



INSTRUCTION MANUAL

Ultra Low Temperature Freezer

MDF-U2086S
MDF-U3086S
MDF-U4086S
MDF-U5086W
MDF-U5186S



MDF-U2086S

Note:

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CONTENTS

PRECAUTIONS FOR SAFE OPERATION	P. 2
CAUTIONS FOR USAGE	P. 6
INSTALLATION SITE	P. 7
PROPER OPERATION	P. 8
FREEZER COMPONENTS	P. 8
OPERATING INSTRUCTIONS	P. 12
OPTIONAL COMPONENT	P. 21
ATTENTION	P. 22
ENVIRONMENTAL CONDITION	P. 23
MAINTENANCE	P. 24
TROUBLE SHOOTING	P. 26
RECYCLE OF NICKEL-CADMIUM BATTERY	P. 27
DISPOSAL OF UNIT	P. 31
SPECIFICATIONS	P. 32
PERFORMANCE	P. 32

PRECAUTIONS FOR SAFETY OPERATION

It is imperative that the user complies with this manual as it contains important safety advice.

Items and procedures are described so that you can use this unit correctly and safely. If the precautions advised are followed, this will prevent possible injury to the user and any other person.

Precautions are illustrated in the following way:

WARNING


Failure to observe WARNING signs could result in a hazard to personnel possibly resulting in serious injury or death.

CAUTION

Failure to observe CAUTION signs could result in injury to personnel and damage to the unit and associated property.

Symbol shows;

this symbol means caution.

 this symbol means an action is prohibited.

this symbol means an instruction must be followed.

Be sure to keep this manual in a place accessible to users of this unit.

< Label on the unit >


















This mark is labeled on the cover in which the electrical components of high voltage are enclosed to prevent the electric shock.

The cover should be removed by a qualified engineer or a service personnel only.









PRECAUTIONS FOR SAFETY OPERATION

WARNING





-  **Do not use the unit outdoors.** Current leakage or electric shock may result if the unit is exposed to rain water.
-  **Only qualified engineers or service personnel should install the unit.** The installation by unqualified personnel may cause electric shock or fire.
-  **Install the unit on a sturdy floor.** If the floor is not strong enough or the installation site is not adequate, this may result in injury from the unit falling or tipping over.
-  **Never install the unit in a humid place or a place where it is likely to be splashed by water.** Deterioration of the insulation may result which could cause current leakage or electric shock.
-  **Install a leak breaker on the power supply side** when you use the unit in humid or wet situations, as well as installing an earth plate. Consult our shops or an electrician for these installations.
-  **Never install the unit in a flammable or volatile location.** This may cause explosion or fire.
-  **Never install the unit where acid or corrosive gases are present** as current leakage or electric shock may result due to corrosion.
-  **Make sure a dedicated power source is used** as indicated on the rating label attached to the unit.
-  **Make sure to remove dust from the power supply plug** before inserting in a power source. A dusty plug or improper insertion may cause a hazard.
-  **Use a power supply outlet with ground (earth)** to prevent electric shock. If the power supply outlet is not grounded, it will be necessary to install a ground by qualified engineers.
-  **Never ground the unit through a gas pipe, water main, telephone line or lightning rod.** Such grounding may cause electric shock in the case of an incomplete circuit.
-  **Do not insert metal objects such as a pin or a wire into any vent, gap or any outlet** for inner air circulation. This may cause electric shock or injury by accidental contact with moving parts.
-  **Never store volatile or flammable substances** in this unit. This may cause explosion or fire.
-  **Never store corrosive substances** in this unit. This may lead to damage to the inner components or electric parts.
-  **Always disconnect the power supply to the unit prior to any repair or maintenance** of the unit in order to prevent electric shock or injury.

PRECAUTIONS FOR SAFETY OPERATION

WARNING















-  As with any equipment that uses CO₂ gas, there is a likelihood of oxygen depletion in the vicinity of the equipment. It is important that you assess the work site to ensure there is suitable and sufficient ventilation. If restricted ventilation is suspected, then other methods of ensuring a safe environment must be considered. These may include atmosphere monitoring and warning devices.
-  **Ensure you do not inhale or consume medication or aerosols** from around the unit at the time of maintenance. These may be harmful to your health.
-  **Never splash water directly onto the unit** as this may cause electric shock or short circuit.
-  **Never disassemble, repair, or modify the unit yourself.** Any such work carried out by an unauthorized person may result in fire or injury due to a malfunction.
-  **Disconnect the power supply plug if there is something wrong with the unit.** Continued abnormal operation may cause electric shock or fire.
-  If the unit is to be stored unused in an unsupervised area for an extended period, **ensure that children do not have access and that doors cannot be closed completely.**
-  **The disposal of the unit should be accomplished by appropriate personnel. Always remove doors** to prevent accidents such as suffocation.
-  **Make sure to prepare a safety check sheet** when you request any repair or maintenance for the safety of service personnel.

CAUTION

-  **Select a level and sturdy floor for installation.** This precaution will prevent the unit from tipping. Improper installation may result in water spillage or injury from the unit tipping over.
-  **Connect the unit to a power source as indicated on the rating label attached to the unit.** Use of any other voltage or frequency other than that on the rating label may cause fire or electric shock.
-  **When removing the plug from the power supply outlet, grip the power supply plug,** not the cord. Pulling the cord may result in electric shock or fire by short circuit.
-  **Never damage or break the power supply plug or cord. Do not use the supply plug if its cord is loose.** This may cause fire or electric shock.

PRECAUTIONS FOR SAFE OPERATION

CAUTION

-  **Do not touch any electrical parts such as the power supply plug or any switches with a wet hand.** This may cause electric shock.
-  **Make sure to check the setting temperature when starting up the operation after the power failure or power off.** A change of set temperature may cause damage to contents.
-  **Do not put a container with water or heavy articles on the unit.** It may cause injury if the articles fall. Current leakage or electric shock may be resulted from the deterioration of insulation by spilled water.
-  **Do not climb onto the unit or do not put articles on the unit.** This may cause injury by tipping or damage to the unit.
-  **Do not put glass bottles or cans into the compartment** since they may be broken by frozen contents and cause injury.
-  **Put on dry gloves when you take out refrigerated articles from the freezer.** Handling frozen contents or the inside walls with naked hands may cause frostbite.
-  **Do not defrost inside walls using a knife or ice pick.** There are pipelines for cooling behind the walls. **Be careful not to damage the lines** as this could cause a breakdown. Also, **do not make a hole in the wall** for installation of attachments.
-  **Always hold the handle when closing the door.** This will reduce the likelihood of a trapped finger.
-  **Check the filter mentioned in this manual and clean it as necessary.** A dusty filter may cause temperature rise or failure.
-  **Do not touch the condenser directly** when the filter is removed for cleaning. This may cause injury by hot surface.
-  **Always disconnect the power supply plug** before moving the unit. Take care not to damage the power cord. A damaged cord may cause electric shock or fire.
-  **Be careful not to tip over the unit** during movement to prevent damage or injury.
-  **Always disconnect the power plug** when the unit is not used for long periods.
-  **Do not put the packing plastic bag within reach of children** as suffocation may result

CAUTIONS FOR USAGE

1. The digital thermometer of this unit is designed to display the temperature of the center part of the freezing compartment. Although the thermometer sometimes displays a temperature about 1°C higher than the actual temperature of the center part, it gradually approaches the real temperature.
2. The freezing temperature is different at each position inside the case of this freezer. The set temperature represents the temperature at the center of the inside case. The refrigerated articles put on the highest position part, are refrigerated about 2°C higher than the set temperature, while those put on the lowest part are refrigerated about 2°C lower.
3. Do not put too many warm articles into a freezer compartment before enough operating. Put items in a few at a time after the freezer compartment temperature has cooled to at least -20°C.
4. An access port to take out the measuring cable in the case is provided on the left wall of the freezer. Be sure to replace the cap and heat insulator after use, or the inside temperature cannot continue to go down and frost may accumulate outside the port surroundings.
5. In case of high ambient temperature, the cabinet front may heat up after the freezer first starts to operate. However, this does not denote a malfunction. It is due to heater or hot gas piped around the unit frame to prevent frost and ice sticking around the cabinet.
6. When the unit is first installed, the warning device may not operate because its Ni-Cd batteries have completely discharged. This does not denote a malfunction. In this case, continue to operate the unit for about 3 hours, then push the test switch to check if the warning device operates. To fully recharge the completely discharged batteries, the unit has to be operated for about 2 days.
7. Leave the remote alarm switch "OFF" until the inside temperature of the freezer reaches the appropriate level.
8. This unit is equipped with a temperature alarm that automatically functions at the preset temperature plus 11°C.
9. Do not clean the unit with scrubbing brushes, acid, thinner, solvents, powdered soap, cleanser or hot water. These agents can scratch the paint or cause it to peel. Plastic and rubber parts can be easily damaged by these materials, especially solvents. When a neutral detergent is used to clean the unit, wipe off the neutral detergent with a wet cloth.

INSTALLATION SITE

This unit is a precision machine. When select a location to install this unit, keep the following conditions for perfect performance.

1. Sturdy, level floor

Install the unit on a sturdy floor to avoid excessive vibration and noise.

2. Away from heat-emitting appliances

Avoid installing the unit near heat-emitting appliances such as heaters. Heat can cause modification of materials and inefficient refrigeration.

3. Out of direct sunlight

Installing the unit in direct sunlight may cause malfunctioning and may shorten the life of the unit.

4. Dry area

Avoid placing the unit in a damp area, for example, near a water faucet or sink.

CAUTION!

Installing a circuit breaker

If the unit is place in a dump area, a circuit breaker must be install the circuit breaker in the power line. Consult your dealer or an electrical for further information.

5. Clean area

Avoid placing the unit where chemicals are stored or gases are produced. Also avoid areas where there is a great deal of dust.

6. Well-ventilated area

If it is necessary due to limited space this unit can be positioned flush with the wall. However, if it is possible we recommended to leave at least 10 cm of clearance behind the unit. Power consumption will be less if the unit is not placed against the wall.

7. Be sure to ground the unit

Grounding the prevents electric shock which occurs when the electrical insulation of the unit becomes insufficient. Be sure to ground the unit.

WARNING!

Make sure of use a plug with earth provision and to ground the unit to prevent the electric shock in the event of the current leakage.

Substituting a water pipe for the ground terminal will not provide proper grounding in many instances since plastic pipes are often used for water piping.

