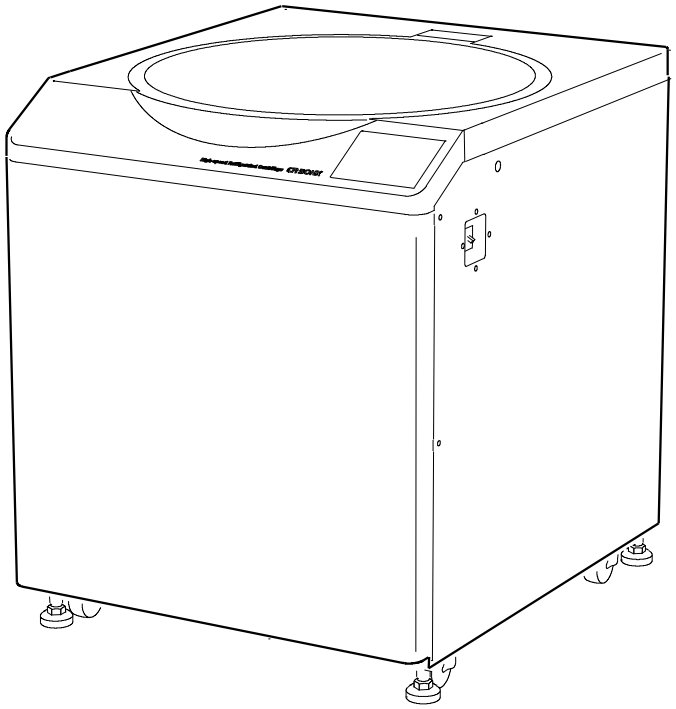
INSTRUCTION MANUAL

himac
EPPENDORF GROUP

HIGH-SPEED REFRIGERATED CENTRIFUGE

CR30NX

Thank you for purchasing
this product.
To ensure safe operation
and maximum performance,
be sure to carefully read this
instruction manual before use.
Keep this instruction manual in an
easily accessible location for future reference.



- The appearance and specifications of the products in this manual are subject to change for incorporating improvements.

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Original instruction manual

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⚠ SAFETY INFORMATION

⚠ General Safety

The centrifuge is designed to separate liquid-suspended materials having different densities and particle size.
Be sure that you carefully read and fully understand the safety information provided here.

- Operate the product by following the instruction manual.
- Follow all safety information in the instruction manual and the safety instructions on the product. Failure to follow this information could lead to an injury and product damage.
- The protective features provided by the product may be impaired if the product is used in a manner not specified by the manufacturer.
- Important safety information is provided below. This manual shows the signal words “DANGER”, “WARNING”, and “CAUTION” together with the hazard alert symbols.

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

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

⚠ **CAUTION:** This indicates a potentially hazardous situation, which if not avoided, could result in minor or moderate injury or serious damage to the equipment.

This hazard alert symbol shown together with a signal word are used to emphasize important safety instructions.

“NOTE” indicates information that has no direct bearing on safety.

- Perform only the operations specified in the instruction manual. If any problem is found with your equipment, please contact an authorized sales or service representative.
- Although every effort was made to present all potential safety hazards in this instruction manual and on the equipment, unexpected situations may arise. Be sure to follow the instructions in the instruction manual and always be careful when operating this equipment.

⚠ SAFETY INFORMATION

○ Mechanical Safety

⚠ **WARNING**:
- To ensure operator safety, maintain a 30-cm “clearance envelope” around the centrifuge while the rotor is spinning. Do not store dangerous substances (such as flammable or explosive substances) on or near the centrifuge.
- Do not attempt to forcefully unlock the door while the rotor is spinning.
- In the event where the door is opened while the rotor is still spinning, close the door immediately.
- Do not attempt to slow or stop the spinning rotor by hand.
- Check the “Chemical Resistance Chart” provided with the rotor, and do not use any sample incompatible the rotor (including the buckets). Using incompatible samples could corrode the rotor (including the buckets).
- Do not tilt or move the equipment while the rotor is spinning. Do not lean on the equipment.
- Do not operate above the maximum rated speed of the rotor or buckets.
- Do not use corroded, scratched, or cracked rotors, buckets, or assemblies. Check that the rotor, buckets, and assemblies are free of corrosion and damage before operation.
- When using a swing rotor, check that the buckets are properly engaged with the rotor pins before operation. Improper mounting can cause severe damage to the centrifuge. Be sure to mount all buckets having the same serial number.
- Do not remove the adapter at the bottom of the rotor from the rotor or replace with an adapter from other rotor. The adapter is an important part for monitoring overspeed of the rotor, and if an adapter not matching the rotor is mounted, the centrifuge and surrounding equipment could be damaged due to breakage of the rotor.
- Use the CR30NX rotors (adapter: red) in CR30NX centrifuges only. Depending on the type of rotor selected in the centrifuge, operation may be performed in a state where overspeed detection is not working properly, and this could lead to damage to the centrifuge and surrounding equipment due to breakage of the rotor.
- Do not insert your fingers and any objects into the door lock hole on the table of the centrifuge.
- Make sure your fingers and other objects do not become caught in the space between the centrifuge door and the table when closing the centrifuge door. This could cause an injury or malfunction.
- If an abnormal sound or vibration occurs, immediately stop operation and contact an authorized sales or service representative.

⚠ **CAUTION**:
- Be sure to carefully read the rotor instruction manual before using the rotor.
- Check the “Chemical Resistance Chart” attached to the rotor, and do not use any sample incompatible with the tubes, bottles, tube racks, microplates, tube or bottle caps, or other parts. Use of incompatible samples could deteriorate these parts.
- The maximum rotor speed depends on the buckets, assemblies, tubes, and adapters that are used. Follow the instructions in the rotor instruction manual.
- Do not operate above the allowable imbalance.
- Use the rotor tubes and bottles within their actual capacities.
- Do not use tubes or bottles that have exceeded their life expectancy. Doing so could result in damage to the tubes or bottles, which could lead to breakdown of the rotor and the centrifuge. The life expectancy of the tubes and bottles depends on factors such as the sample characteristics, rotor speed, and temperature. Always check for any deterioration and damage (cracks, deformation, etc.) in the tubes and bottles before using them. Do not use the tubes and bottles if you find any problems.
- Be sure to mount the rotor cover if provided. Check that the rotor cover is completely secured with a screw if provided.
- Carefully mount the rotor onto the drive shaft. Do not drop the rotor or apply excessive force to the drive shaft. Otherwise, the drive shaft could be damaged.

⚠ SAFETY INFORMATION

⚠ **CAUTION**:
- Clean the inside of the drive hole (crown hole) of the rotor and the surface of the drive shaft (crown) of the centrifuge once a month. Repeated usage with the rotor loaded can cause adhesion of the crown hole and crown so that the rotor can no longer be removed.
- The rotor may be stored on a shelf if proper protective measures against earthquakes have been taken on the shelf to prevent the rotor from falling.
- If condensation has formed on the rotor chamber, wipe off the rotor chamber to prevent the condensation moisture from mixing with sample and from leaking into the drive unit.
- The rotor temperature control accuracy is affected by condensation in the rotor chamber before operation. Because the sample can freeze at certain temperature settings, if the temperature setting is low or when handling temperature-sensitive samples, perform operation while the inside of the rotor chamber is completely dry.
- Do not pour any liquids such as water, detergent, or disinfectant directly into the rotor chamber.
  Doing so could cause the bearings of the drive unit to corrode or deteriorate.
- Do not use a ballpoint pen or other sharp-pointed object to press the touchscreen.
- Be sure to remove the rotor from the rotor chamber whenever the machine is moved. Otherwise, the drive shaft (crown) could be damaged.

○ Safety During Installation and Maintenance

⚠ **DANGER**:
- To prevent electrical shock accidents, follow the guidelines below whenever servicing the centrifuge.
  1) Always turn off the POWER switch and turn off the distribution board of your centrifuge room if your centrifuge is equipped with a three-wire power cord. Then, wait at least three minutes before removing any covers or tables from the centrifuge.
  2) Always turn off the POWER switch and unplug the power cord from the outlet if your centrifuge is equipped with a power cord with a plug. Then, wait at least three minutes before removing any covers or tables from the centrifuge.

⚠ **WARNING**:
- Elevate the centrifuge completely by using the four level adjusters, and level it. Incomplete elevation of the centrifuge can cause significant movement of the centrifuge if the rotor is disengaged.
- After installation and before any test-run, an internal check of this centrifuge by the authorized service representative is required.
- Repairs, disassembly, and other modifications to the centrifuge are strictly prohibited unless performed by an authorized service representative.

⚠ **CAUTION**:
- If the centrifuge is exposed to ultraviolet (UV) rays for an extended period of time, the color of the covers may fade or the coating may peel off. After use, cover the centrifuge with a cloth to protect it from direct UV exposure.

○ Electrical Safety

⚠ **WARNING**:
- Your centrifuge must be grounded properly to prevent electrical shock accidents.

⚠ **CAUTION**:
- Do not place containers holding liquid in the rotor chamber or on or near the centrifuge. If they spill, liquid could get into the centrifuge and damage the electrical components.

○ Safety against Risk of Fire

⚠ **WARNING**:
- This centrifuge does not have an explosion-proof structure. Never use explosive or flammable samples or materials that could incite vigorous chemical reactions. Do not centrifuge these types of materials in this equipment or handle or store them near the centrifuge.

⚠ SAFETY INFORMATION

○Chemical and Biological Safety

⚠ **WARNING**:

- Because this centrifuge uses a vacuum pump to discharge the air in the chamber, take all necessary safety measures before using toxic or radioactive samples or pathogenic or infectious blood samples. Use these types of samples at your own risk.
- Take all necessary safety measures when handling Risk Group II materials (as identified in the World Health Organization “Laboratory Biosafety Manual”), and provide more than one level of protection when handling materials of a higher group.
- If the centrifuge, rotor, or an accessory is contaminated by toxic or radioactive samples or pathogenic or infectious blood samples, be sure to decontaminate the component based on good laboratory procedures and methods.
  If the centrifuge, rotor, or an accessory may be contaminated by samples that could impair human health (such as toxic or radioactive samples or pathogenic or infectious blood samples), it is your responsibility to sterilize and/or decontaminate the centrifuge, rotor, or the accessory properly before disposing or requesting repairs from an authorized sales or service representative.
- It is your responsibility to sterilize and/or decontaminate the centrifuge, rotor, or parts properly before returning them to an authorized sales or service representative.
- For valuable samples, be sure to check that the sample temperature is not abnormal after centrifugation.
- During operation, the chamber is cooled to a temperature below the temperature setting, and so if the rotor is left inside without removing it after operation, it may be cooled to below the temperature that was set. For example, even if operation is performed at a setting of 4°C, the sample could freeze if it is left inside without opening the door, and so remove the sample as soon as possible after operation.

Earthquake Safety Information

An earthquake could damage the centrifuge depending on the magnitude. If you observe any abnormalities, immediately stop using the centrifuge, and ask for inspection by an authorized service representative.

⚠ SAFETY INFORMATION

⚠CAUTION

- Be sure to install the rotor cover and tighten the handle securely.
- When setting the rotor on the drive shaft, adjust it up and down 2 or 3 times in order to confirm that it is correctly in place.

⚠WARNING

- Never use any material capable of producing flammable or explosive vapors.
- Be sure to take the necessary precautions before separating radioactive, toxic or pathogenic materials.

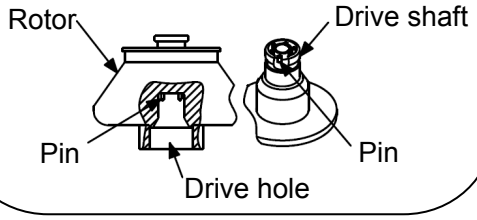


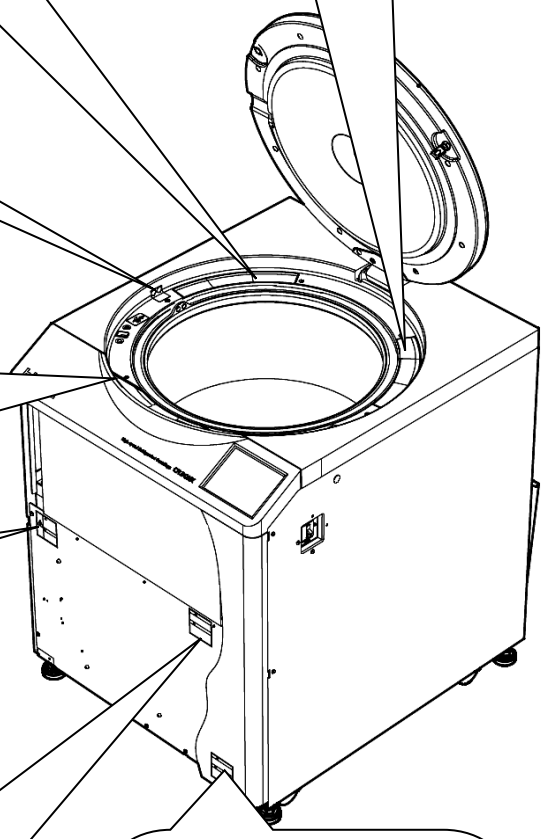
⚠CAUTION

Exposed protrusions can cause severe injury. Do not put your hands on the table when closing the door.

⚠CAUTION

- Foreign substances from broken or leaky tubes and other sources will interfere with the operation of this machine. Monthly cleaning of the drive shaft, the drive hole of the rotor and the chamber is highly recommended.





⚠WARNING



Risk of electrical shock.
Disconnect equipment from power supply before servicing and wait for at least three minutes.

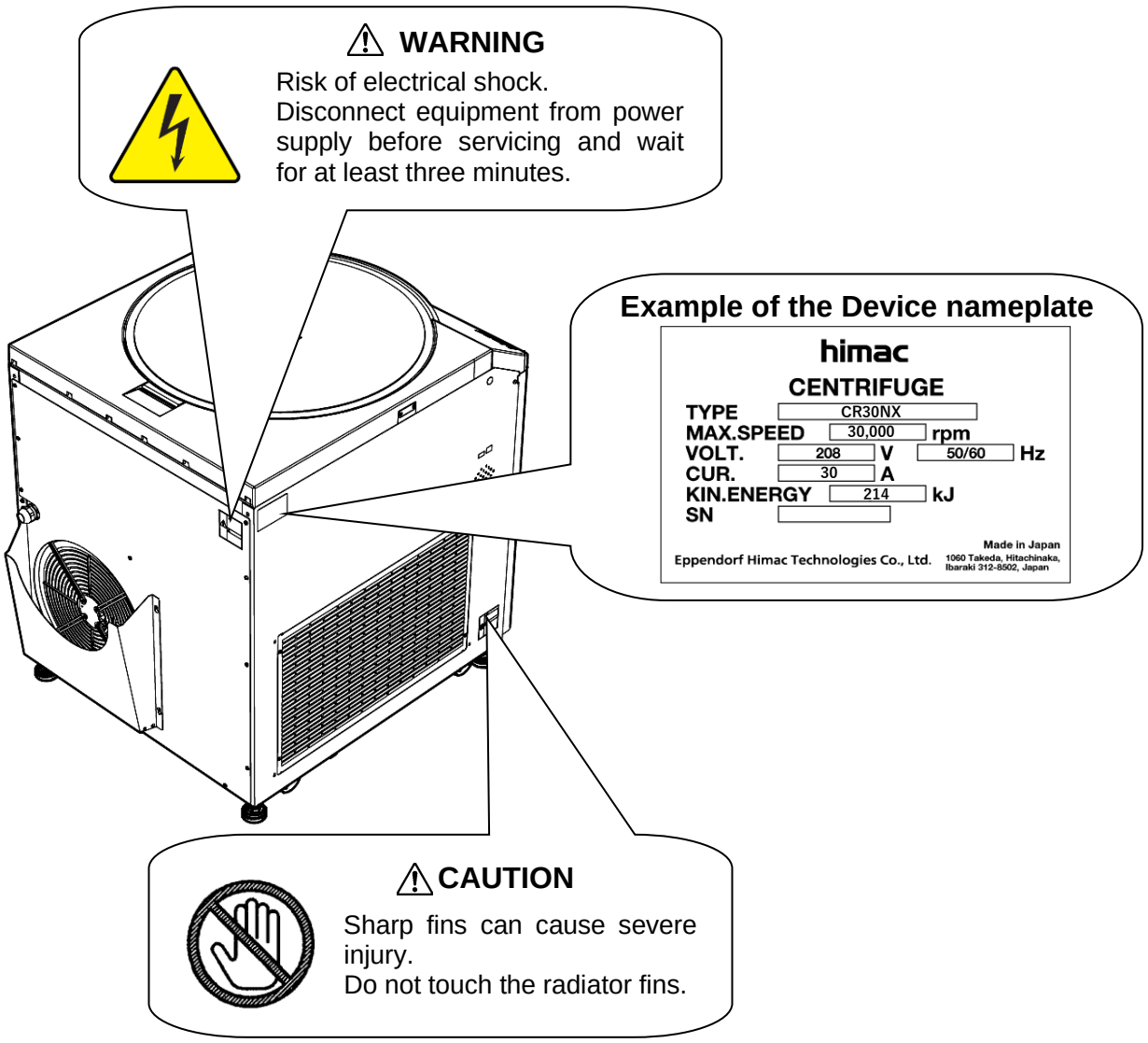
⚠WARNING

Do not loosen the vacuum release screw during rotation. In the event of a power outage, operate according to the instruction manual.

⚠CAUTION

This cover should only be removed for power outages or other situations that are absolutely necessary.
Always make sure that the power source is off and follow the instructions in the manual.

⚠ SAFETY INFORMATION



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APPENDIX

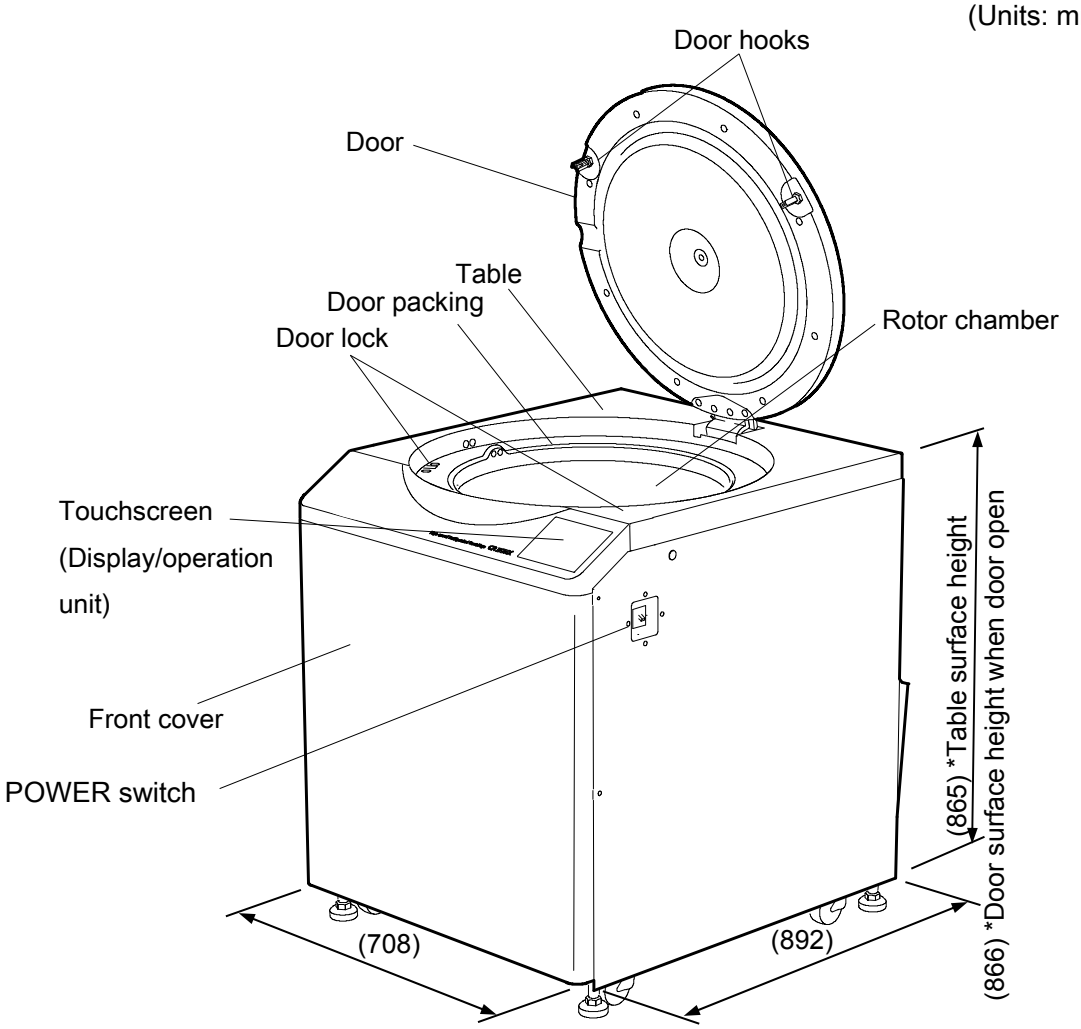
Decontamination Sheet
WEEE Compliance
Marking for the restriction of the use of hazardous substances in electrical and electronic product (THE PEOPLE'S REPUBLIC OF CHINA)

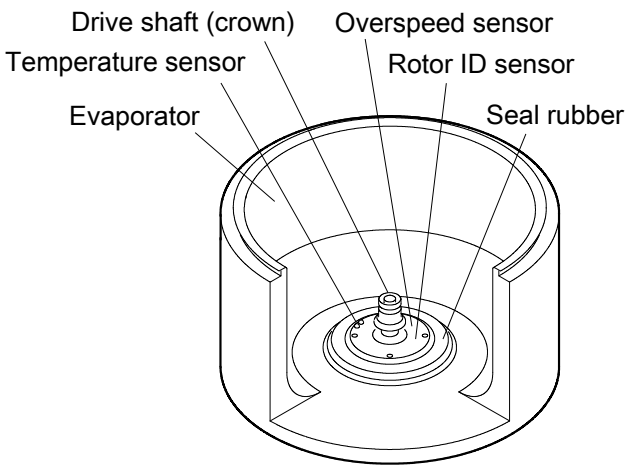
1. Overview

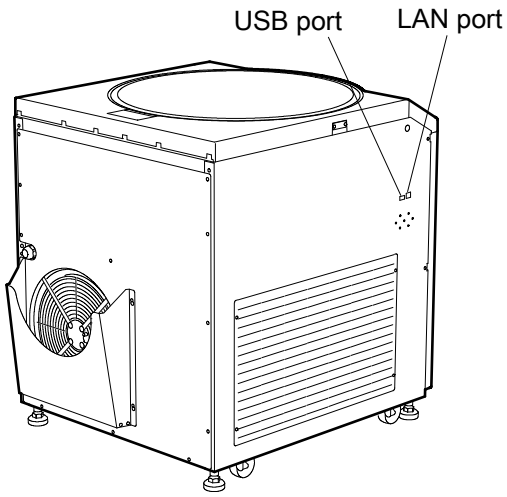
This presents the external view and describes the main parts of the centrifuge.

1-1 External View

(Units: mm)







1-2 Structure

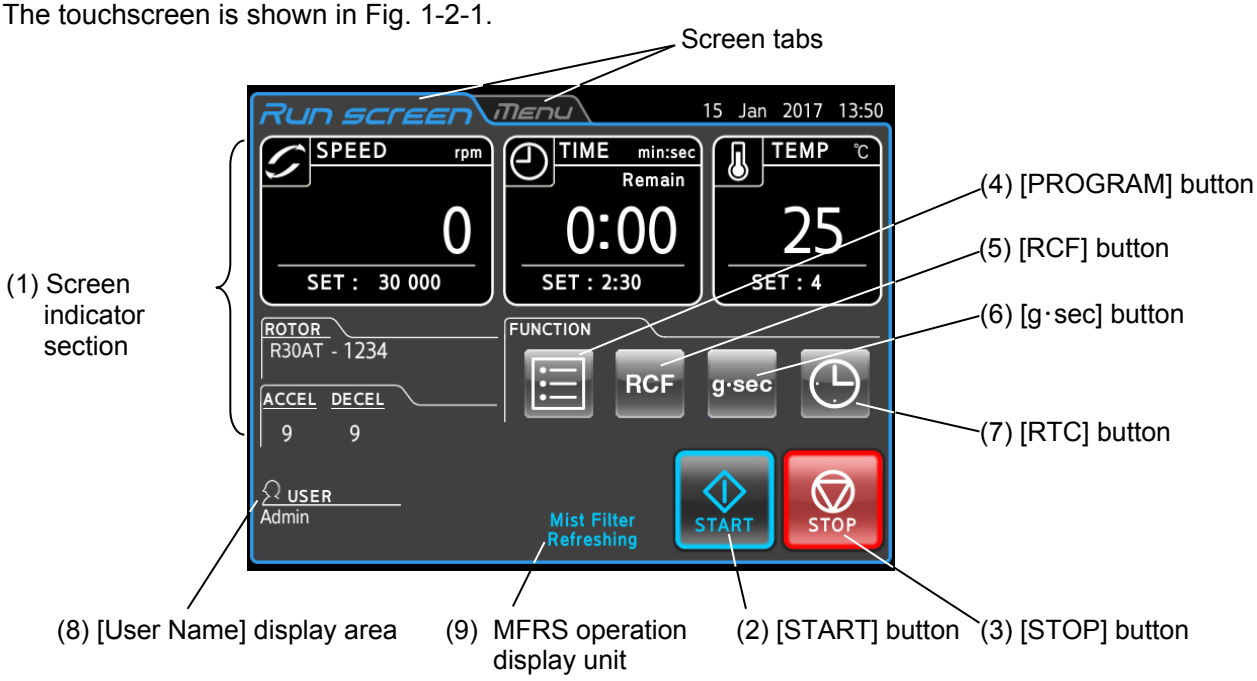
1-2-1 Touchscreen and External Connections

The display unit of this centrifuge uses a touchpanel with color LCD screen.

The user can touch the display screen to set the run parameters and perform operations.

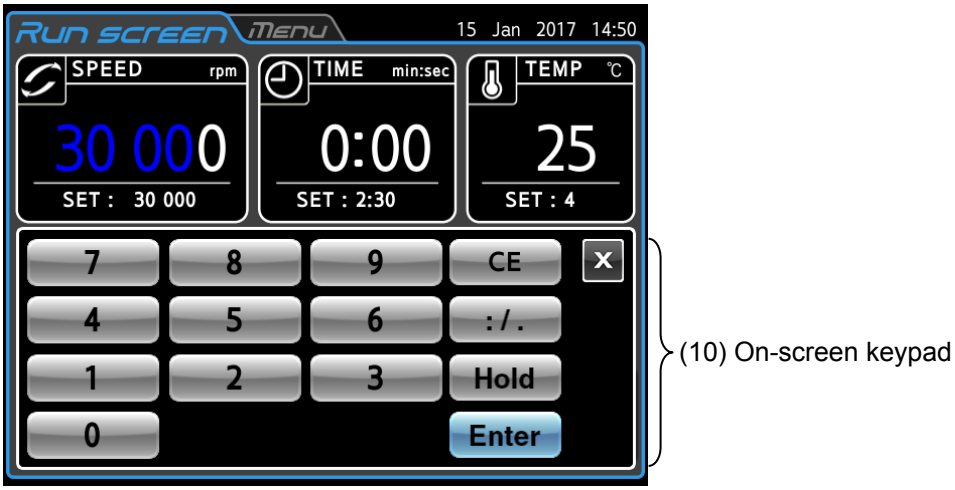
This screen can also be used to display and use the operation history, programmed operation, user customization, and a wide range of other functions.

The touchscreen is shown in Fig. 1-2-1.



Normal operation display

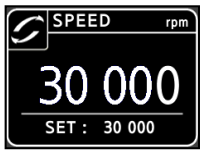
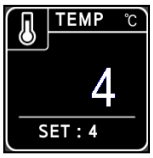
When the [SPEED] [TIME] [TEMP] display area is pressed, the screen for entering values is displayed.



Display for entering run parameters

Fig. 1-2-1 Touchscreen

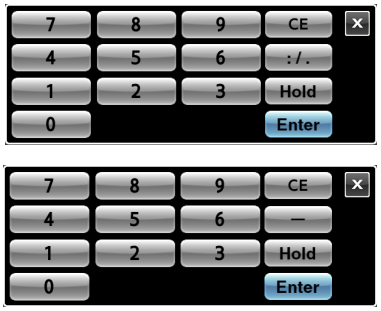
[Functions of the Run screen]

No.	Name and symbol	Functions and actions
①	Display areas	These areas display various types of information. The SPEED, TIME, and TEMP areas display the current status in the upper section and the selected setting in the lower section. (For settings, see section 2-2-1.)
	SPEED area 	● SPEED (Rotational speed indicator) (Upper section) Displays the speed in increments of 100 rpm. (Lower section) Used to set and display a speed from 300 to 9,999 in increments of 10 rpm. Used to set and display a speed from 10,000 to the maximum speed in increments of 100 rpm. The last digit (1 position) displays zero. CR30NX: Max. speed: 30,000 rpm
	TIME area 	● TIME (Running time indicator) (Upper section) Displays the remaining operation time. If the running time is set to HOLD, the upper section displays the elapsed time. (Lower section) “min:sec” unit mode: Used to set and display a value in the range from 1 second to 99 minutes 59 seconds in increments of 1 second or 1 minute. “hr:min” unit mode: Used to set and display a value in the range from 1 minute to 99 hours 59 minutes in increments of 1 second or 1 minute.
	TEMP area 	● TEMP (Temperature indicator) (Upper section) Displays the temperature in increments of 1 °C. (Lower section) Used to set and display a temperature in the range from -20 °C to 40 °C in increments of 1 °C.
	Rotor indicator field 	● Rotor (Rotor indicator) The rotor model name is displayed in this field when the rotor is mounted in this centrifuge. If you press this field, a list containing names (rotor model name and serial number) may appear (see section 2-1-2 and section 2-5-6(3)).
	ACCEL/DECEL field 	Press this field to set the acceleration and deceleration rate. ● ACCEL (Acceleration mode indicator) Displays acceleration modes 1 through 9 together with “#”. ● DECEL (Deceleration mode indicator) Displays deceleration modes 1 through 9 together with free coasting (0). Displays “SLOW” or “FREE” and the deceleration mode change speed when DECEL SLOPE (variable deceleration slope function) was selected.
②	**[START]** button 	● Press this button to start rotor rotation. If short-lasting operations are repeated, the [START] button may turn gray and an hourglass mark may appear as shown at right. When this happens, operation cannot be started even if the [START] button is pressed. Wait several minutes for the hourglass mark to disappear, and then press the [START] button. 
③	**[STOP]** button 	● Press this button to stop rotor rotation.

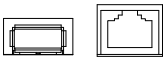
[Functions of the Run screen]

No.	Name and symbol	Functions and actions
④	PROGRAM button	This is used for programmed operation, storing run parameters, and other actions. See Section 2-3-1 “Programmed Operation”.
⑤	RCF button	This is used to display and set the centrifuge acceleration. See Section 2-3-2 “Displaying and Setting RCF”.
⑥	g·sec button	This is used to display and set the integrator (g·sec). See Section 2-3-3 “g-sec Display and Setting Function”.
⑦	RTC button	This allows you to operate the centrifuge by specifying a preset rotation start time and end time. See Section 2-3-5 “RTC (Real Time Control) Operation”.
—	ω^2T button	This is used to display and set the integrator (ω^2T). See Section 2-3-4 “ω^2T Operation”.
⑧	USER User Name display area	This displays the user name. See Section 2-5-6 “Admin Function.”
⑨	Mist Filter Refreshing MFRS operation display unit	This is displayed when the MFRS (system for removing oil collected in the oil mist filter of the built-in vacuum pump) is activated.

[Functions of operation button section]

No.	Name and symbol	Functions and actions
⑩	On-screen keypad (numeric keypad)  	This is used to enter numbers when setting the run parameters. [:/ .] When entering the time, this is used to switch between minutes and seconds. (When using the hour:minutes units, this is used to switch between hours and minutes.) When entering g·sec or ω^2T: This is used to enter the decimal point. [—] When entering a temperature: This is used to enter a negative sign “-”. [Hold] When setting the operation time: Continuous operation setting [CE] When entering the run parameters and numbers, this is used when a mistaken entry was made. Pressing the [CE] button clears the number that was entered and returns to the previous number. [Enter] This is used to finalize the input value. [×] This is used to close the on-screen keypad.

[Functions of external connection section]

No.	Name and symbol		Functions and actions
⑪	USB (Host)	⑪ ⑫	This is used to export the operation history to a USB memory device or to save the DETAILS of programmed operation to a USB memory device.
⑫	LAN		This is used to connect to the computer optional software “himac Log Manager” or smartphone app “himac View”.

1-2-2 POWER Switch

This switch supplies power to the centrifuge unit.
" | ": ON
"O": OFF

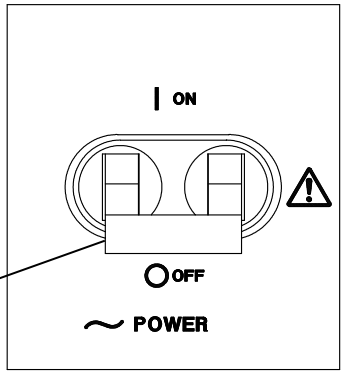


Fig. 1-2-2 POWER switch

1-2-3 Safety Devices

(1) Protection of rotor chamber

The outside of the rotor chamber is enclosed by a protector (steel plate) for ensuring operator safety even if the rotor breaks down or becomes disengaged from the crown while spinning at high speed.

(2) Imbalance detection

This centrifuge is equipped with a sensor for decelerating the rotor when it detects large rotor vibrations due to improper bucket mounting or excessive imbalance.

(3) Door lock mechanism

To ensure safety, the door is automatically locked while the rotor is spinning. Also, the door remains locked even when the power is shut off.

The door can be opened and closed only when the rotor is stopped.

(4) Dual overspeed detectors

This centrifuge is equipped with detectors to prevent the accidental setting of the rotor to speeds exceeding the maximum allowable rotation speed.

(1) The maximum allowable rotation speed of the rotor is recognized when it is mounted on the drive shaft (crown). Operation cannot be performed if the rotation speed that is set exceeds the maximum allowable rotation speed.

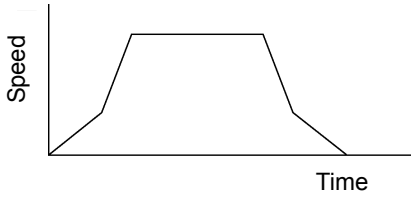
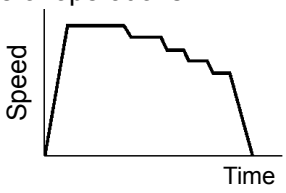
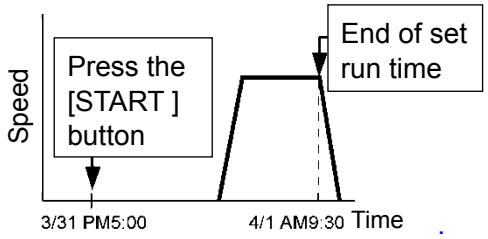
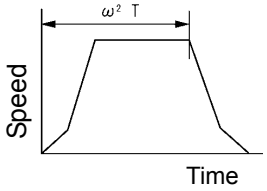
(2) An overspeed detection CPU enables safe stopping of the rotor when overspeed operation occurs.

(5) Mechanism for preventing operation when rotor cover is not mounted

For certain rotor types, if operation is performed without mounting the rotor cover, buoyancy occurring during spinning can cause the rotor to rise up and become disengaged. This centrifuge uses an ultrasonic sensor embedded in the door to detect the cover of these types of rotors, and even if the user performs operation without mounting the rotor cover, a safety device is included for decelerating the rotor.

2. Operation

The centrifuge includes a wide array of functions for supporting a broad range of applications. A brief description of each operation mode is presented below.

		Function overview	Reference
	Normal operation		☞ Section 2-2 “Basic Operation”
Function	Programmed operation	Set run parameters can be saved in memory for later use in repeated operation.	☞ Section 2-3-1 “Programmed Operation”
	Step-mode operation	Normal operations can be combined in a sequence of operations.	☞ Section 2-3-1-3 “Step-Mode Operations”
	RTC operation (Real Time Control)	This function is used to perform a run between a set start time and end time.	☞ Section 2-3-5 “RTC Operation”
	Displaying and setting RCF (Relative Centrifugal Force)	The centrifuge automatically calculates RCF values from the set speed, or the speed from set values, and then displays the calculation result on the control panel.	☞ Section 2-3-2 “Displaying and Setting RCF”
	Displaying and setting g·sec	This centrifuge automatically calculates and displays integrator (g.sec) values from the RCF and run time. The centrifuge can also be operated by entering integrator (g.sec) values.	☞ Section 2-3-3 “Displaying and Setting g·sec”
	ω^2T operation	The centrifuge calculates the run time from the speed and sets the ω^2T value.	☞ Section 2-3-4 “ω^2T Operation”
	User lockout	This function enables control of user access.	☞ Section 2-5-6 (2) “User lockout”

2-1 Run Preparation

⚠ **WARNING:** (1) This centrifuge does not have an explosion-proof structure. Never use explosive or flammable samples or materials that could incite vigorous chemical reactions. Do not centrifuge these types of materials in this equipment or handle or store them near the centrifuge.

(2) Because this centrifuge uses a vacuum pump to discharge the air in the chamber, take all necessary safety measures before using toxic or radioactive samples or pathogenic or infectious blood samples. Use these types of samples at your own risk.

⚠ **CAUTION:** Do not place containers holding liquid in the rotor chamber, on the centrifuge, or near the centrifuge. If liquid is spilled, it could get inside the centrifuge and damage its electrical and mechanical components.

⚠ **CAUTION:** The rotor temperature control accuracy is affected by condensation in the rotor chamber before operation. When handling temperature-sensitive samples, perform operation while the inside of the rotor chamber is completely dry.

2-1-1 Starting up the Centrifuge

Before setting run parameters, display the Run screen (screen for setting run parameters).

(1) Displaying the Run screen (screen for setting run parameters).

Turn on the POWER switch.

↓

The initial screen appears.

↓

The Run screen appears.

↓

Register the desired rotor (see section 2-1-2).



Initial screen

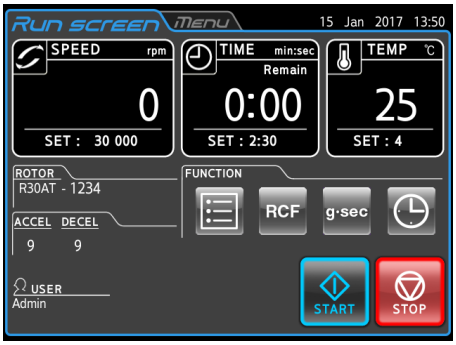


Fig. 2-1-1 Initial Screen and Run Screen

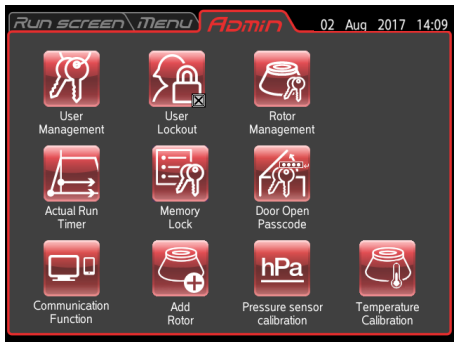
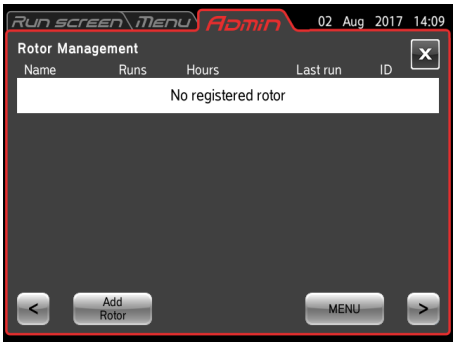
*When the initial screen appears, it may blink momentarily, but this is not a malfunction.

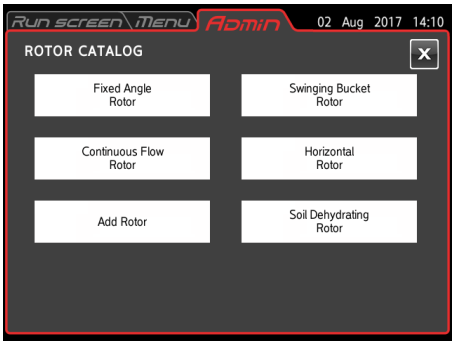
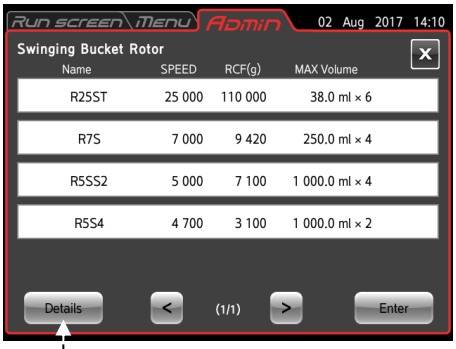
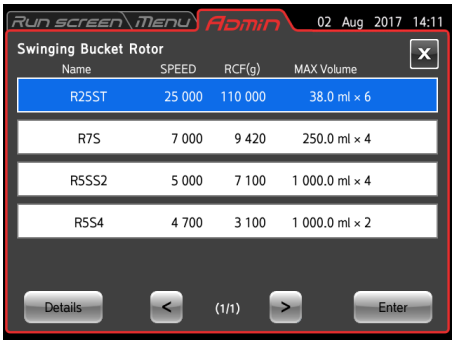
2-1-2 Registering the Rotor to Use

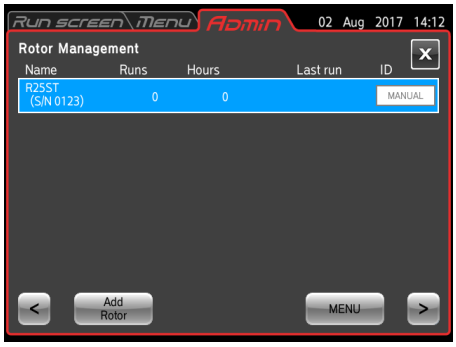
The rotors that can be used in this centrifuge have the run count limits shown in 2-1-4 “Rotor Life”. For this reason, the centrifuge includes a function the supports management of the run count (rotor management function). To use this function, the rotor must be registered beforehand. The rotor registration procedure is shown below.

