NO.	R003-746
ISSUED:	DEC. 11, 2007
REVISED:	DEC. 1, 2008

HOSHIZAKI
COMMERCIAL REFRIGERATOR/FREEZER

MODEL HRE-70B(-F)
HRE-140B(-F)
HFE-70B
HFE-140B

SERVICE MANUAL

CONTENTS

PAGE

I. GENERAL INFORMATION

1. SAFETY INSTRUCTIONS

The following instructions contain important safety precautions and should be strictly observed. The terms used here are defined as follows:

WARNING: There is a possibility of death or serious injury to the service person and a third party or the user due to improper service operations or defects in serviced products.

CAUTION: There is a possibility of injury to the service person and a third party or the user or damage to their property* due to improper service operations or defects in serviced products.

* The term “damage to their property” here refers to extensive damage to household effects, houses and pets.

WARNING

1. Always ask the user to keep children away from the work area. They may be injured by tools or disassembled products.

2. When there is no need to energize the unit during disassembly or cleaning, be sure to unplug the unit or disconnect the main power supply before servicing the unit to prevent electric shocks.

3. If the unit must be energized for inspection of the electric circuit, use rubber gloves to avoid contact with any live parts resulting in electric shocks.

4. Keep the following in mind when servicing the refrigeration circuit:

   (1) Be sure to recover the refrigerant. Do not discharge it into the atmosphere. It will affect the environment.

   (2) Check for any flames in the vicinity, and ensure good ventilation.

   (3) If the refrigerant should leak in servicing, immediately put out any fire used in the vicinity.

   (4) When unbrazing the refrigeration circuit connections, check that the circuit is completely evacuated. The refrigerant may produce a poisonous gas when coming in contact with an open flame.

   (5) Do not braze in an enclosed room to prevent carbon monoxide poisoning.

   (6) In case of a refrigerant leak, locate and repair the leaking part completely before recharging the refrigerant and checking for further leaks. If the leaking part cannot

be located, be sure to check again for further leaks after recharging the refrigerant. Leaked refrigerant may produce a poisonous gas when coming in contact with an open flame of a gas cooking stove or a fan heater.

(7) Before servicing, check the surface temperature of the refrigeration circuit to prevent a burn.

5. Keep the following in mind when making electrical connections:

(1) Check for proper earth connections, and repair if necessary to prevent electric shocks.

(2) Always use service parts intended for the applicable model for replacement of defective parts. Use proper tools to secure the wiring. Otherwise abnormal operation or trouble may occur and cause electric leaks or fire.

(3) Check for proper part installations, wiring conditions and soldered or solderless terminal connections to avoid fire, heat or electric shocks.

(4) Be sure to replace damaged or deteriorated power cords and lead wires to prevent fire, heat or electric shocks.

(5) Cut-off lead wires must be bound using closed end connectors or the like, with their closed ends up to avoid entrance of moisture that could lead to electric leaks or fire.

(6) After servicing, always use a megohmmeter (500V DC) to check for the insulation resistance of at least 1 megohm between the live part (attachment plug) and the dead metal part (earth terminal).

(7) Do not service the electrical parts with wet hands to prevent electric shocks.

(8) The capacitors used for the compressor and other components may be under high voltage and should be discharged properly before servicing.

CAUTION

1. After servicing, follow the instructions below:

(1) Always check the unit for proper operation before finishing services.

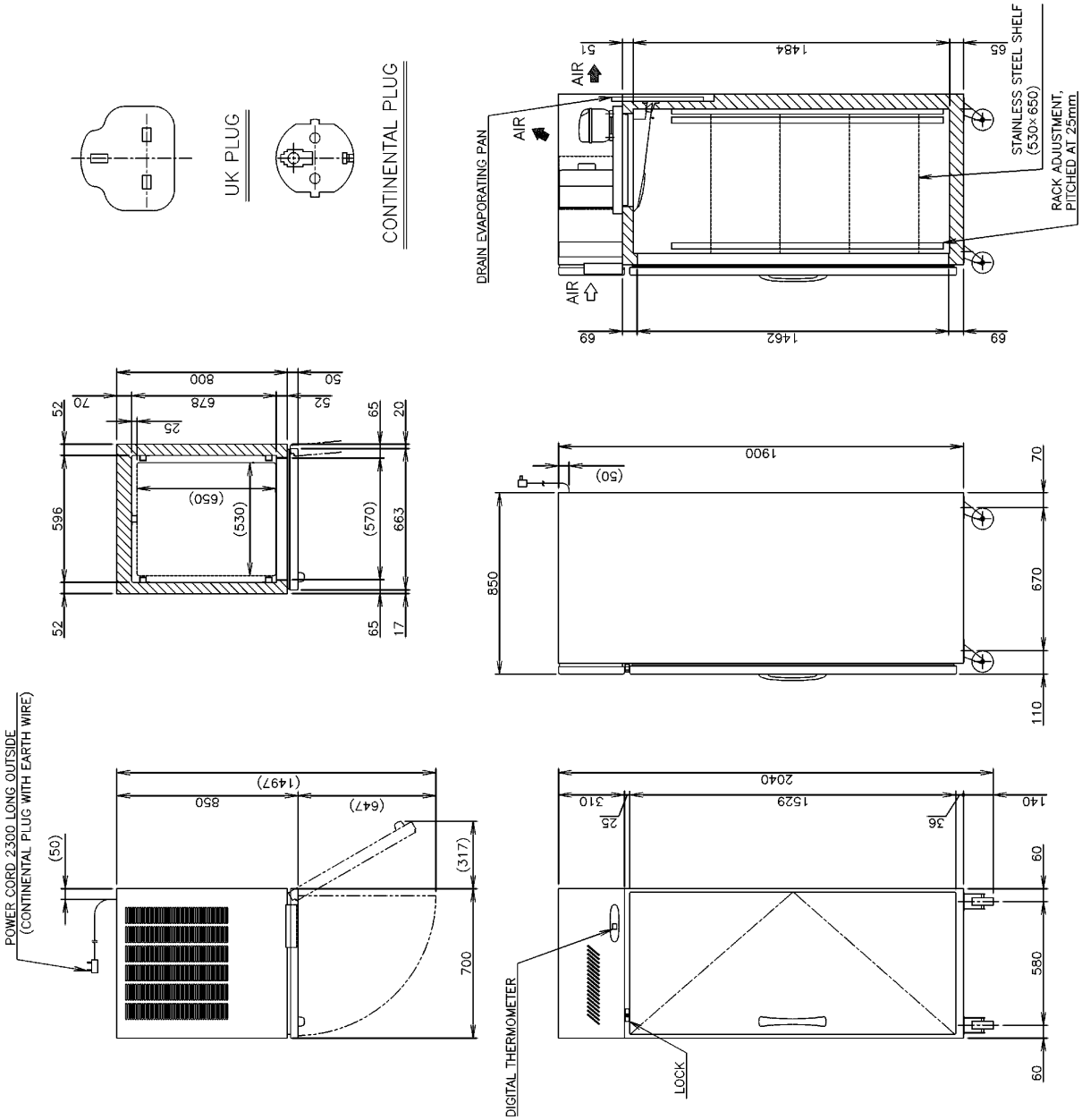
(2) Be sure to reassemble the parts completely. Loose assembly of such parts as control box cover may cause entrance of vermins resulting in a short circuit between terminals and possible ignition.

2. DIMENSIONS/SPECIFICATIONS

[a] HRE-70B

ITEM	Hoshizaki Commercial Refrigerator
MODEL	HRE-70B
POWER SUPPLY	1 Phase 230V 50Hz Capacity: 0.82kVA (3.60A)
AMPERAGE	Rated: 2.06A Starting: 8.2A
ELECTRIC CONSUMPTION	348W (Power Factor: 73%) (Except Drain Pan Heater 150W) Heater: 169W Defrost: 169W
HEAT REJECTION	535W
POWER CORD	2.3m (Continental Plug with Earth Wire)
EFFECTIVE CAPACITY	631L
OUTSIDE DIMENSIONS	700mm(W)×850mm(D)×2040mm(H)
INSIDE DIMENSIONS	596mm(W)×678mm(D)×1484mm(H)
EXTERIOR	Stainless Steel, Galvanized Steel(Rear, Bottom)
INTERIOR	Stainless Steel
INSULATION	Polyurethane Foam
REFRIGERATION SYSTEM	Forced Air Circulation Interior Fan DC12V 4W×1
DEFROST SYSTEM	Off-Cycle
COMPRESSOR	Hermetic 150W
CONDENSER	Fin and Tube type(10 tubes high 2 rows deep) Fan Motor 8W
EVAPORATOR	Fin and Tube type(4 tubes high 7 rows deep)
REFRIGERANT	R134a/160g
TEMPERATURE CONTROL	Microprocessor (Digital Temp. Indication) Adjustable from 0 to 16°C
DEFROST CONTROL	Microprocessor
ELECTRIC CIRCUIT PROTECTION	Earth Wire, Circuit Breaker
REFRIGERANT CIRCUIT PROTECTION	Motor Protector (Auto-reset)
DRAIN EVAPORATING PAN	Stainless Steel, 150W
CASTER	Urethane (100mm DIA, 140mm high)
WEIGHT	116kg (Gross 131kg)
PACKAGE	Carton (Wooden Pallet) 750mm(W)×940mm(D)×2100mm(H)
ACCESSORIES	Power Cord(UK Plug)
OPERATING CONDITIONS	Ambient Temperature: 5 – 43°C Voltage Range: Rated Voltage ±10%

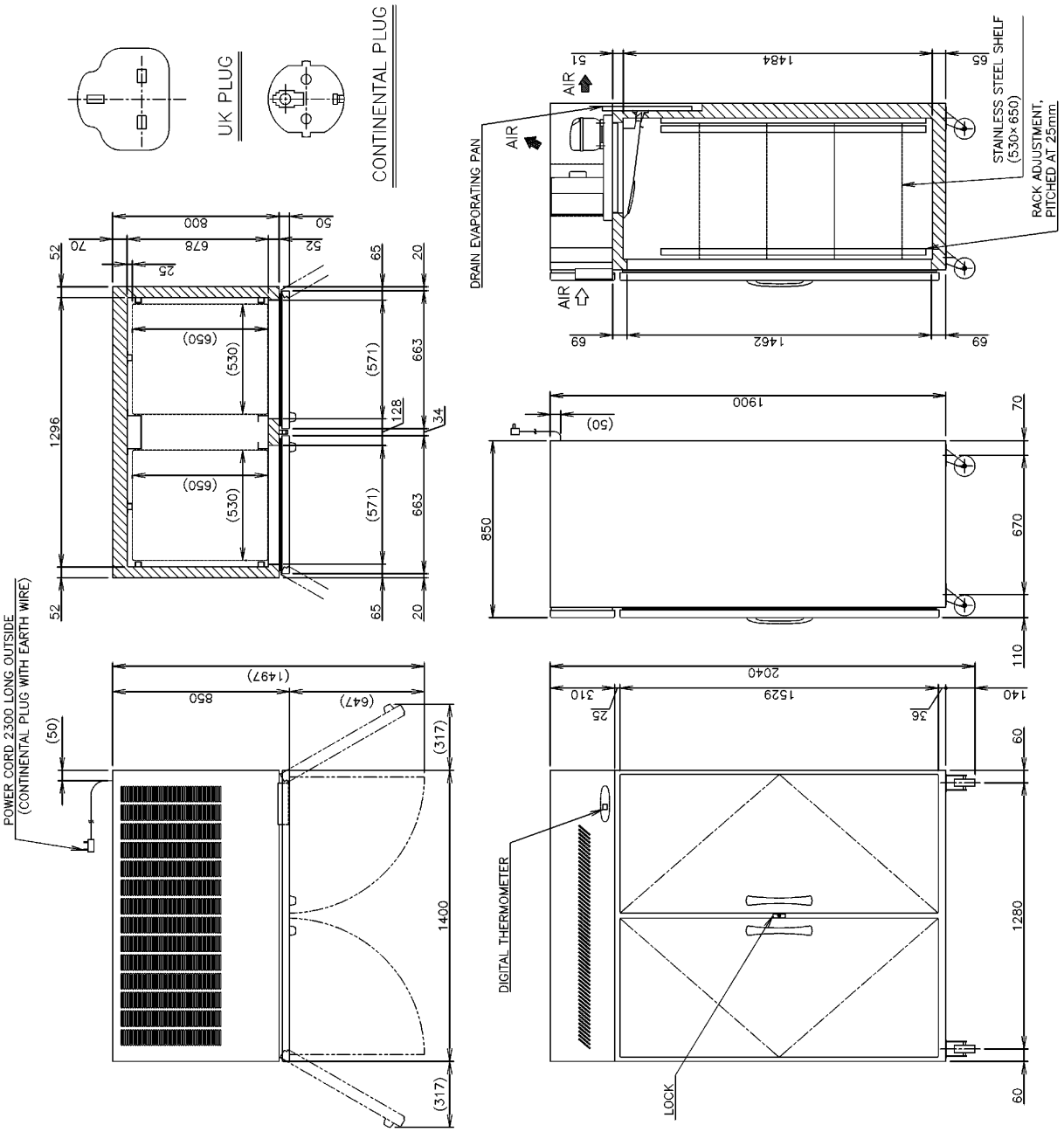
1. Install the product properly in accordance with the instructions on location, water supply/drain connections and electrical connections stated in the instruction and installation manuals provided.
   Allow 10mm extra space at the installation site to meet any installation requirements (additional spacing is also required for proper air flow and water connections).
2. The heat rejection is based on the reached pulldown temperature at ambient temperature of 43°C.
3. The drain pan may overflow if the door is opened frequently or under highly humid conditions in the rainy or summer season.



[b] HRE-140B

ITEM	Hoshizaki Commercial Refrigerator
MODEL	HRE-140B
POWER SUPPLY	1 Phase 230V 50Hz Capacity: 0.86kVA (3.80A)
AMPERAGE	Rated: 2.89A Starting: 12.6A
ELECTRIC CONSUMPTION	501W (Power Factor: 75%) (Except Drain Pan Heater 150W) Heater: 190W Defrost: 190W
HEAT REJECTION	940W
POWER CORD	2.3m (Continental Plug with Earth Wire)
EFFECTIVE CAPACITY	1379L
OUTSIDE DIMENSIONS	1400mm(W)×850mm(D)×2040mm(H)
INSIDE DIMENSIONS	1296mm(W)×678mm(D)×1484mm(H)
EXTERIOR	Stainless Steel, Galvanized Steel(Rear, Bottom)
INTERIOR	Stainless Steel
INSULATION	Polyurethane Foam
REFRIGERATION SYSTEM	Forced Air Circulation Interior Fan DC12V 4W×2
DEFROST SYSTEM	Off-Cycle
COMPRESSOR	Hermetic 350W
CONDENSER	Fin and Tube type(10 tubes high 3 rows deep) Fan Motor 8W
EVAPORATOR	Fin and Tube type(4 tubes high 7 rows deep)
REFRIGERANT	R134a/220g
TEMPERATURE CONTROL	Microprocessor (Digital Temp. Indication) Adjustable from 0 to 16°C
DEFROST CONTROL	Microprocessor
ELECTRIC CIRCUIT PROTECTION	Earth Wire, Circuit Breaker
REFRIGERANT CIRCUIT PROTECTION	Motor Protector (Auto-reset)
DRAIN EVAPORATING PAN	Stainless Steel, 150W
CASTER	Urethane (100mm DIA, 140mm high)
WEIGHT	164kg (Gross 189kg)
PACKAGE	Carton (Wooden Pallet) 1450mm(W)×940mm(D)×2100mm(H)
ACCESSORIES	Power Cord(UK Plug)
OPERATING CONDITIONS	Ambient Temperature: 5 – 43°C Voltage Range: Rated Voltage ±10%

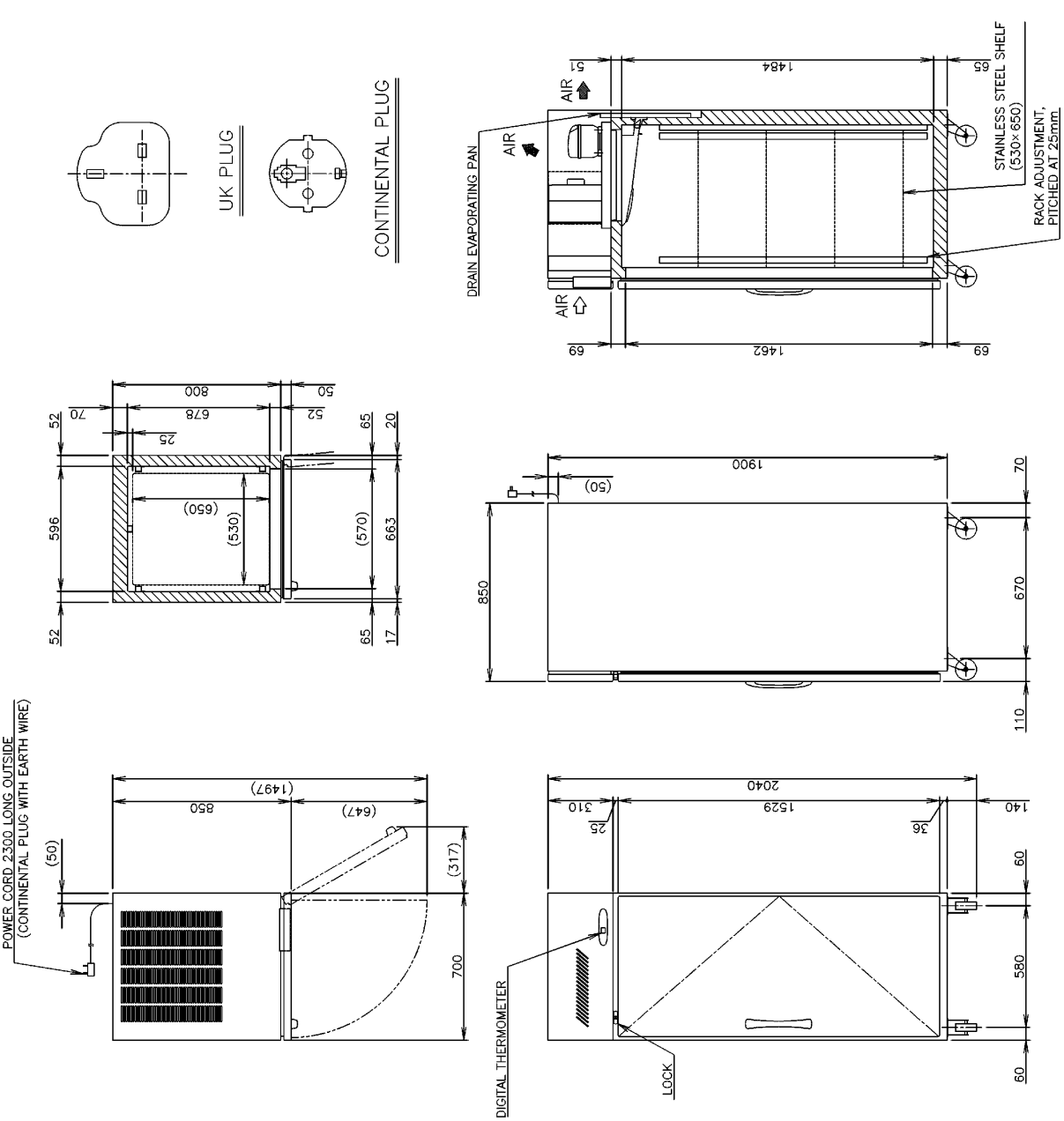
1. Install the product properly in accordance with the instructions on location, water supply/ drain connections and electrical connections stated in the instruction and installation manuals provided.
   Allow 10mm extra space at the installation site to meet any installation requirements (additional spacing is also required for proper air flow and water connections).
2. The heat rejection is based on the reached pulldown temperature at ambient temperature of 43°C.
3. The drain pan may overflow if the door is opened frequently or under highly humid conditions in the rainy or summer season.