Never ground the unit through a gas pipe, as it is very dangerous.

Never ground the unit through the telephone line or lightning rod, as large currents flow if lightning strikes, making it very dangerous.

8. Fixing of the frame

These are adjustable feet for adjusting the frame on the booth sides of the frame bottom. Turn them to the left for fixing on the floor, and completely to the right to retract then before carrying.

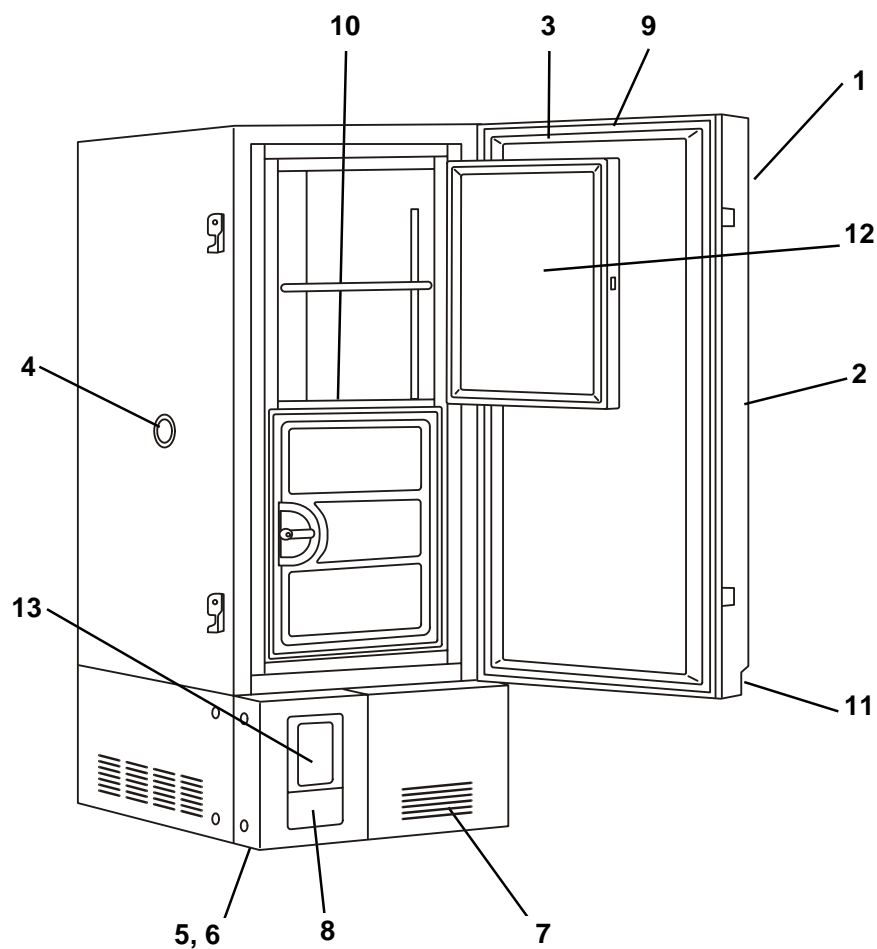
WARNING!

When you dispose of this deep freezer, do not forget to break the hinge and the lock to prevent the door from being closed. Do not allow children to play around the deep freezer. Attach some packing between the door and the body for temporary shutdown.

PROPER OPERATION

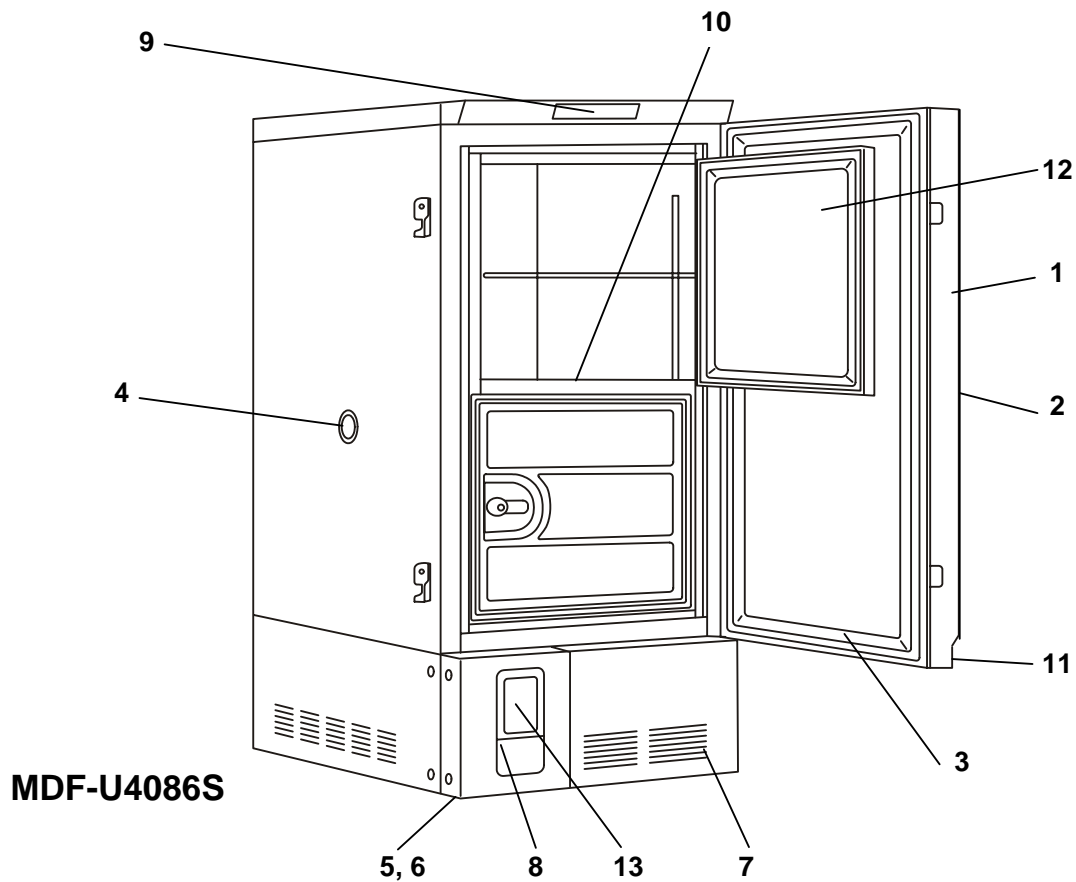
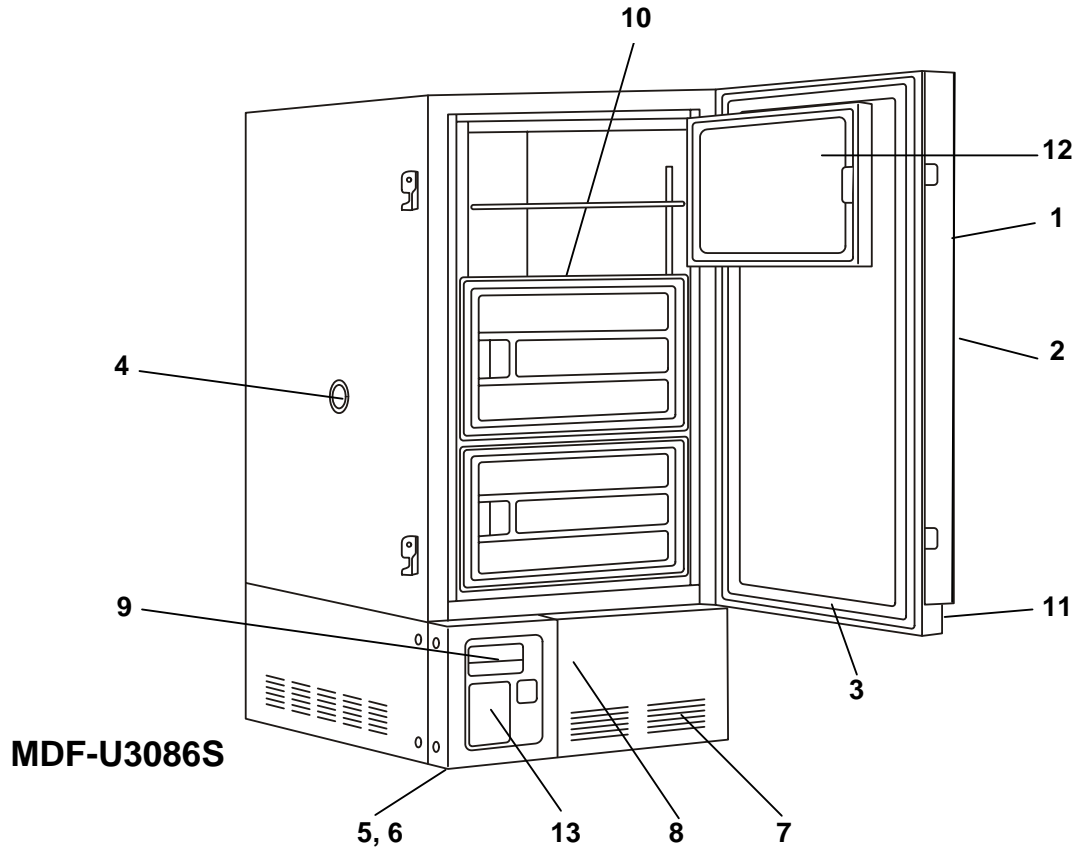
1. Remove packing and let the freezer compartment air out with the door open
2. Install the shelves and close the doors.
3. Connect the power cable to the power supply and turn on the power switch.
4. Set the desired temperature. (Initial setting : -86)
5. Cool down to the desired temperature.

