SERVICE MANUAL

CLASSIC 10

SERIAL NUMBER FROM FEBRUARY 2011 (0211) TO PRESENT

MOVINCOOL®

THE #1 SPOT COOLING SOLUTION

DocID: 00G00089E

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Operation Section

Repair Section

1. PRECAUTIONS FOR SAFETY

1.1 Foreword

- This manual has been published to service the MovinCool Classic 10. Please use this service manual only when servicing this unit.

1.2 Definition of Terms

⚠ **WARNING**	Describes precautions that should be observed in order to prevent injury to the user during installation or unit operation.
⚠ **CAUTION**	Describes precautions that should be observed in order to prevent damage to the unit or its components, which may occur during installation or unit operation if sufficient care is not taken.
NOTE	Provides additional information that facilitates installation or unit operation.

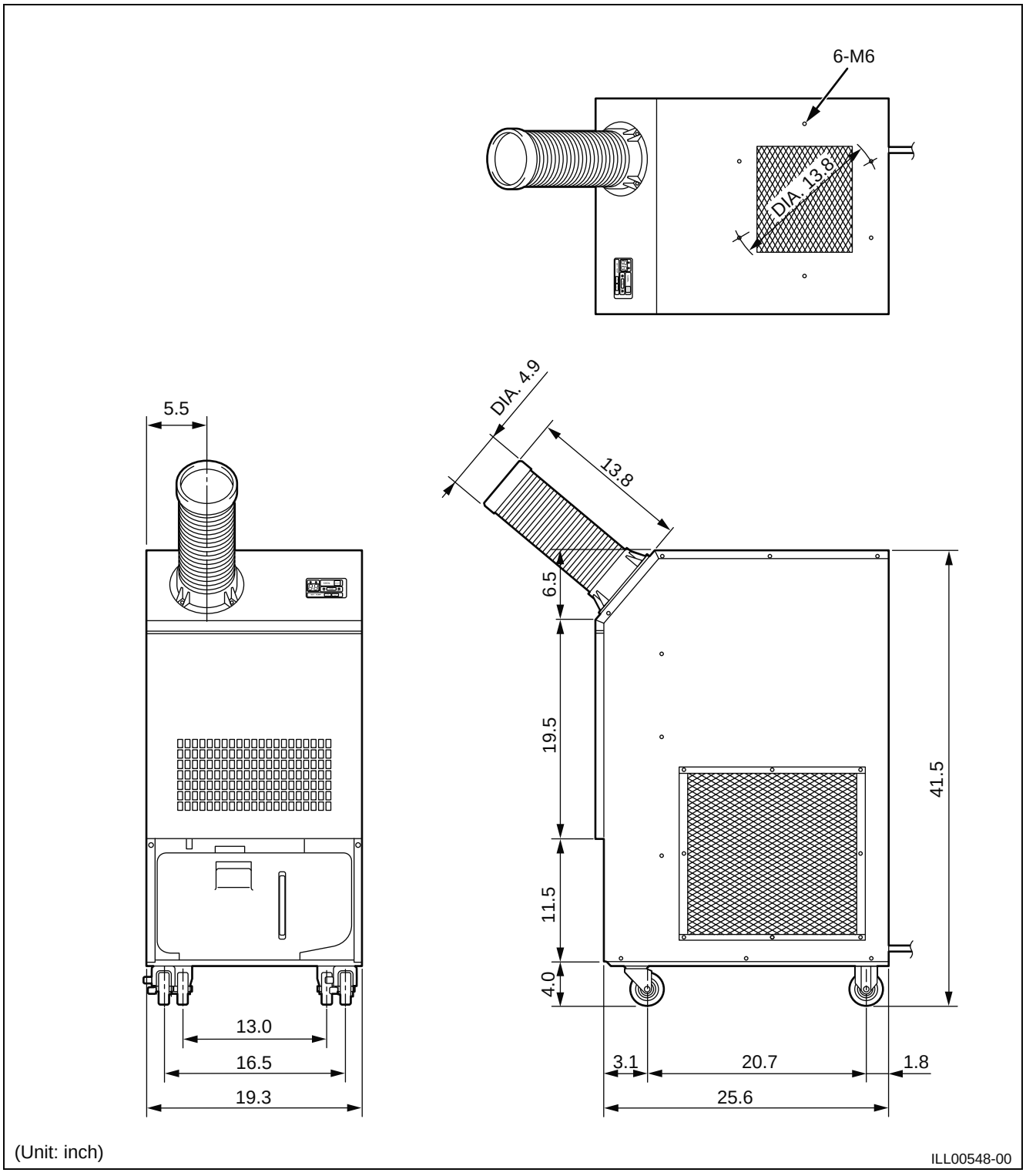
1.3 General Precautions

⚠ WARNING

- **All electrical work should only be performed by qualified electrical personnel. Repair to electrical components by non-certified technicians may result in personal injury and/or damage to the unit. All electrical components replaced must be genuine MovinCool parts, purchased from an authorized reseller.**
- **When handling refrigerant, always wear proper eye protection and do not allow the refrigerant to come in contact with your skin.**
- **Do not expose refrigerant to an open flame.**
- **The power supply for this unit should be a dedicated single outlet circuit with a UL recognized short-circuit and ground-fault protective breaker to prevent electrical shock from the unit.**
- **When brazing any tubing, always wear eye protection, and work only in a well ventilated area.**

2. SPECIFICATIONS

2.1 Exterior Dimension Diagram



(Unit: inch)

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2.2 Technical Specifications

ITEM			SPECIFICATIONS
Electronic Features	Operation		Digital Programmable
Electrical Characteristics	Voltage Requirement		Single-Phase, 115 V, 60 Hz
	Operating Voltage Range	Max.	127 V
		Min.	104 V
	Starting Current		43 A
	Recommended Fuse Size		15 A
	FLA		9.7 A
	LRA		43 A
Cooling Capacity and Power Consumption			
Evaporator: 95 °F (35 °C), 60 %RH Condenser: 95 °F (35 °C), 60 %RH	Total Cooling Capacity		10000 Btu/h (2940 W)
	Sensible Cooling Capacity		4500 Btu/h (1320 W)
	Power Consumption		1.05 kW
	Current Consumption		9.7 A
	EER		9.5
	Power Factor		94 %
Compressor	Type		Hermetic Rotary
	Output		0.70 kW
Evaporator	Type of Evaporator		Plate Fin
	Type of Fan		Centrifugal Fan
	Air Flow		265 CFM (451 m^3/h)
	Max. External Static Pressure		0.33 IWG (82 Pa)
	Motor Output*1		0.15 kW
Condenser	Type of Condenser		Plate Fin
	Type of Fan		Centrifugal Fan
	Air Flow		740 CFM (1258 m^3/h)
	Max. External Static Pressure		0.13 IWG (32 Pa)
	Motor Output*1		-
Refrigerant	Refrigerant Control		Capillary Tube
	Type		R-410A
	Amount		1.43 lb (0.65 kg)
Signal Connection	Fire Alarm Input (Signal Type)		•No-voltage contact input • Contact resistance less than 100 ohm
	Warning Signal Output		2 A at 30 V (DC/AC) or less (resistive load)
Power Cord	NEMA Plug Configuration		5-15
	Gauge x Length		14 AWG (3-core) × 10 ft (3.0 m)
Dimension	W × D × H		19.4 × 26.5 × 41.5 in (493 × 673 × 1054 mm)
Weight	Net		156 lb (71 kg)
	Shipping		194 lb (88 kg)
Drain Tank Capacity			5.0 gal (19 L)
Operating Condition Range	Inlet Air Temperature	Max.	104 °F (40 °C), 50 %RH
		Min.	70 °F (21 °C), 50 %RH
Maximum Duct Length	Cold Duct		40 ft (12.2 m)
	Hot Duct		60 ft (18.3 m)
Sound Level*2	With Condenser Duct		55 dB (A)
	Without Condenser Duct		58 dB (A)
Safety Devices	Compressor Overload Protector		Included
	Fan Motor Overload Protector		Included
	Freeze Protection Thermistor		Included
	Full Drain Tank Switch		Included
	Automatic Restart (Power Interruption)		Included
	Compressor Time Delay		120 sec
	High Pressure Interruption*3		Included
	Signal Input/Output		Included
Control Devices	Temperature Control		Included

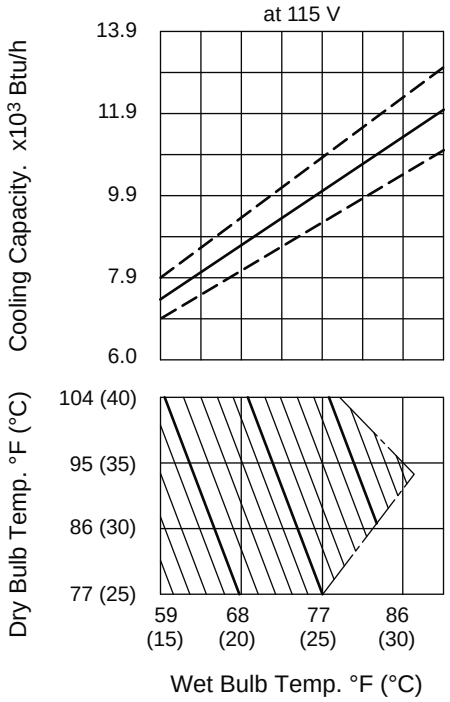
• Specifications are subject to change without notice.

< NOTE >

*1: One motor rotates both the evaporator and the condenser fans.
*2: Measured at 3 feet (1.0 m) from surface of the unit.
*3: For unit serial number from November 2011 (1111) to Present.

2.3 Characteristics

(1) Cooling capacity curve



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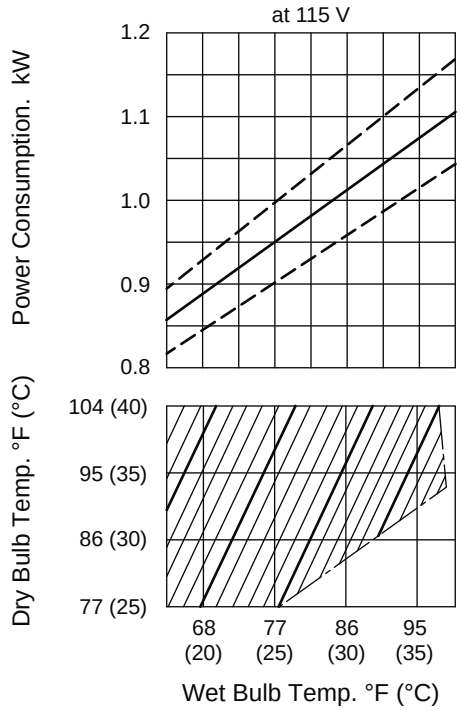
(2) Power consumption curve



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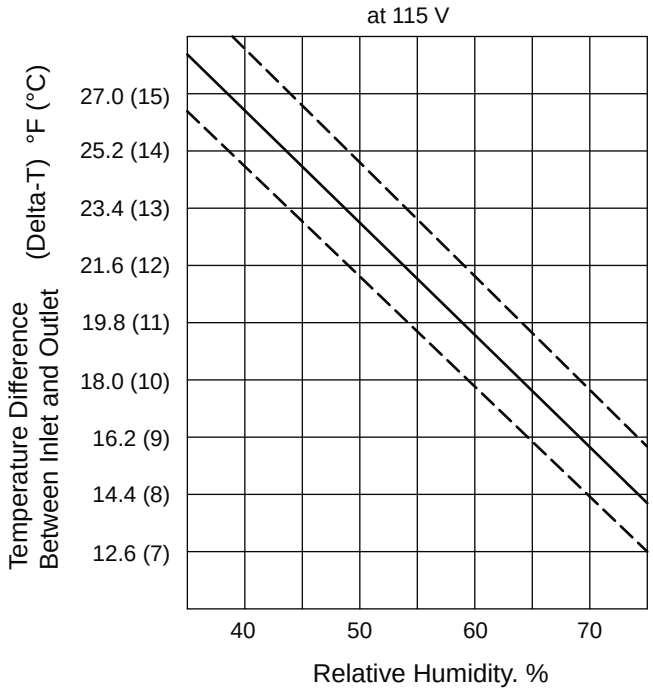
(3) Cool air temperature difference curve



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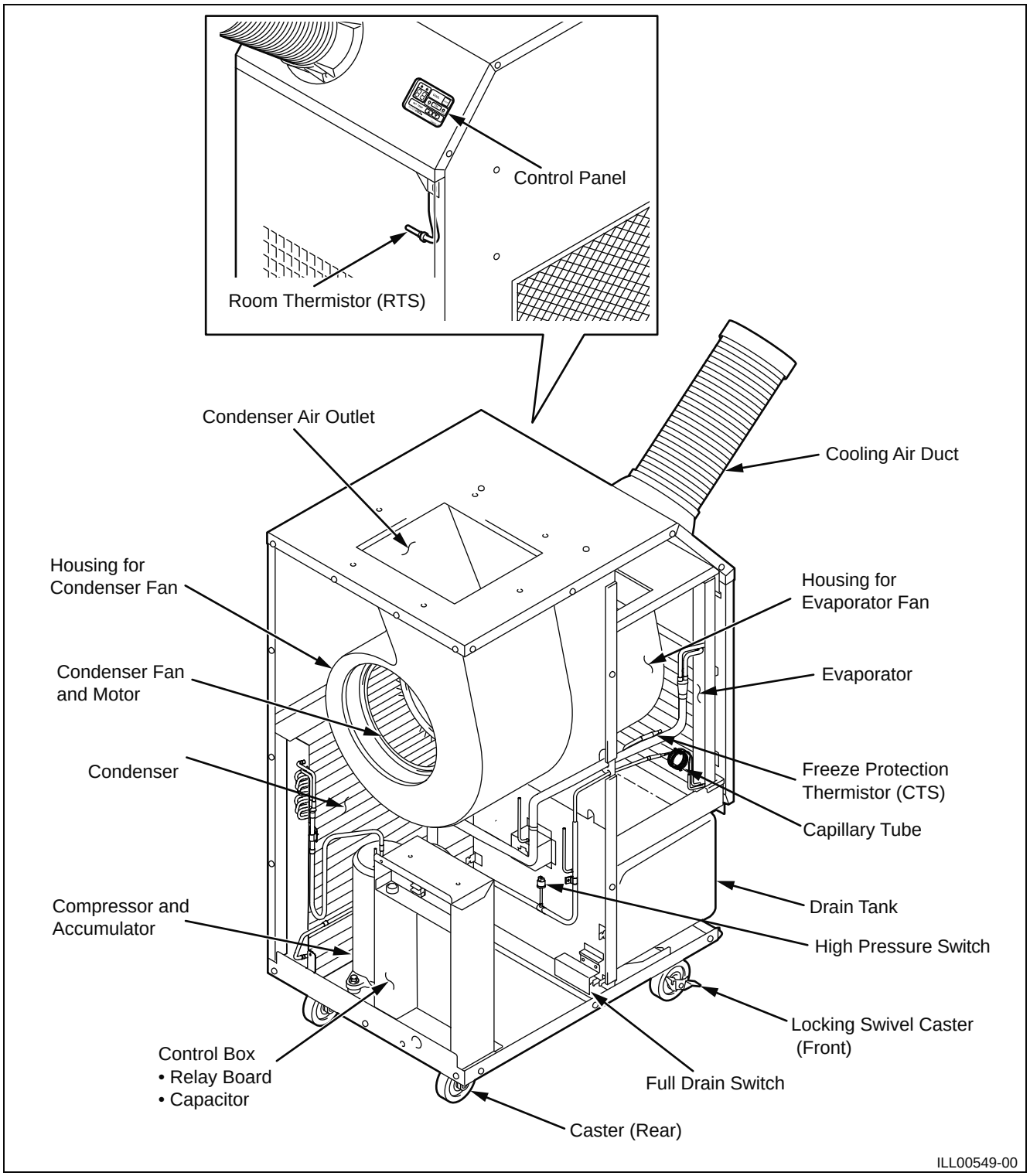
3. CONSTRUCTION

3.1 Internal Structure



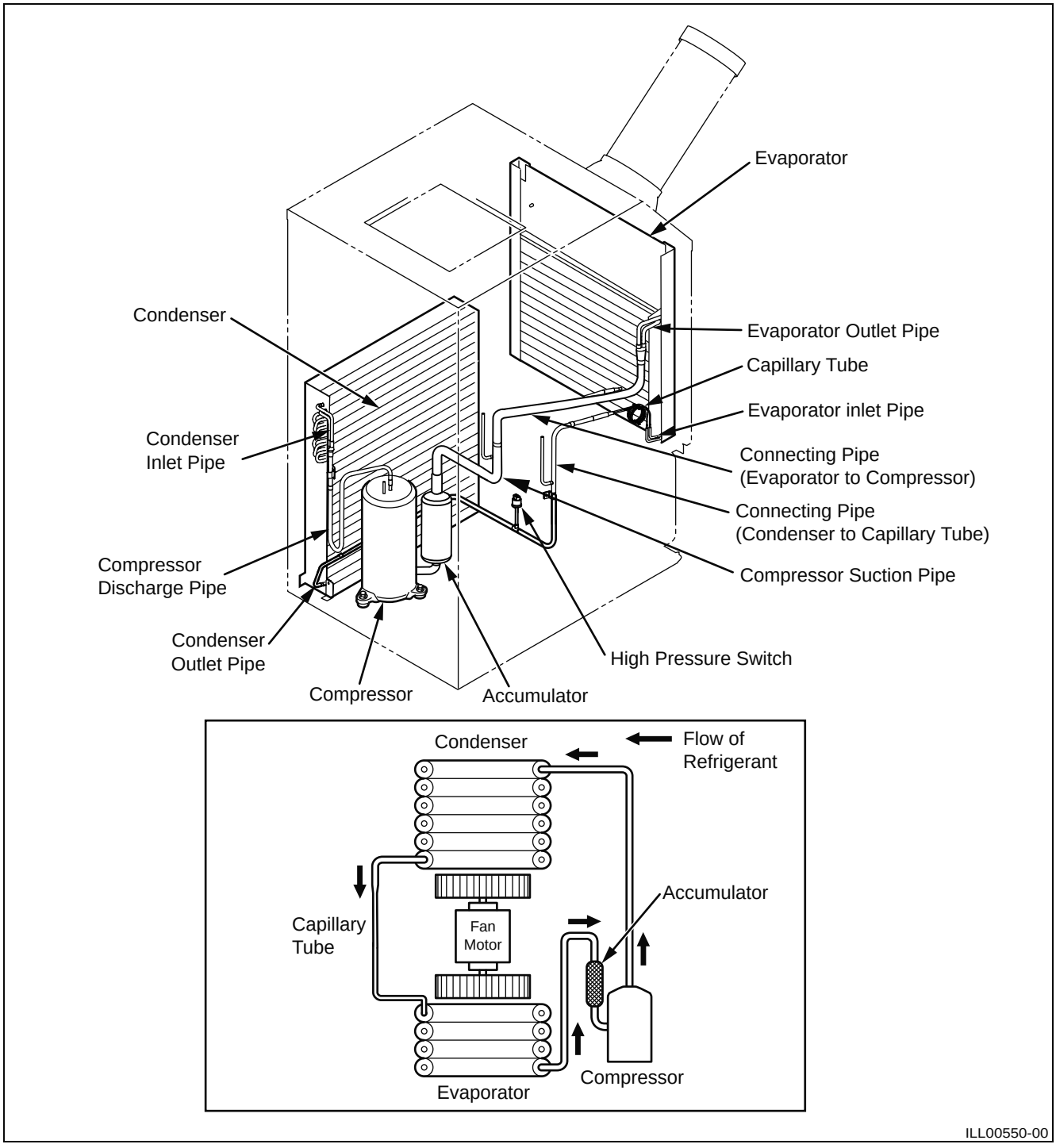
4. REFRIGERATION SYSTEM

4.1 Refrigeration System Construction

The component parts of the refrigeration system include the following:

- Compressor, Evaporator, Condenser, Accumulator, Capillary tube, High Pressure Switch.

The parts above are all connected by copper piping with brazed connections.

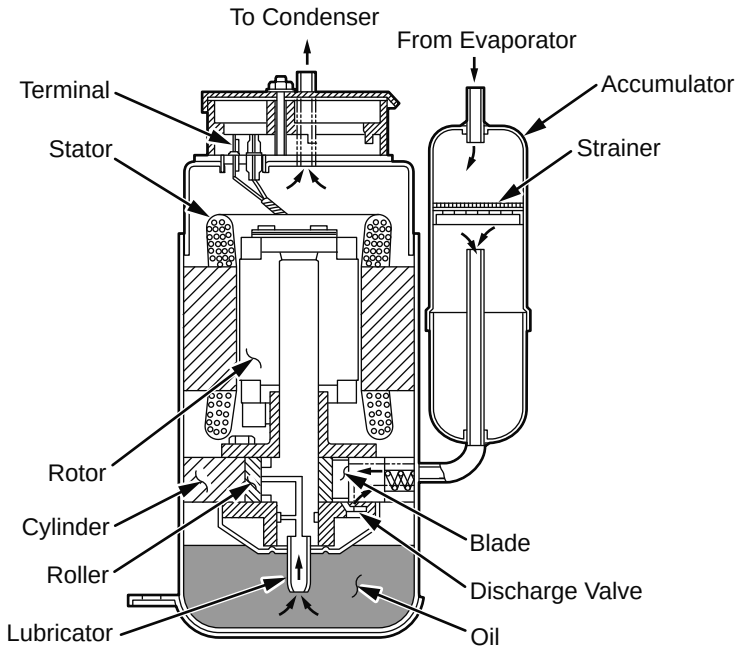


4.2 Compressor

- The compressor used for the unit is hermetically sealed. The compressor and the compressor motor are in one casing.

(1) Compressor construction

- The construction of a rotary type compressor is divided into two mechanisms; the drive mechanism (compressor motor), and the compression mechanism (compressor). When the rotor shaft of the motor (drive mechanism) turns, the roller (compression mechanism) rotates to compress the refrigerant.