[c] HFE-70B

ITEM	Hoshizaki Commercial Freezer
MODEL	HFE-70B
POWER SUPPLY	1 Phase 230V 50Hz Capacity: 1.04kVA (4.60A)
AMPERAGE	Rated: 3.51A Starting: 14.8A
ELECTRIC CONSUMPTION	572W (Power Factor: 71%) (Except Drain Pan Heater 150W) Heater: 469W Defrost: 469W
HEAT REJECTION	735W
POWER CORD	2.3m (Continental Plug with Earth Wire)
EFFECTIVE CAPACITY	631L
OUTSIDE DIMENSIONS	700mm(W)×850mm(D)×2040mm(H)
INSIDE DIMENSIONS	596mm(W)×678mm(D)×1484mm(H)
EXTERIOR	Stainless Steel, Galvanized Steel(Rear, Bottom)
INTERIOR	Stainless Steel
INSULATION	Polyurethane Foam
REFRIGERATION SYSTEM	Forced Air Circulation Interior Fan DC12V 4W×2
DEFROST SYSTEM	Heater
COMPRESSOR	Hermetic 600W
CONDENSER	Fin and Tube type(10 tubes high 4 rows deep) Fan Motor 8W
EVAPORATOR	Fin and Tube type(4 tubes high 7 rows deep)
REFRIGERANT	R404A/250g
TEMPERATURE CONTROL	Microprocessor (Digital Temp. Indication) Adjustable from -25 to -7°C
DEFROST CONTROL	Microprocessor
ELECTRIC CIRCUIT PROTECTION	Earth Wire, Circuit Breaker
REFRIGERANT CIRCUIT PROTECTION	Motor Protector (Auto-reset),Pressure switch
DRAIN EVAPORATING PAN	Stainless Steel, 150W
CASTER	Urethane (100mm DIA, 140mm high)
WEIGHT	116kg (Gross 131kg)
PACKAGE	Carton (Wooden Pallet) 750mm(W)×940mm(D)×2100mm(H)
ACCESSORIES	Power Cord(UK Plug)
OPERATING CONDITIONS	Ambient Temperature: 5 – 43° C Voltage Range: Rated Voltage ±10%

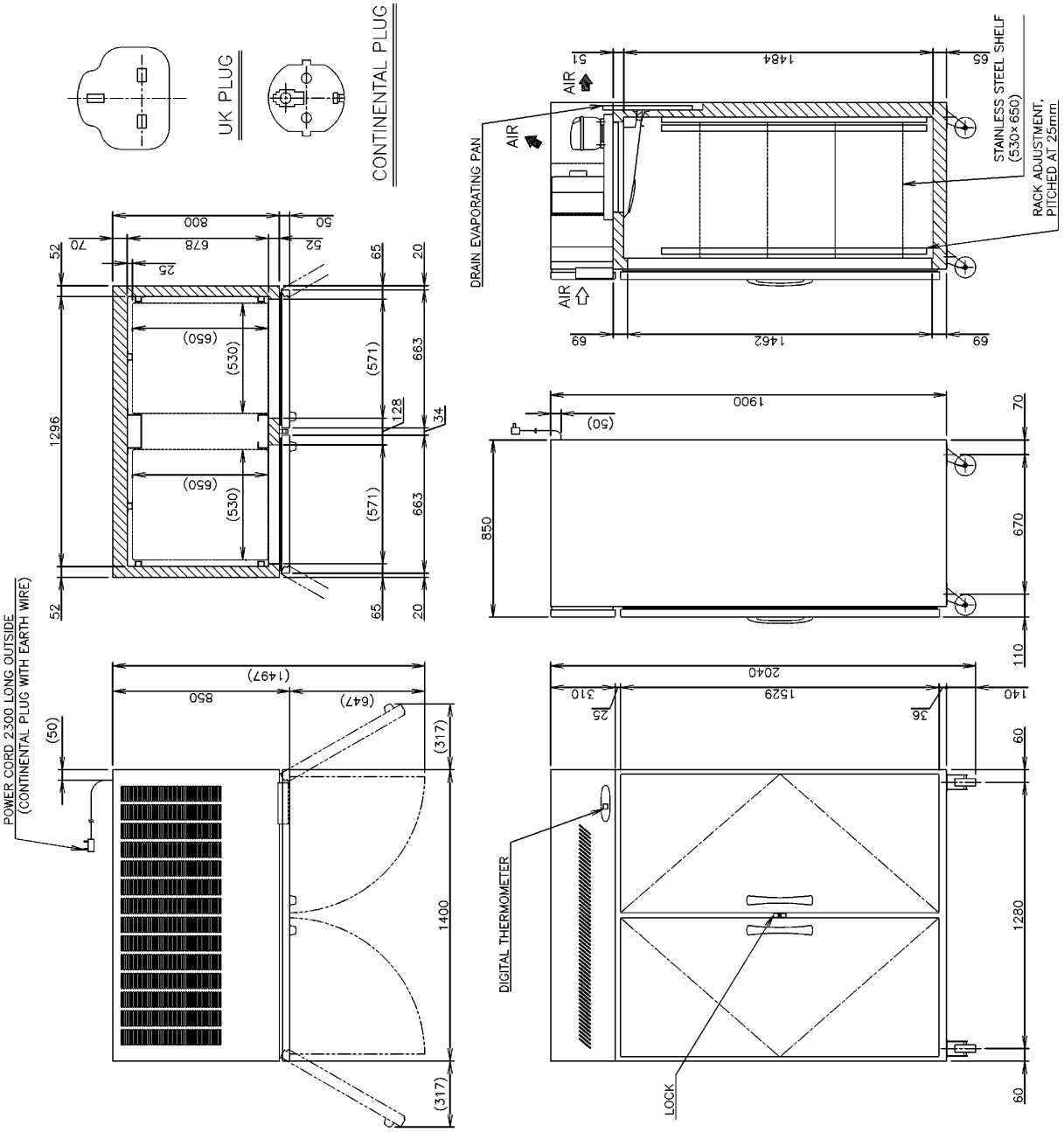
1. Install the product properly in accordance with the instructions on location, water supply/ drain connections and electrical connections stated in the instruction and installation manuals provided.
   Allow 10mm extra space at the installation site to meet any installation requirements (additional spacing is also required for proper air flow and water connections).
2. The heat rejection is based on the reached pulldown temperature at ambient temperature of 43° C.
3. The drain pan may overflow if the door is opened frequently or under highly humid conditions in the rainy or summer season.



[d] HFE-140B

ITEM	Hoshizaki Commercial Freezer
MODEL	HFE-140B
POWER SUPPLY	1 Phase 230V 50Hz Capacity: 1.26kVA (5.5A)
AMPERAGE	Rated: 3.79A Starting: 20.0A
ELECTRIC CONSUMPTION	723W (Power Factor: 83%) (Except Drain Pan Heater 150W) Heater: 651W Defrost: 651W
HEAT REJECTION	1330W
POWER CORD	2.3m (Continental Plug with Earth Wire)
EFFECTIVE CAPACITY	1372L
OUTSIDE DIMENSIONS	1400mm(W)×850mm(D)×2040mm(H)
INSIDE DIMENSIONS	1296mm(W)×678mm(D)×1484mm(H)
EXTERIOR	Stainless Steel, Galvanized Steel(Rear, Bottom)
INTERIOR	Stainless Steel
INSULATION	Polyurethane Foam
REFRIGERATION SYSTEM	Forced Air Circulation Interior Fan DC12V 4W×3
DEFROST SYSTEM	Heater
COMPRESSOR	Hermetic 700W
CONDENSER	Fin and Tube type(10 tubes high 3 rows deep) Fan Motor 8W×2
EVAPORATOR	Fin and Tube type(4 tubes high 7 rows deep)
REFRIGERANT	R404A/350g
TEMPERATURE CONTROL	Microprocessor (Digital Temp. Indication) Adjustable from -25 to -7°C
DEFROST CONTROL	Microprocessor
ELECTRIC CIRCUIT PROTECTION	Earth Wire, Circuit Breaker
REFRIGERANT CIRCUIT PROTECTION	Motor Protector (Auto-reset),Pressure switch
DRAIN EVAPORATING PAN	Stainless Steel, 150W
CASTER	Urethane (100mm DIA, 140mm high)
WEIGHT	174kg (Gross 199kg)
PACKAGE	Carton (Wooden Pallet) 1450mm(W)×940mm(D)×2100mm(H)
ACCESSORIES	Power Cord(UK Plug)
OPERATING CONDITIONS	Ambient Temperature: 5 – 43°C Voltage Range: Rated Voltage ±10%

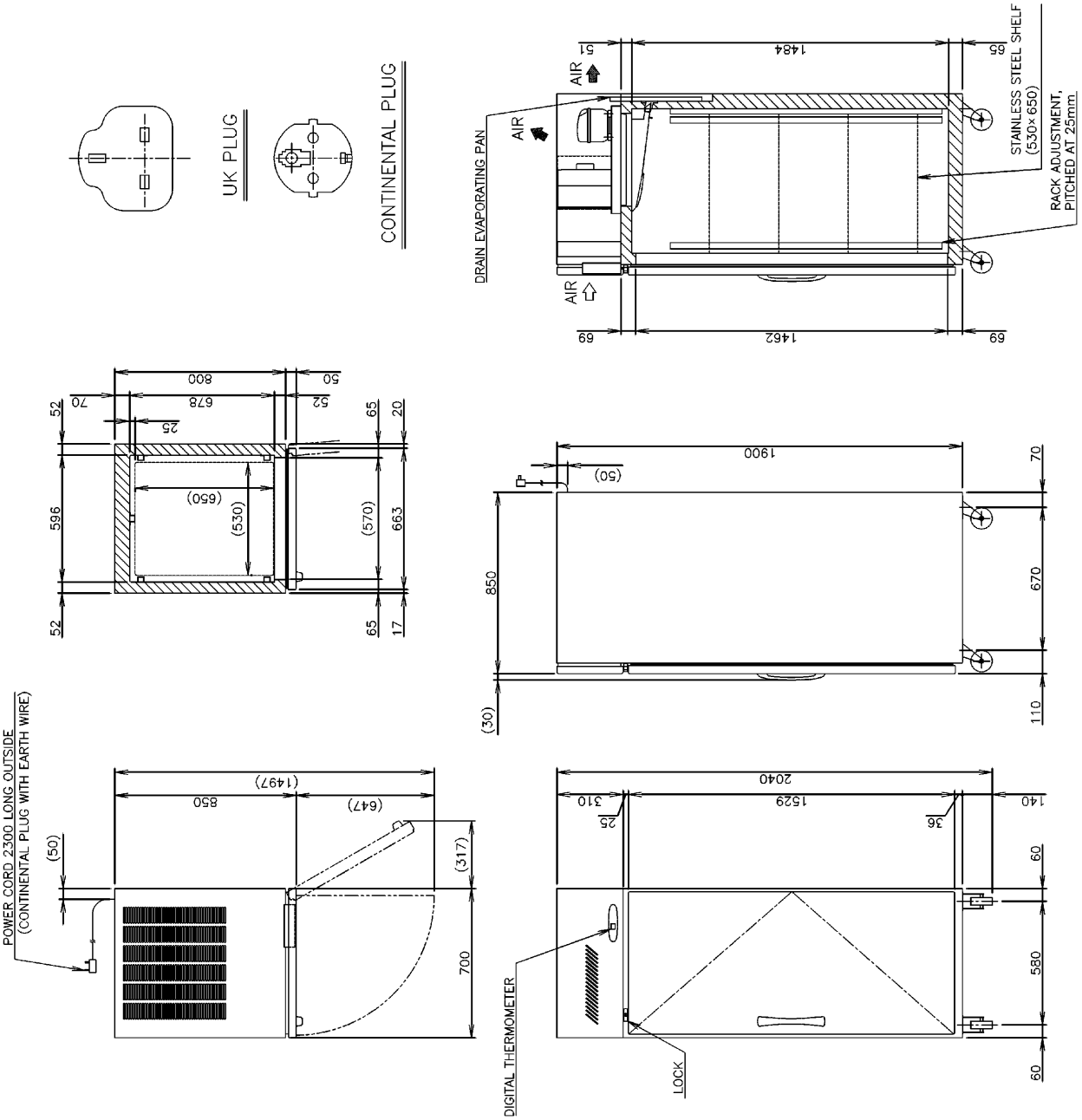
1. Install the product properly in accordance with the instructions on location, water supply/ drain connections and electrical connections stated in the instruction and installation manuals provided.
   Allow 10mm extra space at the installation site to meet any installation requirements (additional spacing is also required for proper air flow and water connections).
2. The heat rejection is based on the reached pulldown temperature at ambient temperature of 43°C.
3. The drain pan may overflow if the door is opened frequently or under highly humid conditions in the rainy or summer season.



[e] HRE-70B-F

ITEM	Hoshizaki Reach-in Refrigerator
MODEL	HRE-70B-F
POWER SUPPLY	1 Phase 230V 50Hz Capacity: 0.82kVA (3.60A)
AMPERAGE	Rated: 2.06A Starting: 8.2A
ELECTRIC CONSUMPTION	348W (Power Factor: 73%) (Except Drain Pan Heater 170W) Heater: 439W Defrost: 439W
HEAT REJECTION	535W
POWER CORD	2.3m (Continental Plug with Earth Wire)
EFFECTIVE CAPACITY	631L
OUTSIDE DIMENSIONS	700mm(W)×850mm(D)×2040mm(H)
INSIDE DIMENSIONS	596mm(W)×678mm(D)×1484mm(H)
EXTERIOR	Stainless Steel, Galvanized Steel(Rear, Bottom)
INTERIOR	Stainless Steel
INSULATION	Polyurethane Foam
REFRIGERATION SYSTEM	Forced Air Circulation Interior Fan DC12V 4W×1
DEFROST SYSTEM	Heater
COMPRESSOR	Hermetic 150W
CONDENSER	Fin and Tube type(10 tubes high 2 rows deep) Fan Motor 8W
EVAPORATOR	Fin and Tube type(4 tubes high 7 rows deep)
REFRIGERANT	R134a/160g
TEMPERATURE CONTROL	Microprocessor (Digital Temp. Indication) Adjustable from -6 to 12° C
DEFROST CONTROL	Microprocessor
ELECTRIC CIRCUIT PROTECTION	Earth Wire, Circuit Breaker
REFRIGERANT CIRCUIT PROTECTION	Motor Protector (Auto-reset)
DRAIN EVAPORATING PAN	Stainless Steel, 170W
CASTER	Urethane (100mm DIA, 140mm high)
WEIGHT	116kg (Gross 131kg)
PACKAGE	Carton (Wooden Pallet) 750mm(W)×940mm(D)×2100mm(H)
ACCESSORIES	Power Cord(UK Plug)
OPERATING CONDITIONS	Ambient Temperature: 5 – 43° C Voltage Range: Rated Voltage ± 10%

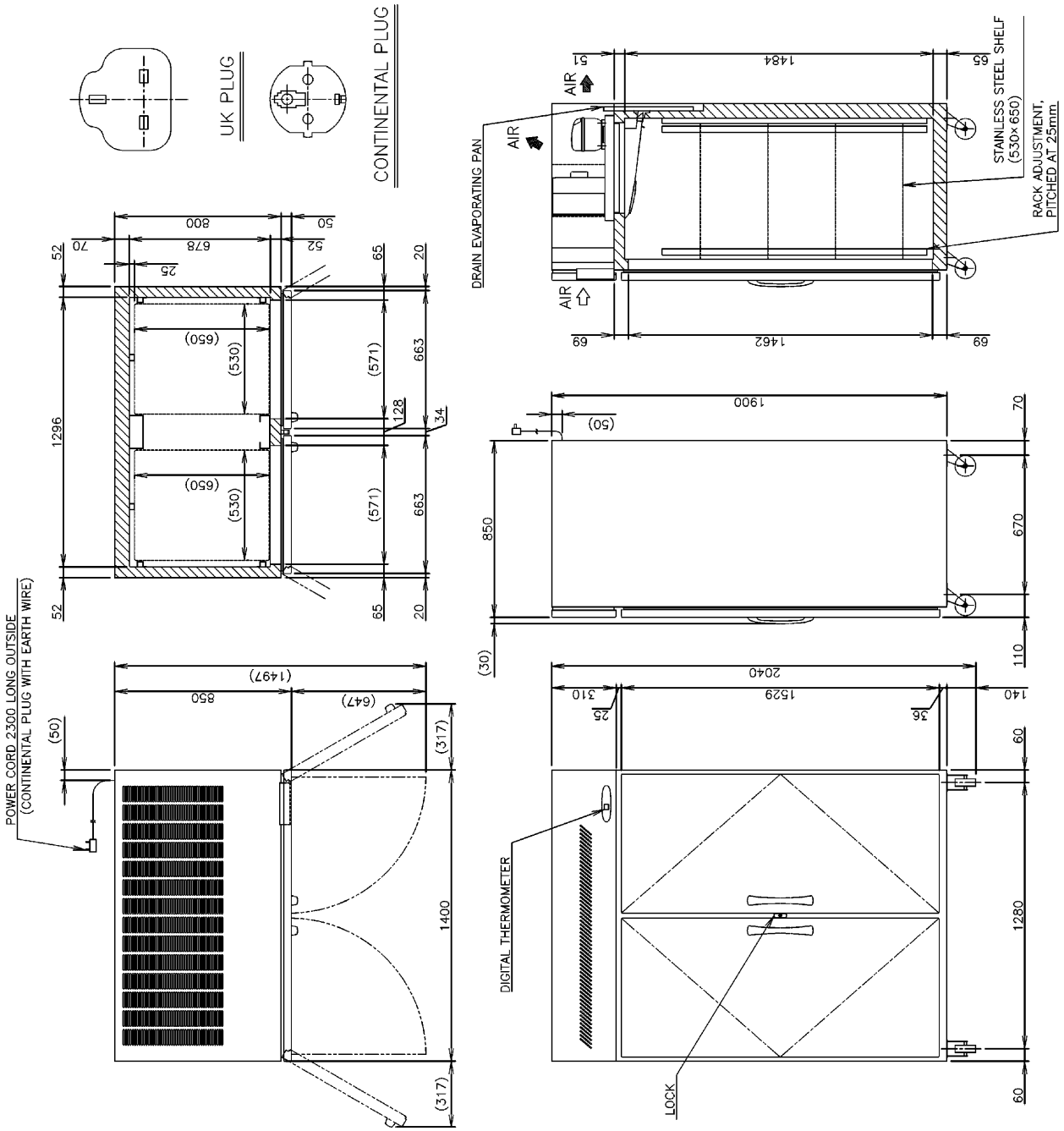
1. Install the product properly in accordance with the instructions on location, water supply/drain connections and electrical connections stated in the instruction and installation manuals provided.
   Allow 10mm extra space at the installation site to meet any installation requirements (additional spacing is also required for proper air flow and water connections).
2. The heat rejection is based on the reached pulldown temperature at ambient temperature of 43° C.
3. The drain pan may overflow if the door is opened frequently or under highly humid conditions in the rainy or summer season.