FREEZER COMPONENTS

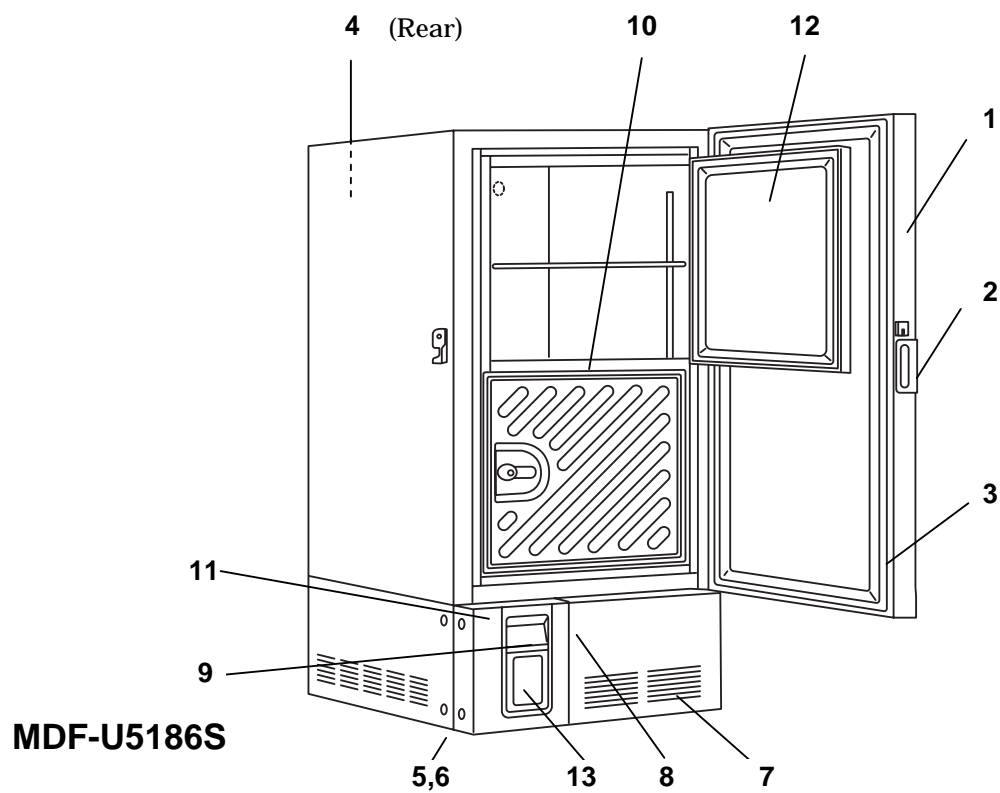
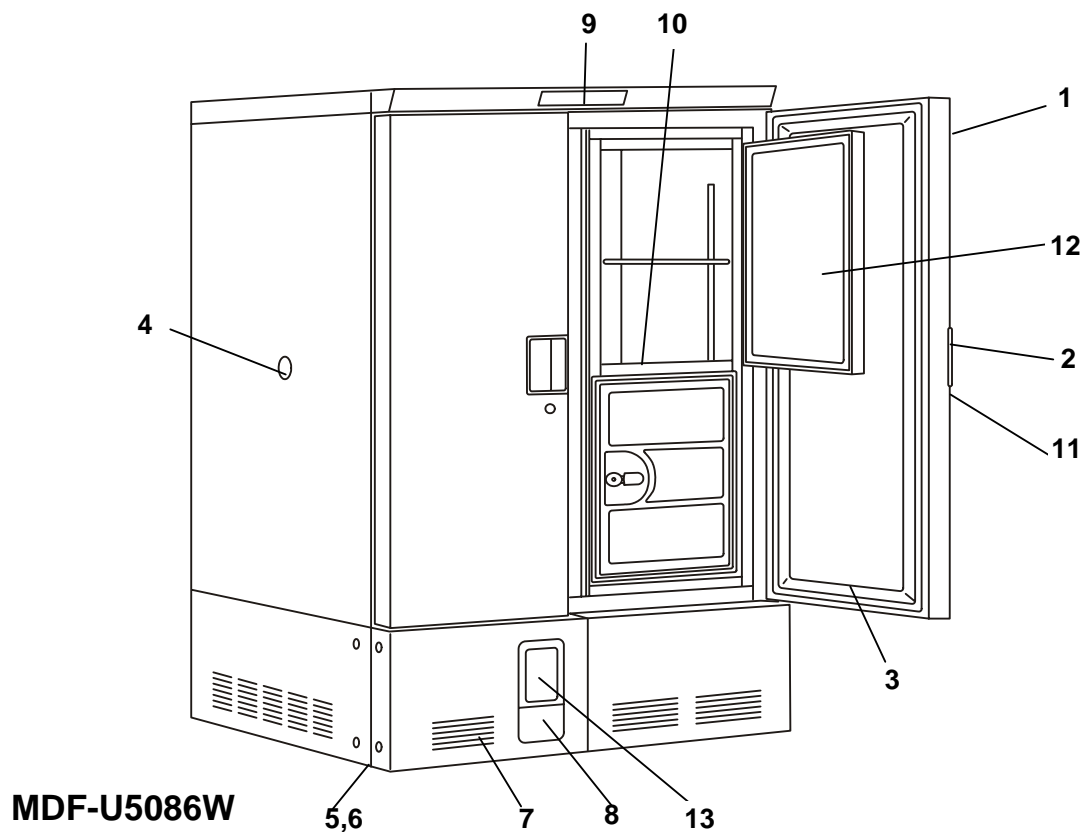


MDF-U2086S

FREEZER COMPONENTS



FREEZER COMPONENTS



FREEZER COMPONENTS

1. Outer door:

To open the door, grip the handle. On closing, make sure to lock the latch completely.

2. Handle:

Always grip this handle to open and close the outer door.

3. Magnetic door gasket:

Provides a tight door seal and prevents cold air leak.

4. Access port:

Serves as a means of leading the measuring cable from freezing room to the outside.

5. Caster:

4 casters are provided to facilitate moving of the frame.

6. Adjustable feet:

Serves to adjust the height and to settle the frame.

7. Air intake (grille):

Do not block this vent to keep the stable temperature control.

8. Switch box:

Power supply switch and battery switch of alarm are installed in this box.

9. Control panel:

The temperature set key, buzzer key and alarm lamp etc. are installed on the panel.

10. Setting spot for the sensors of temperature controller and recorder:

Both the sensor of temperature controller and that of automatic temperature recorder are set at this spot.

Be careful not to contact any refrigerated articles directly with the spot.

11. Key:

Turn counterclockwise to 180 degree and the outside door can be securely locked.

12. Inner door:

Composed of separated door flaps for minimizing temperature rise when putting in and taking out refrigerated articles. You need open only a necessary part of the flaps. Removable type for cleaning and defrosting.

13. Setting position of the temperature recorder (optional part)

14. Power supply switch (POWER):

Power all function except for remote alarm.

15. Remote alarm switch (REMOTE ALARM):

This switch is for remote alarm. In case of operating remote alarm, turn the switch ON.

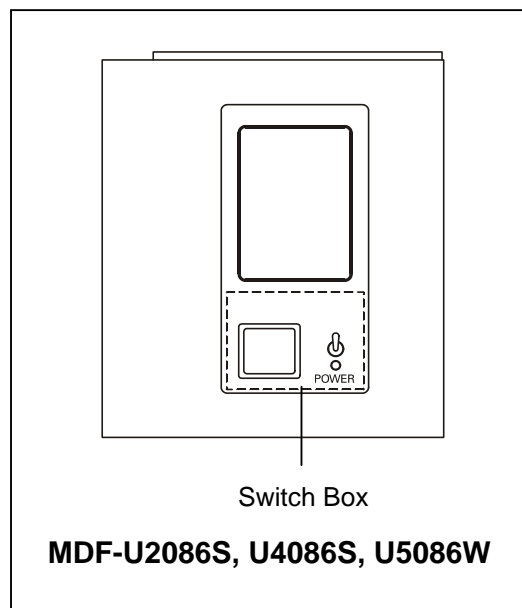
OPERATING INSTRUCTIONS

Switch Box

1. Power Supply Switch (POWER)

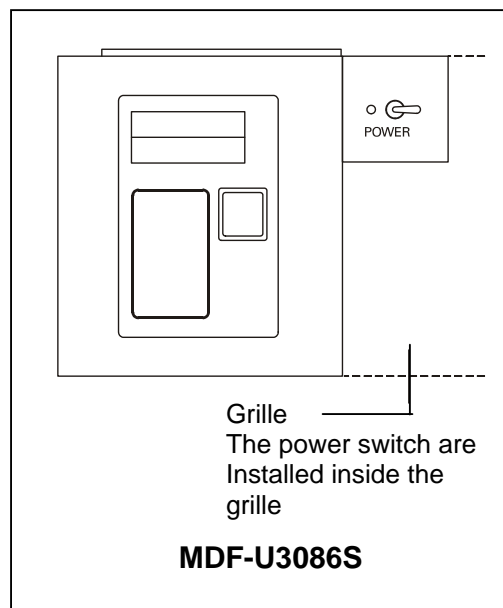
MDF-U2086S, U4086S and U5086W type.

The power supply switch is installed inside the switch cover.



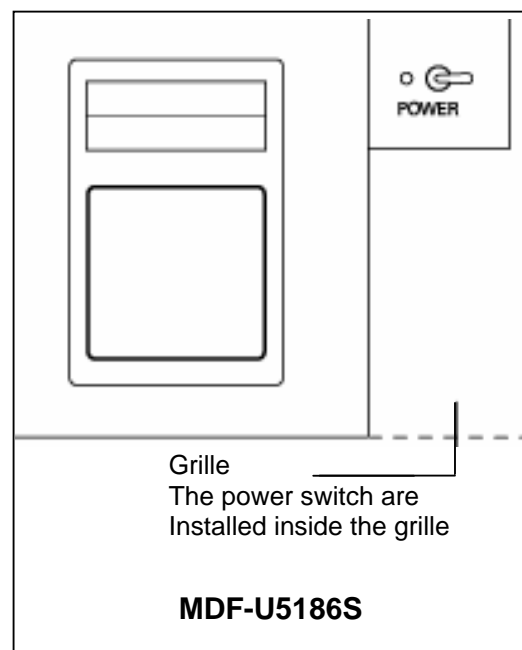
MDF-U3086S

The power supply switch is installed inside the grille.



MDF-U5186S

The power supply switch is installed inside the grille.