* The rotors listed in Section 2-1-4 “Rotor Life” cannot be used in this centrifuge unless this procedure is performed. Other rotors can be used without performing this procedure, but the run count cannot be managed.

⚠ **WARNING**: The rotor management function supports lifespan management of registered rotors. The cumulative run count is not intended as a guarantee of operation. The final cumulative run count should be performed accurately by the customers themselves.

Step	Touchscreen operation	Screen display after operation and usage notes
1	Press the MENU tab in the top section of the Run screen.	 • Open the MENU screen.
2	Press the [Manager (Admin)] button on the MENU screen.	 • Open the ADMIN screen.
3	Press the [Rotor Management] button on the ADMIN screen.	 • Open the Rotor Management screen.

Step	Touchscreen operation	Screen display after operation and usage notes
4	Press the [Add Rotor] button in the Rotor Management screen.	 ● Open the ROTOR CATALOG screen.
5	Press the button for the rotor type to be registered.	 [Details] button ● This shows an example of a Swinging Bucket Rotor list.
6	Select a rotor, and press the [Enter] button. To check the specifications for a rotor, select the rotor and press the [Details] button.	 ● The box for the selected rotor changes to blue.

Step	Touchscreen operation	Screen display after operation and usage notes
7	Enter the serial number, and press the [ENTER] button.	 ● Entering a four-digit number: Add 0 as a prefix so that “123” becomes “0123”.  ● This returns to the Rotor Management screen. Name: Rotor model and serial number Runs: Run count Hours: Run time Last run: Date of last run ID: Auto/Manual selection for reading of rotor ID*
8	Press the Run screen tab to return to the Run screen.	○ The display shows the Run screen again.

*Auto/Manual selection function for reading of rotor ID

This centrifuge can automatically detect the rotor model when the rotor is mounted. However, because the serial number cannot be read, if the customer has multiple rotors of the same model type, to perform rotor management of the run count and other details based on the serial number, the above-described rotor registration procedure must be performed (this is required for rotors listed in Section 2-1-4 “Rotor Life” that have a limit on their run count).

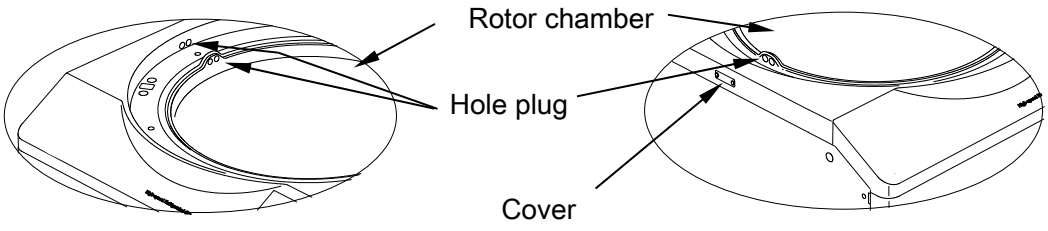
If multiple rotors of the same model type are registered, reading of the rotor ID temporarily switches to Manual. For rotors that are set to Manual, a pop-up window appears in the list when the rotor is mounted, and so select the rotor from the list before using.

Even when multiple rotors of the same model type are registered, a single rotor serial number with the highest usage priority can be set to Auto. Then, the rotor of the serial number that was set to Auto is selected when this rotor is mounted. To use a rotor with a different serial number, press the rotor name display box to open the list, and select the rotor from the list before using. (See step 3 in 2-2-2 “Operational Procedures”.)

2-1-3 ROTOR

⚠**WARNING:** 1. Never use any rotor, bucket, assembly, or other part for the centrifuge that is not authorized by us.
2. Do not use corroded, scratched, or cracked rotors, buckets, or assemblies. Check that the rotor, buckets, and assemblies are free of any abnormalities before operation.
3. Do not operate above the maximum rated speed of the rotor or buckets.
4. Be sure to mount all buckets of the same serial number.
5. The rotor speed is limited based on the mean density of sample and the sample weight. Refer to the rotor instruction manual for details.

⚠ **CAUTION**: 1. Carefully read the rotor instruction manual before use.
2. Never use any adapter, tube, or bottle for the centrifuge that is not authorized by us.
3. Securely mount the rotor cover.
4. Do not operate above the allowable imbalance.
5. To avoid imbalance, fill the same sample in the same tubes or bottles and load them in the buckets located symmetrically to the drive shaft in the rotor. Use caution because imbalanced operation can occur in the following cases.
   - If using samples that are equal in volume but have different composition, the precipitation levels may vary due to centrifugation, and as a result, may increase the level of imbalance.
   - If using samples that are equal in weight but have different volume (density) or if the tubes or bottles have a different inside diameter, material, or shape, variations in the position of the center of gravity may cause imbalance.
6. Be sure to mount all plates and all plate adapters when using the horizontal rotor.
7. Do not run this centrifuge above the allowable maximum speed of the rotor, buckets, tube, bottle, tube/bottle cap, and adapters. If their maximum speeds vary, run it at the lowest maximum speed among them. The allowable maximum speed may be limited depending on the combination of tube/bottle, tube/bottle cap, and adapter. For details about the allowable maximum speed, refer to the rotor instruction manual provided with the rotor. When using tubes on the market, perform operation under the allowable speed or the allowable RCF specified by the manufacturer. Otherwise, the tubes could break during operation.
8. Although the tubes/bottles are balanced within the allowable range, an imbalance alert may occur depending on the combination of the tubes/bottles and the rotor. In that case, balance them more accurately.
9. Do not remove the hole plugs and cover on the left side of the centrifuge except when using a continuous flow rotor in this centrifuge.



For the specifications of rotors compatible with this centrifuge, refer to “Applicable rotors to the CR30NX centrifuge (Part No. S998659)”.

2-1-4 Rotor Life

There is a limit on the number of runs for the rotors used in this centrifuge. If the total number of runs indicated by the “Runs” indicator (total number of runs indicator) on the Rotor management screen reaches the maximum number of runs, the rotor has reached the end of its service life. When a rotor has reached the end of its service life, stop using it, and dispose of it immediately.
In the same way as the rotor, the bucket attached to the swing rotor also has a limit on the number of times it can be used. Because this machine cannot count the number of uses for a bucket, use your own method to count the number of uses. Also, be sure to use the rotor and bucket as a set.

Rotor	Maximum number of runs*1
R25ST	10,000

*1: Continued use of a rotor after the total number of runs has exceeded the maximum number of runs will cause the “**Rotor Life3**” alert, and operation will be disabled.
If the total number of runs of a rotor is approaching the maximum number of runs, replace the rotor as soon as possible.

⚠ **WARNING:** Care must be taken to not exceed the specified life of the rotor and bucket because this could lead to a serious accident.

⚠ **WARNING:** This centrifuge cannot automatically detect the serial number of the rotor. When using multiple rotors in a single centrifuge, all of these rotors must be registered. If you fail to select the correct rotor (serial number) to be used when operating, the cumulative runs will not be counted accurately. Also, when a rotor is used in multiple centrifuges, the cumulative runs are counted for each centrifuge only, and the total number of runs are not counted.

⚠ **WARNING:** This machine is not capable of detecting when replacement is required for the rotor and bucket. Do not replace the bucket only from other rotors. The run count will not be counted correctly.

⚠ **WARNING:** The rotor management function supports lifespan management of registered rotors. The cumulative run count is not intended as a guarantee of operation. The final cumulative run count should be performed accurately by the customers themselves.

Messages displayed for the rotor service life

The following alerts are displayed when the total number of runs of the rotor is approaching or reaches the maximum number of runs.

Level	Number of runs	Displayed information	Meaning
1	8,000 to 9,400	“**Rotor Life1**” is displayed when operation ends.	The rotor is approaching the end of its service life. Consider purchasing a new rotor.
2	9,401 to 10,000	“**Rotor Life2**” is displayed when operation ends.	The service life of the rotor will end soon. Consider purchasing a new rotor.
3	10,001 and higher	“**Rotor Life3**” is displayed when operation starts.	The rotor is being used past the limit of its service life. (The number of runs exceeds the specified value.) Do not use the rotor.

NOTE

You can cancel the displayed messages listed in the table on the previous page by pressing the **[CE]** button. "**Rotor Life1**" is displayed only at the end of the first operation after the power is turned on.

After operation ends, you cannot start operation by pressing the **[START]** button while the alerts listed in the table on the previous page are displayed. Clear the messages by pressing the **[CE]** button, and then start operation by pressing the **[START]** button.

2-1-5 Rotor Compatibility

The CR30NX is compatible with the CR30NX rotors only. Operation cannot be started if a non-CR30NX rotor (adapter: blue or black) is mounted in the CR30NX.

⚠**WARNING:** Use the CR30NX rotors (adapter: red) in CR30NX centrifuges only. Depending on the type of rotor selected in the centrifuge, operation may be performed in a state where overspeed detection is not working properly, and this could lead to damage to the centrifuge and surrounding equipment due to breakage of the rotor.

2-2 Basic Operation

⚠ **WARNING:** Do not press on, tilt, or move the centrifuge while the rotor is spinning. Do not place any object on the centrifuge or lean on it.

⚠ **CAUTION:** ① Do not press the touchscreen with a ballpoint pen or other sharp-pointed object.
② If abnormal sounds occur during operation, stop operation immediately and contact the vendor where you made the purchase or an authorized sales or service representative.

2-2-1 Setting Run Parameters

This section first describes the screen for basic operation (Run screen).
For an overview of the information displayed on screen during normal operation and when entering the operation conditions, see Section 1-2-1 “Touchscreen and External Connections”.

[Information displayed during normal operation]

The screen for displaying the setting values of the run parameters and the operation status is called the run screen.
The rotational speed (SPEED), time (TIME), and temperature (TEMP) are displayed in two sections, where the top section displays the current operation status, and the bottom section displays the run parameter setting values.
Setting values are displayed in the acceleration (ACCEL) and deceleration (DECEL) areas.

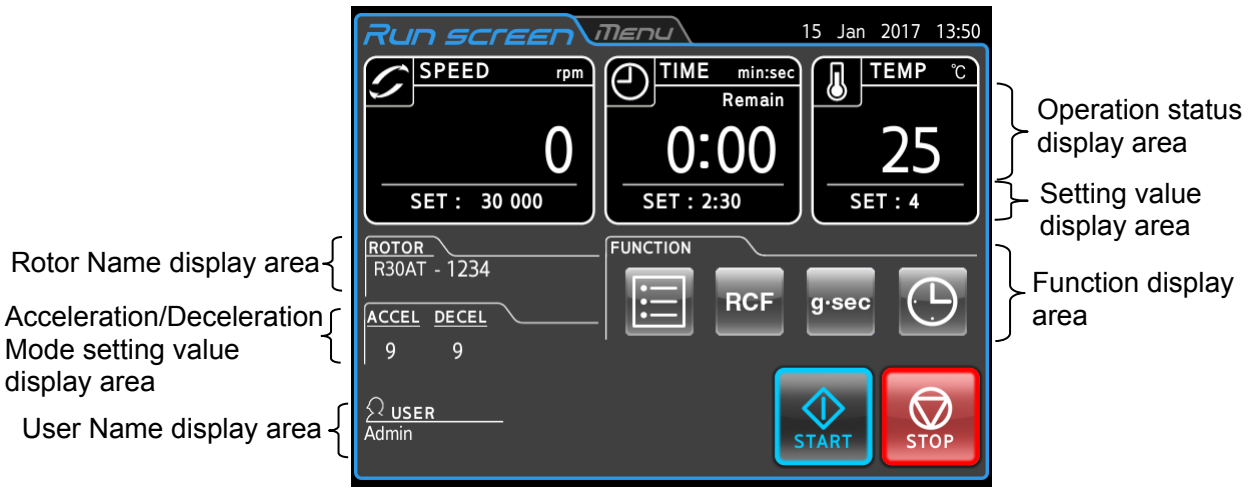
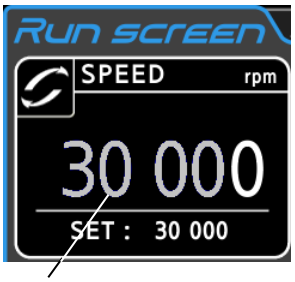


Fig. 2-2-1 (1) Run screen

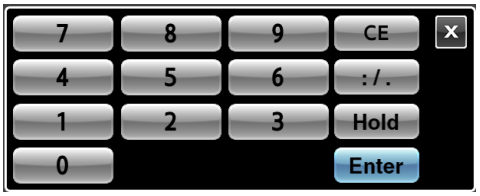
[Display and operations when entering run parameters]

Press the SPEED, TIME, TEMP, ACCEL or DECEL area on the touchscreen to display the on-screen keypad.

(1) Press the field of the item you want to set. The number in the top section is displayed in blue.

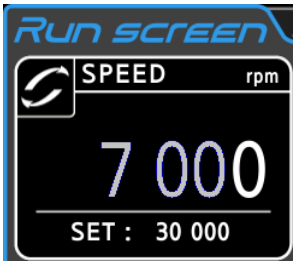


Color of number in top section: Blue



[On-screen keypad (numeric keypad)]

(2) Use the on-screen keypad (numeric keypad) to enter the number.
For example, to enter 7,000 rpm, enter **[7] [0] [0]**.



(3) If there are no other setting items, use the on-screen keypad (numeric keypad) to press the **[Enter]** button.
To make other settings, press the field of the next item.
This completes setting of the selected item, and the new setting item stands by for input.
Setting values are displayed in the setting display field.

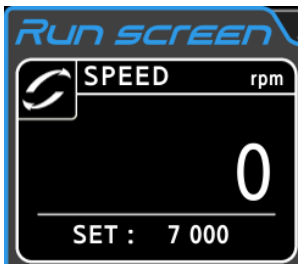


Fig. 2-2-1 (2) Setting value display area

The methods for setting the run parameters are described on the next page using examples.

NOTE

1) If you enter the wrong value, press the **[CE]** button, and enter the correct value. However, if you have already pressed the **[Enter]** button, repeat the process, and enter the correct value.
2) When setting two or more of the SPEED, TIME, and TEMP run parameters, you do not need to press the **[Enter]** button. When you touch the field of the next run parameter, the currently entered item is confirmed.
3) First, to set continuous run (HOLD) and set the time again during operation, enter a value equal to the desired remaining operation time plus the elapsed time up to that point.
   For example, if the centrifuge has been running for 5 minutes and you want operation to stop it in 1 minute 30 seconds, touch the TIME field and enter
   [6] [:/ .] [3] [0]
4) When the TIME field is pressed, the run time units selector button appears in the bottom section of the numeric keypad. When making the TIME setting, press the **[hr:min]** button in the bottom section of the numeric keypad (or **[min:sec]** button) to set the run time units to “minutes: seconds” or “hours: minutes”.
   The indicator in the TIME field of the Run screen also changes based on the run time units.
   For example, the indicator shows “min:sec” when the run time units are set to “minutes: seconds”, and it shows “hr:min” when the run time units are “hours: minutes”.

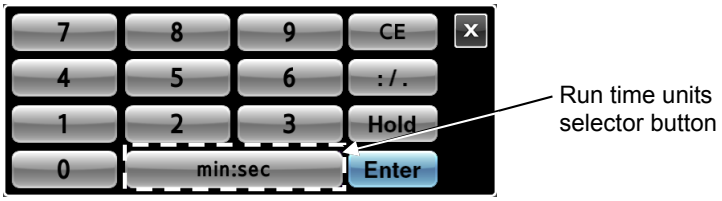


Fig. 2-2-1 (3) Numeric keypad for TIME setting
(when set to “hours: minutes” mode)

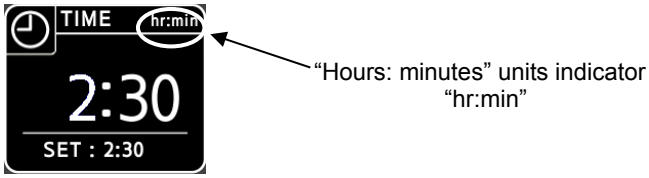
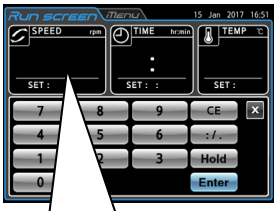
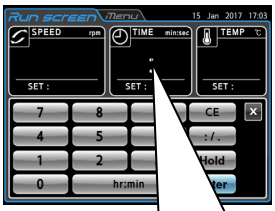
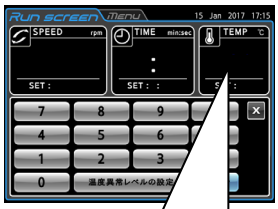
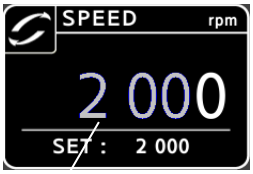
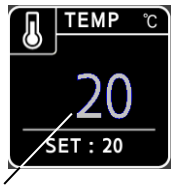
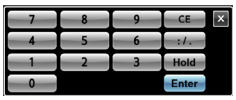
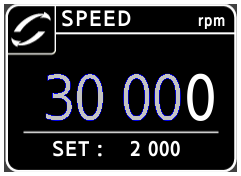
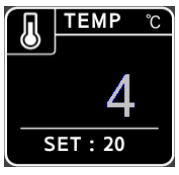
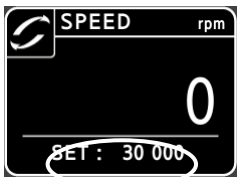


Fig. 2-2-1 (4) Run screen TIME field
(when set to “hours: minutes” mode)

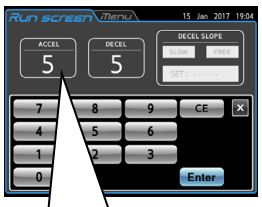
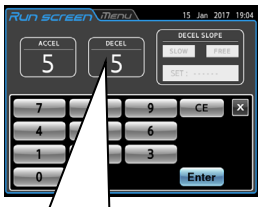
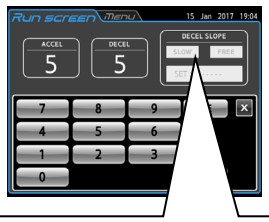
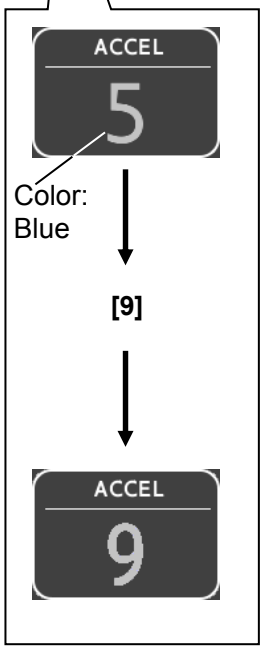
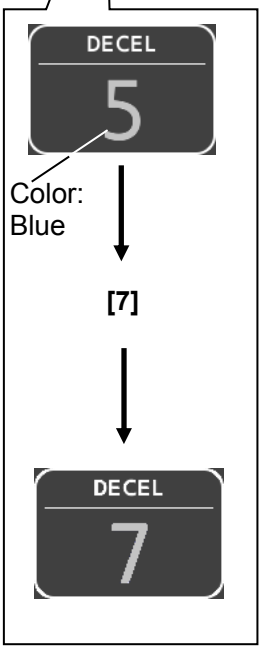
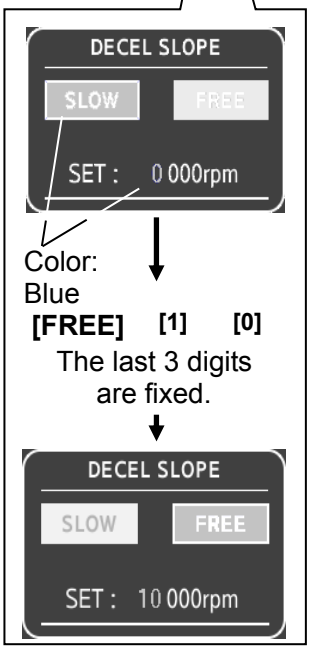
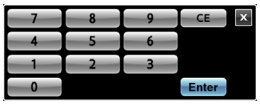
◆ Setting the speed, run time, and temperature

The operating procedures are described using examples.

Setting item			Speed (SPEED)	Run time*1 (TIME)	Temperature (TEMP)
Setting example			30,000 rpm	2 min 30 sec	4℃
Operating procedure	1	Press the SPEED, TIME or TEMP field to display the on-screen keypad (numeric keypad).			
	2	Each field displays the value set for the previous run. If the color of the initial digit of the setting is white, press again the field of the item that you want to set. If the color of the initial digit is blue, go to step 3.	 Color: Blue [3] [0] [0] [0]	 Color: Blue [2] [: / .] [3] [0]	 Color: Blue [4]
	3	Use the on-screen keypad (numeric keypad) to enter the setting value.  Each new digit that is entered is scrolled to the left.	The last digit is fixed. 	Press the **[:/.]** button to move the cursor to the "seconds" position. For continuous operation: Press the **[Hold]** button. 	
	4	Check the entered value. To continue making other settings, press the field of the next setting. When no other settings will be made, press the **[Enter]** button. Use the **[CE]** button to cancel incorrect entries.	Set to 30,000 rpm. 	Set to 2:30. (2 min 30 sec)  *1: The units of the run time can be changed using the run time units selector button near the bottom of the numeric keypad.	Set to 4℃. 
Setting range and units			300 rpm to 30,000 rpm ①Speeds of less than 10,000 rpm are set in 10 rpm steps. ②Speeds or 10,000 rpm or more are set in 100 rpm steps.	This can be set in 1 second increments up to 99 minutes 59 seconds. Also, this can be set in 1 minute increments up to 99 hours and 59 minutes.	This can be set in 1°C steps from -20°C to 40°C. (For the temperature error level settings, see page 2-14.)

◆ Setting the ACCEL, DECEL, and DECEL SLOPE

The operating procedures are described using examples.

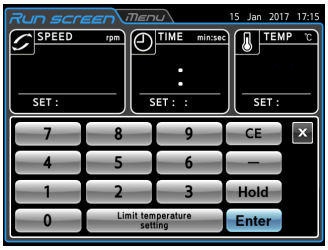
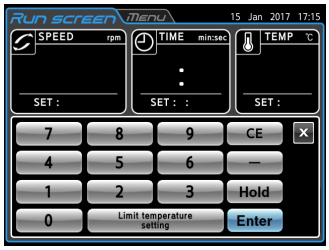
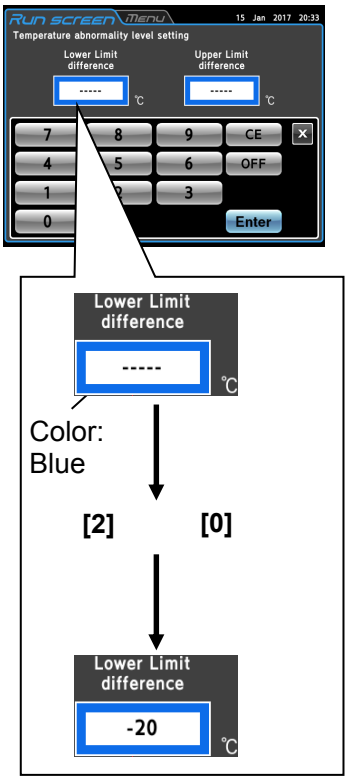
Setting item			Acceleration (ACCEL)	Deceleration (DECEL)	Deceleration slope (DECEL SLOPE)
Setting example			9	7	FREE-10,000 rpm
Operating procedure	1	 Press a field to display the on-screen keypad.			
	2	Press the field whose value you want to set.			
	3	Use the on-screen keypad (numeric keypad) to enter settings. 			
	4	Check the entered value. To continue making other settings, press the field of the next setting. When no other settings will be made, press the **[Enter]** button. Note that DECEL and DECEL SLOPE cannot be set simultaneously. Set one or the other. Use the **[CE]** button to cancel incorrect entries.	Set to 9. 	Set to 7. 	Set to FREE, 10,000 rpm. 
Setting range and units			0 to 9 and #	0 to 9 (0 is natural deceleration)	SLOW or FREE + 1,000 to 10,000 rpm (Set in 1,000 rpm steps)

[Temperature error level settings]

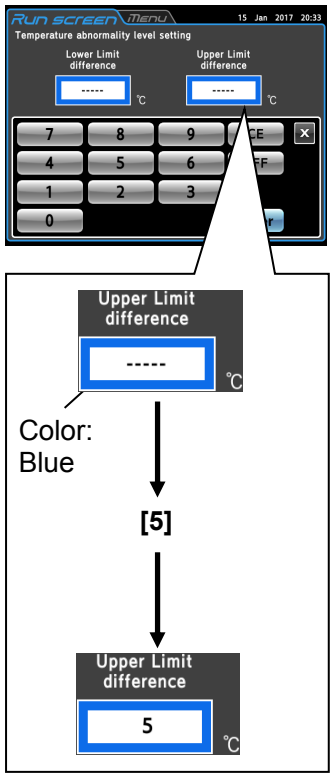
This centrifuge can set the temperature error level. In this function, the lower limit temperature difference[*1] and the upper limit temperature difference[*2] can each be set, and if a sample temperature exceeds one of the setting values during stabilization, a temperature error occurs, and operation is stopped.
The setting procedure for the lower limit temperature difference and upper limit temperature difference is shown below.

*1: Lower limit temperature difference: Tolerance value of temperature difference when the sample temperature drops below the set temperature.
*2: Upper limit temperature difference: Tolerance value of temperature difference when the sample temperature exceeds the set temperature.

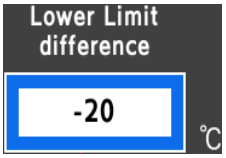
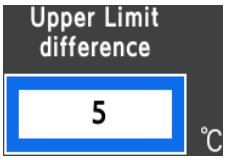
The operating procedures are described using examples.

<table>
<tr><td colspan="3">Setting item</td><td>Lower limit temperature difference</td><td>Upper limit temperature difference</td></tr>
<tr><td colspan="3">Setting example</td><td>-20℃</td><td>5℃</td></tr>
<tr><td rowspan="4">Operating procedure</td><td>1</td><td>Press the TEMP field to display the on-screen keypad.</td><td>
</td><td>
</td></tr>
<tr><td>2</td><td>Press the temperature error level setting button in the on-screen keypad (numeric keypad) to display the setting screen for the temperature difference level.</td><td rowspan="3">

○ When the lower limit temperature difference setting is OFF, “-----” is displayed.

○ When a setting value is entered, the minus symbol (－) is displayed automatically.</td><td rowspan="3">

○ When the upper limit temperature difference setting is OFF, “-----” is displayed.</td></tr>
<tr><td>3</td><td>Press the field of the item that you want to set.</td></tr>
<tr><td>4</td><td>Use the on-screen keypad (numeric keypad) to enter the setting value.
To turn off the setting for either the lower limit temperature difference or upper limit temperature difference, press the [OFF] button.</td></tr>
</table>

Setting item			Lower limit temperature difference	Upper limit temperature difference
Setting example			-20℃	5℃
Operating procedure	4	Check the entered value. To continue making other settings, press the field of the desired setting. When no other settings will be made, press the **[Enter]** button. Use the **[CE]** button to cancel incorrect entries.	Set to -20°C. 	Set to 5°C. 
Setting range and units			This can be set from -20°C to -5°C in 1°C steps.	This can be set from 5°C to 20°C in 1°C steps.

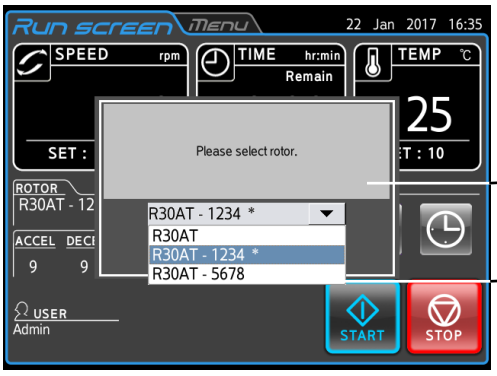
NOTE Be aware that, when using this function, a temperature error may occur when running a rotor that was not precooled, which could cause operation to stop.

2-2-2 Operation Procedures

The normal operating procedures are described below.

NOTE

1) Before you start using your centrifuge, carefully read through the instruction manual for your rotor, and make sure that the correct bottles and sample amounts have been selected.
2) Before starting operation, completely wipe off any condensation adhering to the rotor chamber and door packing. Otherwise, condensation can cause vacuum problems or difficulties in opening the door after operation.

Step	Operation	Centrifuge operation and notes
1	Turn on the centrifuge POWER switch.	○ The touchscreen is displayed.
2	Open the door of the centrifuge.	○ If the door is locked, press the **[OPEN]** button.
3	Mount a rotor.	○ Mount a rotor on the crown. Be sure to properly secure the rotor on the crown. Once the rotor is mounted, the rotor automatically appears on the rotor name area on the Run screen. If you have multiple rotors of the same type or manage the rotor run count by the serial number, register the rotors by following the procedure in “2-5-6 (3) Rotor management”. If a rotor is registered on the Rotor Management screen, pressing the rotor name area opens the screen shown below. Select the rotor to be used.  Rotor list window The rotor selected by default (Auto) appears with an asterisk (*).
4	Close the door of the centrifuge.	○ Hold down the door for 1 or 2 seconds and the door will automatically lock. ⚠ **WARNING:** Make sure your fingers and other objects do not become caught in the space between the door and the table when closing the door. This could result in an injury or malfunction.
5	Set the run parameters.	○ Set run parameters by following the instructions in Section 2-2-1, “Setting run parameters”.

Step	Operation	Centrifuge operation and notes
6	Press the **[START]** button. 	○ The **[START]** button lamp flashes, and the rotor starts spinning. ○ The timer begins operating. (If the actual run timer is set, the timer will start operating when the set speed is reached.) ○ When the set speed is reached, the **[START]** button lamp changes to fully lit.
7	The set centrifugation time has elapsed (timeout). Or press the **[STOP]** button. 	○ The **[STOP]** button lamp flashes, and the rotor starts decelerating. NOTE • A hissing sound may be heard for about 3 seconds. This is normal and is not a malfunction. • If the vacuum pump was operating, the hissing sound may be heard for about 40 seconds during deceleration. This is the sound when the inside of the rotor chamber is returning from a vacuum to normal atmospheric pressure and is not a malfunction.
8	The rotor stops.	○ The **[STOP]** button changes to fully lit. ○ The buzzer sounds to indicate that the rotor has stopped. ○ The **[STOP]** button changes to the **[OPEN]** button. When the **[OPEN]** button is pressed, the door lock is released. 
9	Remove the samples.	○ Carefully remove the samples after the rotor has stopped completely.

NOTE If the door is not opened and the samples are left in the rotor after operation stops, the sample temperature may drop below the set temperature. In a rotor containing few samples, the samples may freeze. Be sure to remove the samples as soon as possible after the rotor stops.

Fig. 2-2-2 is an overview of the procedures described above.

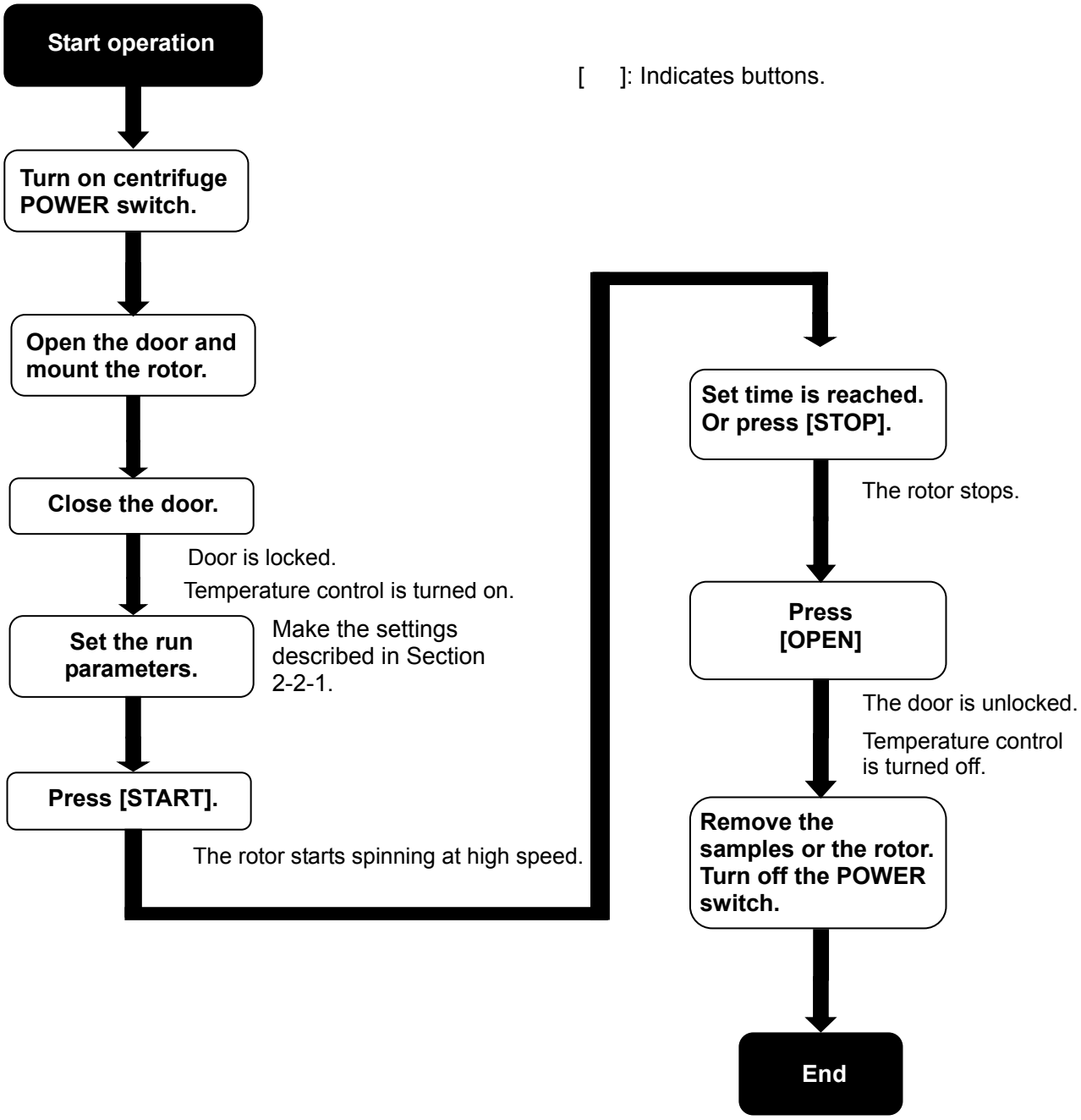
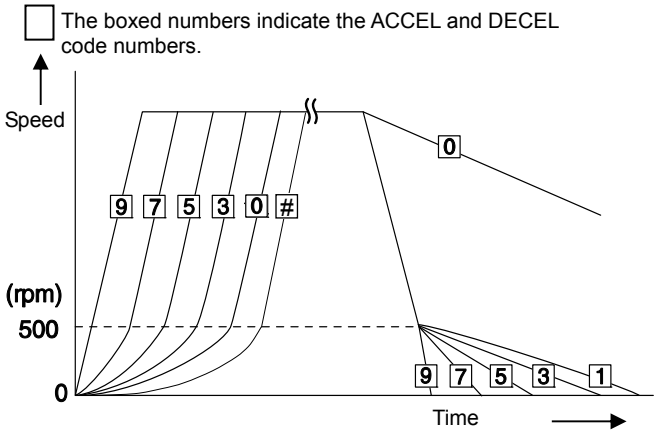


Fig. 2-2-2 Operation procedures

2-2-3 Acceleration and Deceleration Modes

The acceleration and deceleration rates can be adjusted to enable use in a wide variety of applications. By setting an ideal acceleration and deceleration time, samples will not be disturbed, which improves efficiency and reduces centrifugation time.
The table below shows the relationship between the ACCEL and DECEL code numbers and the acceleration and deceleration time.



Code No.	Acceleration time from 0 to 500 rpm	Deceleration time from 500 to 0 rpm
9	Minimum time*1	Minimum time*1
8	30 sec	1 min
7	45 sec	2 min
6	1 min	3 min
5	2 min	4 min
4	3 min	6 min
3	4 min	9 min
2	5 min	12 min
1	8 min	15 min
0	10 min	From stabilized rotation to natural deceleration
#*2	14 min	—

*1: Minimum time: The time it takes the drive motor to accelerate and decelerate the rotor at the maximum torque. Times will vary depending on rotor type.
*2: "#" is the slowest acceleration mode.

NOTE The times in the table above may be longer for some rotor types.
Rotor swinging may become large in modes with long acceleration times, which could cause an imbalance alert to light even within tolerable imbalance values.

2-2-4 Variable Deceleration Slope Function

This function enables selection of two moderate deceleration slopes in addition to the acceleration and deceleration modes provided in the previous section.
These deceleration slopes are useful when separating samples where the sample tends to be easily disturbed.
The three deceleration slopes (SLOPE) are normal deceleration (NORMAL), moderate deceleration (SLOW), and natural deceleration (FREE). As shown in the example below, it is possible to change from normal deceleration to moderate deceleration or natural deceleration at speeds of 10,000 rpm or less. The switching speed can be set in 1,000 rpm steps in the range from 1,000 to 10,000 rpm.
If the switching speed is higher than the set speed, the set speed changes to moderate deceleration or natural deceleration.

This shows an example where the R30AT rotor operates using the variable deceleration slope function.

① Variable deceleration slope function settings
Deceleration slope (SLOPE): Moderate deceleration (SLOW)
Deceleration slope switching speed: 7,000 rpm

② Other operation condition settings
Rotor: R30AT
Speed: 30,000 rpm
Separation time: 2 min 30 sec
Control temperature: 4°C
Acceleration mode: 9

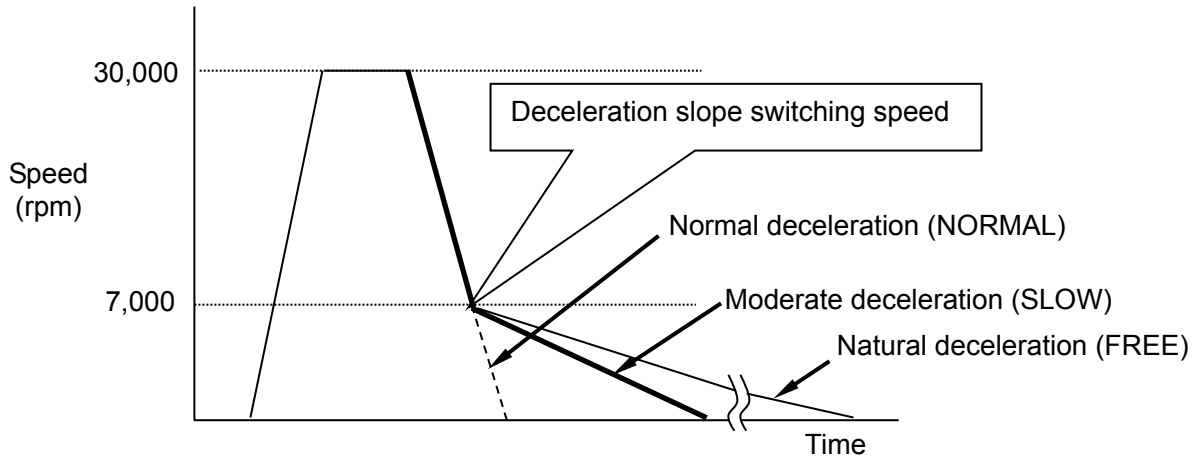


Fig. 2-2-4 (1) Operation example of variable deceleration slope function

NOTE If moderate deceleration is performed using DECEL: 0 (natural deceleration) or the variable deceleration slope function (DECEL SLOPE function), the sample temperature may drop below the set temperature. In particular, if a small-sized rotor with a high maximum speed is operated using a small number of samples, even if it is operated at a setting of 4°C, caution is needed because the samples could freeze in certain cases.

[Screen when set to DECEL SLOPE “SLOW-7000 rpm”]

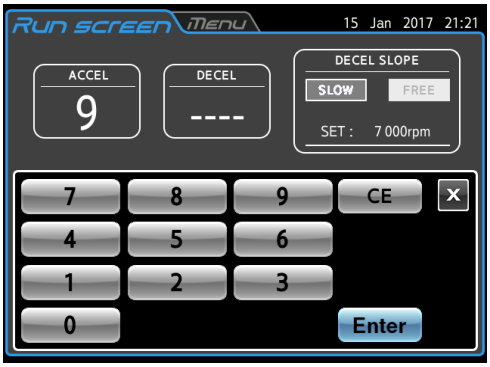


Fig. 2-2-4 (2) Setting screen (when DECEL SLOPE is set)

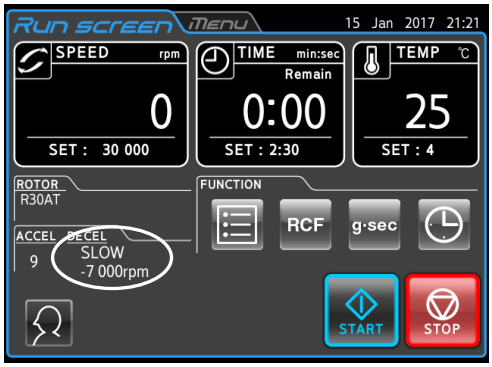


Fig. 2-2-4 (3) Run Screen (when DECEL SLOPE is set)

*For details on setting DECEL SLOPE, see Section 2-2-1, “Setting Run Parameters”.

2-3 How to Use the Function screen

This centrifuge features programmed operation including step-mode operation, RCF and g･sec display and setting functions, ω^2T function, Real Time Control (RTC) that can run the centrifuge at a preset date and time, and a host of other functions. These functions are displayed and controlled using the Run screen (FUNCTION area) buttons.

