	4	16	184.7	2910	7	359476	359155
brown	100	44	2	8	184.7	2910	3	359477	359156
tube decanter	3 5	10 12	37	148	—	—	1	343108[a] (each)	—
1.5-mL adapter plate	1.5 & 1.8	11	26	104	—	—	1	354511[a] (each)	—

BLOOD BAG CUPS (polypropylene)						
Color Code	**Cup Capacity**	**Size (mm)**	**Number Bags per Cup**	**r_{max} at Cup Bottom (mm)**	**RCF at Maximum Speed (x *g*)**	**Part Number (qty one)**
yellow	single bag double pack	90	2	196.2	3090	356856
orange	triple pack quad pack	97	1	196.7	3100	356857

Table 2 Modular Disk Adapters, Bottle Adapters, and Cups Available for the GH-3.8 Rotor *(Continued)*

AEROSOLVE CANNISTER RACKS (polypropylene)								
Color Code	**Nom. Tube Vol. (mL)**	**Nom. Tube Dia. (mm)**	**Max. No. Tubes per Adapter**	**Max. No. Tubes in Rotor**	**r_{max} at Adapter Base (mm)**	**RCF at Maximum Speed (× *g*)[b]**	**Adapter Part Number**	
							Set of Two	**Set of Four**
white	1.5	11	24	96	174	2740	354495 (each)	—
blue	3 & 5	12	24	96	174	2740	359482	359160
tan	5	12	24	96	180	2840	359489	358993
orange	10	14	18	72	175	2760	359483	359161
purple	12 3 & 5	16 12	12 6	48 24	177 178	2790 2800	359484	359162
white (vials)	15	14	10	40	174	2740	344517 (each)	—
green	15 & 20 3 & 5	18 12	12 6	48 24	174 176	2740 2770	359485	359163
lt. green	15 (conical) 3 & 5 (round bottom)	17 12	6 6	24 24	181 180	2850 2840	359487	358991
lime green	50 (conical) 3 & 5 (round bottom)	30 12	4 4	16 16	181 180	2850 2840	359488	358992
yellow	50 3 & 5	29 12	4 4	16 16	177 178	2970 2800	359486	359164
orange	230	62	1	4	180	2852	—	356985
Cannister Kit[c]	500	—	—	—	183	2880	359481	359232

Table 2 Modular Disk Adapters, Bottle Adapters, and Cups Available for the GH-3.8 Rotor *(Continued)*

BOTTLE ADAPTERS (polypropylene)						
Color Code	**Nominal Bottle Volume (mL)**	**Nominal Bottle Diameter (mm)**	**Maximum Number Bottles in Rotor**	**r_{max} at Bottle Bottom (mm)**	**RCF at Maximum Speed (x *g*)**	**Adapter Part Number (qty one)**
orange (conical)	230	62	4	195.1	3070	356983 (use with 349946)
yellow	250	62	4	195.1	3070	349946
warm red (conical)	250[d]	62	4	203.2	3200	349849
light purple[e]	500	70	4	200.2	3150	349945
blue	750	96	4	195.2	3070	349846

a. Tube retainers and adapter plates are sold individually.

b. Tube racks used with Aerosolve cannisters do not provide full tube support; some manufacturers' plastic and glass tubes cannot withstand the maximum forces generated by this rotor when used in these racks. Beckman Coulter highly recommends that you pretest other manufacturers' tubes (in the appropriate Aerosolve cannister labware) using water samples.

c. Cannisters and lids are made of polyphenylsulphone; O-rings are ethylene-propylene. Cannister kit includes the pad that must be used beneath the cannister in the GH-3.8 rotor; sold in sets of two or four.

d. Corning polypropylene bottle.

e. Light purple adapter replaces the previous tan adapter. See note under *Symmetric and Balanced Loading* for weight difference information.

Table 3 Beckman Coulter Tubes and Bottles for the GH-3.8 Rotor

Dimensions	**Volume (mL)**	**Description**	**Part Number**	**Adapter**	
				Set of Two	**Set of Four**
OPEN-TOP TUBES					
16 × 76 mm	10	polypropylene	355640	349471 359484[a]	359150 359162[a]
16 × 76 mm	10	polycarbonate	355630	359471 359484[a]	359150 359162[a]
16 × 76 mm	10	stainless steel	301108	359471 359484[a]	359150 359162[a]
18 × 98 mm	15	polycarbonate	342080	359473	359152
18 × 98 mm	15	polyethylene	342081	359473	359152
18 × 98 mm	15	polypropylene	342082	359473	359152
29 × 104 mm	50	polycarbonate, graduated	363075 (pkg/8)	359474 359486[a]	359153 359164[a]
29 × 103 mm	50	polypropylene	357007	359474 359486[a]	359153 359164[a]
29 × 103 mm	50	polycarbonate	363647	359474 359486[a]	359153 359164[a]

Table 3 Beckman Coulter Tubes and Bottles for the GH-3.8 Rotor *(Continued)*

Dimensions	Volume (mL)	Description	Part Number	Adapter	
				Set of Two	Set of Four
TUBES WITH SNAP-ON CAPS					
11 × 38 mm	1.5	polypropylene	357448	359469 354511[b] 354495[a]	359148
11 × 38 mm	1.5	polypropylene	356090	359469 354511[b] 354495[a]	359148
11 × 38 mm	1.5	blue polypropylene	356091	359469 354511[b] 354495[a]	359148
11 × 38 mm	1.5	green polypropylene	356092	359469 354511[b] 354495[a]	359148
11 × 38 mm	1.5	yellow polypropylene	356093	359469 354511[b] 354495[a]	359148
11 × 38 mm	1.5	orange polypropylene	356094	359469 354511[b] 354495[a]	359148
11 × 38 mm	1.5	polypropylene (cap separate)	343169	359469 354511[b] 354495[a]	359148
11 × 39 mm	1.8	white polyethylene	340196	359469 354511[b] 354495[a]	359148
29 × 103 mm	50	polypropylene	357005	359474 359486[a]	359153 359164[a]
29 × 103 mm	50	polycarbonate	363664	359474 359486[a]	359153 359164[a]
CONICAL TUBES					
17 × 120 mm	15	polypropylene (graduated)	355663	359472 359487[a]	359151 358991[a]
62 × 141 mm	230	polycarbonate (with cap)	356987[c]	349946[b]	356983 356985[a]
62 × 141 mm	230	polypropylene (with cap)	356989[c]	349946[b]	356983 356985[a]

Table 3 Beckman Coulter Tubes and Bottles for the GH-3.8 Rotor *(Continued)*

Dimensions	Volume (mL)	Description	Part Number	Adapter	
				Set of Two	Set of Four
BIOVIALS					
14 × 55 mm	4	polypropylene	566353	359470 344517[a] (each)	359149
BOTTLES					
29 × 104 mm	50	polycarbonate (with cap assembly)	361693	359474 359486[a]	359153 359164[a]
29 × 104 mm	50	polycarbonate (with screw cap)	357002	359474 359486[a]	359153 359164[a]
29 × 104 mm	50	polypropylene (with cap assembly)	357001 or 361694	359474 359486[a]	359153 359164[a]
29 × 104 mm	50	polypropylene (with screw cap)	357003	359474 359486[a]	359153 359164[a]
28.5 × 107 mm	50	Teflon with high-speed screw cap	363076	359474 359486[a]	359153 359164[a]
62 × 141 mm	230	conical, wide-mouth polycarbonate	356987[c]	356983 (use w/ 349946)	—
62 × 141 mm	230	conical, wide-mouth polypropylene	356989[c]	356983 (use w/ 349946)	—
62 × 136 mm	250	polycarbonate (with screw cap, round bottom)	355673	349946[b]	—
62 × 122 mm	250	wide-mouth polycarbonate (with cap)	356013	349946[b]	—
62 × 122 mm	250	wide-mouth polypropylene (with cap)	356011	349946[b]	—
62 × 122 mm	250	wide-mouth polycarbonate	358275	349946[b]	—
62 × 120 mm	250	wide-mouth polypropylene	358326	349946[b]	—
69 × 160 mm	500	polypropylene (with cap assembly)	355607[c]	349945[b]	—
69 × 159 mm	500	polypropylene (with cap)	355665[c]	349945[b]	—
69 × 159 mm	500	polypropylene	355650[c]	349945[b]	—

Table 3 Beckman Coulter Tubes and Bottles for the GH-3.8 Rotor *(Continued)*

Dimensions	Volume (mL)	Description	Part Number	Adapter	
				Set of Two	Set of Four
BOTTLES (Continued)					
96 × 130 mm	750	polycarbonate (with screw cap[d])	358299[e]	349846[b]	—
96 × 130 mm	750	polypropylene (with screw cap[d])	356855[e]	349846[b]	—

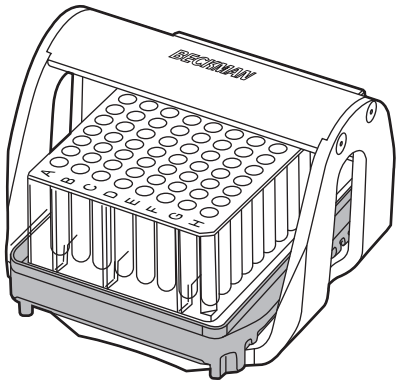
a. Adapter used in Aerosolve cannister (part number 359232).
b. Tube retainers and adapter plates are sold individually.
c. These tubes cannot be run with bucket covers in place.
d. Replacement bottle cap part number is 356263 (set of 6).
e. Do not load the 750-mL bottle directly into the bucket; always use the adapter.