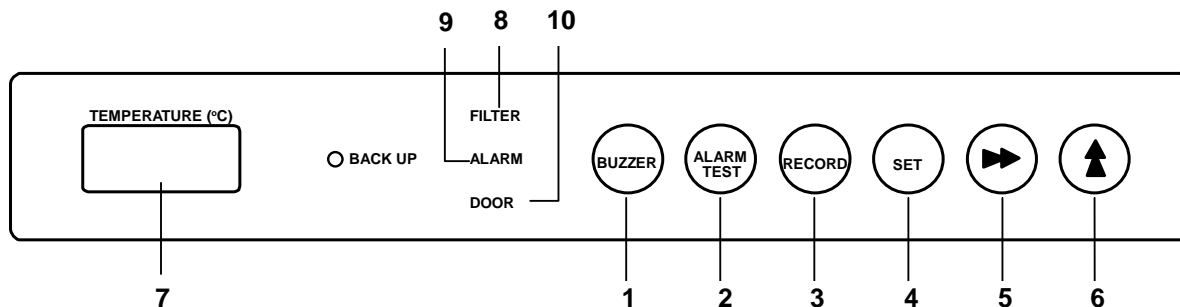
Note:

ON--- " | " side

OFF--- " O " side

OPERATING INSTRUCTIONS

Control panel (Model MDF-U2086S)



- 1. Buzzer key (BUZZER):** To stop the alarm from sounding, press this key. Should a further abnormality occur, the buzzer will sound automatically.
- 2. Alarm test key (ALARM TEST):** Check that the alarm lamp and the buzzer functional when the freezer is operating well.
- 3. Record key (RECORD):** For a digital temperature recorder.
- 4. Set key (SET):** Temperature setting mode will be led by pressing this key. The changeable will be flashed. Press this key again after setting desired temperature, and temperature setting will be stored.
- 5. Digit shift key (▶▶):** Pressing this key in the setting mode will cause the changeable digit to move. Key lock will be caused by pressing this key when in the temperature display mode. As for details, see page 15 "Key lock function".
- 6. Figure shift key (▲):** Pressing this key in the setting mode will cause the numerical value to shift. "ON-OFF" of key lock can be selected by pressing this key when in the key lock mode.
- 7. Digital temperature indicator (Temperature ()):** This indicator shows the present temperature or setting temperature.
- 8. Filter check lamp (FILTER):** This lamp lights when the condenser filter is clogged. Clean the condenser filter according to page 20 "Cleaning the condenser filter".
- 9. Alarm lamp (ALARM):** This lamp will be flashed when the internal temperature will exceed the alarm setting temperature, or at the time of power failure.
- 10. Door alarm lamp (DOOR):** This indicator flashes up when the door is open, allowing confirmation of whether or not the door is completely closed.

OPERATING INSTRUCTIONS





Basic method of Operating the Control Panel (Model MDF-U2086S)

Table 1 shows the basic operation method. Perform key operations in the sequence indicated in the table.

The example in the table is based on the assumption that the temperature is -80°C .

*The unit is set at the factory that the temperature inside the unit is -86°C .

Table 1. Basic operation sequence. (Ambient temperature : 20°C)







	Description of operation	Key operated	Indication after operation	Mode
1	Turn the power switch "on"	----	Present temperature will be displayed. 	Present temperature display mode
2	Press SET key	SET	The second digit of the temperature indicator is flashed. 	Temperature setting mode (SV mode)
3	Set the temperature to -80 with the digit shift key and numerical value shift key.	▶▶	The settable digit will move.	
		▲	The figure of settable digit will increase. 	
4	Press SET key	SET	Setting temperature will be memorized and present temperature will be displayed. 	Present temperature display mode

*Although the value of the internal temperature setting can range from -20°C to -95°C , the guaranteed temperature when there is no load is -86°C when the ambient temperature is $+30^{\circ}\text{C}$.

Key lock function

This unit has the key lock function of control panel shown in Table 2 below.

Table 2. Operation sequence of key lock

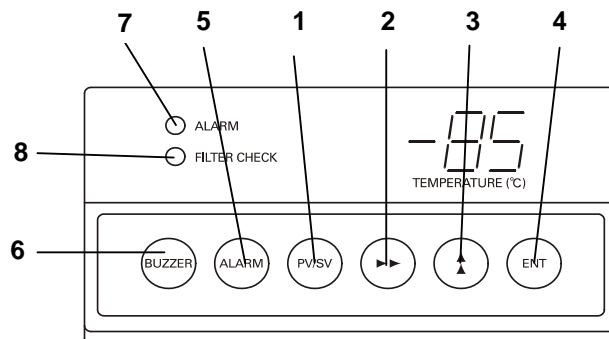
	Description of operation	Key operated	Indication after operation	Mode
1		----	Present temperature will be displayed. 	Present temperature display mode
2	Set the key lock with the digit shift key and numerical value shift key.	▶▶	By pressing for 5 seconds,  will be displayed. 	Key lock mode
		▲	By pressing key,  will be displayed and the key lock will be active. 	
3	Press SET key	SET	Key lock is completed and present temperature will be displayed. 	Present temperature display mode

*The key lock only works with the internal temperature setting and the Record key.

*To release the lock, select when performing the key lock mode operation described above.

OPERATING INSTRUCTIONS

Control panel (Model MDF-U3086S, U5186S)



Functions of the controller at the control panel are as follows:

1. Temperature setting key (PV/SV): This key has functions.

PV: present freezer compartment temperature is displayed.

SV: setting temperature is displayed.

When the desired temperature is set, this key should be pressed (SV side). The temperature setting can be done by using 2, 3, 4, key. Initial setting temperature is -86 °C

2. Digital shift key (►►) :

The digit of the figure displayed for temperature adjustment can be shifted using this key.

3. Figure shift key (▲):

This figure that is displayed digitally can be changed by pressing this key.

4. Entry key (ENT)

When the desired temperature is reached, press this key. Operation will commence toward this new point.

5. Alarm test key (ALARM):

Check that the alarm lamp and the buzzer are functional when the deep freezer is operating well.

6. Buzzer key (BUZZER)

To stop the alarm from sounding, press this key. Should a further abnormality occur, the buzzer will sound automatically.

7. Alarm lamp (ALARM) and Buzzer:

They operate in the following cases:

a) Break down or power failure at the power supply.

Alarm lamp flickering, buzzer (sounds)

b) **Temperature rises about 10°C higher than the setting temperature**

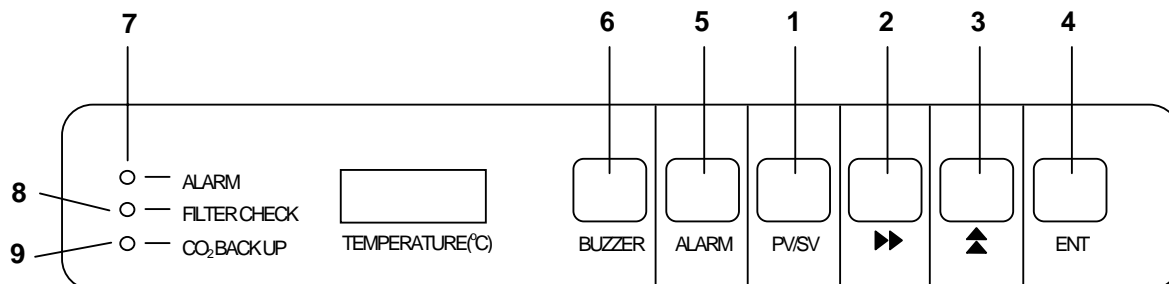
Alarm lamp flickering, buzzer (sounds about 10 minutes later)

8. Filter check lamp (FILTER CHECK)

This lamp lights when the condenser filter is clogged. Clean the condenser filter according to "MAINTENANCE".

OPERATING INSTRUCTIONS

Control panel (Model MDF-U4086S, U5086W)



Functions of the controller at the control panel are as follows :

1. Temperature setting key (PV/SV): This key has functions.

PV: present freezer compartment temperature is displayed.

SV: setting temperature is displayed.

When the desired temperature is set, this key should be pressed (SV side). The temperature setting can be done by using 2, 3, 4, key. Initial setting temperature is -86 °C

NOTE

After power failure, setting temperature will be reset to the initial setting temperature -86 °C . Set to the initial setting temperature -86 °C

2. Digit shift key (▶▶): The digit of the figure displayed for temperature.

3. Figure shift key (▲): The figure that is displayed digitally can be changed by pressing this key.

4. Enter key (ENT): When the desired temperature is reached, press this key. Operation commences toward this new point.

5. Alarm test key (ALARM): Check that the alarm lamp and the buzzer functional when the freezer is operating well.

6. Buzzer key (BUZZER): To stop the alarm from sounding, press this key. Should a further abnormality occur, the buzzer will sound automatically.

7. Alarm lamp (ALARM) and Buzzer: They operate in the following cases:

a) Break down or power failure at the power supply.

Alarm lamp flickering , buzzer (sounds)

b) Temperature rises about 10 °C higher than the setting temperature.

Alarm lamp flickering, buzzer (sounds about 10 minutes later)

c) The door is open.

Alarm lamp lighting, buzzer (sounds about 30 seconds later)

8. Filter check lamp (FILTER CHECK): This lamp lights when the condenser filter is clogged. Clean the condenser filter according to "MAINTENANCE". (P. 22)

9. CO₂ Back up Lamp (CO₂ BACK UP) : This lamp lights when CO₂ back up switch is closed.

OPERATING INSTRUCTIONS




Basic method of Operating the Control Panel (Model MDF-U3086S, U4086S, U5086W, U5186S)

Table 1 shows the basic operation method. Perform key operations in the sequence indicated in the table.

The example in the table is based on the assumption that the temperature is -80°C .

*The unit is set at the factory that the temperature inside the unit is -86°C .

Table 1. Basic operation sequence. (Ambient temperature : 20°C)

	Description of operation	Key operated	Indication after operation	Mode
1	Turn the power switch "on"	----	The second digit of the temperature indicator is flash. 	Temperature setting mode (SV mode)
2	<During the unit is run> Press PV/SV key	PV/SV	The second digit of the temperature indicator is flash.	
3	Set the desired temperature to -80°C with the digit shift key and the numeric value shift keys.	▶▶	The second digit will move.	
		▲	The figure of settable digit will increase. 	
4	Press ENT key	SET	Setting temperature will be memorized and present temperature will be displayed. 	Present temperature display mode

*Although the value of the internal temperature setting can range from -20°C to -90°C , the guaranteed temperature when there is no load is -86°C when the ambient temperature is $+30^{\circ}\text{C}$.

OPERATING INSTRUCTIONS

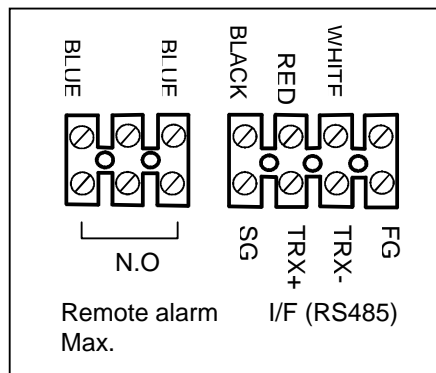
Remote alarm

1. MDF-U2086S

The terminal of the remote alarm is installed at the rear part of the frame.