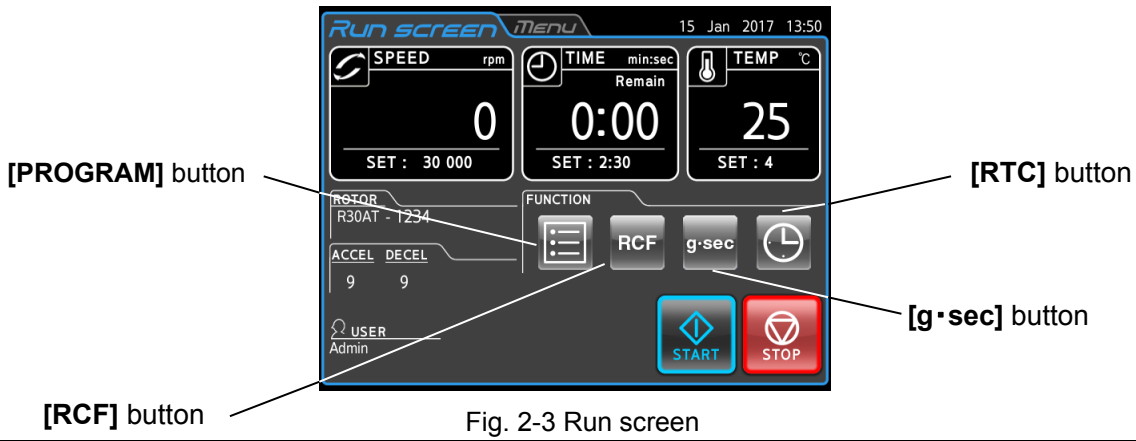


Fig. 2-3 Run screen

Name	Icon (Button)	Function
PROGRAM		This is used to save run parameters in memory for later use in repeated operation. This feature also allows step-mode operation that enables a continuous sequence of operations.
RCF		This is used to automatically calculate and display the centrifugal acceleration of the rotor. It can also set the relative centrifugal force (RCF) value for calculating the speed.
g･sec		This is used to show the integrator during centrifugation (centrifugal acceleration x centrifugation time). It can also be used to set a g･sec value to stop centrifugation when the set g･sec value is reached. (This can be set when g･sec was selected from the g･sec/ω^2T selector screen. For details, see Section 2-5-5 “Customizing”.)
ω^2T		This is used to indicate the centrifugal effect, which is denoted by ω^2T (value obtained by multiplying the square of the angular speed by the run time). Operation can be stopped when the set ω^2T value is obtained. (This can be set when ω^2T was selected from the g･sec/ω^2T selector screen. For details, see Section 2-5-5 “Customizing”.)
RTC		This is used to set a start time or stop time for running the centrifuge at a desired date and time.

The above functions can be used in combination.

NOTE To use **[PROGRAM]** and **[RTC]** in combination, first set **[PROGRAM]** and then set **[RTC]**. Once **[RTC]** is set, you cannot set **[PROGRAM]** because the run time cannot be changed.

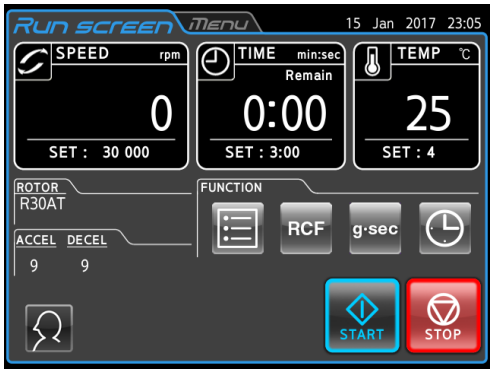
2-3-1 Programmed Operation

When the same centrifugal conditions are used frequently, entering the same conditions every time you perform centrifugation can be a time-consuming task.
This centrifuge has a programmed operation function that stores run parameters. Storing frequently used run parameters enables you to load parameters when you need them for shorter setup times. (The stored run parameters remain stored even after the POWER switch is turned off.)
As shown in the figure below, the centrifuge has a program area that can store 1000 memory items, each of which can hold 30 step conditions.
By storing multiple steps in a memory unit, you can change the speed, run time, temperature, and other parameters during operation.

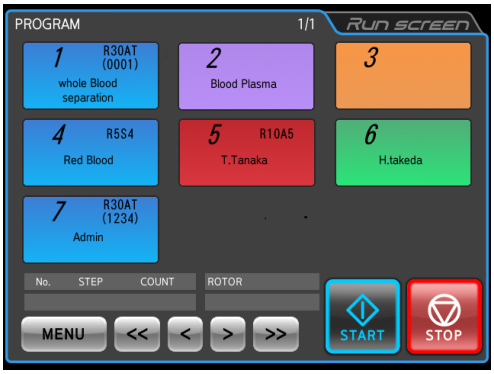
Memory unit 1	Step 1	Step 2	·····	Step 30
Memory unit 2	Step 1	Step 2	·····	Step 30
Memory unit 3	Step 1	Step 2	·····	Step 30
▪	▪	▪	·····	▪
▪	▪	▪	·····	▪
▪	▪	▪	·····	▪
▪	▪	▪	·····	▪
▪	▪	▪	·····	▪
Memory unit 1000	Step 1	Step 2	·····	Step 30

Fig. 2-3-1 Program area

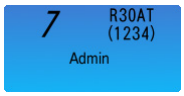
Basic operation of the programmed operation feature

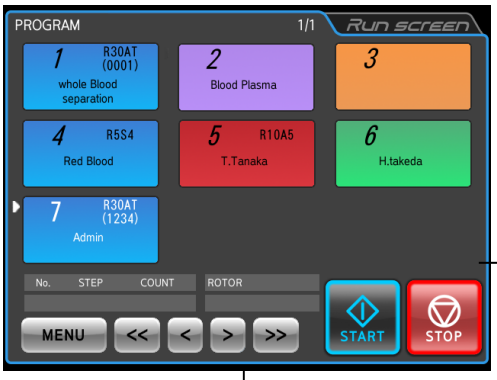


Press the **[PROGRAM]** button.



Press the program folder.





The selected program folder is highlighted, and a white arrow (▷) is added.

To load a run parameter and start operation



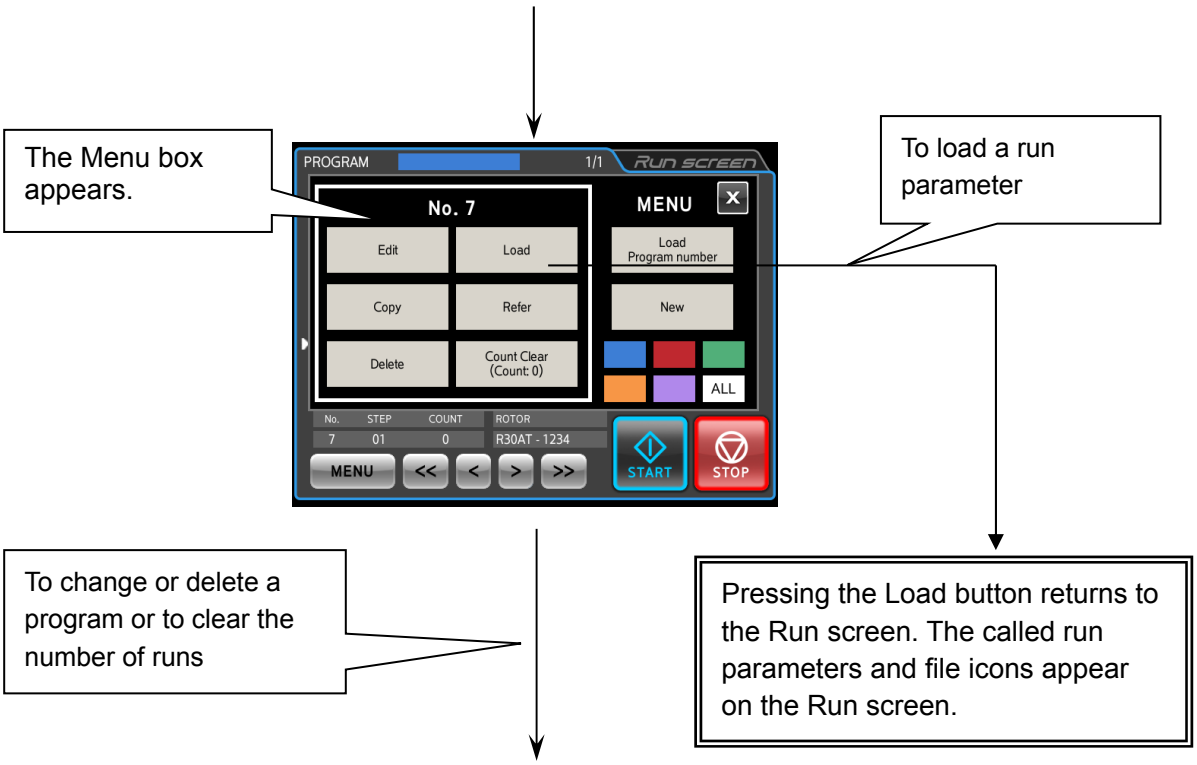
To start programmed operation

To change, delete, or load programmed operation or to clear the number of runs



Press **[MENU]**.

Press the **[START]** button to load the selected program run parameters and start operation. This automatically returns to the Run screen.



To register or change program data ⇨ Press the **[Edit]** button.

To delete program data ⇨ Press the **[Delete]** button.

To clear the number of runs ⇨ Press the **[Count Clear]** button.

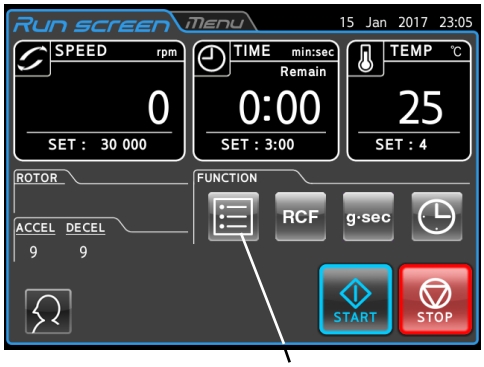
NOTE

1) Programs cannot be registered, changed, or deleted during operation. Perform these operations while the centrifuge is stopped.
2) If the POWER switch is turned off while the Program display screen is open, the Program display screen will close when the centrifuge is restarted, and the Function Selection Area will appear. However, the program will still remain active, and the **[PROGRAM]** button will appear blue.
3) If the **[START]** button is pressed while the **[PROGRAM]** button is blue (and a program is active), program operation will be started.
4) To cancel the loaded program operation, either load another program or change the run parameters.

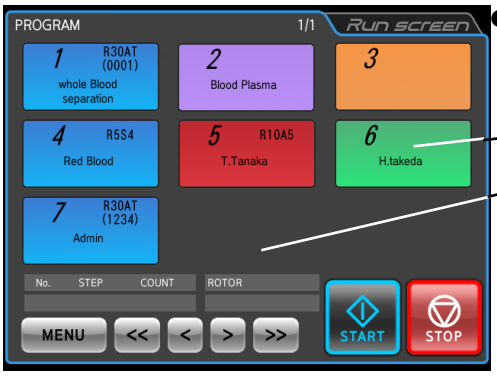
2-3-1-1 Program registration procedures

(1) Procedures for program registration of run parameters

Procedures for registering and changing run parameters are described below.

<table>
<tr><th>Step</th><th>Operation</th><th>Screen display and usage notes</th></tr>
<tr><td>1</td><td>Turn on the centrifuge POWER switch.</td><td>

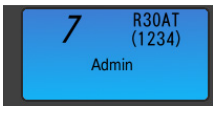
● The Run screen appears

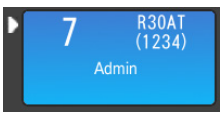
[PROGRAM] button</td></tr>
<tr><td>2</td><td>Press the **[PROGRAM]** button in the Function Selection area in the Run screen.
</td><td>

● The Run screen replaces the Program List screen.
Program folder
Step information of selected program and rotor name area

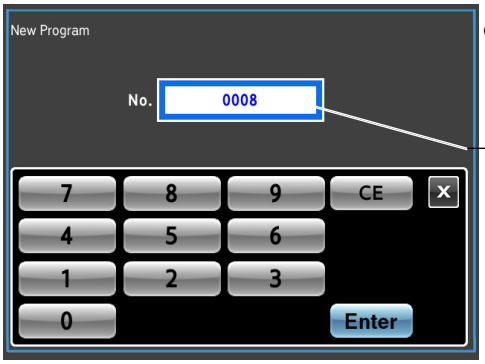
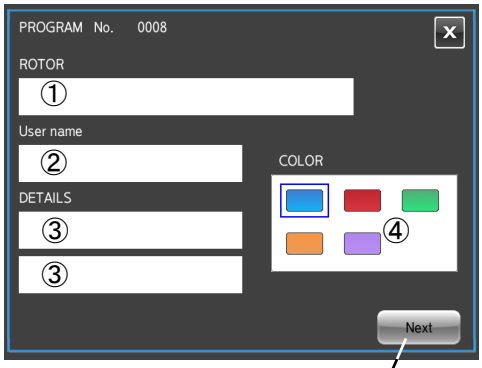
Program number

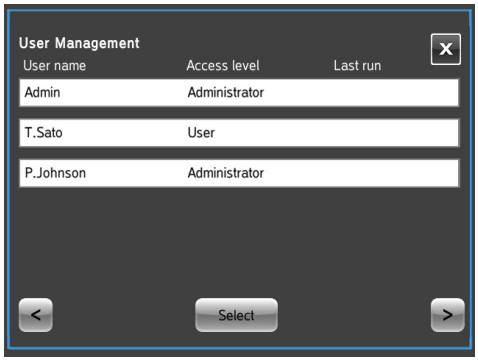

Rotor name (serial number)
Details

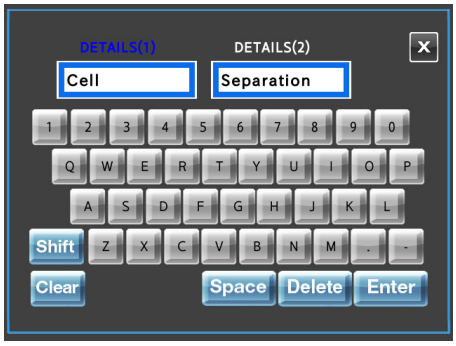
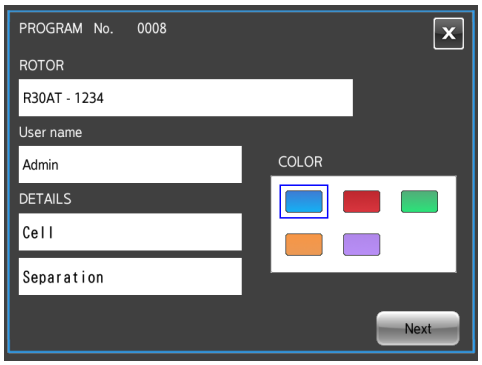
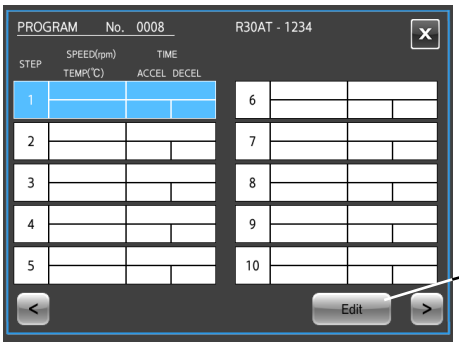
○ When a program folder is pressed, it is highlighted and a white arrow (▷) is added to indicate that it is selected.


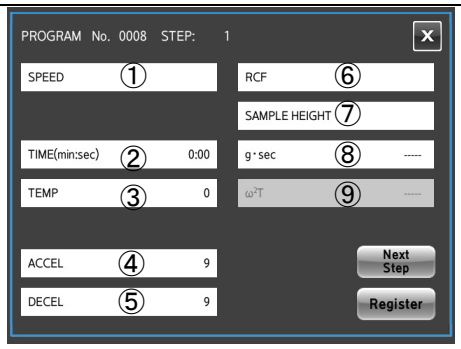
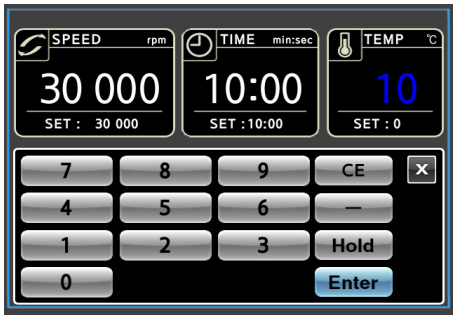
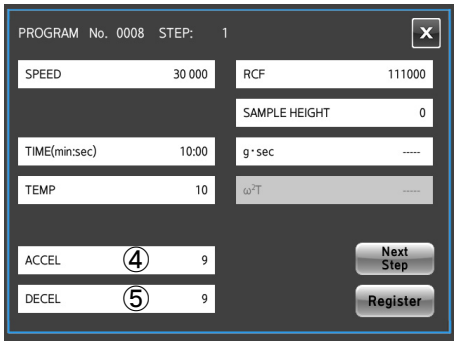
Unselected


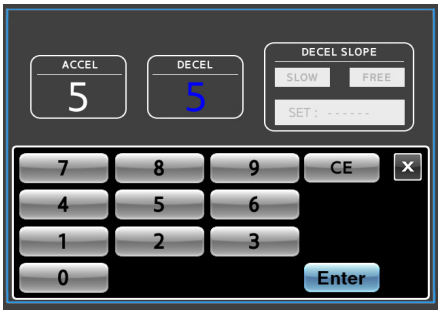
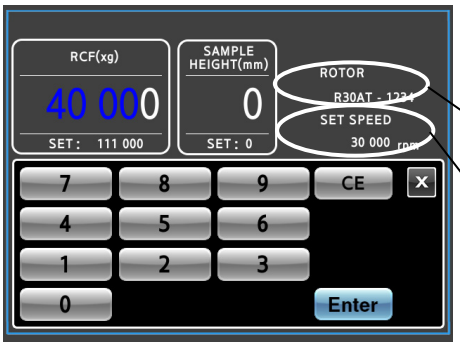
Selected status</td></tr>
</table>

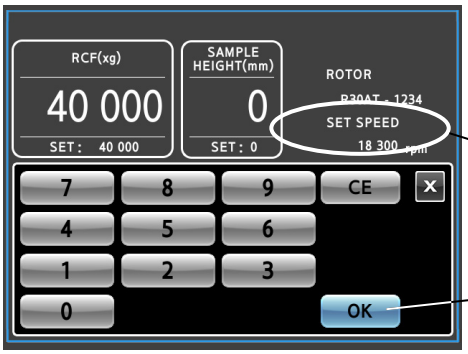
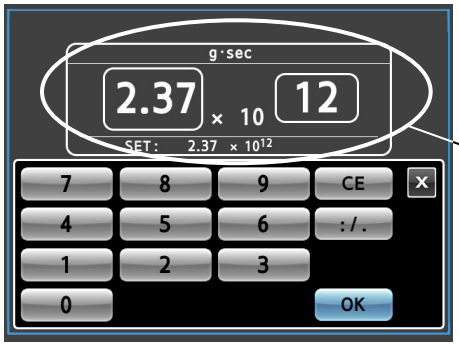
Step	Operation	Screen display and usage notes
3	Press the **[MENU]** button. Press the **[New]** button. To register the folder, press the **[Enter]** button. To select a different number, use the on-screen keypad to enter the desired number, and then press the **[Enter]** button. (The **[Enter]** button will not accept the entry of an already registered program number.)	 ● The MENU box appears. **[New]** button  ● The Program number entry screen appears. Program number entry field The unregistered program with the lowest number is displayed when the screens change.  ● The Program Registration screen appears. ①Rotor name display/registration field ②Registered user display/registration field ③Remarks display/registration field ④Folder color display/registration field **[Next]** button

Step	Operation	Screen display and usage notes
4	Press the white area in the rotor name display/registration field (①) to select a rotor. (You can omit this operation. To set the RCF value, select the rotor.)	 ●The Rotor Management screen appears. ○ Select the rotor you will use, and press the **[OK]** button. ○ If the rotor that you want to use is not found in the Rotor Management screen, press the **[Rotor Catalog]** button, and select a rotor from the Rotor Catalog screen. ○ The selected rotor is displayed in the rotor namedisplay/registration field (①) in the Program Registration screen.
5	Press the white area in the registered user display/registration field (②) to select a user. (You can omit this operation.)	 ●The User Management screen appears. ○ Select the user name to be used, and press the **[Select]** button. ○ Enter the PIN, and press the **[Enter]** button. ○ The user name selected in the registered user display/registration field (②) in the program registration screen appears. ○ For details, see Section 2-5-6 (1) “User Management”.

Step	Operation	Screen display and usage notes
6	Press the white area in the remarks display/registration field (③) to enter a remark. Example: 1st line: Cell 2nd line: Separation (You can omit this operation.)	 ○ Enter the information under DETAILS, and press the **[Enter]** button. ○ Two lines can be entered for DETAILS. Press the field where you want to make an entry, and enter the desired DETAILS. Fields that are ready to accept entries appear in blue. ○ You can enter a maximum of 14 characters per line. The 1st line and the 2nd line are separate fields, and so you can make an entry for the 2nd line only.
7	Select the folder color in the folder color display/registration field (④).	 ○ The selected folder is enclosed by a blue border. ○ Check the registered data, and press the **[Next]** button.
8	Press a field in Step 1, check that the field turns blue, and press the **[Edit]** button.	 ● The Run Parameter Setting/Display screen appears. **[Edit]** button

Step	Operation	Screen display and usage notes
9	Press the white area in the SPEED setting value field (①). (You can make settings in the same way by pressing the TIME (②) or TEMP (③) setting value fields.)	 ● The Run Parameter Entry/ Display screen appears. ① SPEED setting value field ② TIME setting value field ③ TEMP setting value field ④ ACCEL setting value field ⑤ DECEL setting value field ⑥ RCF setting value field ⑦ Sample Height setting valuefield ⑧ g・sec setting value field ⑨ ω^2T setting value field
10	Enter the SPEED, TIME, and TEMP run parameters. Example: SPEED: 30,000 rpm TIME: 10:00 TEMP: 10.0°C NOTE 1) A SPEED entry is not required when an RCF value is set. 2) A TIME entry is not required when a ω^2T value is set.	 ● The SPEED, TIME, and TEMP fields and on-screen keypad appear. ○ Press the field of the item that you want to set, enter the run parameters using the on-screen keypad (numeric keypad), and press the **[Enter]** button. ○ The **[Enter]** button changes to the **[OK]** button. ○ For details, see Section 2-2-1 “Setting run parameters”.
11	Check the entry, and press the **[OK]** button.	 ● This returns to the Run Parameter Entry/Display screen. ● The input values in the previous step appear in the SPEED, TIME, and TEMP fields. ● If a rotor is selected in step 5, the RCF value can be calculated and displayed from the SPEED setting value.

Step	Operation	Screen display and usage notes
12	Press the white area in the ACCEL setting field (④) or the DECEL setting value field (⑤), and set the acceleration and deceleration modes. Example: ACCEL: 5 DECEL: 5	 ● The ACCEL/DECEL setting screen appears. ○ Enter the desired code number, and press the **[Enter]** button. ○ The **[Enter]** button changes to the **[OK]** button. Check the setting, and press the **[OK]** button. This returns to the Run Parameter Entry/Display screen. ○ For details, see "◆Setting the ACCEL, DECEL, and DECEL SLOPE" in Section 2-2-1 "Setting run parameters". ⇩ ○ To set an RCF value, proceed to step 13. To set a g･sec value, proceed to step 16. To set a ω^2T value, proceed to step 18.
13	To set an RCF value, press the white area in the RCF setting display field (⑥) or the Sample Height setting display field (⑦). NOTE The operations from here to step 16 are required only when setting an RCF value.	 ● This returns to the Run Parameter Entry/Display screen. NOTE To set an RCF value, select the rotor using the operation in step 5.
14	Enter the RCF and SAMPLE HEIGHT run parameters. Example: RCF: 40000 x g SAMPLE HEIGHT: 0	 ● The RCF setting screen appears. Settings for rotor model and serial number SPEED indicator ○ When an RCF value is entered, a SPEED value is automatically calculated and displayed. ○ When a SAMPLE HEIGHT value is entered, an RCF value is automatically calculated and displayed. ○ Enter the desired value, and press the **[Enter]** button.

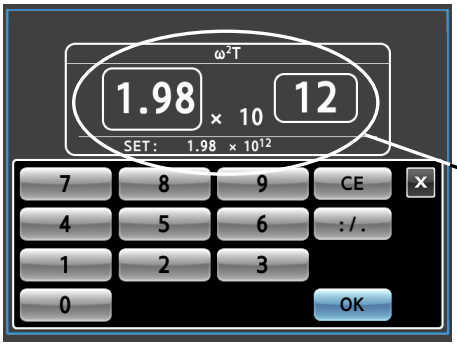
Step	Operation	Screen display and usage notes
15	Check the set value and value calculated from the set value, and press the **[OK]** button.	 ● The SPEED value is calculated from the set RCF value and displayed. SPEED indicator **[OK]** button NOTE If the SPEED value entered in step 5 differs from the SPEED value calculated from the RCF value entered here, the value entered in step 5 is replaced with the calculated value.
16	To set a g･sec value, press the white area in the g･sec setting value display field (⑧). NOTE The operations from here to step 17 are required only when a g-sec value is set.	 ● This returns to the Run Parameter Entry/Display screen. NOTE To set a g･sec value, g･sec must be selected in the custom screen g･sec / ω^2T selector screen. To set a g･sec value, the rotor must first be set. This operation is not accepted unless the rotor is set.
17	Press the g-sec area, and enter the desired value. Example: g-sec: 2.37 x 10^{12}	 ● The g-sec setting screen appears. g-sec area Left box: Mantissa Right box: Exponent ○ Enter the desired value, and press the **[OK]** button. ○ When a g･sec value is entered, a TIME value is automatically calculated and replaced. ○ For details, refer to Section 2-3-3 “g-sec Setting and Display Function”.

<table>
<tr><th>Step</th><th>Operation</th><th>Screen display and usage notes</th></tr>
<tr><td>18</td><td>To set a ω²T value, press the white area in the ω²T setting value display field (⑨).

NOTE
The operations from here to step 20 are required only when setting a ω²T value.</td><td>

● This returns to the Run Parameter Entry/Display screen.

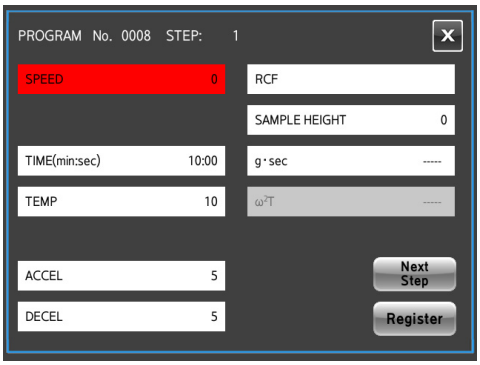
NOTE
To set a ω²T value, ω²T must be selected in the custom screen g・sec / ω²T selector screen.
To set a ω²T value, SPEED must first be set. This operation is not accepted unless SPEED is set.</td></tr>
<tr><td>19</td><td>Press the ω²T area, and enter the desired value.

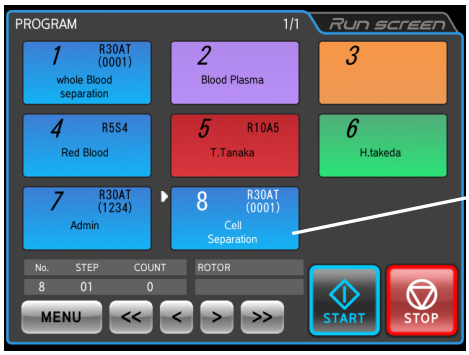
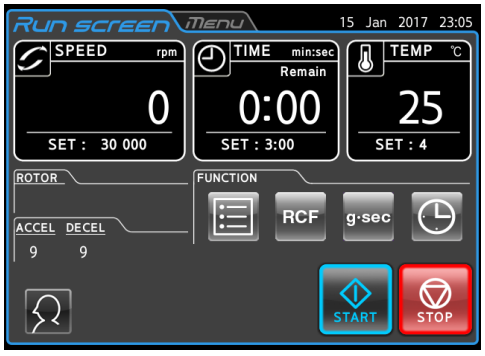
Example:
ω²T: 1.98×10¹²</td><td>

● The ω²T setting screen appears.

ω²T area
Left box: Mantissa
Right box: Exponent

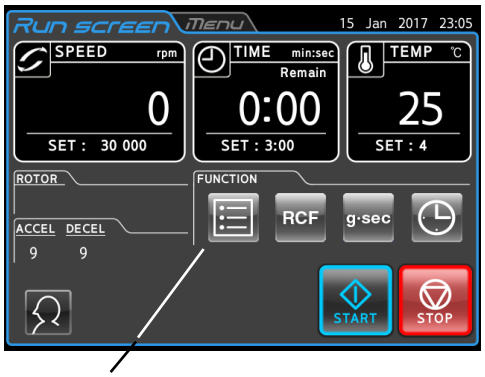
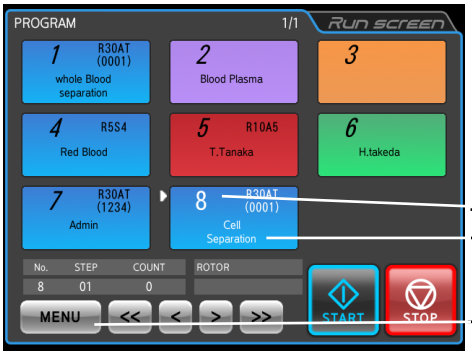
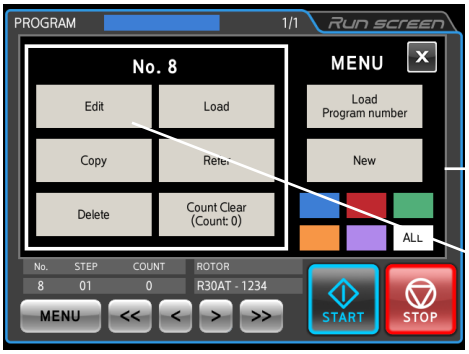
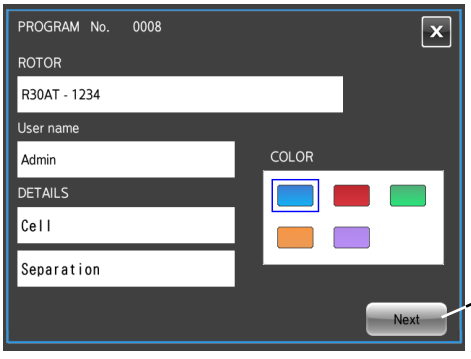
○ Enter the desired value, and press the OK button.
○ When a ω²T value is entered, a TIME value is automatically calculated and replaced.
○ For details, see Section 2-3-4, “ω²T Operation”.</td></tr>
</table>

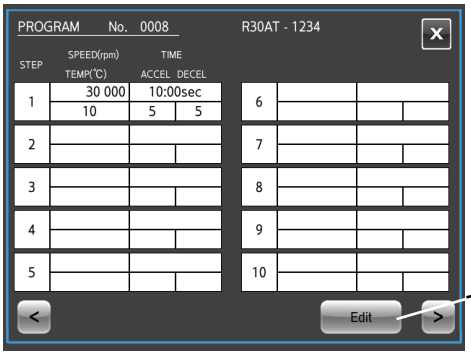
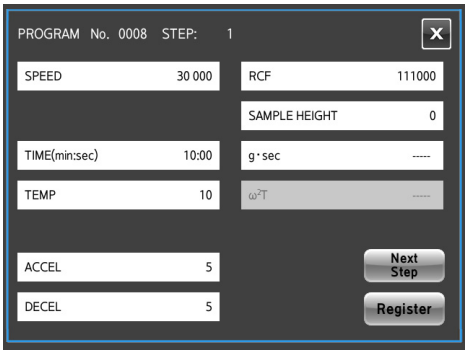
Step	Operation	Screen display and usage notes
20	The **[Enter]** button is replaced by the **[OK]** button. Check the entered value, and press the **[OK]** button.	 ● This returns to the Run Parameter Entry/Display screen. **[Next Step]** button **[Register]** button ○ To register step-mode operations, press the **[Next Step]** button, and enter the next run parameter. For details, see Section 2-3-1-3 “Step-Mode Operation Procedures.” NOTE 1) Pressing the **[Register]** button when no number is entered in the SPEED, TIME, TEMP, ACCEL, or DECEL fields will generate an error, and the field where the error occurred will turn red. An improper setting value also causes the field with the error to be displayed in red. Example when SPEED is not set  2) Be sure to enter the SPEED, TIME, TEMP, ACCEL and DECEL run parameters. (Registration and operation can still be performed even if RCF, ω^2T, and g・sec are not entered.) 3) RCF and g・sec cannot be registered unless a rotor is set. 4) ω^2T cannot be registered unless SPEED is set.

Step	Operation	Screen display and usage notes
21	Check the setting, and press the **[Register]** button.	When normal operation is registered  ● The Program List screen appears. Program registered in this example When step-mode operation is registered  ● The Check Registered Condition screen appears. **[X]** button ○ Pressing the **[X]** button in the Check Registration Condition screen opens the Program List screen.
22	Check that the registered program has been added to the program list, and press the Run screen tab.	 ● This returns to the Run screen.

(2) Procedure for changing program run parameters

The procedure for changing the run parameters of registered programs is shown below.

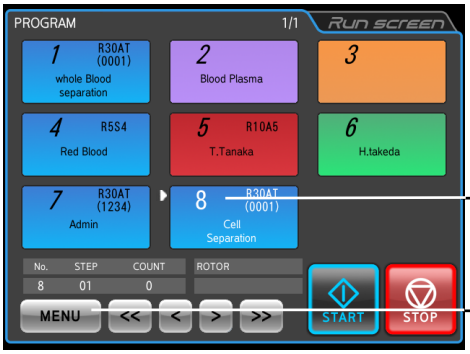
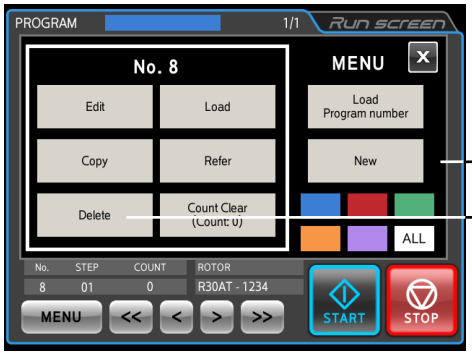
Step	Operation	Screen display and usage notes
1	Press the **[PROGRAM]** button in the Run screen (in the function selection area).	 **[PROGRAM]** button
2	Press the number of the program to be changed from the Program List screen. This example shows how to change registered data for program No. 0008.	 ● The Program List screen appears. ● The selected program folder is highlighted, and a white arrow (▷) is added. — Program number — Selected folder — **[MENU]** button
3	Press the **[MENU]** button.	 ● The MENU box appears in the Program List screen. — MENU box — **[Edit]** button
4	Press the **[Edit]** button in the MENU box, and make any changes by following the procedure in steps 4 to 7 in “(1) Procedure for program registration of run parameters”.	 ● The Program Registration screen appears. ● The registered data is displayed on the screen. — **[Next]** button

Step	Operation	Screen display and usage notes
5	To change run parameters, press the **[Next]** button.	 ● The Run Parameter Setting/Display screen appears. **[Edit]** button
6	Press a field in Step 1, check that the field turns blue, and press the **[Edit]** button.	 ● The Run Parameter Entry/Display screen appears. ○ When multiple run parameters are registered (step-mode operation registration), press the STEP you want to change, and press the **[EDIT]** button.
7	Press the field of the run parameters that you want to change, and make the change as described in steps 9 to 19 in “(1) Procedure for program registration of run parameters” to change the registered information.	○ To add new run parameters, press the empty area (STEP 2 in this example) after the registered STEP, and press the **[EDIT]** button.
8	Check the changes, and press the **[Register]** button.	

NOTE 1) Run parameters cannot be changed during operation (while the rotor is spinning). Perform while the centrifuge is stopped.

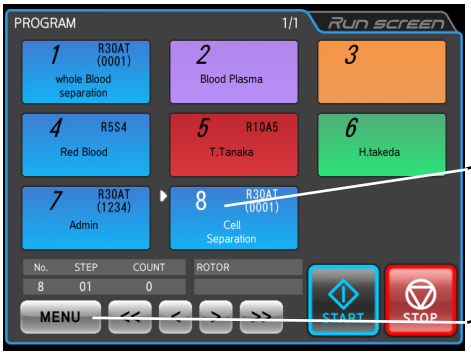
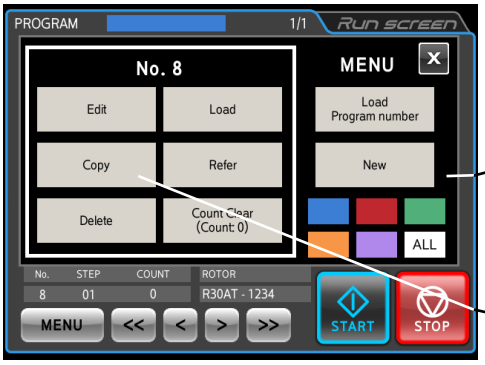
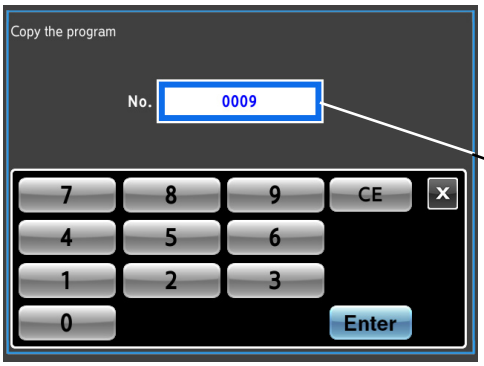
(3) Procedure for deleting programs

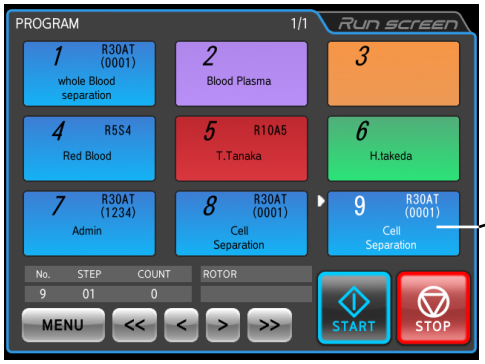
The following describes how to delete registered programs.

Step	Operation	Screen display and usage notes
1	Open the Program List screen as described in step 1 in “(2) Procedure for changing program run parameters”, and press the program folder that you want to delete. This example shows how to delete program No. 0008.	 ● The Program List screen appears. ● The selected program folder is highlighted, and a white arrow (▷) is added. Program No. **[MENU]** button
2	Press the **[MENU]** button.	 ● The MENU box appears in the Program List screen. MENU box **[DELETE]** button
3	Press the **[Delete]** button in the Edit box.	 ● A delete confirmation message appears.
4	Press the **[YES]** button in the delete confirmation message.	○ The file selected in the program list is deleted. NOTE A program that is deleted cannot be restored. Confirm carefully before you delete.

(4) Procedure for copying programs

The procedure for copying a registered program and registering as a new program is shown below. This is a convenient method for registering a new program by changing part of an existing program.

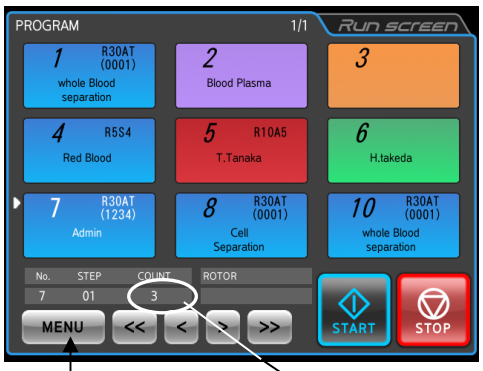
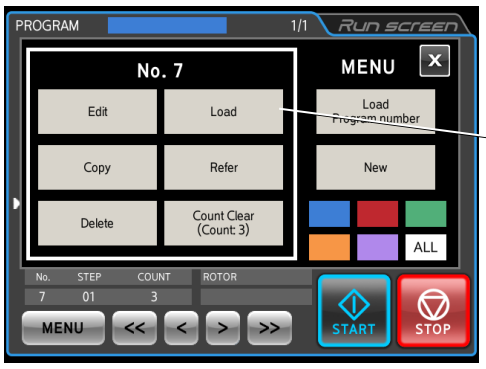
Step	Operation	Screen display and usage notes
1	Open the Program List screen by following step 1 in “(2) Procedure for changing program run parameters”.	
2	Press the program folder you want to copy from the Program List screen. This example shows how to copy program No. 0008.	 ● The Program List screen appears. Program No. **[MENU]** button
3	Press the **[MENU]** button.	 ● The MENU box appears in the Program List screen. MENU box **[Copy]** button
4	Press the **[Copy]** button in the MENU box, and enter the number of the program that you want to register.	 ● The Program No. Entry screen appears. Program No. entry field ○ Unregistered program numbers are displayed. ○ To change the program number, press the **[CE]** button, and then enter the desired number.

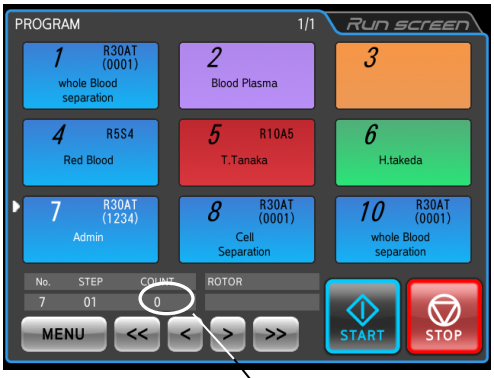
Step	Operation	Screen display and usage notes
5	Press the **[Enter]** button. (The **[Enter]** button does not accept entry of an already registered program number.)	 ● The Program List screen appears. Newly registered program folder that was copied ○ The copied program folder is registered under a new number.

(4) Procedure for clearing the number of program runs

Perform the following procedure to clear the number of program runs.

NOTE First, stop the centrifuge because you cannot clear the number of program runs during operation.