⚠ CAUTION

Do not run chloroformed samples in Aerosolve cannisters. Chloroform vapors can damage the cannister material.

Micro Plus Multiwell Plate Carriers

Figure 1 The Micro Plus Multiwell Plate Carrier



Micro Plus multiwell plate carriers (see Figure 1) are used by installing them on the pivot pins in place of the buckets normally used with the rotor. Micro Plus carriers are made of aluminum, and are black-anodized for corrosion resistance. The design of this carrier allows higher operating speeds than were possible in older carrier designs. A blue thermoplastic base is used to house the multiwell plates. A flexible plastic pad between the base and the plate(s) supports the plates during a run. Each Micro Plus carrier will accommodate a deep-well multiwell plate, or can run up to three 96-well microplates (when more than one are run, one plate is placed directly on top of the other). Refer to Table 4 for a list of labware that can be used with the carrier. Multiwell plates will break if g-forces are too high. *Rotor speed must not exceed 3250 rpm when Micro Plus carriers are run, and additional speed reduction is required if maximum load limits (500 grams per carrier) are exceeded.*

Installation

The Rotor Yoke

NOTE Before the first use of a new rotor, lubricate the rotor pins and bucket pin sockets as described under *Maintenance*. Also, remove the lubrication decal over the rotor drive hole (in the yoke) and lubricate the inside of the drive hole as described under *Maintenance*.

1 Note the orientation of the pin on the drive shaft and the groove in the bottom of the rotor yoke (see Figure 2).

2 Holding the rotor yoke with both hands, carefully lower it onto the drive shaft. Make sure the pin on the drive shaft fits into the groove in the bottom of the rotor yoke.

⚠ CAUTION

Never drop the yoke onto the shaft. The shaft can be bent or broken if the yoke is dropped onto it.

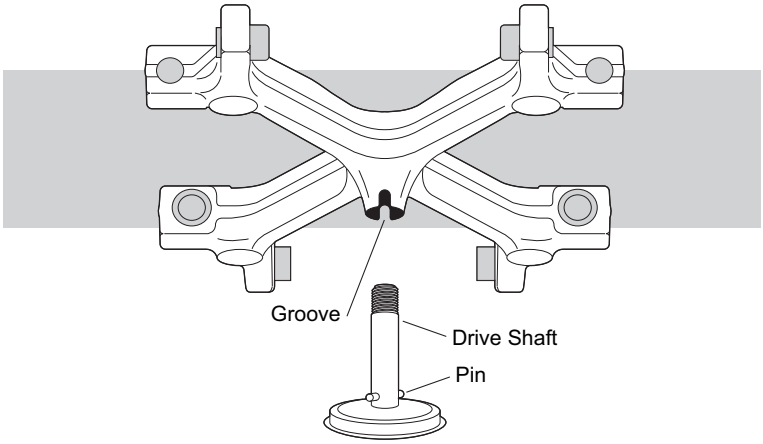
Table 4 *Labware for Use with Micro Plus Carriers*

Description	Volume	Part Numbers	Required Accessory		Rack
			Description	Part Number	
Multiwell plate, 96-well, nonsterile	300 µL/well	609844[a] (pkg/100)	—	—	—
Deep-well polystyrene plate, 96-well, nonsterile	1 mL/well	267001 (pkg/24)	Cap strip, nonsterile[a]	267002 (pkg/10)	—
			Cap strip, sterile[a]	267005 (pkg/10)	
			Aluminum foil lid[b]	538619 (pkg/100)	
Deep-well polystyrene plate, 96-well, sterile	1 mL/well	267004 (pkg/24)	Cap strip, nonsterile[a]	267002 (pkg/10)	—
			Cap strip, sterile[a]	267005 (pkg/10)	
			Aluminum foil lid[b]	538619 (pkg/100)	
Deep-well polypropylene plate, 96-well, nonsterile	1 mL/well	267006 (pkg/24)	Cap strip, nonsterile[a]	267002 (pkg/10)	—
			Cap strip, sterile[a]	267005 (pkg/10)	
			Aluminum foil lid[b]	538619 (pkg/100)	
Deep-well polypropylene plate, 96-well, sterile	1 mL/well	267007 (pkg/24)	Cap strip, nonsterile[a]	267002 (pkg/10)	—
			Cap strip, sterile[a]	267005 (pkg/10)	
			Aluminum foil lid[b]	538619 (pkg/100)	
Square-well polypropylene plate	2 mL/well	140504 (pkg/24)	Aluminum foil lid[b]	538619 (pkg/100)	—
Microfuge tube, polypropylene, clear	1.5 mL	357448 (pkg/500)	Rack insert, white	373696 (pkg/25)	373661 (holds 24 tubes)
Microfuge tube, polypropylene, clear	1.5 mL	356090 (pkg/500)	Rack insert, white	373696 (pkg/25)	373661 (holds 24 tubes)
Microfuge tube, polypropylene, blue	1.5 mL	356091 (pkg/500)	Rack insert, white	373696 (pkg/25)	373661 (holds 24 tubes)
Microfuge tube, polypropylene, green	1.5 mL	356092 (pkg/500)	Rack insert, white	373696 (pkg/25)	373661 (holds 24 tubes)
Microfuge tube, polypropylene, yellow	1.5 mL	356093 (pkg/500)	Rack insert, white	373696 (pkg/25)	373661 (holds 24 tubes)
Microfuge tube, polypropylene, orange	1.5 mL	356094 (pkg/500)	Rack insert, white	373696 (pkg/25)	373661 (holds 24 tubes)

a. Caps are optional.

b. Requires soft rubber roller (4-in.), part number 538618, for installation.

Figure 2 Rotor Yoke and Centrifuge Drive Shaft. Be sure the pin in the drive shaft is in the groove in the rotor yoke.



3 Before using the tie-down nut, check it for damage such as distortion, splitting, or stripped threads; replace it if it is damaged. If no damage is apparent, lightly coat the O-ring (927571) in the base of the nut with silicone vacuum grease (335148). Do not use any type of lubricant or grease on the threads of the tie-down nut.

4 Screw the tie-down nut (366642) onto the centrifuge drive shaft.

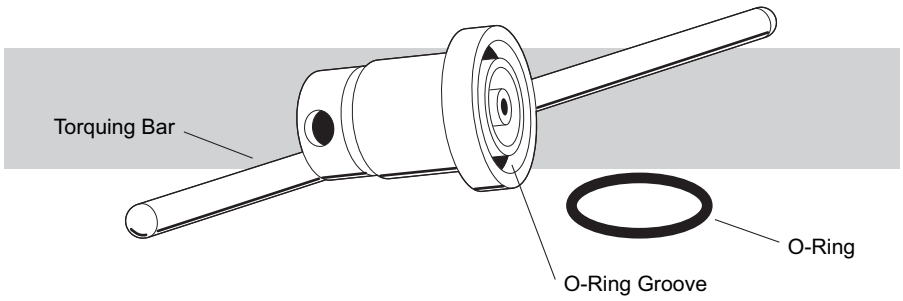
⚠ WARNING

Do not substitute a *metal* fastener for the *plastic* tie-down nut (366642) supplied with this rotor. If a tie-down nut comes off the shaft during centrifugation, the plastic nut furnished will break apart in the chamber, causing minimal damage to the instrument. A loose metal object, however, could substantially damage the rotor, chamber, and lid, and could potentially escape the chamber into the laboratory, causing personal injury or property damage.

5 Insert the torquing bar (356036) through the cross-drilled hole in the tie-down nut and turn the nut to the right (clockwise) until it is tight. Do not overtighten the tie-down nut.

NOTE If the rotor is left in the centrifuge between runs, make sure the rotor is seated on the drive shaft and the tie-down nut is tight before each run.

Figure 3 Rotor Tie-Down Nut and O-Ring



Buckets or Carriers

1 Place buckets or carriers over the pivot pins on the rotor yoke. *Fill all four positions on the yoke with buckets and/or carriers.*

⚠ CAUTION

All four positions on the rotor yoke must contain either a bucket or a carrier during a run. Never run the rotor with only two positions filled.

2 Make sure buckets or carriers are properly seated by gently swinging them on the pivot pins.

You can use four buckets, four carriers, or two buckets and two carriers (with like components positioned opposite each other). If two buckets and two carriers are used, reduce run speed to the speed allowed for multiwell plate carriers (refer to *Speed Derating*, below).

Loading the Rotor

Working with Physiological Fluids

⚠ WARNING

Handle body fluids with care because they can transmit disease. No known test offers complete assurance that they are free of micro-organisms. Some of the most virulent — Hepatitis (B and C) viruses, HIV (I–V), atypical mycobacteria, and certain systemic fungi — further emphasize the need for aerosol protection.

Take appropriate safety precautions when handling toxic, pathogenic, or other hazardous materials.

When working with potentially hazardous materials, always fill or open containers in an appropriate hood or biological safety cabinet. Three levels of containment are offered by Beckman Coulter, and can be used singly or combined, depending upon your application.