Contact capacity is 2A (DC 30V).

output: normal open, connectors are connected with N.O. terminal



2. MDF-U3086S, U5186S

The terminal of the remote alarm is installed at rear of the machinery cell, under the electric box.

Consult our dealer or our office for installation of the remote alarm.

Contact capacity is 2A (DC 30V) - 0.1mA (DC 1V).

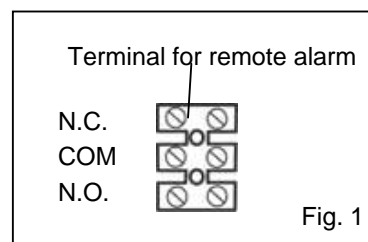


Fig. 1

3. MDF-U4086S MDF-U5086W

The terminal of the remote alarm is installed at the rear upper of the frame.

Contact capacity is 2A (DC 30V) - 0.1mA (DC 1V).

- a) output: normal open
connectors are connected with N.O. side.
- b) output: normal close
connectors are connected with N.C. side.

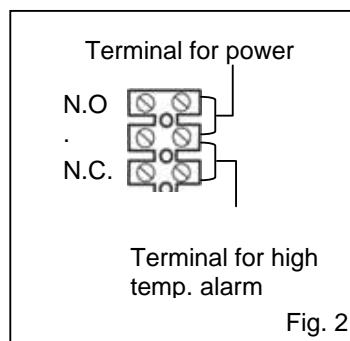
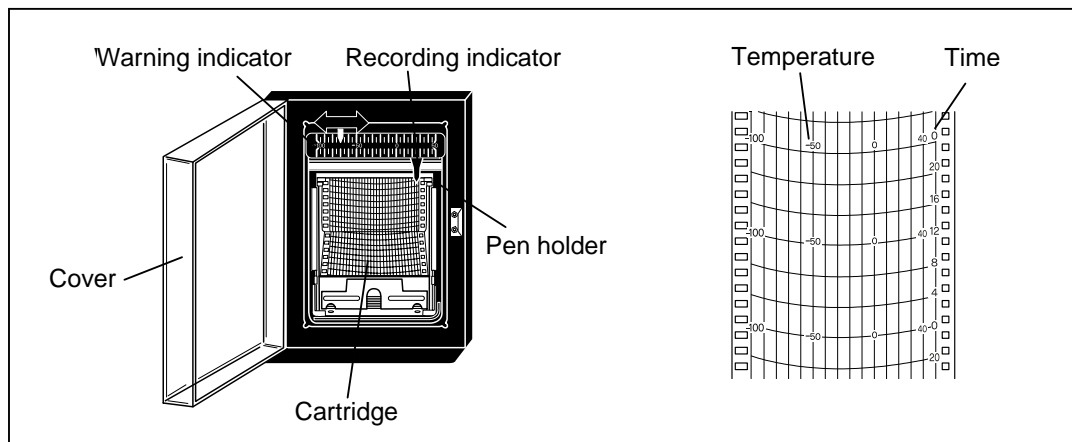


Fig. 2

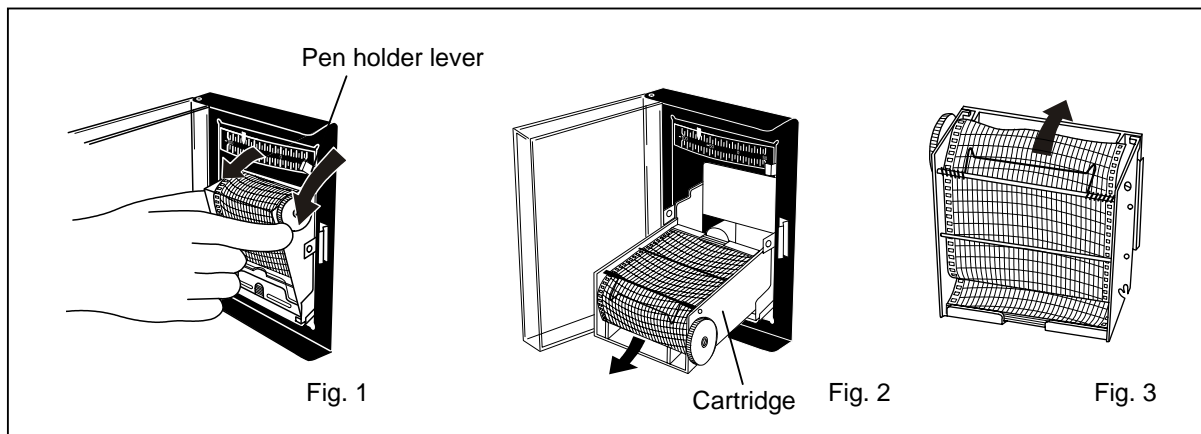
OPERATING INSTRUCTIONS

Temperature recorder (Option)

If the warning is required for the internal temperature record or the interior temperature deviates from the target temperature, an optional auto temperature recorder (MTR-86H) is available. Install the recorder properly as described below.



1. Open the cover and let down the lever of the pen holder; the pen point is apart from the chart. (Fig. 1)
2. Pull the cartridge out of the mounted position. (Fig. 2)
3. Set a new chart in place on the rear bottom of the cartridge. Set the hole on the chart in the cog of the chart driving assembly and feed the chart in the direction of the arrow by driving the cogwheel. (Fig. 3)
4. Set the chart according to the mark of day and time.
5. When mounting, lay down the cartridge first, and push into the mounting position with the groove set at the projection on the position.
6. Set up the cartridge and settle in position.



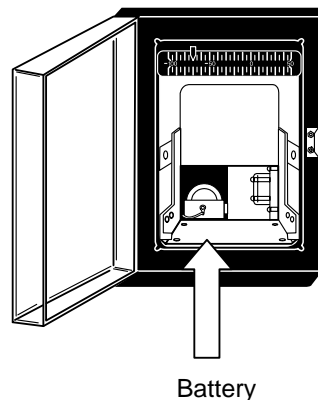
OPERATING INSTRUCTIONS

Temperature recorder

How to replace the battery

Replace the dry cell once a year as follows:

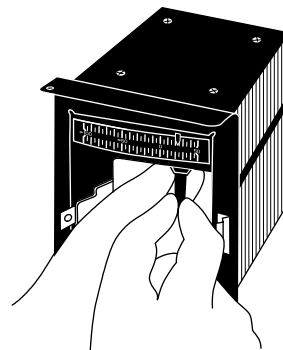
1. Pull up the pen holder first, then pull out cartridge from the mounted position.
2. Reset the battery chamber cover with wire, on the bottom left side, and take out the cell.
3. Set a new cell by turning its anode to this side.
4. Shut the cover after exchanging cells. Mount the cartridge as before and lay down the pen holder.



Pen holder

Install a recording pen in the recording hand as shown in the figure. Make sure that the pen is completely inserted for accurate recording. The pen is packed together with the chart.

1. Let down the lever of the pen holder, then pull out the cartridge from the mounted position.
2. Pull out the used pen.
3. Insert a new pen.
4. Mount the cartridge into place.
5. Lift up the pen holder lever and make sure that the pin point touches the chart.



OPTIONAL COMPONENTS

Back-up system

WARNING

As with any equipment that uses CO₂ gas, there is a likelihood of oxygen depletion in the vicinity of the equipment. It is important that you assess the work site to ensure there is suitable and sufficient ventilation. If restricted ventilation is suspected, then other methods of ensuring a safe environment must be considered. These may include atmosphere monitoring and warning devices.

This freezer can be provided with a back-up system (CVK-UB2) which is available as an optional component. For the installation, refer to the instruction manual enclosed with the system.

1. Switch of back-up system (BACKUP)

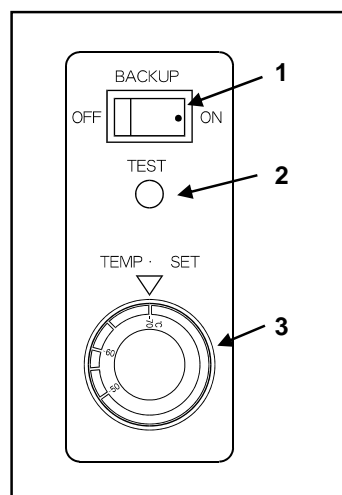
When turning on the system, the lamp is brightened. This means that the system is ready. To stop the operation of the system, turn off this switch.

2. Test switch (TEST)

This switch is for checking the operation of back-up system. Pressing this switch is resulted in the release of liquid carbon dioxide without system operation.

3. Temperature setting knob (TEMP. SET)

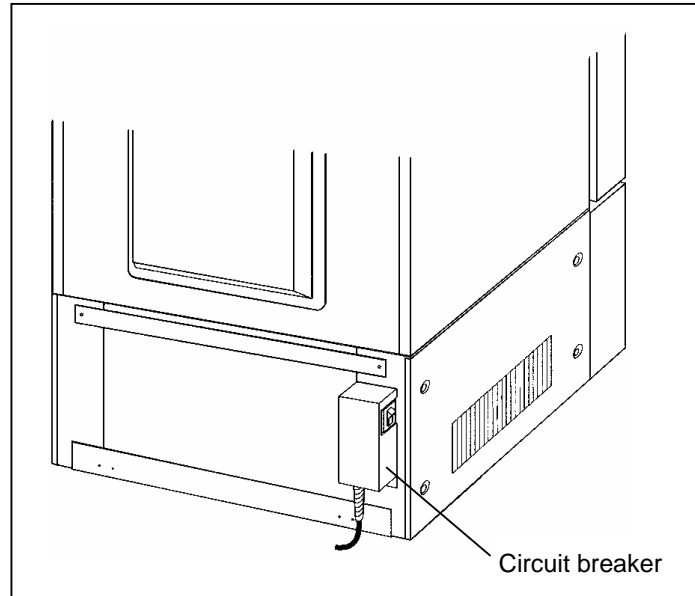
With this knob, set the temperature at which the system is operated. The effective set temperature range is between -50°C and -70°C.



ATTENTION

The unit with CE mark is equipped with a circuit breaker on the back. Make sure this breaker is switched ON before the unit is started to run.

When the operation of the unit is stopped by this breaker, contact a dealer or a service station after disconnecting the power supply plug.



WARNING

Never disassemble, repair, or modify the unit yourself. Any such work carried out by an unauthorized person may result in fire or injury due to a malfunction.

Disconnect the power supply plug if there is something wrong with the unit. Continued abnormal operation may cause electric shock or fire.