[f] HRE-140B-F

ITEM	Hoshizaki Reach-in Refrigerator
MODEL	HRE-140B-F
POWER SUPPLY	1 Phase 230V 50Hz Capacity: 0.86kVA (3.80A)
AMPERAGE	Rated: 2.89A Starting: 12.6A
ELECTRIC CONSUMPTION	501W (Power Factor: 75%) (Except Drain Pan Heater 170W) Heater: 460W Defrost: 460W
HEAT REJECTION	940W
POWER CORD	2.3m (Continental Plug with Earth Wire)
EFFECTIVE CAPACITY	1379L
OUTSIDE DIMENSIONS	1400mm(W)×850mm(D)×2040mm(H)
INSIDE DIMENSIONS	1296mm(W)×678mm(D)×1484mm(H)
EXTERIOR	Stainless Steel, Galvanized Steel(Rear, Bottom)
INTERIOR	Stainless Steel
INSULATION	Polyurethane Foam
REFRIGERATION SYSTEM	Forced Air Circulation Interior Fan DC12V 4W×2
DEFROST SYSTEM	Heater
COMPRESSOR	Hermetic 350W
CONDENSER	Fin and Tube type(10 tubes high 3 rows deep) Fan Motor 8W
EVAPORATOR	Fin and Tube type(4 tubes high 7 rows deep)
REFRIGERANT	R134a/220g
TEMPERATURE CONTROL	Microprocessor (Digital Temp. Indication) Adjustable from -6 to 12°C
DEFROST CONTROL	Microprocessor
ELECTRIC CIRCUIT PROTECTION	Earth Wire, Circuit Breaker
REFRIGERANT CIRCUIT PROTECTION	Motor Protector (Auto-reset)
DRAIN EVAPORATING PAN	Stainless Steel, 170W
CASTER	Urethane (100mm DIA, 140mm high)
WEIGHT	164kg (Gross 189kg)
PACKAGE	Carton (Wooden Pallet) 1450mm(W)×940mm(D)×2100mm(H)
ACCESSORIES	Power Cord(UK Plug)
OPERATING CONDITIONS	Ambient Temperature: 5 – 43° C Voltage Range: Rated Voltage ± 10%

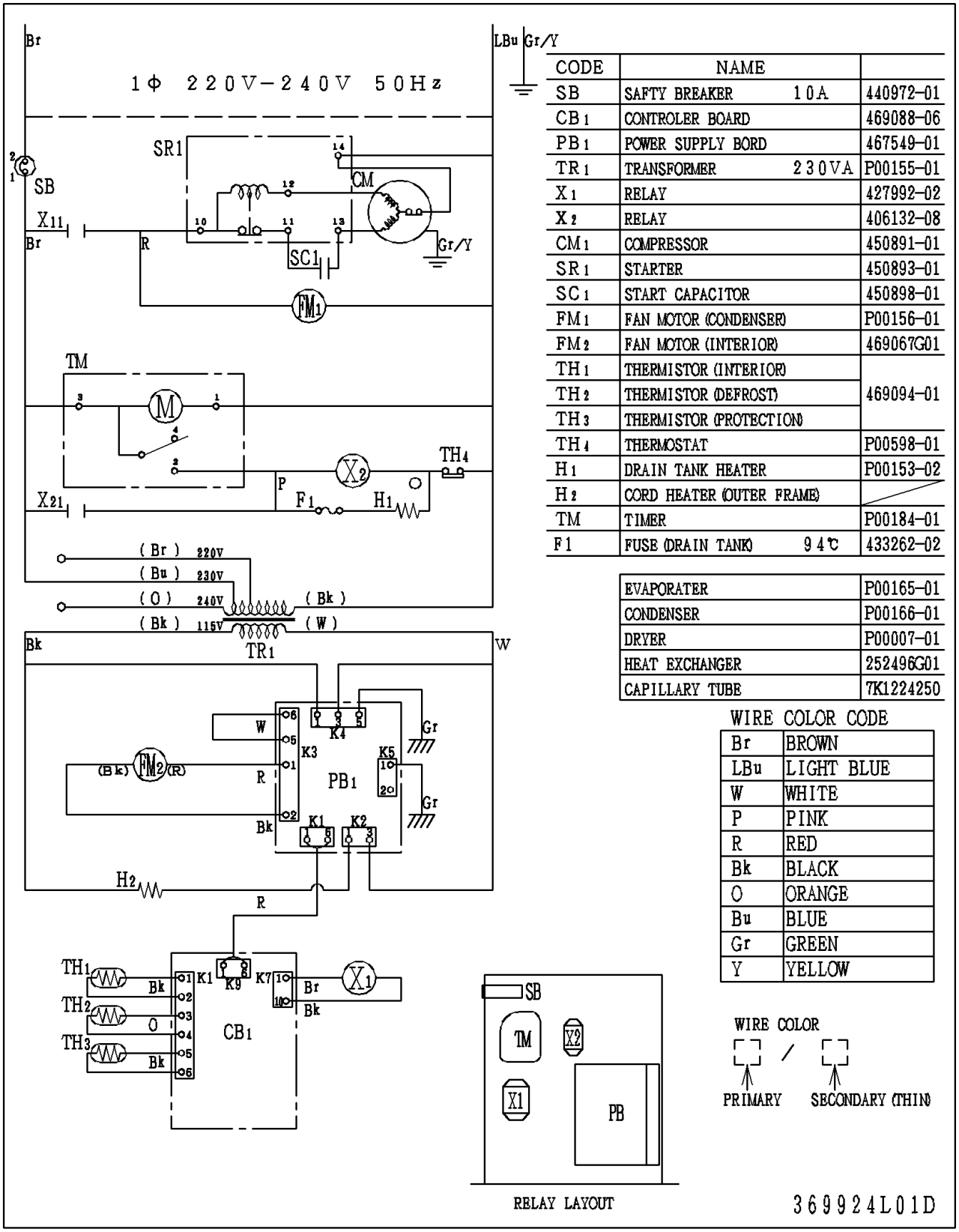
1. Install the product properly in accordance with the instructions on location, water supply/drain connections and electrical connections stated in the instruction and installation manuals provided.
   Allow 10mm extra space at the installation site to meet any installation requirements (additional spacing is also required for proper air flow and water connections).
2. The heat rejection is based on the reached pulldown temperature at ambient temperature of 43° C.
3. The drain pan may overflow if the door is opened frequently or under highly humid conditions in the rainy or summer season.



II. TECHNICAL INFORMATION

1. WIRING DIAGRAM

[a] HRE-70B



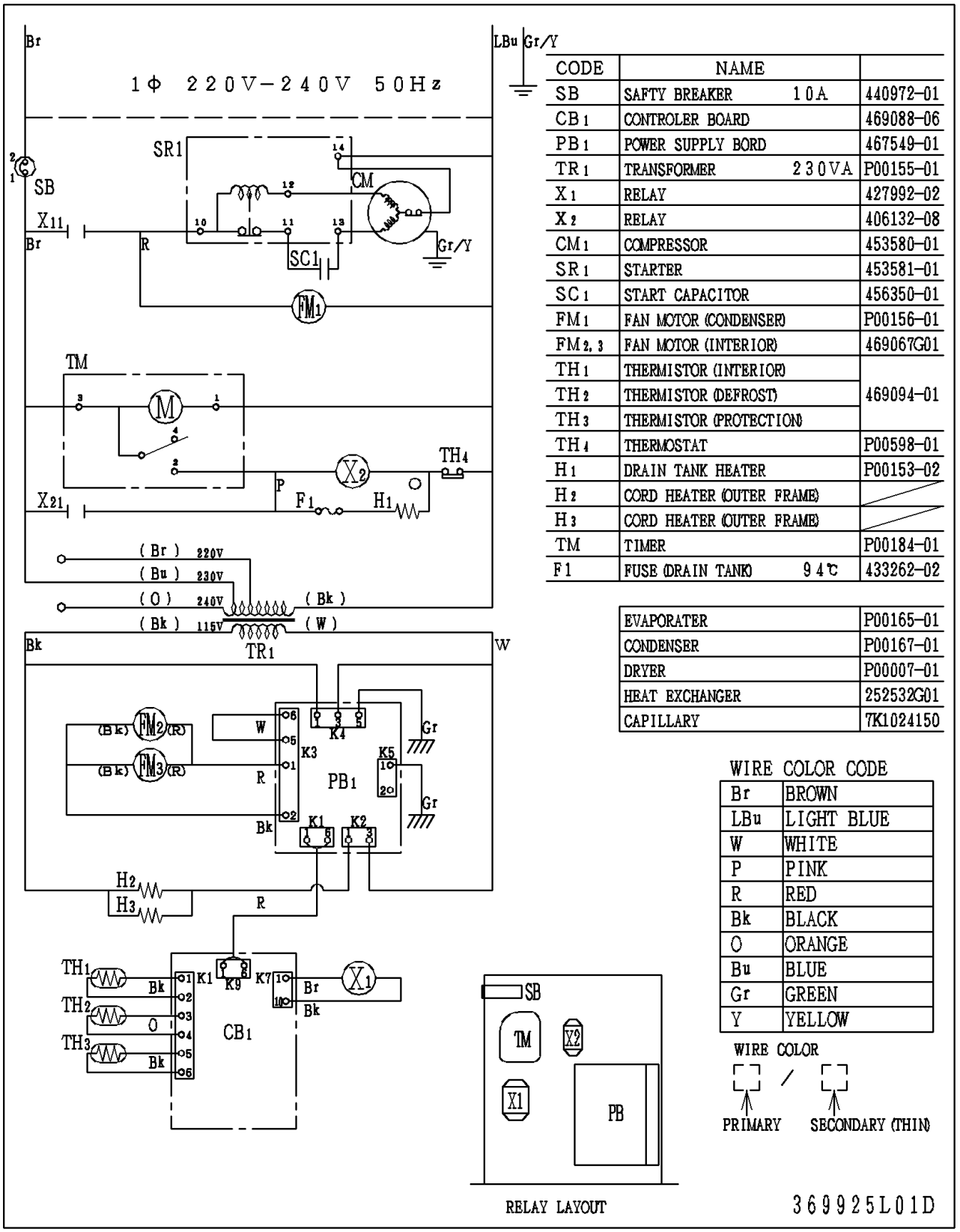
CODE	NAME	
SB	SAFTY BREAKER 10A	440972-01
CB1	CONTROLER BOARD	469088-06
PB1	POWER SUPPLY BORD	467549-01
TR1	TRANSFORMER 230VA	P00155-01
X1	RELAY	427992-02
X2	RELAY	406132-08
CM1	COMPRESSOR	450891-01
SR1	STARTER	450893-01
SC1	START CAPACITOR	450898-01
FM1	FAN MOTOR (CONDENSER)	P00156-01
FM2	FAN MOTOR (INTERIOR)	469067G01
TH1	THERMISTOR (INTERIOR)	469094-01
TH2	THERMISTOR (DEFROST)	
TH3	THERMISTOR (PROTECTION)	
TH4	THERMOSTAT	P00598-01
H1	DRAIN TANK HEATER	P00153-02
H2	CORD HEATER (OUTER FRAME)	
TM	TIMER	P00184-01
F1	FUSE (DRAIN TANK) 94℃	433262-02

EVAPORATER	P00165-01
CONDENSER	P00166-01
DRYER	P00007-01
HEAT EXCHANGER	252496G01
CAPILLARY TUBE	7K1224250

WIRE COLOR CODE

Br	BROWN
LBu	LIGHT BLUE
W	WHITE
P	PINK
R	RED
Bk	BLACK
O	ORANGE
Bu	BLUE
Gr	GREEN
Y	YELLOW

[b] HRE-140B



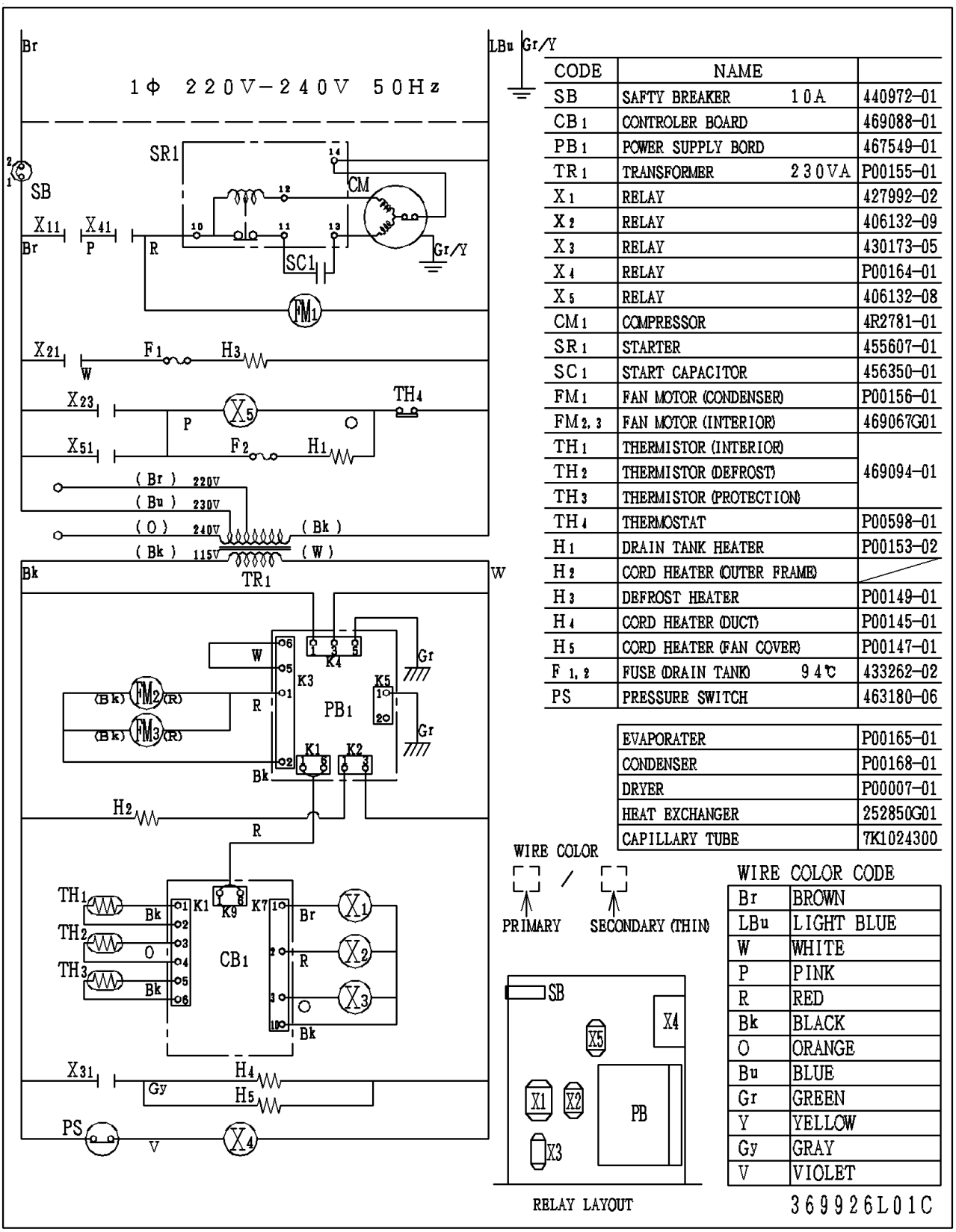
CODE	NAME	
SB	SAFTY BREAKER 10A	440972-01
CB1	CONTROLER BOARD	469088-06
PB1	POWER SUPPLY BORD	467549-01
TR1	TRANSFORMER 230VA	P00155-01
X1	RELAY	427992-02
X2	RELAY	406132-08
CM1	COMPRESSOR	453580-01
SR1	STARTER	453581-01
SC1	START CAPACITOR	456350-01
FM1	FAN MOTOR (CONDENSER)	P00156-01
FM2, 3	FAN MOTOR (INTERIOR)	469067G01
TH1	THERMISTOR (INTERIOR)	469094-01
TH2	THERMISTOR (DEFROST)	
TH3	THERMISTOR (PROTECTION)	
TH4	THERMOSTAT	P00598-01
H1	DRAIN TANK HEATER	P00153-02
H2	CORD HEATER (OUTER FRAME)	
H3	CORD HEATER (OUTER FRAME)	
TM	TIMER	P00184-01
F1	FUSE (DRAIN TANK) 94℃	433262-02

EVAPORATER	P00165-01
CONDENSER	P00167-01
DRYER	P00007-01
HEAT EXCHANGER	252532G01
CAPILLARY	7K1024150

WIRE COLOR CODE

Br	BROWN
LBu	LIGHT BLUE
W	WHITE
P	PINK
R	RED
Bk	BLACK
O	ORANGE
Bu	BLUE
Gr	GREEN
Y	YELLOW

[c] HFE-70B



CODE	NAME	
SB	SAFTY BREAKER 10A	440972-01
CB1	CONTROLER BOARD	469088-01
PB1	POWER SUPPLY BORD	467549-01
TR1	TRANSFORMER 230VA	P00155-01
X1	RELAY	427992-02
X2	RELAY	406132-09
X3	RELAY	430173-05
X4	RELAY	P00164-01
X5	RELAY	406132-08
CM1	COMPRESSOR	4R2781-01
SR1	STARTER	455607-01
SC1	START CAPACITOR	456350-01
FM1	FAN MOTOR (CONDENSER)	P00156-01
FM2, 3	FAN MOTOR (INTERIOR)	469067G01
TH1	THERMISTOR (INTERIOR)	469094-01
TH2	THERMISTOR (DEFROST)	
TH3	THERMISTOR (PROTECTION)	
TH4	THERMOSTAT	P00598-01
H1	DRAIN TANK HEATER	P00153-02
H2	CORD HEATER (OUTER FRAME)	
H3	DEFROST HEATER	P00149-01
H4	CORD HEATER (DUCT)	P00145-01
H5	CORD HEATER (FAN COVER)	P00147-01
F 1, 2	FUSE (DRAIN TANK) 94℃	433262-02
PS	PRESSURE SWITCH	463180-06

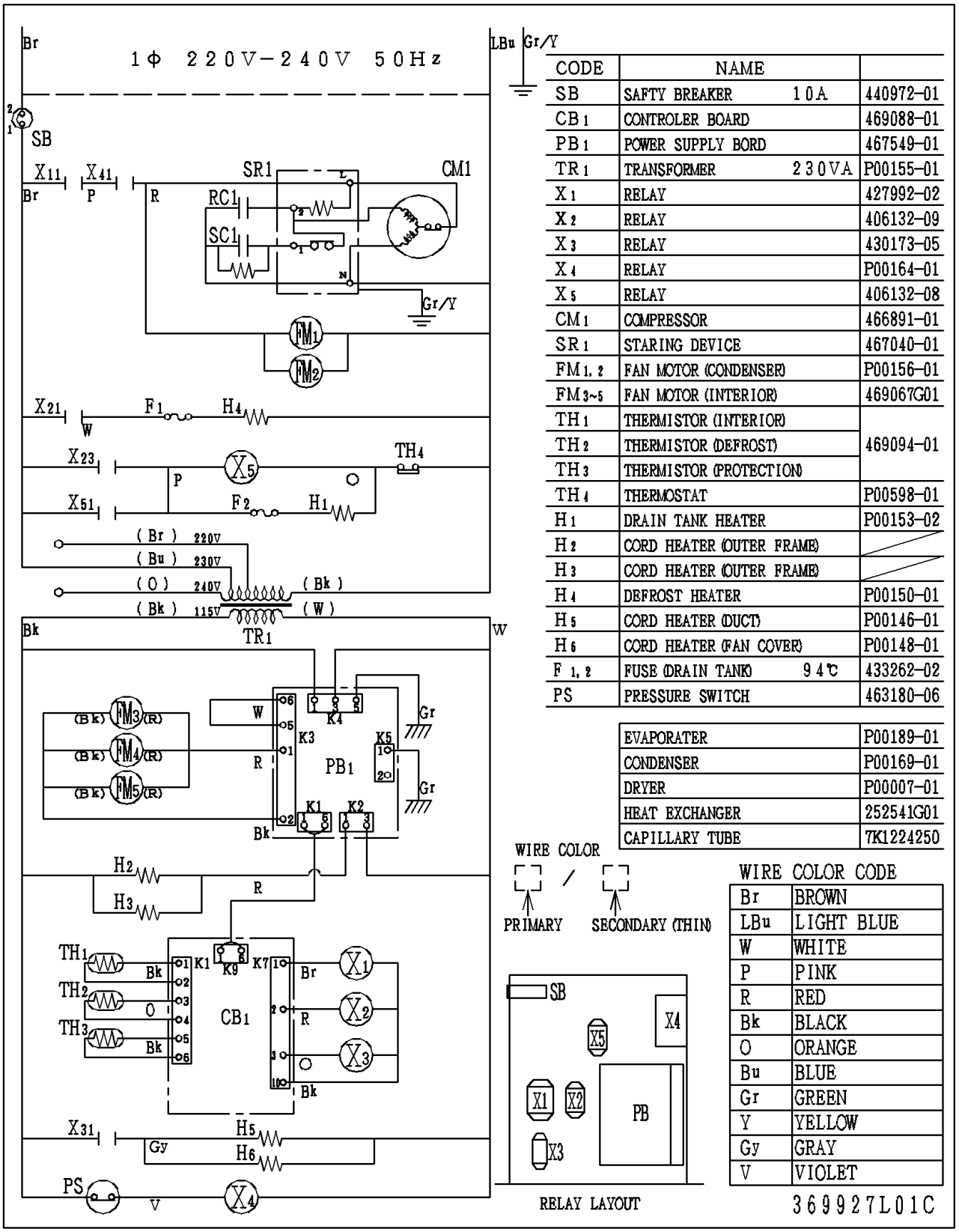
EVAPORATER	P00165-01
CONDENSER	P00168-01
DRYER	P00007-01
HEAT EXCHANGER	252850G01
CAPILLARY TUBE	7K1024300

WIRE COLOR CODE

Br	BROWN
LBu	LIGHT BLUE
W	WHITE
P	PINK
R	RED
Bk	BLACK
O	ORANGE
Bu	BLUE
Gr	GREEN
Y	YELLOW
Gy	GRAY
V	VIOLET

369926L01C

[d] HFE-140B



CODE	NAME	
SB	SAFTY BREAKER 10A	440972-01
CB1	CONTROLER BOARD	469088-01
PB1	POWER SUPPLY BORD	467549-01
TR1	TRANSFORMER 230VA	P00155-01
X1	RELAY	427992-02
X2	RELAY	406132-09
X3	RELAY	430173-05
X4	RELAY	P00164-01
X5	RELAY	406132-08
CM1	COMPRESSOR	466891-01
SR1	STARING DEVICE	467040-01
FM1, 2	FAN MOTOR (CONDENSER)	P00156-01
FM3~5	FAN MOTOR (INTERIOR)	469067G01
TH1	THERMISTOR (INTERIOR)	469094-01
TH2	THERMISTOR (DEFROST)	
TH3	THERMISTOR (PROTECTION)	
TH4	THERMOSTAT	P00598-01
H1	DRAIN TANK HEATER	P00153-02
H2	CORD HEATER (OUTER FRAME)	
H3	CORD HEATER (OUTER FRAME)	
H4	DEFROST HEATER	P00150-01
H5	CORD HEATER (DUCT)	P00146-01
H6	CORD HEATER (FAN COVER)	P00148-01
F 1, 2	FUSE (DRAIN TANK) 94℃	433262-02
PS	PRESSURE SWITCH	463180-06