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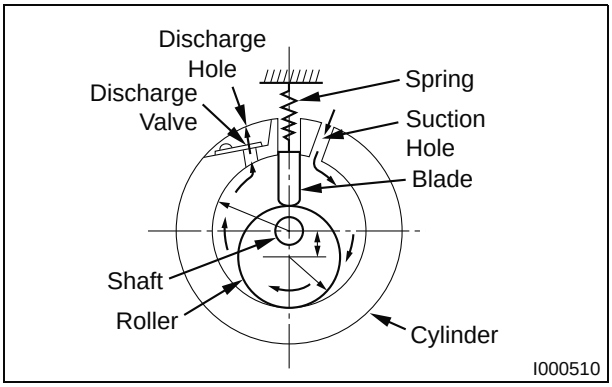
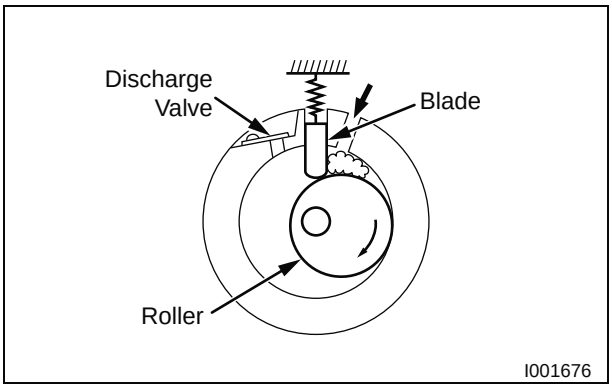
(2) Basic compressor operation



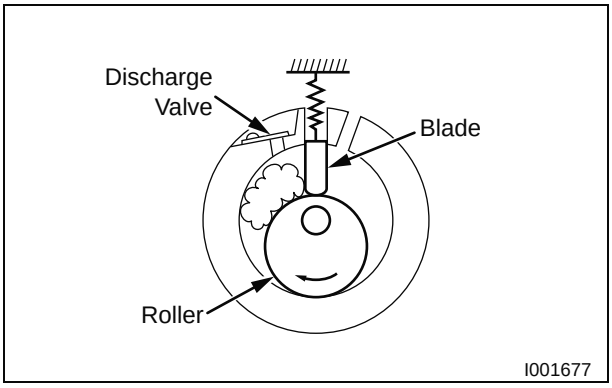
- The roller (compression mechanism) is set eccentrically with a certain distance given from the axis of the center of the cylinder. A spring loaded blade is mounted on the cylinder. The roller turns to compress the refrigerant in the space between the cylinder and eccentrically mounted roller. The blade is in contact with the roller by means of spring force. The blade partitions the space between the suction side and the discharge side to keep compressed refrigerant from returning to the suction side. There is no suction valve. The discharge valve is designed not to open until the pressure of the refrigerant within the cylinder reaches or exceeds discharge side pressure. As a result, the discharge valve prevents the backward flow of refrigerant gas.

(3) Operation



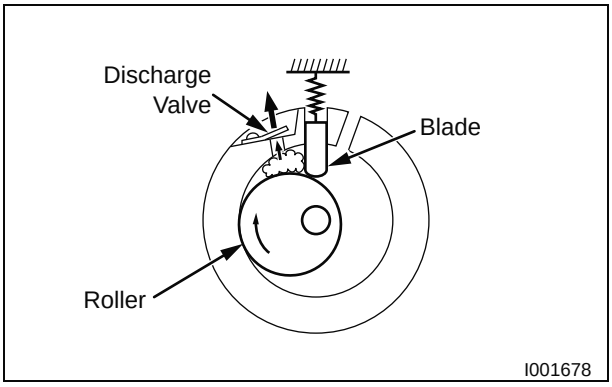
1) Start of compression

1) The cylinder is filled with low pressure gas.
2) Since pressure in the discharge chamber is higher than in the cylinder, the discharge valve is kept closed.



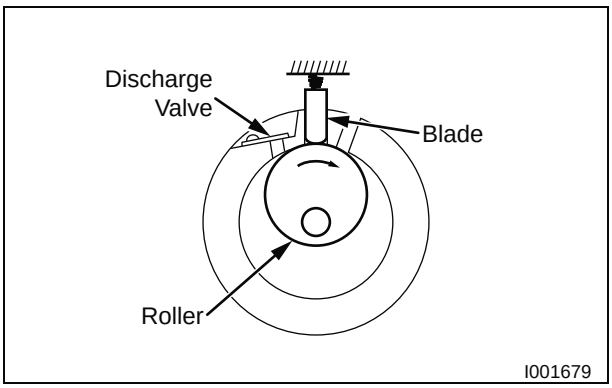
2) Suction and compression

1) The pressure in the cylinder increases gradually.
2) Refrigerant suction begins on the suction side of the cylinder.
3) The discharge valve remains closed.



3) Discharge

1) The pressure in the cylinder exceeds that in the discharge chamber, and the discharge valve opens.
2) On the suction side, refrigerant suction continues.

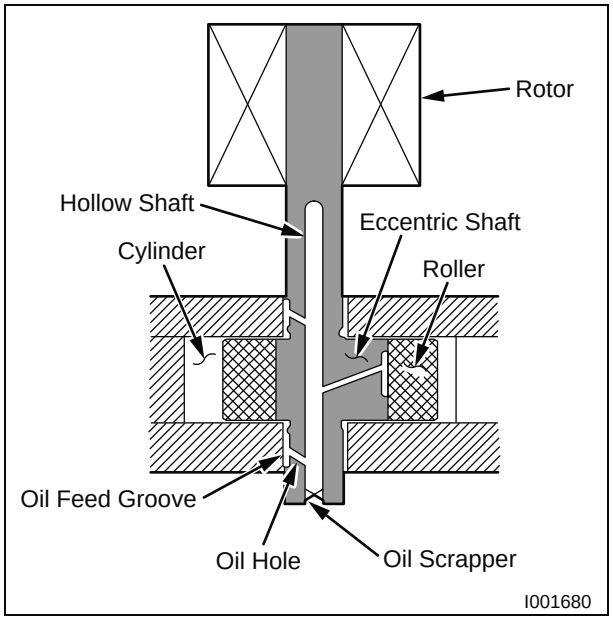


4) Completion of compression

1) When compression is completed, all of the refrigerant has been drawn from the suction chamber.
2) Operation then returns to step 1) (Start of compression) and the above process of suction and compression continues repeatedly in succession.

(4) Compressor lubrication

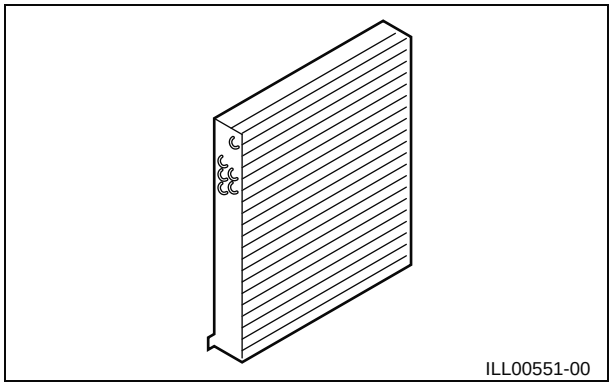
- The lubrication system is comprised of a hollow shaft, an oil scraper mounted at the end face, hollow shaft, a shaft journal (shaft bearing), and the lubrication groove for the shaft journal. The lubrication groove is wider than the oil hole. When the shaft turns, oil is scraped upward by the oil scraper along the inside diameter of the hollow shaft. The oil is fed through the oil hole by centrifugal force, then supplied to the lubrication groove for each shaft journal, lubricating the bearing. In this lubrication system, oil enters into each bearing separately and returns to the oil reservoir.



This system effectively prevents bearing temperature increases, and offers high reliability. In addition, the specially treated shaft journal keeps the bearing from being damaged during high temperature operation.

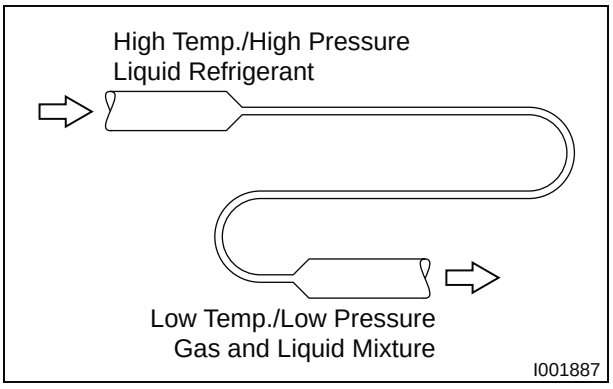
4.3 Condenser

- The condenser is a heat exchanger with copper tubes that are covered with thin aluminum projections called plate fins.
- Heat is given off and absorbed by air being pulled across the condenser fins by the centrifugal fan and then expelled through the exhaust air duct.



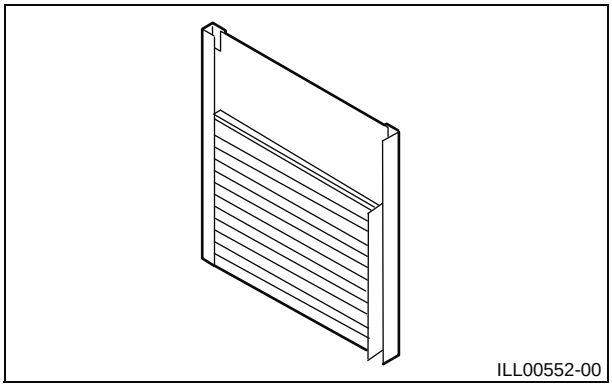
4.4 Capillary Tube

- The capillary tube is a long thin tube that utilizes line flow resistance as an expansion valve. The length and the inner diameter of the capillary tube are determined according to the capacity of the refrigeration system, operating conditions, and the amount of refrigerant. The high pressure, high temperature liquid refrigerant sent from the condenser expands rapidly as the refrigerant is sprayed out through the fixed orifice in the capillary tube. As a result, the temperature and state of the refrigerant becomes low and mist-like, and therefore evaporates easily.



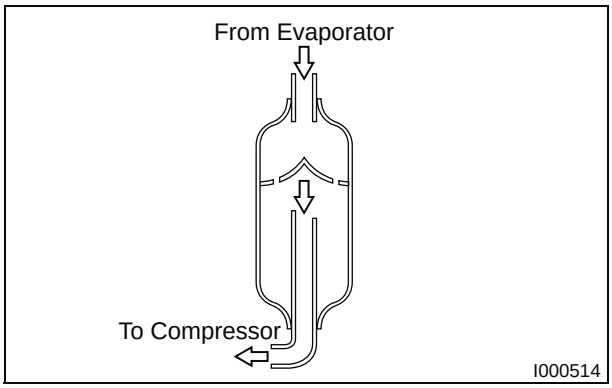
4.5 Evaporator

- The evaporator is a heat exchanger covered with plate fins. Heat is removed from the air being pulled across the evaporator by the centrifugal fan. The resulting cool air is expelled through the cooling air ducts.



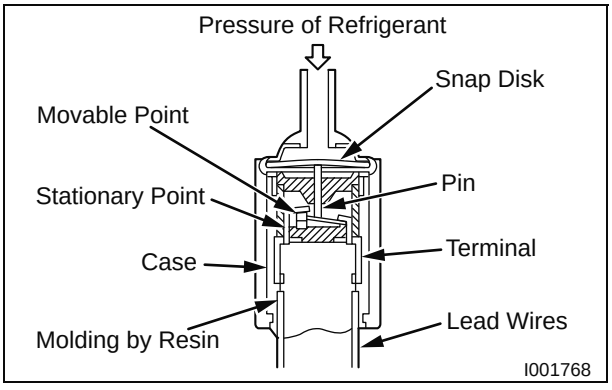
4.6 Accumulator

- The accumulator is mounted on the suction gas piping between the evaporator and the compressor. The accumulator separates the liquid refrigerant from the gas refrigerant, allowing only the gas refrigerant to enter the compressor. In the accumulator, suction gas is led into a cylindrical vessel where the speed of the gas is decreased. This process separates the refrigerant contained in the gas by the force of gravity, causing the refrigerant to accumulate at the bottom of the vessel. As a result, the compressor is protected from possible damage caused by liquid refrigerant intake.



4.7 High-Pressure Switch

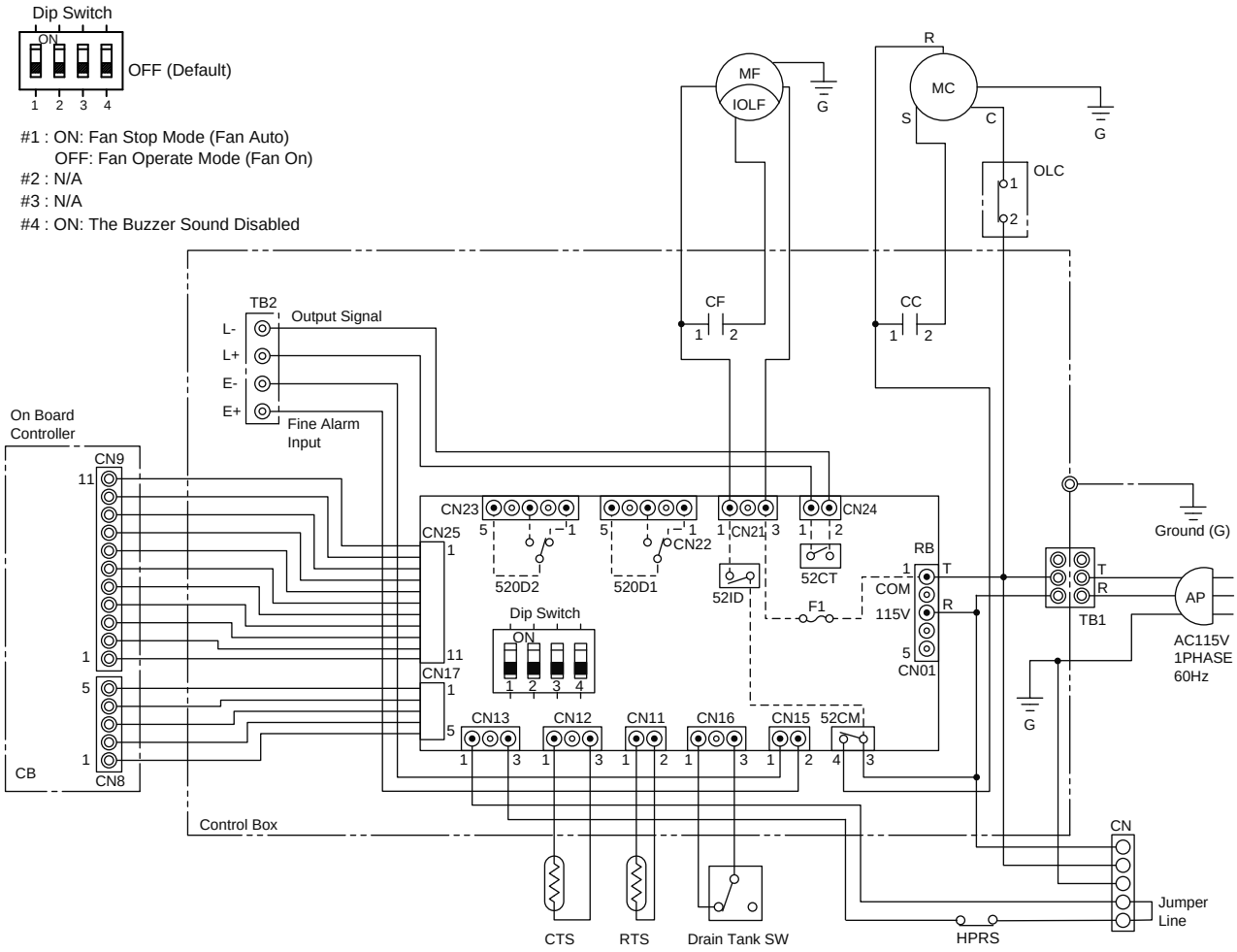
- The high-pressure switch prevents the condenser and compressor from being damaged by excessive high pressure in the high-pressure line of the refrigeration cycle. The switch is normally closed. The snap disk responds to the variations in pressure and, if pressure is abnormally high, the snap disk moves down to push the pin down, causing the internal contacts to open. This interrupts the ground signal at the relay board which turns the compressor off.



5. ELECTRICAL SYSTEM

5.1 Circuit Diagram

For Unit Serial Number from February 2011 (0211) to October 2011(1011)



TB1	Terminal Block1	CN	Connector for Option Drain Pump
TB2	Terminal Block2		
RB	Relay Board	CTS	Freeze Protection Thermistor
MF	Fan Motor	RTS	Room Thermistor
MC	Compressor Motor	G	Ground
CF	Capacitor for Fan Motor	CB	Control Board
CC	Capacitor for Compressor	HPRS	High Pressure Switch
OLC	Overload Protector		

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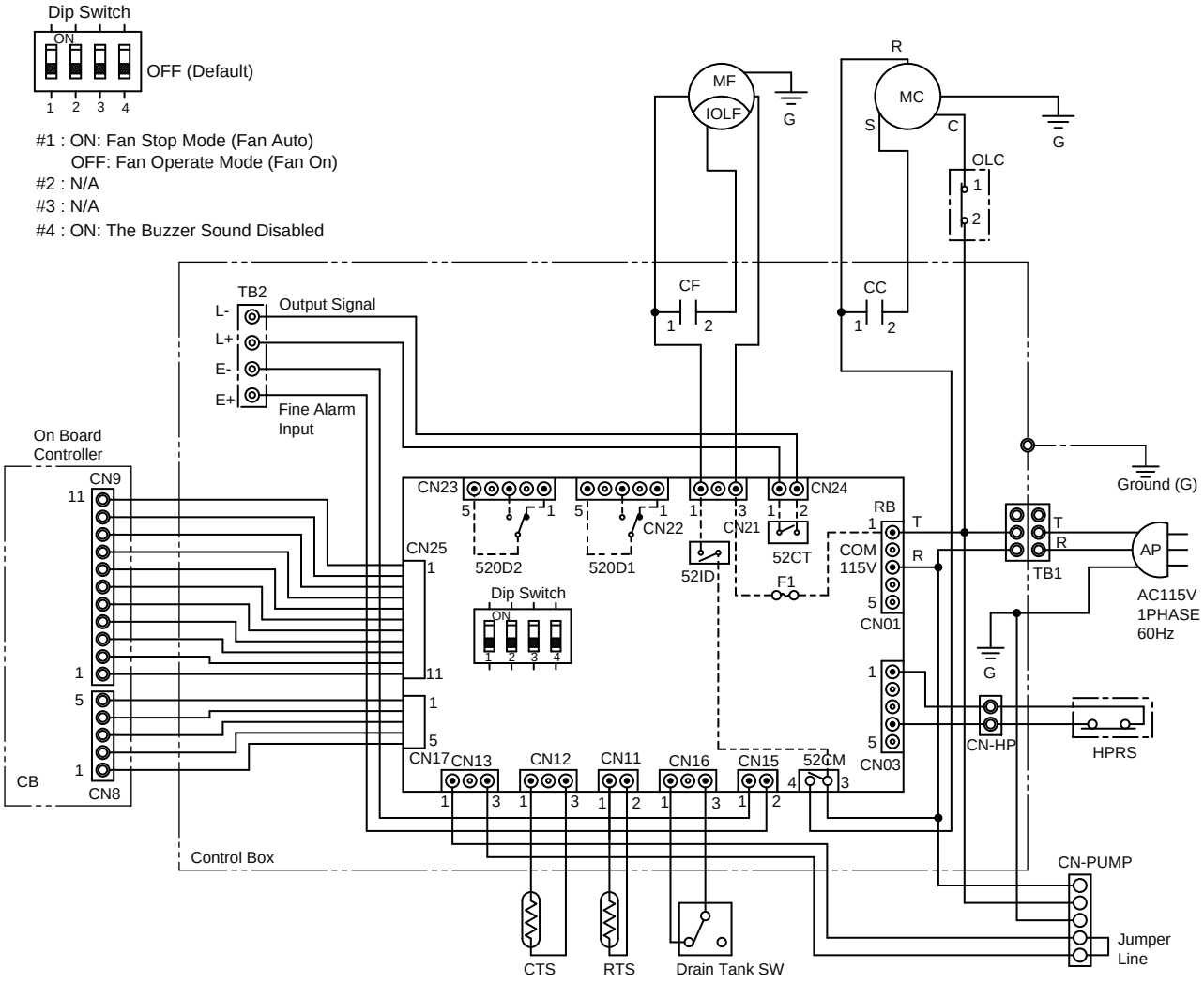
For Unit Serial Number from November 2011 (1111) to Present



TB1	Terminal Block1	CN-PUMP	Connector for Option Drain Pump
TB2	Terminal Block2		
RB	Relay Board	CTS	Freeze Protection Thermistor
MF	Fan Motor	RTS	Room Thermistor
MC	Compressor Motor	G	Ground
CF	Capacitor for Fan Motor	CB	Control Board
CC	Capacitor for Compressor	HPRS	High Pressure Switch
OLC	Overload Protector		