CAUTION

Connect the unit to a power source as indicated on the rating label attached to the unit. Use of any other voltage or frequency other than that on the rating label may cause fire or electric shock.

ENVIRONMENTAL CONDITIONS

This equipment is designed to be safe at least under the following conditions (based on the IEC 1010-1):

1. Indoor use;
2. Altitude up to 2000 m;
3. Ambient temperature 5°C to 40°C
4. Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 40°C;
5. Mains supply voltage fluctuations not to exceed $\pm 10\%$ of the nominal voltage;
6. Other supply voltage fluctuations as stated by the manufacturer;
7. Transient over voltages according to Installation Categories (Over voltage Categories) II; For mains supply the minimum and normal category is II;
8. Pollution degree 2 in accordance with IEC 664.

MAINTENANCE

Cleaning

1. Clean the unit once a month. Regular cleaning keeps the unit looking new.
2. Use a dry cloth to wipe off small amounts of dirt on the outside and inside of the unit and all accessories. If the unit is very dirty, use a neutral detergent.
3. After cleaning, wipe away the cleaner completely with a cloth washed in clean water.
4. Never pour water onto or into the unit. Doing so can damage the electric shock or short circuit.
5. The compressor and other mechanical part are completely sealed. This unit requires absolutely no lubrication. There is a fan behind the compressor, so be very careful if you stick your hand into this part of the unit.

Defrosting of inside wall

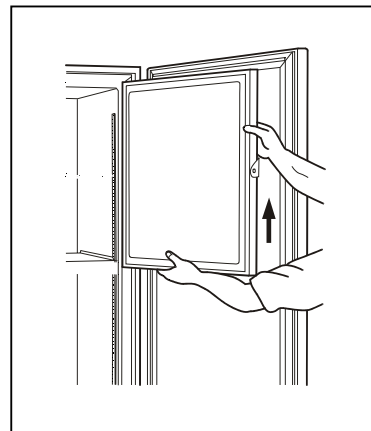
Defrost the inside wall of the freezer as follows:

Normal defrosting

Remove the frost by the enclosed scraper. Take care not to damage the inside wall.

Thorough defrosting

1. Take out and transfer all the contents to another freezer or container which contains liquid CO₂, liquid N₂, or dry ice.
2. Switch off the remote alarm.
3. Switch off the power supply.
4. Open the door and remove the inner lid. To remove the inner door, open and lift as shown in the figure.
5. Leave the freezer as it is.
6. The water remaining in the freezer compartment should be wiped up.
7. After cleaning is completed, restart the operation according to the procedure. Put back the articles into the sufficiently cooled freezer compartment.



MAINTENANCE

Cleaning of condenser filter

This unit is provided with the filter check lamp. This lamp lights when the condenser filter is clogged. Clean the filter according to the following procedure. As a clogged filter may cause poor cooling and compressor trouble, clean it once a month.

1. Remove the mounting screw securing the grille and pull out the grille. (Fig. 1)
2. Remove the filter installed inside the grille (Fig. 2), wash it with water and dry it naturally.
3. Replace the clean filter as before.
4. Replace the grille and tighten the screws.
5. Check that the filter check lamp is off.

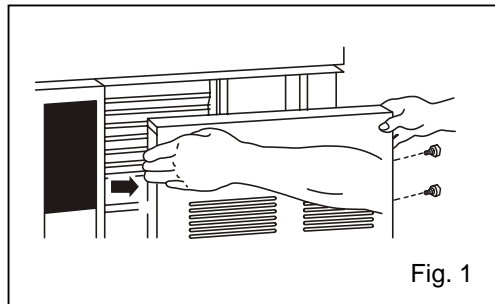


Fig. 1

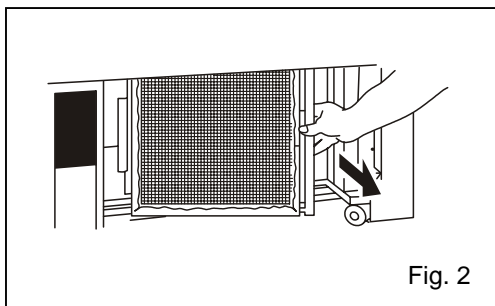


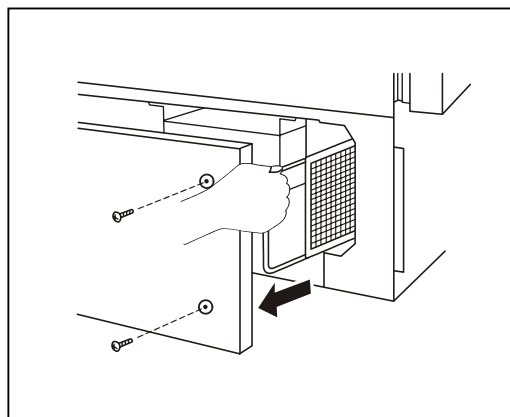
Fig. 2

CAUTION

Never touch the condenser directly when the filter is removed for cleaning. It may cause injury by heat.

This unit is provided with the filter check lamp. This lamp lights when the condenser filter is clogged. Clean the filter according to the following procedure. As a clogged filter may cause poor cooling and compressor trouble, clean it once a year.

1. Turn the power switch OFF.
2. Take off the 4 screws from the left side cover and remove it. Pull the condenser filter toward you.
3. For cleaning dust and other foreign substances accumulated on the condenser filter surface, wash it with clean water, and dry naturally.
4. After finishing the cleaning, insert the condenser filter to the rail.
5. Fix the cover in its former place and operate the freezer again.



TROUBLE SHOOTING

If the unit malfunctions, check out the following before calling for service.

No refrigeration

1. The voltage is too low. (In this case, call an electrician.)
2. The power is not supplied.
3. The breaker is free.

Poor refrigeration

1. The environmental temperature is high.
2. The door is not shut tightly.
3. The inner lid is not installed correctly.
4. The set temperature in the controller is not set properly.
5. The grille is blocked out.
6. The filter is clogged.
7. The freezer is in the direct sunlight.
8. There is any heating source near the freezer.
9. A rubber cap and insulation for the access port are not set correctly.
10. You put too many unfrozen articles into the freezer compartment.

Noise

1. The freezer is not stable.
2. The freezer has not been leveled with the leveling feet.
3. There is anything touching the frame.
4. It is the first operation after shutdown.

High temperature loads this freezer, and sometimes causes a noise. Accordingly when the temperature lowered, the noise ceases.

Alarm test key cannot actuate the power failure alarm

1. The battery has been discharged entirely.

In this case, operate the freezer for about 3 hours and switch on the alarm test key again. Entirely discharged cell requires about 2 days' operation.

When only the buzzer or only the alarm is actuated by the alarm test key, the unactuated part is out of order, and must be replaced.

Recorder does not operate normally

1. If the chart was not fed, examine the dry cell. The cell for the recorder lasts about 1 year.
2. If the temperature was not recorded, examine the recording pen.

The pen should be our specified one. Is the recorder chart set correctly?

RECYCLE OF NICKEL-CADMIUM BATTERY

MDF-U2086S



The unit contains a rechargeable battery. The battery is recyclable. At the end of its useful life, check with your local solid officials option or proper disposal.



This product has an electric battery.

Please recycle it for effective utilization of resources and protection of our environment.

Thank you for your cooperation.

Label indication is obliged to comply with Taiwanese battery regulation.

1. Location of a nickel-cadmium battery

This unit is provided a nickel-cadmium battery for the power failure and temperature warning device.

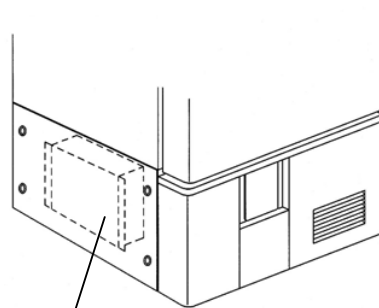
The battery is located in the electrical box inside the cover. (Fig. 1)

2. Removal of nickel-cadmium battery

- 1) Turn off the power switch and battery switch, and disconnect the power supply plug.
- 2) As shown in the Fig. 2, remove 4 screws fixing the side cover by using a screw driver.
- 3) Remove 4 screws fixing the electrical box cover by using a screw driver. (Fig. 3)
- 4) Disconnect the battery connector and remove 2 clips securing the battery by removing the screws. (Fig. 4)
- 5) Take out the battery.

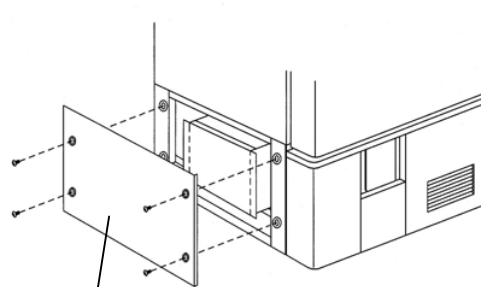
3. Handling of battery

Cover the battery terminal with an insulating tape to avoid the short circuit. Then follow the procedure for recycling or proper disposal.



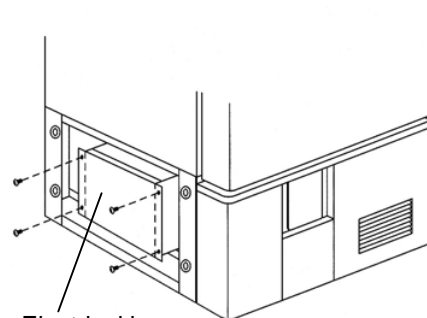
Electrical box

Fig. 1



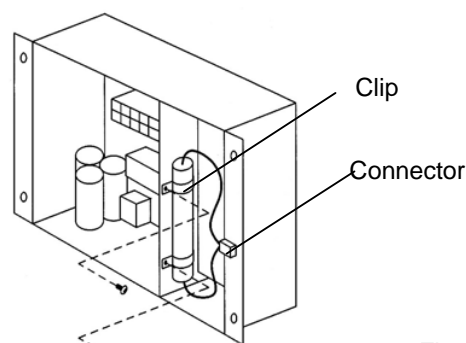
Side cover

Fig. 2



Electrical box

Fig. 3



Clip

Connector

Fig. 4

RECYCLE OF NICKEL-CADMIUM BATTERY

MDF-U3086S



The unit contains a rechargeable battery. The battery is recyclable. At the end of its useful life, check with your local solid waste officials for proper disposal.



This product has an electric battery.

Please recycle it for effective utilization of resources and protection of our environment.