EVAPORATER	P00189-01
CONDENSER	P00169-01
DRYER	P00007-01
HEAT EXCHANGER	252541G01
CAPILLARY TUBE	7K1224250

WIRE COLOR

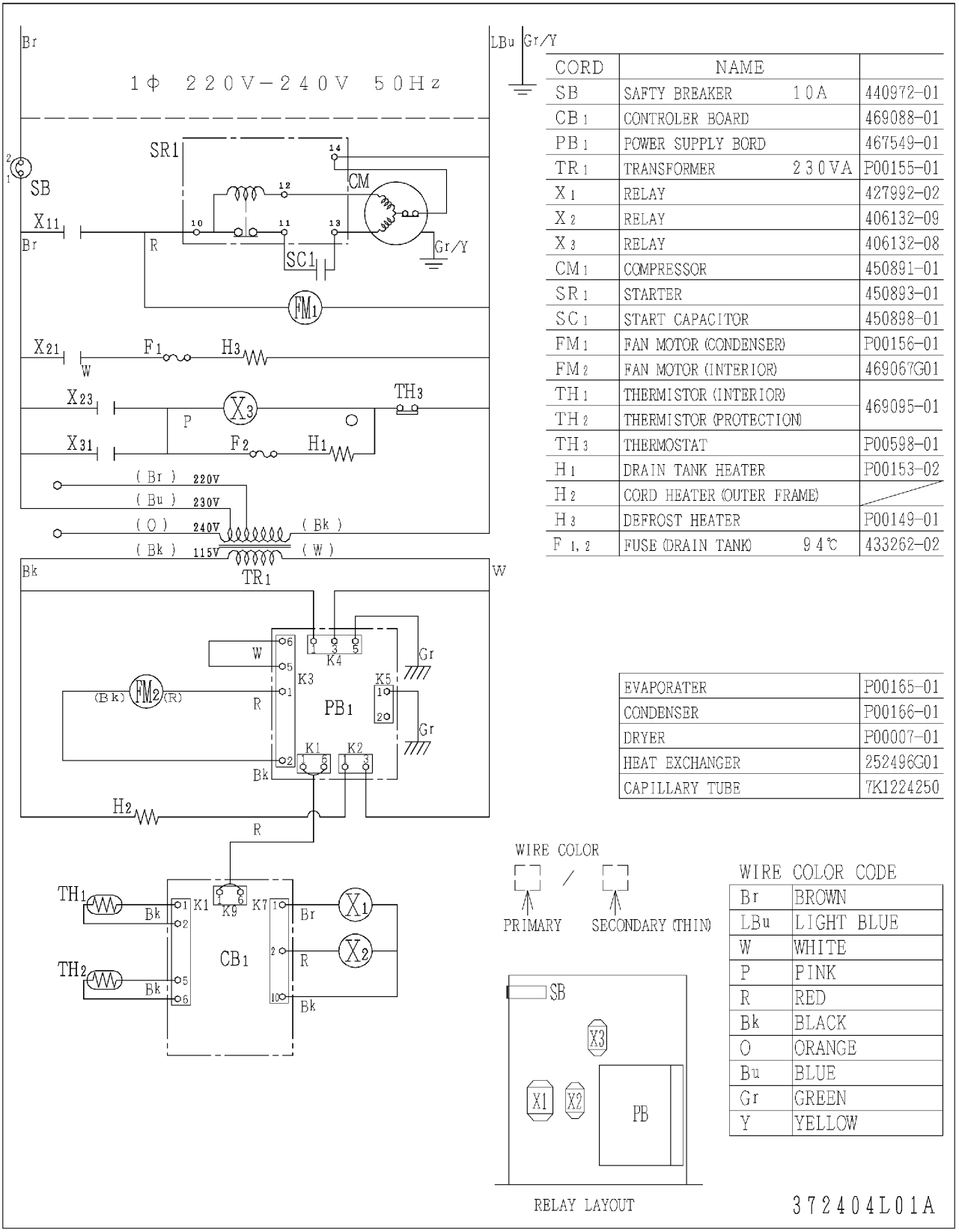
PRIMARY / SECONDARY (THIN)

WIRE COLOR CODE

Br	BROWN
LBu	LIGHT BLUE
W	WHITE
P	PINK
R	RED
Bk	BLACK
O	ORANGE
Bu	BLUE
Gr	GREEN
Y	YELLOW
Gy	GRAY
V	VIOLET

369927L01C

[e] HRE-70B-F

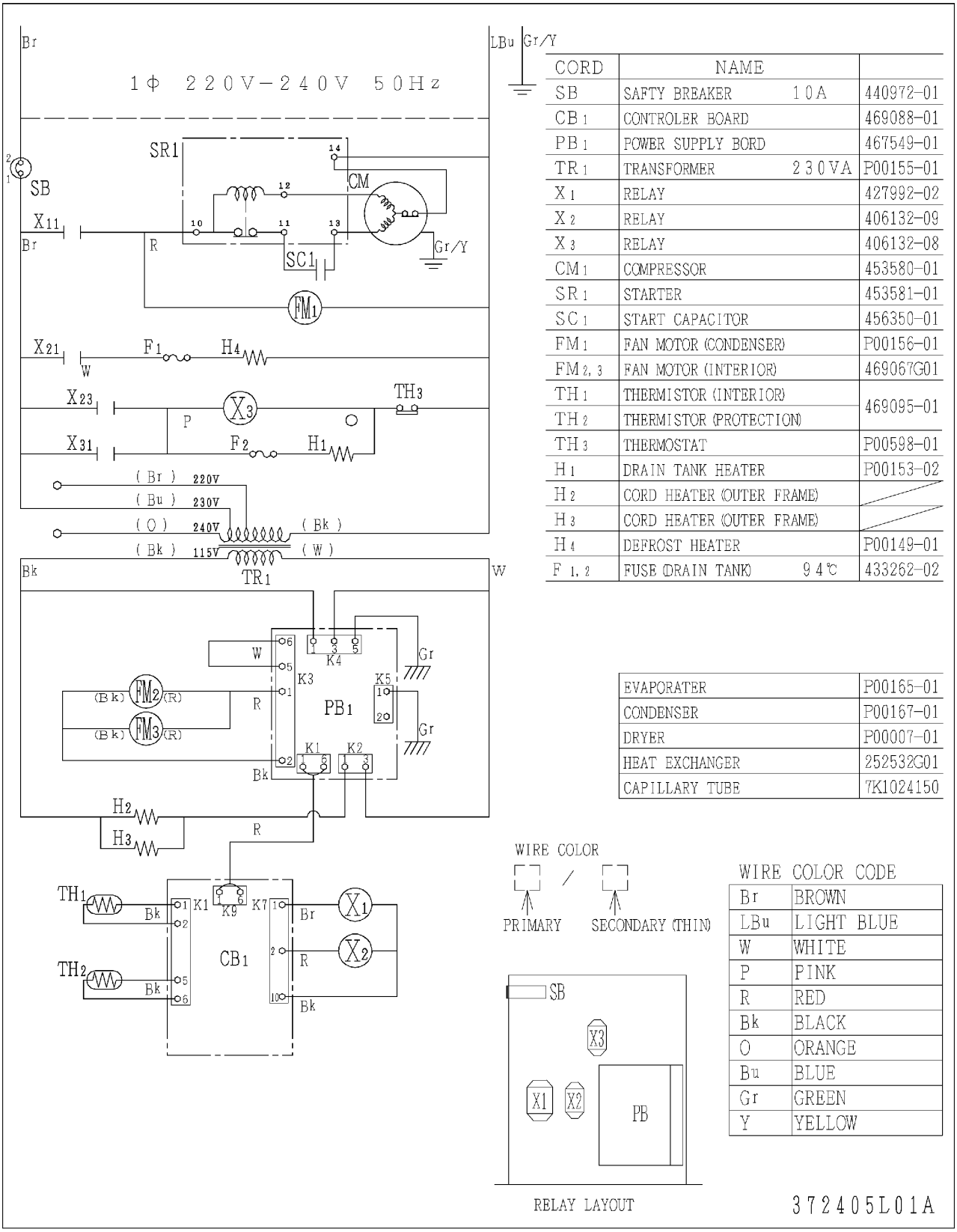


CORD	NAME	
SB	SAFTY BREAKER 10A	440972-01
CB1	CONTROLER BOARD	469088-01
PB1	POWER SUPPLY BORD	467549-01
TR1	TRANSFORMER 230VA	P00155-01
X1	RELAY	427992-02
X2	RELAY	406132-09
X3	RELAY	406132-08
CM1	COMPRESSOR	450891-01
SR1	STARTER	450893-01
SC1	START CAPACITOR	450898-01
FM1	FAN MOTOR (CONDENSER)	P00156-01
FM2	FAN MOTOR (INTERIOR)	469067G01
TH1	THERMISTOR (INTERIOR)	469095-01
TH2	THERMISTOR (PROTECTION)	
TH3	THERMOSTAT	P00598-01
H1	DRAIN TANK HEATER	P00153-02
H2	CORD HEATER (OUTER FRAME)	
H3	DEFROST HEATER	P00149-01
F 1, 2	FUSE (DRAIN TANK) 94℃	433262-02

EVAPORATER	P00165-01
CONDENSER	P00166-01
DRYER	P00007-01
HEAT EXCHANGER	252496G01
CAPILLARY TUBE	7K1224250

WIRE COLOR CODE	
Br	BROWN
LBu	LIGHT BLUE
W	WHITE
P	PINK
R	RED
Bk	BLACK
O	ORANGE
Bu	BLUE
Gr	GREEN
Y	YELLOW

[f] HRE-140B-F



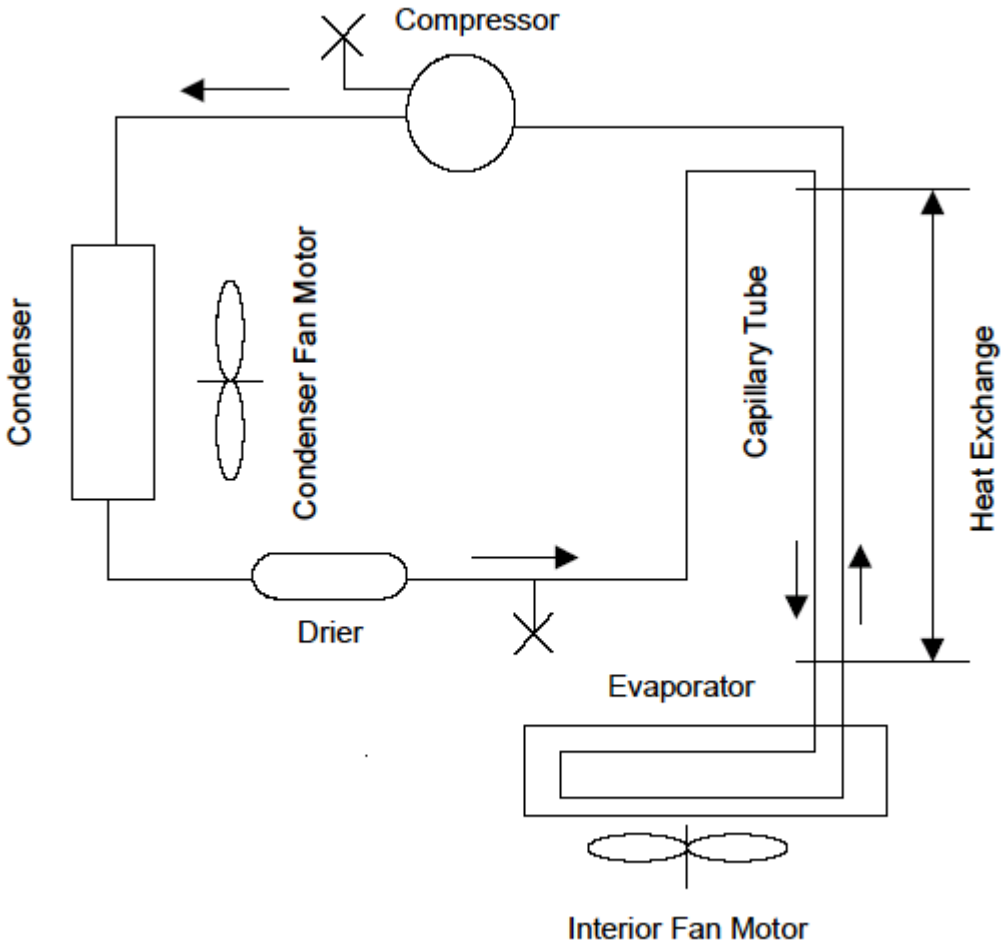
CORD	NAME	
SB	SAFTY BREAKER 10A	440972-01
CB 1	CONTROLER BOARD	469088-01
PB 1	POWER SUPPLY BORD	467549-01
TR 1	TRANSFORMER 230VA	P00155-01
X 1	RELAY	427992-02
X 2	RELAY	406132-09
X 3	RELAY	406132-08
CM 1	COMPRESSOR	453580-01
SR 1	STARTER	453581-01
SC 1	START CAPACITOR	456350-01
FM 1	FAN MOTOR (CONDENSER)	P00156-01
FM 2, 3	FAN MOTOR (INTERIOR)	469067G01
TH 1	THERMISTOR (INTERIOR)	469095-01
TH 2	THERMISTOR (PROTECTION)	
TH 3	THERMOSTAT	P00598-01
H 1	DRAIN TANK HEATER	P00153-02
H 2	CORD HEATER (OUTER FRAME)	
H 3	CORD HEATER (OUTER FRAME)	
H 4	DEFROST HEATER	P00149-01
F 1, 2	FUSE (DRAIN TANK) 94℃	433262-02

EVAPORATER	P00165-01
CONDENSER	P00167-01
DRYER	P00007-01
HEAT EXCHANGER	252532G01
CAPILLARY TUBE	7K1024150

WIRE COLOR CODE	
Br	BROWN
LBu	LIGHT BLUE
W	WHITE
P	PINK
R	RED
Bk	BLACK
O	ORANGE
Bu	BLUE
Gr	GREEN
Y	YELLOW

372405L01A

2. REFRIGERATION CIRCUIT



Refrigerant:	HFC-134a (HRE series) HFC-404A (HFE series)

3. ENERGY SAVING FEATURES

[a] FRAME HEATER ENERGIZING CONTROL

The Frame Heater is energized intermittently to keep the Front Frame surfaces at the optimum temperature for preventing condensation. As the optimum surface temperature depends on the ambient temperature, the ratio between ON time and OFF time is determined by the difference between the ambient temperature (measured by the Temperature Sensor built in the Controller Board) and the cabinet temperature (measured by the Interior Thermistor). This duty ratio has eight patterns and is updated every two minutes.

The duty ratios are sorted into seven levels (HRE series) or six levels (HFE series) depending on the difference between the ambient and cabinet temperatures. The higher levels at the same ambient and cabinet temperatures mean the higher duty ratios. The unit is factory adjusted to level 2.

The user is allowed to choose between levels 2 and 3 only, and service persons between levels 0 - 6 (HRE series) or 1 - 6 (HFE series).

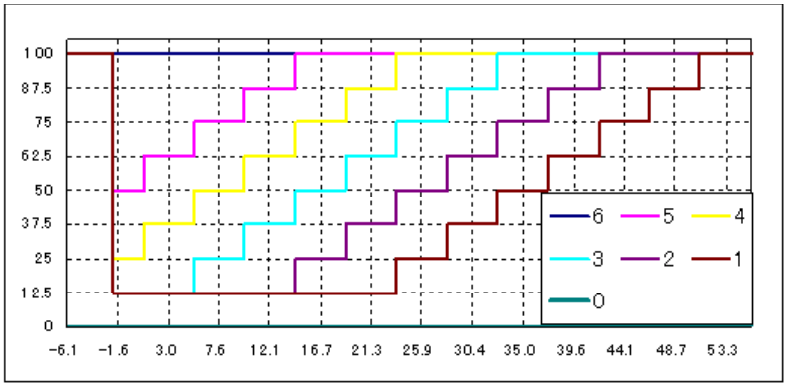
[Reference]
Level 2: No condensation at ambient temperature 35°C, relative humidity 70%
Level 3: No condensation at ambient temperature 35°C, relative humidity 80%

Duty Ratio (%)	ON time (sec)	OFF time (sec)	Ambient temp - cabinet temp			
			HRE series		HFE series	
			Level 3	Level 2	Level 3	Level 2
12.5	15	105	5 or less	14 or less	9 or less	23 or less
25	30	90	5 - 10	14 - 19	9 - 16	23 - 30
37.5	45	75	10 - 14	19 - 24	16 - 23	30 - 37
50	60	60	14 - 19	24 - 28	23 - 30	37 - 44
62.5	75	45	19 - 24	28 - 33	30 - 37	44 - 52
75	90	30	24 - 28	33 - 37	37 - 44	52 - 59
87.5	105	15	28 - 33	37 - 41	44 - 52	59 - 66
100	120	0	33 or more	41 or more	52 or more	66 or more

[Relations between duty ratio and ambient and cabinet temperature differences]

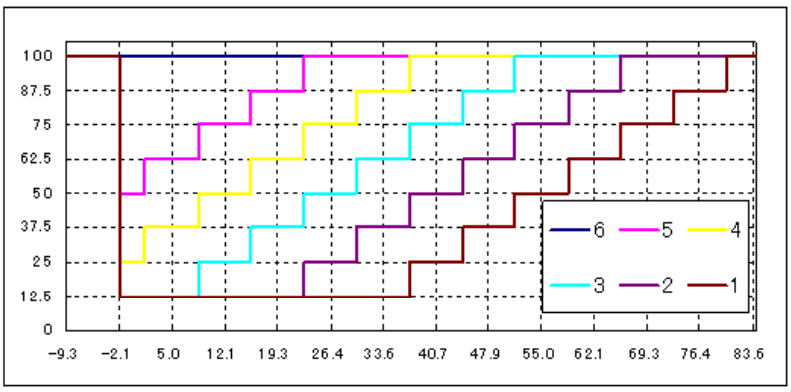
HRE series duty ratio

Level 0: Constantly OFF
Level 2: Factory adjustment
Level 6: Constantly ON



HFE series duty ratio

Level 2: Factory adjustment
Level 6: Constantly ON



The heater control reduces the power consumption, and the less heat invasion into the cabinet improves the refrigeration unit operating efficiency, resulting in significant energy saving effects.

[b] INTERIOR DC FAN MOTOR

The highly efficient DC brushless motor reduces the power consumption of the motor body from 21 W to 4 W with the same output. Also, the lower heating value prevents cabinet temperature rise and improves the refrigeration unit operating efficiency, resulting in energy saving effects.

[c] CONTROLLER BOARD

To save energy, HRE series stops energizing the Frame Heater for a maximum of 15 minutes during a defrost cycle (HFE series has an energizing control).

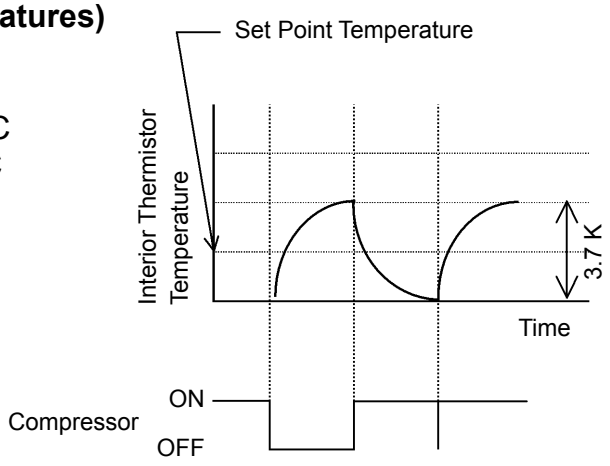
[d] REFRIGERATION UNIT

Provided with the best matched Capillary Tubes for refrigerant control.
Plastic Unit Base and Unit Frame in shape to minimize heat input/output.
Corrosion resistant aluminum Evaporator with boehmite treated and clear coated surfaces.

4. ELECTRONIC CONTROLS

[a] SET POINT TEMPERATURE (mean temperature between compressor ON and OFF temperatures)

Off-cycle defrost (HRE series): 0 to +16°C
Heater defrost (HRE-F series): -6 to +12°C
Heater defrost (HFE series): -25 to -7°C



[b] CABINET TEMPERATURE DIFFERENTIAL

3.7 K (from “set point temp - 2.0 K” to “set point temp + 1.7 K”)

Note: On the Controller Board only. Actual differential may be 4 - 6 K.

[c] DEFROST CYCLE

Every 6 hours (from the beginning of a cycle to the beginning of the next cycle)

[d] DEFROST COMPLETION TEMPERATURE

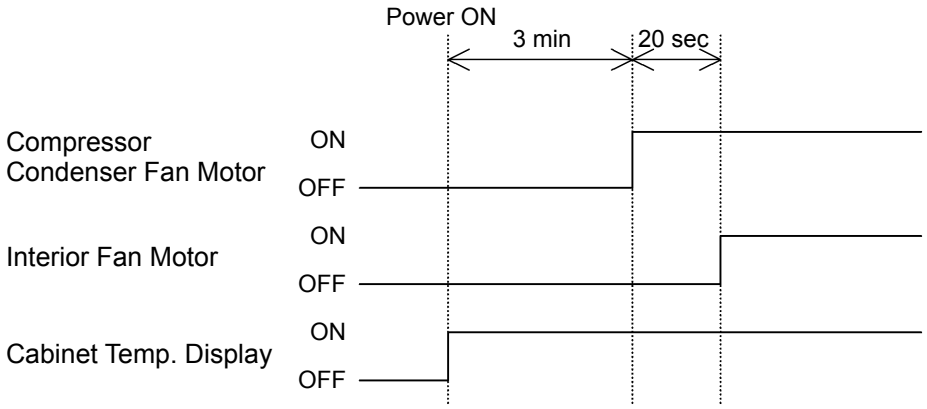
Off-cycle defrost (HRE series): +3°C
Heater defrost (HRE-F series): +30°C
Heater defrost (HFE series): +20°C

[e] TEMPERATURE DISPLAY CYCLE

The Temperature Display Window renews its cabinet temperature display every 30 seconds. The display remains the same for 30 seconds even if the actual temperature changes in the meantime. During a defrost cycle, the Temperature Display Window indicates “dF”.