1. Capped tubes or bottles are designed to provide fluid containment. We strongly recommend that all containers carrying physiological fluids be capped to prevent leakage.
2. Bucket covers for the GH-3.8 rotor help to contain fluids within the bucket in the event of tube breakage or blood-bag failure.
3. Aerosolve cannisters are designed to minimize the possibility of aerosol (and fluid) leakage during centrifugation.

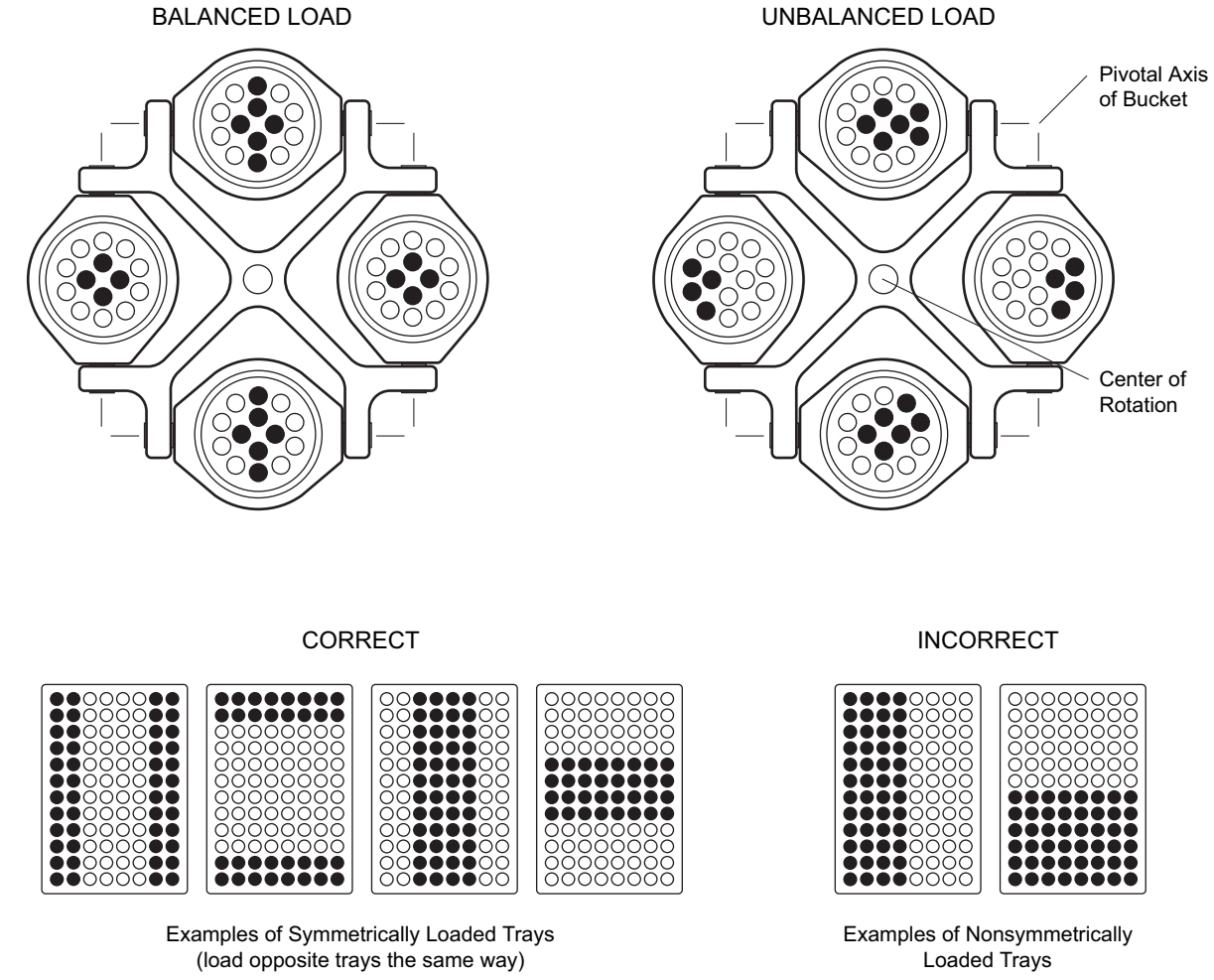
Symmetric and Balanced Loading

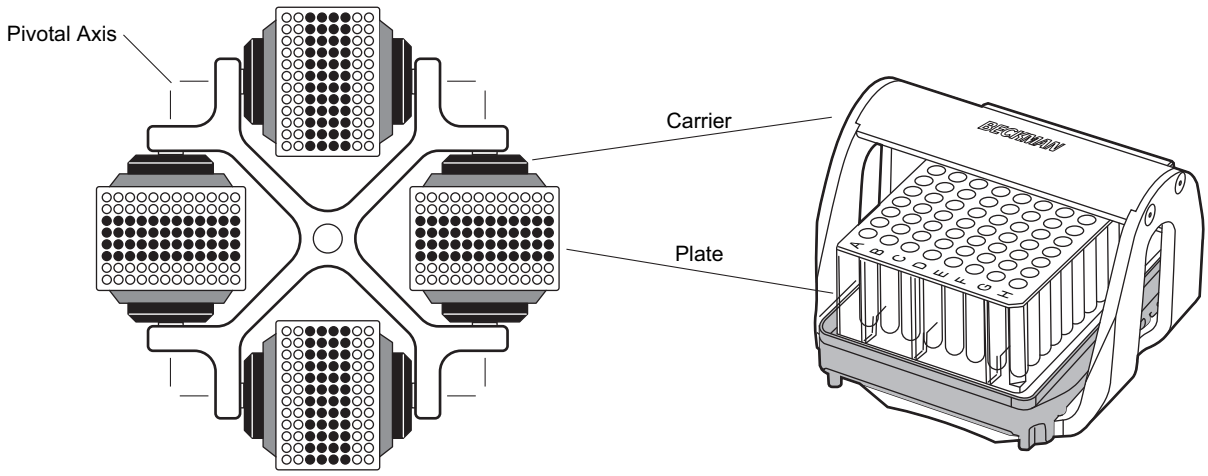
To ensure optimal performance and stability, the GH-3.8 rotor must be loaded symmetrically (see Figure 4). Two factors affect symmetric loading:

- The buckets must be loaded symmetrically with respect to their pivotal axes.
- The rotor should be loaded symmetrically with respect to its center of rotation.

This means that for best results you should load opposing buckets or carriers with the same type of labware containing the same amounts of fluid of equal density. Additionally, opposing buckets and their contents should weigh approximately the same (within 6 grams). Do not exceed the rated maximum load for either buckets (1000 grams each, including labware and sample) or Micro Plus carriers (500 grams each, including base, pad, plate(s), and sample).

Figure 4 Examples of Correctly and Incorrectly Loaded Buckets and Carriers. Contents of opposing buckets must be the same and each bucket must be balanced on its pivotal axis.





⚠ CAUTION

If only two buckets are loaded with blood bags, bottles, or modular disk adapters, the other two buckets should contain at least a minimal "blank" load (such as empty modular disk adapters) to achieve optimal results and to avoid rotor imbalance. If only two blood bags are being run and modular disk adapters are not available, we recommend using two water-filled blood bags in cups in the empty buckets. Placing empty blood bag cups or bottle adapters in the open buckets does not provide enough weight to prevent possible imbalance.

Beckman Coulter supplies buckets in weight-matched sets to make balancing easier (the weight and warranty expiration date are marked on the side of each bucket). Modular disk adapters are also sold in weight-matched sets. However, there are variances in weight between sets, as well as variance in weight between previously purchased adapters. To prevent accidental imbalance it is important to keep matched sets of adapters together and to weigh other adapters to be sure they are approximately the same. Marking matched sets will help you keep them together.

NOTE The light purple 500-mL adapters (349945) replace the previous tan adapters. There is a weight difference between the old tan adapters and the current purple adapters. If you run a mix of the purple and tan adapters, be sure to run matching colors in opposing positions or rotor imbalance could occur.

It is not necessary to completely fill all tubes, positions in adapters, or wells in multiwell plates; however, partially filled adapters or multiwell plates must be balanced with respect to the pivotal axis of the bucket or carrier as discussed below.

In adapters, each tube should be placed so that its weight is balanced by a tube in a diametrically opposite position across the pivotal axis in the same adapter (see Figure 4). Adapters placed in opposing buckets should also be filled the same way.

If you must run only one tube in an adapter, be sure this tube rests over the bucket's pivotal axis.

- Use the center hole of the adapter, if one is available.
- Use a side hole in line with the bails (vertical supports).
- Turn the adapter so that the tube rests across the pivotal axis of the bucket. The bails will no longer be in line with the pivotal axis; check that they do not interfere with the proper swing of the bucket.

  NOTE Be sure to run a tube of the same approximate weight in the same configuration in the opposite bucket.