Step	Operation	Screen display and usage notes
1	Open the Program List screen by following step 1 in "(2) Procedure for changing program run parameters".	
2	Press the program folder of the program number where the number of runs will be cleared. Check that the selected program folder is highlighted and a white arrow (▷) is added, and press the **[MENU]** button. This shows the procedure for clearing the number of runs for program No. 7.	 ● The Program List screen appears. ● The selected program folder is highlighted, and a white arrow (▷) is added. **[MENU]** button Number of runs of selected program
3	Press the **[Count Clear]** button in the MENU box.	 ○ The MENU box appears. **[Count Clear]** button

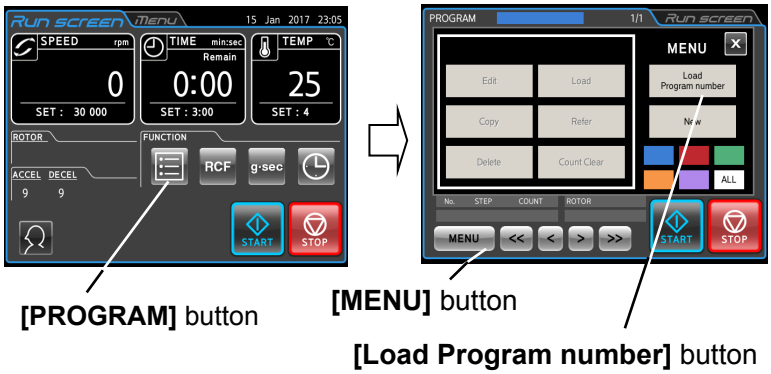
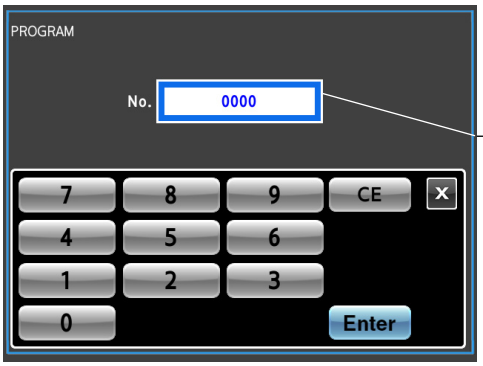
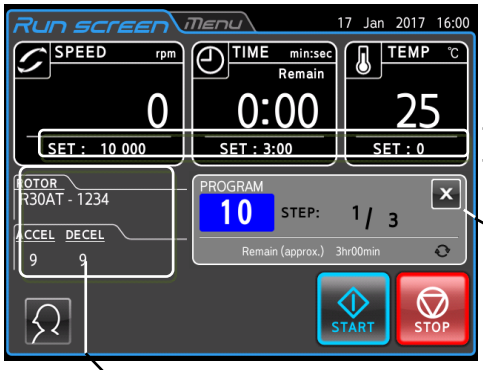
Step	Operation	Screen display and usage notes
4	Press the **[YES]** button in the run count clear confirmation message.	 ● A run count clear confirmation message appears.  ● The number of runs is cleared. The number of runs for the program becomes “0”. NOTE ○ Once the number of runs for a program is cleared, it cannot be restored. Confirm carefully before you clear.

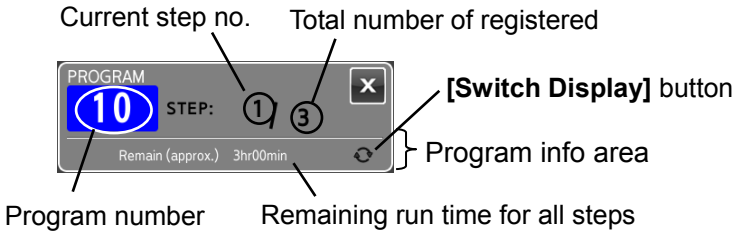
NOTE 1) When memory lock is enabled, a user with an access level other than ADMIN cannot clear the number of runs of a program.

2-3-1-2 Programmed operation procedures

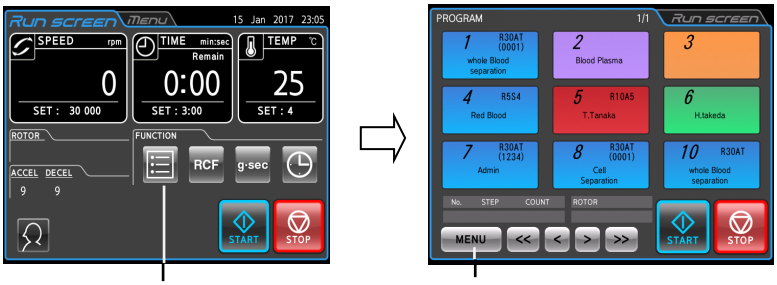
The procedures for “programmed operations” that call registered run parameters are described below. This is convenient when using the same run parameters repeatedly.

(1) When directly entering the registered program number

Step	Operation	Screen display and usage notes
1	Turn on the centrifuge POWER switch.	The Run screen appears.
2	Press the **[PROGRAM]** button in the function selection area. Press the **[MENU]** button, and press the **[Load Program number]** button in the MENU box.	
3	Use the on-screen keypad to enter the program number that you want to call, and press the **[Enter]** button.	 ● The Program No. Entry screen appears. Program No. entry field
4		 ● The Run screen appears again. } Run parameters called from the program Program Display screen

Step	Operation	Screen display and usage notes
4		○ The number of the called program is shown in the Program Display screen. ○ This allows you to set and display the run parameters (SPEED, TIME, TEMP, ACEL/DECEL, ROTOR, USER) registered in the program. ○ The Program Display screen shows the following information.  The **[Switch Display]** button can be pressed to change the content in the program information area. You can switch to view the remaining run time for all steps, next step information, rotor name, and details. For details on step-mode operation, see “(2) Step-mode operation procedure” in Section 2-3-1-3, “Step-Mode Operation Procedures”.
5	In the operation below, start a run without changing the run parameters.	○ Operate the centrifuge by following the instructions in Section 2-2-2, “Operation Procedures”. NOTE Reentering (changing) the run parameters (for example, SPEED, TIME, etc.) after calling a program will cancel the called program.

(2) Selecting from Program List screen

Step	Operation	Screen display and usage notes
1	Turn on the centrifuge POWER switch.	The Run screen appears.
2	Press the **[PROGRAM]** button in the function selection area. Press the **[MENU]** button in the Program List screen.	 **[PROGRAM]** button **[MENU]** button
3	a) If you remember the color of the registered folder, press the button for that color. b) If you do not remember the color of the registered folder, press the **[ALL]** button.	 ● The MENU box appears. Folder color buttons **[ALL]** button ○ Pressing a color button will display only the programs registered to that color. ○ Pressing the **[ALL]** button will display all folders in program number order. Search for the program using one of the two methods above. Use the **[<<]**, **[<]**, **[>]**, and **[>>]** buttons to turn pages.

NOTE To combine programmed operation and RTC operation (see Section 2-3-5, “RTC (Real Time Control) Operation”),

call a program, and then set the RTC.

When a program includes step-mode operation, the run time of all steps must be totaled to calculate the RTC start time because the program cannot be called once the RTC is set.

2-3-1-3 Step-Mode Operation Procedures

This centrifuge is provided with a “step-mode operation” function that can store two or more run parameters in one program memory area and up to 30 steps. This allows it to change speed, run time, temperature, and other conditions during operation.

For example, you could set the speed of a step to 0 rpm to stop rotation and enable opening and closing of doors. This makes it possible to register in advance the repeat count of samples that are removed and processed each run under the same separation conditions, which prevents samples from being processed too many or too few times.

The operation procedure is described using the example below.

(1) Registration Procedure for Step-mode Operation

Setting example:

This shows the setup procedure for continuous operation under the three run parameters in the table below.
In this example, the operations shown in Fig. 2-3-1 (1) are performed automatically.

	Step 1	Step 2	Step 3
Speed	30,000 rpm	20,000 rpm	10,000 rpm
Run time	90 min	60 min	30 min
Temperature	4.0℃	4.0℃	4.0℃
Acceleration mode	9	9	9
Deceleration mode	9	9	7

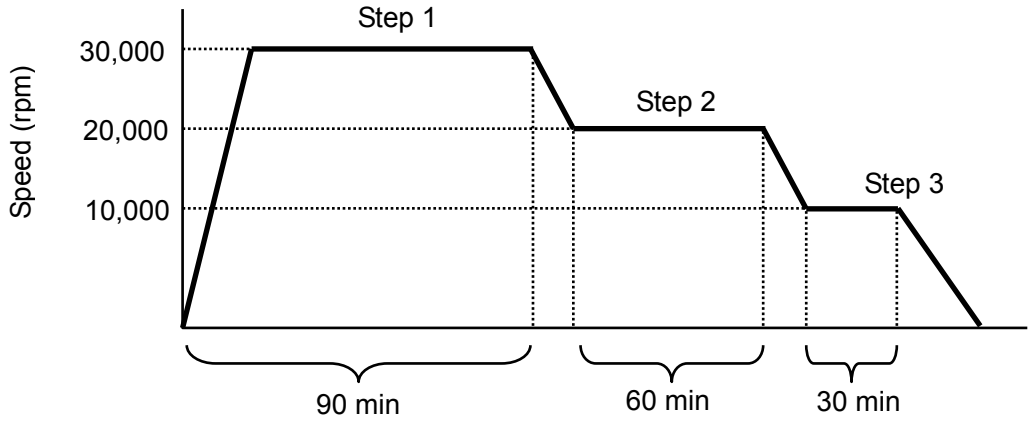
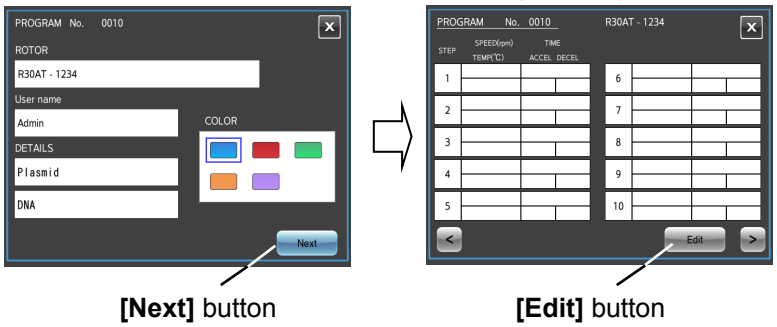
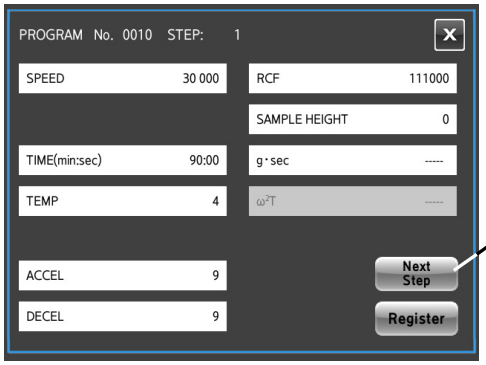
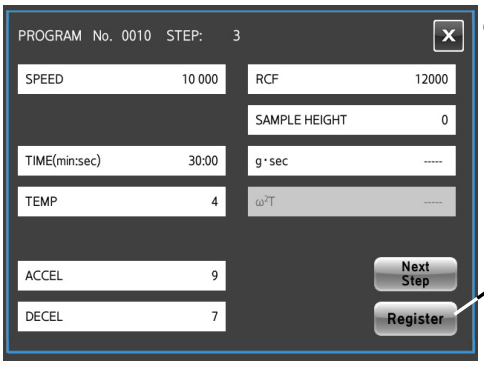
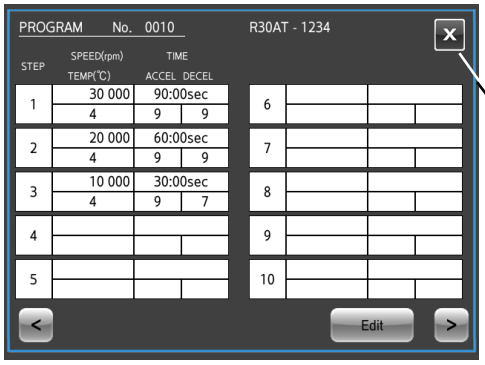
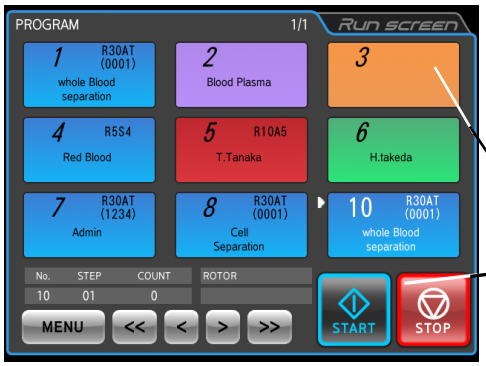


Fig. 2-3-1 (1) Example of step-mode operation

Step	Operation	Screen display and usage notes
1	As described in steps 1 to 7 in "(1) Procedure for program registration of run parameters" in Section 2-3-1-1, "Program registration procedures", enter the program number, registered rotor, user, and remarks, select a folder color, and press the **[Next]** button. In this example, the steps are stored in program No. 10.	● Program Registration screen ● Run Parameter Setting/Display screen  **[Next]** button **[Edit]** button
2	Press a field in Step 1, check that the field turns blue, and press the **[Edit]** button.	 ● The Run Parameter Entry/Display screen appears. **[Next Step]** button
3	Enter the run parameters for step 1 from the Run Parameter Entry/Display screen. Step 1 SPEED: 30,000 rpm TIME: 90 min TEMP: 4°C ACCEL: 9 DECEL: 9	 ● The Run Parameter Entry/Display screen appears. **[Next Step]** button ○ Registering a rotor enables automatic calculation and display of the RCF value from the SPEED setting value.
4	Press the **[Next Step]** button, and enter the run parameters for step 2 from the Run Parameter Entry/Display screen for step 2. Step 2 SPEED: 20,000 rpm TIME: 60 min TEMP: 4°C ACCEL: 9 DECEL: 9	 ● The Run Parameter Entry/Display screen in STEP 2 appears. Entry screen STEP No. ○ The value entered in STEP 1 is copied to the Run Parameter Entry/Display screen.

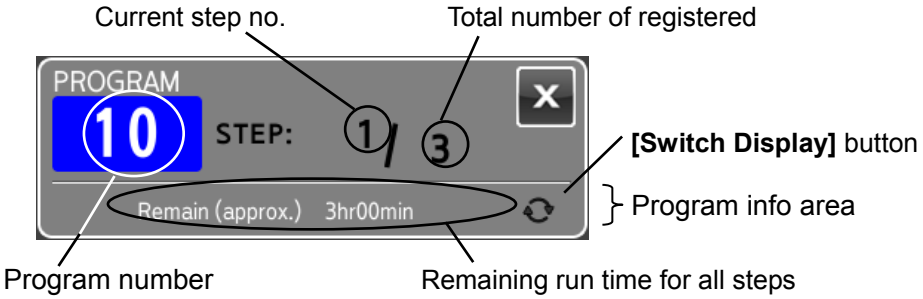
Step	Operation	Screen display and usage notes
5	Press the **[Next Step]** button, and enter the run parameters for step 3 from the Run Parameter Entry/Display screen for step 3. Step 3 SPEED: 10,000 rpm TIME: 30 min TEMP: 4°C ACCEL: 9 DECEL: 7	 ● The Run Parameter Entry/Display screen in STEP 3 appears. **[Register]** button ○ In the same way as STEP 1, the value entered in STEP 2 is copied to the Run Parameter Entry/Display screen.
6	Press the **[Register]** button.	 ● This returns to the Run Parameter Setting/Display screen. **[X]** button ○ The entered conditions are displayed in the STEP 1, 2 and 3 fields. ○ To correct entry errors, press the STEP field that you want to correct, and after the field turns blue, press the **[Edit]** button to make corrections.
7	Check the entries displayed for each step in the Run Parameter Setting/Display screen. If they are correct, press the **[X]** button, and then press the **[X]** button in the Program Registration screen.	 ● This returns to the Program List screen. **[Run screen]** button Program registered in this example
8	Check that the folder that you just registered has been added to and appears in the Program List screen before pressing the **[Run screen]** button.	○ This returns to the Run screen.

(2) Step-Mode Operation Procedure

Call the number of the program where the step-mode operation is registered, and run it by following the instructions in Section 2-2-2, “Operation Procedures”.
After calling the program, run it without changing the run parameters. Changing the run parameters will cancel the called program.

NOTE

1) The Program Display screen in the Run screen displays the following data.
The remaining run time for all steps is the total TIME (run time) for all set steps less the time that the centrifuge has been running. (In this example, the run has not started yet, and so the total 180-minute run time is displayed as the remaining run time.)
Because this time does not include the deceleration time between different steps, it does not indicate the exact remaining time. Use this information as a rough estimate of the remaining run time until all steps are completed.



The **[Switch Display]** button can be pressed to change the content in the program information area.
You can switch to view the remaining run time for all steps, next step information, rotor name, and details.

2) When acceleration is performed before the next step, the acceleration time is included in the remaining time. However, the time for deceleration is not counted, and the time count resumes when the next step starts.
3) Run parameters in step mode cannot be changed during operation (while the rotor is spinning). Perform while the centrifuge is stopped.
4) To combine step-mode operation and RTC (Real Time Control) operation (see Section 2-3-5, “RTC (Real Time Control) Operation”), call the program and then set the RTC.
The centrifuge totals the run time for all programmed operation steps and calculates the RTC start time.
Programs cannot be called after setting the RTC.
5) If a speed exceeding the maximum allowable speed for your rotor is set in a step, the SPEED alarm will be triggered. Check the speed settings for all steps, and correct as required.
6) To stop the run before completion, press **[STOP]** button. This will stop the rotor and prevent the centrifuge from proceeding to the next step.

(3) Registration Procedure for Step-mode Operation Including Stops

The procedure is identical to “(1) Registration Procedure for Step-mode Operation”. The registration procedures are shown below for some setting examples.

Setting example:

The setting procedure is shown below for continuous operation under the five run parameters including a 0 rpm setting in the following table.
In this example, the operations described in Fig. 2-3-1 (2) are performed automatically.

	Step 1	Step 2	Step 3	Step 4	Step 5
Speed	30,000 rpm	0 rpm	30,000 rpm	0 rpm	30,000 rpm
Run time	60 min	HOLD	30 min	HOLD	30 min
Temperature	15.0℃	15.0℃	15.0℃	15.0℃	15.0℃
Acceleration mode	9	-	9	-	9
Deceleration mode	7	-	7	-	7

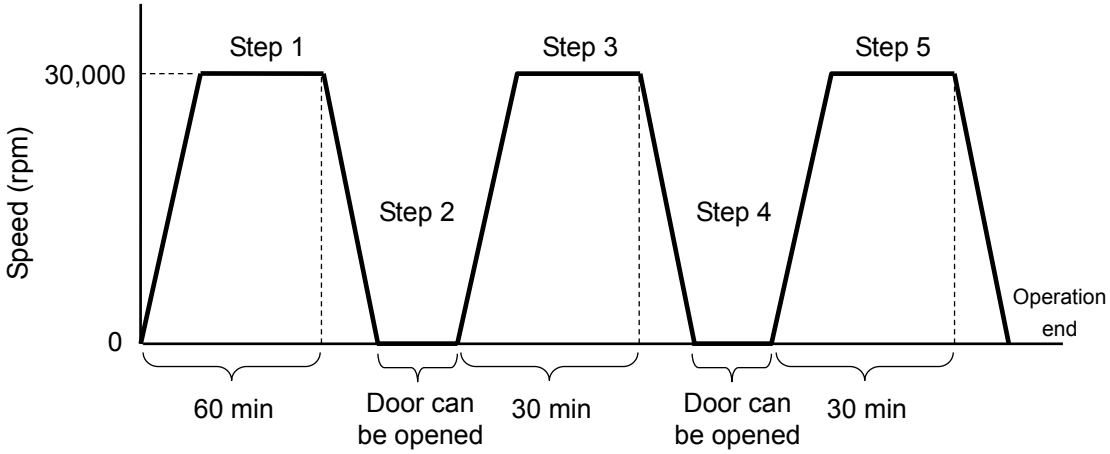
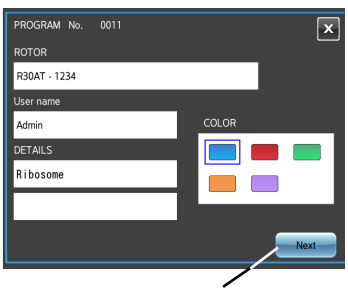
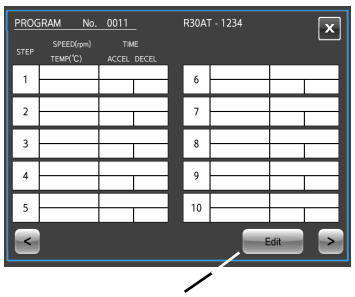
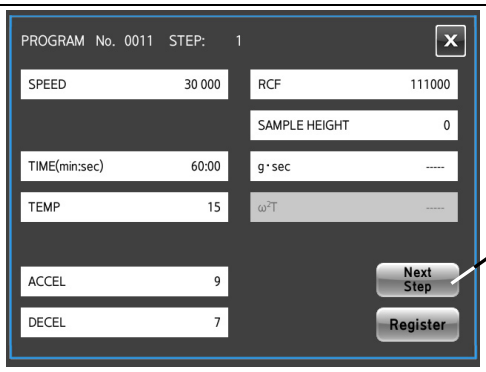


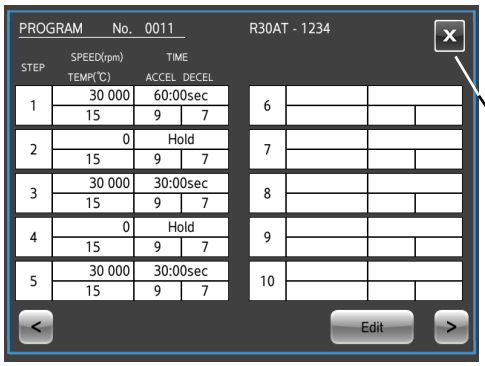
Fig. 2-3-1 (2) Example of step-mode operations including stops

Step	Operation	Screen display and usage notes
1	Enter the rotor, user, and remarks, select the folder color, and press the **[Next]** button. In this example, the steps are stored in program No. 11 and in a blue folder.	● Program Registration screen  **[Next]** button ● Run Parameter Setting/Display screen  **[Edit]** button

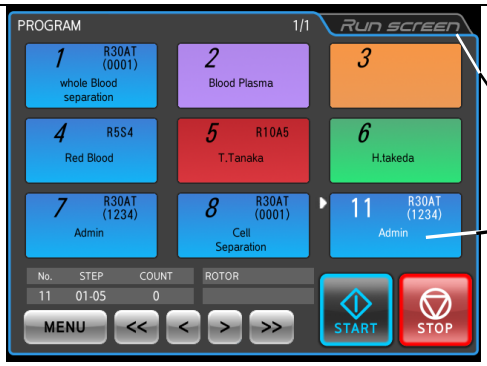
<table>
<tr><th>Step</th><th>Operation</th><th>Screen display and usage notes</th></tr>
<tr><td>2</td><td>Enter the run parameters for step 1 as described in “(1) Registration Procedure for Step-Mode Operation”.

Step 1
SPEED: 30,000 rpm
TIME: 60 min
TEMP: 15°C
ACCEL: 9
DECEL: 7</td><td>

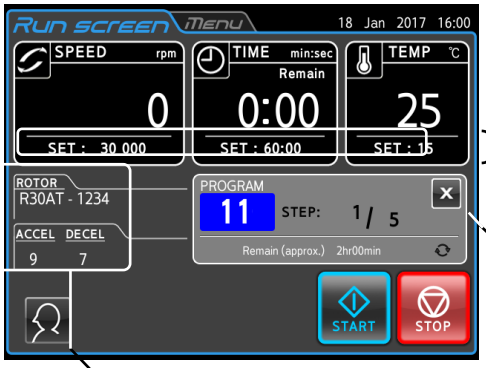
● The Run Parameter Entry/Display screen appears.
[Next Step] button
○ Registering a rotor enables automatic calculation and display of the RCF value from the SPEED setting value.</td></tr>
<tr><td>3</td><td>Press the [Next Step] button, and enter the run parameters for step 2 from the Run Parameter Entry/Display screen.
Step 2
SPEED: 0 rpm
TEMP: 15°C</td><td>

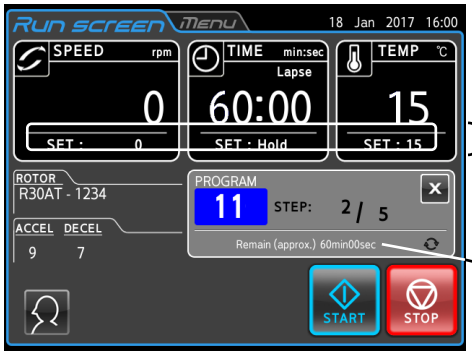
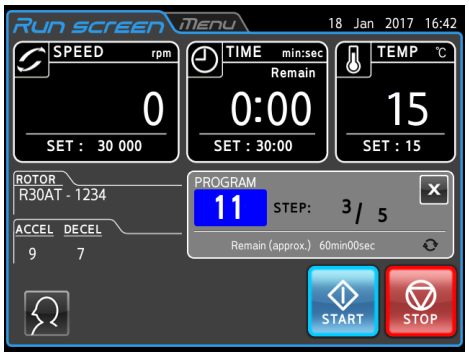
● The Run Parameter Entry/Display screen in step 2 appears.
STEP No.
[Next Step] button
[Register] button
○ When a SPEED of 0 rpm is set, TIME is automatically set to “HOLD.”
○ A user-selected TIME setting cannot be made.</td></tr>
<tr><td>4</td><td>In the same way, press the [Next Step] button, and enter the run parameters for step 5 from step 3.</td><td></td></tr>
<tr><td>5</td><td>Finally, press the [Register] button.</td><td>

● This returns to the Run Parameter Setting screen.
[X] button
○ The entered conditions are displayed in the STEP 1 to 5 fields.
○ To correct entry errors, press the STEP field that you want to correct, and after the field turns blue, press the [Edit] button to make corrections.</td></tr>
</table>

Step	Operation	Screen display and usage notes
6	Press the **[X]** button to return to the Program List screen.	 ● This returns to the Program List screen. **[Run screen]** button Program registered in this example

(4) Procedure for Step-mode Operation Including Stops

Step	Operation	Screen display and usage notes
1	Call the desired program based on the instructions in Section 2-3-1-2, “Programmed Operation Procedures”. In this example, program No. 11 registered in the previous procedure is called.	 ● The Program Display screen appears in the Run screen. Run parameters called from the program Program Display screen Run parameter called from the program ○ The number of the called program is displayed in the Program Display screen. ○ This allows you to set and display the run parameters (SPEED, TIME, TEMP, ACEL/DECEL, ROTOR, USER) registered in the program.
2	Mount the rotor, close the door, and press the **[START]** button by following the instructions in Section 2-2-2, “Operation Procedures”.	

Step	Operation	Screen display and usage notes
3	After the run time for step 1 has elapsed, processing proceeds automatically to step 2, and the rotor decelerates and stops.	 ● The Program Display screen in the Run screen proceeds to step 2. Run parameters called from the program Program Display screen ○ The Program Display screen proceeds to step 2, and SPEED is set to **[0]** rpm and TIME to **[Hold]**.
4	Once the rotor stops spinning, open the door and remove the rotor.	○ Process the samples as necessary.
5	Mount the rotor again, and press the **[START]** button.	 ● The Program Display screen in the Run screen proceeds to step 3. ○ In steps where the speed is set to **[0]** rpm, the user must press the **[START]** button to proceed to the next step of processing. After performing the required processing, close the door, and be sure to press the **[START]** button.
6	Repeat these operations as required.	

NOTE

1) If any run parameters are changed while executing step operation, including the **[0]** rpm step, program operation is canceled, and no further steps are processed.
2) To prevent condensation from forming in the rotor chamber, close the door while executing the **[0]** rpm step.
3) In step-mode operation that includes stops, the run time calculation of all steps does not include the run time of **[0]** rpm steps. Step-mode operation cannot be used in combination with RTC (Real Time Control) operation (see Section 2-3-5, “RTC (Real Time Control) Operation”).

2-3-2 Displaying and Setting the RCF

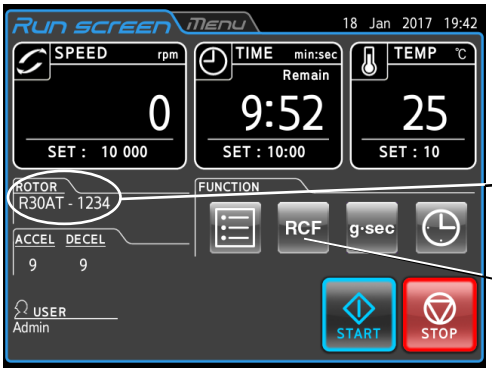
This centrifuge stores the maximum radius of each rotor in the internal memory. It provides a function that automatically calculates and displays the relative centrifugal force (RFC) from the speed setting and calculates and displays the speed from the RFC setting. The procedure for displaying and setting the RCF is shown below.

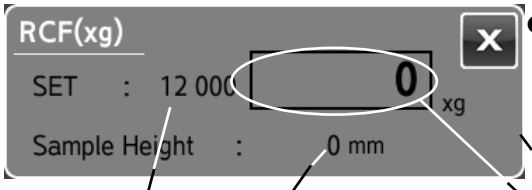
This section describes how to display and set a RCF value.

NOTE The RCF value computed from a certain speed and the speed computed from a certain RCF value may not be identical due to a residual in the numerical value.

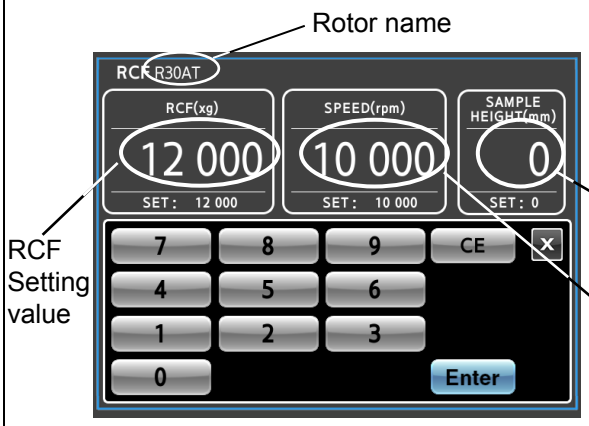
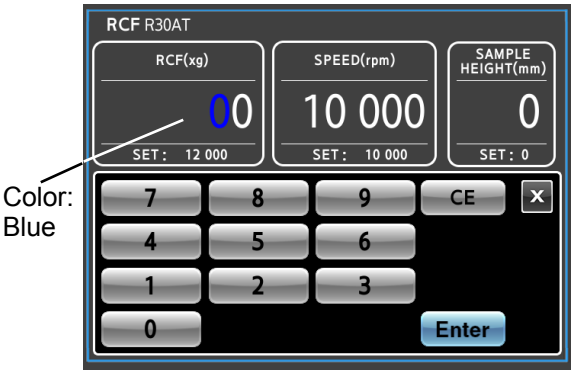
NOTE Some applicable rotors to this centrifuge have outside tube cavities and inside tube cavities in them (see the rotor instruction manuals and “Applicable rotors to the CR30NX centrifuge”). This centrifuge can compute the RCF value and the speed in outside tube cavities. Some applicable rotors to this centrifuge have large tube cavities and small tube cavities in them (see the rotor instruction manuals and “Applicable rotors to the CR30NX centrifuge”). This centrifuge can compute the RCF value and the speed in large tube cavities.

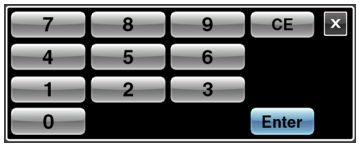
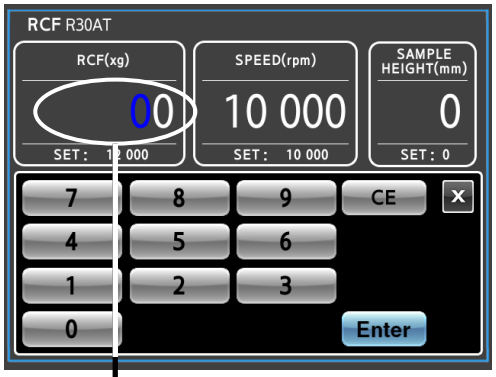
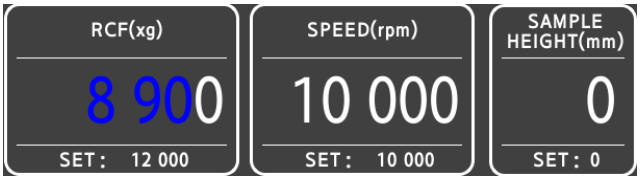
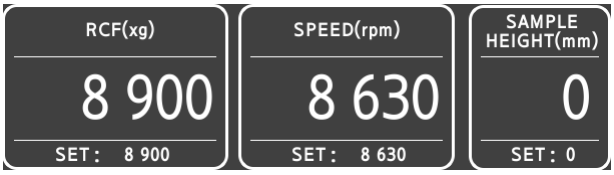
(1) Displaying and setting the RCF value

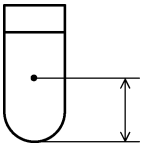
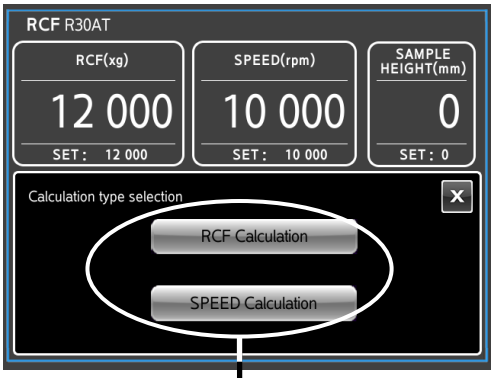
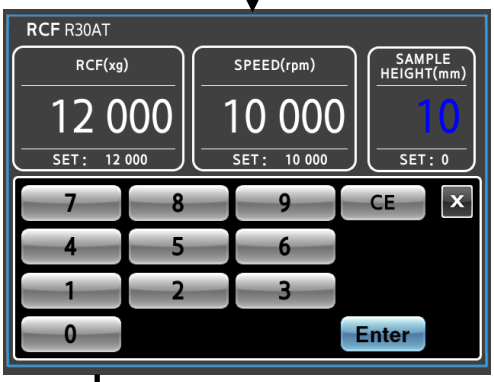
<table>
<tr><th>Step</th><th>Operation</th><th>Screen display after operation and usage notes</th></tr>
<tr><td>1</td><td>Mount a rotor in the centrifuge.</td><td>

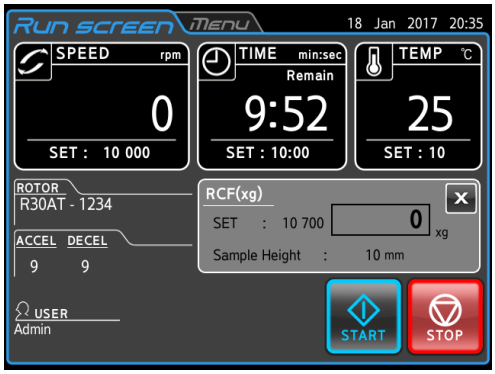
● The rotor name appears in the Rotor Name area.
Rotor Name area
[RCF] button</td></tr>
<tr><td>2</td><td>Press the RCF button in the FUNCTION area of the Run screen.</td><td>

● The FUNCTION area changes to the RCF Display screen.
RCF Display screen
RCF setting value
Sample Height setting value
Current RCF value
○ The RCF button is available only when a rotor has been mounted.
○ The RCF Display screen shows the RCF and Sample Height setting values and the current RCF value during operation.</td></tr>
</table>

Step	Operation	Screen display after operation and usage notes
3	Press the RCF display screen field.	 ○ The setting screen shows the RCF, SPEED, and Sample Height setting values.
4	Press the field of the item that you want to set. If the color of the initial digits are blue, go to step 5. (Go to step 6 to set a Sample Height value.)	 ○ Pressing the input fields makes them ready to accept entries.

Step	Operation	Screen display after operation and usage notes
5	a) Use the on-screen keypad (numeric keypad) to enter the settings.  Each new digit that is entered is scrolled to the left. (The last digit is fixed at “0”.) b) Press the **[Enter]** button. <u>Use the **[CE]** button to cancel incorrect entries.</u> To not set a Sample Height value, press the **[X]** button to return to the Run screen.	RCF and SPEED value settings Example: To set RCF value to “8900”  **[8] [9] [0]** a) The entered RCF value appears blue.  Press the **[Enter]** button. The speed is calculated from the set Sample Height value and the entered RCF value. b) The calculated SPEED value is displayed in the SPEED setting value area of the Run screen.  ○ Set RCF using the same procedure as for SPEED. If a SPEED value was entered, the RCF value is calculated from the Sample Height value that was set and the entered SPEED value.

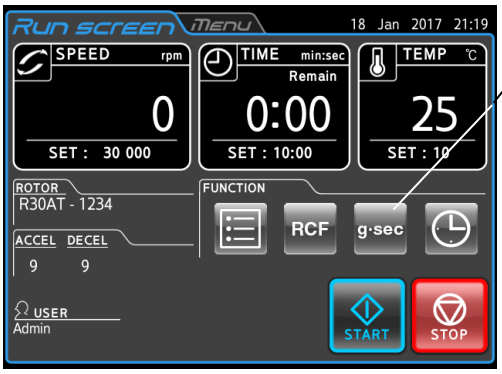
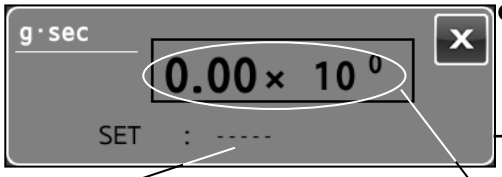
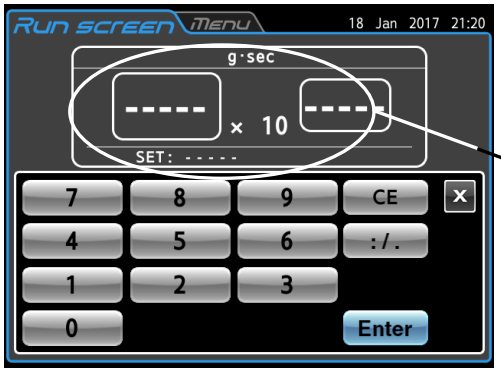
Step	Operation	Screen display after operation and usage notes
6	[Setting the Sample Height] Press inside the field of the Sample Height setting value. a) Press the **[RCF Calculation]** button or Press the **[SPEED Calculation]** button.  Sample Height 10 mm b) Press the on-screen keypad (numeric keypad) to enter the Sample Height value to be set. c) Press the **[Enter]** button. <u>Use the **[CE]** button to cancel incorrect entries.</u> To not set an RCF or SPEED value, press the **[X]** button to return to the Run screen.	Sample Height setting Example: To set Sample Height value to “10”  a) The on-screen keypad displays a screen for selecting calculation. Press the **[RCF Calculation]** button, and use the on-screen keypad to enter **[1] [0]**.  b) The entered Sample Height value appears blue. Press the **[Enter]** button. RCF calculation: The RCF value is calculated from the entered Sample Height and the SPEED value that was set. SPEED calculation: The SPEED value is calculated from the entered Sample Height value and the RCF value that was set.  c) The calculated RCF value is displayed in the field.

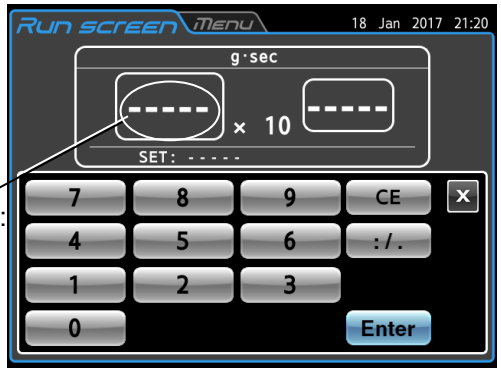
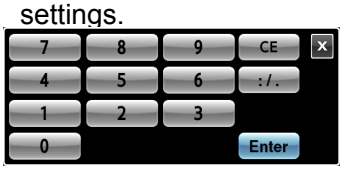
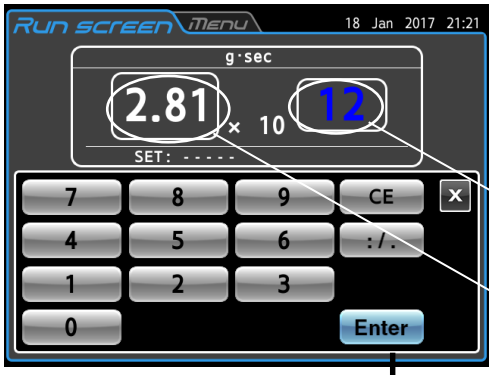
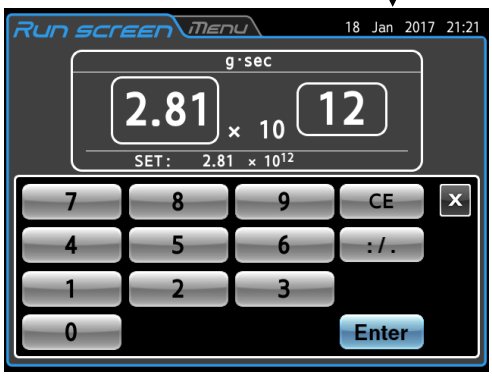
Step	Operation	Screen display after operation and usage notes
7		 ● This returns to the Run screen. ○ RCF/Sample Height setting value in the FUNCTION area shows the newly set value.

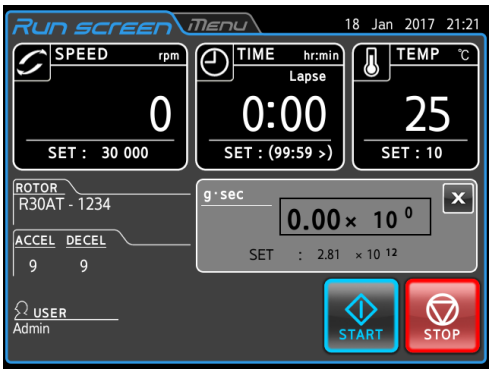
2-3-3 g-sec Display and Setting Function

The procedure for displaying and setting the g-sec is shown below.

(1) Procedure for displaying and setting g-sec

Step	Operation	Screen display after operation and usage notes
1	Mount a rotor.	 **[g-sec]** button If the button is light blue, g-sec has already been set. ○The **[g-sec]** button is not available unless a rotor is mounted.
2	Press the g·sec button in the FUNCTION area of the Run screen.	 ● The FUNCTION area changes to the g-sec Display screen. g-sec Display screen g-sec setting value Current g-sec state ○ The g-sec Display screen shows the current g-sec state in the top section and the g-sec value that was set in the bottom section. ○ "-----" is displayed when a g-sec setting has not been made.
3	Press inside the g-sec Display screen.	 ● The g-sec Setting screen appears. g-sec setting value Left box: Mantissa Right box: Exponent ○ The setting screen displays the g-sec setting value. "-----" is displayed when a g-sec setting has not been made.