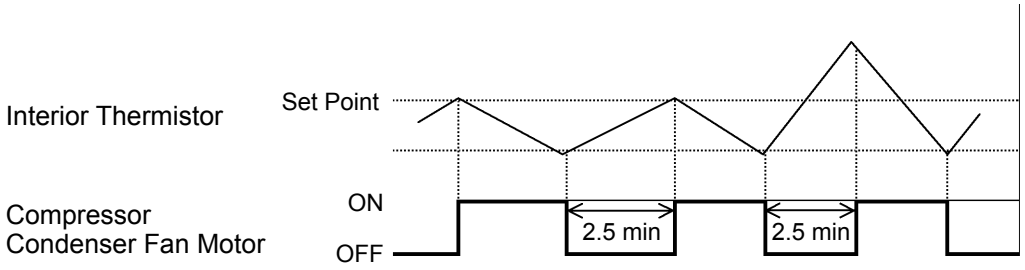
[f] COMPRESSOR SOFT START

1) Startup



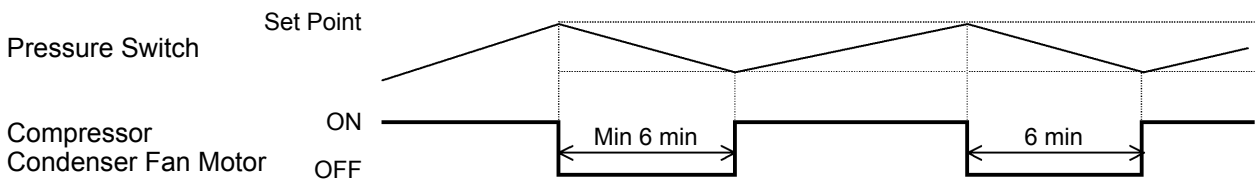
When the power supply is turned on, the Temperature Display Window shows the cabinet temperature, but the Compressor and Condenser Fan Motor start up with a 3 minute delay. Then, the Interior Fan Motor starts up 20 seconds later.
This delay is intended to minimize the difference between the high-side and low-side pressures and to reduce the load on the Compressor so that it can start easily in case of a short (especially instantaneous) power failure.

2) Normal Control



When the Compressor turns off during normal control, it has a mandatory 2.5 minute delay before startup. For example, if the Compressor turns off by its Thermistor and the Door is opened immediately after (causing the cabinet temperature to immediately exceed the restart temperature), the Compressor will still not start until 2.5 minutes have passed since its shutdown.

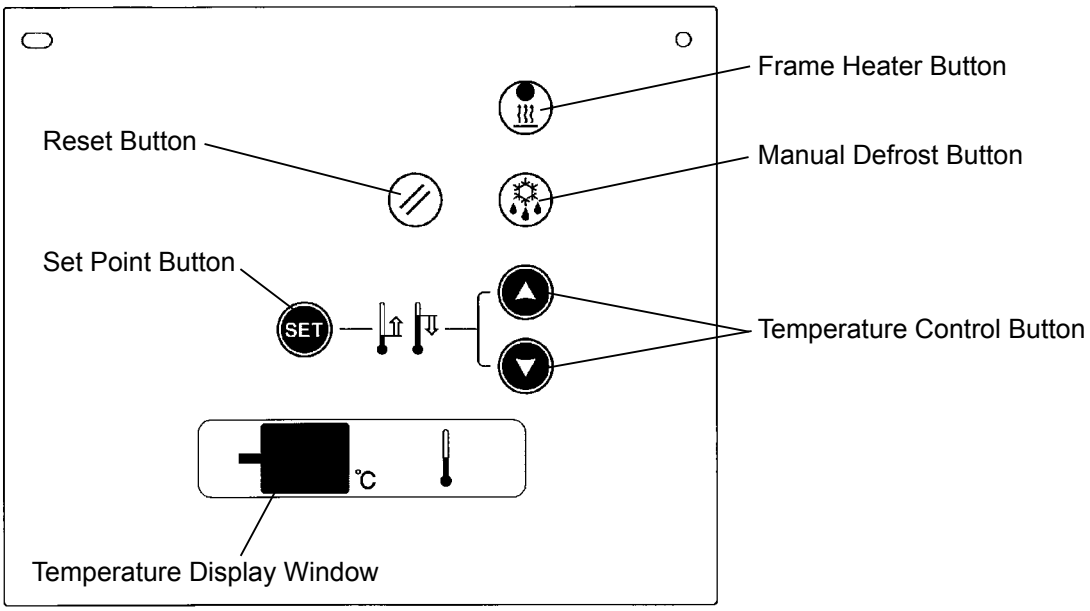
[g] HIGH PRESSURE SWITCH



All models are provided with a High Pressure Sensor to monitor the condensing temperature. If the high-side pressure rises to operate the High Pressure Sensor, the Compressor will not restart for at least 6 minutes to protect itself.
HFE series is also equipped with a backup High Pressure Switch. If the Condensing Temperature Thermistor becomes defective, the High Pressure Switch operates to stop and protect the Compressor.

[h] CHECKING AND ADJUSTING SET POINT TEMPERATURE

Press the Set Point Button to display the set point temperature on the Temperature Display Window. To change the set point temperature, hold down the Set Point Button and press the Temperature Control Button.



[i] MANUAL DEFROST

When the Manual Defrost Button is pressed for more than 5 seconds, the unit will start a manual defrost cycle. The unit will start repeating automatic defrost cycles 6 hours after the Manual Defrost Button is pressed.
To cancel the manual defrost cycle, turn off the power supply. Wait for at least 30 seconds before turning the power back on.

[j] FRAME HEATER SETTING

The duty ratio of the Frame Heater is controlled. The unit is factory adjusted to the duty ratio level 2 with the lamp on the Frame Heater Button off. If condensation occurs at the installation site, press the Frame Heater Button for more than 3 seconds to change the duty ratio level from 2 to 3. Then, the lamp on the Frame Heater Button will illuminate.
To de-energize the Frame Heater (HRE series only), see “6. BUTTON OPERATION”.

[k] CANCELING SOFT START

To cancel the “soft start” (3 minute delay), turn on the power supply while pressing the Set Point Button. The Compressor and Condenser Fan Motor will start at the same time after 10 seconds.
When the soft start is cancelled, the illuminated seven segment LED on the Temperature Display Window changes to the model setting number. To resume the cabinet temperature display, press the Set Point Button again or wait for 30 seconds.

Note: If the power supply is turned off while the Compressor is running and immediately turned back on to cancel the soft start, the high-side and low-side pressures cannot be equalized, often resulting in Compressor starting failure. Do not cancel the soft start for at least 2.5 minutes after the power supply is turned off.

[l] ERROR CODES

In case of trouble, the Temperature Display Window will alternately flash every second between one of the following error codes and the cabinet temperature. See “III. 1. ERROR CODES” for further details.

Code	Error	Code	Error
E1	Cabinet Temperature Too High	E7	Condenser Clogged
E2	Cabinet Temperature Too Low	E8	Defrost Thermistor Defective
E3	Defrost Cycle Too Long	E9	Clog Thermistor Defective
E4	Abnormal High-Side Pressure	EA	EEPROM Write Error
E5	Interior Thermistor Defective	Ed	EEPROM Verify Error

In case of error, an external output (12V DC) function is available for connection with a buzzer.

[m] CONTROLLER BOARD MODEL SETTING

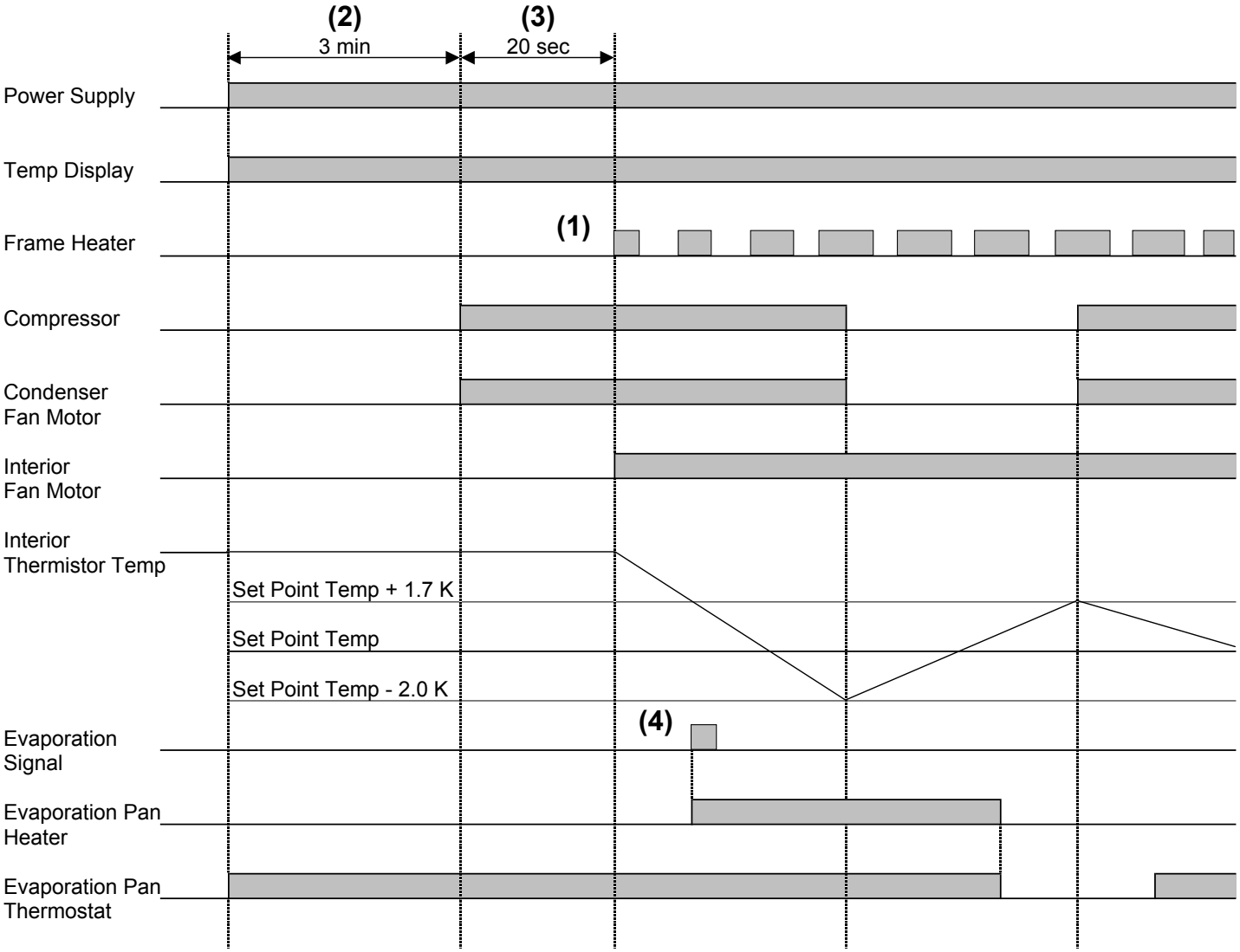
To indicate the Controller Board model setting number on the Temperature Display Window, turn on the power supply while pressing the Set Point Button.

Note: Proper model setting is required when the Controller Board is replaced. See “6. BUTTON OPERATION” for further details.

5. TIMING CHART

[a] STARTUP - CONTROL

HRE, HFE series



(1) Frame Heater Control
Intermittent energization by difference between ambient and cabinet temperatures.
Energization time has 8 patterns (duty ratio 12.5% - 100%).
Duty ratio is updated every 2 min, except previous ratio is maintained during defrost cycle.

(2) Standby at Startup
Only temperature indication is available for 3 min (not a sign of failure).

(3) Interior Fan Motor Delay at Startup
Interior Fan Motor and Frame Heater will not operate for 20 sec after Compressor starts.

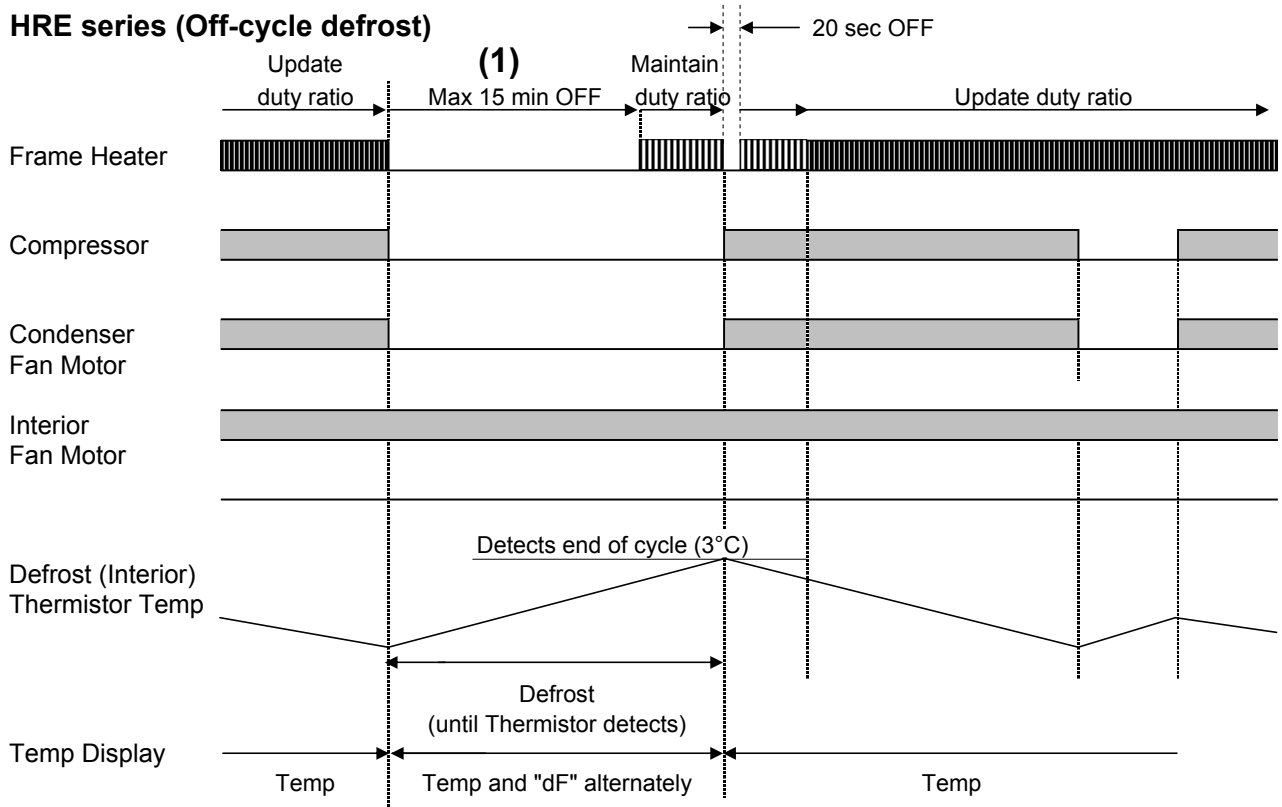
Interior Fan Motor OFF after End of Control
Interior Fan Motor will not operate for 2 min.

(4) Evaporation Signal

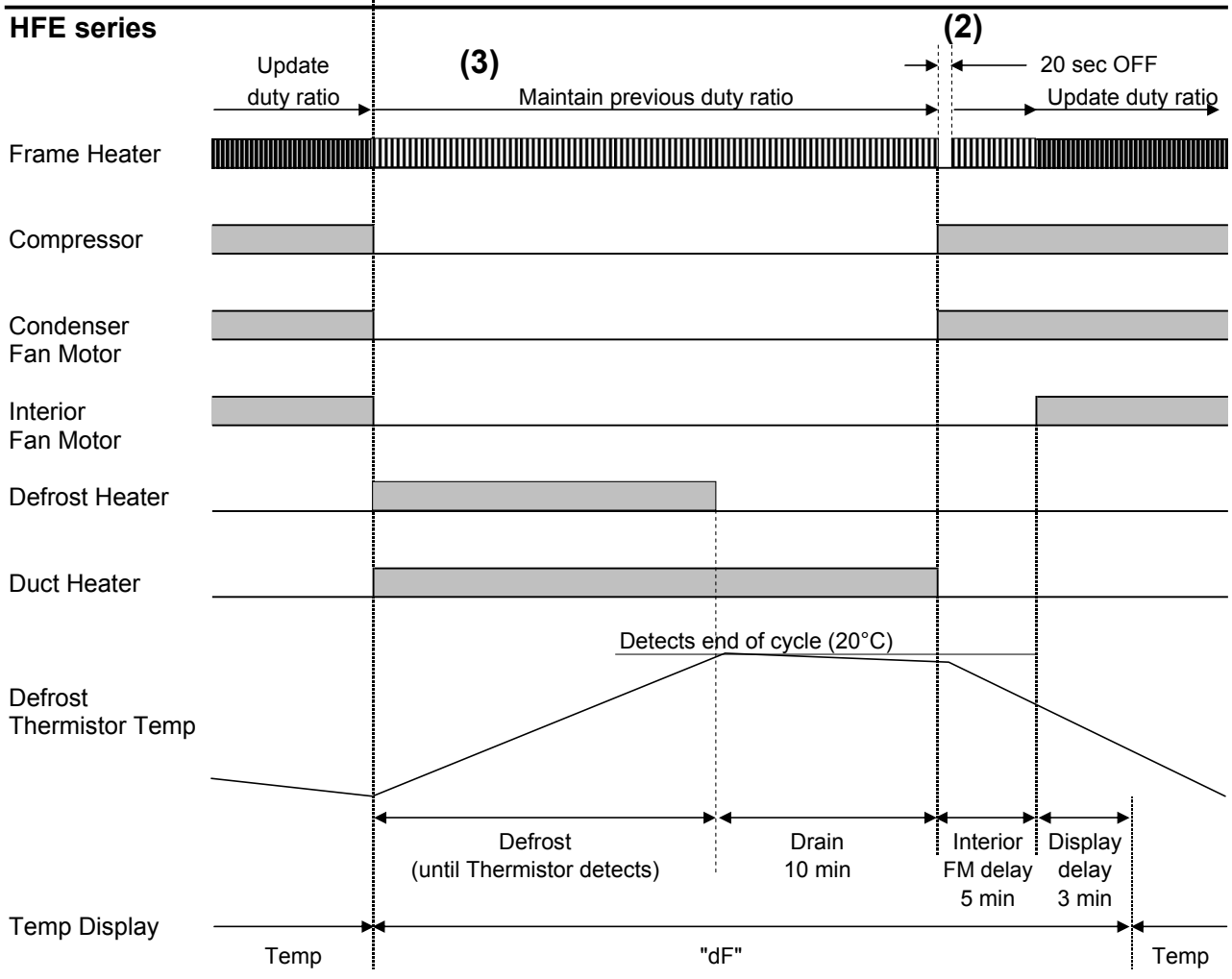
HRE series:	Cam Timer, for 7 min every 8 hrs
HRE-F series, HFE series:	Defrost start signal, every 6 hrs