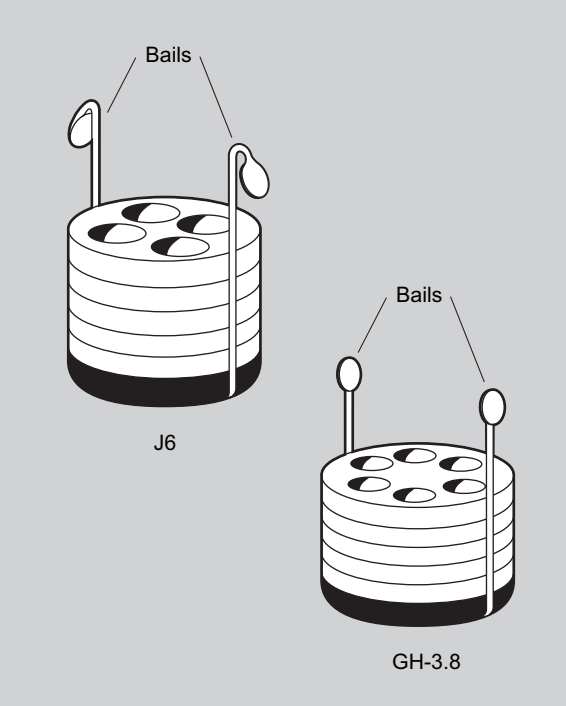
In multiwell plate carriers, samples should be loaded into the wells symmetrically with respect to the pivotal axis of the carrier (the pivotal axis runs parallel to the crossbar), and opposing carriers should contain the same loads (see Figure 4).

⚠ CAUTION

If multiwell plate carriers are not loaded symmetrically with respect to each carrier's pivotal axis, the carriers could come off the rotor pivot pins and could damage the rotor and the centrifuge.

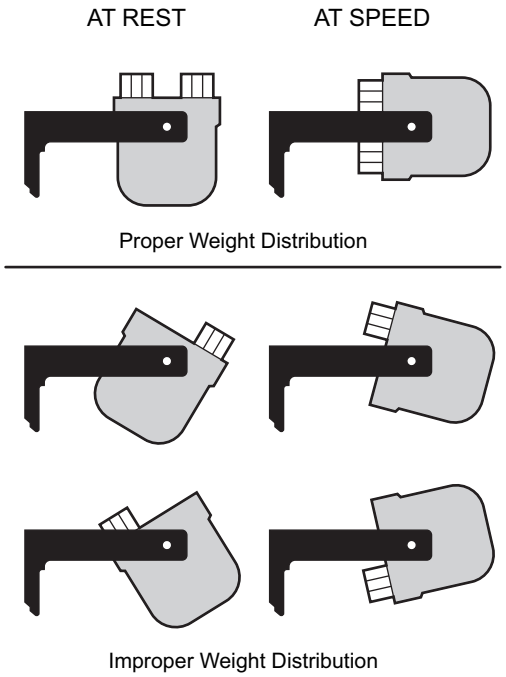
NOTE The same adapters can be used in the GH-3.8 and GH-3.7 rotors (see Table 2). However, *do not intermix adapters (or their individual parts) from Beckman Coulter J6 series rotors with those for the GH-3.8 rotor.* While the adapters are very similar in appearance (see Figure 5), they have very different weights. J6 adapters have bails that are curved at the top; bails for the GH-3.8 adapters are straight. Keep J6 and GH-3.8 disks and bases separate — mixing them can cause imbalance.

Figure 5 The Bails (Vertical Supports) of the GH-3.8 (and GH-3.7) Modular Disk Adapters and the J6 Series Adapters are Not the Same. Bails for the GH-3.8 are straight and end in a disk; bails for the J6 have curved ends. Do not intermix adapters (or disks from adapters) between sets.



During a run, buckets and carriers swing 90 degrees from their at-rest position. The pivotal axis of a bucket or carrier can be imagined as a line extending across the bucket or carrier from one pivot pin to the other. If a bucket or carrier is loaded so that its weight is unequally distributed on either side of its pivotal axis, it will not hang vertically at rest and, more importantly, may not swing to a horizontal position during a run (see Figure 6). As a result, extra stress will be placed on the bucket, carrier, tubes, and/or multiwell plates during the run, increasing the possibility of breakage or rotor imbalance.

Figure 6 Examples of the Effects on the Horizontal Swing of Buckets Caused by Proper and Improper Weight Distribution



Using Buckets

You can load buckets before or after they are installed on the rotor yoke. In either case, we recommend filling the appropriate labware first and then loading the labware into the buckets. This is especially important when using blood bags — you can trip the imbalance detector in the centrifuge by pushing blood bags into cups within buckets installed in the rotor.

Refer to Tables 2 and 3 to determine the appropriate labware required for your application. Whether you are running tubes, bottles, or blood bags, you must load the buckets symmetrically around the center of rotation and each bucket must be loaded symmetrically with respect to its pivotal axis (see *Symmetric and Balanced Loading*, above).

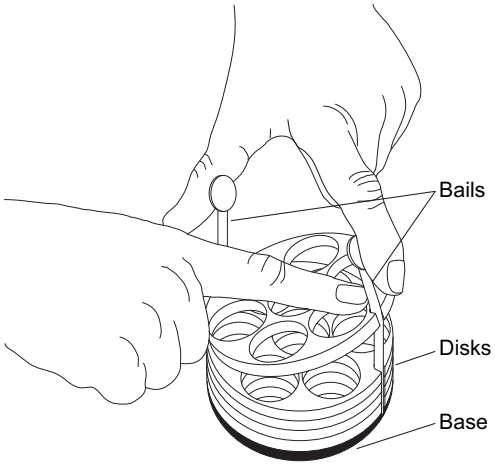
⚠ CAUTION

Buckets are designed to be used only with modular disk adapters, bottle adapters, and blood bag cups. Do not pour samples directly into buckets, bottle sleeves, or blood bag cups. Do not load bottles or blood bags directly into the buckets. Do not use labware that is not specified for use in this rotor.

Assembling Modular Disk Adapters

Refer to Table 2 to determine which color adapter is required for the tubes you are using and the number of disks needed to support the length of the tubes.

Figure 7 Assembling a Modular Disk Adapter



1. Select the appropriate adapter base (from Table 2) and attach a bail to it (see Figure 7).

2. Place the base and bail in an empty bucket on the lab bench (not in the rotor).

3. Position one of the disks in the bucket so that its grooves are aligned with the bail. Push the disk down until the bail snaps into the grooves.

4. Add more disks in this way until the height of the assembly is nearly as tall as the tubes you will be using. (If the height of the disks is very tall, you may have to push the bail into the grooves of the top disks by hand.) Remove or add disks to the bail to accommodate shorter or longer tubes. If the tubes fit too snugly in the adapter's rubber base, apply a light film of powder, such as talcum powder, to prevent the tubes from sticking.

Loading Tubes in Adapters

When placing tubes in modular disk adapters, it is important to make sure that they will not contact the rotor yoke during a run.

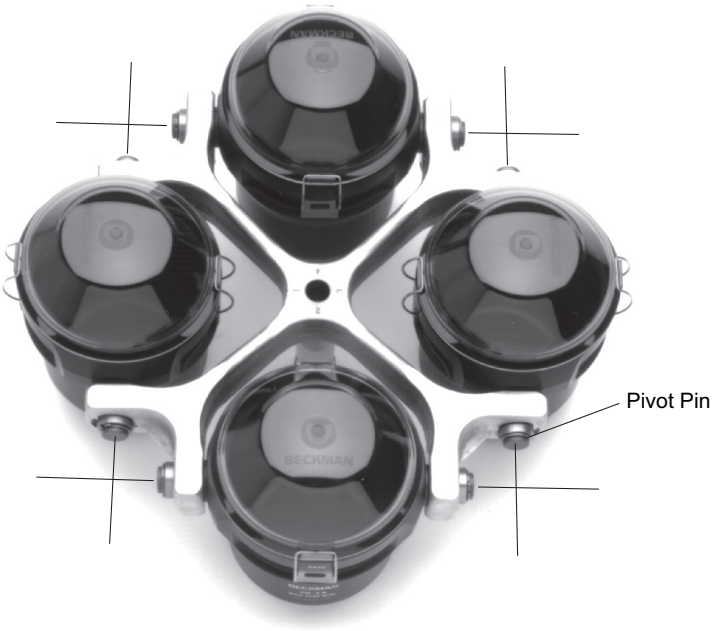
- One way to do this is to place empty tubes in an adapter, place the adapter in a bucket on the rotor yoke, and manually swing the bucket to the horizontal position, making sure that all tubes clear the yoke.
- Another method is to place the adapter in a bucket and position a bucket cover over the tubes, checking that tubes do not touch the cover.

If all positions in an adapter are not filled, the adapter should be loaded symmetrically with respect to its pivotal axis (see *Symmetric and Balanced Loading*, above).

Loading Adapters in the Buckets

After placing tubes in the disk adapters, lower the adapters into the buckets so that the bails line up with the rotor pivot pins (see Figure 8). If only two loaded adapters are run, place them in opposing buckets. The other two buckets should contain empty adapters to prevent imbalance. (See *Symmetric and Balanced Loading*, above.)

Figure 8 Installing an Adapter in a Bucket. Be sure the bails (vertical supports) line up with the bucket pivot pins.



Using Bottles in Adapters

Load bottles into their appropriate adapters (see Table 2), then place the filled adapters in the rotor buckets. If only two bottles are run, place them in opposite buckets. Make sure the other two buckets contain at least a minimal "blank" load (such as empty modular disk adapters) to prevent rotor imbalance. If modular disk adapters are not available, use two water-filled bottles in adapters to balance the load. (See *Symmetric and Balanced Loading*, above.)