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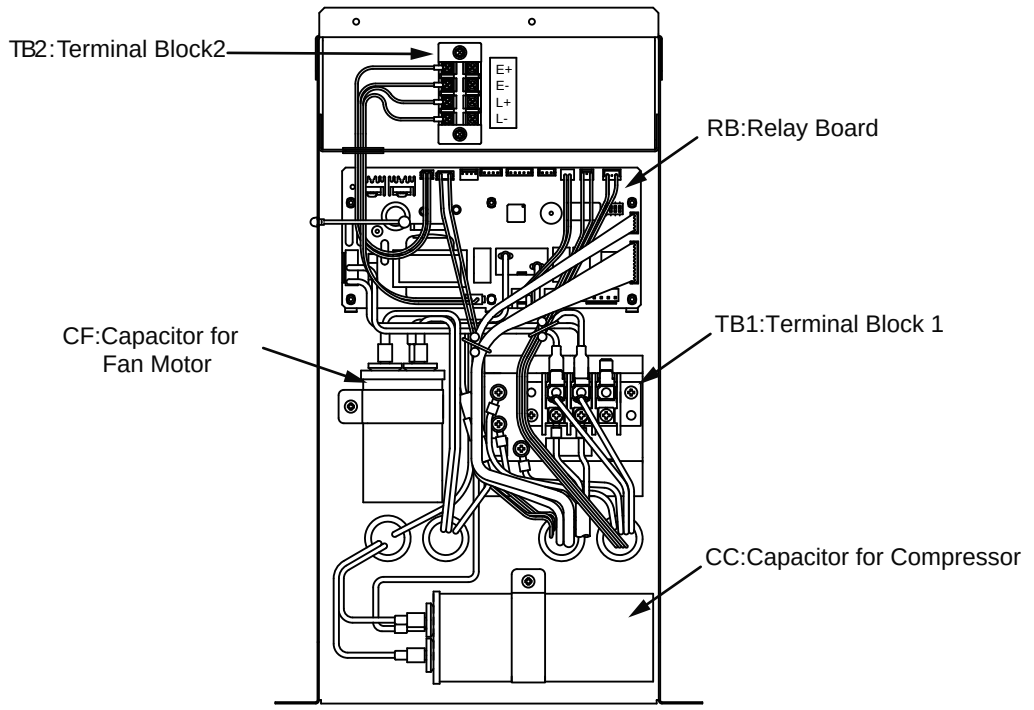
5.2 Control Box

For Unit Serial Number from February 2011 (0211) to October 2011 (1011)



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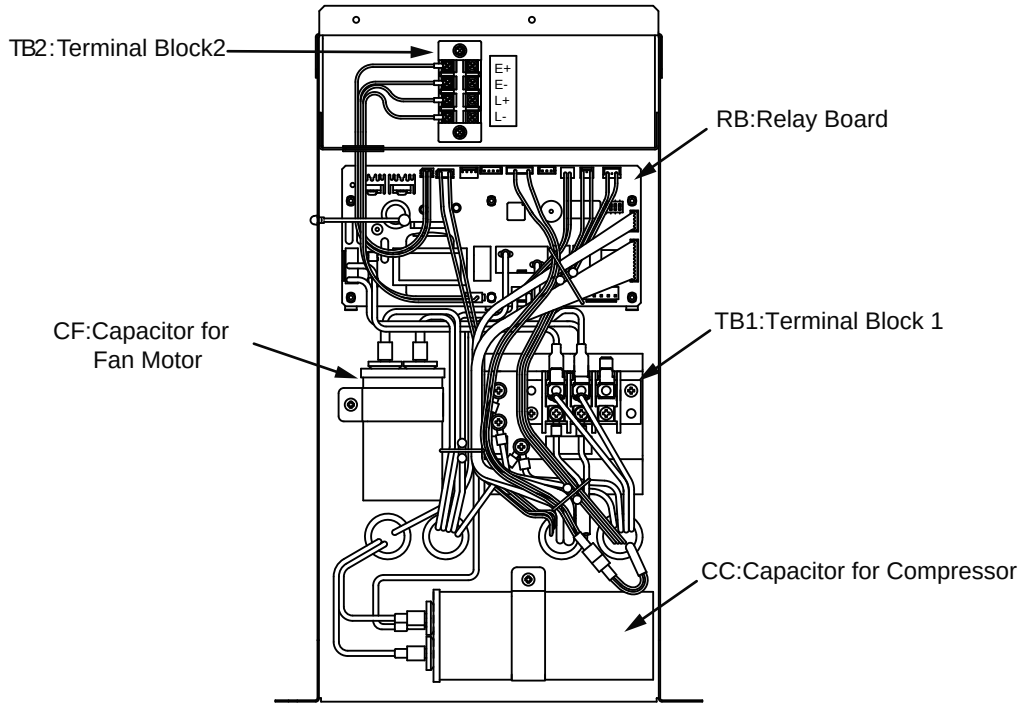
For Unit Serial Number from November 2011 (1111) to Present



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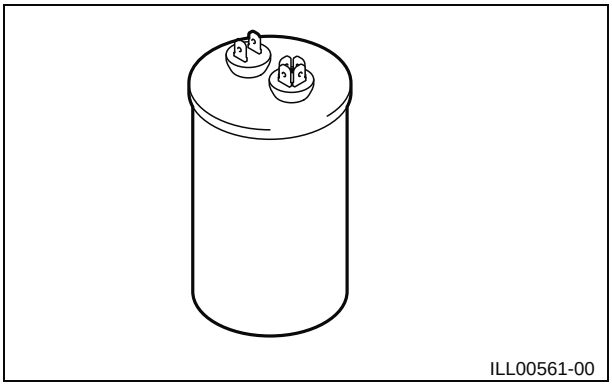
(1) Capacitor

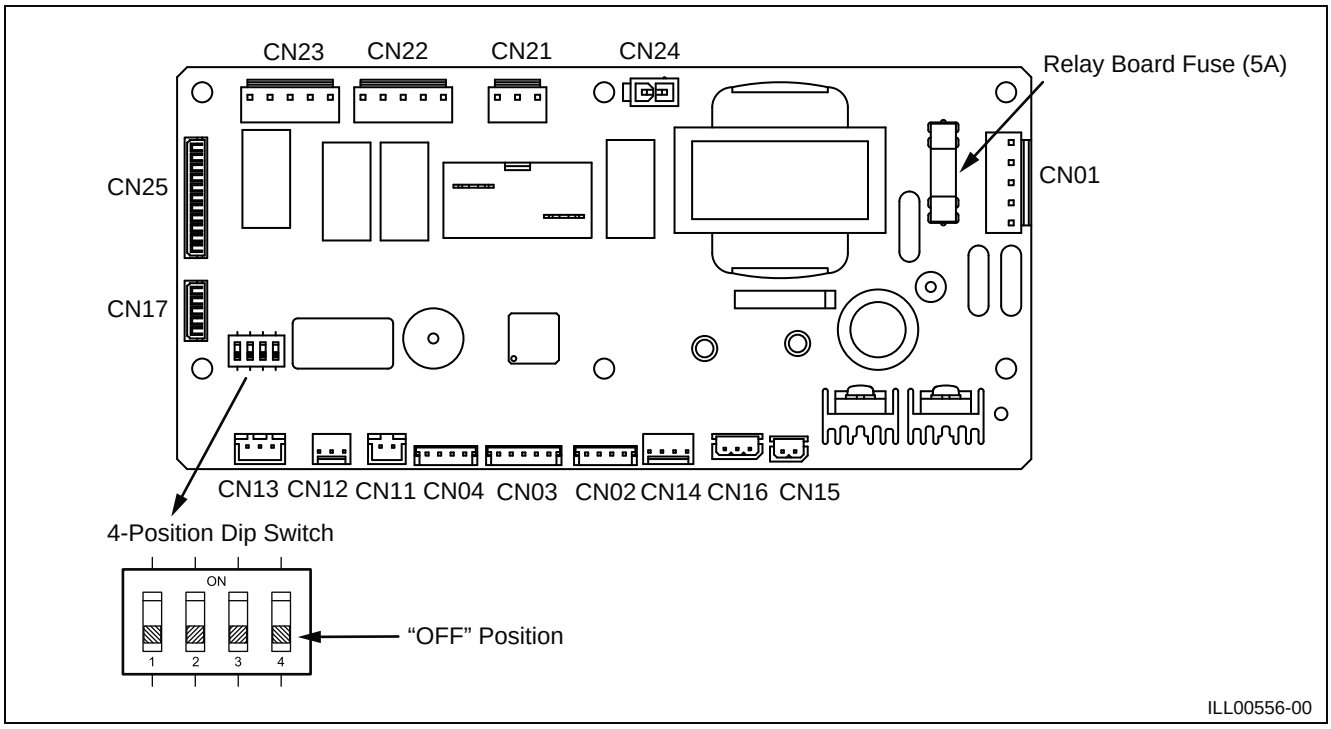
- The capacitor is used to improve the rotational power of the fan motor and compressor at startup. The specification for each capacitor is shown below.



Model	Capacitor	Rated Voltage	Capacitance
For unit serial number from February 2011 (0211) to March 2011 (0311)	For Fan Motor	450 V	16 μF
	For Compressor	450 V	55 μF
For unit serial number from April 2011 (0411) to Present	For Fan Motor	250 V	25 μF
	For Compressor	450 V	55 μF

(2) Relay board

- The relay board contains the dip switch, the compressor and fan relays, and a step-down transformer that reduces the line voltage from 115VAC to approx. 14 VAC. This voltage is then rectified from 14 VAC to 12 VDC and used for relay coil activation. The 12 VDC voltage is sent to the control panel assembly, and further being reduced to 5 V for the system logic.



1) Power supply requirements

- This unit requires a single-phase 115 V, 60 Hz power supply.

2) Relay board fuse

- The relay board fuse is the only serviceable component on the relay board assembly. This fuse provides protection against damage to the step-down transformer. The fuse must be replaced with the exact same part, or a suitable equivalent.

Specifications:

- 5 A, 250 VAC

⚠ CAUTION

Failure to use the exact same fuse may result in damage to the unit and/or components, and will also void the unit warranty.

3) Input signal

- The relay board receives inputs from the control panel, sensors, and external devices to perform device control.

Control Panel Input

Symbol	Indication	Function	Connector
SW1	ON/OFF Button	On/off control for unit operation. Turns the unit on and off.	CN17
SW2	FAN Button	Changes the fan control mode between continuous and automatic on/off control.	
SW3	SET TEMP △ Button	Increases the set temperature.	
SW4	SET TEMP ▽ Button	Decreases the set temperature.	

Sensor Input

Symbol	Type	Specification			Connector
		Characteristic	"Short" Detection	"Open" Detection	
RTS	Room Thermistor	5 k ohm at 77 °F (25 °C)	181 °F (83 °C) or more	-29 °F (-34 °C) or less	CN11
CTS	Freeze Protection Thermistor	5 k ohm at 77 °F (25 °C)	181 °F (83 °C) or more	-29 °F (-34 °C) or less	CN12

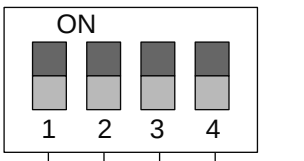
External Input Signal Specification

Symbol	Signal	Specification	Function	Connector
AUX2	Fire Alarm Input	On: Between 10 to 20 mA at DC12 V (Off: No signal)	On: Activates "Defect control" (Contact: Normally open) LED shows "AL", Output signal "ON" On board buzzer sound	CN15
TANK FULL S/W	Tank Full Switch	On: Between 10 to 20 mA at DC12 V (Off: No signal)	Off: Activates "Defect control" (Contact: Normally closed) LED shows "FL", Output signal "ON"	CN16
AUX1	External Pump Failure	On: Between 10 to 20 mA at DC12 V (Off: No signal)	Off: 1) From 1 to 180 seconds - Compressor stops. 2) After 180 seconds - Compressor stops. LED shows "AS", Output signal turns "ON"	CN13
HPRS[*1]	High Pressure Switch	On: Between 0.4 to 1.0 mA at DC 5V (Off: No signal)	Off: Activates "Defect control" (Contact: Normally closed) 1) Activates 3 times in 24 hours: LED shows blinking "HP". 2) Activates 10 times in 24 hours: LED shows "HP", Output signal "ON"	CN03

*1 : For unit serial number from November 2011 (1111) to Present

4) Dip switch setting

• The controller is equipped with a four position dip switch that defaults in the OFF position. The dip switch can be set to configure the following functions:



Symbol	Item	Function
DSW4	Buzzer	On --- Disable “onboard buzzer” Off --- Enable “onboard buzzer”
DSW3	-	N/A
DSW2	-	N/A
DSW1	Fan Mode	Change Fan Mode On --- Fan stop mode (Fan AUTO) Off --- Fan operate mode (Fan ON)

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5.3 Control Specifications

(1) Fan control

- When the FAN button is pressed, the 52ID (fan motor on/off) relay on the relay board turns on, operating the fan.

Specifications:

- 52ID (Fan motor On-Off) relay contact rating: 5 A at 250 VAC

(2) Compressor start control

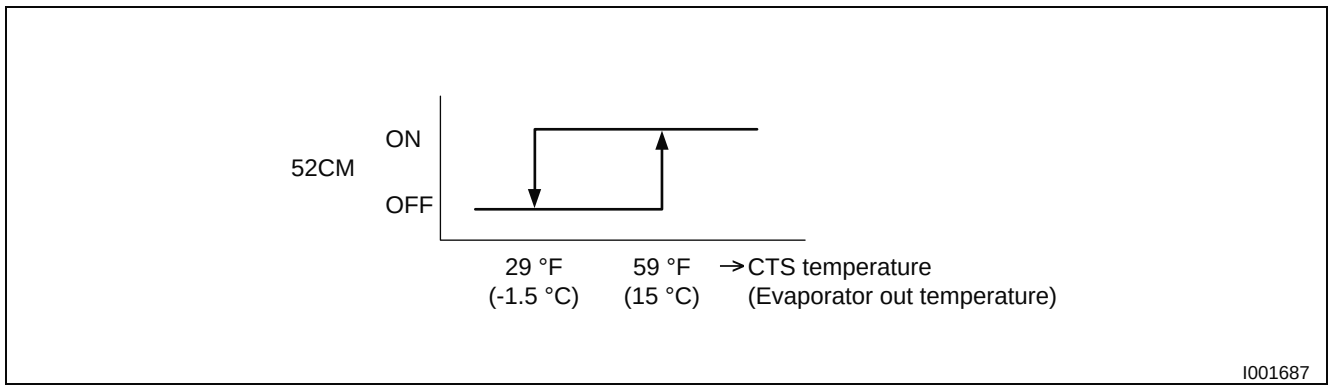
- When the ON/OFF button is pressed, the 52CM relay on the relay board turns on, operating the compressor.

Specifications:

- 52CM (Compressor On-Off) relay contact rating: 20 A at 250 VAC

(3) Anti-freeze control

- Anti-freeze controls turns the compressor on and off by turning the 52CM relay on in accordance with the freeze protection thermistor (CTS) temperature. As a result, decreases in cooling performance due to frost buildup on the evaporator are prevented.
- Compressor off conditions: Freeze protection thermistor (CTS) temperature ≤ 29 °F (-1.5 °C)
- Compressor on (recovery) conditions: CTS temperature ≥ 59 °F (15 °C)

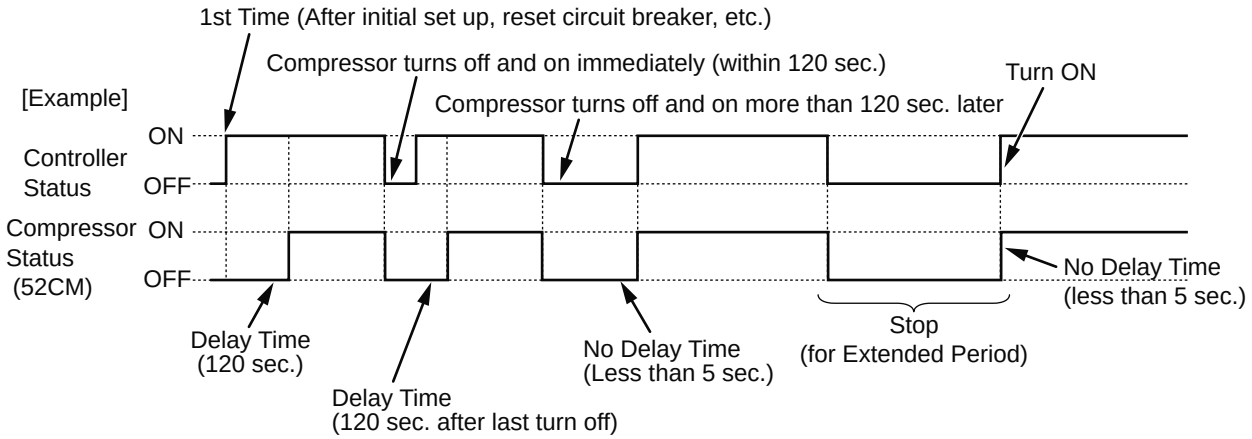


(4) Compressor time delay control (compressor protection)

- Compressor protection consists of a time delay program within the microprocessor. This program prevents a heavy load from being applied to the compressor motor when restarting the unit (cool mode) after a very short period of time. This “delay” is in effect any time the compressor is turned on by either the COOL ON/OFF button, or power interruption restart (automatic recovery.)

Specifications:

- Time Delay: 120 seconds.



Reference: Initial turn on

Within: 120 sec. after (the power cord is connected to) the power supply, the compressor will start with delay timer.
After: 120 sec. since (the power cord was connected to) the power supply, the compressor will start without delay timer.

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(5) Automatic restart and recovery function

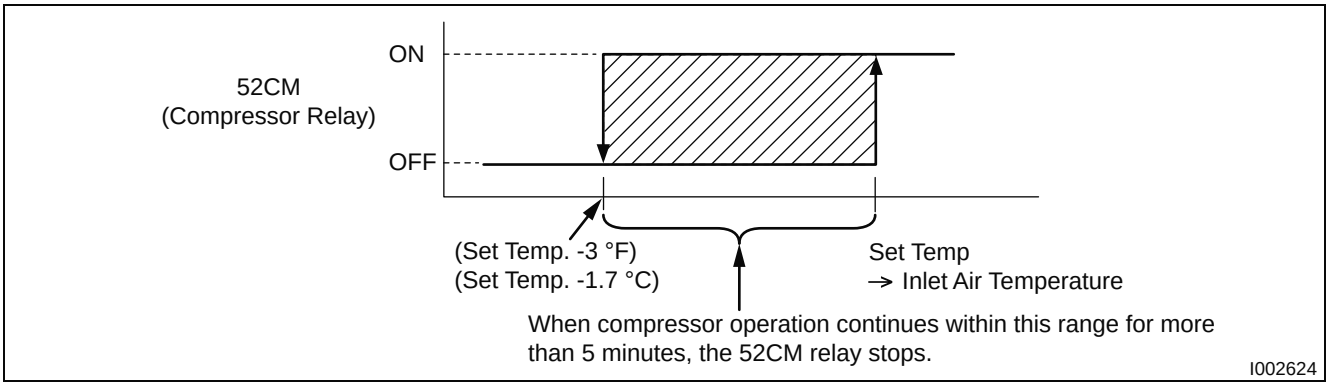
- The microprocessor contains a feature that automatically restart the unit after power is lost and regained, and also has memory to store and recover operation status in the event of a power loss.

Status of memory during power interruption

- When the input power is off, the status items below are saved in the memory.
  - Running status (on or off)
  - Operating mode: Cool mode or fan only mode
  - Set temperature
  - Temperature mode (°F or °C)
  - Fan mode: Fan operation mode (fan on) or fan stop mode (fan auto)

(6) Temperature control

• During cool mode, temperature control changes the 52CM (compressor on/off) relay status according to RTS temperature in the available range (-4 °F to 140 °F (-20 °C to 60 °C)).



(7) Fire alarm signal control

• When receiving the signal from the fire alarm control panel, the buzzer sounds, and the 52CT (signal output) relay on the relay board turns on.

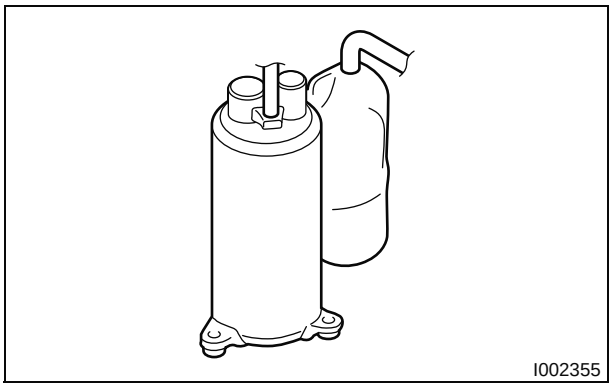
5.4 Compressor

(1) Compressor motor

- The compressor motor is a single-phase motor and is contained within the same housing as the compressor.

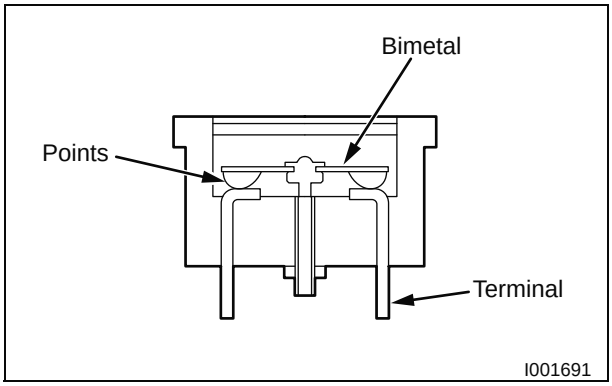
Specifications:

Rated Voltage	115 V
Rated Output	700 W



(2) Compressor overload relay

- An external compressor overload relay is used to protect the compressor motor. This relay is mounted within the connector housing that attaches to the top of the compressor. The relay interrupts the flow of current when there is an overload condition such as high current draw and/or high temperature build up in the compressor.



Operating Temperature		Non-Operating Limit at 212 °F (100 °C)	Marking
OFF (Open Contacts)	ON (Closed Contacts)		
302 °F (150 °C)	142 °F (61 °C)	12.8 A	MRA1261-12026

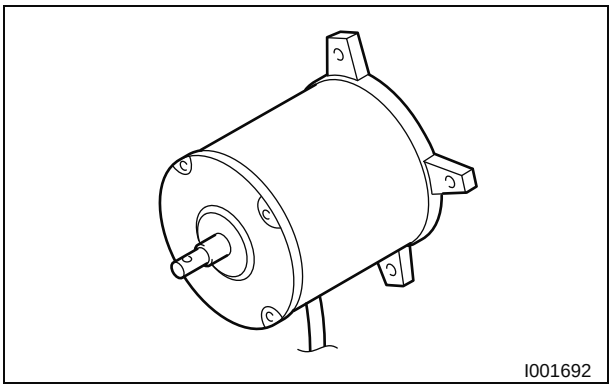
5.5 Fan Motor

(1) For unit serial number from February 2011 (0211) to March 2011 (0311)

- The fan motor is a single phase, induction type. The motor rotates the fan on both the evaporator side and the condenser side at the same time.