[b] DEFROST

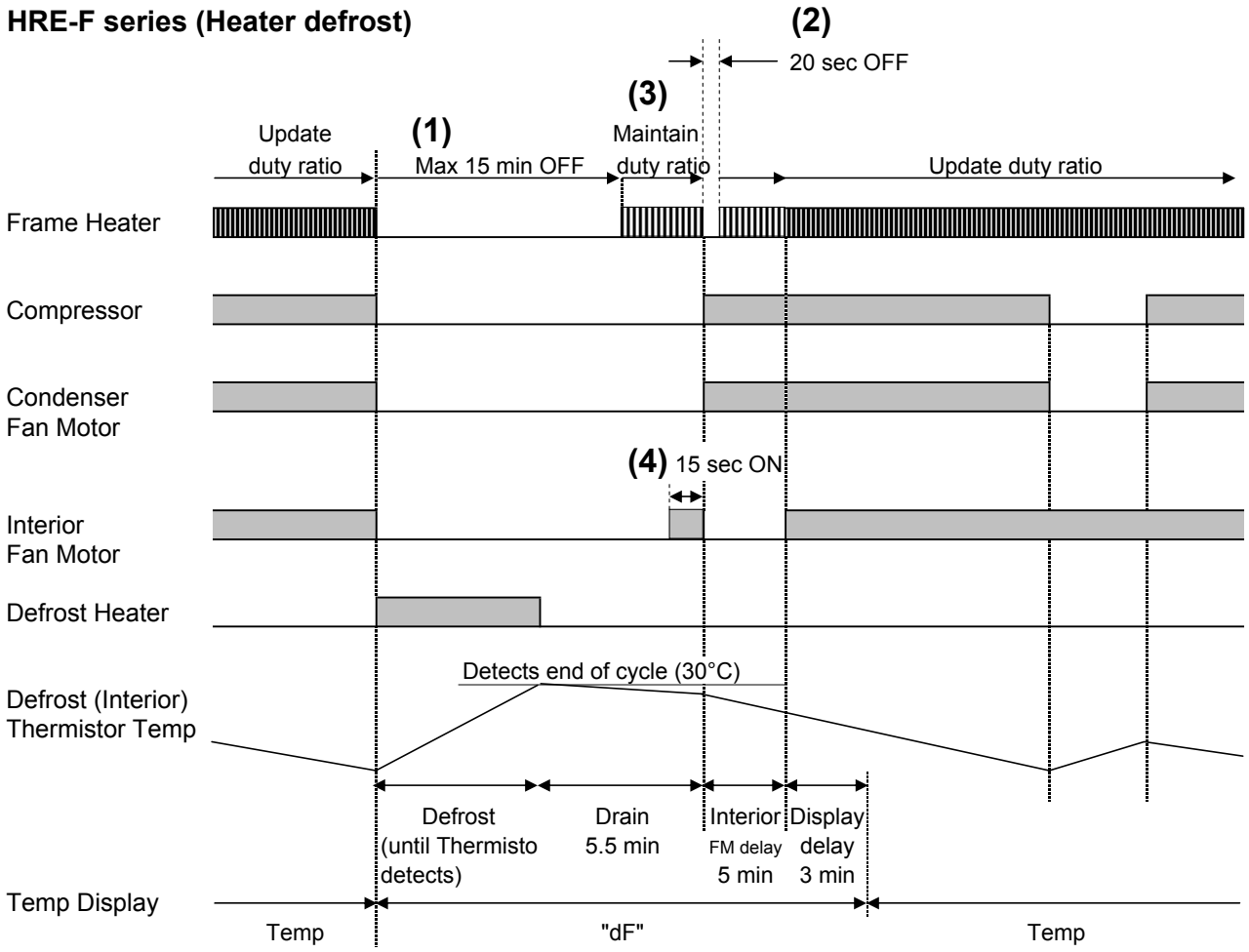
HRE series (Off-cycle defrost)



HFE series



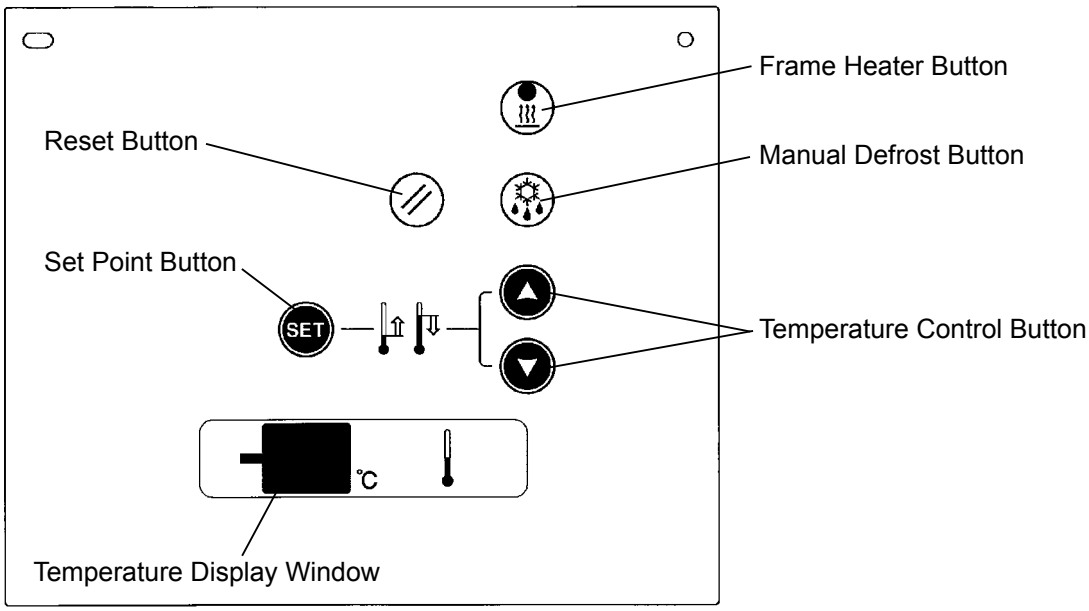
HRE-F series (Heater defrost)



Subject of Control		Description	Model	Purpose
Frame Heater	(1)	Remains OFF for max 15 min after defrost cycle starts (until Interior Fan Motor delay ends at longest)	HRE	Save energy
	(2)	Remains OFF for 20 sec after Compressor starts following drain cycle	HFE	Improve Compressor startability
	(3)	Duty ratio is not updated and maintains previous ratio after defrost cycle starts and until Interior Fan Motor delay ends	HFE	Prevent condensation
Interior Fan Motor	(4)	Remains ON for 15 sec after Compressor starts following drain cycle	HRE-F (Heater defrost)	Improve Compressor startability

6. BUTTON OPERATION

[a] OPERATION PANEL LAYOUT



[b] BASIC OPERATION

Condition	Button	Pressing Duration	Function
Constant	Set Point	—	Indicate set point temp while depressed
Constant	Set Point Temp Control	—	Change set point temp
Constant	Manual Defrost	Long (5 sec)	Start manual defrost
Error	Reset	Short	Cancel error code indication (not available on some errors) With more than one error, press to cancel one by one
Constant	Frame Heater	Long (3 sec)	Change Frame Heater level High: Lamp ON (raise default duty ratio by 1 level) Low: Lamp OFF (default)

[c] CHECKING AND DELETING ERROR RECORDS

To check error records:

1) Press the Reset Button and Set Point Button at the same time for 5 seconds (Reset Button first). The Temperature Display Window will show “F0”.

2) Press the Temperature Control Buttons until “F6” appears.
3) Press the Reset Button to flash the error records in the order of occurrence. “– –” will appear if no error is recorded.
4) Press the Manual Defrost Button to return to “F6”.
5) Repeat step 1) to indicate the cabinet temperature.

To delete error records:

1) Follow steps 1) to 3) above.
2) Press the Reset Button for 5 seconds to flash “– –”.
3) Follow steps 4) to 5) above.

Note: 1. Do not perform any other button operation until the Temperature Display Window shows from “F0” to “FF” before showing “F6”. Otherwise, the basic settings will change and may cause malfunction. In case of misoperation, see the list in “[d] ADJUSTING OPERATION SETTINGS” to restore the default settings.

2. Repeated errors are stored as one record. For example, errors in the order of E7, E7, E7, E4, E7 are recorded as E7, E4, E7.

[d] ADJUSTING OPERATION SETTINGS

The following settings are adjustable:

(1) Set Point Temperature
(2) Frame Heater Duty Ratio Level
(3) Soft Start Cancelation
(4) Automatic Defrost Cycle Interval
(5) E1 (Cabinet Temperature Too High) Occurrence Timing
(6) E2 (Cabinet Temperature Too Low) Occurrence Timing
(7) Buzzer Output (External Output)
(8) Defrost Backup Timer

Except (1) and (2), the default settings are optimal to meet the specifications. To prevent unexpected malfunction, do not adjust them unless necessary.

(1) Set Point Temperature

Hold down the Set Point Button, use the Temperature Control Buttons to adjust to the desired set point temperature, and release the Set Point Button.

(2) Frame Heater Duty Ratio Level

If condensation occurs on the Front Frame:
Press the Frame Heater Button for 3 seconds to illuminate the lamp on the button (the duty ratio is raised by 1 level).

To freely select the Frame Heater duty ratio level from 1 to 6:

1) Hold down the Frame Heater Button and press the Set Point Button. The Temperature Display Window will show “2”.
2) Hold down the Set Point Button and use the Temperature Control Buttons to indicate “1” - “6”. The higher levels at the same ambient and cabinet temperatures mean the higher duty ratios (level 6 is constantly ON).

To keep the Frame Heater OFF (HRE series only):

1) Hold down the Frame Heater Button and press the Set Point Button. The Temperature Display Window will show “2”.
2) Hold down the Set Point Button, use the Temperature Control Button to indicate “0”, and release the Set Point Button.

(3) Soft Start Cancelation (for immediate startup of Compressor)

Hold down the Set Point Button and turn on the power supply. The Compressor will start after 10 seconds. This operation is available only once when the power supply is turned on.

Note: If the power supply is turned off while the Compressor is running and immediately turned back on to cancel the soft start, the high-side and low-side pressures cannot be equalized, often resulting in Compressor starting failure. Do not cancel the soft start for at least 2.5 minutes after the power supply is turned off.

(4) - (9)

These adjustments are available by the following button operation including the error records checking and deleting procedures:

1) Press the Reset Button and Set Point Button at the same time for 5 seconds (Reset Button first). The Temperature Display Window will show “F0”.
2) Press the Temperature Control Buttons until the desired function code (F0 - FF) appears.
3) Press the Set Point Button to indicate the current setting (except “F6”).
4) Hold down the Set Point Button and use the Temperature Control Buttons to indicate the desired value. Adjust to the default setting when the correct value is not known.
5) Release the Set Point Button.
6) Repeat step 1) or wait for more than 1 minute. The Temperature Display Window will show the cabinet temperature.

Code	Function	Indication with Set Point Button
F0	Automatic Defrost Cycle Interval	– –: No automatic defrost cycle 3: Every 3 hrs 6: Every 6 hrs (default setting) 8: Every 8 hrs 12: Every 12 hrs 24: Every 24 hrs Long defrost cycle intervals may increase frosting and cause inadequate cooling.
F3	E1 (Cabinet Temp Too High) Occurrence Timing	0: Immediate occurrence (no error record) For remote alarm checking. Return to original setting after checking. 1: After 1 hr 2: After 2 hrs (default setting) 3: After 3 hrs
F4	E2 (Cabinet Temp Too Low) Occurrence Timing	0: Immediate occurrence (no error record) For remote alarm checking. Return to original setting after checking. 1: After 1 hr (default setting)
F6	Checking/Deleting Error Records	1) Press Reset Button to indicate error records (E1 - EE) every 0.5 sec for 1 sec each (max 8 records per compartment). 2) Press Reset Button for more than 5 sec to delete error records. 3) Press Manual Defrost Button to indicate “F6”.
Fb	Buzzer Output (External Output)	AL: Buzzer output for all errors (default setting) 1.2: Buzzer output for E1 and E2 only
FC	Defrost Backup Timer (duration until forced de-energization of Defrost Heater)	– –: No backup (no E3 occurrence) 0.4: 24 min 0.7: 40 min 1: 60 min (default setting) 1.3: 80 min 1.7: 100 min 2: 120 min Long duration until backup (or no backup) may cause fuse to blow when Defrost Heater is energized for a long time.

[e] MODEL SETTING AT CONTROLLER BOARD REPLACEMENT

The replacement Controller Boards are shipped without model setting. To prevent malfunction and inadequate cooling, be sure to finish model setting before use.

Some buttons on the replacement Controller Boards may be unnecessary for some models. Proper model setting will disable those buttons.

To set the mode setting number:

1) Turn off the power supply.
2) Hold down the two Temperature Control Buttons and turn on the power supply. The Temperature Display Window will show “01”.
   Note: This is not the preset model number.
3) Use the Temperature Control Buttons to indicate the desired model number.
   Note: Do not select “00”, or further settings will be made unavailable. When “00” is selected by mistake, turn off the power supply and go back to step 2).
4) Press the Reset Button for more than 3 seconds. The Temperature Display Window will flash “rc”.
5) Press the Reset Button again for more than 3 seconds. The Temperature Display Window will flash “oF”.
6) Turn off the power supply.

To check the model setting number:

1) Hold down the Set Point Button and turn on the power supply.
2) The Temperature Display Window will illuminate and show the model setting number. (The Compressor will start 10 seconds after this button operation.)

Model setting number: 1D (HRE series: Off-cycle defrost)
0D (HRE-F series: Heater defrost)
29 (HFE series)

III. SERVICE DIAGNOSIS

1. ERROR CODES

In case of trouble, the Temperature Display Window indicates the cabinet temperature and the applicable error code alternately every 1 second (even in a defrost cycle).
Except EA and Ed, there is no need to restart the unit to reset errors.

Code	Error	Description	Possible Cause		Reset
			Component	Condition	
E1	Cabinet Temp Too High	Cabinet temp stays 10K above set point for 2 hrs (available after power is turned on and cabinet temp drops to lower limit).	- Compressor control error - Compressor defective - Refrigeration circuit defective (ex. gas leak) - Interior Thermistor defective	- Ambient temp too high - Gap between Door and cabinet - Door opened too frequently - Too many warm items inside	Press Reset Button. Automatically resets when cabinet temp drops to lower limit.
E2	Cabinet Temp Too Low	Cabinet temp stays 5K below set point for 1 hr.	- Compressor control error - Interior Thermistor defective	- Ambient temp too low - Too many frozen items inside	Press Reset Button. Automatically resets when cabinet temp rises to upper limit.
E3	Defrost Cycle Too Long (HFE series only)	Defrost Heater remains energized for 1 hr and is forcibly de-energized.	- Heater control error - Heater defective - Thermal Fuse circuit open - Defrost Thermistor defective	- Door opened too frequently, causing excessive Evaporator frosting	Press Reset Button (no automatic reset).
E4	Abnormal High-Side Pressure	High pressure is detected 5 or more times in 1 hr (4 times within 1 hr after 1st detection). Clog Thermistor * See table below for set point.	- Condenser Fan Motor defective - Dirty Air Filter - Clog Thermistor defective	- Ambient temp too high	Press Reset Button (no automatic reset).

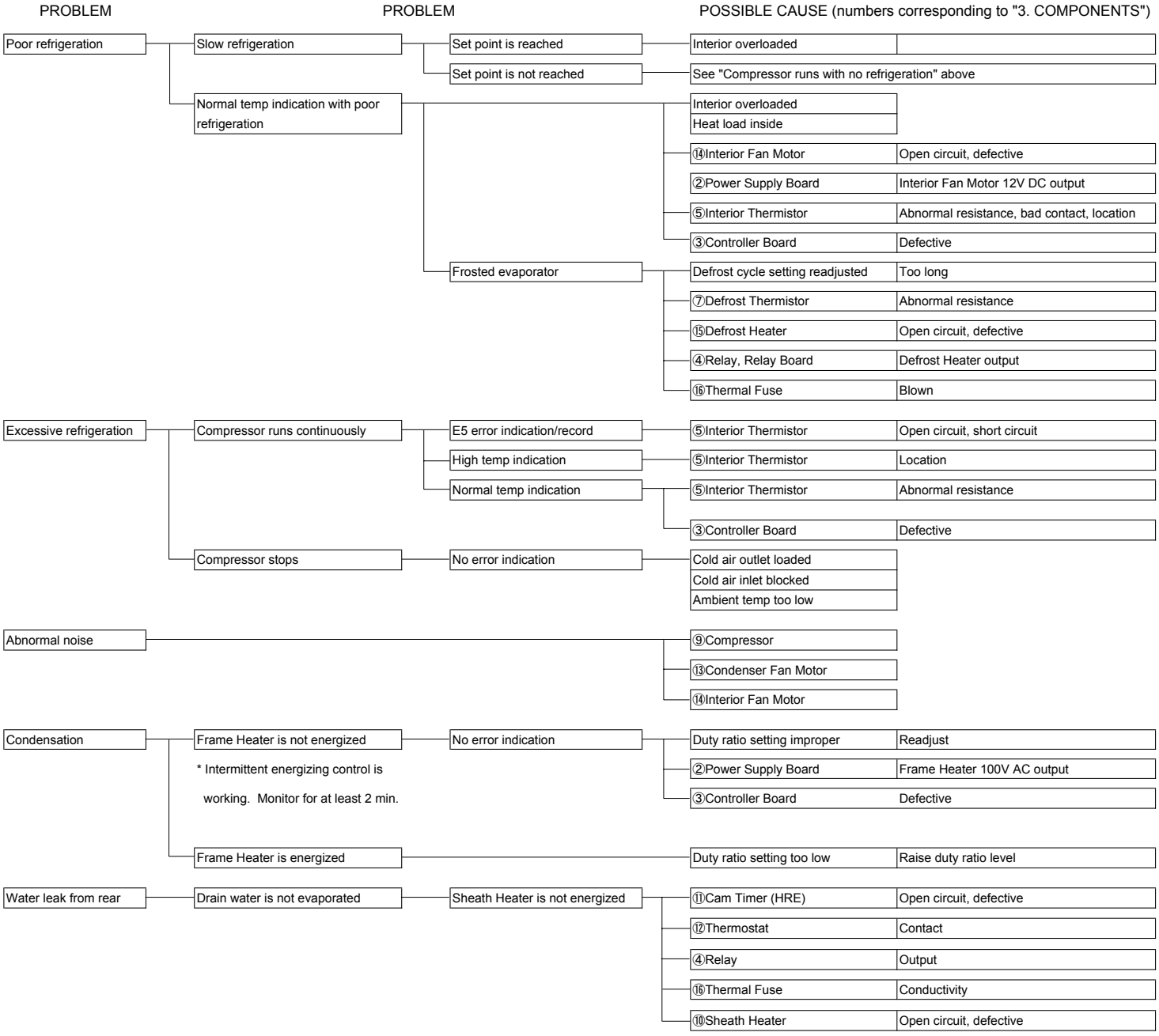
Code	Error	Description	Possible Cause		Reset
			Component	Condition	
E5	Interior Thermistor Defective	Interior Thermistor circuit is open or shorted for 10 min or more. Note: For either reason, Compressor will operate continuously. Be careful with frozen refrigerator compartment.	- Interior Thermistor circuit open, connector unplugged - Interior Thermistor circuit shorted, dusty connector		Press Reset Button after removing cause (no automatic reset).
E7	Condenser Clogged	Surface temp of Condenser piping (U bend at center or outlet) stays above set point for 5 min. * See table below for set point.	- Condenser Fan Motor defective - Dirty Air Filter	- Ambient temp too high	Automatically resets when Clog Thermistor senses temp lower than set point (Reset Button will not work).
E8	Defrost Thermistor Defective	Defrost Thermistor circuit is open or shorted for 10 min or more.	- Defrost Thermistor circuit open, connector unplugged - Defrost Thermistor circuit shorted, dusty connector		Automatically resets after cause is removed (Reset Button will not work).
E9	Clog Thermistor Defective	Clog Thermistor circuit is open or shorted for 10 min or more.	- Clog Thermistor circuit open, connector unplugged - Clog Thermistor circuit shorted, dusty connector		Automatically resets after cause is removed (Reset Button will not work).
EA	EEPROM Write Error	Abnormal value is detected in EEPROM reading/writing (Controller Board hardware problem).	- Controller Board defective - Controller Board malfunction		Turn power off and back on after 30 sec (no automatic reset).
Ed	EEPROM Verify Error	Inconsistency is detected in setting information used (Controller Board software problem).	- Controller Board defective - Controller Board malfunction		Turn power off and back on after 30 sec (no automatic reset).