Using Blood Bag Cups

NOTE This rotor is suitable for obtaining cell-free plasma or for cell packing, not for separating blood components.

The yellow 90-mm cup (356856) accommodates up to two single bags or one double pack; the orange 97-mm cup (356857) supports either one triple or one quad pack. *Do not pour liquid directly into blood bag cups*. Fit blood bags into cups before loading the cups into the rotor buckets — you can trip the imbalance detector in the centrifuge by pushing blood bags into cups within buckets installed in the rotor. Load the blood bag cups as follows:

---

1 Load the bags as far down into the cups as possible

NOTE Make sure the bags stay as vertical as possible, with no folds at the top or corners. If folds are present, blood cells could remain in the folds and then mix with the plasma when the bag is removed

---

2 Sandwich the tubing between the blood bag and any transfer packs (see Figure 9).

---

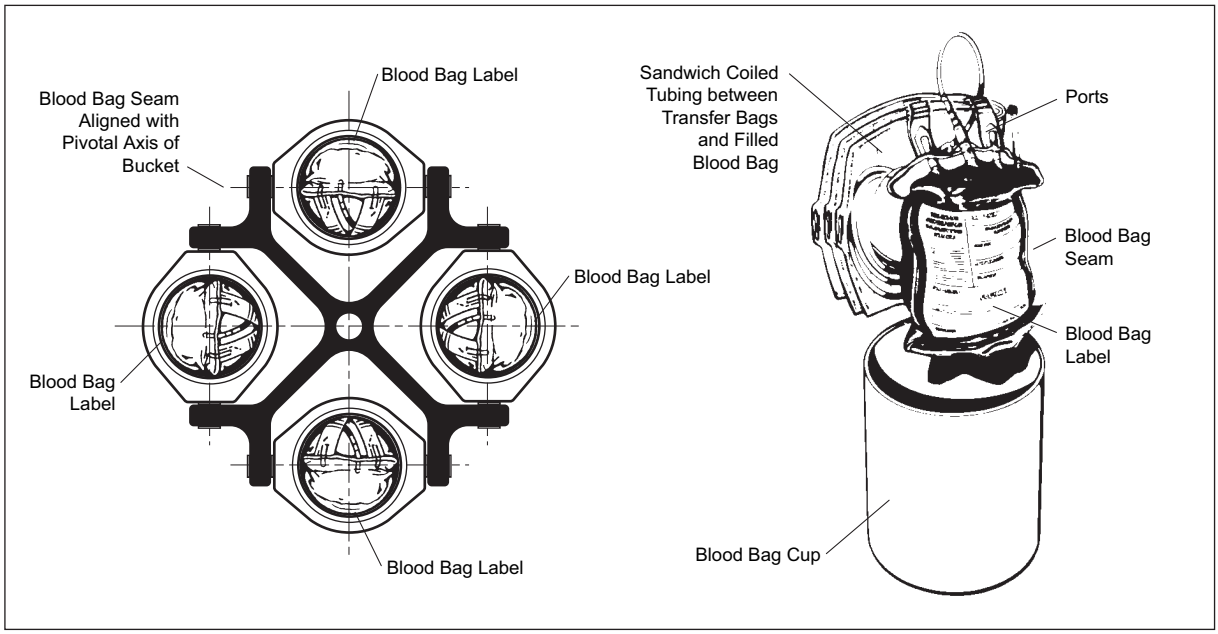
3 Make sure the loaded blood bag cups opposite each other on the rotor yoke are approximately the same weight (within 1 gram). Soft pliable balancing pads that will not puncture blood bags (see the *Supply List*) can be used if necessary to maintain weight balance.

---

4 Place loaded cups into rotor buckets. To reduce the possibility of bag breakage, align the blood bag seam with the rotor pivot pins (see Figure 9) with the label facing out.

5 Place bucket covers on rotor buckets to prevent blood bags or tubing from contacting the rotor yoke during centrifugation.

Figure 9 Blood Bag Loading Procedures



⚠ CAUTION

If bucket covers are not used, make sure the superstructure of the blood bag protruding from the cup does not inhibit the bucket from reaching its horizontal position. If it does, remove the cup from the rotor and reposition the blood bag so that it seats further into the cup. Allowing the blood bags to contact the rotor yoke during centrifugation can cause the bucket to come off the pivot pins and can seriously damage both the rotor and the centrifuge.

If only two filled cups are run, place them in opposing buckets. The other two buckets should contain similar "blank" loads to prevent imbalance (either empty modular disk adapters or water-filled blood bags in cups).

Bucket Covers

Beckman Coulter recommends that you use bucket covers (360586) to help contain spills and glass particles in the event of tube breakage. Bucket covers can be used with all blood bags, bottles (except 230-mL conical), and tubes up to 130 mm long. They are not designed to contain aerosols.

NOTE Because of the shape of the covers, 130-mm tubes can be used only in the center cavities of the adapters when covers are used.

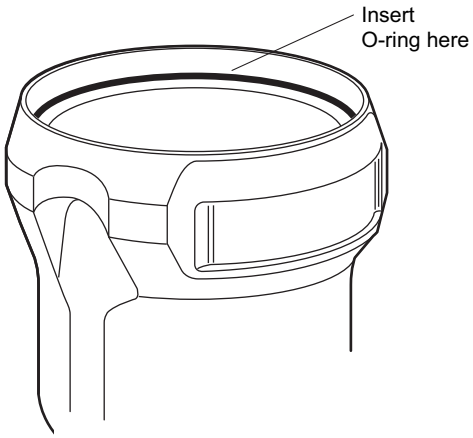
Install the covers as follows:

1 Make sure that the bucket and the bucket cover surface are clean, dry, and undamaged.

2 Make sure that the O-ring (961648) is in good condition and lightly coated with silicone vacuum grease (335148)

3 Place the O-ring on the ledge inside the bucket (see Figure 10).

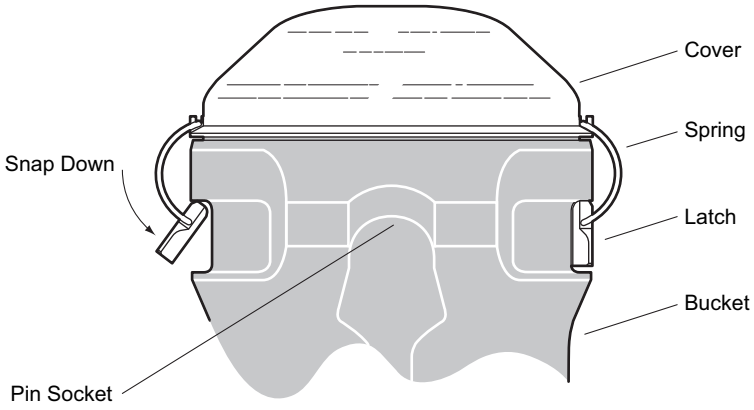
Figure 10 Proper Placement of O-Ring



4 Place the cover on the bucket with the latches perpendicular to the pin sockets (see Figure 11).

5 Snap the latches down and secure them under the bucket rim.

Figure 11 Securing Bucket Cover Latches



Using Aerosolve Cannisters

⚠ CAUTION

Do not run chloroformed samples in Aerosolve cannisters. Chloroform vapors can damage the cannister material.

Aerosolve cannisters can be used as wide-mouth bottles or with tubes in racks that are specially designed to fit in the cannisters. Table 2 lists the Aerosolve tube racks and the number and sizes of tubes they accommodate. When Aerosolve cannisters are used in the GH-3.8 rotor buckets, pads (361269) must be placed beneath the cannisters in the buckets to provide support and prevent the cannisters from being damaged during centrifugation. These pads are included in the GH-3.8 Aerosolve cannister kits (359232).

⚠ CAUTION

Be sure to remove the pad when you remove the cannister; placing other accessories on top of the pad could cause tube breakage, rotor imbalance, improper run results, or rotor mishap. Tubes, bottles, or blood bags placed in labware that rests on Aerosolve cannister pads will be closer to the rotor yoke and can interfere with the proper swing of the bucket.

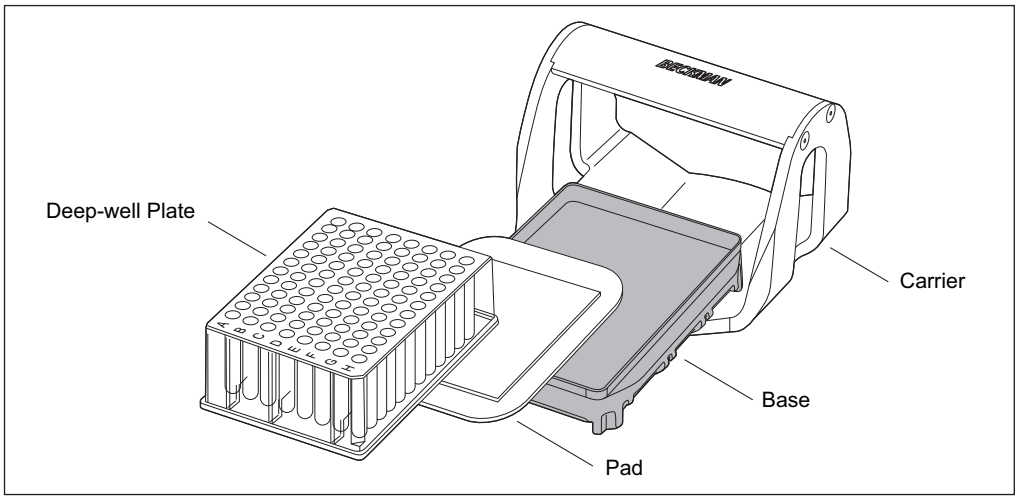
If using tube racks, load them symmetrically (refer toFigure 4). If only two cannisters are being run, place the cannisters in opposite buckets; place empty adapters (or “blank” loads) in the two empty buckets for balance.