Specifications:

Rated Voltage	115 V
Rated Output	140 W

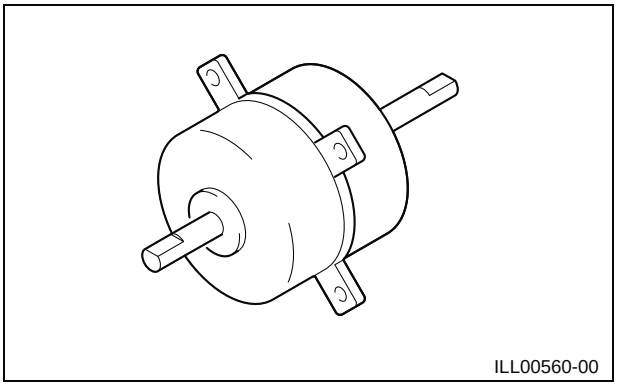

I001692

(2) For unit serial number from April 2011 (0411) to Present

- The fan motor is a single phase, induction type. The motor rotates the fan on both the evaporator side and the condenser side at the same time.

Specifications:

Rated Voltage	115 V
Rated Output	150 W

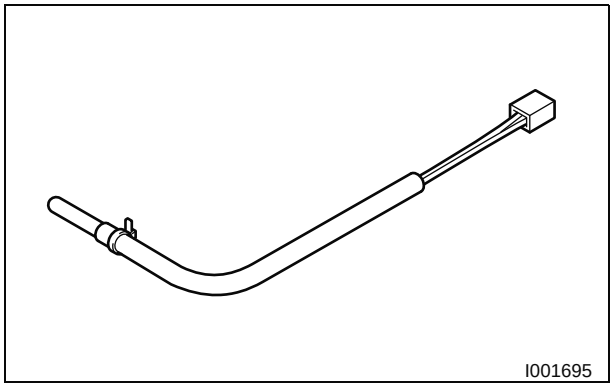

ILL00560-00

< NOTE >

An internal overload relay is used to protect the fan motor. This relay is built into the fan motor and interrupts the flow of current when there is an over current situation, or if there is an abnormally high temperature build up in the fan motor.

5.6 Temperature Thermistor

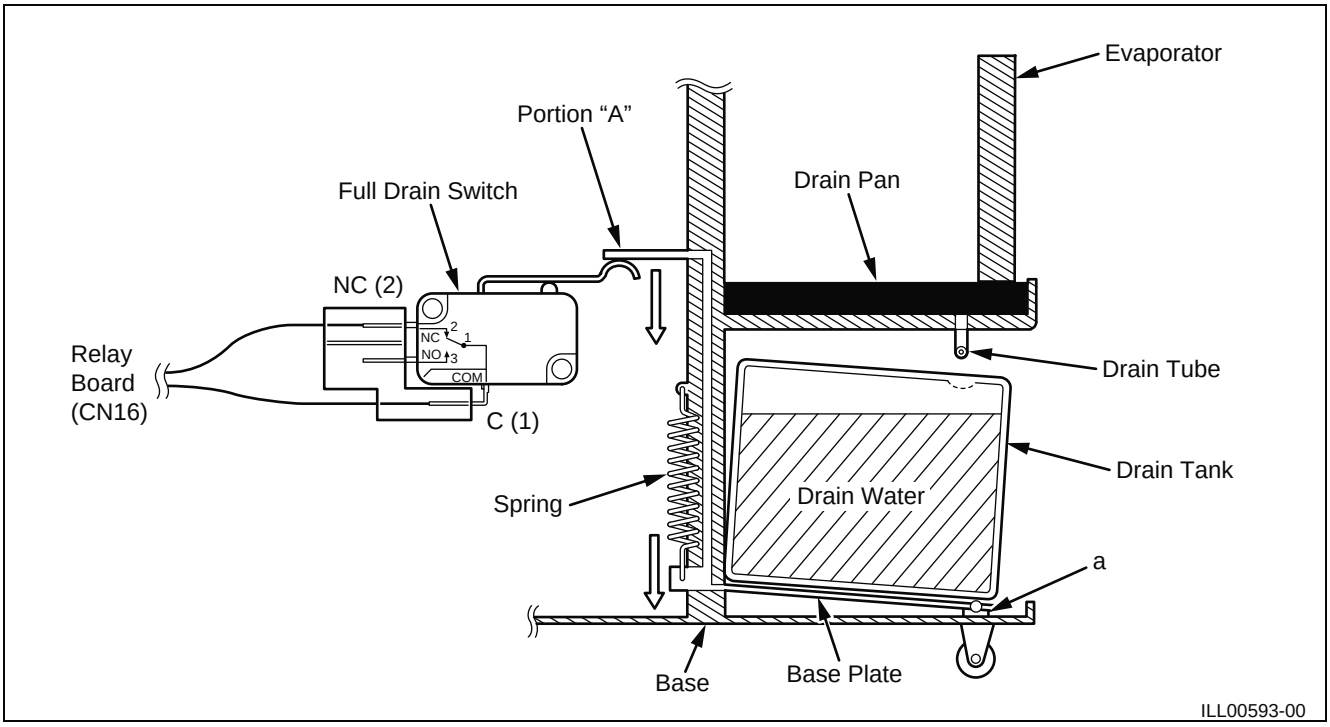
- The room thermistor (RTS) is installed upstream of the evaporator, and detects evaporator inlet temperature as a resistance value.
- The freeze protection thermistor (CTS) is installed in the evaporator outlet piping, and detects low temperature on the evaporator as a resistance value.



Type	Specification		
	Characteristic	“Short” Detection	“Open” Detection
Room Thermistor (RTS)	5 k ohm at 77 °F (25 °C)	181 °F (83 °C) or more	-29 °F (-34 °C) or less
Freeze Protection Thermistor (CTS)	5 k ohm at 77 °F (25 °C)	181 °F (83 °C) or more	-29 °F (-34 °C) or less

5.7 Drain Tank Switch

- The drain switch activates and stops the operation of compressor motor and fan motor when approximately 4.4 gal (16 L) of drain water accumulates in the drain tank. At the same time, control panel display "FL", and compressor and fan operations stop. This system uses a 250 V, 0.1 A rating micro switch for this function.
- When approximately 4.4 gal (16 L) of drain water accumulates in the drain tank, the drain tank base plate, which is supported at fulcrum (a), is pushed down in the direction of the arrow.
- When the drain tank base plate is forced down, “portion A”, located at the top of the drain tank base plate, turns off micro switch contacts (1)-(2).



6. CONNECTION AND SETTING

6.1 Warning Signal Connection (Output Signal Terminal L+ and L-)

- The controller is equipped with a warning signal output relay type (Form C, normal open dry contact) which can be used to monitor the failure conditions.

Relay contactor is closed if any of the following conditions has occurred:

- Tank Full
- Temperature sensor fails
- High pressure switch error *1

< NOTE >

* 1 : For unit serial number from November 2011 (1111) to Present

- The relay output contactor is rated 2 A at 30 VDC or 2 A at 30 VAC (resistive load) and it is compatible with various warning devices such as alarm speaker, light indicators, etc.

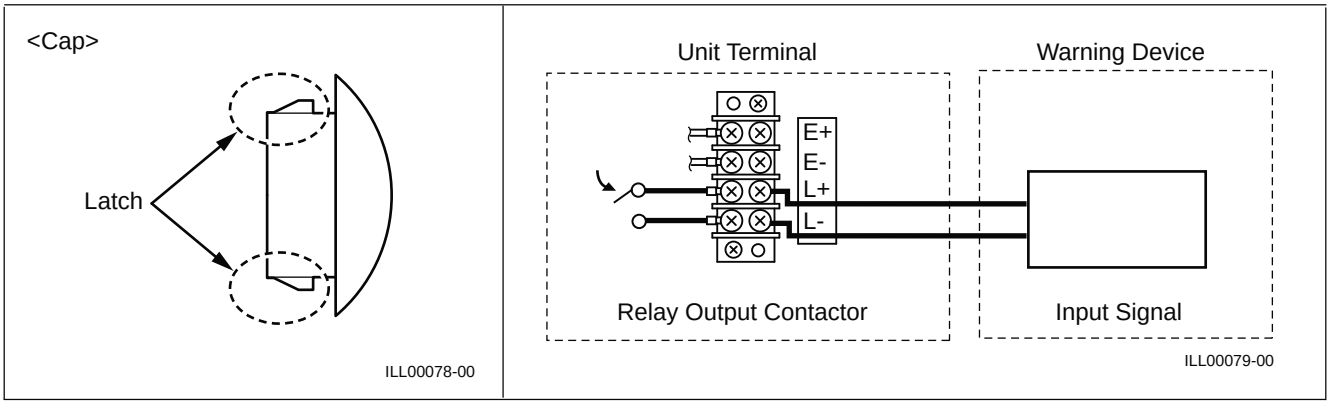
Connecting warning signal from controller

1) Remove service panel from the rear of the unit.

2) Squeeze the inner latches and push out the black cap from inside the panel. (See drawing of cap and inner latch shapes.)

3) Insert the warning signal wire through the hole in the rear panel.
Use recommended warning signal wire size from 16 AWG to 26 AWG or a solid wire, or 16 AWG to 22 AWG for a stranded wire with ring terminal for #6 stud size.

4) Connect warning device to terminal L+ and L- according to its polarities.



6.2 Fire Alarm Control Panel Connection (Input Signal Terminal E+ and E-)

- The controller is equipped with a normal open input signal, which can be connected directly from the fire alarm control panel. When receiving the signal from the fire alarm control panel, the unit turns off and does not turn back on until it has been reset.

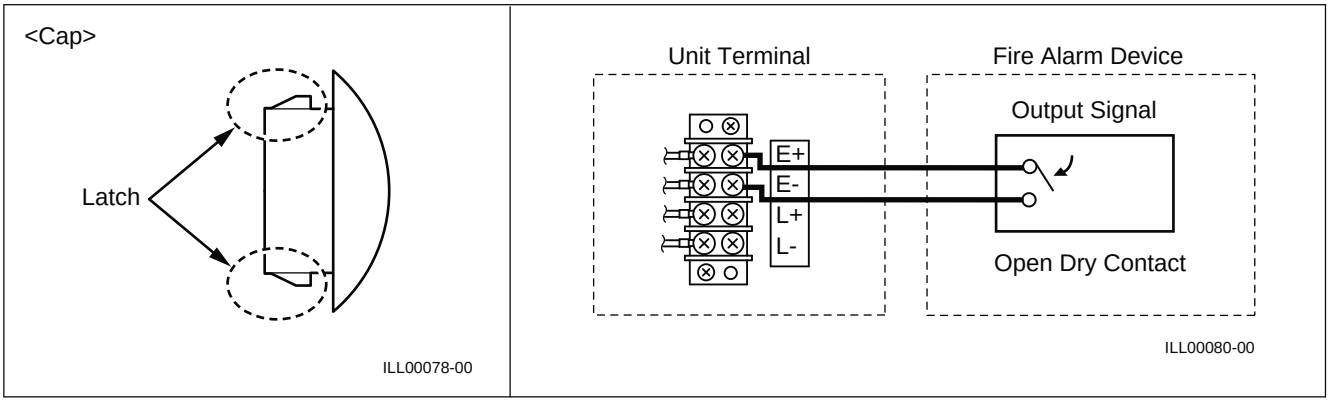
Connecting fire alarm control panel to controller

1) Remove service panel from the rear of the unit.

2) Squeeze the inner latches and push out the black cap from inside the panel. (See drawing of Cap and inner latch shapes.)

3) Insert the fire alarm signal wire through the hole in the rear panel.
Use recommended warning signal wire size from 16 AWG to 26 AWG for a solid wire, or 16 AWG to 22 AWG for a stranded wire with ring terminal for #6 stud size.

4) Connect warning device to terminal E+ and E- according to its polarities.

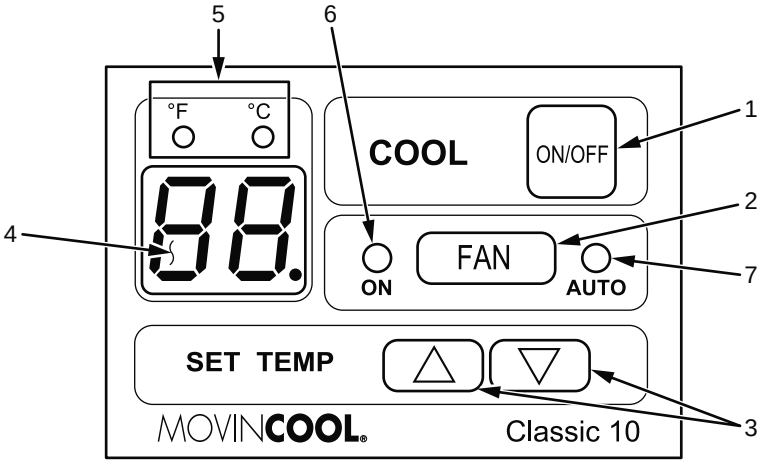


7. OPERATION

7.1 Operation of Control Panel

(1) Control panel

•Before operating the unit, it is important to be familiar with the basic operation of the control panel.



1	COOL ON/OFF Button	Activates/deactivates the cool mode; turns the unit off.
2	FAN Button	Activates/deactivates the fan only mode; turns the unit off.
3	SET TEMP Buttons (△/▽)	Increases/decreases the temperature set point during cool mode.
4	Room Temperature/ Set Point Display	Shows a blinking set point temperature for 5 seconds, then continuously indicates room temperature.
5	Temperature Scale LED	Illuminates to indicate the current temperature being displayed is either in °C or °F.
6	ON LED	Illuminates during fan only mode and cool mode using fan operate mode.
7	AUTO LED	Illuminates during cool mode using fan stop mode.

[LED Display Indication] In normal operation, LED displays the following indication.

Display	Indication	Conditions
.	Right decimal segment is on	Power stand by or during fan only mode
78	Indicates room temperature when display is solid. (Left fig. : Room temp. at 78 °F)	During cool mode
75	Indicates set point temperature when display is flashing. (Left fig. : Set Point temp. at 75 °F)	During set point temperature adjustment or cool mode on. (5 seconds)

ILL00557-00

< NOTE >

- The room temperature display range is from 0 °F to 109 °F.
  (When displayed in "°C " the range is from -9 °C to 60 °C)
- In Fahrenheit only, when the display value is greater than 99 °F, 100 °F, 101 °F, and 109 °F are displayed as "00", "01", and "09" respectively.

(2) Fan only mode

- When the FAN button on the control panel is pressed, the FAN “ON” LED illuminates, and the fan operates. At this time, the compressor is off, and only the fan is in operation. When the FAN button is pressed again, the fan stops.

(3) Cool mode

- When the COOL ON/OFF button is pressed, the FAN “ON” LED illuminates, and room temperature is shown on the display. At this time, the compressor and fan begin to operate to provide cooling. When the COOL ON/OFF button is pressed again, the compressor and fan stop.
- When the COOL ON/OFF button is pressed in fan only mode, room temperature is shown on the display, and the compressor operates to provide cooling. If room temperature reaches the set temperature during cooling operations, the compressor stops, and only the fan continues to operate. (Fan operate mode is a default setting from the manufacturer.)

< NOTE >

The fan only mode will not operate after the cool mode has been activated. Once the cool mode is activated, the unit cannot be turned off by pressing the fan button. Rather, the COOL ON/OFF button must be pressed.

***Fan stop mode**

- In fan stop mode, if room temperature reaches the set temperature during cooling operations, both the compressor and fan stop. The fan stop mode setting can be changed using the dip switch on the relay board. (For details, refer to page 23). During cooling operations when in the fan stop mode, the FAN “AUTO” LED illuminates.

(4) Change temperature mode “°C” and “°F”

- The temperature display can be switched between “°C” and “°F” by holding the SET TEMP arrow buttons (△, ▽) and the FAN button down simultaneously for 3 seconds.

(5) Diagnostic code

- Most of the diagnostic codes can be RESET by holding the SET TEMP arrow buttons (△,▽) down simultaneously for 3 seconds. (For details, refer to page 35 to 36.)

8. TROUBLESHOOTING

8.1 Troubleshooting

• Before troubleshooting the system, the following inspection should be performed.

⚠ WARNING

Disconnect power supply from the unit before performing any service. Beware that some residual voltage may remain in the unit immediately after the power is disconnected.

(1) Inspection Voltage of the Power Source

• Check the voltage of the power source.
  - Single Phase 115V (60 Hz)

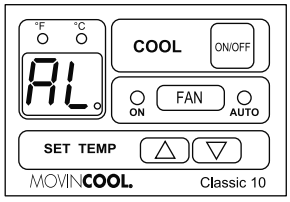
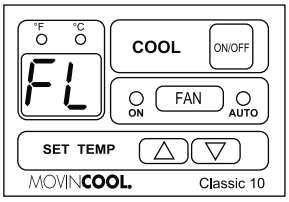
• Check the operation and condition of the fuse or circuit breaker in the power source.

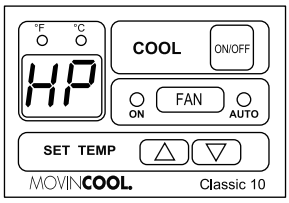
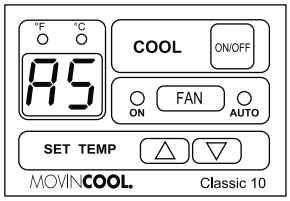
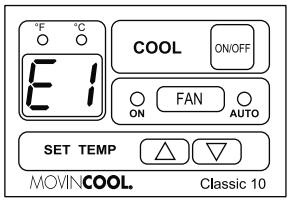
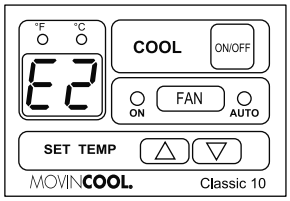
(2) Inspection of Air Filters

• Remove the air filters and check the element, if the element is dirty, wash the element as described in the OPERATION MANUAL supplied with the unit.

8.2 Self-Diagnostic Codes

• Self-diagnostic codes are displayed on the control board under the following conditions.

	Indication	Condition	Output Signal	Buzzer (On Board)
No. 1		When the fire alarm control panel input signal is CLOSED, the unit turns off, the LED displays “AL”, and the buzzer turns on. This condition returns to normal when the input signal is once again OPEN, and unit has been RESET. To RESET, hold down the SET TEMP buttons (△/▽) simultaneously for 3 seconds, and the controller returns to normal status.	Yes	Yes
No. 2		When the drain tank switch is activated, the LED displays “FL” and the unit turns off automatically. Once emptying the drain tank procedure is completed and ON/OFF has been pushed, unit returns to normal operation.	Yes	No

	Indication	Condition	Output Signal	Buzzer (On Board)
No. 3*1		When the high pressure switch (connected to CN03) is activated (= CN03 input turns open) for the first 2 times in 24 hours, “HP” turns on but goes away as the high pressure switch resets.	No	No
		If the high pressure switch is activated 3 times in 24 hours, “HP” blinks and signal output (CN24) turns on.	Yes	No
		When the high pressure switch is activated 10 times in 24 hours, “HP” turns on and signal output (CN24) turns on.	Yes	No
		To RESET, hold down the SET TEMP buttons (△/▽) simultaneously for 3 seconds, and the controller returns to normal status.		
No. 4		Improper hose connection (including kink or blockage) or a defect in the condensate pump for more than 180 seconds will display "AS" on the LED resulting the compressor to stop immediately; however, fan will continue to operate. Normal condition is resumed when condensate pump or hose connection is fixed, and the unit has been RESET.	Yes	No
		To RESET, hold down the SET TEMP buttons (△/▽) simultaneously for 3 seconds, and the controller returns to normal status.		
No. 5		When room thermistor becomes open or shorted, display shows “E1” and cool mode operation is off. Display and cool mode operation are returned to normal operation after condition is corrected.	Yes	No
No. 6		When freeze protection thermistor becomes open or shorted, display shows “E2” and cool mode operation is off. Display and cool mode operation are returned to normal operation after condition is corrected.	Yes	No

*1 : For unit serial number from November 2011 (1111) to Present

8.3 Troubleshooting Chart

- To accurately troubleshoot the problem, it is important to carefully confirm the nature of the problem. Common problems are:
  - Insufficient cooling.
  - Unit does not operate.
  - Overflow of drain water.
  - Abnormal noise or vibrations.
  - Others.

(1) Insufficient cooling

- This problem may occur from electrical components, mechanical components, environmental condition, or installation location. Refer to the troubleshooting chart on the next page for possible causes of insufficient cooling and remedies.

Condition		Possible Cause		Remedy
Insufficient Cooling		Check Area	Cause	
Air volume normal	Compressor operates.	1. Usage conditions (high temperature).	Operation near usage limits.	Review the installation place.
		2. Dirt in condenser or evaporator.	Insufficient heat exchange.	Clean fins.
		3. Frost in refrigeration cycle.	Clogging at the frost section.	Replace clogged section.
		4. No temperature difference between evaporator and condenser.	Insufficient refrigerant.	Check the leaking part, then repair and charge refrigerant.
	Compressor does not operate.	1. Compressor coil resistance. (0 ohm or ∞ ohm)	Short or open circuit.	Replace compressor. (In case of short, check the compressor relay on the relay board)
		2. Compressor on/off relay (52CM) on the relay board.	Open circuit or insufficient contact.	Replace relay board.
		3. Capacitor for compressor and fan motor.	Capacitor malfunction.	Replace capacitor.
		4. Compressor overload relay.	Overload relay fault.	Replace overload relay.
		5. Voltage.	Low voltage.	Repair power supply.
		6. High Pressure Switch*1.	Defective high pressure switch (short or open).	Replace high pressure switch.
			Loose high pressure switch connection.	Reconnect high pressure switch and check connection.
Insufficient air volume	No air.	1. Coil resistance of fan motor. (0 ohm or ∞ ohm)	Short or open circuit.	Replace fan motor.
		2. Fan motor on-off relay (52ID) on the relay board.	Open circuit or bad contact .	Replace relay board.
	Insufficient air volume.	1. Air filter.	Clogged air filter.	Clean air filter.
		2. Evaporator.	Clogged evaporator or crushed fins.	Repair and clean fins, or replace evaporator.
		3. Duct connection state.	Improper connection.	Repair duct connection.
		4. Fan motor.	Insufficient rotation.	Replace motor.