Step	Operation	Screen display after operation and usage notes
4	Press the field of the item that you want to set. If the digits or the "----" mark is blue, go to step 5.	 Color: Blue ●The setting value turns blue. ○ Pressing the input fields makes them ready to accept entries.
5	a) Use the on-screen keypad (numeric keypad) to enter settings.  Each new digit that is entered is scrolled to the left. To enter 2.81 x 10^{12} as shown in the example, enter the following numbers in the specified boxes. • Mantissa: Left field **[2] [: / .] [8] [1]** • Exponent: Right field **[1] [2]** b) Press the **[Enter]** button. <u>Use the **[CE]** button to cancel incorrect entries.</u>	Example: To set a g・sec value of "2.81×10^{12}"  a) Entered digits appear blue. Exponent entry field Mantissa entry field Press the **[Enter]** button.  b) The entered g-sec value is set and appears white.

Step	Operation	Screen display after operation and usage notes
6	Press the **[X]** button to return to the Run screen.	 ● The Run screen appears. ○ When the **[Enter]** button is pressed, the TIME setting value field shows the time calculated from the entered g-sec value. (If a time of 99 hours 59 minutes is exceeded, the display appears as (99:59 >).) The TIME display shows the elapsed time. ○ Setting the run time (TIME) cancels the g-sec setting operation.

NOTE

If there is no **[g-sec]** button in the FUNCTION area, select g-sec by referring to Section 2-5-5 (11) “g-sec / ω^2T”.

The mantissa of g-sec is expressed as a 3-digit number having 1 digit in the integer place and 2 digits after the decimal. As a result, when entering values like those shown in Example 1 and Example 3, the value is displayed as shown below.

Example 1: When entering a mantissa as a 3-digit integer

Enter “500×10^{3}”, and press the **[Enter]** button. → “5.00×10^{5}” is displayed.

Example 2: When entering a mantissa as a 2-digit integer

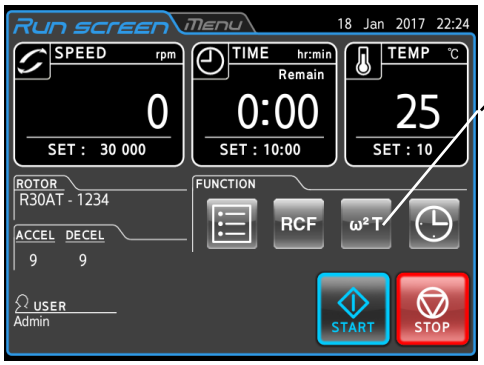
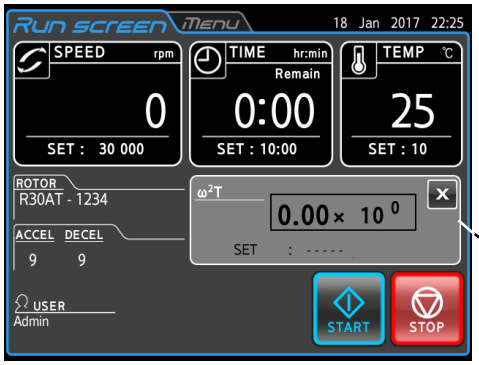
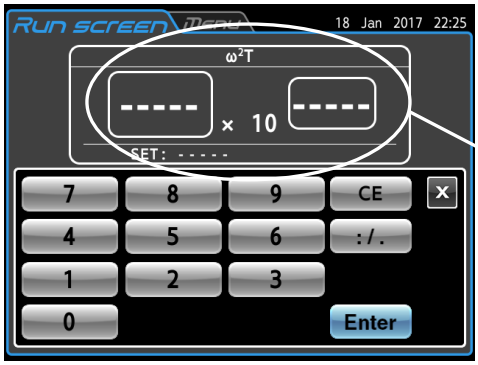
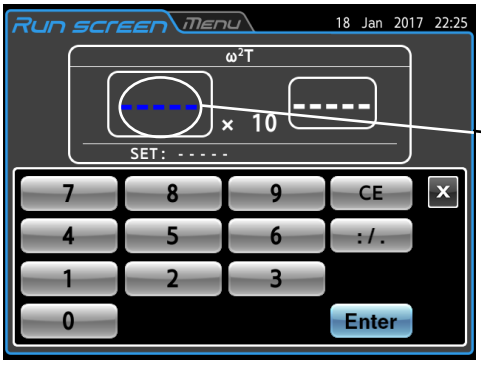
Enter “12.3×10^{7}”, and press the **[Enter]** button. → “1.23×10^{8}” is displayed.

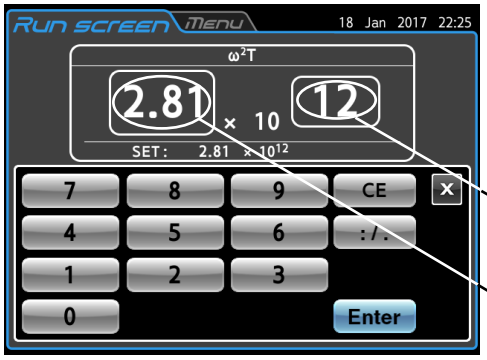
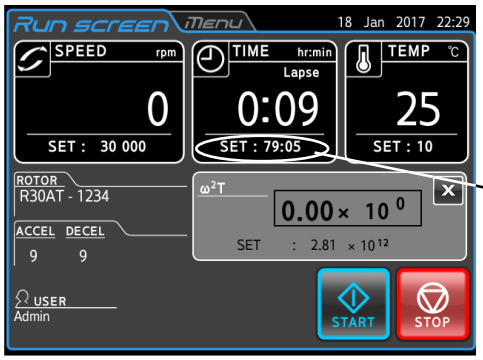
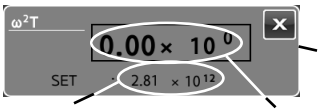
Example 3: When entering a mantissa as a 1-digit integer

Enter “5×10^{1}”, and press the **[Enter]** button. → “5.00×10^{1}” is displayed.

2-3-4 ω²T Operation

This function is used to indicate the centrifugal effect, which is denoted by ω²T (value obtained by multiplying the square of the angular speed by the run time).
When the same rotor is used, setting ω²T enables centrifugal separation that is easily reproducible.

Step	Operation	Screen display and usage notes
1	Set the speed by following the instructions in Section 2-2-1 “Setting Run Parameters”.	 **[ω²T]** button If the button is light blue, ω²T has already been set.
2	Press the ω²T button in the FUNCTION area of the Run screen.	 ●The FUNCTION area changes to the ω²T display screen. ω²T display screen
3	Press the ω²T display screen field.	 ● The ω²T Setting screen appears. ω²T setting value Left box: Mantissa Right box: Exponent
4	Press the field of the item that you want to set.	 ●The setting turns blue. Blue

Step	Operation	Screen display and usage notes
5	Press the on-screen keypad to enter a setting value. To enter the mantissa, press the exponent entry field, enter the exponent, and press the **[Enter]** button. Example: To set the ω²T value of "2.81×10¹²"	 ○ Press the **[: / .]** button to enter mantissa decimals.
6	Press the **[X]** button on the on-screen keypad.	 ●The Run screen appears. Calculated run time value ○ The ω²T display screen displays the following data.  ω²T display screen ω²T setting value Current ω²T value ○ The run time (79h05min) is calculated from the speed setting and the ω²T value and is displayed in the run time area. ○ When the ω²T setting value and the current ω²T value are identical, deceleration starts, and the current ω²T value continues to show the total value until the rotor stops.

NOTE

1) If no ω²T button is found in the FUNCTION area, select ω²T by referring to Section 2-5-5, "Customizing (11) g-sec / ω²T".
2) If the SPEED and TIME settings are changed after setting the ω²T value, ω²T operation is canceled.
3) To cancel ω²T operation, change the speed or run time setting.

2-3-5 RTC (Real Time Control) Operation

This centrifuge contains an internal clock for enabling operation of the centrifuge between a specified start time and stop time.

This function for operating the centrifuge between set time intervals is called Real Time Control (RTC).

The RTC operation procedures are described using examples below.

Example: To operate the centrifuge under the following run parameters starting from rotor mounting on June 10 and removing the samples around 9:20 the next morning.

①Rotor: R30AT

②Speed: 30,000 rpm

③Separation time: 60 min

④Acceleration mode: 9

⑤Deceleration mode: 9

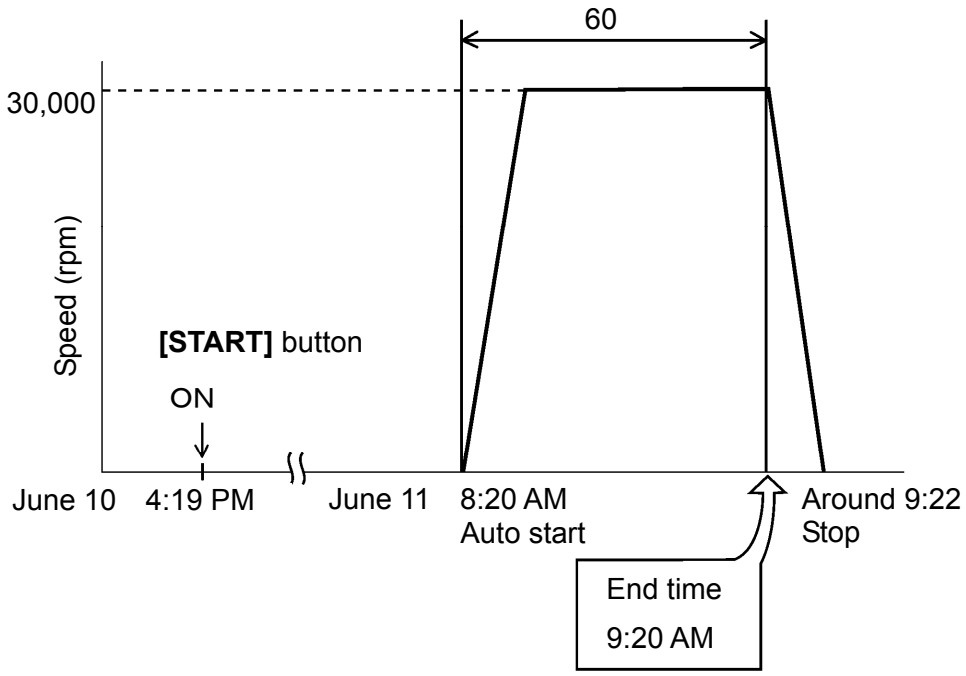
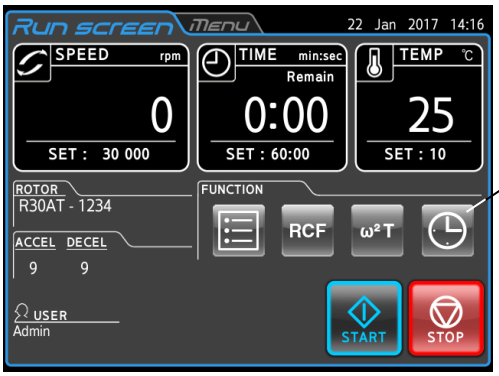
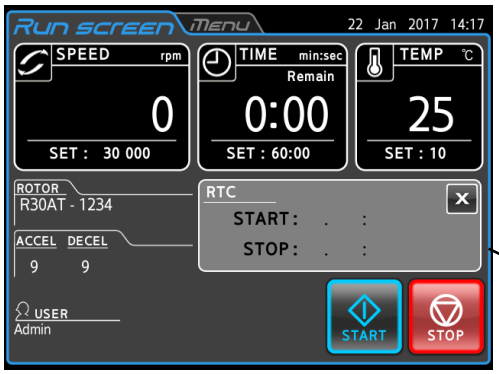
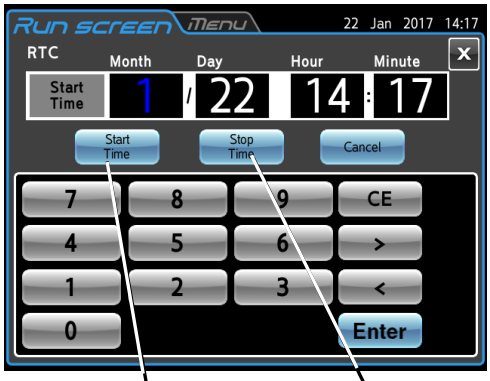


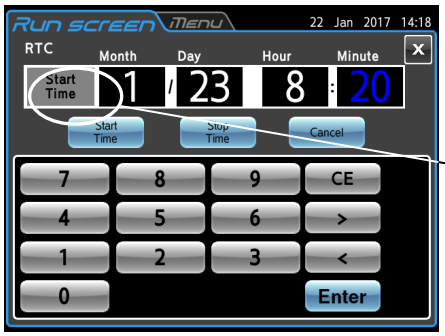
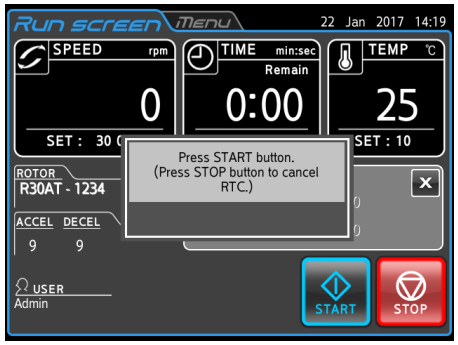
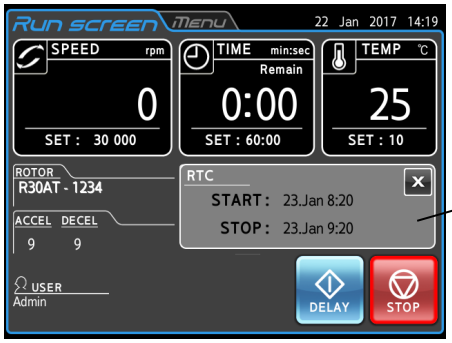
Fig. 2-3-5 RTC operation example

In this example, set the above run parameters ② to ⑤, set the RTC operation start time to June 11 at 8:20, and start the centrifuge.

(Note that the same operation can be performed by setting a stop time of 9:20 instead of the start time of 8:20.)

(1) RTC operation procedure

Step	Operation	Screen display after operation and usage notes
1	Set the run parameters in the Run screen.	 **[RTC]** button ○ Enter the run time (centrifugation time) as a number instead of HOLD.
2	Press the  button in the FUNCTION area of the Run screen.	 ● The FUNCTION area changes to the RTC Display screen. RTC display screen
3	Press the RTC display screen field.	 ●The RTC setting screen appears. **[Start Time]** button **[Stop Time]** button ○ The current date and time are displayed, and the month appears blue to indicate that it is ready to accept entries.

Step	Operation	Screen display after operation and usage notes
4	To specify the start time, press the **[Start Time]** button. To specify the stop time, press the **[Stop Time]** button. Then, enter the start time or stop time using the on-screen keypad (numeric keypad).	 Specified setting ○ Pressing the **[Start Time]** button displays “Start Time” as the specified setting, and pressing the **[Stop Time]** button displays “Stop Time” as the specified setting. ○ Press an input field to make it ready to accept entries. Use the **[<]** and **[>]** to switch between setting items (month, day, hour, minute). ○ Enter a number between 0 and 23 (24-hour clock) for **[Hour]**. ○ Enter a date and time later than the current time. In particular, the stop time should take the centrifugation time into account, and centrifugation start time should be set to a time later than current time.
5	Press the **[Enter]** button.	 ●The operation start check box appears.
6	Press the **[START]** button. RTC operation will not start unless you press the **[START]** button The RTC operation setting can be canceled by pressing the **[STOP]** button.	 RTC display screen Top section: Operation start time Bottom section: Operation stop time ○ The START time and STOP time are displayed on the RTC display screen, and the **[START]** button changes to the **[DELAY]** button. This is the RTC operation standby state. ○ The centrifuge starts automatically at the set time.

NOTE 1) The RTC cannot be set in the following situations.

① When the Run screen setting is HOLD (continuous operation)

☞ Change the run time (centrifugation time) to a number instead of HOLD.

② When the start time has already passed

☞ Set the start time to a time that comes after the current time.

③ When the start time is more than 20 days later than the current date

☞ Set to a date and time that is within 20 days of the current date.

2) To change the run time (centrifugation time) in the Run screen after setting the RTC, cancel the RTC, and set the run time again. The RTC can be canceled by pressing a field in the RTC display screen, and pressing the **[Cancel]** button in the RTC setting screen or the **[STOP]** button in the Run screen.

3) In the state in Section 2-4, “User Login”, a field for entering the PIN appears as shown below when the RTC is canceled. Enter the PIN of the login user or administrator.



4) To combine programmed operation (including step-mode operation) and RTC operation,

call a program, and then set the RTC.

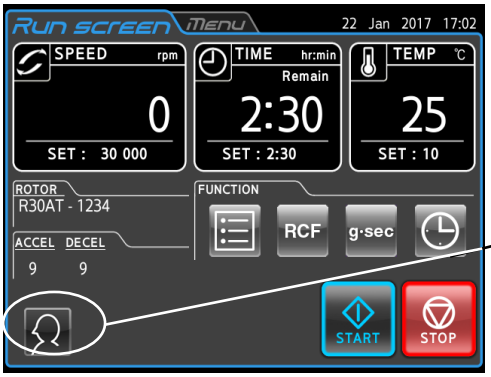
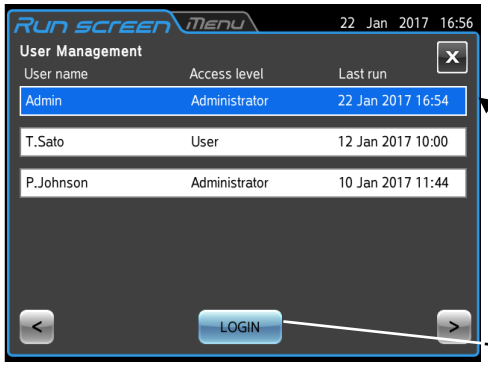
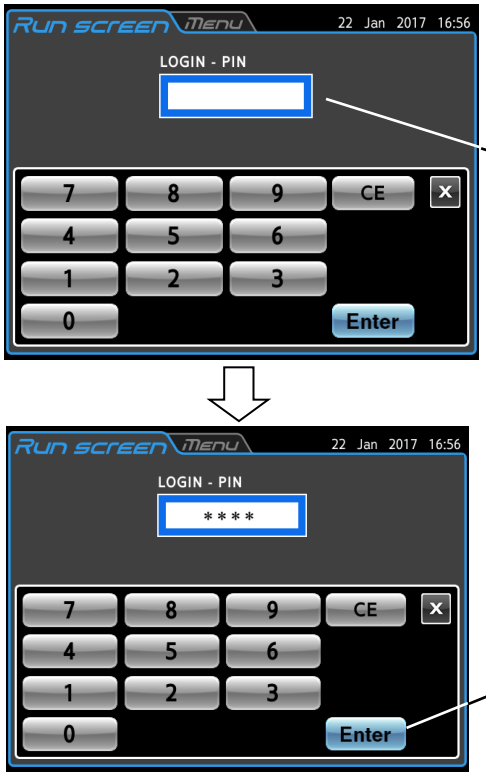
The centrifuge totals the run time for all programmed operation steps to calculate the RTC start time. For this reason, programs cannot be called after setting the RTC.

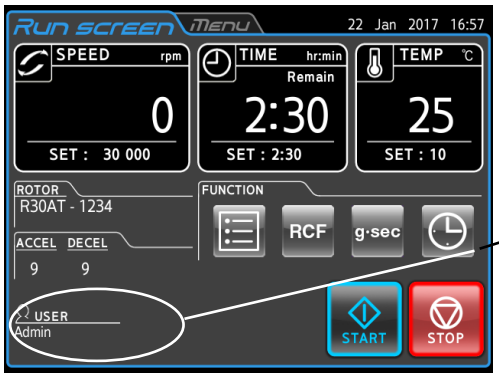
5) To stop the run before completion, press **[STOP]** button.
This cancels RTC operation and stops the rotor.

2-4 Logging in as a User

Operation can be performed by specifying the user of the centrifuge.

(1) User login procedure

Step	Operation	Screen display and usage notes
1	Press the user name field in the Run screen.	
2	In the User Management screen, press the field for the desired user name, check that the pressed field turns blue, and then press the **[LOGIN]** button. (“Admin” is the registered factory default for this centrifuge.)	
3	Enter the PIN using the on-screen keypad (numeric keypad) on the LOGIN screen, and press the **[Enter]** button. The PIN is the 4-digit number that you set in Section 2-5-6 (1) “User Management”. (The default PIN for “Admin” is “1111”.)	

Step	Operation	Screen display and usage notes
4	The user name appears in the User Name area in the Run screen.	 ●The Run screen appears. User Name area

NOTE When the user lockout function described in Section 2-5-6 (2) “User Lockout” is enabled, you must login as a user to operate the centrifuge. Operation cannot be performed unless you log in.

Be sure to register beforehand as described in Section 2-w5-6 (1) “User Management”.

2-5 Features of the MENU Screen

These features, including the Run History function shown in Fig. 2-5, are provided to make this centrifuge easier to use. The MENU screen can be displayed by pressing the MENU tab on the touchscreen.



Fig. 2-5 MENU screen

The functions of the MENU screen icons are described in the table below.

Name	Icon (Button)	Function
Run History		This enables viewing, reuse, and saving of the run history to a USB memory stick. (For details, refer to Section 2-5-1 "Displaying the Run History and Reusing Run Parameters".)
Rotor Catalog		This enables viewing of the rotor models and their specifications. (For details, refer to Section 2-5-2 "Rotor Catalog".)
RCF Calculation		This enables calculation of the RCF. (For details, refer to Section 2-5-3 “RCF Calculation”.)
ID/Contact		This enables setting of individual machine IDs for cases such as when multiple centrifuges are used. (For details, refer to Section 2-5-4 "Machine ID and Service Contact Information".)
Customize		This enables selection of the stop signal, volume, LCD panel screensaver, language, and other options. (For details, refer to Section 2-5-5 "Customizing".)
Manager (Admin)		This enables setting of administrator functions such as rotor management and user management. (For details, refer to Section 2-5-6 “Admin Function".)

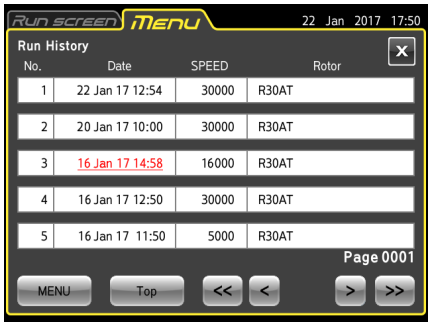
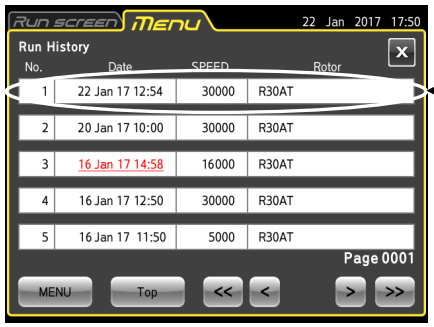
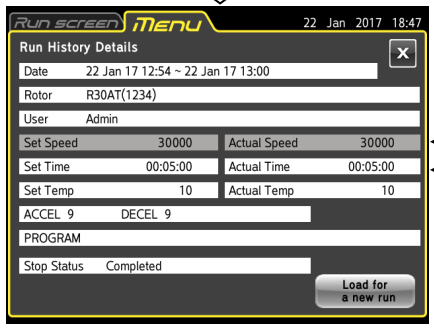
Press the icon for the function that you want to use to display the available options.

2-5-1 Displaying the Run History and Reusing Run Parameters



This enables viewing, reuse, and saving of the run history to a USB memory stick.

(1) Viewing and reusing the run history

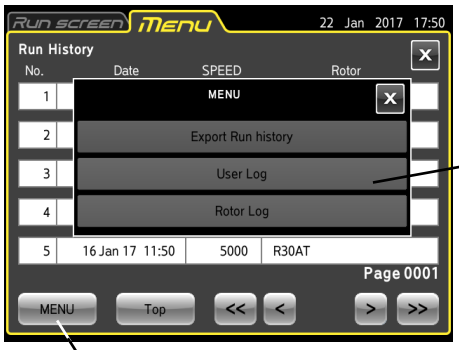
Step	Operation	Screen display and usage notes
1	Press the **[Run History]** button in the MENU screen.	 ●The Run History screen appears.
2	To view details on the run history, press the row of the desired run history item.	 ← Select the run history  ●The Run History Details screen appears. ← Speed field ← Run time field ○ If the Speed field appears gray, pressing this field changes the display to the RCF. ○ In the run history for ω^2T (g･sec) operation, the run time field appears gray. Pressing this field switches between display of TIME and ω^2T (g･sec). ○ When an alert occurs, the Stop Condition field provides details on the alert.

Step	Operation	Screen display and usage notes
3	To reuse run parameters, press the **[Load for a new run]** button.	○ The run parameters are reused, and the display changes to the Run screen.
	To not reuse the run parameters, press the Run screen tab to return to the Run screen.	○ The Run screen appears again.

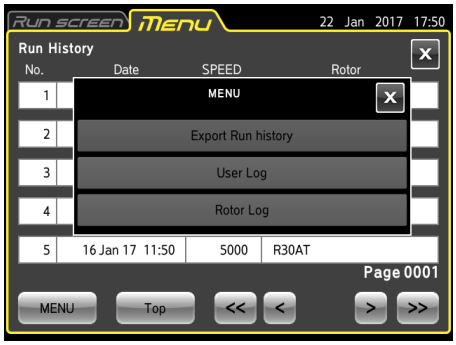
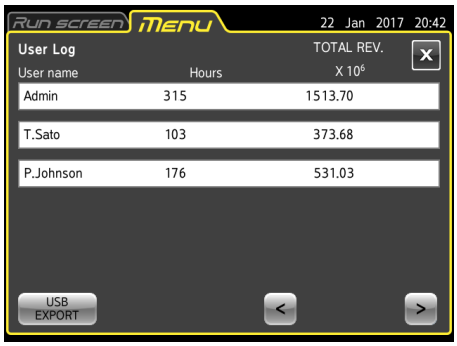
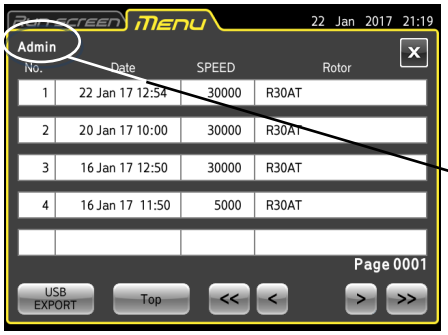
NOTE In the Run History screen, history items where the run time appears with a red underline indicate that an alert has occurred.

(2) Output of the run history and viewing of the user or rotor run history

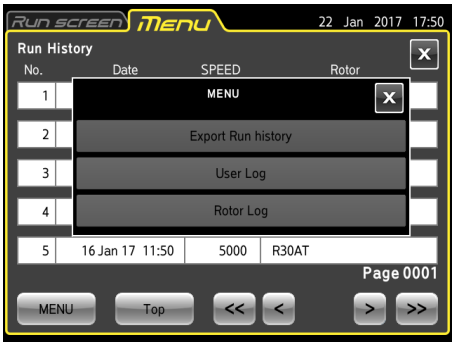
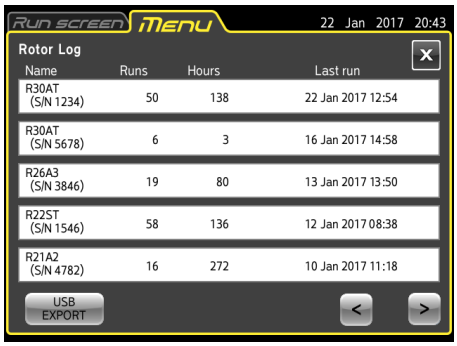
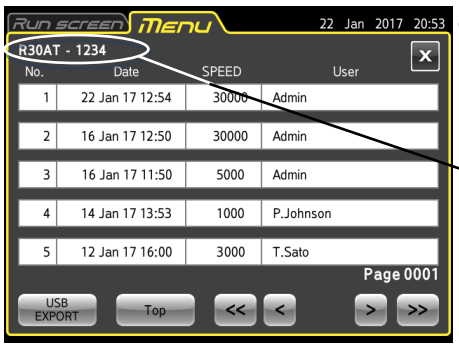
(2)-1 Output of run history to USB memory stick

Step	Operation	Screen display and usage notes
1	Press the **[Run History]** button in the MENU screen, and press the **[MENU]** button at the bottom left in the Run History screen.	 ● The Menu box in Run History appears. MENU box **[MENU]** button
2	Insert a USB memory stick into the USB port, and press the **[Export Run history]** button in the MENU box.	○ This outputs the stored run history to the USB memory stick in CSV file format. ○ No special procedure is required to remove a USB memory stick. Remove the USB memory stick after writing is complete.

(2)-2 Viewing the user run history

Step	Operation	Screen display and usage notes
1	Press the **[MENU]** button at the bottom left in the Run History screen.	 ●The Menu box in Run History appears.
2	Press the **[User Log]** button in the MENU box.	 ●The user run history is displayed. ○ Pressing the **[USB EXPORT]** button outputs the total run time for each user to a USB memory stick in CSV file format.
3	Select the user whose information you want to view. The figure at the right shows the case when viewing the run history for the user name “Admin”.	 ●The Run History List screen for the selected user appears. Selected user name ○ Pressing the **[USB EXPORT]** button outputs the run history of the selected user to a USB memory stick in CSV file format.

(2)-3 Viewing the rotor run history

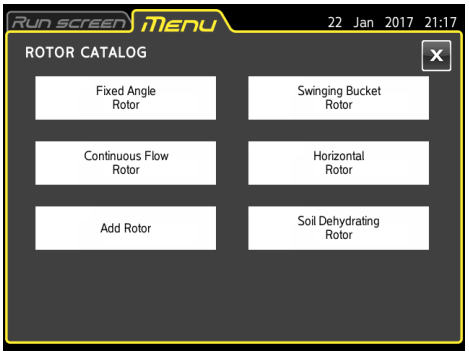
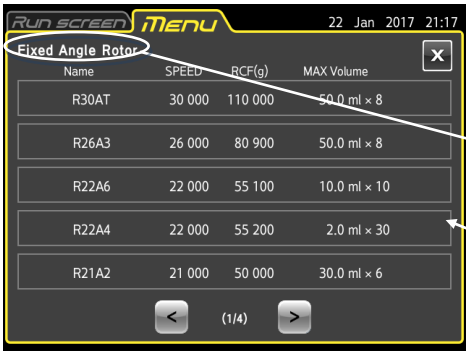
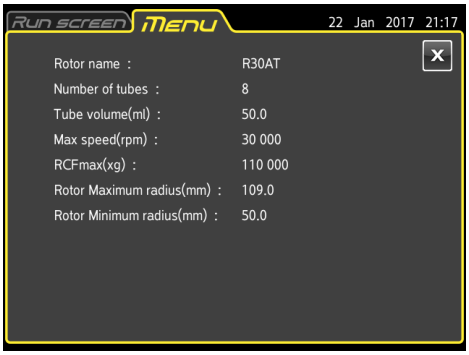
Step	Operation	Screen display and usage notes
1	Press the **[MENU]** button at the bottom left in the Run History screen.	 ●The Menu box in Run History appears.
2	Press the **[Rotor Log]** button in the Menu box.	 ●The rotor run history is displayed. ○ Pressing the **[USB EXPORT]** button outputs the run history for each rotor to a USB memory stick in CSV file format.
3	Select the rotor whose information you want to view. The figure at right shows the run history for the rotor “R30AT-1234”.	 ●The Run History List screen for the selected rotor appears. Selected rotor name ○ Pressing the **[USB EXPORT]** button outputs the run history of the selected rotor to a USB memory stick in CSV file format.

2-5-2 Rotor Catalog



This enables viewing of the rotor models and their specifications.

(1) Procedure for viewing rotor catalog

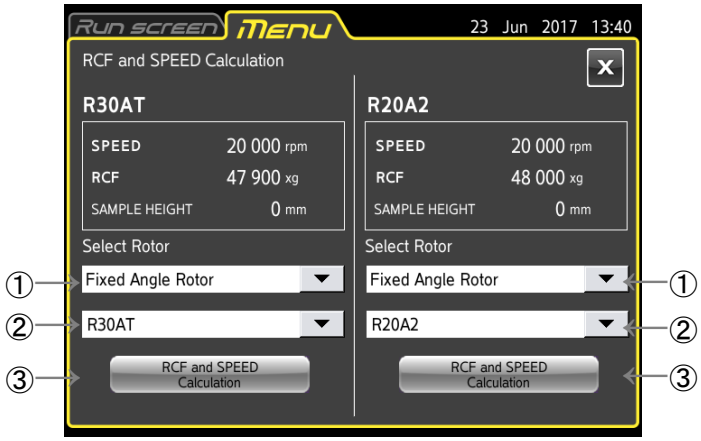
Step	Operation	Screen display and usage notes
1	Press the **[Rotor Catalog]** button in the MENU screen.	 ● The ROTOR CATALOG screen appears.
2	Select the type of rotor from the ROTOR CATALOG screen. Press the **[<]** and **[>]** buttons to turn pages.	 ● The Rotor List screen appears. Type of selected rotor Rotor cell
3	Press the desired rotor cell to open the Rotor details screen.	 ● A screen showing rotor specifications appears.

Step	Operation	Screen display and usage notes
4	To return to the previous screen, press the **[X]** button. To return to the MENU screen, press the MENU tab. To return to the Run screen, Press the Run screen tab.	○ The Touchscreen returns to the previous screen, MENU screen, or the Run screen.

2-5-3 RCF Calculation

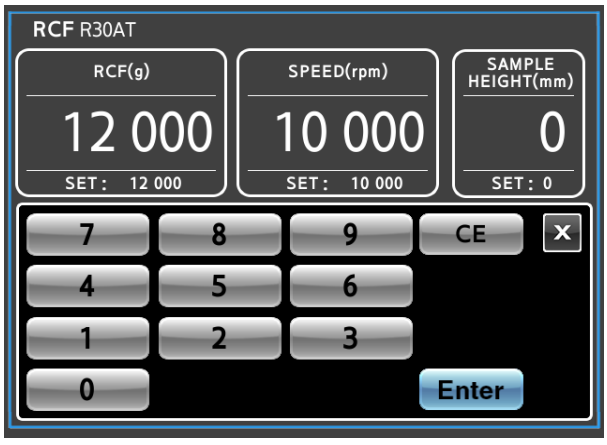


This enables calculation of the RCF.



Operating Procedure

(1) Select the type of rotor from the pull-down list at ①.
(2) Select the rotor from the pull-down list at ②.
(3) Press the [RCF and SPEED Calculation] button at ③, and set the RCF and SPEED from the screen shown below.
For details on the setting procedure, refer to Section 2-3-2 “Displaying and Setting the RCF”.



2-5-4 Machine ID and Service Contact Information

This enables setting of individual machine IDs for cases such as when multiple centrifuges are used.

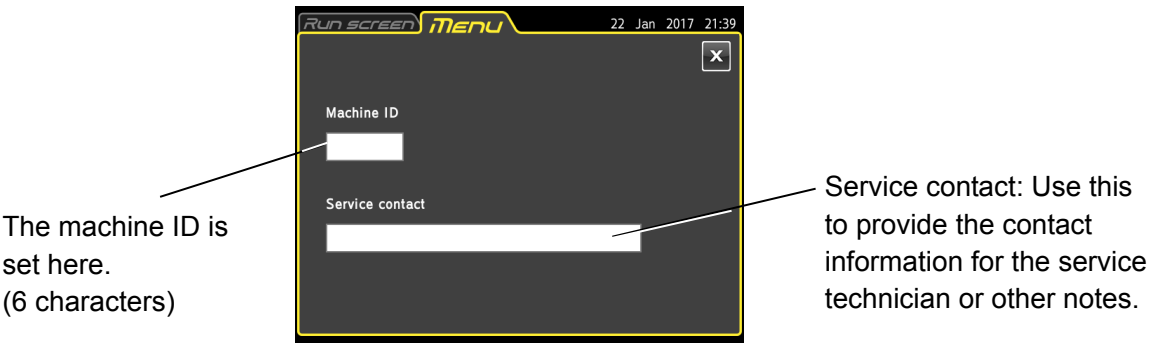


Fig. 2-5-4 (1) Machine ID and service contact information setting screen

Press the field for the Machine ID.

Press the field for the service contact.



Fig. 2-5-4 (2) Machine ID entry screen



Fig. 2-5-4 (3) Service contact information entry screen

2-5-5 Customizing



This enables selection of the stop signal, volume, LCD panel screensaver, language, and other options.

Pressing the **[Customize]** button in the MENU screen displays the Custom screen.
Use page navigation buttons to switch between the screens in the figure below.



Fig. 2-5-5 CUSTOM screen

The functions of the CUSTOM screen icons are described below.

Name	Icon (Button)	Function
Zoom		This enables setting of the zoom magnification when stabilized. (For details, refer to Section 2-5-5 (1).)
Stop Signal		This enables selection of a stop signal from six different types. (For details, refer to Section 2-5-5 (2).)
Volume		This enables adjustment of the sound volume. (For details, refer to Section 2-5-5 (3).)
Backlight		This enables adjustment of the screen brightness and setting of the screensaver. (For details, refer to Section 2-5-5 (4).)
Pre-cool		This enables making of the precooling settings. (For details, refer to Section 2-5-5 (5).)

Name	Icon (Button)	Function
Language		This enables selection of the display language. (For details, refer to Section 2-5-5 (6).)
Date/Time		The date and time are set here. (For details, refer to Section 2-5-5 (7).)
Operation Mode		This enables setting of the operation mode. (For details, refer to Section 2-5-5 (8).)
Auto Standby		This enables setting of auto standby mode and the screensaver. (For details, refer to Section 2-5-5 (9).)
Operation Lock		This enables setting of the operation lock mode. (For details, refer to Section 2-5-5 (10).)
g･sec / ω^2T		This enables setting of the g･sec / ω^2T mode. (For details, refer to Section 2-5-5 (11).)
Start mode		This enables setting of the vacuum when operation is started. (For details, refer to Section 2-5-5 (12).)

(1) Zoom



This enables setting of the zoom magnification when stabilized.

[NORMAL] button: Select to display the normal Run screen.
[ZOOM] button: 20 seconds after the speed setting is reached, the speed and run time are displayed at an enlarged (zoom) size.

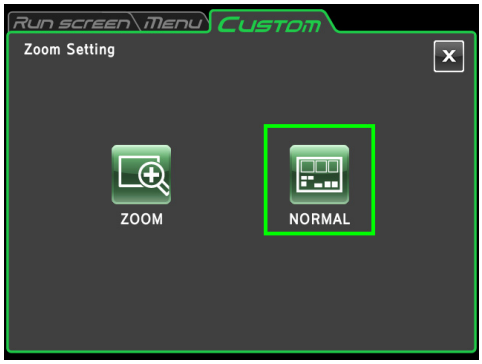


Fig. 2-5-5 (1) Zoom setting screen

The setting is saved by pressing the **[×]** button or Custom tab. Pressing an area other than the **[STOP]** button while the zoom screen is being displayed returns to the normal screen.

(2) Stop Signal



This enables selection of the stop signal from one of six sounds including five tunes and an electronic beep.

Pressing the selected stop signal field changes the field to blue and plays a preview of the stop signal.

Press the **[Enter]** button to set the stop signal.

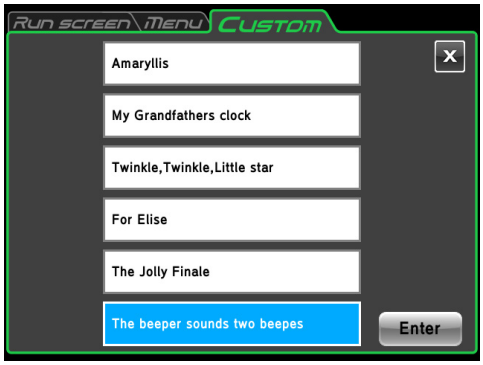


Fig. 2-5-5 (2) Stop signal setting

(3) Volume



This enables adjustment of the sound volume.

Press **[<]** to lower the sound volume.
Press **[>]** to raise the sound volume.

Press [ ] to mute the volume.
Press [ ] to set to the maximum volume.

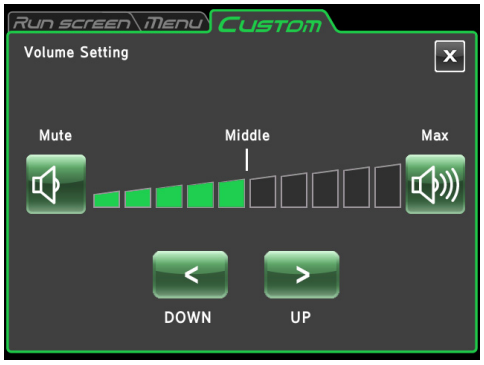


Fig. 2-5-5 (3) Sound volume setting screen

The setting is saved by pressing the **[×]** button or Custom tab.

(4) Backlight



This enables adjustment of the screen brightness.
It also enables setting of dimming backlight mode.

Adjusting the Screen Brightness

Press **[<]** to darken the screen.

Press **[>]** to brighten the screen.

The setting is saved by pressing the **[×]** button or Custom tab.

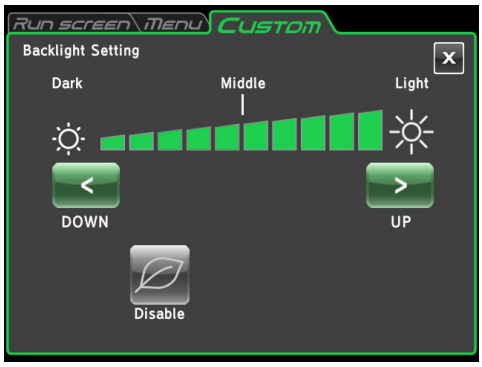


Fig. 2-5-5 (4a) Backlight setting screen (When dimming backlight mode is disabled)

Dimming backlight mode settings

Dimming backlight mode allows you to dim the touchscreen brightness, such as when you are not using it or during operation.

Pressing the [ ] button switches between Enable and Disable for this function.



Fig. 2-5-5 (4b) Setting box appearing when dimming backlight mode is enabled

① Detailed settings of dimming backlight mode

- The setting box for dimming backlight mode in Fig. 2-5-5 (4b) appears, and the user-selected time until dimming backlight mode is activated can be set.
  Pressing [min.] opens the screen shown in Fig. 2-5-5 (4c) where the wait time until activating dimming backlight mode can be set. Any value from 5 to 99 minutes can be set.
- For dimming backlight mode, select either “Dimming only while stop” or “Dimming even while operation” (dimming while stopped or while operating).

② Operation of dimming backlight mode
If no screen operations are performed for the wait time that was set, the backlight is dimmed.
Touching the screen while it is dimmed returns it to the normal brightness.