Read publication TJ6-TB-011, supplied with the cannister, for complete information regarding its use and maintenance.

Using Micro Plus Multiwell Plate Carriers

Micro Plus plate carriers (see Figure 12) can be used in place of the buckets normally used with the rotor. (For complete information about the carriers, see publication GS6-TB-011, which accompanies the carriers.) If only two carriers are run, they must be installed opposite each other in the rotor, and either two buckets or two other carriers must also be run (they need not be loaded) to prevent rotor imbalance. *The rotor should never be run with only two buckets or two carriers installed.* Opposing Micro Plus carriers must balance to within 10 grams. (See *Symmetric and Balanced Loading*, above.)

Figure 12 The Micro Plus Multiwell Plate Carrier, Base, Pad, and Deep-well Plate



NOTE If symmetrical pelleting is required, use round ("U-bottom") or "V-bottom" multiwell plates (commercially available from many suppliers) for best results.

Load a multiwell plate into a carrier as follows.

1. To prevent plate breakage during centrifugation, place the flexible plastic pad (362390), ridged side up, into the flat, indented area of the blue base (361302).

2. Place the filled labware on top of the pad, being careful not to spill the contents. If you are using two or three microplates, place a 96-well cap strip (267002) between the plates to prevent plate breakage during centrifugation.

   NOTE If running stacked polystyrene plates, place a 96-well cap strip (267002) beneath the bottom plate, as well as between each set of plates.

3. Slide the base, pad, and plate assembly into the carrier until the base locating feet click into place.

IF YOU USE MORE THAN ONE GH-3.8 ROTOR

Complete sets of buckets, Micro Plus plate carriers, and labware may be used in any GH-3.8 rotor. Remember the following points:

- Buckets are sold in weight-matched sets. Keep matched sets together and check their weights prior to use to avoid centrifuge imbalance.
- Modular disk adapters and tube racks for Aerosolve cannisters are sold in weight-matched sets. Mark sets of adapters so that they can be easily identified. When cleaning adapters, do not mix sets. Check the weight of adapters prior to use.
- Do NOT intermix adapters (or their components) from Beckman Coulter's J6 series rotors with those used in the GH-3.8 rotor. These adapters are similar in appearance (see Figure 5) but have very different weights and functional characteristics. Mixing them will cause centrifuge imbalance and potential instrument damage.

Operation

Speed Derating

The maximum allowable run speed (3750 rpm) listed in the rotor specifications is for operation when all conditions are within the standard specifications (using four buckets). Maximum allowable run speed for the GH-3.8 rotor must be reduced in any of the following circumstances.

- Maximum allowable run speed when Micro Plus plate carriers are used is 3250 rpm. If two buckets and two carriers are used, reduce run speed to the speed allowed for carriers.
- If the weight of the load *in a bucket* exceeds 1000 grams, or if the solution density is greater than 1.2 g/mL, use the following square-root reduction formula to determine the allowable rotor speed:

$$\text{speed} = (3750\ \text{rpm}) \sqrt{\frac{1000\ \text{grams}}{\text{heaviest load in grams}}} \qquad (1)$$

- If the weight of the load *in a Micro Plus multiwell plate carrier* exceeds 500 grams, including base, pad, labware, and sample, use the following square-root reduction formula to determine the allowable rotor speed:

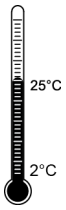
$$\text{speed} = (3250\ \text{rpm}) \sqrt{\frac{500\ \text{grams}}{\text{heaviest load in grams}}} \qquad (2)$$

- Reduce rotor speed if the desired rotor temperature (when run in a refrigerated centrifuge) is lower than -3°C and ambient temperature is higher than 25°C.

- When certain plastic tubes made by other manufacturers are used in Aerosolve cannister tube racks, you must reduce speed to prevent tube deformation or breakage, as these racks do not provide full tube support. Beckman Coulter recommends that you pretest other manufacturers' tubes in these racks using water samples to determine run speed and duration reductions to avoid tube deformation or breakage.
- When using certain glass tubes, you must reduce rotor speed to prevent tube breakage. Table 5 indicates recommended g-force limits to minimize breakage and *is intended as a guide only.* Because the strength of glass and plastic tubes can vary between lots, and will depend on handling and usage, Beckman Coulter highly recommends that you pretest these tubes in the appropriate labware in the GH-3.8 rotor using water samples to determine optimal operating conditions.

NOTE Scratches (even microscopic ones) significantly weaken glass tubes.

Temperature Limits



- Beckman Coulter plastic containers have been centrifuge tested for use at temperatures between 2° and 25° C. For centrifugation at other temperatures, pretest containers under anticipated run conditions.
- If plastic containers are frozen before use, make sure that they are thawed to at least 2° C before centrifugation.

Run Procedure

⚠ WARNING

Operator error or tube failure may generate aerosols. Toxic, pathogenic, or other hazardous materials must not be run in this rotor unless all appropriate safety precautions are taken. Also see *Working with Physiological Fluids*, above.

⚠ CAUTION

Make sure the rotor is seated on the drive shaft and the tie-down nut is tight before each run.

Refer to the appropriate instrument instruction manual for centrifuge operation. It is best to precool or warm the rotor to the desired temperature before installing it in the centrifuge. Table 6 and Table 7 indicate approximate acceleration and deceleration times for this rotor in both 60-Hz and 50-Hz instruments.

Table 5 Recommended g-Force Limits to Minimize Breakage of Certain Glass Tubes and Bottles Made by Other Manufacturers in the GH-3.8 Rotor

Tube Description	Volume (mL)	Dimensions (mm)	Safe *g* Force (RCF)	Safe Speed (RPM)	Modular Disk Adapter Color
Pyrex, Kimax, B-D, or Dispo (RB or FB)	3 or less	10 × 75	max	3750	blue
Pyrex (LT)	3	11 × 75	max	3750	blue
B-D Vac (RB, plain)	5[a]	12 × 75	max	3750	blue
Kimax (RB)	5	12 × 75	max	3750	blue
Pyrex 9820 (RB)	5[a]	12 × 75	max	3750	blue
B-D SST (RB, SB)	7[a]	13 × 100	max	3750	orange
B-D Vac (RB, plain)	7[a]	13 × 100	max	3750	orange
B-D SST (RB, SB)	10[a]	16 × 100	3000	3600	purple
B-D SST (RB, plain)	10[a]	16 × 100	max	3750	purple
Kimax 45049 (RB)	10	16 × 100	max	3750	purple
Kimax 45200 (LT, G, SC)	10	17 × 116	max	3750	purple
Pyrex 9820 (RB)	10	16 × 100	max	3750	purple
Pyrex 8140 (LT, G)	12	17 × 117	max	3750	purple
B-D SST (RB, SB)	15[a]	16 × 130	2700	3500	green
B-D Vac (RB, plain)	15[a]	16 × 130	2900	3550	green
Corex 8060A (LT)	15	17 × 120	max	3750	green
Corex 8080A (LT, G)	15[a]	17 × 120	max	3750	green
Corex 8442 (RB)	15	16 × 115	max	3750	green
Corvac (RB, SB)	15[a]	16 × 131	max	3750	green
Kimax (LT, G)	15	17 × 118	3000	3600	green
Pyrex 8500 (ST)	15	17 × 110	2700	3500	green
Pyrex 8080 (LT, G)	15[a]	17 × 120	max	3750	green
Pyrex 8320 (ST)	40	29 × 116	max	3750	yellow
Kimax 45212 (ST)	50[a]	29 × 118	1000	2100	yellow
Pyrex 8280 (ST)	50[a]	29 × 115	2500	3300	yellow

a. Most common usage.

Code:

B-D = Becton Dickinson	LT = long taper	ST = short taper
Dispo = disposable	RB = round bottom	Vac = Vacutainer (B-D)
FB = flat bottom	SB = silicone gel barrier	
G = graduated	SC = screw capped	

Table 6 Approximate Acceleration and Deceleration Times for the GH-3.8 Rotor in Allegra 6 Series, GS-6 Series, and Spinchron Series Centrifuges

Instrument	Acceleration (seconds)	Deceleration (H)[a] (seconds)	Deceleration (L)[a] (seconds)
60-Hz Nonrefrigerated Centrifuge	160	80	110
60-Hz Refrigerated Centrifuge	140	80	110
50-Hz Nonrefrigerated Centrifuge	160	80	110
50-Hz Refrigerated Centrifuge	160	80	110

a. H = HIGH brake setting; L = LOW brake setting

Table 7 Approximate Acceleration and Deceleration Times for the GH-3.8 Rotor in GP Series Centrifuges

Instrument	Acceleration (seconds)	Deceleration (H)[a] (seconds)	Deceleration (L)[a] (seconds)
60-Hz GP or GPK	165	85	120
60-Hz GPR or GPKR	140	80	125
50-Hz GP or GPK	180	105	120
50-Hz GPR or GPKR	150	85	130

a. H = HIGH brake setting; L = LOW brake setting

NOTE Line voltage fluctuations can cause variations in acceleration and deceleration times. The times listed in Table 6 and Table 7 were achieved with line voltage ratings at 120 volts for 60-Hz instruments and 230 volts for 50-Hz instruments.