*1 : For unit serial number from November 2011 (1111) to Present.

(2) Unit does not start (operate)

- This problem occurs mainly from the safety devices, electrical components, environmental condition, or installation location. Refer to the troubleshooting chart below and the next page for possible causes of unit does not start and remedies.

Condition		Possible Cause		Remedy
Unit does not operate.		Check Area	Cause	
Unit does not operate	Control panel LED display turns off.	1. Voltage.	Power failure.	Repair power supply.
		2. Ground fault breaker trip.	Ground fault or defective ground fault breaker.	Repair ground fault section.
				Reset or repair breaker.
		3. LCDI power cord trip.	Leakage current detected.	Reset power cord.
				Replace power cord.
		4. Fuse.	Fuse blown on relay board.	Check and fix shorted circuit and replace fuse.
Control panel LED display turns off.	Control panel display shows error codes.	1. Display code “FL”.	Drain tank is filled with the drain water.	Discharge the drain water. RESET the controller*1.
			Loose drain switch connection.	Reconnect the drain switch and check the connection. RESET the controller*1.
			Defective Drain Switch.	Replace the drain switch. RESET the controller*1.
		2. Display code “AS”	Optional condensate pump stops pumping water due to any kinks/blockage in the drain line or due to improper routing of the drain line.	Remove any blockage or kinks from the drain line or improve hose installation. RESET the controller*1.
			Defective condensate pump.	Replace the condensate pump. RESET the controller*1.
			Missing jumper connector at the pump connector.	Insert the pump connector and check the connection. RESET the controller*1.
		3. Display code “AL” with beep sound.	Signal is input from the fire alarm.	Check the fire alarm system and confirm there is no input signal to the unit, then RESET the controller*1.
		4. Display code “E1”.	Loose or defective room thermistor.	Reconnect or replace room thermistor. RESET the controller*1.
		5. Display code “E2”.	Loose or defective freeze protection thermistor.	Reconnect or replace freeze protection thermistor. RESET the controller*1.

*1 : To RESET the controller, press SET TEMP (△/▽) buttons simultaneously for 3 seconds.

Condition		Possible Cause		Remedy
Unit does not operate.		Check Area	Cause	
Control panel LED display turns on.	Control panel display shows error codes.	6.Display code “HP”[*2] .	Operating outside of the operating temperature’s range.	Check environmental condition. Do not use the unit outside the operating range (See page 7). RESET the controller[*1.]
			Loose high-pressure switch connection.	Reconnect the high pressure switch and check the connection.
			Defective high-pressure switch (short/open).	Replace high pressure switch.
			Refrigerant is over charged.	Charge the correct amount of refrigerant (See page 70). RESET the controller[*1].
Unit stops immediately after starting	Control panel LED displays normal.	1.Fan Motor on/off relay (52ID) on the relay board.	Open circuit or insufficient contact.	Replace relay board.
		2. Fan Motor insulation resistance.	Insulation failure on fan motor.	Replace fan motor.
		3.Compressor insulation resistance.	Insulation failure on compressor.	Replace compressor.
Unit stops after running for a while.	Control panel LED displays normal.	1. Coil resistance of fan motor.	Defective fan motor.	Replace fan motor.
		2.Temperature of fan motor abnormally high.	Operation of safety device (IOLF) due to fan motor malfunction.	Replace fan motor.
		3.Temperature of compressor abnormally high.	Operation of safety device (IOLC) due to compressor malfunction.	Replace compressor.
			Insufficient refrigerant or gas leakage.	Repair and charge refrigerant.
		4. Dirt on air filter or condenser.	Insufficient cooling of condenser.	Clean air filter and condenser.

*1 : To RESET the controller, press SET TEMP (△/▽) buttons simultaneously for 3 seconds.

*2 : For unit serial number from November 2011 (1111) to Present.

(3) Drain water overflow

Condition	Possible Cause		Remedy
	Check Area	Cause	
Overflow from the unit.	1. Drain pan.	Cracks in drain pan.	Check and replace.
	2. Water level in drain pan.	Clogged drain hose.	Check and repair.
	3. Drain hole.	Reversed air flow from drain hole.	Insert a trap on the discharge drain hose.
	4. Clogged air filter.	Reversed air flow from drain hole due to the excessive negative pressure inside of the unit.	Clean air filter.

(4) Abnormal noise or vibration

- To prevent abnormal noise or vibration, carefully determine the source of the problem and come up with proper countermeasures to solve the problem so that it does not occur again.

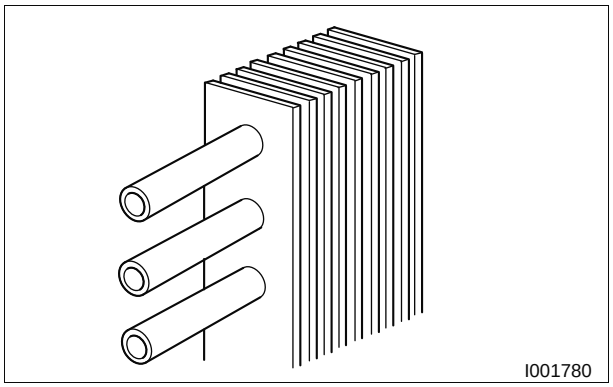
Condition	Possible Cause		Remedy
	Check Area	Cause	
Abnormal noise or vibration.	1. Fan.	Fan interference.	Repair interfering section.
		Fan deformation.	Replace fan.
	2. Compressor fixing nuts.	Loose nuts.	Tighten nuts further.
	3. Piping.	Pipe interference.	Repair interfering section.
	4. Panel fixing screws.	Loose screws.	Tighten screws further.

8.4 Basic Inspection

• Perform the following inspections before disassembly.

(1) Inspection of plate fins

• To inspect the plate fins of either the evaporator or condenser, the air filter must be removed. After removal of the air filters, inspect the plate fins for any dirt, dust, lint, or debris that may have caused insufficient cooling performance of the unit. If cleaning of the fins is necessary, it is recommended that this service be performed by a qualified service technician.

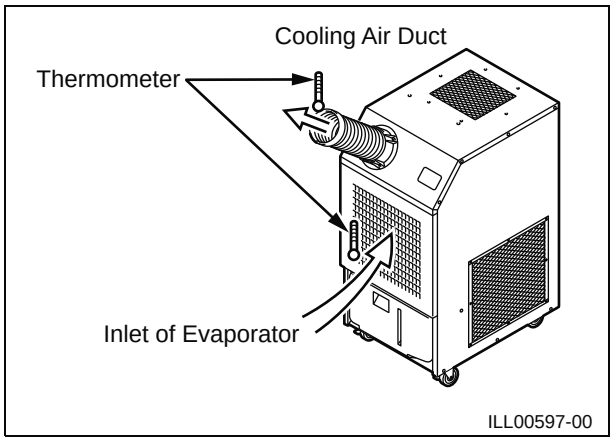


(2) Examination of operating environment

• Operating environments can vary depending on location, climate and surrounding conditions. Installation location can also cause operational problems. Consult with your reseller concerning operational environment requirements.

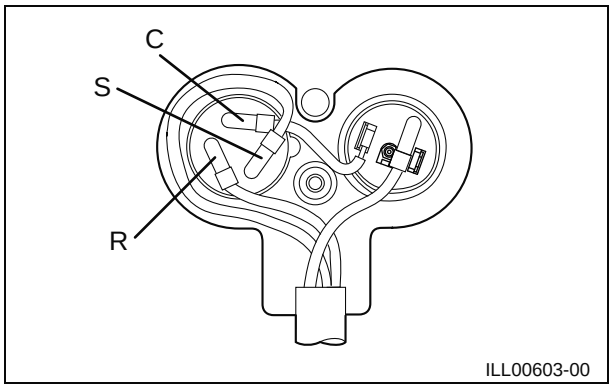
(3) Cooling capacity inspection

• Measure the temperature difference between the evaporator inlet and the cooling air duct outlet. If the difference is out of the range shown in the graphs on page 9, proceed with the remedy suggested in the troubleshooting chart on page 35 to 41.



8.5 Compressor Inspection

(1) Compressor motor inspection

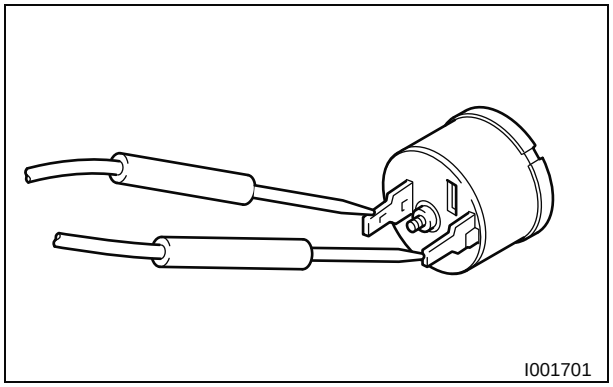


- Measure resistance across the terminals of the compressor motor.

Resistance at 77 °F (25 °C)	
R-C	C-S
Approx. 0.83 ohm	Approx. 1.92 ohm

- If the measured resistance is not equal to the standard values listed above, replace the compressor. The compressor has an external overload relay. The overload relay should be operational if the above resistance is obtained under normal temperature. For overload relay specifications, refer to the chart below.

(2) Overload relay inspection



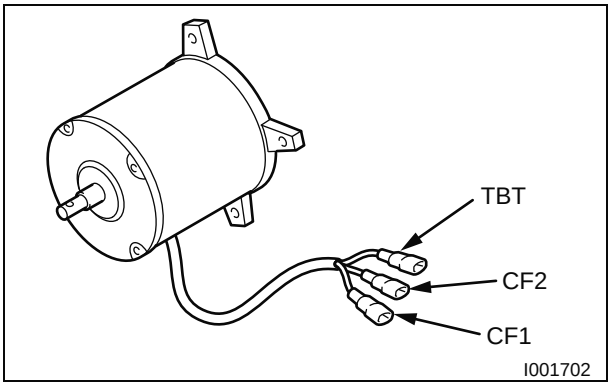
- Check for continuity across two terminals of the overload relay. At normal temperature, there should be continuity across the terminals.

Operating Temperature	
OFF (open contacts)	ON (closed contacts)
302 °F (150 °C)	142 °F (61 °C)

- If there is no continuity across the terminals, replace the overload relay.

8.6 Fan Motor Inspection

(1) For unit serial number from February 2011 (0211) to March 2011 (0311)



- Measure resistance across the terminals of the fan motor.

Resistance at 68 °F (20 °C)	
CF1-TBT	CF2-TBT
Approx. 7.06 ohm	Approx. 8.73 ohm

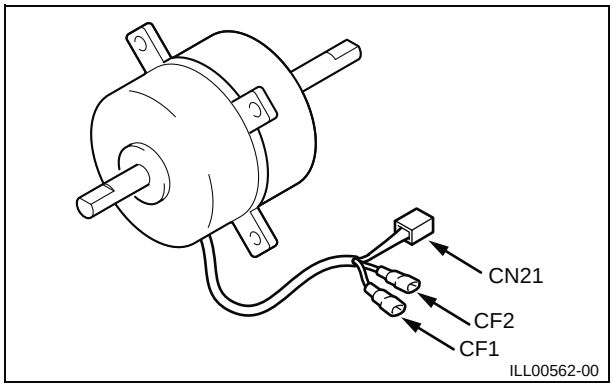
- If the measured resistance is not equal to the standard values listed above, replace the fan motor.

(2) For unit serial number from April 2011 (0411) to Present

- Measure resistance across the terminals of the fan motor.

Resistance at 68 °F (20 °C)	
CF1 - CN21-3	CF2 - CN21-3
Approx. 8.2 ohm	Approx. 9.8 ohm

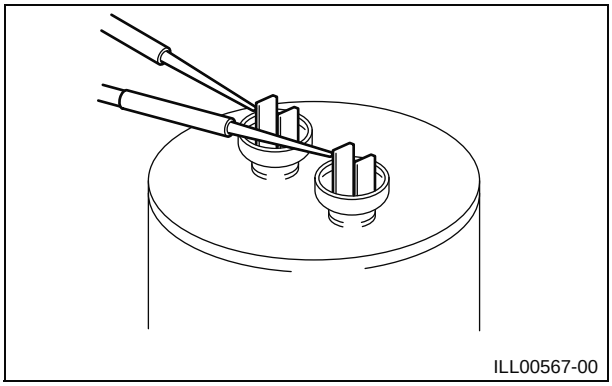
- If the measured resistance is not equal to the standard values listed above, replace the fan motor.



8.7 Capacitor Inspection (For Fan Motor and Compressor)

(1) Ohmmeter method

- Set the ohmmeter to the 10 M ohm range. Place the two probes against the two terminals of the capacitor. At first, the ohmmeter indicates small value, then the reading should gradually increase towards infinity (∞), indicating that the capacitor is charging. If the reading indicates infinity immediately (open), or the ohmmeter fails to move from 0 ohm (shorted), replace the capacitor.



(2) Capacitance tester method

- Use a capacitance tester to check the capacitors for the values indicated below. If the value tested is not within 10% of the indicated capacitance, replace the capacitor.

Unit Serial Number	Capacitor	Rated Voltage	Capacitance
From February 2011 (0211) to March 2011 (0311)	For Fan Motor	450 V	10 µF
	For Compressor	450 V	55 µF
From April 2011 (0411) to Present	For Fan Motor	250 V	25 µF
	For Compressor	450 V	55 µF

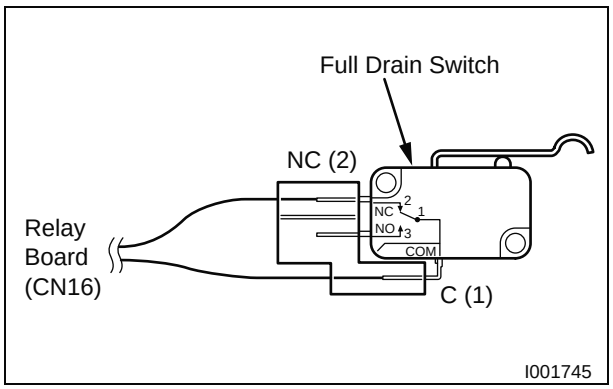
⚠ WARNING

- **Properly discharge the capacitor(s) before and after testing. Failure to discharge the capacitor may cause damage to the test equipment and/or unit, and result in personal injury (electrical shock) or death.**

8.8 Full Drain Switch Inspection

- Depress the full drain switch to check for continuity. If there is no continuity, replace the switch.

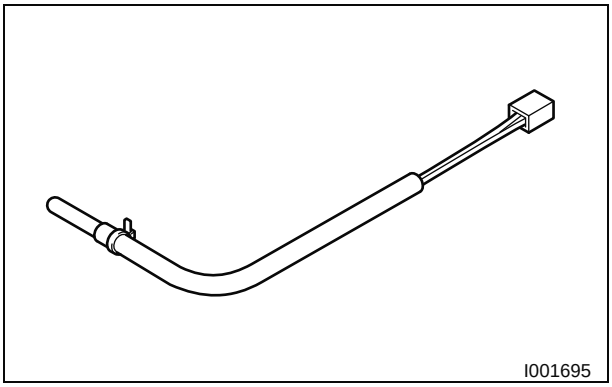
- Normally: Continuity across 1 and 2.
- Switch Depressed: Continuity across 1 and 3.



8.9 Thermistor Inspection

- Use an ohmmeter to check the resistance across the 2-pin connector at normal temperature (77 °F (25 °C)).

Type	Specification
	Characteristic
Room Thermistor (RTS)	5 k ohm at 77 °F (25 °C)
Freeze Protection Thermistor (CTS)	5 k ohm at 77 °F (25 °C)



8.10 Wiring Connection Inspection

- Refer to the wiring diagram on page 17 to 18, and check the connection of each wire.

⚠ CAUTION

Secure the wires using clamps to prevent contact with the edges of the structure, etc. Secure the wires in the same position as prior to removal.

8.11 Refrigeration System Inspection

- In most cases, the causes for insufficient cooling is a clog in the system, a leakage, or an incorrect amount of refrigerant. In such cases, inspect the system according to the following procedure.

(1) Clogged refrigeration system

- Check the component parts of the refrigeration system, including piping, that could be clogged with refrigerant. If clogged with refrigerant, only the clogged part is partially frosted. If this occurs, change the part in question (see page 63).

(2) Refrigerant leak

- Carefully check all connections, and each component for leaks whenever the refrigeration system is installed or repaired. Use an electronic gas leak tester to inspect the system. (See page 68).

(3) Insufficient refrigerant

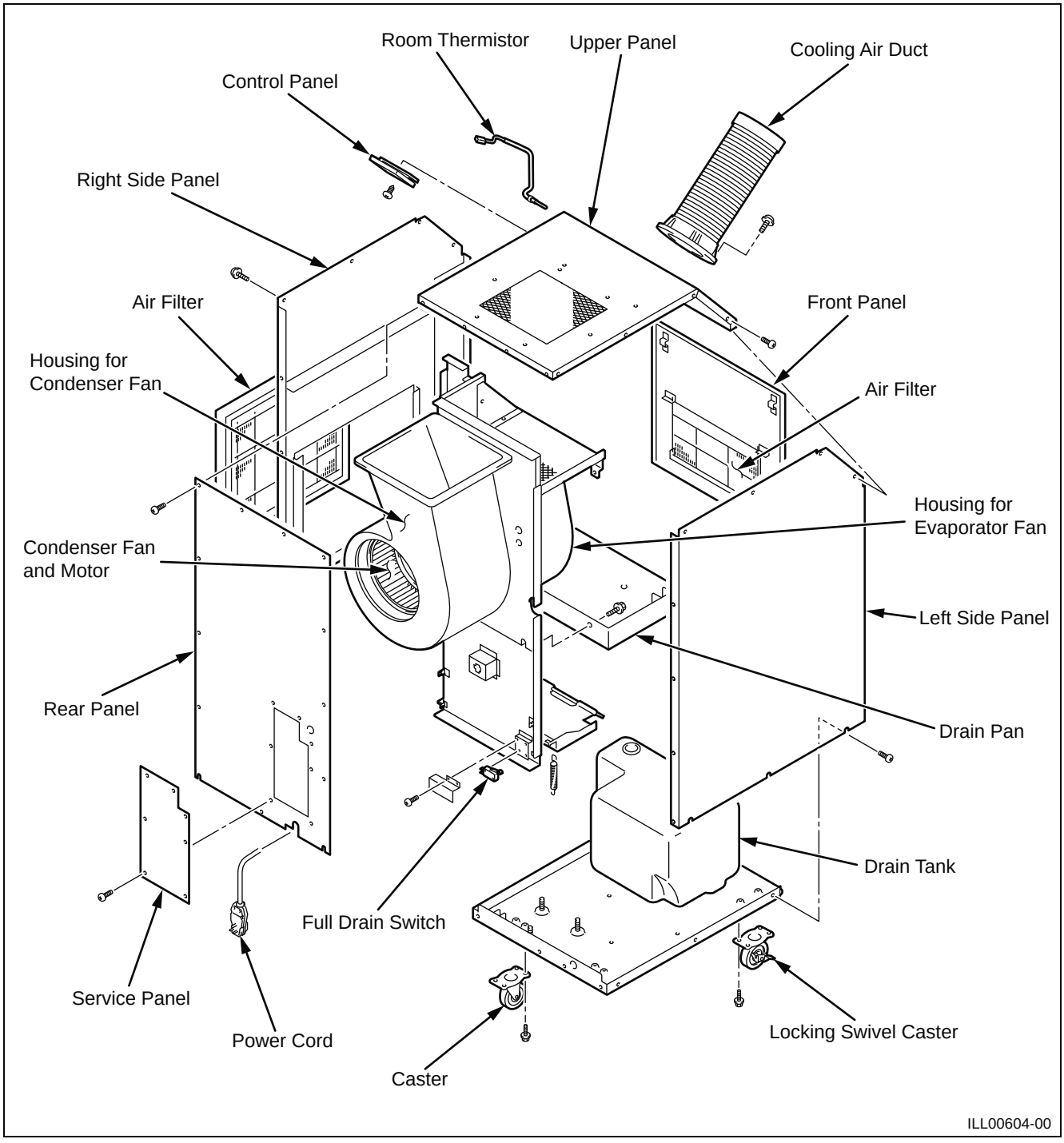
- When the unit is not producing sufficient cooling, follow the troubleshooting chart on page 38 to confirm the cause of the problem. Then, charge the system with the refrigerant to the specified amount as indicated on page 70.

9. DISASSEMBLY

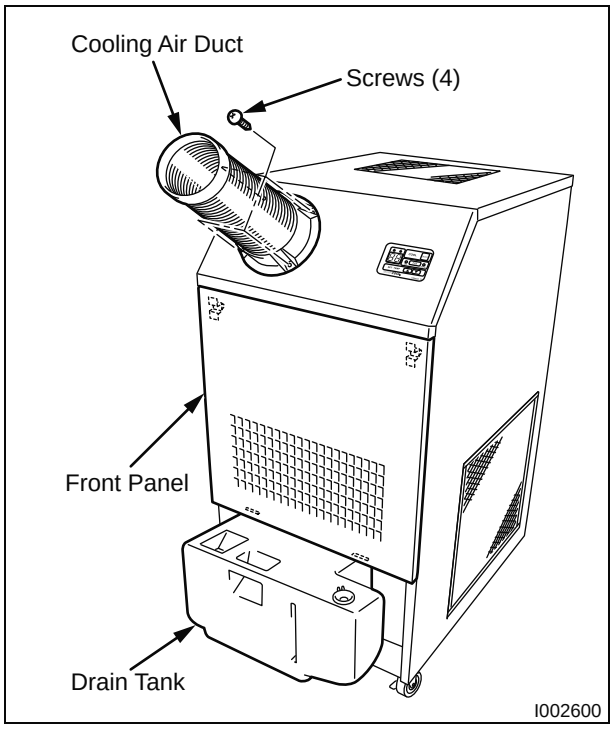
⚠ WARNING

Disconnect power supply from the unit before performing any service. Beware that some residual voltage may remain in the unit immediately after the power is disconnected.