The error cords are indicated in the following order of priority:
EA > Ed > E5 > E8 > E9 > E4 > E7 > E3 > E1 > E2

Error	Detection	Set Point	
		HRE	HFE
		R-134a	R-404A
E4	High pressure	Clog Thermistor Immediately at 78°C	Clog Thermistor Immediately at 73°C 5 min above 70°C
E7	Clog	Clog Thermistor 5 min above 56°C	Clog Thermistor 5 min above 56°C

2. FLOWCHART

PROBLEM	PROBLEM		POSSIBLE CAUSE (numbers corresponding to "3. COMPONENTS")	
No refrigeration	Compressor will not start	No temp indication	①Safety Breaker	OFF
			②Power Supply Board	Controller Board 12V DC output
			③Controller Board	Open circuit, connector unplugged
		EA, Ed error indication	③Controller Board	Defective
		No error indication	⑤Interior Thermistor	Abnormal resistance, bad contact
			⑥Clog Thermistor	Abnormal resistance, bad contact
			⑧Pressure Switch (HFE)	Short circuit, defective
			④Relay	Output
			⑨Compressor	Winding open, electrical part defective
	Compressor starts and stops immediately (within 3 min)	E4 error indication/record (high pressure)	Ambient temp too high	
			Condensing capacity insufficient	Heat source, ventilation
			Air Filter	Clogged
			⑬Condenser Fan Motor	Locked, open circuit
			④Relay	Condenser Fan Motor output
			⑥Clog Thermistor	Abnormal resistance, bad contact
			⑧Pressure Switch (HFE)	Defective
		No error indication	See "E4 error indication/record" above	
			⑤Interior Thermistor	Location
			⑨Compressor	Locked, etc
	Compressor runs with no refrigeration	E7 error indication/record (high condensing temp)	Ambient temp too high	
			Condensing capacity insufficient	Heat source, ventilation
			Air Filter	Clogged
			⑬Condenser Fan Motor	Locked, open circuit
			④Relay	Condenser Fan Motor output
		E8 error indication/record	⑦Defrost Thermistor	Abnormal resistance, bad contact
		E3 error indication/record (frosted evaporator)	⑦Defrost Thermistor	Abnormal resistance
			⑮Defrost Heater	Open circuit, defective
			④Relay	Defrost Heater output
			⑯Thermal Fuse	Blown
		No error indication	Internal load too large	
			Door gap	
			⑤Interior Thermistor	Location
			⑭Interior Fan Motor	Open circuit, defective
			②Power Supply Board	Interior Fan Motor 12V DC output
			⑰Refrigeration circuit clogged	Capillary, Drier
			⑱Refrigerant leak	
			⑨Compressor	Defective


PROBLEM
PROBLEM
POSSIBLE CAUSE (numbers corresponding to "3. COMPONENTS")
Poor refrigeration
Slow refrigeration
Set point is reached
Interior overloaded
Set point is not reached
See "Compressor runs with no refrigeration" above
Normal temp indication with poor refrigeration
Interior overloaded
Heat load inside
⑭Interior Fan Motor
Open circuit, defective
②Power Supply Board
Interior Fan Motor 12V DC output
⑤Interior Thermistor
Abnormal resistance, bad contact, location
③Controller Board
Defective
Frosted evaporator
Defrost cycle setting readjusted
Too long
⑦Defrost Thermistor
Abnormal resistance
⑮Defrost Heater
Open circuit, defective
④Relay, Relay Board
Defrost Heater output
⑯Thermal Fuse
Blown
Excessive refrigeration
Compressor runs continuously
E5 error indication/record
⑤Interior Thermistor
Open circuit, short circuit
High temp indication
⑤Interior Thermistor
Location
Normal temp indication
⑤Interior Thermistor
Abnormal resistance
③Controller Board
Defective
Compressor stops
No error indication
Cold air outlet loaded
Cold air inlet blocked
Ambient temp too low
Abnormal noise
⑨Compressor
⑬Condenser Fan Motor
⑭Interior Fan Motor
Condensation
Frame Heater is not energized
No error indication
Duty ratio setting improper
Readjust
* Intermittent energizing control is working. Monitor for at least 2 min.
②Power Supply Board
Frame Heater 100V AC output
③Controller Board
Defective
Frame Heater is energized
Duty ratio setting too low
Raise duty ratio level
Water leak from rear
Drain water is not evaporated
Sheath Heater is not energized
⑪Cam Timer (HRE)
Open circuit, defective
⑫Thermostat
Contact
④Relay
Output
⑯Thermal Fuse
Conductivity
⑩Sheath Heater
Open circuit, defective

3. COMPONENTS

CHART NO.	COMPONENT	CHECK	REMEDY
①	Safety Breaker	Safety Breaker trips	Locate earth leakage/short circuit
		Safety Breaker splashed with water	Dry and replace if necessary
②	Power Supply Board (in Relay Box)	Open circuit	Correct or replace
		Input/output (Controller Board, Interior Fan Motor) Input: 115V AC Output: 12V DC Controller Board output - K1 Connector No. 1, 2 Interior Fan Motor - See wiring label	Replace
		Frame Heater voltage (K2 Connector No. 1, 3) Heater ON: 0V Heater OFF: 115V Switches every 2 min	Replace
③	Controller Board	Connector/pin disconnected	Correct
		Connector dusty/dirty	Remove
		7 segment display partially/totally off	Replace
		Electronic parts defective/burnt out	Replace
		Ambient Temp Sensor damaged (Frame Heater will be continuously energized)	Replace
		Relay, Relay Board output (12V DC)	Replace
④	Relay	Fast-on terminal/pin disconnected	Correct
		Connector dusty/dirty	Remove
		Open circuit	Correct
		Output to each load Check with wiring diagram/timing chart	Replace
		Abnormal noise	Replace
⑤	Interior Thermistor	Location (holder in front of Evaporator) Disconnected, replaced with Defrost Thermistor, etc	Correct
		Incorrect temp indication	Immerse in ice water to check resistance (5 - 6.5kΩ) Replace if necessary
		Short circuit (temp displayed as "HH")	Clean/dry connector Replace
		Open circuit (temp displayed as "-60")	Replace
⑥	Clog Thermistor	Abnormal resistance	Immerse in ice water to check resistance (150 - 180kΩ) Replace if necessary
		Short circuit	Clean/dry connector Replace
		Open circuit	Replace
⑦	Defrost Thermistor	Location (plug in from Evaporator front) Disconnected, replaced with Interior Thermistor, etc	Correct
		Abnormal resistance	Immerse in ice water to check resistance (5 - 6.5kΩ) Replace if necessary
		Short circuit	Clean/dry connector Replace
		Open circuit	Replace
⑧	Pressure Switch	Terminal splashed with water	Dry and replace if necessary
		Terminal dusty/dirty	Remove
		Conductivity between contacts	Replace if conductive
⑨	Compressor	Resistance between terminals Compressor / Winding Resistance (Ω) / Primary / Secondary FR8.5G 8.9 12.0 SC18G 3.7 14.1 SC12CL 5.0 13.7 SC18CL 3.7 14.1	Replace
		Insulation resistance 1MΩ or more at 500V	Replace
		Abnormal noise	Replace
		Insufficient compression (discharge temp too low)	Replace if no gas leaks

CHART NO.	COMPONENT	CHECK	REMEDY
⑨	Compressor	Electrical part defective (constant speed compressor only) - Run/Start Capacitor ruptured/deformed - Capacitor defective Check resistance between terminals Gradually reduces: No problem 0Ω from start: Defective - Starter defective Loose terminal, no conductivity, damaged - Overload Relay defective Loose terminal, no conductivity, damaged	
⑩	Sheath Heater	Open circuit	Correct
		Conductivity	Replace
		Insulation resistance 1MΩ or more at 500V	Replace
⑪	Cam Timer	Fast-on terminal disconnected	Correct
		Coil circuit open	Replace
⑫	Thermostat	Open circuit	Correct
		Conductivity	Replace if not conductive
⑬	Condenser Fan Motor	Open circuit	Correct
		Locked (not rotating with voltage)	Replace
		Internal fuse blown (coil not conductive)	Replace
		Abnormal noise	Replace
⑭	Interior Fan Motor	Open circuit	Correct
		Locked (not rotating with voltage)	Replace
		Abnormal noise	Replace
⑮	Defrost Heater	Open circuit	Correct
		Conductivity	Replace
		Insulation resistance 1MΩ or more at 500V	Replace
⑯	Thermal Fuse	Conductivity	Replace
		Relay contact fused	Replace Relay/Relay Board
⑰	Refrigeration Circuit Clogged	Operate constantly at 55Hz in operation setting mode Discharge pressure: High Suction pressure: Low (vacuum)	Replace Capillary/Expansion Valve (Replace Drier at same time)
⑱	Refrigerant Leak	Discharge pressure: Low Suction pressure: High	Locate leakage and replace (Replace Drier at same time)

4. CONTROLLER BOARD

[a] SERVICING CONTROLLER BOARD

1) If receiving a service call, ask the user to turn off the power supply and turn it back on after 30 seconds, while watching the unit. This will reset the controller, and in some cases normal operation will resume.

2) Keep the following in mind when servicing the Controller Board:

* Check that the unit has been earthed properly. If not, the Controller Board will not work properly.

* To get static free, always touch the cabinet (earth) before servicing. Electrostatic discharge will cause severe damage to the Controller Board. Also, keep it away from vinyl, plastic or other electrostatically charged products.

* Do not touch the reverse side of the Controller Board and tiny electronic devices on it.

* The Controller Board and Thermistor can be replaced separately.

* Handle the Controller Board by the edges only. Do not push the electric parts and wires.

* Do not drop the Controller Board on the floor.

* To protect the pattern from damage, place the Controller Board on a flat surface.

* The Thermistor and Pressure Switch leads have a thin coating and potentially breakable. Do not tension the leads.

* The connectors must not be subjected to tension to prevent disconnection or breakage. After servicing the Controller Board, check for disconnected connectors.

* The Thermistor is provided with single-wire leads. Do not bend or stretch them (about 400 mm from the end and at lead connections).

* Do not pinch or weigh down the Thermistor and Thermistor leads. The coatings may be broken, resulting in a short circuit.

* Keep the Thermistor and Relay Box wires at least 30 mm away from the high voltage (100V AC or more) wires.

3) After replacing the Controller Board, make the following settings:

* The replacement Controller Boards are shipped without model setting. To prevent malfunction and failure, be sure to finish model setting before use according to “II. 6. [e] MODEL SETTING AT CONTROLLER BOARD REPLACEMENT”.

* Some buttons on the replacement Controller Boards may be unnecessary for some models. Proper model setting will disable those buttons.

[b] CHECKING THERMISTOR

1) Remove the Thermistor's intermediate connector from the Controller Board.

2) Put ice and water in a glass or other container to make 0°C water. Immerse the Thermistor bulb in the water for 5 minutes (at the center of the container).

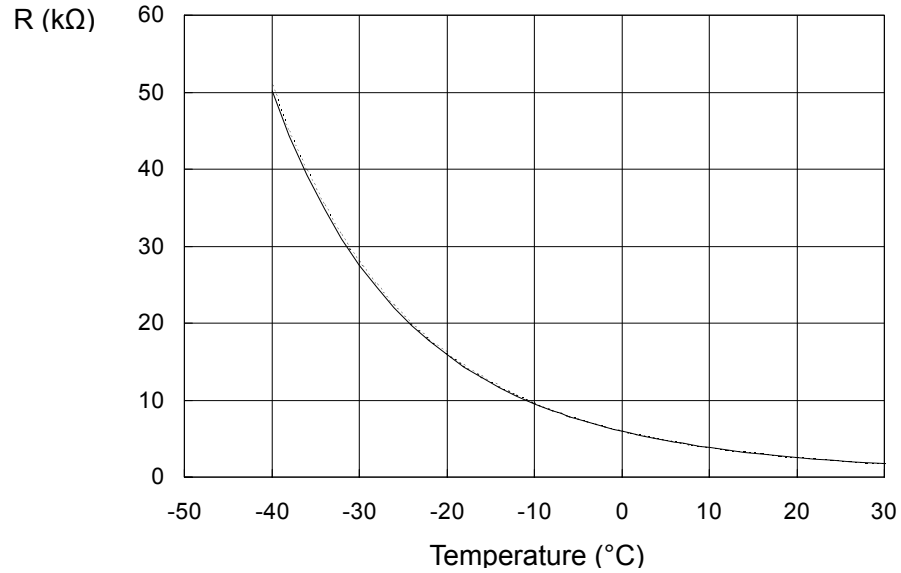
3) Use the Ω range of the tester to measure the resistance between the Thermistors.

4) If the measured resistance is not within:
   Interior/Defrost Thermistor 5 - 6.5 kΩ (standard 6 kΩ)
   Clog Thermistor 150 - 180 kΩ (standard 162 kΩ)
   replace the Thermistor (see the T-R curve below).

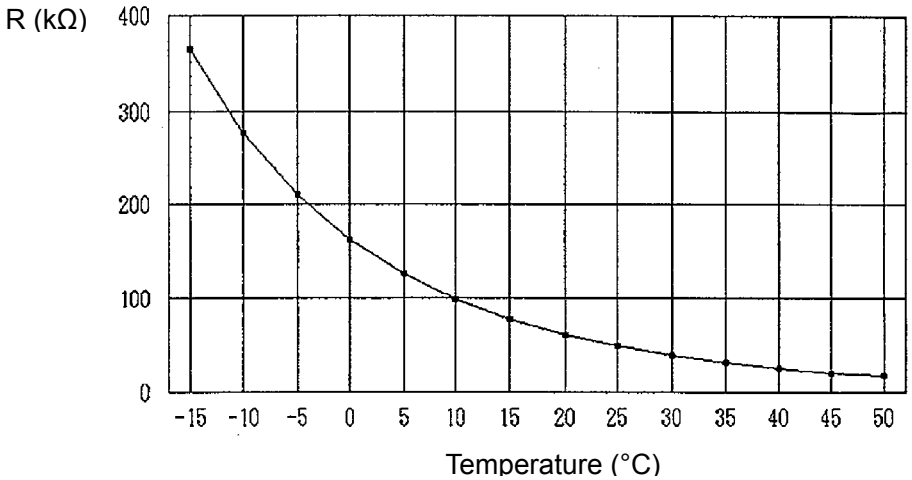
T-R Curve (Interior/Defrost Thermistor)

$$R = 6 \times Exp\left\{3390 \times \left(\frac{1}{273.15+T} - \frac{1}{273.15}\right)\right\}$$

The graph shows reference values only and may differ from actual values.

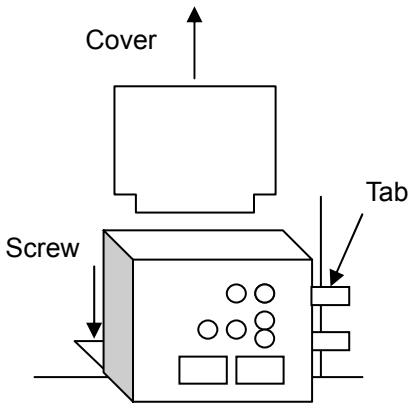


T-R Curve (Clog Thermistor)



IV. REMOVAL AND REPLACEMENT OF COMPONENTS

1. CONTROLLER BOARD AND THERMISTOR



[a] REMOVAL OF CONTROL BOX

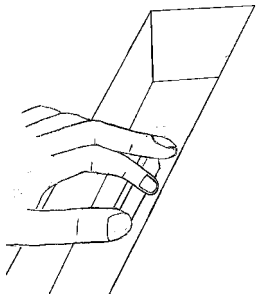
1) Lift the Cover off the back of the Control Box.

2) Remove the screw (rear left) securing the Control Box, and remove the Control Box.

3) Disconnect the connectors from the Control Box by pinching both ends of the connectors with thumb and middle finger and unlocking the connectors with forefinger.

4) Remove the four screws of the Control Box, and separate it into the Operation Panel side and box side.

5) Remove the two screws from the Operation Panel side, and remove the Controller Board.



[b] REPLACEMENT OF CONTROL BOX

1) Handle the Controller Board with care according to “III. 4. [a] SERVICING CONTROLLER BOARD”.

2) Replace the Controller Board in the reverse order of the removal procedure with the following points in mind:
   * To replace the Control Box, be sure to hook the two tabs on the grips.
   * Plug in the connectors until they lock in place.
   * Keep the wires inside the Rear Cover.

3) Check that the Operation Panel is securely mounted.

4) After replacing the Controller Board, be sure to make model setting. Otherwise, the unit will not operate properly, and the Compressor may be damaged.

[c] THERMISTOR

1) Remove the Air Duct inside the cabinet. See “5. [a] AIR DUCT”.

2) Remove the Interior Thermistor Bulb on the ceiling in front of the Evaporator by unhooking the two tabs securing the Thermistor Holder.

3) Remove the Defrost Thermistor Bulb inside the Evaporator Fins by pinching off the Thermistor Holder.

4) Pull out the Thermistors through the hole in the Refrigeration Unit Base. Be careful

not to press hard on the bulbs and leads.

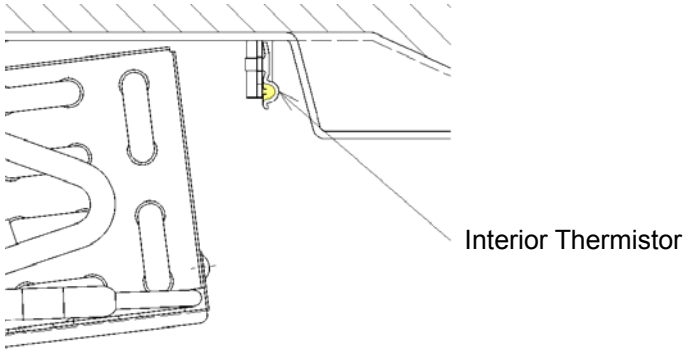
5) Remove the Clog Thermistor Bulb by removing the Thermistor Holder located at the center or outlet of the Condenser.

6) Remove the Control Box, and disconnect the Thermistor connectors.

Note: 1. To replace the removed parts, reverse the above procedure.

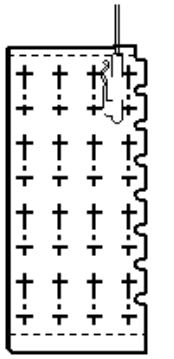
2. To prevent the Evaporator from freezing, use the Bush - Thermistor to securely plug the wiring hole in the Refrigeration Unit Base.

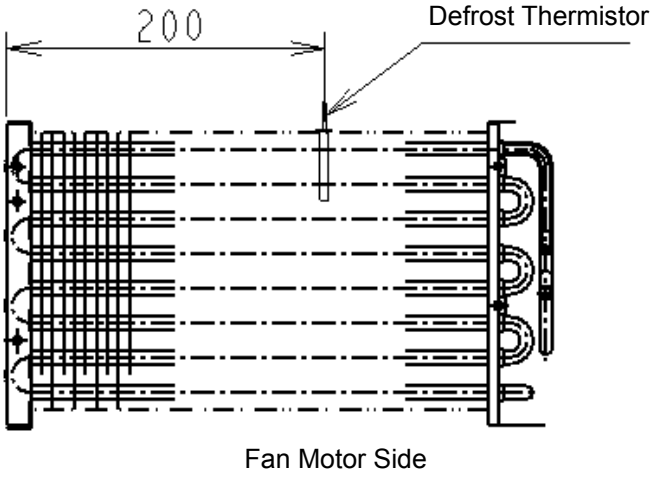
Interior Thermistor Bulb Location



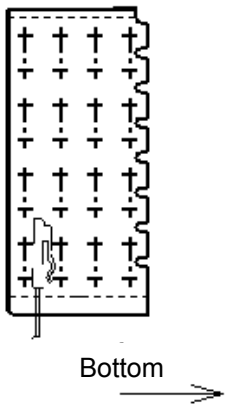
Defrost Thermistor Bulb Location

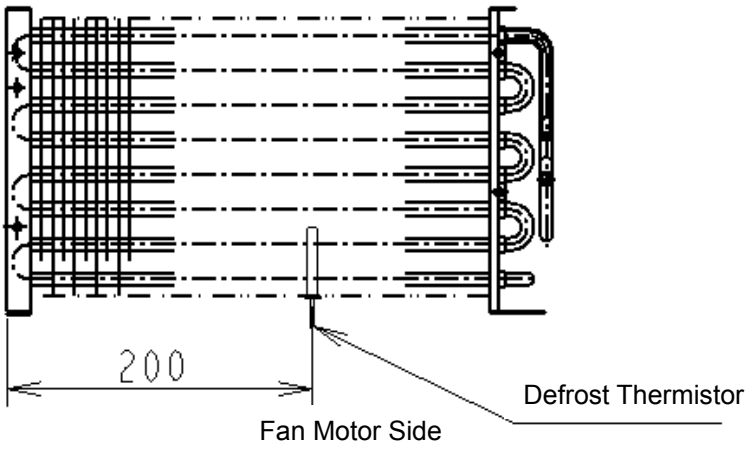
HRE (Off-cycle defrost)





HFE





2. RELAY BOX

[a] POWER SUPPLY BOARD

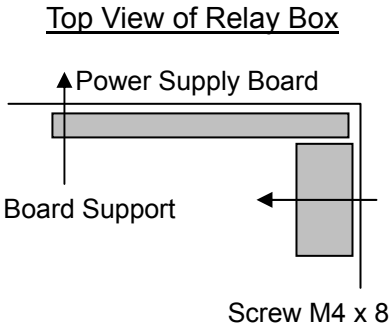
1) Unplug the unit.

2) Disconnect the connectors.

3) Loosen and remove the two Board Supports at the back.

4) Loosen the three screws from outside the Relay Box, and remove the Power Supply Board. Do not remove the screws from inside the Relay Box, or the parts may fall off the Power Supply Board.

5) To replace the removed parts, reverse the above procedure.



Note: 1. The Power Supply Board is connected to a commercial power supply. Be sure to disconnect the power supply before servicing.

2. Some parts may have become hot just after operation. Handle with care.

3. REFRIGERATION CIRCUIT

[a] COMPRESSOR

1) Unplug the unit.

2) Remove the Front Panel.

3) Remove the Top Panel.

4) Remove the Protector Cover enclosing the electrical parts. Remove the Overload Relay, Starting Relay, and other parts.

5) Recover the refrigerant from the low side Access Valve.

6) Disconnect the discharge and suction pipes by using brazing equipment.

7) Remove the hexagon bolts securing the Compressor.

8) To replace the removed parts, reverse the above procedure.

[b] CONDENSER AND DRIER

1) Unplug the unit.

2) Remove the Front Panel.

3) Recover the refrigerant from the low side Access Valve.

4) Unscrew the Condenser.

5) Unscrew the Drier.

6) Disconnect the Condenser from the upper inlet pipe connection using brazing equipment.