NOTE Do not use high brake when Micro Plus plate carriers are run, as the force of the deceleration will disturb the contents of the plate. Set the centrifuge brake switch to either LOW or OFF to coast to a stop.

Care and Maintenance

NOTE Accumulations of dust or other foreign matter can damage rotor pins (resulting in rotor vibrations). To prevent this, clean the centrifuge bowl daily. Spray the centrifuge bowl with an antistatic solution and wipe it clean.

Inspection

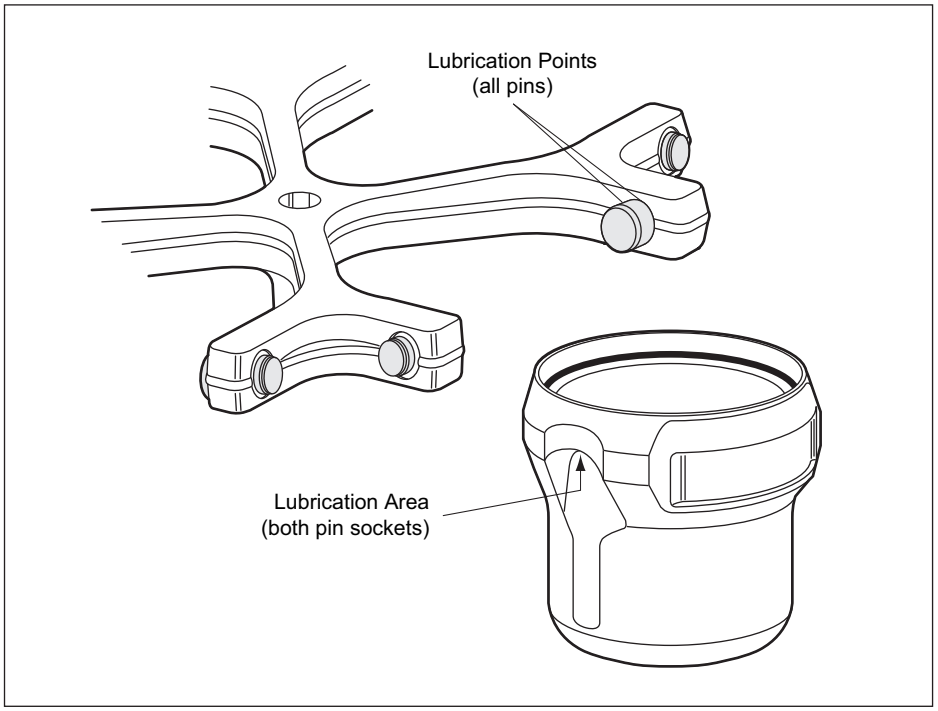
- Periodically (at least monthly) inspect the rotor yoke, buckets, and/or multiwell plate carriers, especially inside cavities, for rough spots or pitting, white powder deposits — frequently aluminum oxide — or heavy discoloration. If any of these signs are evident, do not run the rotor. Contact your Beckman Coulter representative for information about the Field Rotor Inspection Program and the rotor repair center.
- Regularly check the condition of the O-ring (927571) in the tie-down nut; if it is worn or damaged, replace it.
- Regularly check the condition of the Micro Plus plate carrier base (361302) and pad (362390) and do not use them if there are visible signs of damage.

Maintenance

Buckets and Micro Plus carriers are made of anodized aluminum. Do not use sharp tools on them, as scratches in the anodized surface may lead to corrosion.

- Approximately once a week, and after cleaning and/or autoclaving, wipe the rotor pins and pin sockets (see Figure 13) with a paper towel, then coat with Paint On Graphite Lubricant (977212). Allow the lubricant to dry for at least 5 minutes before installing the rotor in a centrifuge.
- Before using the tie-down nut (366642), check it for damage such as distortion, splitting, or stripped threads; replace it if it is damaged. Inspect the O-ring (927571) in the base of the nut for cracks, replace if damaged. Do not use any type of lubricant or grease on the threads of the tie-down nut.
- Before first use of the rotor, and after washing, apply Anti-Seize (961660) to the rotor yoke drive hole as described under *Cleaning*, below.

Figure 13 Lubricating Pivot Pin/Bucket Contact Areas



- Do *not* use any type of lubricant or grease on the threads of the drive shaft.
- Refer to publication TJ6-TB-011 for information on Aerosolve cannister maintenance.

  Refer to *Chemical Resistances* (publication IN-175) for the chemical compatibilities of rotor and tube materials. Your Beckman Coulter representative provides contact with the Field Rotor Inspection Program and the rotor repair center.

Cleaning

NOTE Do not wash the rotor components or accessories in a dishwasher. Do not soak components in detergent solution for long periods such as overnight. *Do not autoclave the tie-down nut*.

The Rotor Components

- If spillage has occurred, or if salt solutions or other corrosive materials are used, clean the rotor and components immediately. Do not allow corrosive materials to dry on rotor components.
- Approximately once a week (or every 1000 runs) clean the pins and bucket pin sockets, then lubricate as described under *Maintenance*.
- Under normal conditions, remove the rotor from the centrifuge at least once a month for cleaning and lubrication to prevent buildup of residues.

Use a mild detergent such as Beckman Solution 555 (339555), diluted 10 to 1 with water, and a soft brush to clean the rotor yoke and tie-down nut. The Rotor Cleaning Kit (339558) contains two quarts of Solution 555 and brushes that will not scratch the rotor.

Thoroughly rinse the cleaned rotor and components with water and air-dry upside down. *Do not use acetone to dry the rotor*. When the rotor is dry, lubricate the bucket sockets and pins as described under *Maintenance*. Before reinstalling the rotor, lightly lubricate the drive hole of the rotor with Anti-Seize (961660) to prevent the rotor from sticking, as follows:

1. Apply the lubricant onto a swab.
2. Draw the coated swab through a paper towel to remove excess lubricant.
3. Lightly coat the inside of the drive hole with the lubricant remaining on the swab.

Buckets

1. Remove the O-ring from the bucket before cleaning.
2. Clean the bucket and O-ring with a mild detergent such as Solution 555 (339555), diluted 10 to 1 with water, then rinse thoroughly and dry completely.
3. Coat the O-ring with a light film of silicone vacuum grease (335148). Place the O-ring on the ledge inside the bucket.

After cleaning, lubricate bucket pin sockets with Paint On Graphite Lubricant (977212) as described under *Maintenance*.

Micro Plus Plate Carriers (Including Base and Pad), Blood Bag Cups, and Bucket Covers

Wash with a mild detergent such as Solution 555 (339555), diluted 10 to 1 with water, and a soft brush. Thoroughly rinse them and air-dry upside down.

Modular Disk Adapters

1. To disassemble adapters for washing, first pull the bail out of the groove in the disks, then remove the disks and unsnap the bail from the rubber bottom.
2. Use a mild detergent such as Solution 555 (339555), diluted 10 to 1 with water, and a soft brush to scrub the adapters.

3 Rinse and dry, then reassemble.

4 If necessary, apply a light film of silicone vacuum grease (335148) to the grooves on the rubber bottom to make reassembling easier.

Keep matched sets of adapters together; do not intermix sets.

Aerosolve Cannisters

Refer to publication TJ6-TB-011.

Decontamination

If the anodized aluminum buckets or carriers become contaminated with radioactive material, decontaminate them using a solution that will not damage their anodized surfaces. Beckman Coulter has tested a number of solutions and found two that do not harm anodized aluminum: RadCon Surface Spray or IsoClean Solution* (for soaking), and Radiacwash†.

Beckman Coulter does not however, warrant the performance of these products with respect to their effect on the carriers or their ability to decontaminate these parts.

If the rotor or other components are contaminated with toxic or pathogenic materials, follow appropriate decontamination procedures as outlined by your laboratory safety officer.

Sterilization and Disinfection

The rotor yoke, buckets, tube adapters, and aluminum parts of multiwell plate carriers can be autoclaved at 121°C for up to an hour. Blood bag cups, bucket covers, and Aerosolve cannisters purchased after April 1993 (see the date code on the cannister bottom) can be autoclaved at that temperature for about 15 minutes. Do not autoclave the plastic tie-down nut or Aerosolve cannisters purchased prior to April 1993. Ethanol‡ (70%) may be used on all rotor components, including those made of plastic. Refer to publication IN-175 for other chemical resistances of tubes, bottles, and accessories.

NOTE IsoClean can cause fading of colored anodized surfaces. Use it only when necessary and remove it promptly from rotor surfaces.