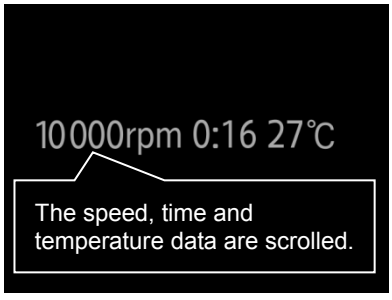


Fig. 2-5-5 (4c) Screen for setting the wait time for dimming the backlight

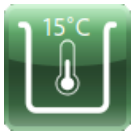
Screensaver settings

If the same screen is displayed on an LCD panel for an extended period of time, afterimages can burn into the screen.To prevent afterimages from occurring, select Screensaver as shown in Fig. 2-5-5 (4b).

The screensaver screen shown in the figure at right is displayed once the same wait time setting as dimming backlight mode is reached.



(5) Pre-cool



This enables making of the precooling settings.

If the temperature setting is 15°C or less and the rotor is not mounted, the inside of the rotor chamber can be maintained at around 15°C.

To use the Pro-cool function, press the **[Enable]** button. The setting is saved by pressing the **[×]** button or Custom tab.

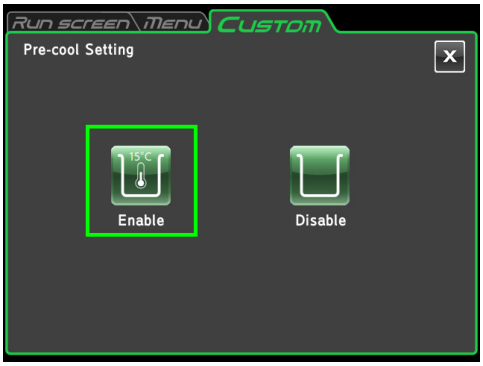


Fig. 2-5-5 (5) Pre-cool selection

NOTE

1) The Pre-cool function may not be activated if the temperature in the room or inside the rotor chamber is 15°C or less.
2) This is controlled to the temperature setting if the temperature setting is 16°C or more.
3) This is controlled to the temperature setting if the rotor is mounted.

(6) Language setting



This enables selection of the display language.

Pressing the selected language changes the field to blue.
The setting is saved by pressing the **[×]** button or Custom tab.



Fig. 2-5-5 (6) Language setting

(7) Date/Time



The date and time are set here.

When you press the field that you want to set, the field changes to red.
Press the operation buttons in the bottom of the screen, and enter the current date and time.



Fig. 2-5-5 (7) Date/Time setting

(8) Operation Mode



This enables setting of the operation mode.

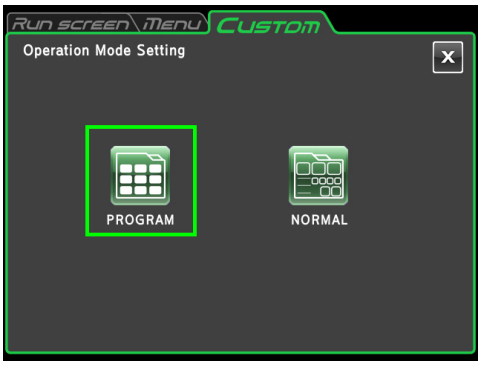


Figure 2-5-5 (8a)
Operation mode setting screen

[PROGRAM]: This mode performs programmed operation only.

- If this mode is selected, you will be unable to change the run parameters from the Run screen. (The program run parameters can be changed.)
- The program screen becomes the main screen, and the program screen appears after the power is turned on.

[NORMAL]: This mode performs normal operation.

- The run parameters can be set from the Run screen for performing operation. You can also use programmed operation.
- The Run screen becomes the main screen, and the Run screen appears after the power is turned on.

Press the **[PROGRAM]** or **[NORMAL]** button to select an operation mode.
The setting is saved by pressing the **[×]** button or Custom tab.

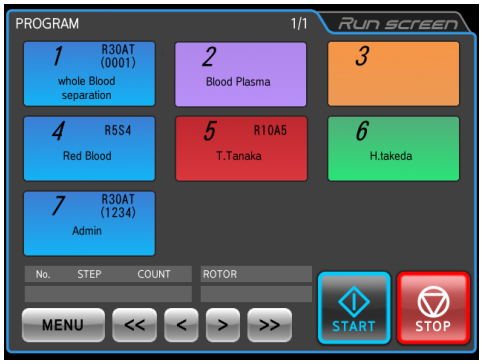


Figure 2-5-5 (8b)
Program screen

(9) Auto Standby



The auto standby settings can be made here.



Fig. 2-5-5 (9a)
Auto Standby Setting screen

Auto standby is a function for reducing power usage when the centrifuge is stopped or when no panel operations are performed by dimming the LCD backlight, performing temperature control, and other means.

Auto Standby Setting
- Select [Enable].
- Press the “Timeout” field in Fig. 2-5-5 (9b), and set the standby time until activated. The standby time can be set in the range from 5 to 99 minutes.

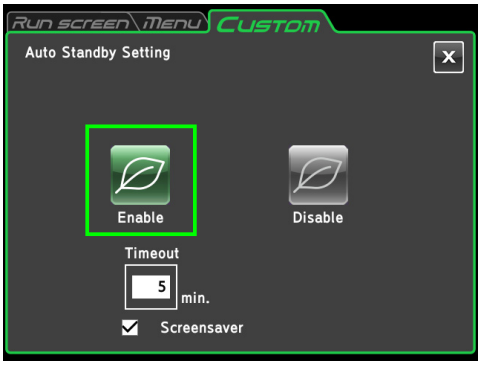


Fig. 2-5-5 (9b)
Setting screen when Auto Standby is enabled

Screensaver settings
(4) The screensaver settings can be made in the same way as dimming mode for the backlight adjustment.
The screensaver is activated at the same time that was specified for Auto Standby operation. When this happens, the backlight is dimmed.

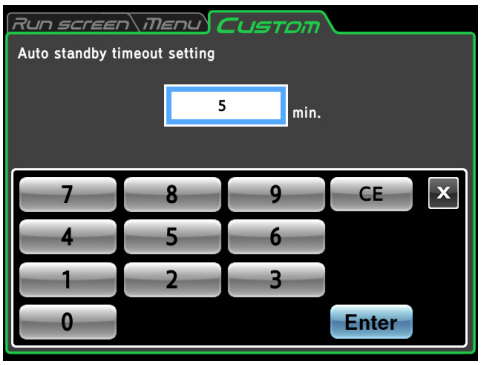


Fig. 2-5-5 (9c)
Screen for setting Auto Standby wait time

⚠ NOTICE: When this mode is enabled, the refrigerating machine does not operate, and the rotor cannot be precooled even if the door is closed.

(10) Operation Lock



This enables selection of operation lock mode.

[NORMAL]: Touch panel operation can always be performed.
[LOCK]: Touch panel operation is limited. When the door of this unit is opened, no operations can be performed in the Run screen or programmed operation screen. Operation can be performed when the door is closed.

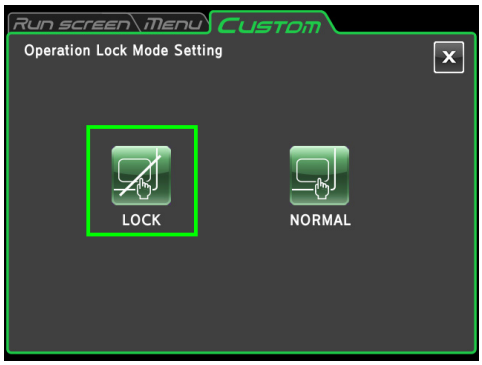


Fig. 2-5-5 (10a)
Operation Lock Mode Setting screen

If the LCD panel is pressed in operation lock mode, the message shown in Fig. 2-5-5 (10b) is displayed.

Press the **[LOCK]** or **[NORMAL]** button to select an operation lock mode.

The setting is saved by pressing the **[×]** button or Custom tab.

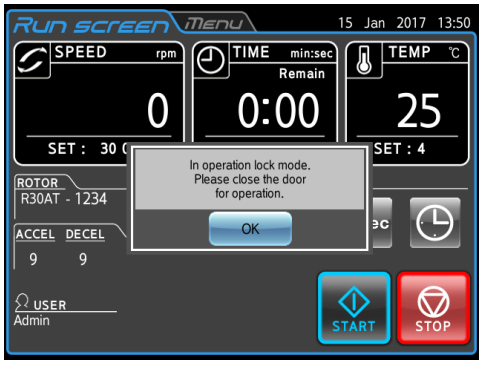


Figure 2-5-5 (10b)
Confirmation message screen

(11) g･sec / ω²T



This enables selection of g･sec or ω²T.

[g･sec]: Input for g･sec is enabled.
[ω²T]: Input for ω²T is enabled.
The button in the function area of the Run screen changes.

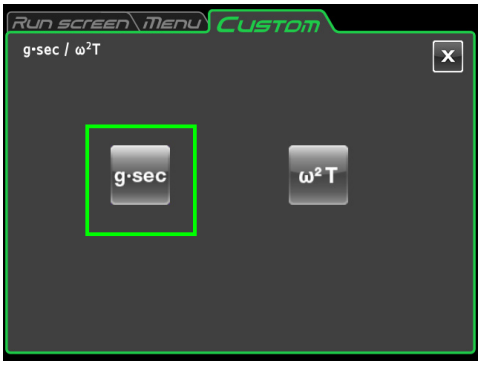


Fig. 2-5-5 (11a)
g･sec / ω²T mode setting screen

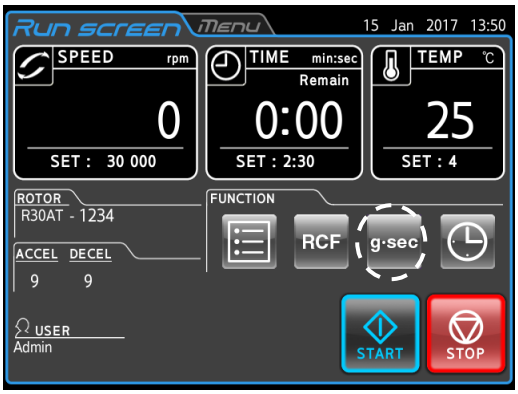


Fig. 2-5-5 (11b)
Run screen (g･sec)

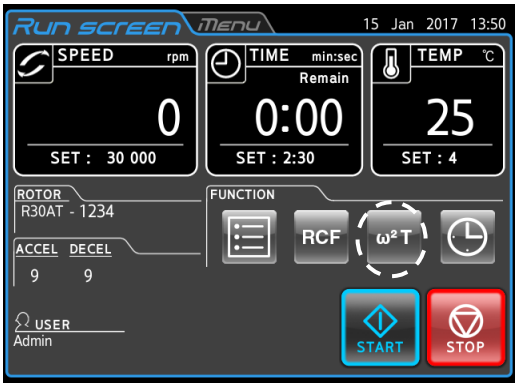
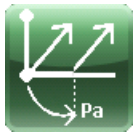


Fig. 2-5-5 (11b)
Run screen (ω²T)

NOTE In programmed operation, step-mode operations that mix use of both g･sec and ω²T cannot be created.

(12) Start mode



This enables setting of the vacuum when operation is started.

[NORMAL START]: This is a mode for all rotors that establishes a vacuum after operation starts.

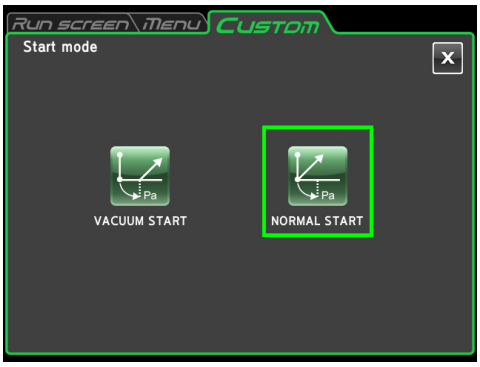


Fig. 2-5-5 (12a)
Start mode setting screen

・For some rotors, the rotor temperature may temporarily increase during acceleration, and so VACUUM START mode is recommended when handling samples that are sensitive to temperature changes

[VACUUM START]: This is a mode for some rotors that establishes a certain vacuum level before operation is started. When START is pressed, the WAIT indicator appears, and operation is started once a certain vacuum level is reached.

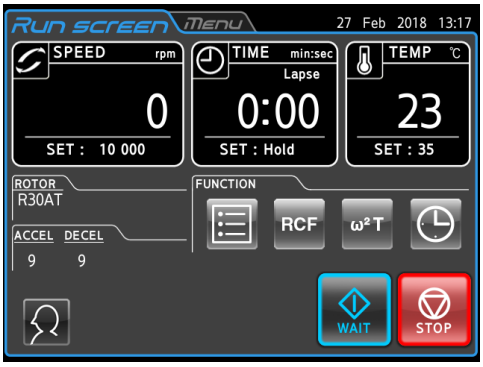


Fig. 2-5-5 (12b)
Run screen (WAIT)

・For rotors that do not increase in temperature during acceleration, a vacuum is established after operation is started in the same way as for NORMAL START.

Press the **[VACUUM START]** or **[NORMAL START]** button to select a start mode.

The setting is saved by pressing the **[×]** button or Custom tab.

2-5-6 Admin Function



This enables setting of administrator functions such as rotor management and user management.

Pressing the **[Manager (Admin)]** button in the MENU screen opens the ADMIN screen.

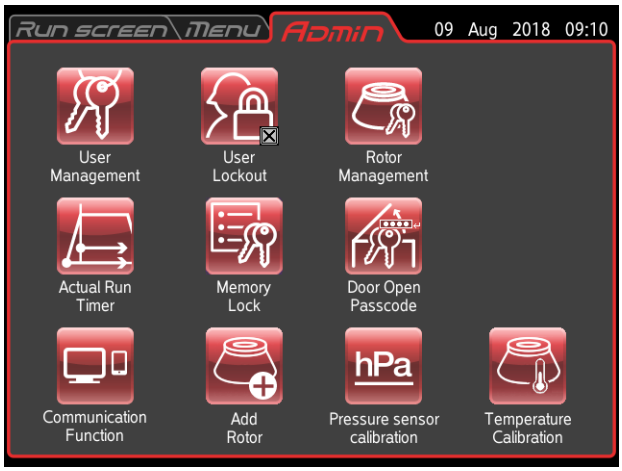


Fig. 2-5-6 ADMIN screen

Name	Icon	Function
User Management		This is used to register and delete users. (For details, refer to Section 2-5-6 (1).)
User Lockout		This is used to limit user access. (For details, refer to Section 2-5-6 (2).)
Rotor Management		This is used to manage a rotor by the number of runs and other parameters. (For details, refer to Section 2-5-6 (3).)
Actual Run Timer		This is used to select the actual run timer. (For details, refer to Section 2-5-6 (4).)
Memory Lock		This is used to set the memory lock in programmed operation. (For details, refer to Section 2-5-6 (5).)
Door Open Passcode		This is used to enable the function that limits unlocking of the door (door open). (For details, refer to Section 2-5-6 (6).)
Communication Function		This is used to select the LAN communication function for himac LogManager or himac View. (For details, refer to Section 2-5-6 (7).)
Add Rotor		This is used to add rotors. (For details, refer to Section 2-5-6 (8).)
Pressure sensor calibration		This is used to calibrate the pressure sensor in the rotor chamber. (For details, refer to Section 2-5-6 (9).)
Temperature calibration		This is used to calibrate the rotor temperature. (For details, refer to Section 2-5-6 (10).)

Press the icon for the function that you want to use to display the available options.
After completing the settings, press the tab of the screen that you want to return to.

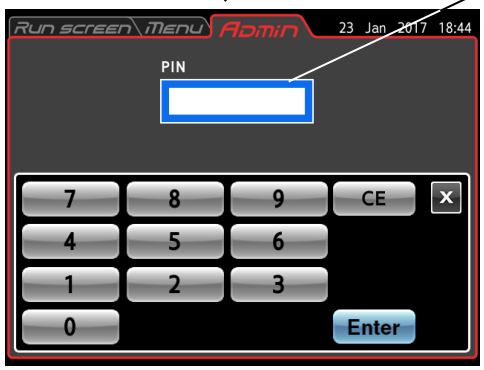
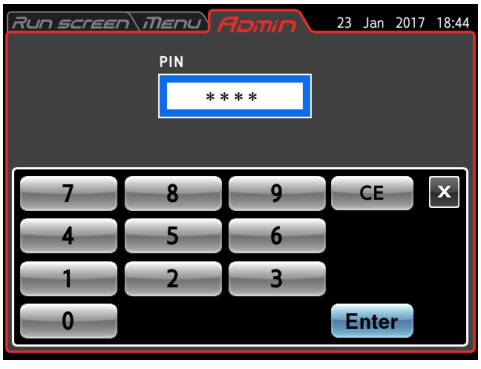
(1) User Management

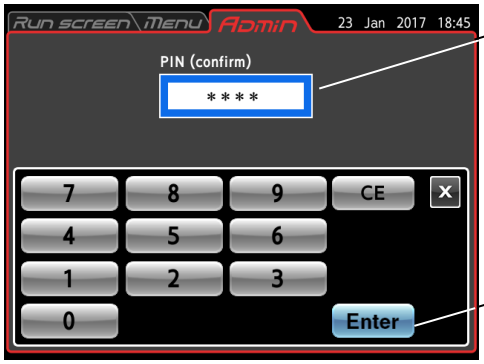


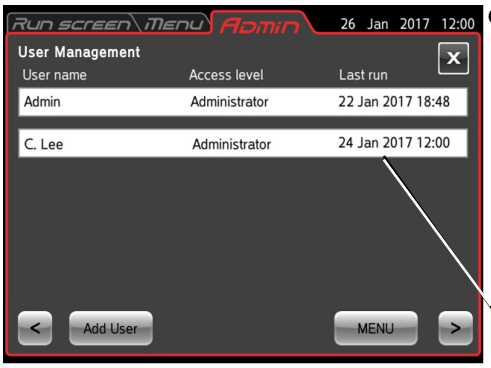
The centrifuge can register (store) up to 50 users that are managed at three different management levels.
The procedures for registering users and changing user information are described below. When a user is registered, the operations that can be performed by the user can be restricted.

1) Procedure for registering users

Step	Operation	Screen display and usage notes
1	Press the User Management icon. Next, press the **[Add User]** button.	 ●The User Management screen **[Add user]** button  User name field **[×]** button ●The User Name Registration screen appears. **[Clear]** button **[Space]** button **[Enter]** button **[Shift]** button **[Delete]** button ○ **[Shift]**: This switches between lowercase and uppercase letters. ○ **[Clear]**: This deletes all text in the User Name box. ○ **[Space]**: This inserts a space at the rightmost end in the User Name box. ○ **[Delete]**: This deletes the rightmost character in the User Name box. ○ **[Enter]:** This changes the screen to the Register PIN screen. ○ **[×]**: This returns to the User Management screen.

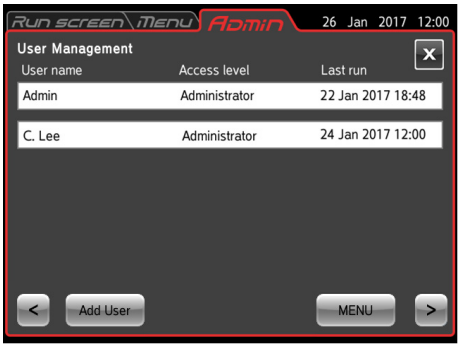
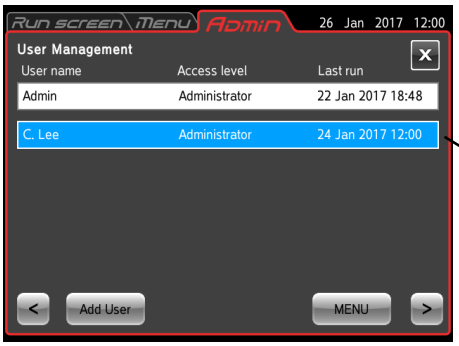
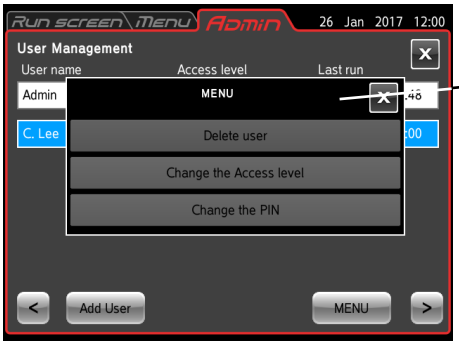
Step	Operation	Screen display and usage notes
2	Enter the user name, and press the **[Enter]** button.	 **[Enter]** button  PIN box ●The Register PIN screen appears.
3	Enter any PIN (4-digit number) into the PIN box, and press the **[Enter]** button.	 ●The PIN is masked by asterisks.  ●The PIN Confirmation screen

Step	Operation	Screen display and usage notes
4	Enter the PIN (4-digit number) that was entered in step 3 into the PIN (confirm) box, and press the **[Enter]** button.	 PIN (confirm) box ●The PIN is masked by asterisks. **[Enter]** button  ●The Access Level selection box appears. Access Level box ○ An access level can be set to control access at three different levels. ○ To apply controls on user operations, the user lockout function must be enabled. For details, refer to Section 2-5-6 (2) “User Lockout”. ○ The following access levels are provided. Administrator: All operations are allowed. Supervisor: Setting and changing of run parameters, selection of programs, and similar operations can be performed. User: START and STOP operations only can be performed. For details, refer to Table 2-5-6 “Allowed operations by access level”.

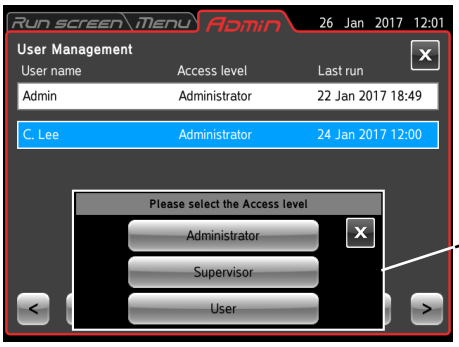
Step	Operation	Screen display and usage notes
5	Select an access level.	 ● This returns to the User Management screen. C. Lee has been added under User Name, and the Access Level appears as “Administrator”. Added user ○ The added user name and access level are displayed again.
6	Either press the ADMIN tab or the **[×]** button, or press the Run screen tab or the MENU tab.	○ To return to the ADMIN screen, press the ADMIN tab or the **[×]** button. ○ Press the Run screen tab or MENU tab to proceed to the respective screen.

NOTE In the factory default settings, the user name “Admin” is set to an access level of “Administrator” and a PIN of “1111”. This user cannot be deleted.

2) Procedure for deleting users and changing registered information

Step	Operation	Screen display and usage notes
1	Press the **[User Management]** button.	 ●The Admin screen changes to the User Management screen.
2	Press the user field for the user that you want to delete or whose information you want to change.	 ●The selected user field changes from white to blue. Selected user field
3	Press the **[MENU]** button.	 ●The MENU box appears. MENU box

Step	Operation	Screen display and usage notes
3 -1	To delete the selected user, press the **[Delete user]** button.	 ●A delete confirmation message appears. Delete confirmation
	Press the **[YES]** button to open the screen for entering the PIN.	○ Enter the PIN of the user that you want to delete, and press the **[Enter]** button. ○ This returns to the User Management screen, and the user field has been deleted.

<table>
<tr><th>Step</th><th>Operation</th><th>Screen display and usage notes</th></tr>
<tr><td rowspan="2">3 -2</td><td>To change the access level, press the [Change the Access level] button.</td><td>

●The select access level box appears.
Select access level box</td></tr>
<tr><td>Press the access level that you want to change to open the screen for entering the PIN.</td><td>○ Enter the PIN of the user that you want to change, and press the [Enter] button.
○ This returns to the User Management screen, and the access level of the user field has been changed.</td></tr>
<tr><td>3 -3</td><td>To change the PIN, press the [Change the PIN] button.

① A screen for entering the current PIN appears. Enter the current PIN, and press the [Enter] button.

② A screen for entering a new PIN appears. Enter the new PIN, and press the [Enter] button.

③ A screen for confirming the PIN appears. Enter the PIN entered in step ②, and press the [Enter] button.</td><td>

●A screen for entering the current PIN appears.


●A screen for entering a new PIN appears.


●A screen for confirming the new PIN appears.

○ The PIN is confirmed, and this returns to the User Management screen.</td></tr>
</table>

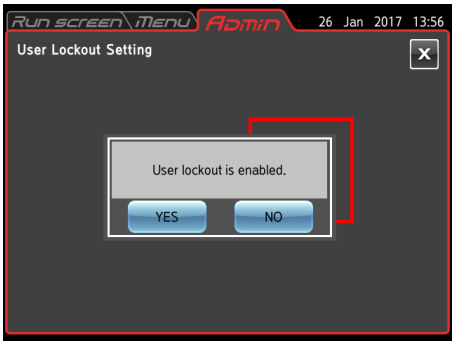
NOTE The user name cannot be changed. If the user name must be changed, delete the user name, and then register the desired user name.

(2) User Lockout



When this function is enabled, user access can be controlled at three different levels.

1) User lockout setting procedure

Step	Operation	Screen display and usage notes
1	Log in as a user as described in Section 2-4 “Logging in as a User”.	○ The login user must have “Administrator” privileges.
2	Press the **[User Lockout]** button. 	 ●The User Lockout Setting screen appears. ○ The selected button is shown inside a red frame. (Disable is selected in this example.)
3	Press the **[Enable]** button. (Press the **[Disable]** button.)	 ●A dialog box for confirming the user lockout enable operation appears. ○ In the same way, when you change from enable to disable user lockout, a dialog box for confirming the user lockout disable operation appears.
4	Press the **[YES]** button.	○ The **[Enable]** button is shown inside a red frame, and user lockout is enabled. (When the **[Disable]** button is pressed in step 3, it is shown inside a red frame, and user lockout is disabled.) ○ To return to the ADMIN screen, press the ADMIN tab or the **[×]** button.

② Procedure for enabling user lockout

Press the User Name field in the Run screen as described in Section 2-4 "Logging in as a User", and select a registered user. Further operation is not possible unless a user is selected.
The user access level determines what operations are permitted.

NOTE

1) Only a user logged in with “Administrator” privileges can enable the user lockout function.
2) Users must be registered before using the user lockout function. Register users as described in (1) “User Management”.
3) When user lockout is enabled, a user must be logged in to perform operations.
4) Once user lockout is enabled, only a user with an Administrator access level can load the Admin screen.
   The user lockout function can be disabled only by a user having an administrator access level and who is logged in.
5) In the factory default settings, the user name “Admin” is set to an access level of “Administrator” and a PIN of “1111”.
6) The operations that users at each access level are permitted when user lockout is enabled are shown in the table below.

Table 2-5-6 Allowed operations by access level

Screen	Function \ Access level		Administrator	Supervisor	User
Run screen	Change run parameters		○	○	×
	Clear alarms		○	○	×
	START/STOP switch operation		○	○	○
	User login switch		○	○	○
	Select rotors (select operation rotors)		○	○	×
Function	Program	Register, change, delete	○	×	×
		Select	○	○	○
	RCF g･sec ω^2T	Change	○	○	×
		View	○	○	×
	RTC	Register, change, delete	○	○	×
		View	○	○	×
Menu	Run history	View	○	○	×
		Set run parameters	○	○	×
	Rotor catalog		○	○	○
	Customize switch		○	○	○
	Administrator switch		○	×	×
	Machine ID	Register	○	×	×
		View	○	○	×
	Calculate RCF		○	○	○
Customize	Select zoom screen		○	○	×
	Select stop signal		○	○	×
	Set volume		○	○	○
	Backlight	Adjust	○	○	○
		Set dimming time	○	○	×
	Select precooling control mode		○	○	×
	Select display language		○	○	×
	Change date/time		○	○	×
	Select operation mode		○	○	×
	Auto standby (select standby mode)		○	○	×
	g･sec / ω^2T		○	○	×
Admin	Admin function		○	×	×

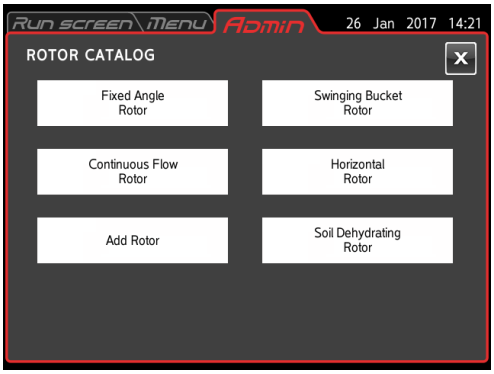
O: Enable X: Disable

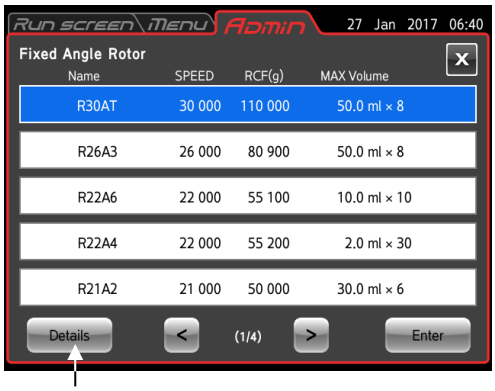
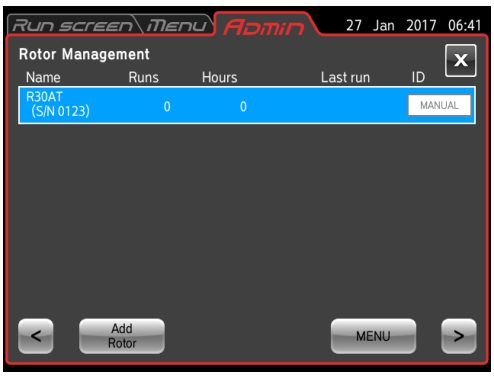
(3) Rotor Management



This registers the rotor that is used for operation. In addition to operation settings, the number of runs, run time, and other parameters can be managed for the registered rotor. Be sure to register your rotor before operation.

1) Rotor registration procedure

Step	Operation	Screen display after operation and usage notes
1	Press the **[Rotor Management]** button in the ADMIN screen.	 ● The Rotor Management screen appears.
2	Press the **[Add Rotor]** button.	 ● The ROTOR CATALOG screen appears.
3	Press the button for the rotor type to be registered.	 ● This is an example of a list of angle rotors.

Step	Operation	Screen display after operation and usage notes
4	Select a rotor, and press the **[Enter]** button. To check the specifications for a rotor, select the rotor and press the **[Details]** button.	 **[Details]** button ● The box for the selected rotor changes to blue.
5	Enter the serial number, and press the **[ENTER]** button.	 ● Entering a four-digit number: Add 0 as a prefix so that “123” becomes “0123”.  ● This returns to the Rotor Management screen. Name: Rotor model and serial number Runs: Run count Hours: Run time Last run: Date of last run ID: Auto/Manual selection for reading of rotor ID*
6	Press the Run screen tab to return to the Run screen.	○ The display shows the Run screen again.

*Auto/Manual selection function for reading of rotor ID

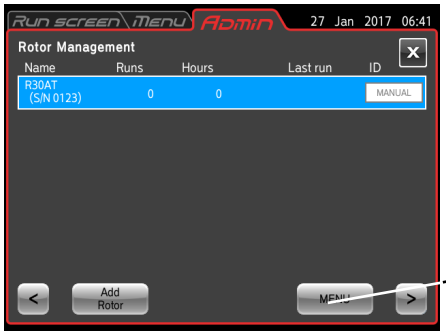
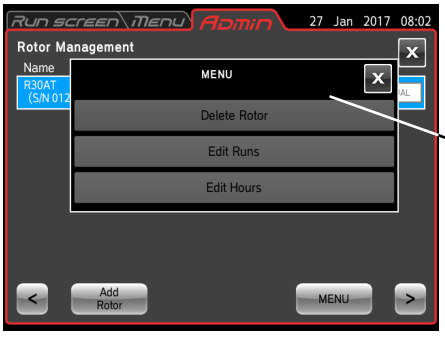
This centrifuge can automatically detect the rotor model when the rotor is mounted. However, because the serial number cannot be read, if the customer has multiple rotors of the same model type, to perform rotor management of the run count and other details based on the serial number, the above-described rotor registration procedure must be performed (this is required for the rotors listed in Section 2-1-4 “Rotor Life” that have a limit on their run count).

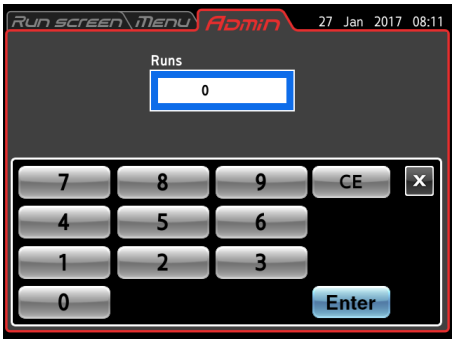
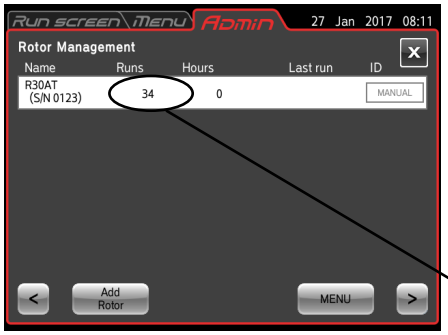
When multiple rotors of the same model type are registered, reading of the rotor ID temporarily switches to Manual. For rotors that are set to Manual, a list appears in a pop-up window when the rotor is mounted, and so select the rotor from the list before using.

Even when multiple rotors of the same model type are registered, a single rotor serial number with the highest usage priority can be set to Auto. Then, the rotor of the serial number that was set to Auto is selected when this rotor is mounted. To use a rotor with a different serial number, press the rotor name display box to open the list, and select the rotor from the list before using. (See step 3 in 2-2-2 “Operational Procedures”.)

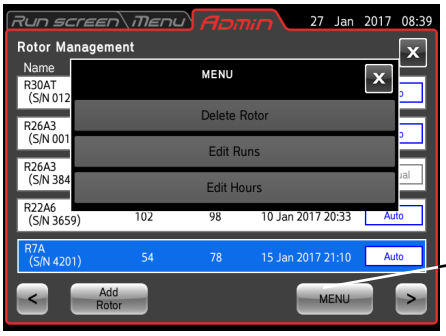
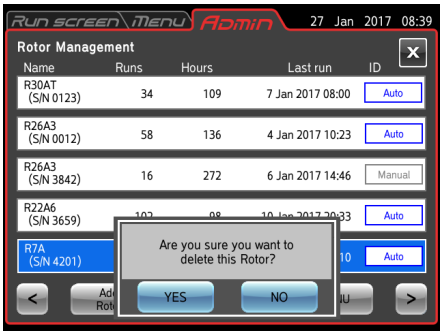
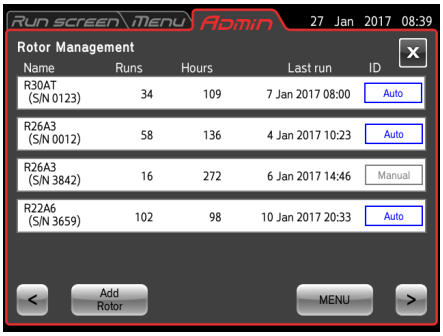
2) Procedure for registering a rotor that has been used before

The following example shows how to register a rotor that has been used in another centrifuge. In the registration process, the run history so far (total run time and number of runs) must be registered. If, after registration in this centrifuge, the rotor is used in another centrifuge, then before the rotor can be used in this centrifuge again, the run results from the other centrifuge must be added to enable correct management of the run time and number of runs.

Step	Operation	Screen display and usage notes
1	Press the **[Rotor Management]** button, and select a rotor to register.	 ●The added rotor is displayed in the Rotor Management screen. **[MENU]** button
2	Check that the field of the rotor registered in step 1 appears blue, and press the **[MENU]** button.	 ●The MENU box appears in the Rotor Management screen. MENU box

Step	Operation	Screen display and usage notes
3	Press the **[Edit Runs]** button in the MENU box.	 ●A screen for entering the number of runs appears.
4	Check the total number of runs the rotor was used in the other centrifuge, enter it, and press the **[Enter]** button. If usage data has already been stored, add the usage data for the other centrifuge. A value less than the currently registered number of times cannot be entered.	 ●This returns to the Rotor Management screen, and the entered number of runs appears in the Runs field indicating the total number of runs for the selected rotor. Entered total number of runs
5	Select the rotor that you want to register again, press the [MENU] button, and press the **[Edit Hours]** button in the MENU box.	 ●A screen for entering the total run time appears.
6	Check the total run time that the rotor was used in the other centrifuge, enter it, and press the **[Enter]** button. If usage data has already been stored, add the usage data for the other centrifuge. A value less than the currently registered time cannot be entered.	 ●This returns to the Rotor Management screen, and the entered time is displayed in the Hours field indicating the total run time for the selected rotor. Entered total run time
7	Press the Run screen tab to return to the Run screen.	○ The Run screen appears again.

3) Procedure for deleting a registered rotor

Step	Operation	Screen display and usage notes
1	Press the **[Rotor Management]** button, select the rotor to delete, and press the **[MENU]** button.	 ●The MENU box appears in the Rotor Management screen. **[MENU]** button
2	Press the **[Delete Rotor]** button in the MENU box.	 ●A delete confirmation message appears.
3	Press the **[YES]** button in the dialog box for confirming the deletion.	 ●The selected rotor is deleted from the Rotor Management screen.
4	Press the Run screen tab to return to the Run screen.	○ The Run screen appears again.

(4) Actual Run Timer



This enables selection of the timing when the run time count is started.

① **[Enable]** button: The run time is counted from when the set speed is reached.

② **[Disable]** button: The run time is counted from immediately after the **[START]** button is pressed.

The setting is saved by pressing the **[×]** button or ADMIN tab.

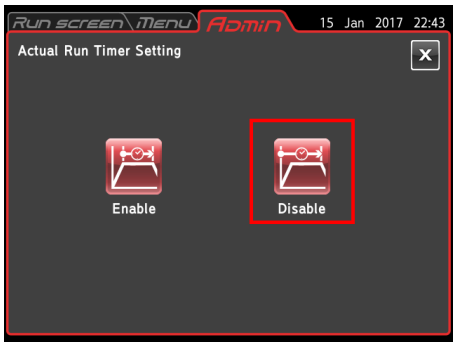


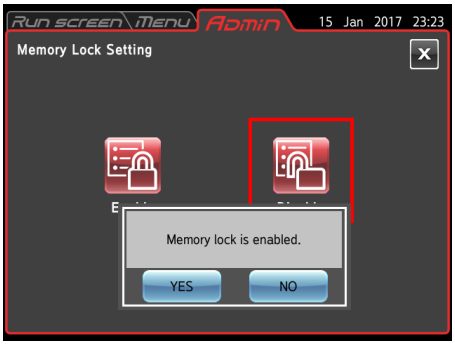
Fig. 2-5-6 (4)
Actual Run Timer Setting screen

(5) Memory Lock



When this function is enabled, a lock can be applied to prevent users from changing or deleting memory data (run parameters) settings during programmed operation.

1) Memory lock setting procedure

Step	Operation	Screen display and usage notes
1	Press the **[Memory Lock]** button. 	 ●The Memory Lock Setting screen ○ The selected button is shown inside a red frame. (Disable is selected in this example.)
2	Press the **[Enable]** button. (Press the **[Disable]** button.)	 ●A message for confirming the memory lock enable operation ○ In the same way, when you change from enable to disable memory lock, a dialog box for confirming the memory lock disable operation appears.
3	Press the **[YES]** button.	 ●The setting changes. ○ The button selected in step 2 is shown inside a red frame. (In this case, the Enable setting has been selected.) ○ To return to the ADMIN screen, press the ADMIN tab or the **[×]** button.

2) Program screen when memory lock is enabled

When memory lock is enabled, memory data (run parameters) cannot be changed or deleted. For this reason, the MENU box in the program screen changes so that only the Refer and Load memory functions are available as shown in Figure 2-5-6 (5c).
When memory lock is disabled, the MENU box appears as shown in Figure 2-5-6 (5b), where the Edit, Delete, and Load memory functions are available.

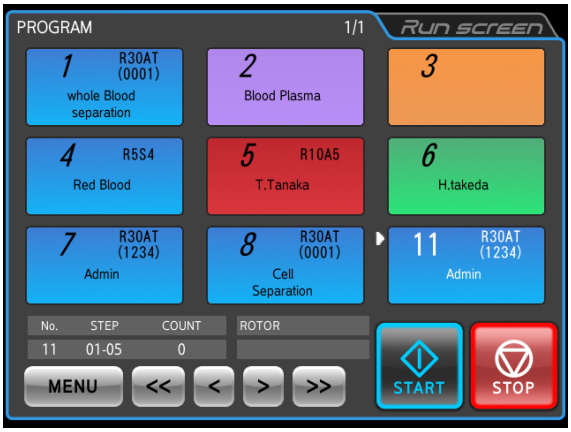


Figure 2-5-6 (5a) Program screen

Press the **[MENU]** button.

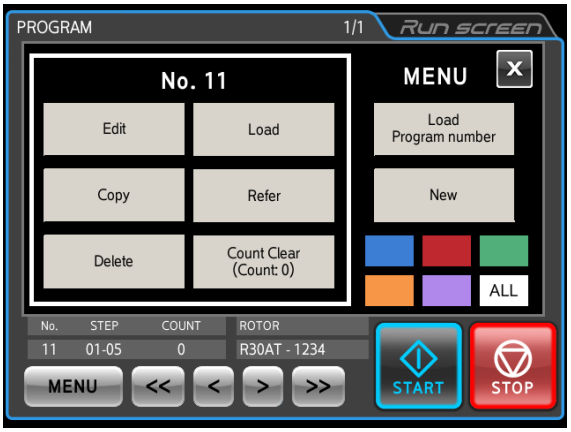


Figure 2-5-6 (5b)
Program MENU box screen
(When memory lock is disabled)

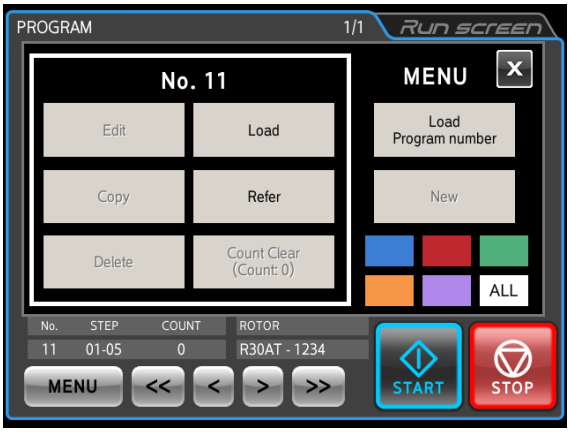


Figure 2-5-6 (5c)
Program MENU box screen
(When memory lock is enabled)

(6) Door Open Passcode



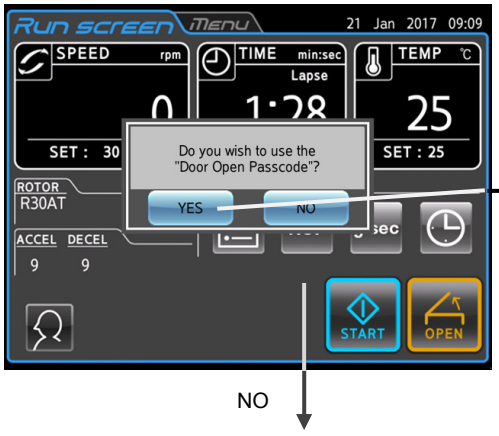
The Door Open Passcode is a function that controls opening of the door by requiring entry of a passcode whenever a user tries to open the door using the **[OPEN]** button on the Run screen.
The passcode can be set only when a rotor is mounted in the centrifuge.
This screen enables selection of whether this function will be used to apply this control when opening the door.