7) Remove the Condenser and Drier from the Refrigeration Unit Base, and disconnect them using brazing equipment.

8) To replace the removed parts, reverse the above procedure.

Note: The Capillary Tube is directly brazed to the Drier. To prevent brazing material from clogging, be sure to insert the Capillary Tube securely into the point of Stopper before brazing.

[c] EVAPORATOR

1) Unplug the unit.

2) Remove the Front Panel.

3) Recover the refrigerant from the low side Access Valve.

4) Remove the Insulation Hoses on the Refrigeration Unit Base. Disconnect the Evaporator using brazing equipment.

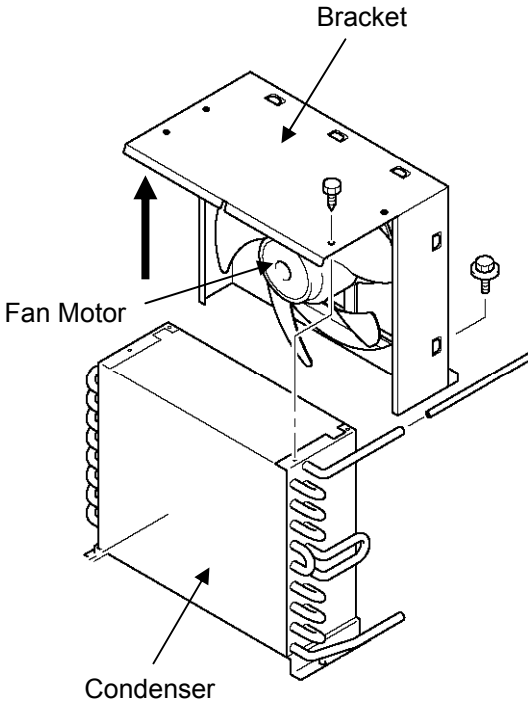
5) Remove the Air Duct.

6) Disconnect the Defrost Heater wires. See “[e] DEFROST HEATER AND THERMAL FUSE”.

7) Unscrew and remove the Evaporator.

8) To replace the removed parts, reverse the above procedure.

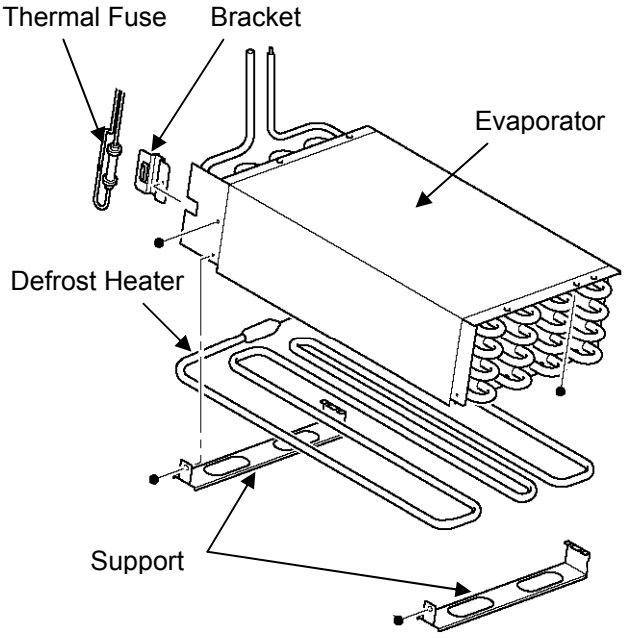
[d] CONDENSER FAN MOTOR



1) Unplug the unit.
2) Remove the Front Panel.
3) Remove the Top Panel.
4) Disconnect the Condenser Fan Motor.
5) Remove the two screws securing the Bracket on the Refrigeration Unit Base.
6) Pull up the Fan Motor together with the Bracket.
7) Loosen the nut securing the Fan Motor Shaft, and remove the Fan Motor.
8) Remove the Fan Motor from the Bracket.
9) To replace the removed parts, reverse the above procedure.

Note: After replacement, check for abnormal noise or vibration noise by trial run.

[e] DEFROST HEATER AND THERMAL FUSE - HRE-F (Heater defrost), HFE



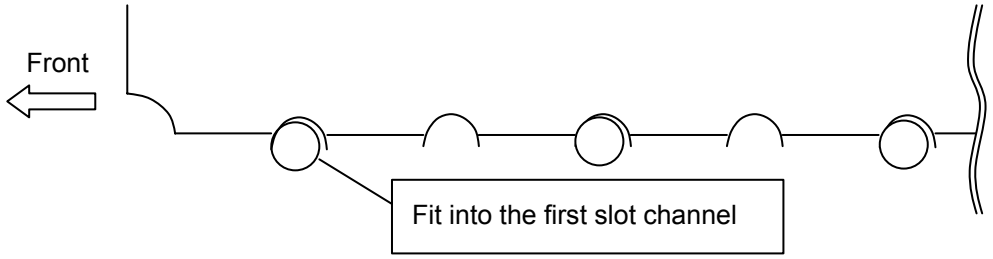
1) Unplug the unit.
2) Disconnect the Defrost Heater at the back of the Refrigeration Unit. The Defrost Heater and Thermal Fuse are connected in series and interchangeable without any operational problems.
3) Remove the putty from the wire hole in the Refrigeration Unit Base, and put the connector through the hole.
4) Remove the Air Duct. See “5. [a] AIR DUCT”.
5) Remove the Supports at both ends of the Evaporator bottom by loosening the screws at the front and unhooking the backside.
6) Remove the Defrost Heater from the Evaporator by pulling each U bend from the front to the back.

7) Unscrew and remove the Thermal Fuse from the Evaporator and Bracket.

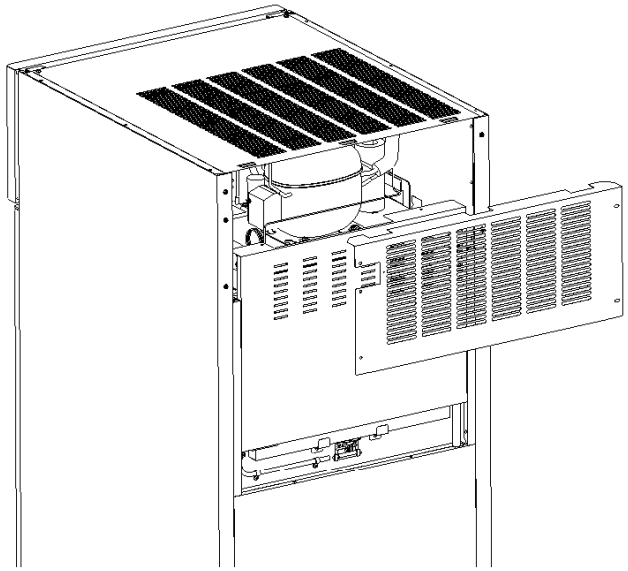
8) Pull out the wire through the hole in the Refrigeration Unit Base.

9) To replace the removed parts, reverse the above procedure.

Note: Locate the Defrost Heater in the same position as before. Fit the first front line into the first slot channel, and position the rest according to the U-bend dimensions.



4. EVAPORATION TANK



1) Unplug the unit.

2) Unscrew and remove the Rear Panel.

3) Unscrew the upper part of the Evaporation Tank Cover, and lift off the Cover.

[a] DRAIN TANK HEATER

1) Unscrew and remove the Drain Tank Duct.

2) Unscrew the Drain Tank Flange securing the Drain Tank Heater.

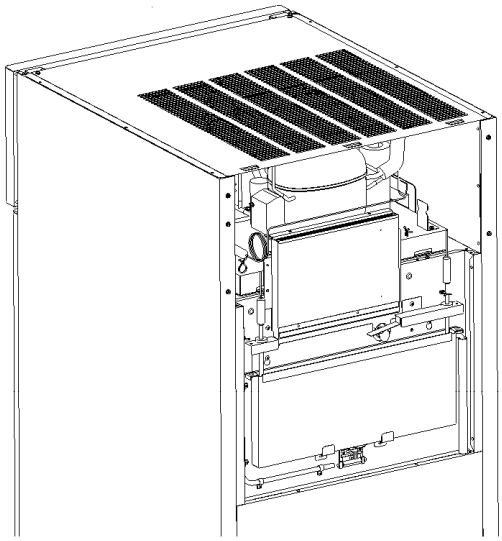
3) Cut the Drain Tank Heater leads at their connection.

4) Lift the Drain Tank Heater off the Drain Tank.

5) Lift off the Drain Tank Heater together with the Heater Bush from the Drain Tank Flange.

6) Remove the Heater Bush from the Drain Tank Heater.

7) To replace the removed parts, reverse the above procedure.



[b] THERMOSTAT

1) Unscrew the Thermostat attached to the Drain Tank bottom.

2) Cut the Thermostat leads at their connection.

3) To replace the removed parts, reverse the above procedure.

[c] THERMAL FUSE

1) Unscrew the Fuse Holder at the Drain Tank bottom, and remove the Thermal Fuse.

2) Cut the Thermal Fuse leads at their connection.

3) To replace the removed parts, reverse the above procedure.

5. AIR DUCT

[a] AIR DUCT

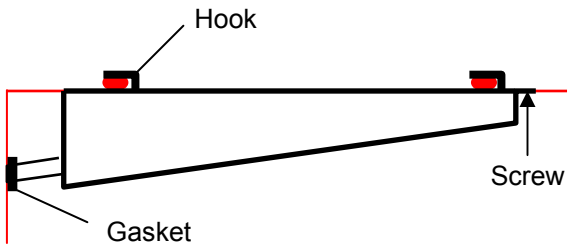
1) Remove the two or three screws at the front of the Air Duct.

2) Hold both sides of the Air Duct, and pull it forward. The Air Duct in the freezer compartment is provided with a Gasket in the Drain Pipe and must be pulled hard to remove.

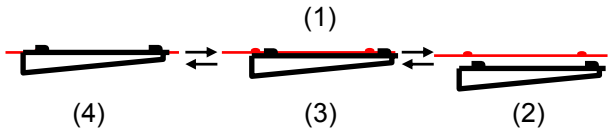
3) To prevent tension on the wires, place the removed Air Duct on a shelf.

4) To replace the Air Duct, first insert the Drain Pipe into the drain outlet at the rear of the unit. For the freezer compartment, move the Gasket backward before inserting the Drain Pipe.

Left Side View of Air Duct



To remove: (1) Pull forward. Air Duct will fall off.
To replace: (2) Position to fit hooks. (3) Lift up.
(4) Push backward.



5) Position the Air Duct to fit the six hooks on both sides. Keep the Air Duct slightly forward for smooth positioning.

6) Lift up the Air Duct, and push it backward to fit in.

7) Tighten the screws at the front of the Air Duct.

Note: Be careful not to catch the Interior Fan Motor leads in the Air Duct.

[b] INTERIOR FAN MOTOR

1) Unplug the unit.

2) Disconnect the Interior Fan Motor connector (blue) beside the Refrigeration Unit.

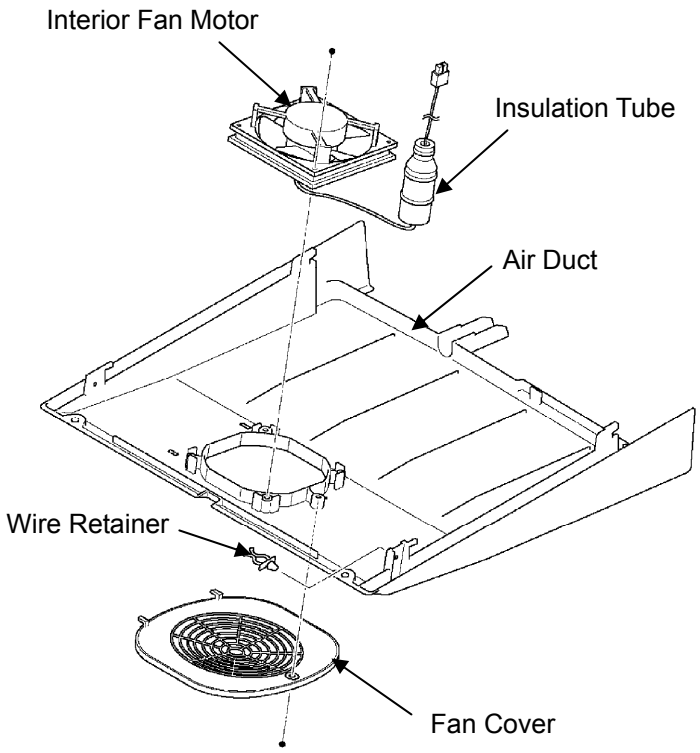
3) Unscrew the Refrigeration Unit.

4) Slightly lift up the Refrigeration Unit, and put the Interior Fan Motor leads inside the cabinet.

5) Remove the Air Duct.

6) Remove the Interior Fan Motor from the Air Duct.

7) To replace the removed parts, reverse the above procedure. Cover the Interior Fan Motor leads with the Insulation Tube as a cushion through the hole in the Refrigeration Unit.



Note: To prevent the leads from being caught between the Fan Blades, fix the leads with the Wire Retainer inside the Air Duct before fitting the Air Duct.

6. DOOR PARTS

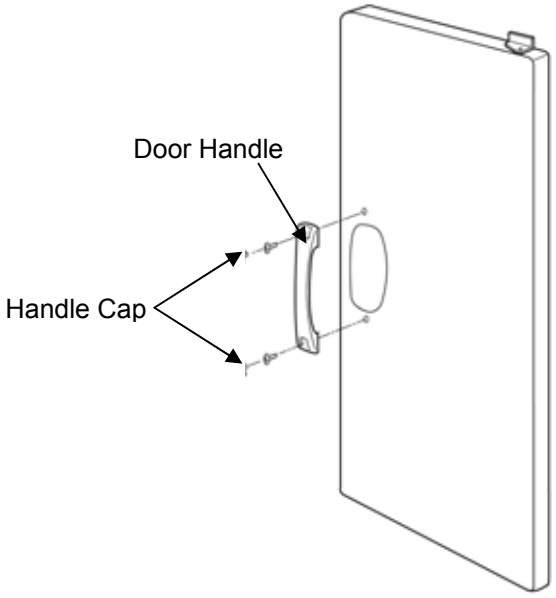
[a] DOOR HANDLE

The Door Handle is replaceable. Order the new Door Handle and two Handle Caps. The Handle Caps are damaged when removed and need to be replaced together with the Door Handle.

1) Put a precision screwdriver into the notches to remove the Handle Caps.

2) Unscrew and remove the Door Handle.

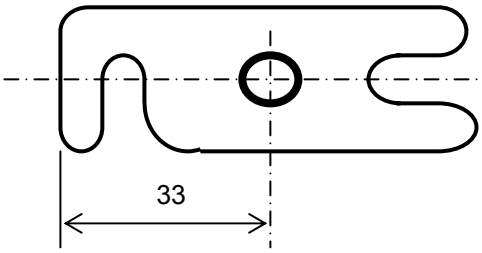
3) To replace the removed parts, reverse the above procedure. Tighten the mounting screws to a torque of 98 - 127 Nm･cm (10 - 13 kgf･cm). Manual tightening with a screwdriver needs additional tightening.



[b] HINGE SPACER

For Door closing adjustment, the Hinge Spacers (clear, colorless plastic plates) may be provided between the Hinges and cabinet. When removed, the Hinge Spacers must be reinstalled in the correct position.
When the Door is replaced or the Gasket is often caught in the Door, order the following parts and replace the Hinge Spacers:

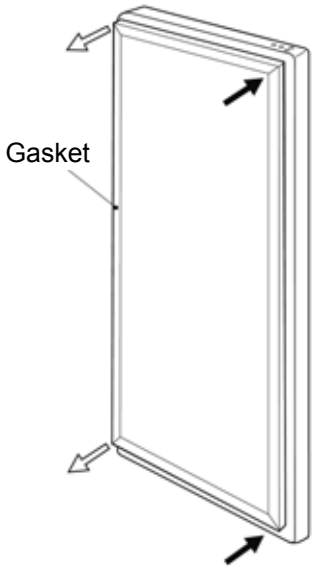
For Upper Hinge: Hinge Spacer (A) 453746-01
For Lower Hinge: No Hinge Spacer is available.
Order the above Hinge Spacer (A), and drill a 10 mm diameter hole.



[c] LIFT HINGE

To ensure smooth Door closing, the Hinge Shaft employs a Lift Hinge. If the Hinge makes an abnormal noise or the worn out Lift Hinge hinders smooth Door closing, apply White Alcom Grease (white grease used for industrial icemakers). If the Lift Hinge is severely worn out, replace the Hinge Collar (Lift Hinge) on both the Door and Hinge sides.

* Apply White Alcom Grease also when the Door is replaced in the field.



[d] DOOR GASKET

To replace the Door Gasket:

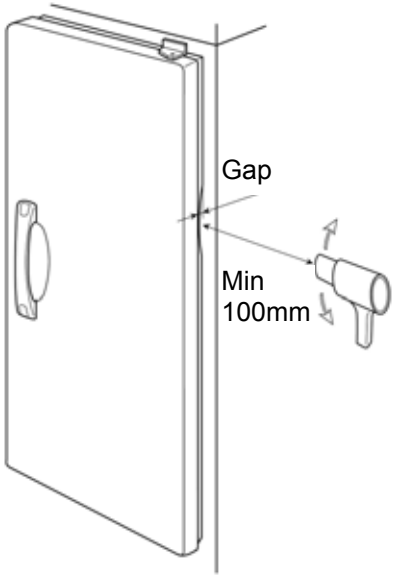
1) Pinch and pull out the Door Gasket from the corners.

2) Push the convex of the new Door Gasket into the concave of the Door interior. Insert the corners first to facilitate replacement.

Replacement of the Door or Door Gasket may cause a gap between the cabinet and the Gasket. To correct this gap, slightly heat the Gasket with a drier. To avoid melting the Gasket:

1) Keep the drier at least 100 mm away from the Gasket.

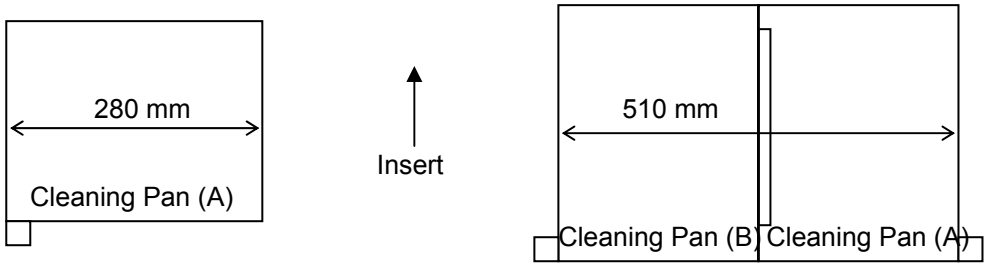
2) Move the drier up and down to heat the entire gap.



7. CONDENSER CLEANING PAN

The Condenser is designed to allow the Cleaning Pan at the bottom.

* Insert the Cleaning Pan (wastewater pan), and connect the Drain Hose to the drain outlet. Use the Cleaning Pan (A) for the 280 mm wide Condenser [HRE-70B, HRE-140B, HFE-70B], and connect the Cleaning Pan (A) and Cleaning Pan (B) for the 500 mm wide Condenser [HFE-140B].

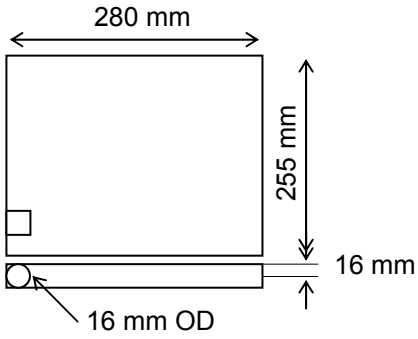


* Cover the Cleaning Pan with a waste cloth to prevent wastewater from splashing around (especially the Compressor and Condenser Fan Motor).

* The Cleaning Pan has a capacity of about 1 L and takes 1 minute to drain. Do not allow a large amount of water into the Cleaning Pan.

The Cleaning Pan is not provided in the unit and must be ordered by the following part numbers:

Cleaning Pan (A) 354309G01
Cleaning Pan (B) 354310G01 for connection only



Dimensions: W280 x D255 x H16 (t 0.8) mm
Drain Outlet: 16 mm OD x 14 mm ID
Drain Hose: 16 mm DIA
Capacity: 1.0 L

8. OPTIONAL PARTS

[a] HINGE KIT

The Door Hinges for HRE-70B and HFE-70B can be moved to the other side of the Door by using the following Hinge Kit. Please note that these Door Hinges are not interchangeable with those for HRE-70A and HFE-70A.

Hinge Kit (R)

Door Hinge (R) - Lo	363989G01	1 pc
Door Hinge (R) - Up	339968G01	1 pc
Hinge Collar - Hinge	339948-01	2 pcs

Hinge Kit (L)

Door Hinge (L) - Lo	363991G01	1 pc

Door Hinge (L) - Up	339971G01	1 pc
Hinge Collar - Hinge	339948-01	2 pcs

[b] GASTRONOME PAN RAIL

Rail (R)	369511M01
Rail (L)	369512M01