9.1 Parts Construction



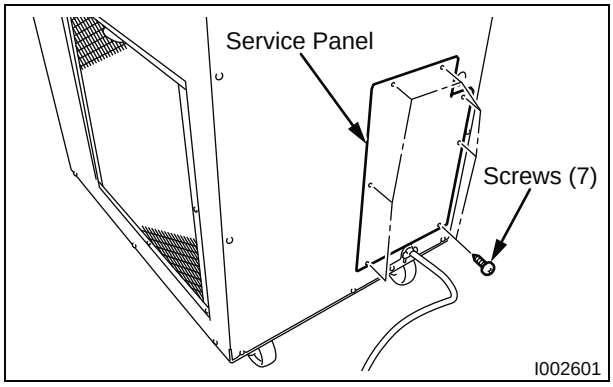
9.2 Disassembly



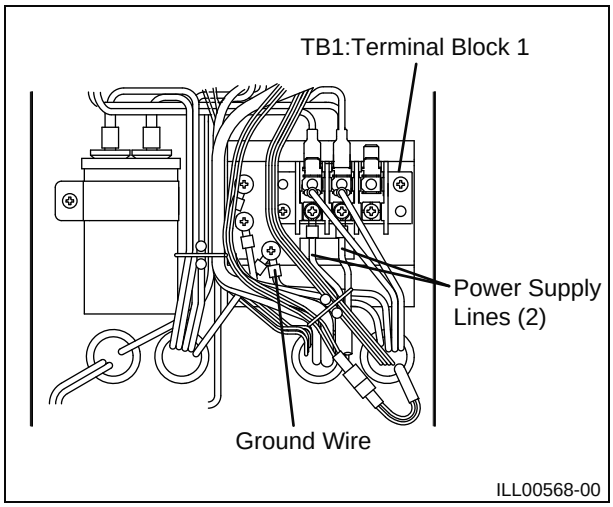
1) Remove the drain tank.

2) Unfasten the two clips and the lower-side hook, and then remove the front panel.

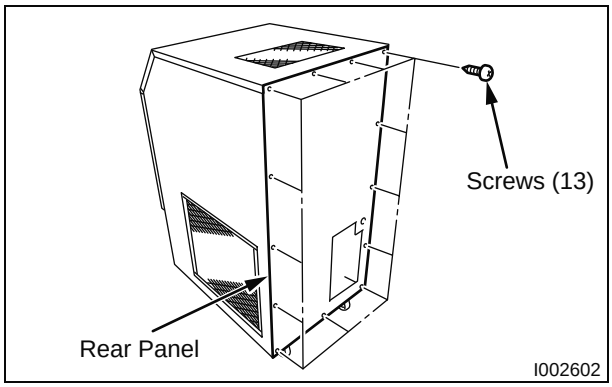
3) Take out the four (4) screws, and then remove the cooling air duct.



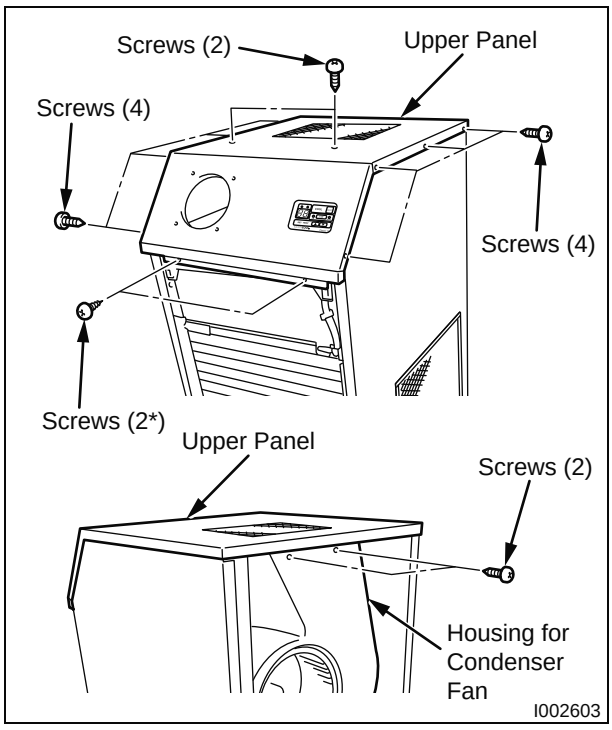
4) Take out the seven (7) screws, and then remove the service panel.



5) Remove the two (2) power supply lines from the terminal block 1, and remove the ground wire.



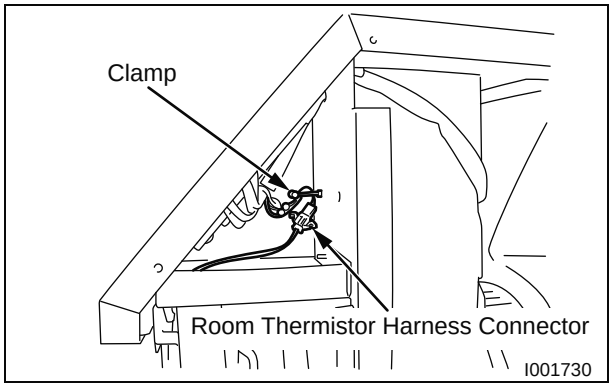
6) Take out the thirteen (13) screws, and then remove the rear panel.



7) Take out the fourteen (14) screws, and then remove the upper panel.

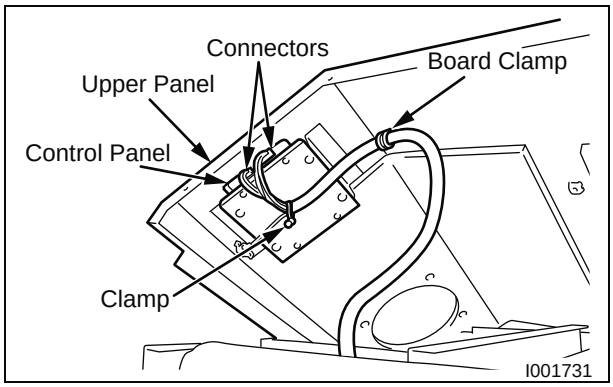
⚠ CAUTION

The two screws (2*) used on the front side of the upper panel differ from the rest. Ensure that the correct screws are used when attaching the upper panel.



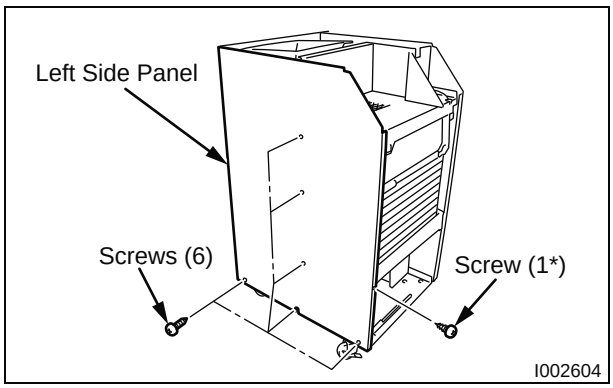
8) Unfasten the connector on the room thermistor wiring harness.

9) Remove the wiring harness from the clamp.



10) Unfasten the two connectors (11-pin, 5-pin) from the control panel.

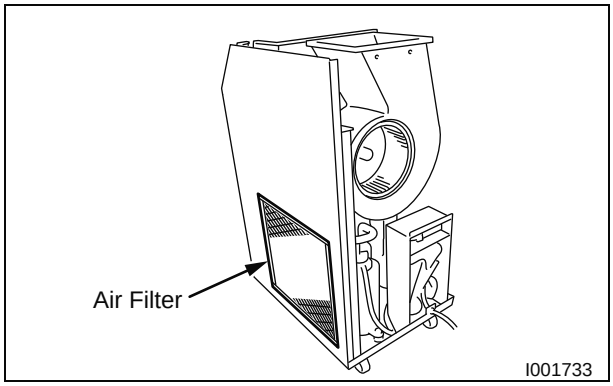
11) Remove the wiring harness from the clamp and board clamp.



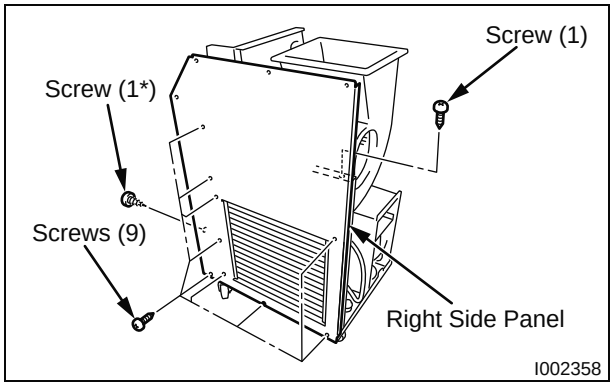
12) Take out the seven (7) screws, and then remove the left-side panel.

⚠ CAUTION

The screw (1*) on the front side of the left-side panel differs from the rest. Ensure that the correct screw is used when attaching the left-side panel.



13) Remove the air filter from the right-side panel.



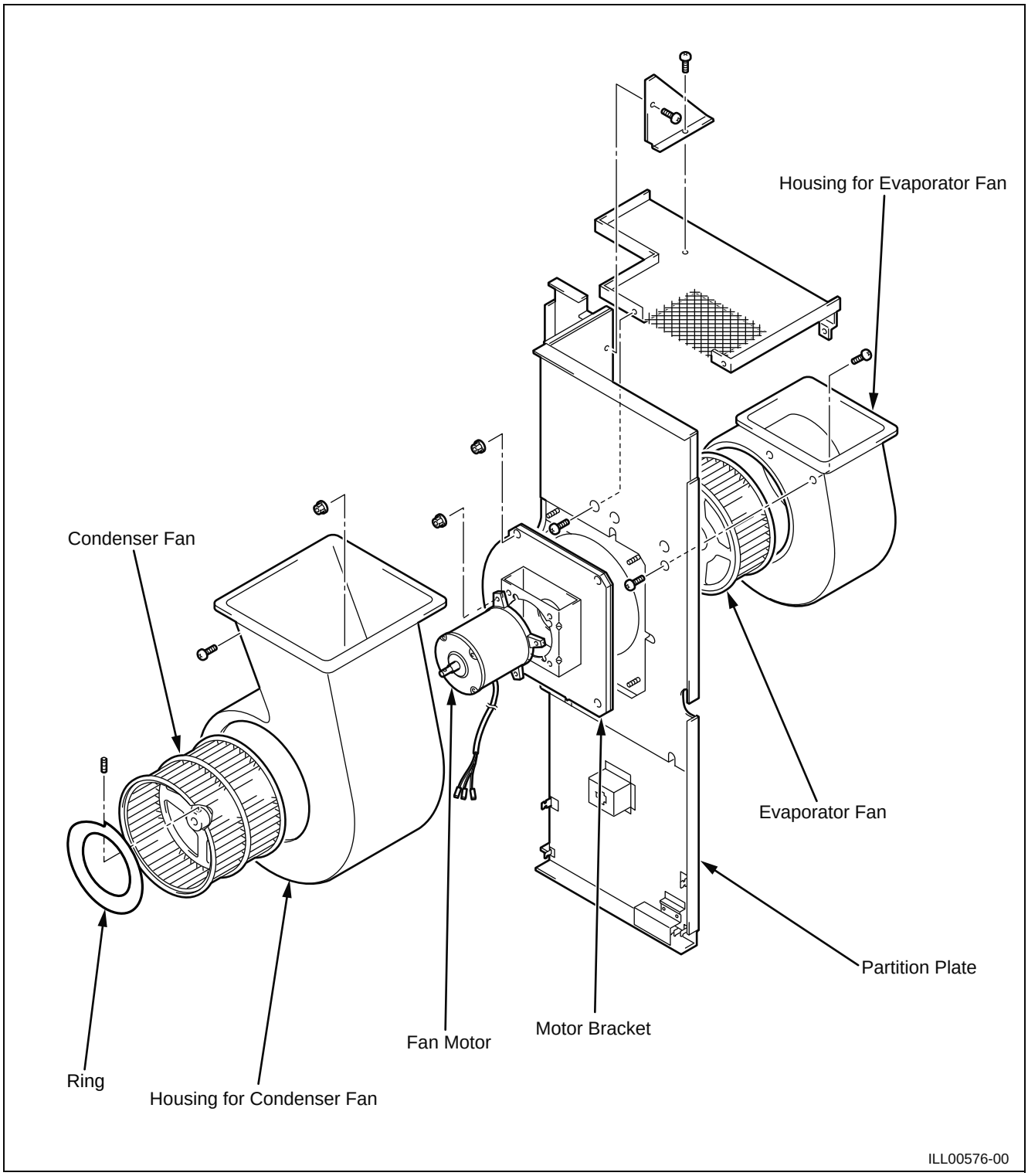
14) Take out the eleven (11) screws, and then remove the right-side panel.

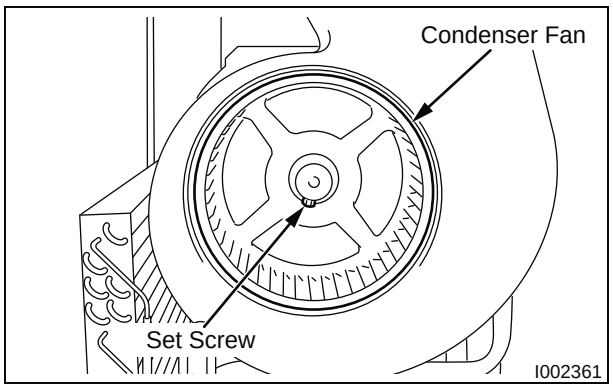
⚠ CAUTION

The screw (1*) on the front side of the right-side panel differs from the rest. Ensure that the correct screw is used when attaching the right-side panel.

9.3 Fan Motor Removal

(1) For Unit Serial Number From February 2011 (0211) to March 2011 (0311)

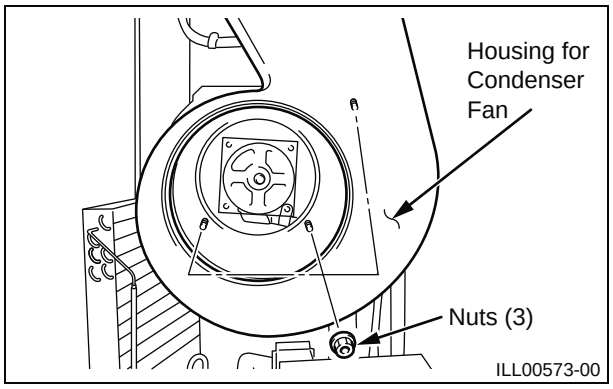




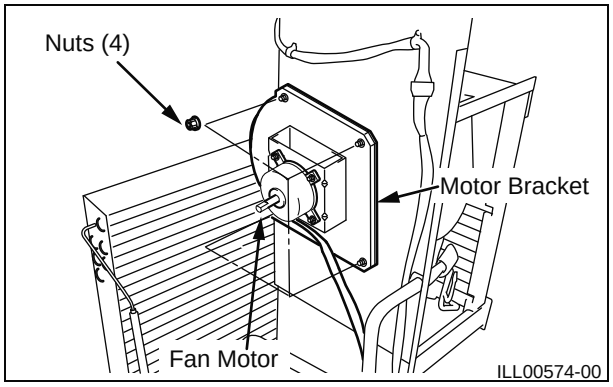
1) Loosen the set screw with a hex key, and then remove the condenser fan.

⚠ CAUTION

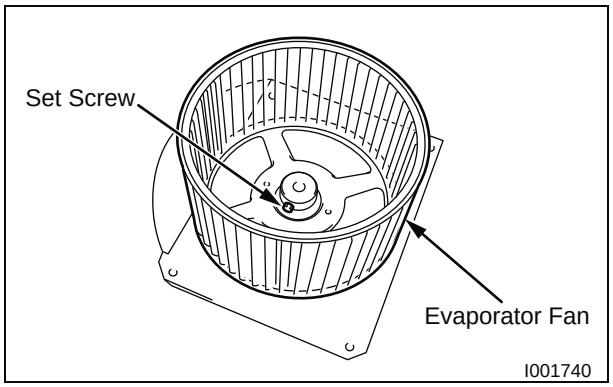
- Set Screw Torque Value (for Installation)
  - 10.80 ± 2.17 ft•lbf (14.7 ± 3.0 N•m)



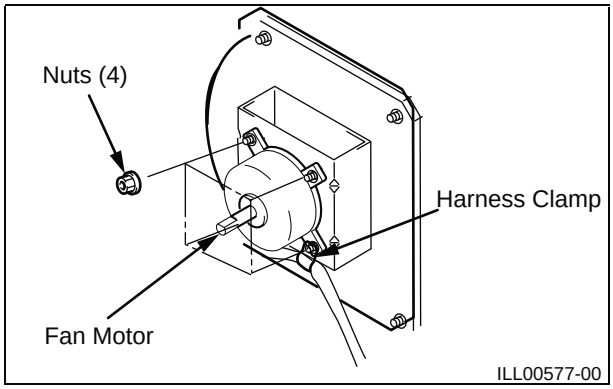
2) Take off the thee (3) nuts, and then remove the condenser fan housing.



3) Take off the four (4) nuts, and then remove the fan motor together with the motor bracket.

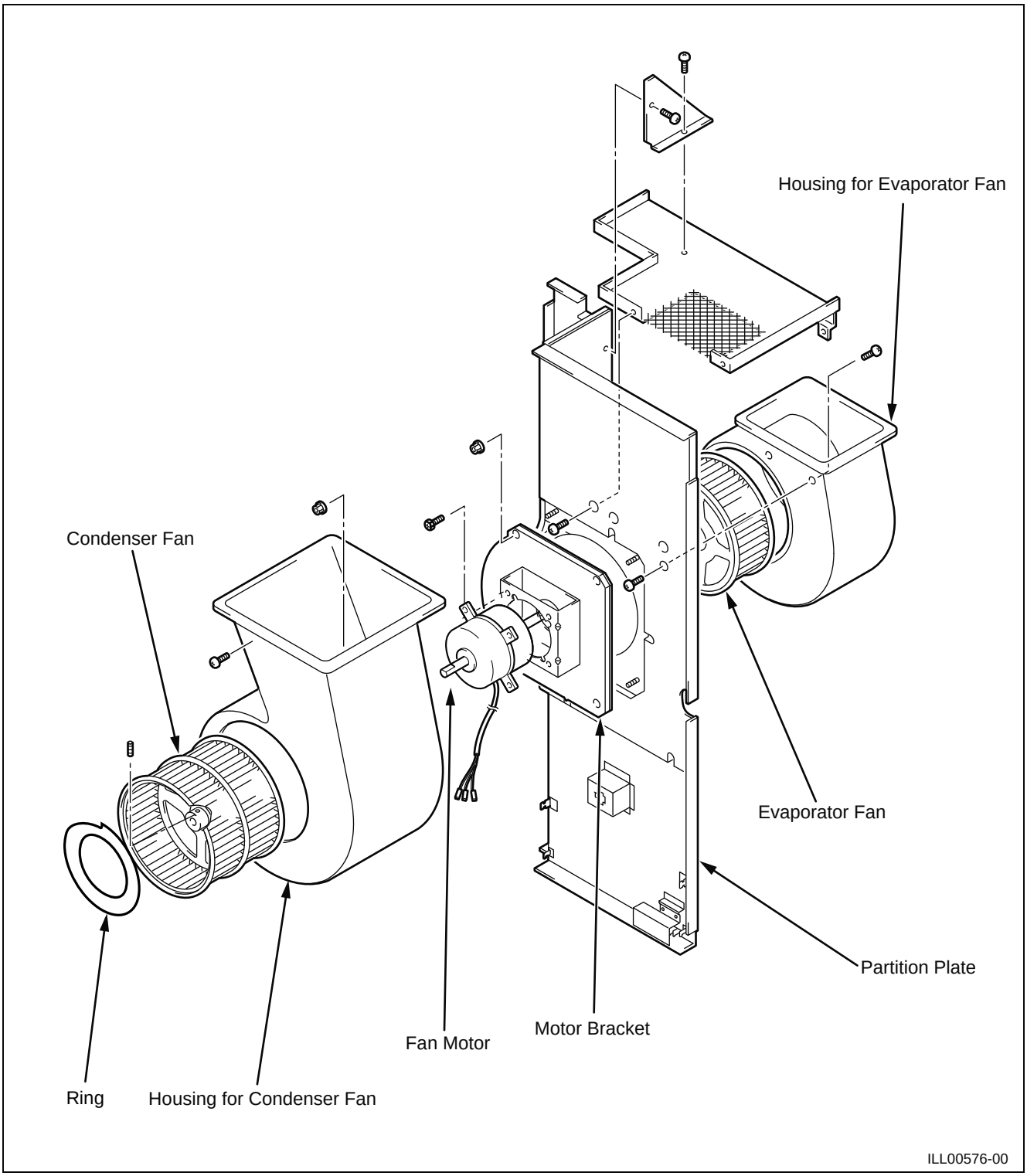


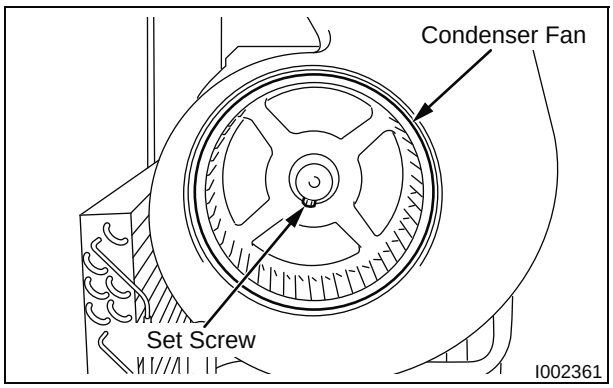
4) Loosen the set screw with a hex key, and then remove the evaporator fan.