Step	Operation	Screen display and usage notes
1	Press the **[Door Open Passcode]** button on the ADMIN screen. 	 ●The Door Open Passcode screen appears. Select **[Enable]** or **[Disable]**. • Enable: A passcode must be entered when opening the door. • Disable: This is the normal door opening operation.

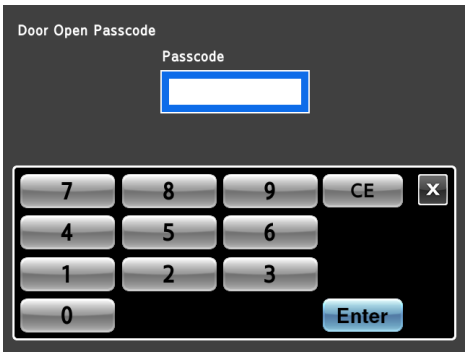
Procedure for setting the passcode and opening the door when Door Open Passcode is enabled

① Passcode setting procedure

When a rotor is mounted in the centrifuge and the door is closed, the screen shown below appears.



YES



• Enter a 4-digit passcode, and press the **[Enter]** button.
(The passcode is cleared.)

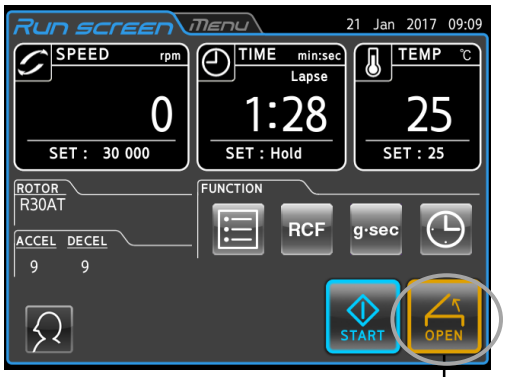
NO

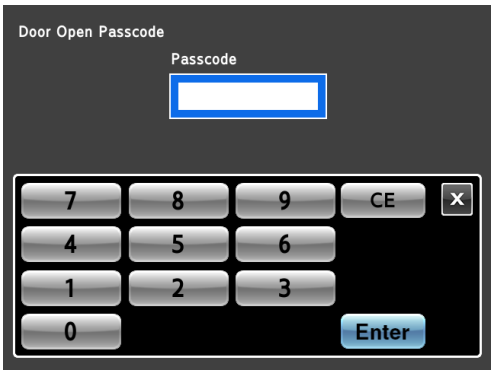
If **[NO]** is selected, the Door Open Passcode function is disabled.

This completes the setting procedure.

② Door opening procedure

The screen for entering the passcode appears when the **[OPEN]** button in the Run screen is pressed.





- Enter the 4-digit passcode, and press the **[Enter]** button.

- If the passcode was correct, the door is unlocked and opens.
  (The passcode is reset.)
  The screen returns to the Run screen.

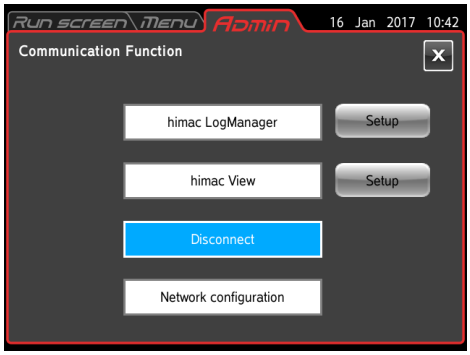
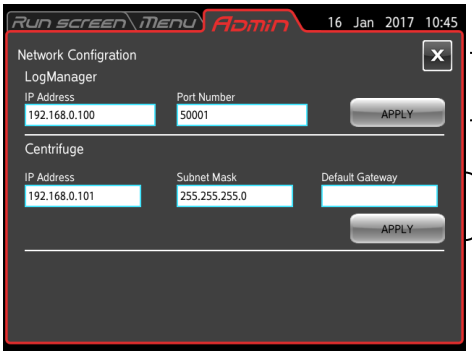
(7) Communication Function



This sets the function for communication over a LAN connection. Either himac LogManager or himac View can be selected.

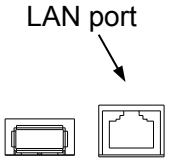
- himac LogManager is a software program that enables monitoring, recording of operation results, and management of up to 16 centrifuge units from a single computer.
- himac View is a software program that enables monitoring of a centrifuge unit from a mobile terminal (iPhone or Android terminal). Operation can also be started and stopped by remote control.
- The network settings for the himac LogManager and himac View are described in their respective instruction manuals.

■ Network settings (settings at centrifuge side)
If using himac LogManager or himac View for the first time, set the IP address and other network parameters using the procedure below.

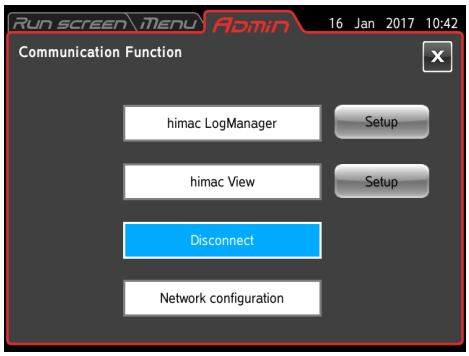
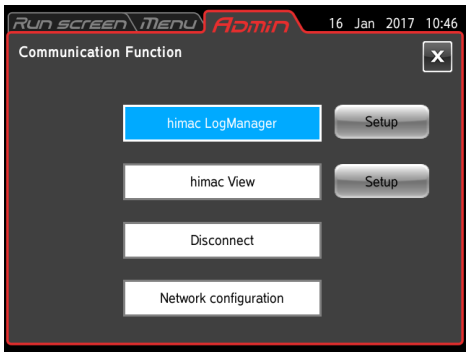
Step	Operation	Screen display and usage notes
1	Press the **[Communication Function]** button. 	
2	Press the **[Network Configuration]** button.	 ① IP address of PC where LogManager is installed ② IP address of centrifuge Pressing the field for the IP address and other parameters opens a setting screen.
	When using LogManager: I. Set the IP address in the field at ①. (The port number is set to 50001.) II. Press the [APPLY] button at ①. III. Set the IP address and subnet mask in the fields at ②. (If necessary, the default gateway can also be set.) IV. Press the [APPLY] button at ②. **When using himac View:** I. Set the IP address and subnet mask in the fields at ②. (If necessary, the default gateway can also be set.) II. Press the [APPLY] button at ②.	

NOTE

1) The LAN port is located in the external connections on the left side of the machine (refer to Section 1-1 "External View").

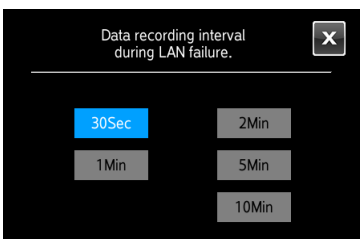


■ himac LogManager settings

Step	Operation	Screen display and usage notes
1	Press the **[Communication Function]** button. 	 ● The Communication Function setting screen appears, and the currently-selected parameters are displayed. The figure at the left shows the state when the Communication Function is not selected.
2	Press the **[himac LogManager]** button.	 ● himac LogManager has been selected. Communication with himac LogManager is started.

A function is available for temporarily storing operation data in the centrifuge unit when data cannot be sent to the himac LogManager due to an error in the LAN connection or other cause, and then automatically resending the data when the LAN connection is restored. Because the memory capacity of the centrifuge unit is limited, the storage interval can be selected, and the time that the data can be temporarily stored can be adjusted.

Pressing the **[Setup]** button next to the **[himac LogManager]** button opens the screen shown in the figure below.
The data storage interval can be selected from 30 seconds, 1 minute, 2 minutes, 5 minutes, and 10 minutes. (The default setting is 30 seconds.)



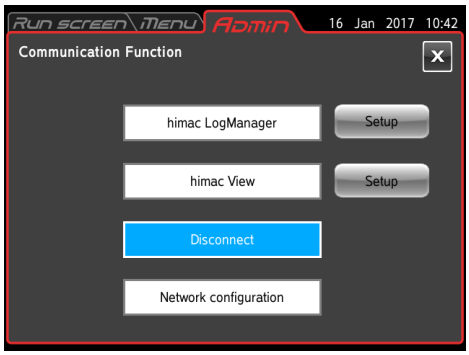
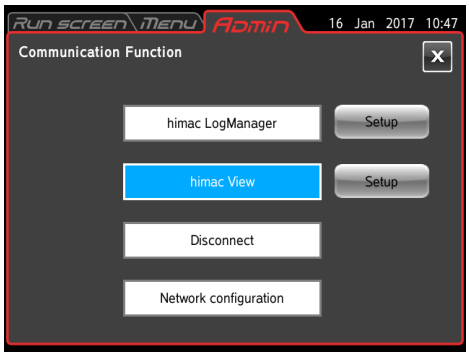
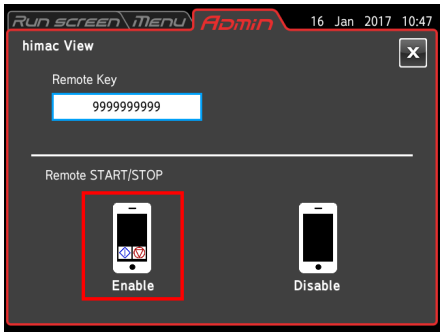
- To make no changes to the settings, press the **[×]** button.
- The maximum recording time to the centrifuge unit is about 500 times the recording interval that is set here.

• The LAN connection status of himac LogManager is indicated using one of the icons below on the right side of the MENU tab. (Some screens may not display a connection status icon.)


Connected normally.


Connection error. Check the LAN cable connection to the centrifuge unit, start the himac LogManager, and check the operation and settings of the network.

■ himac View settings

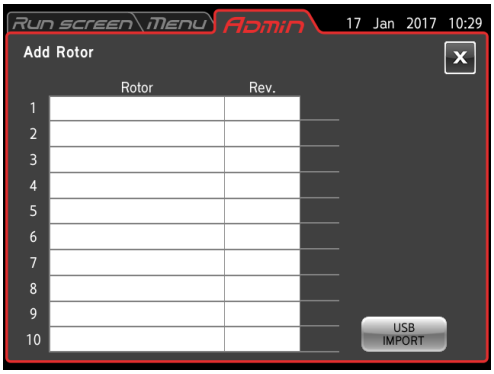
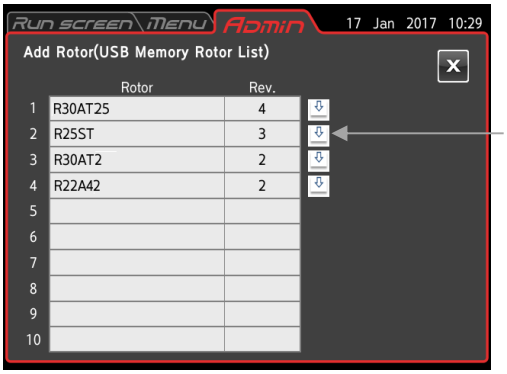
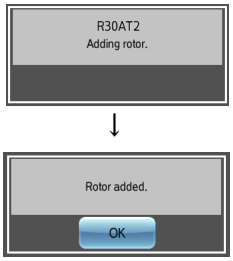
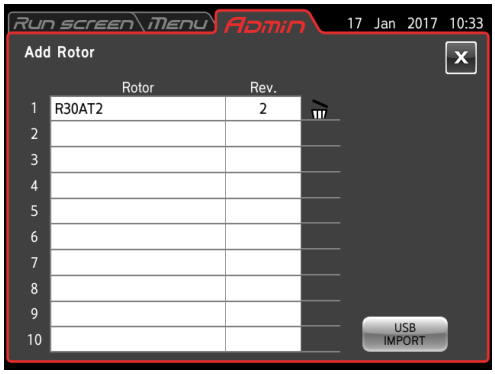
Step	Operation	Screen display and usage notes
1	Press the **[Communication Function]** button. 	 ● The Communication Function setting screen appears, and the currently-selected parameters are displayed. The figure at the left shows the state when the Communication Function is not selected.
2	Press the **[himac View]** button. Monitoring by mobile terminal Screen example 	 ● himac View has been selected. The operation status can be monitored if the centrifuge and mobile terminal are connected over a network. ● For details on the procedures for making the network settings for the centrifuge unit and the monitoring settings for the mobile terminal, see “Network Settings” and “Monitoring Settings” in the himac View instruction manual.
3	To perform remote control of the start and stop operation of the centrifuge from the mobile terminal, select Enable for **[Remote START/STOP]**.	 ● Enter the authentication code of himac View to enable receiving of START and STOP commands. For details on the procedure for checking the authentication code, see “Remote Control” in the himac View instruction manual.

(8) Add Rotor

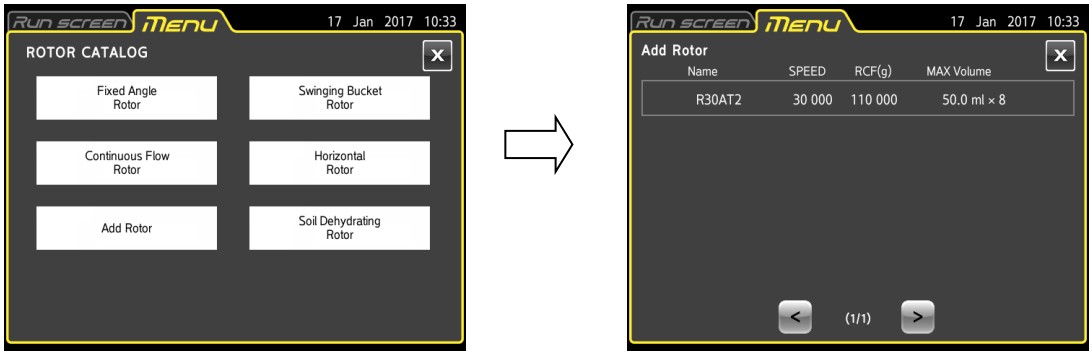


- The Add Rotor option on the Rotor Catalog screen can be used to register up to 10 available rotors in the centrifuge.
- When rotors are added, rotor data provided by the authorized service representative is used by inserting a USB memory stick. For details, please contact the authorized service representative.

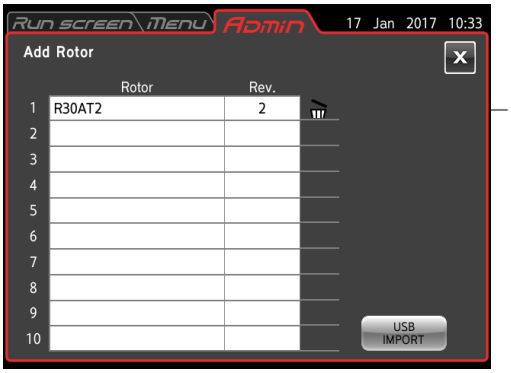
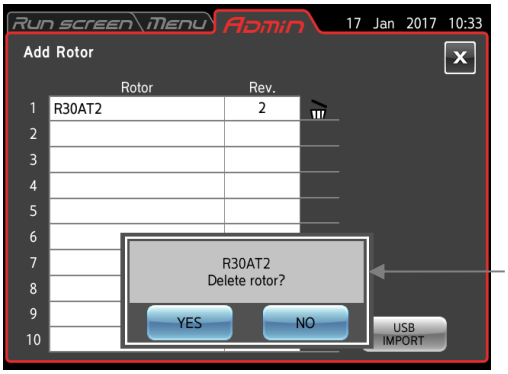
1) Add Rotor registration procedure

Step	Operation	Screen display and usage notes
1	Press the **[Add Rotor]** button. 	 • The Add Rotor screen appears. A list of the added rotors appears. The figure at left shows the case when there are no rotors that can be added.
2	Mount a USB memory stick containing rotor data into the USB port of the centrifuge unit. Press the **[USB EXPORT]** button.	• The rotor data is loaded from the USB memory stick, and a list of the rotors stored in the USB memory stick is displayed.  Download Rotor Data icon
3	Touch the “Download Rotor Data” icon for the rotor to be added. The message shown in the figure below is displayed.  Press the **[OK]** button.	• A list of the added rotors appears. 

● The added rotors are registered in the Rotor Catalog screen. Selecting the **[Add Rotor]** button in the Rotor Catalog screen enables viewing of the data for added rotors.



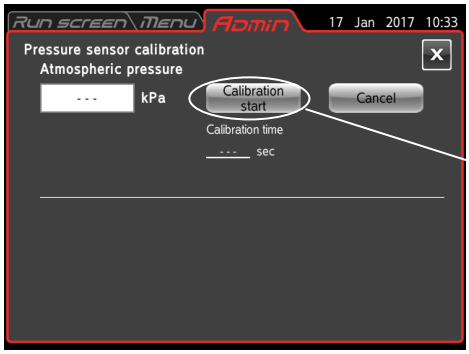
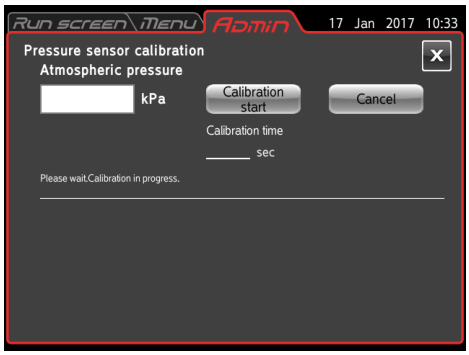
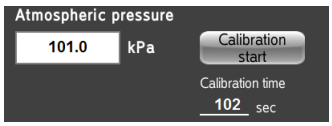
2) Procedure for deleting added rotors

Step	Operation	Screen display and usage notes
1	Press the **[Add Rotor]** button. 	• A list of the added rotors appears.  Delete Rotor Data icon
2	Select the “Delete” icon for the rotor to be deleted.	 Press the **[YES]** button to delete the added rotor.

(9) Pressure Sensor Calibration



This is used to calibrate the sensor for measuring the pressure in the rotor chamber. This enables measurement of the proper pressure at the location (altitude) where the centrifuge was installed.

Step	Operation	Screen display and usage notes
1	Turn on the centrifuge power. Wait for one minute.	If the door is open, close it. If the door is already closed, open it and then close it again. (The door can be opened using the **[OPEN]** button on the Run screen.)
2	Press the **[Pressure sensor calibration]** button on the ADMIN screen. 	 **[Calibration start]** button
3	Press the **[Calibration start]** button.	 ●The vacuum pump is activated, and calibration of the pressure sensor is started. After about two minutes, the vacuum pump is stopped, and calibration is complete. After calibration is completed, the measured atmospheric pressure value and calibration time are displayed on the screen. 

(10) Temperature Calibration



Temperature calibration is performed to increase the accuracy of temperature control.

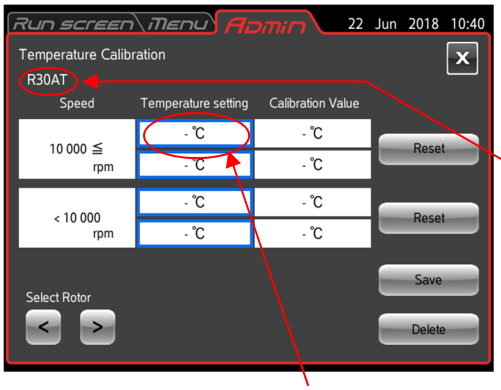
The temperature calibration is performed for each rotor, and calibration can be stored for 10 rotors.

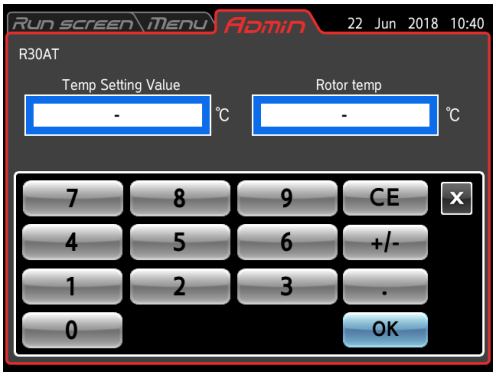
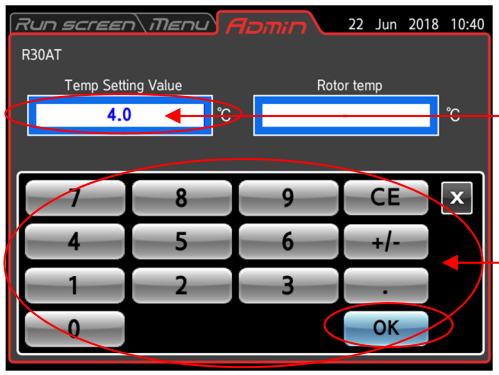
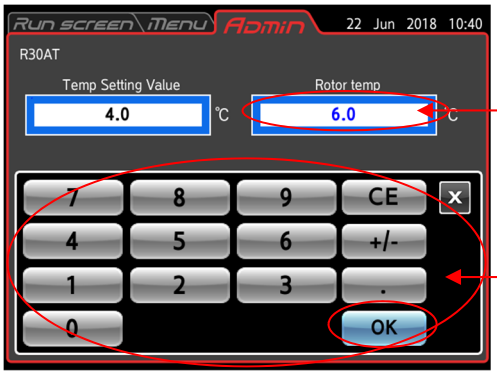
This describes the case when there is only one temperature setting value to be calibrated.
(The procedure for calibrating two points, such as 4°C and 10°C, will be described later.)
For example, if the R30AT rotor operates at 10,000 rpm and 4.0°C setting, when the sample temperature reaches 6.0°C, the temperature can be brought closer to 4°C using the following calibration.

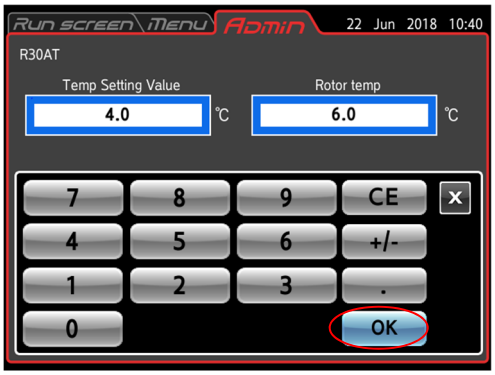
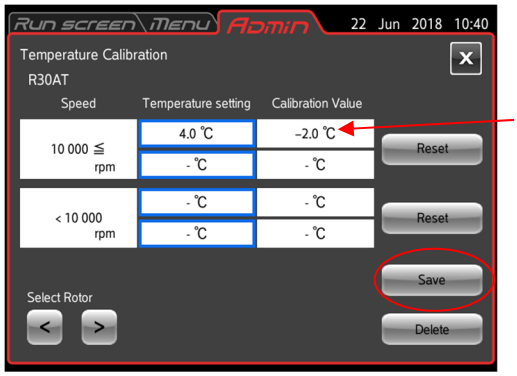
NOTE

For the sample temperature input in the temperature calibration, enter the sample temperature when operated under the usage conditions, including the rotor temperature before operation, operation time, and other factors. If calibration is performed using conditions where the rotor temperature before operation or operation time is different, the sample temperature may deviate from the setting even if temperature calibration is performed.

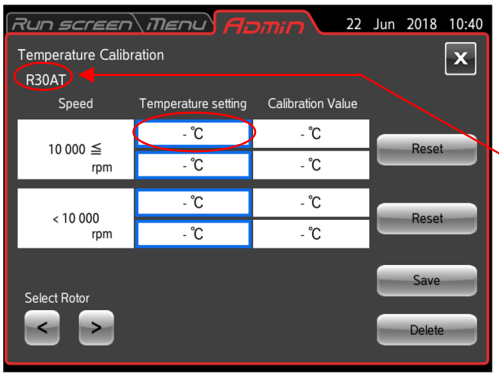
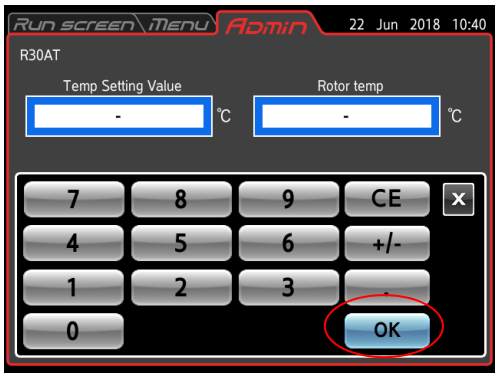
Also, if any moisture remains inside the chamber, the sample temperature may not become constant in certain cases. If temperature calibration is performed under this type of sample temperature, the temperature could deviate from the setting when operation is performed in the proper state. For this reason, be sure to completely wipe off any condensation inside the chamber (bowl surface, door rear, door packing, rubber cover) so that it is dry. Also, if any frost has formed inside the chamber, run a separate rotor at the 40°C setting to heat up until the temperature indicator shows 24°C or higher to completely defrost, and then wipe off the moisture before operation.

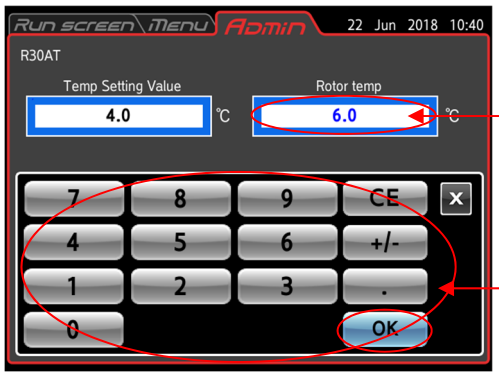
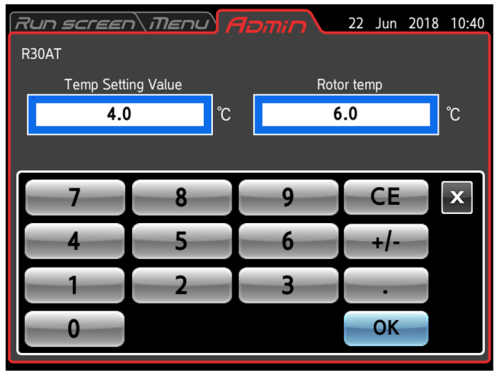
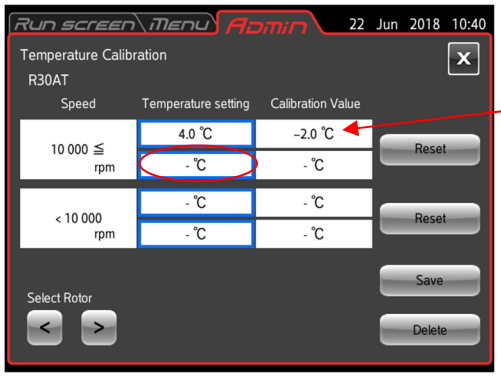
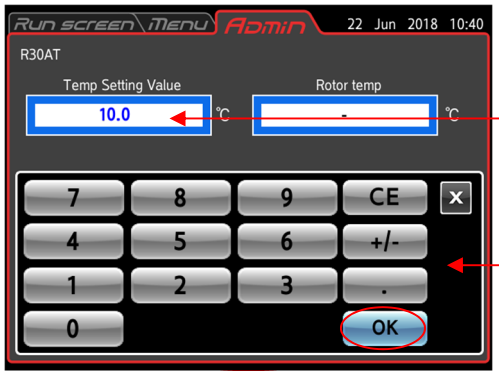
Step	Operation	Screen display and usage notes
1	Mount the rotor to be adjusted into the centrifuge, and press the **[Temperature Calibration]** button on the ADMIN screen. 	 ●This opens the Temperature Calibration screen. Calibration target rotor Press the Temperature Setting cell (upper row) to the right of the Speed cell “10000≦”. If the usage speed will be less than 10,000 rpm, press the Temperature Setting cell (upper row) to the right of “<10000”. Note: The displayed information in the Speed cell varies depending on the target rotor.

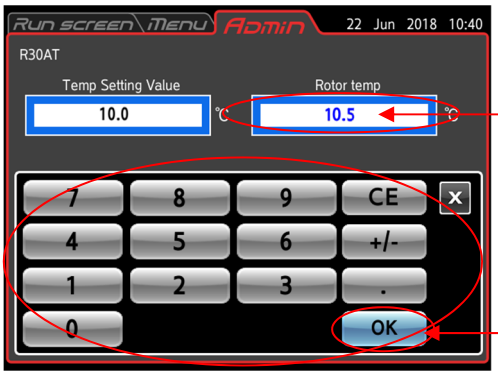
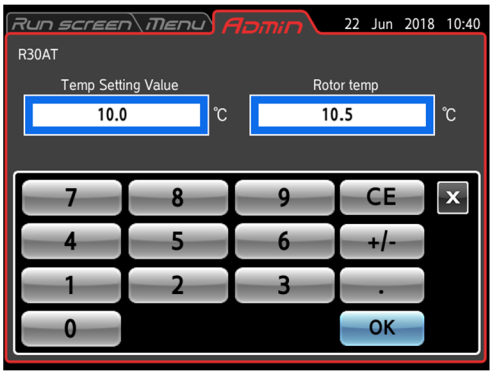
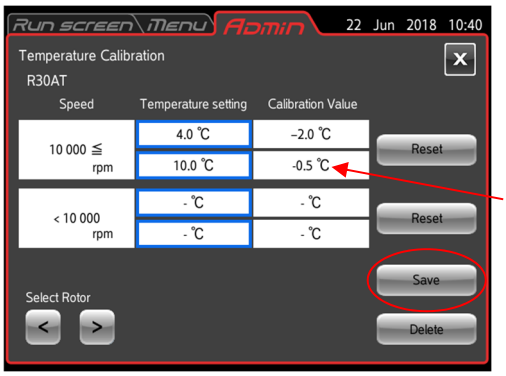
Step	Operation	Screen display and usage notes
2	Pressing the Temperature Setting cell opens a temperature input screen.	
3	Press the temperature setting input section, use the numeric keys to enter a temperature setting of 4.0°C, and press the **[OK]** button.	
4	Press the rotor temperature input section, use the numeric keys to enter a rotor temperature (sample temperature after operation) of 6.0°C, and press the **[OK]** button.	

Step	Operation	Screen display and usage notes
5	Press the **[OK]** button.	
6	Press the **[Save]** button to save the calibration for the R30AT rotor.	 The difference between the temperature setting of 4.0°C and rotor temperature of 6.0°C is displayed. This calibration temperature is applied in all cases even when the temperature setting value is not 4°C.

Next, this describes the case when there are two temperature setting values to be calibrated.
For example, if the R30AT rotor operates at 10,000 rpm and 4.0°C setting, and the sample temperature reaches 10.5°C at operation under the 6.0°C and 10.0°C settings, the following calibration is performed.

Step	Operation	Screen display and usage notes
1	Mount the rotor to be adjusted into the centrifuge, and press the **[Temperature Calibration]** button on the ADMIN screen. 	 ●This opens the Temperature Calibration screen. Calibration target rotor Press the Temperature Setting cell (upper row) to the right of the Speed cell “10000≦”. If the usage speed will be less than 10,000 rpm, press the Temperature Setting cell (upper row) to the right of “<10000”. Note: The displayed information in the Speed cell varies depending on the target rotor.
2	Pressing the Temperature Setting cell opens a temperature input screen.	
3	Press the temperature setting input section, use the on-screen keypad (numeric keypad) to enter a temperature setting of 4.0°C, and press the **[OK]** button.	 Temperature setting input section On-screen keypad (numeric keypad)

Step	Operation	Screen display and usage notes
4	Press the rotor temperature input section, use the on-screen keypad (numeric keypad) to enter a rotor temperature (sample temperature after operation) of 6.0°C, and press the **[OK]** button.	
5	Press the **[OK]** button.	
6	Press the Temperature Setting cell (lower row) to the right of the speed “10000≦”. If the usage speed will be less than 10,000 rpm, press the Temperature Setting cell (upper row) to the right of “<10000”.	
7	Press the temperature setting input section, use the on-screen keypad (numeric keypad) to enter a temperature setting of 10.0°C, and press the **[OK]** button.	

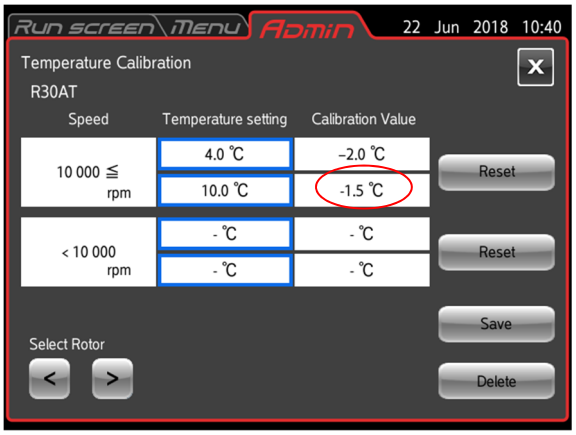
Step	Operation	Screen display and usage notes
8	Press the rotor temperature input section, use the on-screen keypad (numeric keypad) to enter a rotor temperature (sample temperature after operation) of 10.5°C, and press the **[OK]** button.	
9	Press the **[OK]** button.	
10	Press the **[Save]** button to save the calibration for the R30AT rotor.	 The calibration applies -2.0°C to a temperature of 4.0°C or less and -0.5°C to a temperature of 10°C or more. Temperatures between 4.0°C and 10°C are calculated by linear interpolation.

NOTE

If performing a new temperature calibration based on the sample temperature after operation using the saved temperature calibration, simply enter the actual sample temperature into the rotor temperature input section.

The calibration temperature in this case will be a value where the new temperature difference is added to the previously-saved calibration temperature.

The figure below shows an example of a new calibration when the calibration temperature of the R30AT rotor is -2°C (sample is 6°C at 4°C setting) and is saved, and then a sample where operation was performed at the 10°C setting becomes 9.5°C.
The calibration temperature of -2°C that was saved is also used for the 10°C setting. The new calibration temperature is -1.5°C, which is the result of adding the difference 0.5°C between the temperature setting and rotor temperature after operation at the 10°C setting in this state.



2-6 Emergency Recovery from Power Failure

⚠**DANGER:** To prevent the risk of electrical shock when removing the cover, do not just turn off the POWER switch on the centrifuge. Be sure to also turn off the main power supply, and wait at least three minutes before removing the cover.

⚠**WARNING**: ① Do not open the door while the rotor is spinning.
② Do not touch the rotor while it is spinning.

⚠**CAUTION**: Do not perform any actions or operations not contained in this instruction manual. If any problem occurs with the centrifuge, contact the vendor where you made the purchase or the authorized service representative.

(1) Rotor spinning
Although the rotor stops due to natural deceleration, when the power is restored, it automatically accelerates again back up to the original speed setting before the power outage if it had not dropped to a speed of 250 rpm or less. If the speed dropped to 250 rpm or less, the rotor decelerates and comes to a stop even if the power is restored.

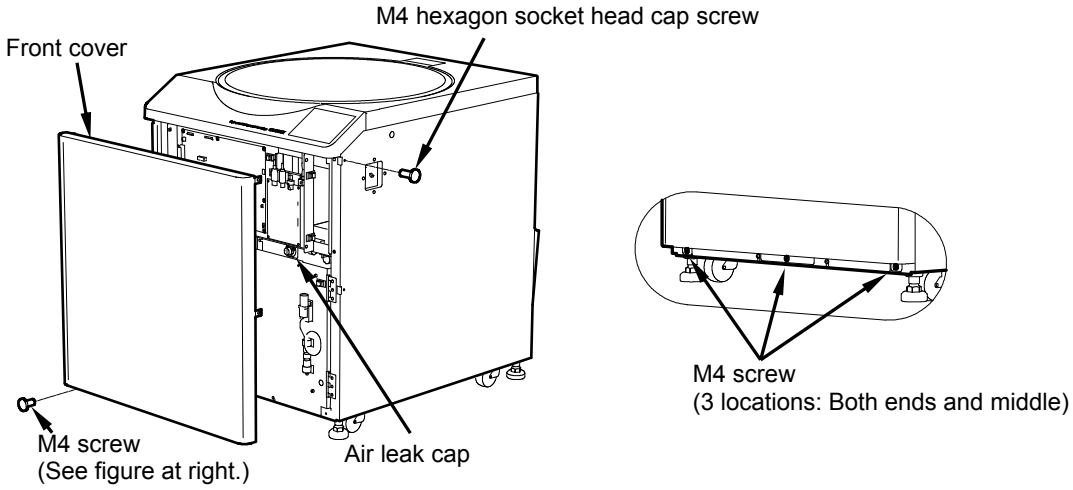
(2) Display information on control panel
No information is displayed during a power outage, but when the power is restored, control is restarted at the setting values before the power outage occurred. (The setting values are backed up by a battery.)
Also, an alarm is displayed to indicate that a power outage occurred.

(3) To remove the rotor during a power outage
If the power outage will last for an extended period of time, use the procedure below to open the door and remove the rotor.

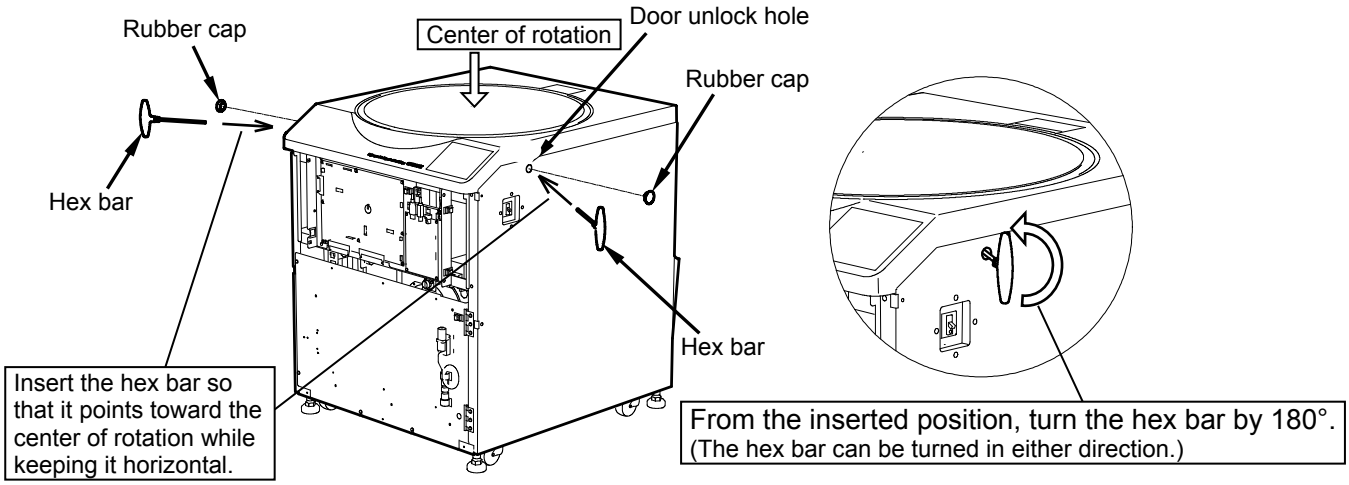
⚠**WARNING**: Before performing this procedure, listen carefully for any sounds from the rotor chamber to check that the rotor is not spinning.
Never forcefully unlock the door while the rotor is spinning.
The inside of the rotor chamber may be a vacuum state for certain rotors, and because there is no air resistance, it can take 10 hours or longer before it comes to a stop. Make sure that you wait long enough before opening the door.

⚠**CAUTION**: Even if a power outage has occurred, be sure to always set the power switch to OFF when performing this operation.

① Check that the rotor has stopped.
② Set the POWER switch on the centrifuge unit and the power circuit breaker in the room to OFF.
③ Use the supplied hex key to remove the M4 hexagon socket head cap screws (4 locations) from both sides of the centrifuge, and then remove the M4 screws (3 locations, see the figure at bottom right) from the bottom section, and take off the front cover.
④ Remove the air leak cap (turn counterclockwise), and insert air to the rotor chamber.



⑤ Remove the right and left rubber caps on the centrifuge unit, and insert the supplied hex bar into the door unlock hole so that it points towards the rotor's center of rotation. (Estimated insertion depth for right side: 8 cm, left side: 12 cm)
After insertion, turn the hex bar by 180°. (Perform once each for the right and left sides.)



⑥ Gently open the door.
After the door is opened, check that the rotor is not spinning.
⑦ Remount the air leak cap and front cover in their original positions.

⚠**WARNING:** If the rotor is spinning when the door is opened, immediately close and lock the door.

⚠**WARNING:** Do not touch the rotor while it is spinning.

MEMO

3. Maintenance

Be sure to read the following safety information before maintenance.

⚠ **DANGER:** To prevent electrical shock accidents, follow the guidelines below whenever servicing the centrifuge.

1) Always turn off the POWER switch and turn off the distribution board of your centrifuge room if your centrifuge is equipped with a three-wire power cord. Then, wait at least three minutes before removing any covers from the centrifuge.
2) Always turn off the POWER switch and unplug the power cord from the outlet if your centrifuge is equipped with a power cord with a plug. Then, wait at least three minutes before removing any covers from the centrifuge.

⚠ **WARNING:** 1. If the centrifuge, rotor, or an accessory is contaminated by toxic or radioactive samples or pathogenic or infectious blood samples, be sure to decontaminate the component based on good laboratory procedures and methods.