Thank you for your cooperation.

Label indication is obliged to comply with Taiwanese battery regulation.

1. Location of a nickel-cadmium battery

This unit is provided a nickel-cadmium battery for the power failure and temperature warning device. The battery is located in the control box behind the control panel.

2. Removal of nickel-cadmium battery

- 1) Turn off the power switch and battery switch, and disconnect the power supply plug.
- 2) As shown in the Fig. 1, remove 2 screws on the right side, fixing the grille by using a screw driver.
- 3) Remove 4 screws fixing the control panel cover to take off the cover. (Fig. 2)
- 4) Remove 4 screws fixing the control panel and separate the panel from the frame. (Fig. 3)
- 5) Remove the control box cover behind the control panel. (Fig. 4)
- 6) Take out the battery by removing the clip fixing the battery.

3. Handling of battery

Cover the battery terminal with an insulating tape to avoid the short circuit. Then follow the procedure for recycling or proper disposal.

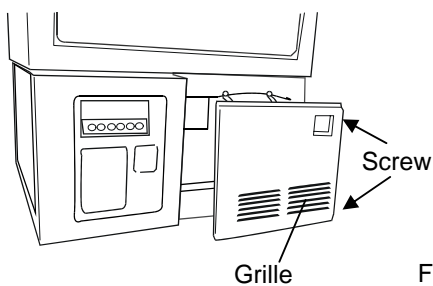


Fig. 1

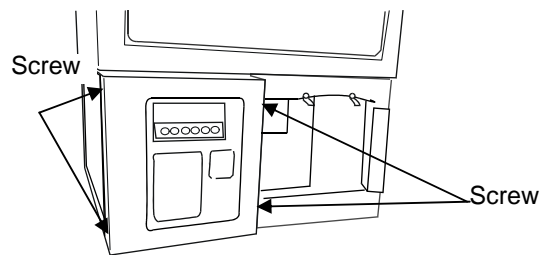


Fig. 2

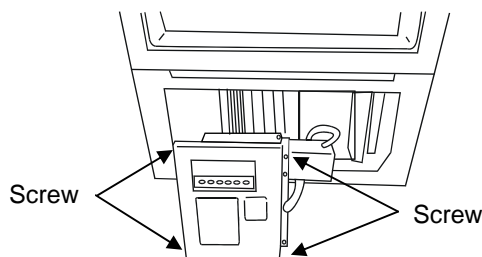


Fig. 3

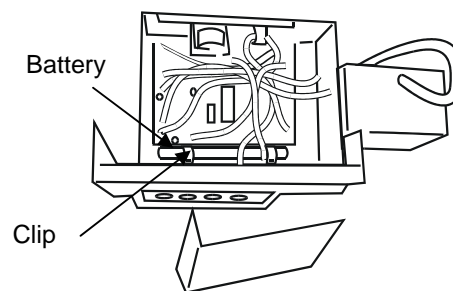


Fig. 4

RECYCLE OF NICKEL-CADMIUM BATTERY

MDF-U4086S, MDF-U5086W



The unit contains a rechargeable battery. The battery is recyclable. At the end of its useful life, check with your local solid officials option or proper disposal.



This product has an electric battery.

Please recycle it for effective utilization of resources and protection of our environment.

Thank you for your cooperation.

Label indication is obliged to comply with Taiwanese battery regulation.

1. Location of a nickel-cadmium battery

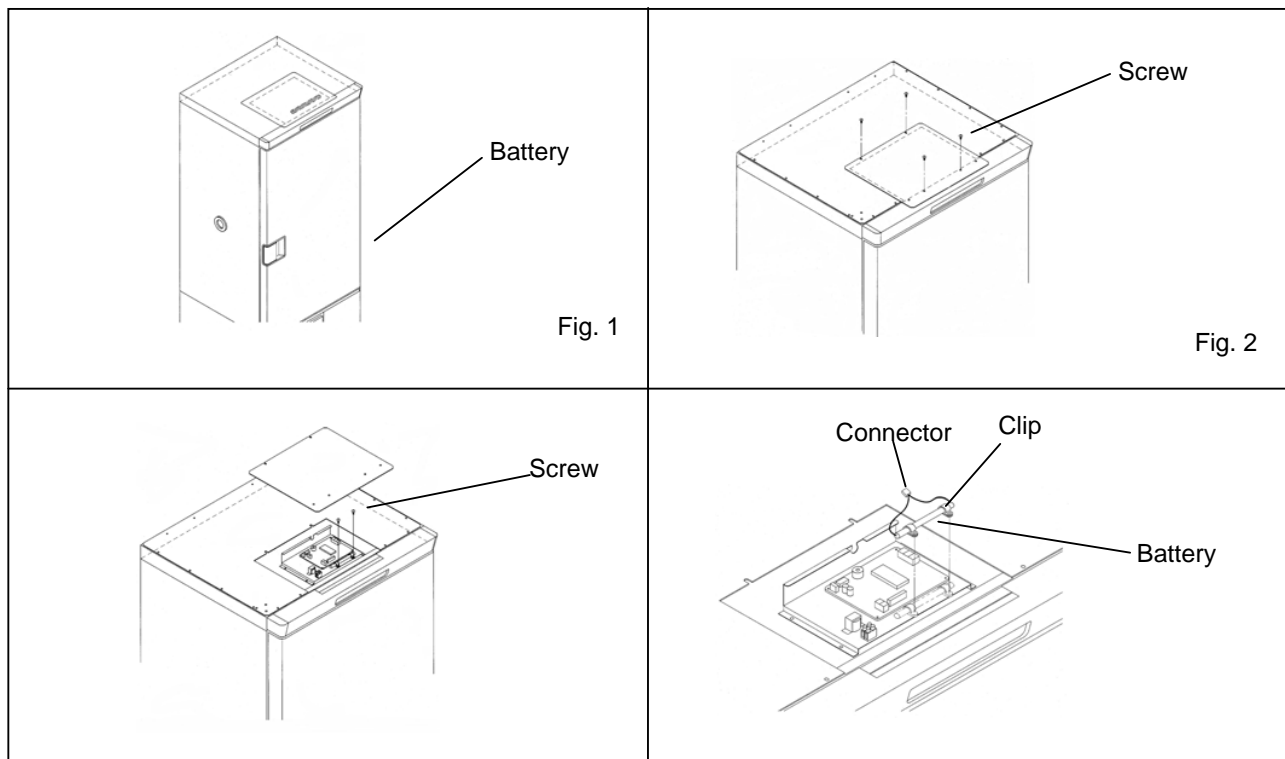
This unit is provided with a nickel-cadmium battery for the power failure and high temperature warning device. The battery is located near the temperature control device behind the control panel. (Fig. 1)

2. Removal of nickel-cadmium battery

- 1) Turn off the power switch and disconnect the power supply plug.
- 2) As shown in the Fig. 2, remove 4 screws fixing the control case cover by using a screw driver.
- 3) Remove 2 screws for 2 clips fixing the battery. (Fig. 3)
- 4) Disconnect the battery connector. (Fig. 4)
- 5) Take out the battery.

3. Handling of battery

Cover the battery terminal with an insulating tape to avoid the short circuit. Then follow the procedure for recycling or proper disposal.



RECYCLE OF NICKEL-CADMIUM BATTERY

MDF-U5186S



The unit contains a rechargeable battery. The battery is recyclable. At the end of its useful life, check with your local solid waste officials for proper disposal.



This product has an electric battery.

Please recycle it for effective utilization of resources and protection of our environment.

Thank you for your cooperation.

Label indication is obliged to comply with Taiwanese battery regulation.

1. Location of a nickel-cadmium battery

This unit is provided a nickel-cadmium battery for the power failure and temperature warning device.

The battery is located in the control box behind the control panel. (Fig. 1)

2. Removal of nickel-cadmium battery

1) Turn off the power switch and battery switch, and disconnect the power supply plug.

2) Remove 2 screws (A) fixing the grille to take off the grille. To remove the control panel assembly, remove 2 screws (B) and then remove 4 screws (C) fixing the assembly. (Fig. 2)

3) Loosen 2 screws (D) and then remove 1 screw (E) to slide off the control box cover. (Fig. 3)

4) Disconnect the battery connector and remove 2 screws (F) fixing the clips. (Fig. 4)

5) Take out the battery.

3. Handling of battery

Cover the battery terminal with an insulating tape to avoid the short circuit. Then follow the procedure for recycling or proper disposal.

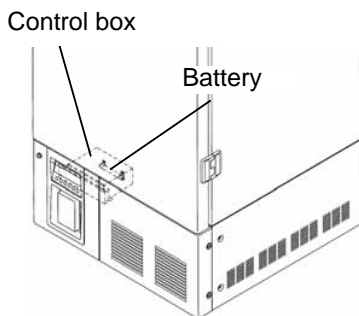


Fig. 1

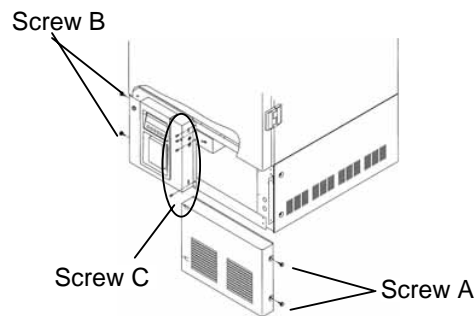


Fig. 2

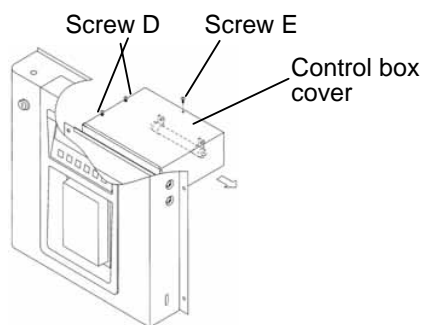


Fig. 3

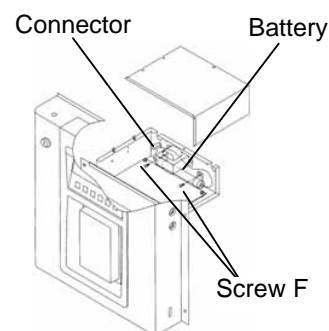


Fig. 4

DISPOSAL OF UNIT

WARNING

If the unit is to be stored unused in an unsupervised area for an extended period **ensure that children do not have access and doors cannot be closed completely.**

The disposal of the unit should be accomplished by appropriate personnel. Always remove doors to prevent accidents such as suffocation.