5) Take out the four (4) nuts, and then remove the fan motor.

(2) For Unit Serial Number From April 2011 (0411) to Present

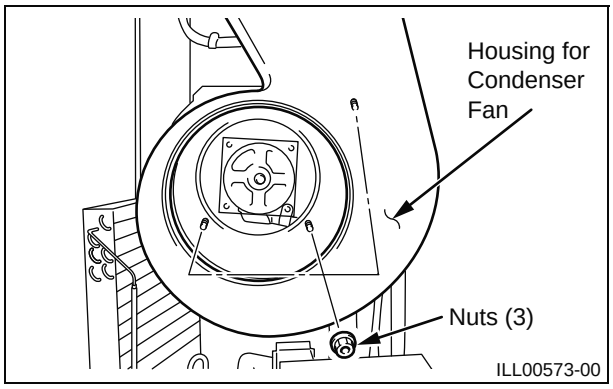




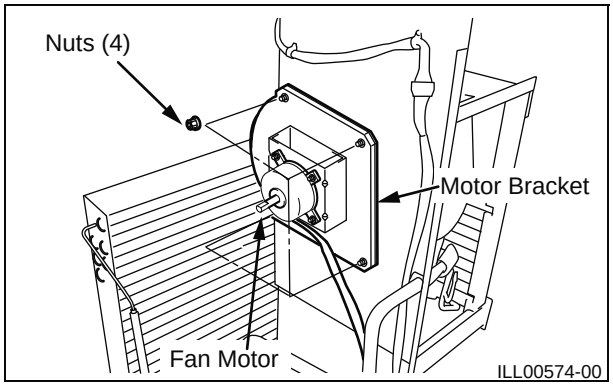
1) Loosen the set screw with a hex key, and then remove the condenser fan.

⚠ CAUTION

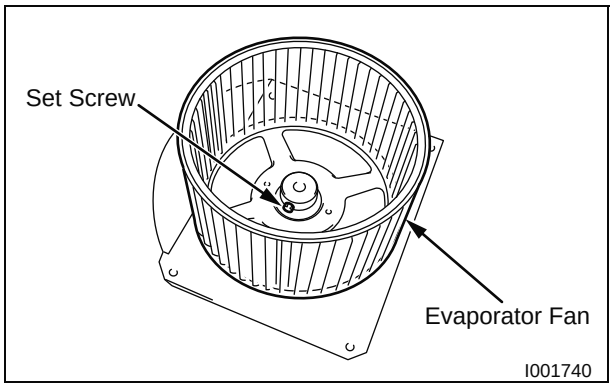
- Set Screw Torque Value (for Installation)
  - 10.80 ± 2.17 ft•lbf (14.7 ± 3.0 N•m)



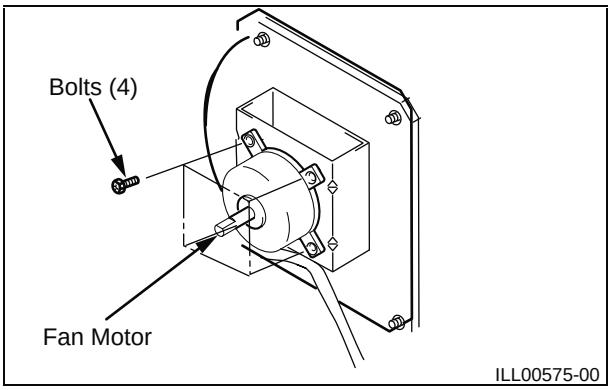
2) Take off the thee (3) nuts, and then remove the condenser fan housing.



3) Take off the four (4) nuts, and then remove the fan motor together with the motor bracket.



4) Loosen the set screw with a hex key, and then remove the evaporator fan.



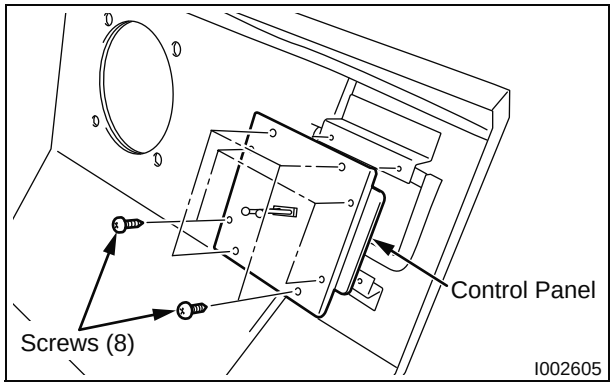
5) Take out the four (4) bolts, and then remove the fan motor.

9.4 Removal of Electrical Components

⚠ WARNING

Disconnect power supply from the unit before performing any service. Beware that some residual voltage may remain in the unit immediately after the power is disconnected.

(1) Removal of control panel

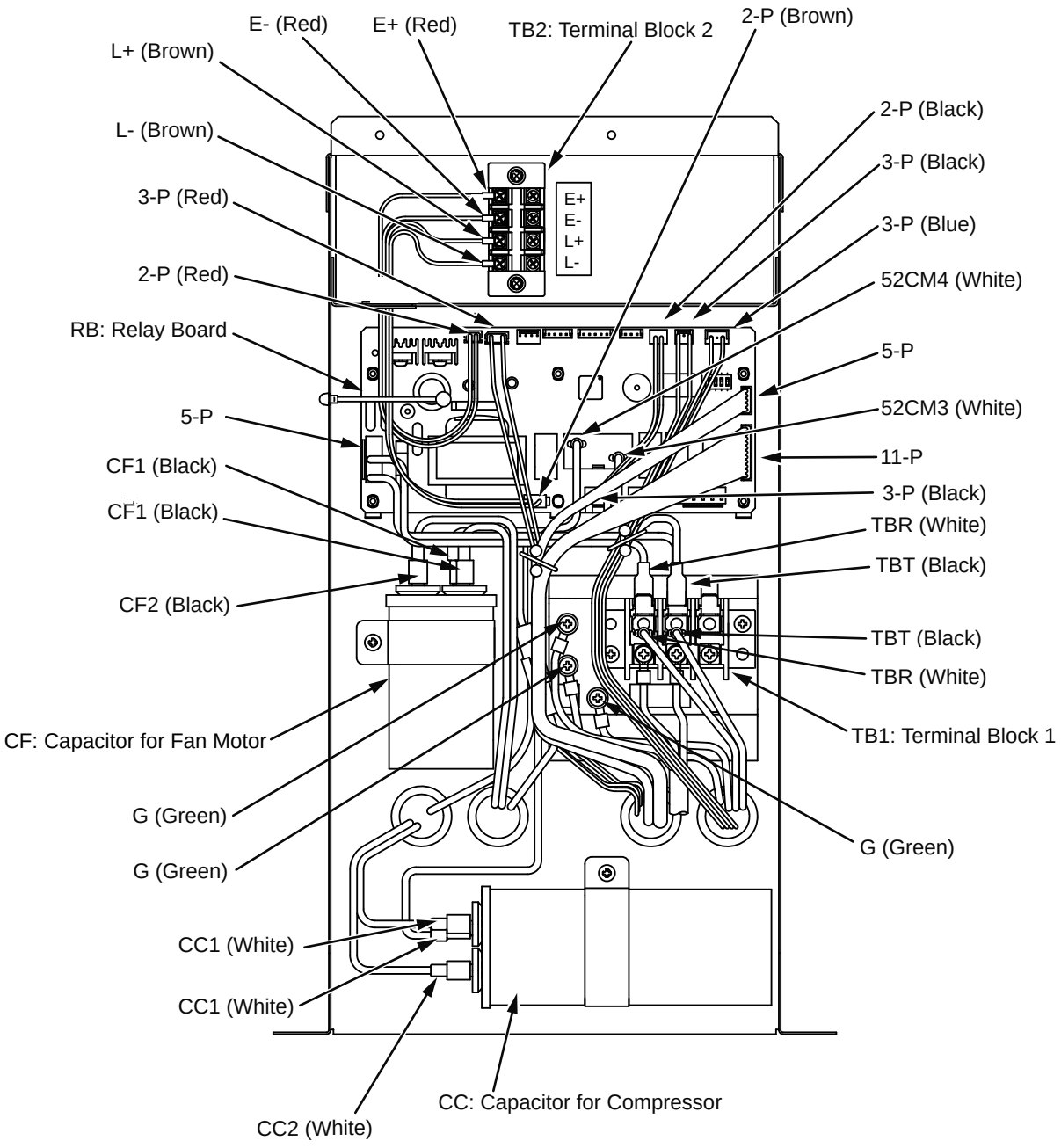


1) Take out the eight (8) screws, and then remove the control panel.

(2) Removal of wire-harness in control box

1) Disconnect all the wires from the electrical parts in control box .

For Unit Serial Number from February 2011 (0211) to October 2011 (1011)



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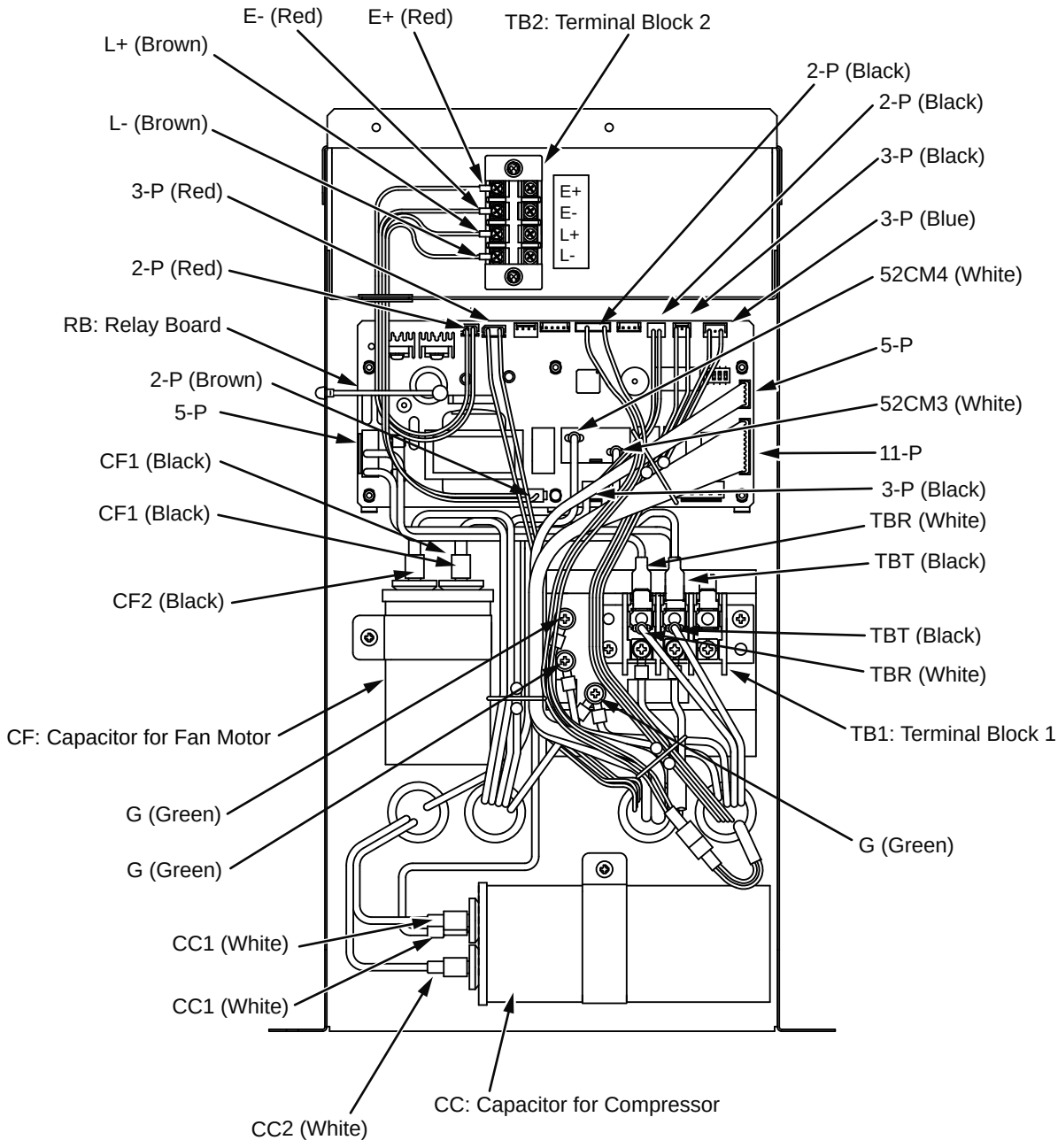
2) Disconnect all the wires from the electrical parts in control box.

For Unit Serial Number from November 2011 (1111) to Present



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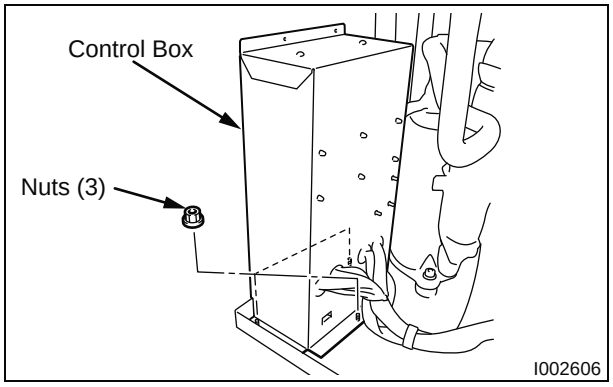
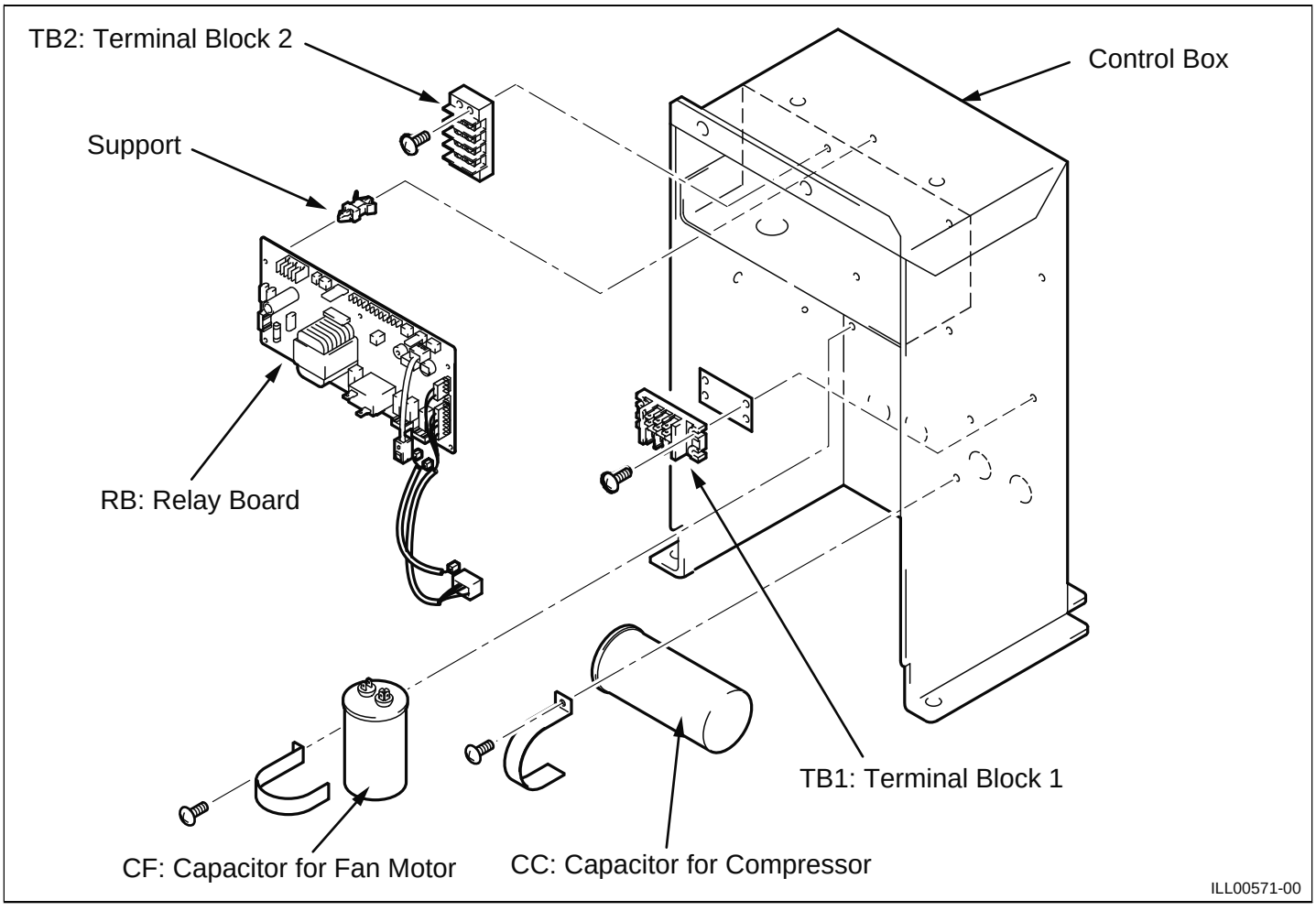
(3) Removal of control box



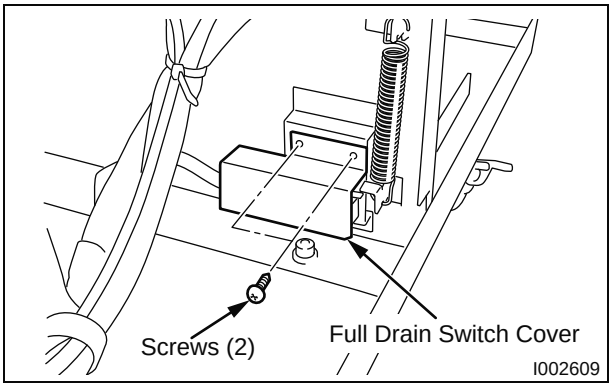
1) Take out the three (3) nuts, and then remove the control box.

(4) Removal of electrical parts

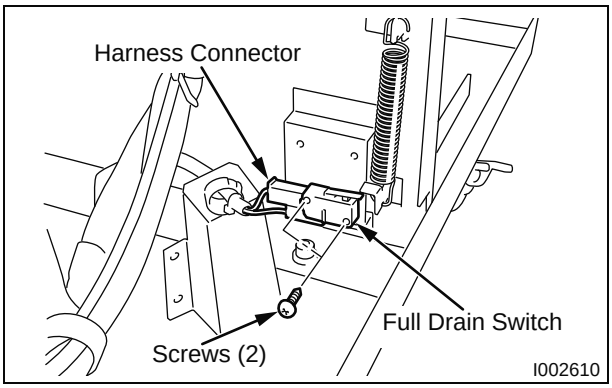
- Terminal block 1 (power connection): Remove the two (2) screws from the control box.
- Terminal block 2 (signal connection): Remove the two (2) screws from the control box.
- Capacitor for compressor: Remove the one (1) screw from the control box.
- Capacitor for fan motor: Remove the one (1) screw from the control box.
- Relay Board: Remove the six (6) supports from the relay board.



9.5 Full Drain Switch Removal



1) Take out the two (2) screws, and then remove the full drain switch cover.



2) Unfasten the wiring harness connector.

3) Take out the two (2) screws, and then remove the full drain switch.

10. REFRIGERATION SYSTEM REPAIR

10.1 Repair of Refrigeration System

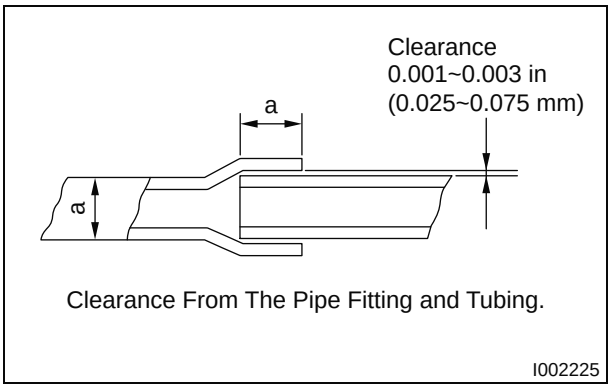
- When there is a leak, obstruction, or problem in the refrigeration system of the unit, replace or repair the defective refrigeration component. After replacing any refrigeration component, all the connections must be brazed.

(1) Proper brazing techniques

- When brazing, use a slightly reduced flame. Oxyacetylene is commonly used since it is easy to verify and adjust the condition of the flame. Unlike gas welding, a secondary flame is used for brazing. It is necessary to preheat the base metal properly depending on the shape, size, or thermal conductivity of the brazed fitting.
- The most important point in flame brazing is to bring the whole brazed fitting to a proper brazing temperature. Care should be taken to not cause overflow of the brazing filler metal, oxidation of the brazing filler metal, or to not deterioration due to overheating of the flux.

(2) Brazed fittings and fitting clearance

- In general, the strength of the brazing filler metal is lower than the base metal. Therefore, the shape and clearance of brazed fitting are very important. As for the shape of brazed fitting, it is necessary to maximize its adhesive area. The clearance of the brazed fitting must be minimized to facilitate brazing filler metal to flow into the fitting by capillary action.



Clearance From The Pipe Fitting and Tubing.

I002225

(3) Cleaning brazing filler metal and pipe

- When the refrigeration system has been opened and exposed to the heat which could cause the brazing filler metal to stick to the inside and outside of the pipe. Brazing filler metal may also be compounded with oxygen in the air to form the oxide film. In addition, grease and oils may stick to the pipe during handling. All these factors can reduce the effectiveness of brazing . It is necessary to eliminate the excessive brazing filler metal using sand paper and by thorough cleaning with solvent such as Trichlene.