2. If the centrifuge, rotor, or an accessory may be contaminated by samples that could impair human health (such as toxic or radioactive samples or pathogenic or infectious blood samples), it is your responsibility to sterilize and/or decontaminate the centrifuge, rotor, or the accessory properly before requesting repairs from an authorized sales or service representative. Note that we cannot repair the centrifuge, rotor, or accessory unless sterilization or decontamination is completed.

3. It is your responsibility to sterilize and/or decontaminate the centrifuge, rotor, or parts properly before returning them to an authorized sales or service representative. In this case, make a copy of the Decontamination Sheet at the end of this manual, fill out the copied sheet, and attach it to the item to be returned. We may contact you about the treatment for the centrifuge, rotor, or the part if the decontamination is checked and judged as inadequate by us. You are responsible for all costs relating sterilization or decontamination.
Note that we cannot repair or inspect the centrifuge, rotor, or accessory unless sterilization or decontamination is completed.

⚠ **CAUTION:** Perform only the operations specified in this manual. If any problem is found with your centrifuge, please contact an authorized sales or service representative.

This centrifuge does not require complicated maintenance and inspection. Be sure to follow the instructions below to ensure long and safe use of this centrifuge without problems.

⚠ **CAUTION:** Use of cleaning or sterilization methods other than those recommended in this instruction manual may cause corrosion or deterioration of this centrifuge. Refer to the "Chemical Resistance Chart" attached to the rotor, or contact an authorized sales or service representative.

⚠ **CAUTION:** To sterilize the surface of the centrifuge and rotor chamber, wipe with a cloth dampened with 70% ethanol. Using a different method might cause corrosion or deterioration of the centrifuge. Refer to the "Chemical Resistance Chart" provided with the rotor, or contact an authorized sales or service representative.
While we recommend that 70% ethanol be used for sterilization, no guarantee of sterility or disinfection is expressed or implied. When sterilization or disinfection is a concern, consult your laboratory safety officer regarding the proper methods to use.

⚠ **CAUTION**: Before cleaning or sterilizing the centrifuge, perform the following procedure.
1) Always turn off the POWER switch and turn off the distribution board of your centrifuge room if your centrifuge is equipped with a three-wire power cord.
2) Always turn off the POWER switch and unplug the power cord from the outlet if your centrifuge is equipped with a power cord with a plug.

For information on maintenance for the rotors and tubes, see the rotor instruction manual.

3-1 Rotor Chamber

⚠ **CAUTION:** Do not pour any liquids such as water, detergent, or disinfectant directly into the rotor chamber. Doing so could cause the bearings of the drive unit to become corroded or deteriorated.

To maintain the rotor chamber, follow the instructions below.
(1) When the centrifuge is not in use, keep the rotor chamber well-ventilated.
(2) If the bowl is moist, wipe it with a clean, dry cloth or sponge. If the bowl is coated with frost, operate the rotor at a high temperature setting to melt the frost before wiping off the moisture. For example, frost is removed by operating the R20A2 rotor at the 9000 rpm and 40°C setting for about 15 minutes.
(3) If the rotor chamber is dirty, wipe it with a clean cloth or sponge dampened with a diluted solution of mild, non-alkaline detergent.
(4) If the door packing is dusty or scratched, a high vacuum level will not be obtained. Always keep the door packing clean.

3-2 Drive Shaft (Crown)

⚠ **CAUTION:** Clean the inside of the drive hole (crown hole) of the rotor and the surface of the drive shaft (crown) of the centrifuge once a month. If the drive hole or the drive shaft is stained or foreign matter is adhering to it, the rotor may not be mounted properly and may become disengaged while spinning.

This part is extremely important because the rotor is mounted on it and the crown transmits driving force to the rotor. Before mounting a rotor, completely wipe the outer surface of the crown with a soft cloth dampened with water.

3-3 Cabinet

Always keep the top deck and the cabinet of the centrifuge clean to prevent dust and other materials from falling into the rotor chamber. Wipe the top deck and the cabinet with a cloth or sponge dampened with a diluted solution of neutral detergent. If any toxic, radioactive, or pathogenic solution was spilled inside or outside the centrifuge, take necessary action according to your proper laboratory procedures and methods.

3-4 Rotor

(1) To prevent corrosion, take out the rotor from the rotor chamber after operation and remove the rotor cover to enable the tube holes to dry.

(2) If any sample is spilled inside the rotor, completely wash and dry the rotor, and then apply a thin layer of silicone grease (vacuum grease) to the rotor.

(3) Regularly apply screw lubricant to the threading of the rotor cover knob.

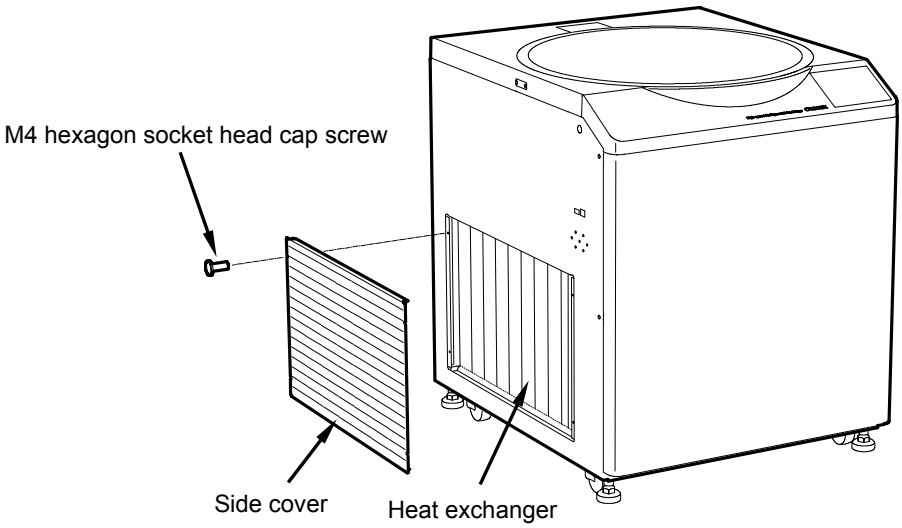
(4) The rotors used in this centrifuge have a limit on the number of runs (see Section 2-1-4, “Rotor Life”).

3-5 Refrigerating Machine Heat Exchanger

⚠ **CAUTION:** Cooling performance will be reduced if dust collects on the heat exchanger. Clean the heat exchanger about once every six months.

(1) Use the supplied hex key to to remove the M4 hexagon socket head cap screws holding the side cover on the left side of the centrifuge, and then remove the side cover.

(2) Use a vacuum cleaner or other device to suck up any dust and debris adhering to the heat exchanger.



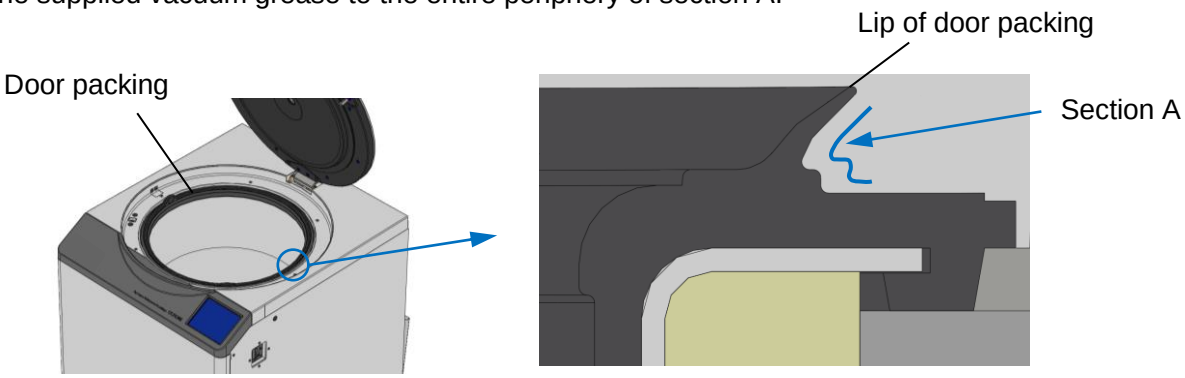
(3) After cleaning, restore to the original state.

⚠ **CAUTION:** Do not touch the heat exchanger with your bare hands. Your hands could get cut.

3-6 Door Packing

(1) Foreign objects adhering to the door packing can lead to vacuum problems. Clean on a regular basis.

(2) Vacuum grease is applied to the rear side of the lip of the door packing. About once a year, apply the supplied vacuum grease to the entire periphery of section A.



Cross-sectional view of door packing

4. Troubleshooting

Be sure to read the following safety information before troubleshooting.

⚠ **DANGER**: To prevent electrical shock accidents, follow the guidelines below whenever servicing the centrifuge.

1) Always turn off the POWER switch and turn off the distribution board of your centrifuge room if your centrifuge is equipped with a three-wire power cord. Then, wait at least three minutes before removing any covers from the centrifuge.
2) Always turn off the POWER switch and unplug the power cord from the outlet if your centrifuge is equipped with a power cord with a plug. Then, wait at least three minutes before removing any covers from the centrifuge.

⚠ **WARNING**: 1. If the centrifuge, rotor, or an accessory is contaminated by toxic or radioactive samples or pathogenic or infectious blood samples, be sure to decontaminate the part based on good laboratory procedures and methods.

2. If the centrifuge, rotor, or an accessory may be contaminated by samples that could impair human health (such as toxic or radioactive samples or pathogenic or infectious blood samples), it is your responsibility to sterilize and/or decontaminate the centrifuge, rotor, or the accessory properly before requesting repairs from an authorized sales or service representative. Note that we cannot repair the centrifuge, rotor, or accessory unless sterilization or decontamination is completed.

3. It is your responsibility to sterilize and/or decontaminate the centrifuge, rotor, or parts properly before returning them to an authorized sales or service representative. In this case, make a copy of the Decontamination Sheet at the end of this manual, fill out the copied sheet, and attach it to the item to be returned.
   We may contact you about the treatment for the centrifuge, rotor, or the part if the decontamination is checked and judged as inadequate by us. You are responsible for all costs relating sterilization or decontamination.
   Note that we cannot repair or inspect the centrifuge, rotor, or accessory unless sterilization or decontamination is completed.

⚠ **CAUTION**: Perform only the operations specified in this manual. If any problem is found with your centrifuge, please contact an authorized sales or service representative.

This centrifuge incorporates a self-diagnostic function that diagnoses the cause of any problems that may occur when starting the centrifuge or during operation.

4-1 Alert Indicators

If any problem occurs, the centrifuge emits a buzzer sound and displays an alert message in the FUNCTION area of the Run screen to notify about the problem.

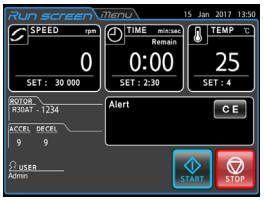


Fig. 4-1. Alert Display Screen

If an alert message appears, remove the cause of the problem as described below, and then press the **[CE]** button. You can then resume centrifugation.

⚠ **WARNING:** Performing any repairs, modification, or disassembly of the centrifuge that is not specifically listed below is strictly prohibited by any person except the authorized service representative.

If the alert message is still displayed even after you perform the corrective action specified below, contact the authorized service representative to order a repair.

Alert	Cause	Corrective action
POWER FAILURE	While the rotor was spinning, a power outage has caused the speed to drop more than 300 rpm below the set rotation speed. When power is restored, the rotor reaccelerates if the rotor rotation speed is more than 250 rpm and decelerates and comes to a stop if the rotor rotation speed is less than 250 rpm.	If the rotor is stopped, check the operation time, and perform operation again if necessary.
SET ROTOR COVER	The door was closed without mounting the rotor cover.	Mount the cover correctly before starting operation. Check that the rotor is mounted, and then perform operation again.
Rotor mounting error or no rotor	(1) The rotor is not correctly mounted on the crown. (2) A rotor not registered in the rotor catalog was mounted. (3) Operation was performed without mounting a rotor.	Remove the rotor and then load it again. If this message appears again, contact a service representative.
TEMP	The [TEMP] indicator has reached 50°C or higher, or the TEMP indicator differs from the set temperature by ±20°C.	Lower the room temperature if it exceeds 40°C.
CLOSE DOOR	The [START] button was pressed while the door was open.	Close the door before starting operation.
INVALID SPEED	The [START] button was pressed while a rotor rotation speed exceeding the allowable rotation speed or maximum centrifuge acceleration was set.	Check the rotation speed (or RCF) that was set, and set it to a value not exceeding the allowable speed before performing operation.

Alert	Cause	Corrective action
TEMP LEVEL	The sample temperature has exceeded the preset lower limit temperature difference or upper limit temperature difference.	Lower the room temperature if it exceeds 40°C.
IMBALANCE	The loaded sample is imbalanced.	Rebalance the sample, and perform operation.
ROOM TEMP	The room temperature exceeds 40°C.	Lower the room temperature to below 40°C.
ROTOR LIFE3	The rotor in use has exceeded the allowable run count.	Stop use of the rotor as quickly as possible, and replace with another one.
Pressure sensor	The pressure sensor was not calibrated after installation.	Perform the procedure in 2-5-6 (9) “Pressure sensor calibration”.
VACUUM	(1) Incomplete vacuum seal in door section (2) A large amount of moisture is adhering to the door or rotor chamber.	Start while holding down the door. If the lip of the door packing is collapsed after operation, apply vacuum grease to the lip. For details, see Section 3-6, “Door Packing”.
		Wipe off any moisture on the door or rotor chamber.
		If this message appears again even after taking the above corrective action, contact a service representative.
Moisture on door or rotor chamber	Moisture is adhering to the door or rotor chamber.	Wipe off any moisture on the door or rotor chamber.
		If this message appears again even after taking the above corrective action, contact a service representative.
E10 to E90	Maintenance alarm	Contact a service representative.

If an alert “E10” to “E90” occurs, maintenance by a service representative is required. Contact the vendor where you made the purchase or an authorized sales or service representative, and inform them of the alert code.

NOTE “E10” and “E13” are alerts indicating errors in the rotation detector.
When this alert occurs, for safety reasons, the rotor is stopped, and the [CE] button is disabled. Wait until the rotor has come to a stop, and then press the [CE] button.

4-2 Troubleshooting When No Alert Is Displayed

If the centrifuge is not operating properly even though no alert is displayed, troubleshoot using the following procedures.

Problem	Check points	Corrective action
Initial screen does not appear even though the POWER switch is set to “ON”.	Is the power supply circuit breaker in the room set to “OFF”?	If the power supply circuit breaker in the room is set to “OFF”, set it to “ON”, and then set the POWER switch to “ON” again.
The run parameters cannot be entered.	Did you enter the value, and press the [Enter] button?	After entering the value, press the [Enter] button.
The centrifuge does not start even after pressing the [START] button.	When the [START] button is pressed, the buzzer makes a short ringing sound.	Check and enter the correct run parameters. After entering the run parameters, close the door firmly again.
Unable to set or load a program.	Is the rotor currently spinning?	Set or load a program while the rotor is stopped. Programs cannot be set or called while the rotor is spinning.
The content of the loaded program was changed.	The backup battery of the program has run out of power.	Set the program again, and leave the POWER switch at ON for about 10 hours to charge the battery.
Rotor does not cool down.	Has the room temperature exceeded 30°C?	In rooms with cooling equipment, run the cooling equipment to lower the room temperature. In rooms without any cooling equipment, lower the rotation speed when using.
	Are there are refrigerators, power generators, or other sources of heat near the centrifuge?	Either move the sources of heat to another location, or contact the vendor where you made the purchase, and relocate the centrifuge to a location without any sources of heat.
Touchpanel screen is too dark or too bright	The screen backlight has not been adjusted.	Adjust by referring to Section 2-5-5 (4) “Backlight”.
The door does not open.	Has the area around the door packing become frozen?	Repeatedly press from above the door edge in multiple locations until the door opens automatically. After opening the door, remove any ice or other frozen objects in the door packing section.

5. Installation and Relocation

To install or relocate the centrifuge, contact the vendor where you made the purchase or an authorized sales or service representative. Be sure to follow the guidelines below when installing and relocating the centrifuge.

⚠ **DANGER:** To avoid electrical shock hazards, follow below when servicing the centrifuge.

1) Be sure to turn off the POWER switch and turn off the distribution board of your centrifuge room if your centrifuge is equipped with a three wire power cord or a four wire power cord. Then wait at least three minutes and then remove covers or tables from the centrifuge.
2) Be sure to turn off the POWER switch and unplug the power cord from the receptacle if your centrifuge is equipped with a power cord with a plug. Then wait at least three minutes and then remove covers or tables from the centrifuge.

(1) Electric power requirements

Your centrifuge can operate on the following power source:
Single phase, AC 200, 208, 220, 230 or 240 V+/-10%; 50/60 Hz; 30A
Three-phase four-wire, AC 220, 230, or 240 V+/-10%; 50/60 Hz; 16A.

1) When your centrifuge is equipped with a three-wire power cord or a four-wire power cord, install and identify an exclusive emergency switch (a circuit breaker whose breaking capacity is equal to the centrifuge rated current) to cut the power for centrifuge in the event of failure.
   It is recommended to install the switch at the outside of the centrifuge room or near the exit of the centrifuge room.
2) When your centrifuge is equipped with a power cord with a NEMA 6-30P plug to fit a NEMA 6-30R receptacle, do not place any objects which disturb to disconnect the power cord from the receptacle.
   If you do so, you cannot to disconnect the power cord from the receptacle in case of abnormality.

(2) Installation location

⚠ **WARNING:** To ensure safety, maintain a clearance envelope of 30 cm around the centrifuge where people cannot enter while it is operating. Also, never place dangerous substances capable of developing flammable or explosive vapors in this area.

① Select a flat floor surface made of concrete or stone for the installation location. Avoid installing on floor surfaces where vibrations from people walking could be transferred to the centrifuge and on soft floor surfaces such as carpet.

② The operating environment temperature is 2°C to 40°C. When the environment temperature exceeds 25°C, the rotor holding temperature becomes higher.
Also, avoid installing in locations exposed to direct sunlight.

③ Ensure that there is a clearance of at least 30 cm on all sides around the centrifuge unit at the installation location.
Also, never place objects within the 30-cm area around the centrifuge.

④ Install in a location where there are no objects blocking usage of the above-described emergency stop switch for the power supply unit.

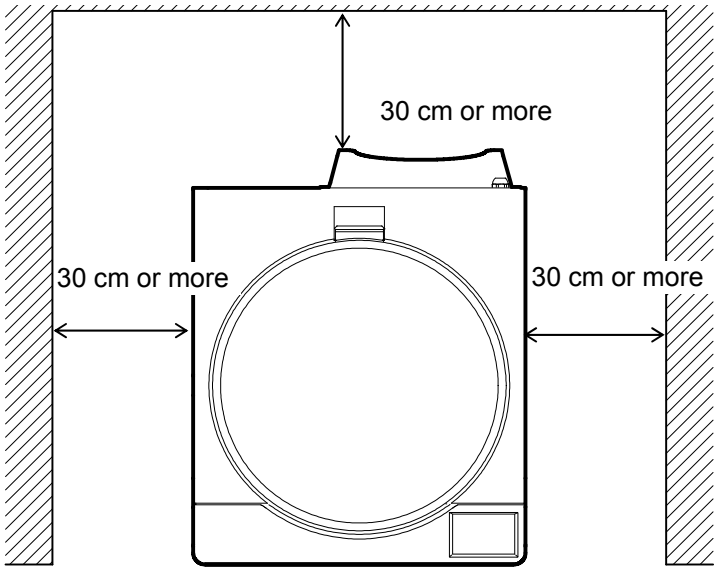
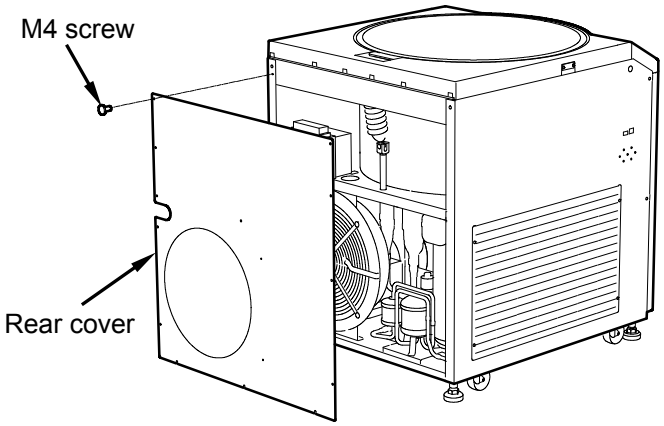


Fig. 5. Installation Location

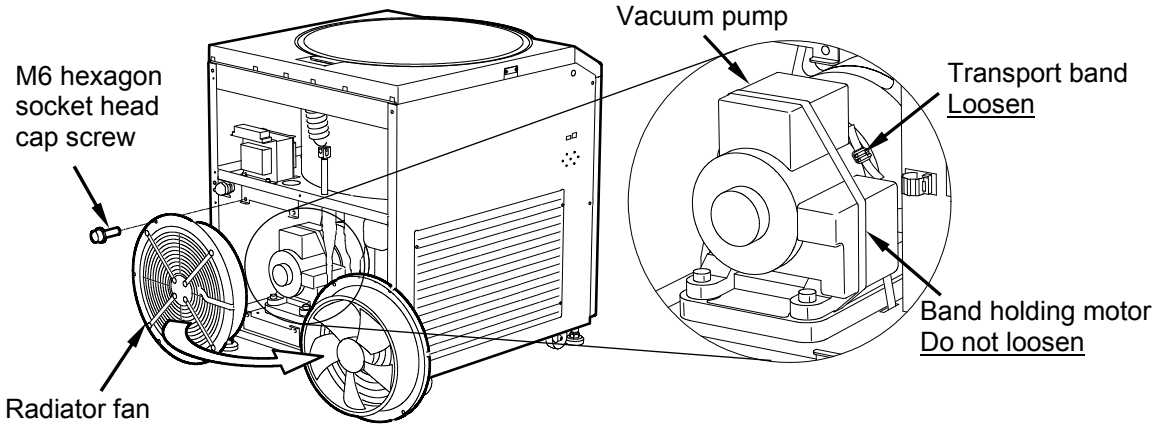
(3) Loosen the transport bands of the vacuum pump.

① Of the M4 screws (13 locations) holding the rear cover, loosen the three screws on the bottom section (loosen only, but do not remove). Next, remove the remaining 10 screws, and remove the rear cover.



② Remove the M6 hexagon socket head cap screws (4 locations) holding the radiator fan, and move the radiator fan to the side as shown in the figure below. (Do not remove the cable of the radiator fan.)

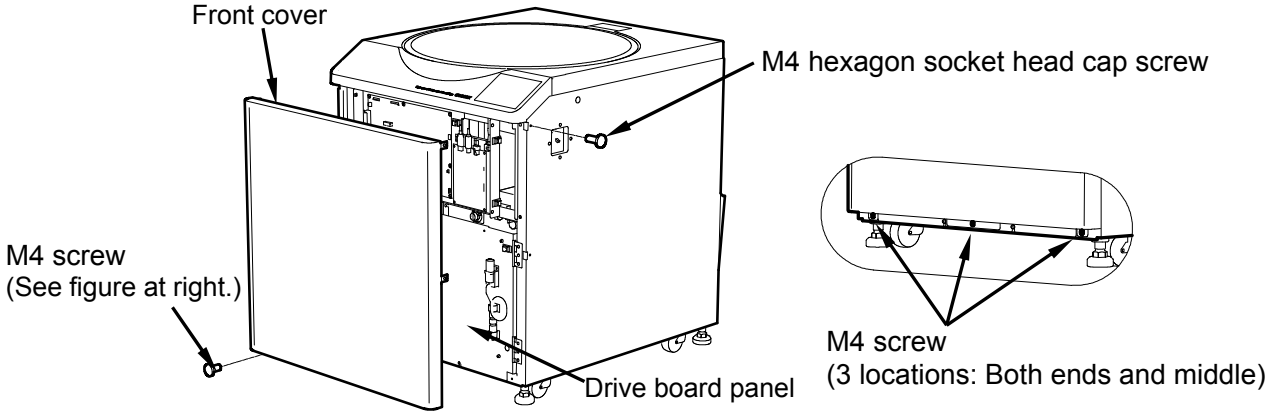
③ Loosen the transport bands holding the vacuum pump. When loosening, do not loosen the bands holding the motor in place shown in the figure below.



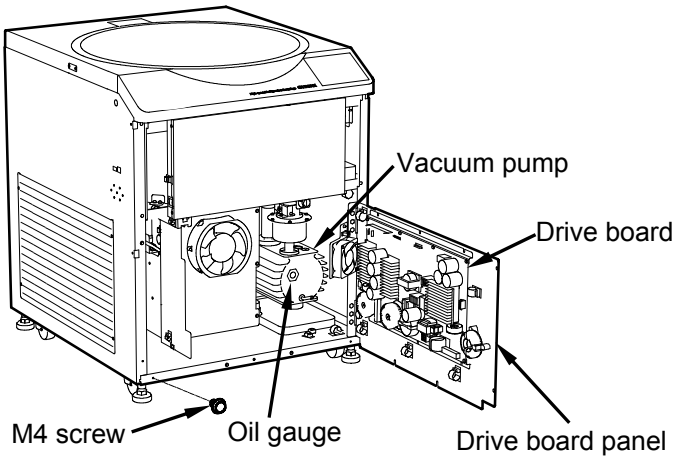
④ Perform the procedure in reverse to remount the radiator fan and rear cover.

(4) Check for oil leaks and the oil level in vacuum pump

① Remove the M4 hexagon socket head cap screws (4 locations) from both sides of the centrifuge, and then remove the M4 screws (3 locations, see the figure at bottom right) from the bottom section, and take off the front cover.



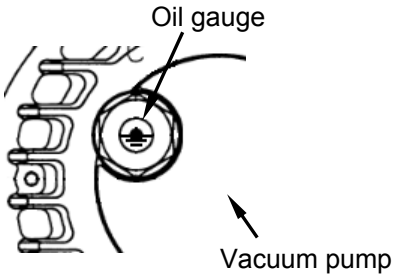
② Remove the M4 screws (4 locations) holding the drive board panel, and open the drive board panel as shown in the figure below.



⚠ **WARNING:** Be sure to always shut off the power supply before opening the drive board panel. When power is being supplied, power is flowing in certain parts of the drive board, which could result in an electrical shock.

③ Check that no oil is leaking from the oil gauge or drain tube. If any oil leak is found, contact an authorized sales or service representative.

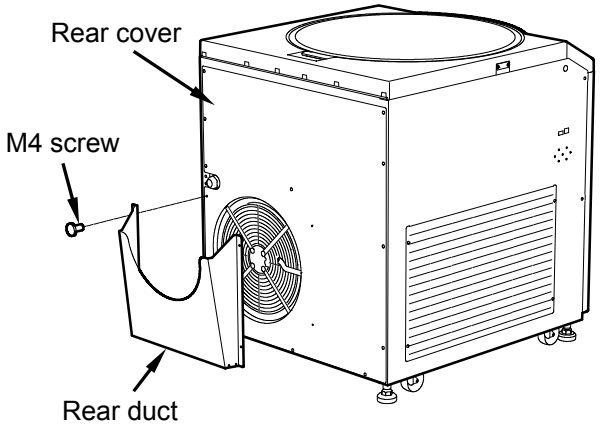
④ Check that the oil level is at the ● mark in the center of the oil gauge. If the oil level is low, add oil from the oil supply port.



⚠ **CAUTION:** The oil level varies slightly depending on the room temperature.
- Do not use any oils other than the specified oil. Specified oil: NEOVAC MR-100 (Matsumura Oil)

⑤ Perform the procedure in reverse to remount the drive board panel and front cover.

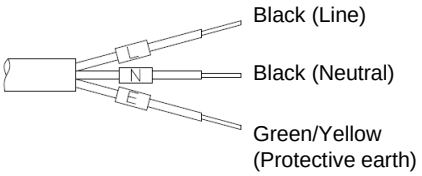
(5) Mounting the rear duct
Use the M4 screws (4 locations) attached to the rear cover to mount the supplied rear duct as shown in the figure at right.



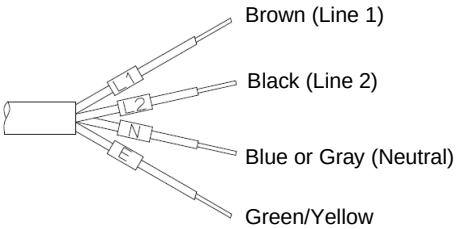
(6) Power cord

⚠ **WARNING:** To prevent the risk of electrical shock, always ground the centrifuge unit.
⚠ **WARNING:** To prevent the risk of electrical shock, never touch the power cord when your hands are wet.

1) When your centrifuge is equipped with a three wire power cord or a four wire cord (see below), plug the power cord coming from the rear of the centrifuge in the terminal of the distribution board in accordance with ANSI/NFPA 70, NEC, with CSA C22.1, CEC, Part Ⅰ or with both as appropriate. The green/yellow wire is a grounding wire. Your centrifuge must be grounded properly.



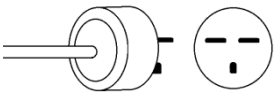
Single phase



Three-phase four-wire (star connection)

⚠ **DANGER:** For models with three-phase four-wire specifications, be careful that you never make the wrong connection for the neutral wire.
Doing so could result in an electrical shock or failure of the centrifuge.

2) When your centrifuge is equipped with a power cord with a NEMA 6-30P plug (see below) to fit a NEMA 6-30R receptacle, plug the power cord coming from the rear of the centrifuge into the receptacle. Your centrifuge must be grounded properly.

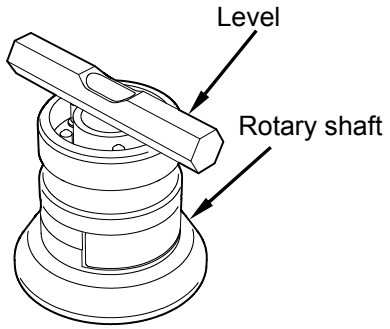


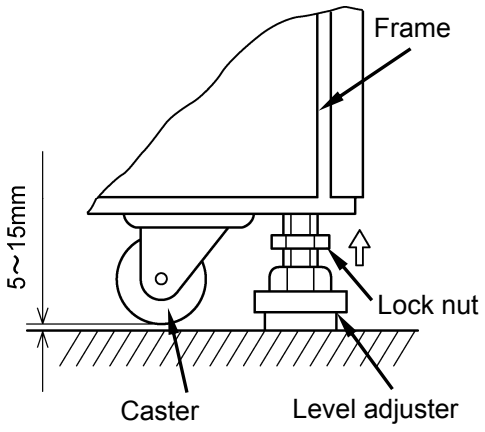
⚠ **WARNING:** Do not hold the cord when disconnecting the power cord from the receptacle. Hold the plug when disconnecting it.

(7) Leveling of centrifuge unit

① Turn on the power for the centrifuge unit, and open the door.
(If there is no power supply unit, see “2-7 Emergency Recovery from Power Failure”.)

② Place the level above the rotary shaft, adjust the flatness in the front-back direction and right-left direction.





③ Use a wrench to turn the level adjusters (4 locations) under the frame so that the casters are raised about 5 to 15 mm above the floor surface.

④ Once flatness is obtained in the front-back and right-left directions, press the centrifuge unit forward and back and to the right and left to check that there is no rattling.

⑤ Once the above operation is completed, turn the lock nuts to lock the level adjusters in place so that they do not turn.

⚠ **WARNING:** Be sure to use the four level adjusters to jack up the centrifuge unit, perform the leveling operation, and then use the lock nuts to lock in place. Do not use with the casters contacting the floor.

⚠ **CAUTION**: Do not use the centrifuge if any one of the four level adjusters is raised from (not making contact with) the floor surface.
This could cause large vibrations in the centrifuge and result in a breakdown.

(8) Pressure sensor calibration
Calibrate the pressure sensor by referring to 2-5-6 (9) “Pressure sensor calibration”.

⚠ **CAUTION:** If the pressure sensor is not calibrated, the “Pressure sensor” alert turns on, and the centrifuge cannot be used. Be sure to always perform calibration after installation.

⚠ **CAUTION:** Also calibrate the pressure sensor if the centrifuge is installed in a new location at a different altitude (air pressure). Otherwise, differences in rotor temperature control may occur.

(9) Relocating the centrifuge unit
Before relocating the centrifuge unit, remove the power cord, and then use a wrench to turn the level adjusters so that the casters make contact with the floor surface. Raise the level adjusters high enough, and then move the centrifuge unit.
After moving, be sure to install again, and perform the leveling operation.

⚠ **CAUTION:** Before moving the centrifuge unit, be sure to take out the rotor from the rotor chamber.
Also, pay careful attention to unevenness, slopes, and other features of the floor surface when moving to ensure that the centrifuge does not fall over.

To install or relocate the centrifuge, contact the vendor where you made the purchase or an authorized sales or service representative.

MEMO

6. Specifications

	CR30NX
Maximum speed	30,000 rpm
Maximum RCF	110,000xg （R25ST rotor and R30AT rotor ）
Maximum nominal capacity	6,000mL （R7A rotor and R9A2 rotor）
Speed control range	300 to 30,000rpm (*1)
Speed control accuracy	±10rpm（300rpm to maximum speed (*1) ）
Temperature setting range	-20º C to +40º C
Timer	“min:sec” unit mode: Range from 1 second to 99 minutes 59 seconds HOLD for continuous operation “hr:min” unit mode: Range from 1 minute to 99 hours 59 minutes HOLD for continuous operation
Acceleration/deceleration control	11-stage variable acceleration control, 10-stage braked deceleration plus coasting deceleration control, and variable deceleration slope function
Programming function	Capable of saving 1,000 programmed run conditions
Display and run functions	Displaying and setting of the RCF(g) and g·sec, ω^2T operation, and RTC (real-time control) operation
Lockout function	Available
Machine log management function	Available
Driving motor	Induction motor (inverter-controlled)
Refrigerator	Hermetically sealed (refrigerant: HFC410A) (For further information, see the equipment labels (*2).)
Safety devices	Door interlock, dual-overspeed detector, rotor cover detector, imbalance detector, over-temperature detector
Screen display and operation	Color touch-sensitive LCD (*3)
Dimensions	708 (W) x 892* (D) x 866 (H) mm
Noise level	≦56 dB(A) (measured 1m in front of the instrument)
Power requirements	Supply required Single phase: AC 200/208/220/230/240 V+/-10 %, 50/60 Hz, 30 A Three-phase four-wire: AC 220/230/240 V+/-10%, 50/60 Hz, 16A
Environment requirements	Install indoors at a maximum altitude of 2,000 m, and in an environment having a relative humidity of 80% up to a room temperature of 31°C and decreasing linearly from 80% to 50% from a room temperature of 31°C to 40°C. Installation category: II, Contamination level: 2
Ambient temperature	Ambient temperature for operation: 2°C to 40°C Ambient temperature for assuring performance: 15°C to 25°C
Weight	310 kg

(*1): The R9A2 rotor has a minimum rotation speed setting of 2,000 rpm.

(*2): Because the equipment labels may vary by country, please contact your local dealer or an authorized sales/service representative.

(*3): Please note that the LCD panel may contain a few dead or stuck pixels.

CE

The CR30NX centrifuges satisfy CE marking requirements. The CE marking indicates that the product conforms with EU directives.
Standards concerning these directives are as follows:

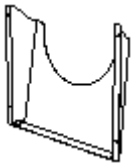
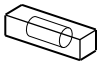
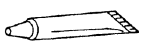
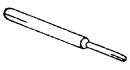
- Machinery Directive (2006/42/EC)
- Low Voltage Directive (2014/35/EU)
  EN 61010-1:2010, EN 61010-2-020:2006
- EMC Directive (2014/30/EU)
  EN 61326-1: 2013 Class A
  EN 61000-3-2: 2014 (*), EN61000-3-3: 2013 (*)
- RoHS Directive (2011/65/EU)
  EN 50581: 2012

(*): Only three-phase four-wire specification (Rating 16A).

C US

The CR30NX centrifuges which are sold in North America are certified with cCSAus. The cCSAus certification indicates that products have been manufactured to the requirements of both Canadian and US Standards.
Standards concerning these directives are as follows:
- CAN/CSA-C22.2 No.61010-1-12 and CAN/CSA-C22.2 No.61010-2-020:17
- UL Std. No.61010-1 (3rd Edition) and UL Std. No.61010-2-020:2016

7. List of Standard Accessories

Accessory	Q'ty	Figure	Remarks
Instruction manual	1		S998658
List of applicable rotors	1		S998659
Instruction manuals CD set	1		S311444A
Rear duct assembly	1		S413856A (To be mounted to the rear cover at installation)
Level	1		8485091
Hexagonal bar	1		S413900
Hexagonal key	1		60000122
Silicone grease (Vacuum grease)	1		483719
Screw lubricant	1		84810601
Rotor cleaning bar	1		S301333
Pump oil	1		3058513

8.Tubes and Bottles

Cleaning and sterilizing tubes and bottles

Use the best method for cleaning and sterilizing tubes and bottles by referring to the table below.

Cleaning and sterilizing requirements for tubes and bottles

✓: Allowed ×: Not allowed

Requirement \ Material			PA	PC	PP
Cleaning	Cleaning fluids	Acidic (pH 5 or lower)	×	×	×
		Acidic (higher than pH 5)	✓	✓	✓
		Alkaline (higher than pH 9)	✓	×	✓
		Alkaline (pH 9 or lower)	✓	✓	✓
		Neutral (pH 7)	✓	✓	✓
		Warm water (up to 70°C)	✓	✓	✓
	Ultrasonic cleaning	Neutral detergent (pH 7)	✓	✓	✓
Sterilization	Autoclaving	115°C（0.7kg / cm^2）30 minutes	✓	✓	✓
		121°C（1.0kg / cm^2）20 minutes	×	✓	✓
		126°C（1.4kg / cm^2）15 minutes	×	×	×
	Boiling	15 to 30 minutes	✓	✓	✓
	Ultraviolet sterilization	200 to 300 nm	×	×	×
	Gas sterilization	Ethylene oxide	✓	×	✓
		Formaldehyde	✓	✓	✓

PA: Polypropylene copolymer, PC: Polycarbonate, PP: Polypropylene

Cleaning PC tubes and bottles

PC materials have low chemical resistance to alkaline solutions. Avoid using neutral detergents higher than pH 9. Note that some neutral detergents are still higher than pH 9 even if diluted according to the instructions in the manufacturer's catalog. Use detergents between pH 7 and pH 9.

Autoclaving PA, PC, and PP tubes and bottles

PA begins softening at about 120°C, and PC and PP at about 130°C. Autoclave PA tubes/bottles at 115°C (0.7 kg/cm^2) for 30 minutes and PC and PP tubes/bottles at 121°C (1.0 kg/cm^2) for 20 minutes. If these temperatures are exceeded, the tubes and bottles may be deformed.

Observe the following instructions when using a sterilizing chamber:

(1) Place bottles in a vertical position, mouths facing up. If bottles are placed sideways, they may deform into an oval shape due to their own weight.
(2) Remove screw caps and inner covers to prevent deformation or rupture.
(3) Wait until the sterilizing chamber cools down to room temperature before removing the bottles.

Requirements and life expectancy of tubes and bottles

⚠ **CAUTION:** Do not use tubes or bottles that have exceeded their life expectancy. Usage past the life expectancy could result in damage to tubes or bottles and the rotor and the centrifuge.
The life expectancy of tubes and bottles depends on factors such as the sample characteristics, speed of the rotor used, and temperature.
Always check for deterioration and damage (cracks, deformation, and so on) on tubes and bottles before using them. Do not use the tubes or bottles if you find any problems.

The life expectancy of plastic tubes and bottles depends on factors such as the sample characteristics, speed of the rotor used, and temperature.
When plastic tubes and bottles are used for centrifugation of ordinary aqueous samples (between pH 5 and pH 9), their life expectancy is specified as follows.

When operated for 1 hour at the maximum speed:

Tubes (PA, PC, PP): 5 operations

Thick-walled tubes and bottles (PA, PC, PP): 50 operations

himac 50 TC tubes, himac 15 TC tubes, and tubes on the market: 1 operation

The life expectancy of the PC bottles is specifically specified as follows based on the pretreatment conditions such as cleaning and sterilization.

Cleaning and sterilization / Sample	Gas sterilization and cleaning with warm water	Autoclaving at 121°C for 20 min.
Neutral (pH 7)	50 operations	10 operations
Alkalescent (PH 7 to 9)	30 operations	5 operations

Do not use crazed (cracked) tubes or bottles.

The above life expectancies of plastic tubes and bottles are intended as an approximate guide only. We do not warrant the life expectancies of tubes and bottles.

APPENDIX

It is requested that you return the faulty product with this Decontamination Sheet in order to repair it safely in our plant.
Be sure to decontaminate the product according to good laboratory procedures and methods, and fill out this Decontamination Sheet and attach it to the product to be returned to Eppendorf Himac Technologies for repair.

Attention: Eppendorf Himac Technologies Co., Ltd.

Decontamination Sheet

Date:

Name:
Name of company(organization) or school:
Division or faculty/Subject of study:
Telephone number:
Address:

I performed decontamination to remove biological or chemical contaminants(including radioactive isotope) from this product as follows.

Model of centrifuge: Serial number
Model of rotor: Serial number
Accessory: Serial number
Contaminants used:
Decontamination methods(conditions):

Date of decontamination Signature

* If you return an ultracentrifuge rotor, fill out the following information.

Number of runs of the rotor
Cumulative operating time of the rotor

WEEE Compliance

The WEEE mark indicates compliance with the Waste Electrical and Electronic Equipment Directive 2012/19/EU (WEEE).

The mark indicates the requirement NOT to dispose the equipment as unsorted municipal waste, but to use the return and collection systems available.

For further information regarding return, collection, recycle or disposal, please contact your local dealer or an authorized sales or service representative.



Marking for the restriction of the use of hazardous substances in electrical and electronic products

(THE PEOPLE'S REPUBLIC OF CHINA)

The mark and separate sheet "Names and Contents of Hazardous Substances in Each Component of This Centrifuge" are in compliance with "People's Republic of China Electronic Industry Standard SJ/T11364-2014" requirements.

The mark indicates that this electrical and electronic product contains certain hazardous substances, and can be used safely during its environment-friendly use period. The number in the middle of the mark indicates the environment-friendly use period of the product. The outer circle indicates that the product can be recovered.



After-sales Service

Periodic inspection of the centrifuge is recommended to assure safe and efficient operation.
If the centrifuge fails to function normally, do not attempt to repair it yourself.
Contact an authorized sales or service representative.

Eppendorf Himac Technologies Co., Ltd.

1060, Takeda, Hitachinaka City
Ibaraki Pref., 312-8502 Japan

URL: https://www.himac-science.com