* In U.S.A., contact Nuclear Associates (New York); in Eastern Europe and Commonwealth States, contact Victoreen GmbH (Munich); in South Pacific, contact Gammasonics Pty. Ltd. (Australia); in Japan, contact Toyo Medic Co. Ltd. (Tokyo).

† In U.S.A., contact Biodex Medical Systems (Shirley, NY); internationally, contact the U.S. office to find the dealer nearest you.

‡ Flammability hazard. Do not use in or near operating centrifuges.

While Beckman Coulter has tested these methods and found that they do not damage components, no guarantee of sterility or disinfection is expressed or implied. When sterilization or disinfection is a concern, consult your laboratory safety officer.

Tube Breakage

⚠ CAUTION

To reduce the potential for corrosion, clean buckets or carriers thoroughly immediately following a tube or well plate breakage.

If a glass tube breaks, remove the glass very carefully from the adapter and bucket. Imbedded glass particles that remain in the bucket or adapters can cause tube failure during subsequent runs.

Aerosolve Cannisters

⚠ WARNING

When working with potentially hazardous materials, open cannisters in an appropriate hood or biological safety cabinet in case of tube breakage.

If a glass tube breaks in an Aerosolve cannister tube rack, discard and replace the O-ring and rubber tube cushion in the base of the rack. Imbedded glass particles that remain in the bucket or adapters can break tubes during subsequent runs.

SST or Corvac Tubes

If an SST or Corvac tube breaks, the tube's silicone gel barrier material becomes laced with glass fragments and the tube contents contaminate the entire tube adapter and bucket (or tube rack and cannister).

If one of these tubes breaks in an adapter in a bucket, use the following procedure.

1. Fill the bucket with water.
2. Autoclave the entire bucket and contents at 121°C for 20 minutes.
3. Decant any remaining water and dislodge the tube adapter (do not remove it) over a waste container.
4. Working under a hood and using plastic gloves, immerse the bucket and tube adapter (intact) in a 2-liter beaker or similar vessel containing ethyl acetate*.

* Flammability hazard. Do not use in or near operating centrifuges.

5 Scrub the adapter with a brush and decant the ethyl acetate mixture into a waste bottle for proper disposal.

6 Rinse with water and air-dry the bucket and tube adapter.

If one of these tubes breaks *in an Aerosolve cannister*, use the following procedure.

1 Working in a biologic safety cabinet and wearing plastic gloves, open the cannister and immerse the cannister, lid, and contents (intact) in a 2-liter beaker or similar vessel containing 5% sodium hypochlorite (undiluted bleach).

2 Leave the cannister to soak overnight.

3 Carefully dislodge the tube rack and scrub it with a brush.

4 Decant the bleach into a waste bottle for proper disposal.

5 Rinse with water and air-dry the cannister and tube rack.

Returning a Rotor

Before returning a rotor or accessory for any reason, prior permission (a Returned Goods Authorization form) must be obtained from Beckman Coulter, Inc. This RGA form, which may be obtained from your local Beckman Coulter sales office, should contain the following information:

- serial number,
- history of use (approximate frequency of use),
- reason for the return,
- original purchase order number, billing number, and shipping number, if possible,
- name and phone number of the person to be notified upon receipt of the rotor or accessory at the factory, and
- name and phone number of the person to be notified about repair costs, etc.

To protect our personnel, it is the customer's responsibility to ensure that the parts are free from pathogens and/or radioactivity. Sterilization and decontamination must be done before returning the parts. Smaller items (such as tubes, bottles, etc.) should be enclosed in a sealed plastic bag.

All parts must be accompanied by a note, plainly visible on the outside of the box or bag, stating that they are safe to handle and that they are not contaminated with pathogens or radioactivity. ***Failure to attach this notification will result in return or disposal of the items without review of the reported problem.***

Use the address label printed on the RGA form when mailing the rotor and/or accessories.

Customers located outside the United States should contact their local Beckman Coulter office.

Supply List

Contact Beckman Coulter Sales (1-800-742-2345 in the United States; worldwide offices are listed on the back cover of this manual) or see the Beckman Coulter Benchtop *Rotors, Tubes & Accessories* catalog (BR-9742, available at www.beckmancoulter.com) for detailed information on ordering rotors, tubes, and accessories. For your convenience, a partial list is given below.

Replacement Rotor Parts

Rotor assembly 360581
Tie-down nut 366642
O-ring (Buna N rubber) 927571
Anodized aluminum buckets (set of 4) 360589
Bucket cover kit (set of 2) 360585
  each set includes:
    cover assembly 360586
    O-ring (ethylene-propylene) 961648
    silicone vacuum grease (2 oz) 335148
Micro Plus multiwell plate carriers, includes bases and pads (set of 2) 362394
Micro Plus replacement carriers (set of 2) 361304
Replacement bases for Micro Plus carrier, includes bases and pads (set of 2) 361302
Replacement pads for Micro Plus carrier (set of 4) 362390

Supplies

Modular disk adapters (polypropylene). . . . . see Table 2
Tubes and bottles . . . . . see Table 3
Micro Plus labware. . . . . see Table 4
Soft rubber roller (for aluminum foil lids) 538618
Torquing bar 356036
Tube decanter (for use with blue adapter) 343108
includes:
gasket for 10-mm dia tubes (silicone) 343106
gasket for 12-mm dia tubes (silicone) 343107
Adapter plate,1.5-mL (for use with blue adapter) 354511
Aerosolve cannister kit (set of 4) (each kit includes 1 cannister, 1 1id,
1 O-ring, silicone vacuum grease, and 1 pad). 359232
Aerosolve cannister O-ring (ethylene-propylene). 345366
Aerosolve pad (placed beneath cannister in bucket) 361269
Tube racks for Aerosolve cannisters. . . . . see Table 2
Neoprene tube cushions
for blue rack (pkg of 24) 344117
for orange rack (pkg of 18) 344118
for purple rack (pkg of 18; 12 large, 6 small) 344119
for dark green rack (pkg of 18; 12 large, 6 small) 344120
for yellow rack (pkg of 8; 4 large, 4 small) 344121
Blood bag cup, 90-mm, yellow (polypropylene). 356856
Blood bag cup, 97-mm, orange (polypropylene) 356857
Balancing pads (six pads, 3 grams each, red) 358365
Balancing pads (six pads, 6 grams each, grey) 358364
Microfuge tube rack inserts:
Blue insert, 13-mm dia (25/pkg) 373697
Red insert, 12-mm dia (25/pkg). 373698
White insert, 11-mm dia. for 1.5-mL Microfuge tubes (25/pkg). 373696
Black insert, 10-mm dia (25/pkg) 373699
Rotor Cleaning Kit 339558
Solution 555 (1 qt). 339555
Silicone vacuum grease (1 oz) 335148
Anti-Seize (1 1/2 oz). 961660
Paint On Graphite Lubricant 977212

Benchtop Rotor Warranty

Subject to the conditions specified below and the warranty clause of the Beckman Coulter, Inc., terms and conditions in effect at the time of sale, Beckman Coulter agrees to correct either by repair or, at its election, by replacement, any defects of material or workmanship which develop within seven (7) years after delivery of a benchtop centrifuge rotor to the original buyer by Beckman Coulter or by an authorized representative, provided that investigation and factory inspection by Beckman Coulter discloses that such defect developed under normal and proper use. Should a Beckman Coulter centrifuge be damaged due to a failure of a rotor covered by this warranty, Beckman Coulter will supply free of charge all centrifuge parts required for repair.

Conditions

1. Except as otherwise specifically provided herein, this warranty covers the rotor only and Beckman Coulter shall not be liable for damage to accessories or ancillary supplies including but not limited to (i) tubes, (ii) tube caps, (iii) tube adapters, or (iv) tube contents.
2. This warranty is void if the rotor has been subjected to customer misuse such as operation or maintenance contrary to the instructions in the Beckman Coulter rotor or centrifuge manual.
3. This warranty is void if the rotor is operated with a rotor drive unit or in a centrifuge unmatched to the rotor characteristics or operated in a Beckman Coulter centrifuge that has been improperly disassembled, repaired, or modified.
4. Each bucket, whether purchased with a rotor assembly or purchased separately, is covered by this warranty forseven (7) years from the date of purchase, and will be replaced or repaired during such period according to the terms and conditions of this warranty. The date of manufacture marked on the bucket may be earlier than the date of purchase, and the expiration date marked on the bucket, which is seven (7) years after the date of purchase, may be correspondingly offset.
5. Buckets should not be used after the expiration date marked on the bucket. If at the time of purchase the marked expiration date is less than 7 years from the date of purchase, the expiration date becomes the date of purchase plus seven (7) years. use of a bucket after such expiration date voids Beckman Coulter's warranty obligations with respect to any rotor and/or centrifuge in which such a bucket is used.
6. Thermoplastic rotors or components used in some benchtop centrifuges are warranted for one (1) year from date of purchase.

Disclaimer

IT IS EXPRESSLY AGREED THAT THE ABOVE WARRANTY SHALL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND OF THE WARRANTY OF MERCHANTABILITY AND THAT BECKMAN COULTER, INC. SHALL HAVE NO LIABILITY FOR SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER ARISING OUT OF THE MANUFACTURE, USE, SALE, HANDLING, REPAIR, MAINTENANCE, OR REPLACEMENT OF THE PRODUCT.

www.beckman.com

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