- When disposing of the freezer, always destroy the hinges and locks to make sure the door cannot be closed completely.
- Be especially careful not to dispose of the unit carelessly in locations where children may play.

SPECIFICATIONS

Name	Ultra-Low Temperature Freezer
Model	MDF-U2086S
External dimensions	W630 x D780 x H1880 (mm)
Internal dimensions	W370 x D490x H1200 (mm)
Effective capacity	216 L
Exterior	Acrylic finish baked on zinc galvanized steel
Interior	Acrylic finish baked on zinc galvanized steel
Door	Acrylic finish baked on zinc galvanized steel
Insulation	Rigid polyurethane foamed-in place (CFC-FREE)
Compressor	Hermetic type, Output; 750 W
Condenser	Fin and tube type
Evaporator	Tube on sheet type
Refrigerant	Mixed refrigerant (CFC-FREE)
Temperature controller	Microprocessor control system, 1 °C graduation (SR485 interface)
Temperature display	Digital display (+60 to -180 °C)
Sensor	Platinum resistance (Pt 1000)
Alarm	Buzzer, lamp (filter alarm ; lamp only), Remote alarm contact
Battery	For power failure alarm; Nickel-cadmium battery, 6VDC, 270mAh
Shelf	3 shelves
Caster	4 caster
Accessories	1 set of key, 2 rubber caps, 1 scraper
Weight	195 kg

Note: Design or specifications will be subject to change without notice.

The battery for power failure alarm is an article for consumption. It is recommended that the battery will be replaced about every 3 years. Contact Sanyo sales agency at the time of replacement of the battery for recycling.

PERFORMANCE

Model	MDF-U2086S			
Cooling performance	Center part of freezing room; -86°C (Ambient temperature; +30°C, no load)			
Control range	-20 to -90°C			
Power source	AC 220 V, 50 Hz	AC 220 V, 60 Hz	AC 230 V, 50 Hz	AC 240 V, 50 Hz
Rated power consumption	1150 W	1150 W	1150 W	1150 W
Noise level	50 dB (A scale)			
Maximum pressure	2706 kPa			

Note: The unit with CE mark complies with EC directives 89/336/EEC, 93/68/EEC and 73/23/EEC.

SPECIFICATIONS

Name	Ultra-low Temperature Freezer
Model	MDF-U3086S
External dimensions	W800 x D832 x H1810 (mm)
Internal dimensions	W520 x D517 x H1120 (mm)
Effective capacity	301 L
Exterior	Acrylic finish baked on galvanized steel
Interior	Acrylic finish baked on galvanized steel
Door	Acrylic finish baked on galvanized steel
Insulation	Rigid polyurethane foamed-in place (CFC-FREE)
Compressor	Hermetic type, High stage side; 400W, Low stage side; 600W
Condenser	High stage side; fin and tube type, Low stage side; shell and tube type
Evaporator	Tube on sheet type
Refrigerant	High stage side; R-407D, Low stage side; R-508 (TP5R3)
Temperature control	Microprocessor control system, 1°C graduation
Temperature display	Digital display (+50°C to -100°C)
Sensor	Platinum resistance (PT 100)
Alarm	Buzzer & lamp, (filter alarm: lamp only), Remote alarm contact
Battery	For power failure alarm; Nickel-cadmium battery, 6VDC, 270mAh
Shelf	6 shelves
Caster	4 casters.
Accessories	1 set of key, 2 rubber caps, 1 scraper, 24 shelf retainers
Weight	273 kg

Note: Design or specifications will be subject to change without notice.

The battery for power failure alarm is an article for consumption. It is recommended that the battery will be replaced about every 3 years. Contact Sanyo sales agency at the time of replacement of the battery for recycling.

PERFORMANCE

Model	MDF-U3086S					
Cooling performance	Center part of freezing room; -86°C(ambient temperature; 30°C, no load)					
Temperature control range	-20°C to -90°C					
Rated voltage	AC 110 V	AC 115 V	AC 220 V	AC 220 V	AC 230 V	AC 240 V
Rated frequency	60 Hz	60 Hz	60 Hz	50 Hz	50 Hz	50 Hz
Rated power consumption	826 W	826 W	785 W	826 W	785 W	785 W
Noise level	52 dB (A scale)					
Maximum pressure	1726 kPa					

Note :The unit with CE mark complies with EC directives 89/336/EEC, 93/68/EEC and 73/23/EEC.

SPECIFICATIONS

Name	Ultra-low Temperature Freezer
Model	MDF-U4086S
External dimensions	W870x D780x H1945 (mm)
Internal dimensions	W620 x D515 x H1200 (mm)
Effective capacity	382 L
Exterior	Acrylic finish baked on galvanized steel
Interior	Acrylic finish baked on galvanized steel
Door	Acrylic finish baked on galvanized steel
Insulation	Rigid polyurethane foamed-in place (CFC-FREE)
Compressor	Hermetic type, High stage side; 750W, Low stage side; 750W
Condenser	High stage side; fin and tube type, Low stage side; shell and tube type
Evaporator	Tube on sheet type
Refrigerant	High stage side; R-407D, Low stage side; R-508 (TP5R3)
Temperature control	Microprocessor control system, 1°C graduation
Temperature display	Digital display (+50°C to -100°C)
Sensor	Platinum resistance (PT 100)
Alarm	Buzzer & lamp, (filter alarm: lamp only), Remote alarm contact
Battery	For power failure alarm; Nickel-cadmium battery, 6VDC, 270mAh
Shelf	3 shelves
Caster	4 casters.
Accessories	1 set of key, 2 rubber caps, 1 scraper
Weight	286 kg

Note: Design or specifications will be subject to change without notice.

The battery for power failure alarm is an article for consumption. It is recommended that the battery will be replaced about every 3 years. Contact Sanyo sales agency at the time of replacement of the battery for recycling.

PERFORMANCE

Model	MDF-U4086S			
Cooling performance	Center part of freezing room; -86°C(ambient temperature; 30°C, no load)			
Temperature control range	-20°C to -90°C			
Power source	AC 220 V, 50 Hz	AC 220 V, 60 Hz	AC 230 V, 50Hz	AC 240 V, 50Hz
Rated power consumption	950W	1320W	950W	950W
Noise level	50 dB (A scale)			
Maximum pressure	1902 kPa			

Note : The unit with CE mark complies with EC directives 89/336/EEC, 93/68/EEC and 73/23/EEC.

SPECIFICATIONS

Name	Ultra-low Temperature Freezer
Model	MDF-U5086W
External dimensions	W1200 x D780 x H1880 (mm)
Internal dimensions	W930 x D490 x H1130 (mm)
Effective capacity	497 L
Exterior	Acrylic finish baked on galvanized steel
Interior	Acrylic finish baked on galvanized steel
Door	Acrylic finish baked on galvanized steel
Insulation	Rigid polyurethane foamed-in place (CFC-FREE)
Compressor	Hermetic type, High stage side; 750W, Low stage side; 1100W
Condenser	High stage side; fin and tube type, Low stage side; shell and tube type
Evaporator	Tube on sheet type
Refrigerant	High stage side; R-407D, Low stage side; R-508 (TP5R3)
Temperature control	Microprocessor control system, 1°C graduation
Temperature display	Digital display (+50°C to -100°C)
Sensor	Platinum resistance (PT 100)
Alarm	Buzzer & lamp, (filter alarm: lamp only), Remote alarm contact
Battery	For power failure alarm; Nickel-cadmium battery, 6VDC, 270mAh
Shelf	6 shelves
Caster	4 casters.
Accessories	1 set of key, 2 rubber caps, 1 scraper
Weight	353 kg

Note: Design or specifications will be subject to change without notice.

The battery for power failure alarm is an article for consumption. It is recommended that the battery will be replaced about every 3 years. Contact Sanyo sales agency at the time of replacement of the battery for recycling.

PERFORMANCE

Model	MDF-U5086W			
Cooling performance	Center part of freezing room; -86°C(ambient temperature; 30°C, no load)			
Temperature control range	-20°C to -90°C			
Power source	AC 220 V, 50 Hz	AC 220 V, 60 Hz	AC 230 V, 50Hz	AC 240 V, 50Hz
Rated power consumption	1160W	1450W	1160W	1160W
Noise level	58 dB (A scale)			
Maximum pressure	1550 kPa			

Note :The unit with CE mark complies with EC directives 89/336/EEC, 93/68/EEC and 73/23/EEC.

SPECIFICATIONS

Name	Ultra-low Temperature Freezer
Model	MDF-U5186S
External dimensions	W900 x D900 x H2010 (mm)
Internal dimensions	W640 x D625 x H1300 (mm)
Effective capacity	518 L
Exterior	Acrylic finish baked on galvanized steel
Interior	Acrylic finish baked on galvanized steel
Door	Acrylic finish baked on galvanized steel
Insulation	Rigid polyurethane foamed-in place (CFC-FREE)
Compressor	Hermetic type, High stage side; 750W, Low stage side; 1100W
Condenser	High stage side; fin and tube type, Low stage side; shell and tube type
Evaporator	Tube on sheet type
Refrigerant	High stage side; R-407D, Low stage side; R-508 (TP5R3)
Temperature control	Microprocessor control system, 1°C graduation
Temperature display	Digital display (+50°C to -100°C)
Sensor	Platinum resistance (PT 100)
Alarm	Buzzer & lamp, (filter alarm: lamp only), Remote alarm contact
Battery	For power failure alarm; Nickel-cadmium battery, 6VDC, 270mAh
Shelf	3 shelves
Caster	4 casters.
Accessories	1 set of key, 2 rubber caps, 1 scraper, 24 shelf retainers
Weight	287 kg

Note: Design or specifications will be subject to change without notice.

The battery for power failure alarm is an article for consumption. It is recommended that the battery will be replaced about every 3 years. Contact Sanyo sales agency at the time of replacement of the battery for recycling.

PERFORMANCE

Model	MDF-U5186S			
Cooling performance	Center part of freezing room; -86°C(ambient temperature; 30°C, no load)			
Temperature control range	-20°C to -90°C			
Power source	AC 220 V, 50 Hz	AC 220 V, 60 Hz	AC 230 V, 50Hz	AC 240 V, 50Hz
Rated power consumption	1065W	1310W	1065W	1065W
Noise level	56 dB (A scale)			
Maximum pressure	1872 kPa			

Note :The unit with CE mark complies with EC directives 89/336/EEC, 93/68/EEC and 73/23/EEC.

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