⚠ CAUTION

- Do not use chlorine cleaner

(4) Use of Dry Nitrogen gas

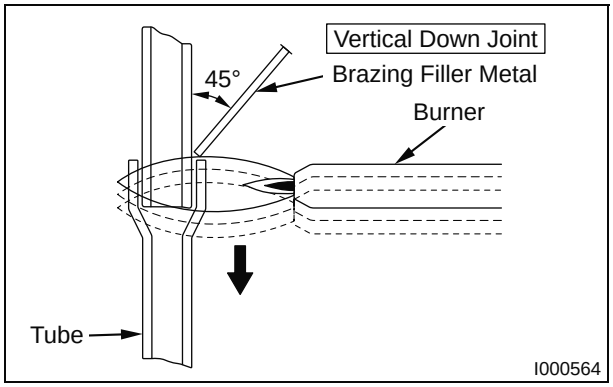
- During brazing, the inside of the pipe undergoes an oxidative reaction due to the brazing flame. Introduce dry nitrogen gas (0.27 gal/min (1 L/min); adjust with the flow regulator) through the pinch-off tube of the refrigerant cycle to prevent oxidation.

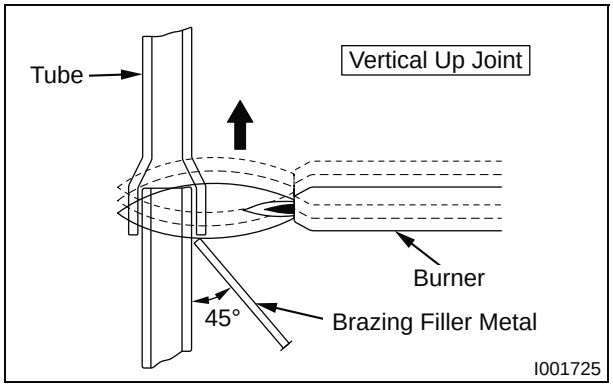
< NOTE >

- Make sure not to allow dirt, water, oil, etc . to enter into the pipes.

(5) Vertical joint

- Heat the entire brazed fitting to a proper brazing temperature. Bring the brazing filler metal into contact with the fitting so that the brazing filler metal starts to flow by itself.
- Stop heating the fitting as soon as the brazing filler metal has flown into the gap (clearance). Since the brazing filler metal flows easily into the portions heated to a proper temperature, it is essential to keep the whole fitting at a proper brazing temperature.





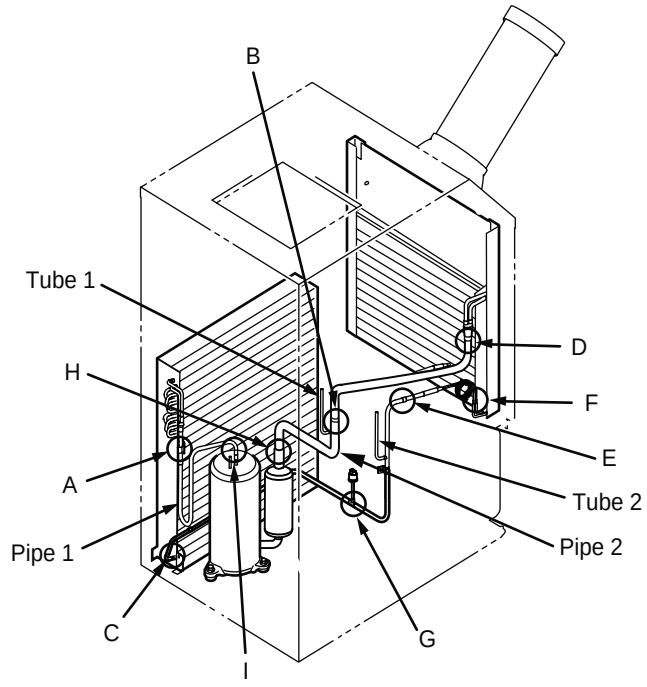
10.2 Removal of Refrigeration System Components

⚠ WARNING

- **Before replacing any refrigeration component, recover the refrigerant using standard recovery procedures and equipment.**
- **When recovering the refrigerant, use the pinch-off tubes at the low pressure side (tube 1) and high pressure side (tube 2) as shown in figure below.**

⚠ CAUTION

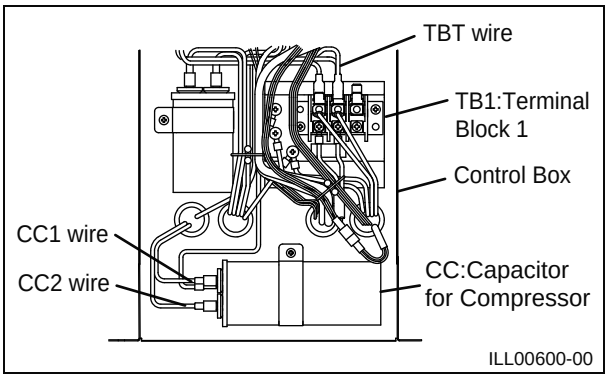
- To prevent oxidation, dry nitrogen should be conducted (flow rate 0.27 gal/min (1 L/min)) through the pinch-off tube during any brazing operation.
- During any component replacement involving brazing, shield nearby parts with a steel plate to protect them from the flame.



Part to Replace	Disconnect at
• Compressor	(See the next page.)
• Condenser	A & C
• Capillary Tube	E & F
• Evaporator	D & F
• High Pressure Switch	G

ILL00579-00

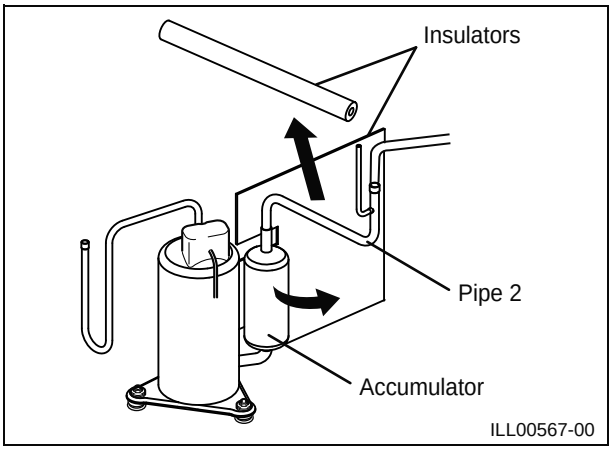
(1) Removal of compressor assembly



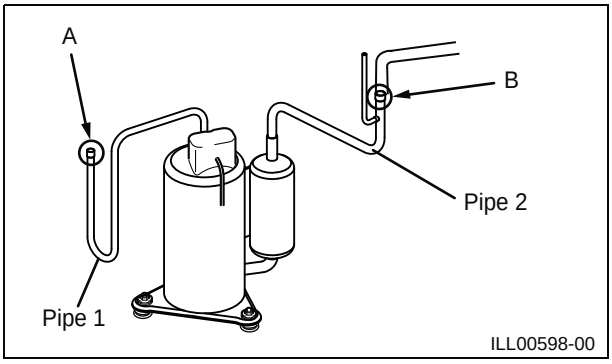
1) Disconnect CC1 and CC2 wires (white) from the capacitor for compressor in the control box. Disconnect TBT wire (black) from the terminal block 1 in the control box.

⚠ WARNING

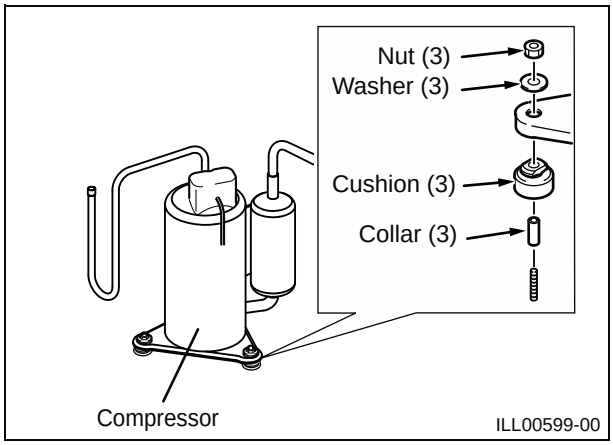
Disconnect power supply from the unit before performing any service. Beware that some residual voltage may remain in the unit immediate after the power is disconnected.



2) Remove the insulators from pipe 2 and accumulator.



3) Braze at point A and B.



4) Remove three (3) nuts and three (3) washers, and keep them for installation, then remove the compressor. Remove three (3) cushions and three (3) collars and discard.

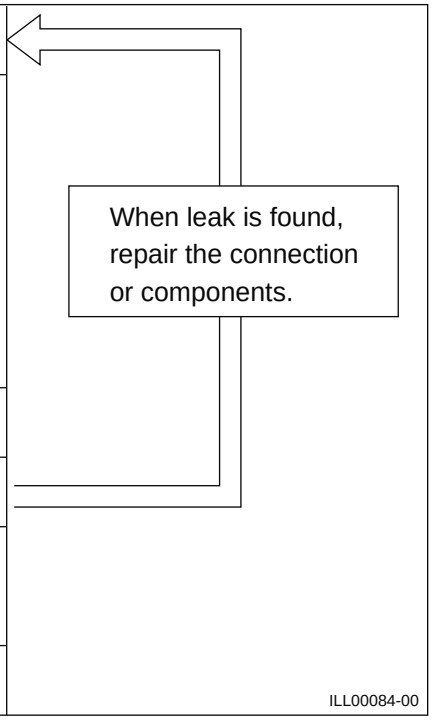
10.3 Charging the System with R-410A Refrigerant

- Always ensure that the refrigeration system has been properly evacuated before charging with the specified amount of R-410A.
- Equipments is for R-410A only.
- Liquid charge (no gas charge).
- Make sure not to use more than 90 % of the initial weight of R-410A in the cylinder.

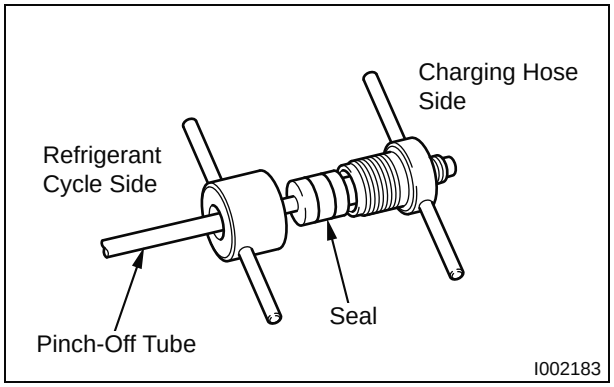
⚠ WARNING

- **When handling refrigerant (R-410A), the following precautions should always be observed:**
  - **Always wear proper eye protection while handling refrigerant.**
  - **Maintain the temperature of the refrigerant container below 104 °F (40 °C).**
  - **Perform repairs in a properly ventilated area. (Never in an enclosed environment.)**
  - **Do not expose refrigerant to an open flame.**
  - **Never smoke while performing repairs, especially when handling refrigerant.**
  - **Take caution so that the liquid refrigerant does not come in contact with the skin.**
- **If liquid refrigerant strikes eye or skin:**
  - **Do not rub the eye or the skin.**
  - **Splash large quantities of cool water on the eye or the skin.**
  - **Apply clean petroleum jelly to the skin.**
  - **Go immediately to a physician or to a hospital for professional treatment.**

Step 1	Connect manifold gauge.
Step 2	1) Evacuate the system. • 15 minutes or more. • 30 inHg (100 kPa) or more of vacuum. 2) Stop evacuating the system. • Leave for 5 minutes. 3) Check the vacuum.
Step 3	Connect to refrigerant source.
Step 4	Test the system for leaks.
Step 5	Charge the system with R-410A. • See “Technical Specifications” for the specified amount.
Step 6	Remove manifold gauge.

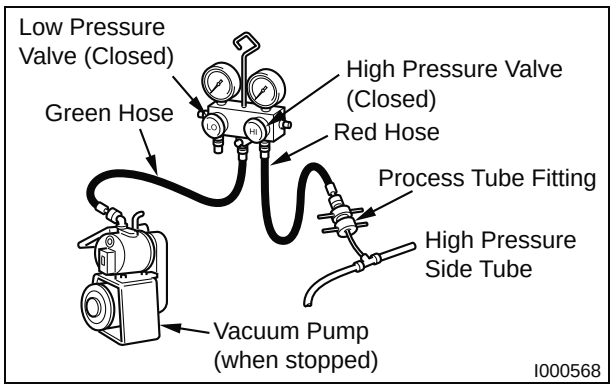


(1) Connection of gauge manifold



1) Properly remove the crushed end of the pinch-off tube at the high pressure side and the low pressure side of the refrigerant cycle with a pipe cutter.

2) Fit the process tube fitting to the pinch-off tube on both sides.



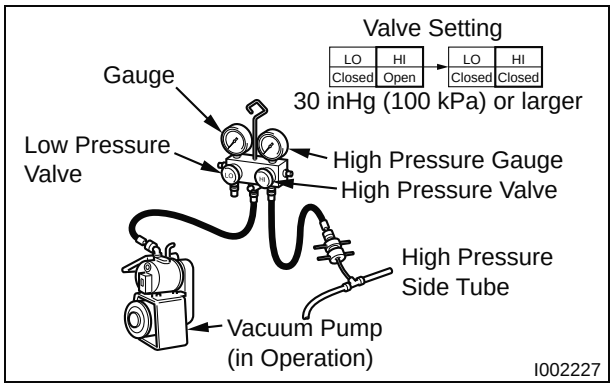
3) Connect the charging hoses (red high pressure side) for the gauge manifold to the process tube fitting.

< NOTE >

Connect the hoses using care not to mistake the high pressure side for the low pressure side and vice versa.

4) Connect the charging hose (green) at the center of the gauge manifold to the vacuum pump.

(2) Evacuation

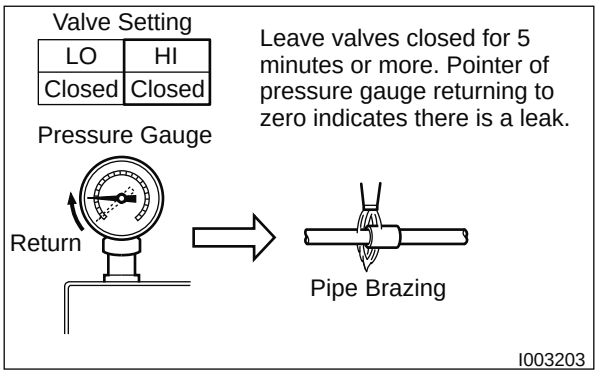


1) Open the high pressure valve (HI) of the gauge manifold.

2) Turn on the vacuum pump to start evacuation. (Evacuate the system for approximately 15 minutes.)

3) When the high pressure gauge indicates 30 inHg (100 kPa) or higher, turn off the vacuum pump and close the high pressure valves of the gauge manifold.

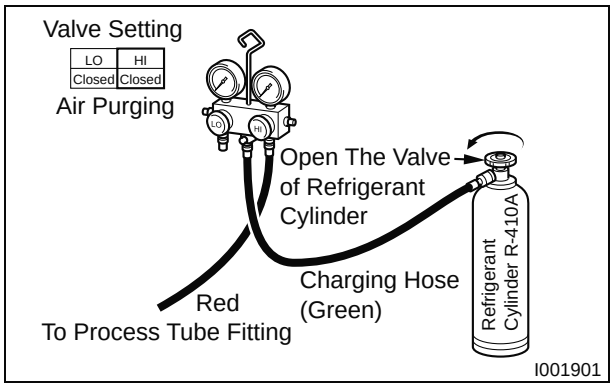
(3) Checking vacuum

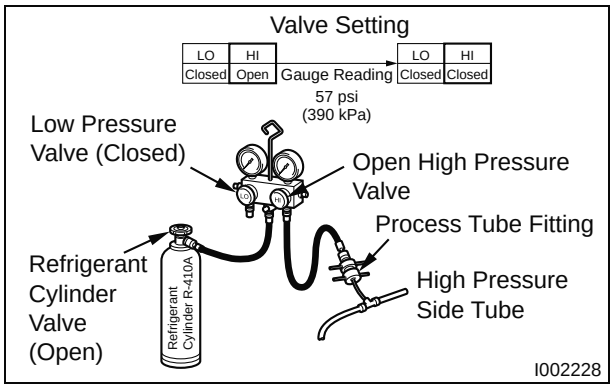


1) Leave the high pressure valve and the low pressure valve of the gauge manifold closed for five minutes or more, and confirm that the gauge pointer does not return to zero.

2) If the gauge pointer returns gradually to zero, there is a leak somewhere in the system (this could also include gauge manifold). Perform a leak check according to the procedure indicated in the next step. Once the leak has been found and repaired, evacuate the system once more to confirm that the system holds vacuum.

(4) Checking gas leak





1) Remove the charging hose (green) from the vacuum pump, and connect the hose to the refrigerant cylinder (R-410A).

2) Loosen the nut on the gauge manifold side of the charging hose (green).

3) Open the valve of the refrigerant cylinder and perform air purging in the charging hose (green). Then tighten the nut.

4) Open the high pressure valve of the gauge manifold. Charge the system with refrigerant until the high pressure gauge indicates 57 psi (390 kPa). After charging is complete, close the high pressure valve.

5) Open the valve of the refrigerant cylinder and perform air purging in the charging hose (green). Then tighten the nut.

6) Check carefully for gas leaks inside the refrigeration system using the gas leak tester.

7) Repair any leak.

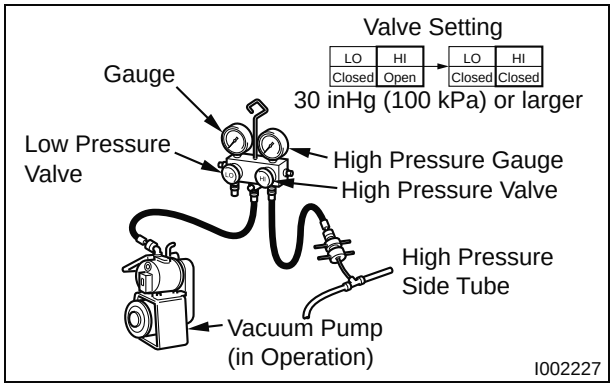
⚠ WARNING

Any repair on a charged system should be performed by a licensed professional only.

⚠ WARNING

Before checking for gas leaks, confirm that there is nothing flammable in the area to cause an explosion or fire. Contact of refrigerant with an open flame generates toxic gas.

(5) Evacuation (repeat)



1) Close the valve of the refrigerant cylinder. Then remove the charging hose (green) from the refrigerant cylinder, and connect it to the refrigerant recovery machine.

< NOTE >

Keep the high pressure valve and the low pressure valve of the gauge manifold closed.

2) Using the procedure under “Evacuation”, evacuate the system until the high pressure gauge indicates 30 inHg (100 kPa) or higher. (For 15 minutes or more.)

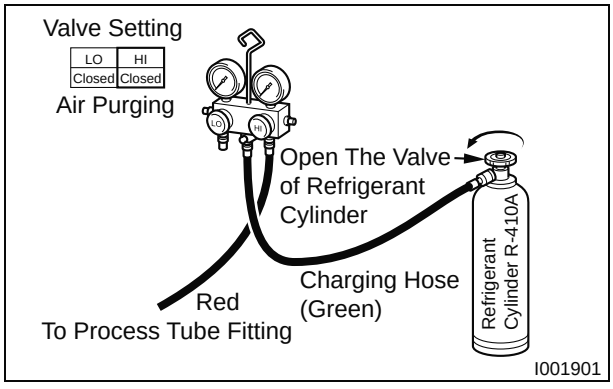
3) After evacuation is complete, close the high and the low pressure valves of the gauge manifold.

⚠ CAUTION

Make sure to evacuate the system twice or more using the repetitive vacuum method. Evacuate the system an additional time on rainy or humid days.

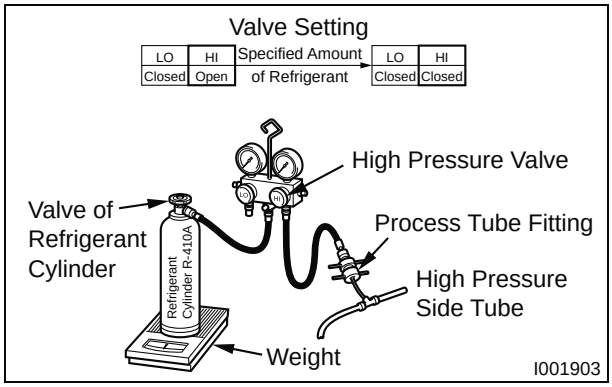
10.4 Refrigerant Charging Work

(1) Refrigerant charging



4) Remove the charging hose (green) from the vacuum pump, and connect it to the refrigerant cylinder (R-410A).

5) Loosen the nut on the gauge manifold side of the charging hose (green). Open the valve of the charging hose (green). Open the valve of the refrigerant cylinder. After air purging, tighten the nut and close the valve of the refrigerant cylinder.



6) Securely place the refrigerant cylinder on a scale with a weighing capacity of 70 lb (30 kg) that is graduated by 0.2 oz (5 g) increments.

7) Open the high pressure valve of the gauge manifold and the valve of the refrigerant cylinder. Charge the system with refrigerant to the specified amount.

Standard Amount of Refrigerant:

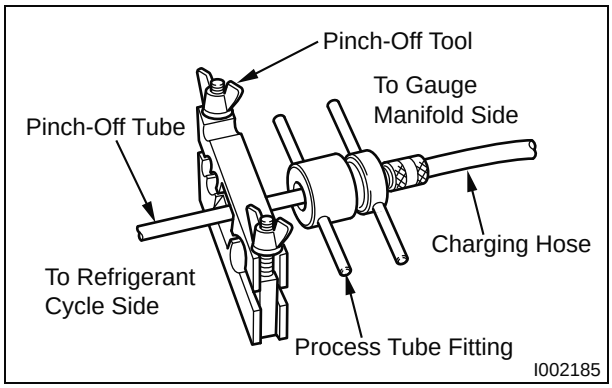
1.43 lb (0.65 kg)

⚠ CAUTION

The amount of refrigerant charged has a great effect on the cooling capacity of the unit. Charge to the specified amount, always observing the scale graduations while charging.

8) Close the high pressure valve of the gauge manifold and the valve of the refrigerant cylinder.

(2) Removal of gauge manifold



1) Crimp the pinch-off tube with a pinch-off tool.

2) Remove the gauge manifold and the process tube fitting. Crush the end of the pinch-off tube.

3) Braze the end of the pinch-off tube.

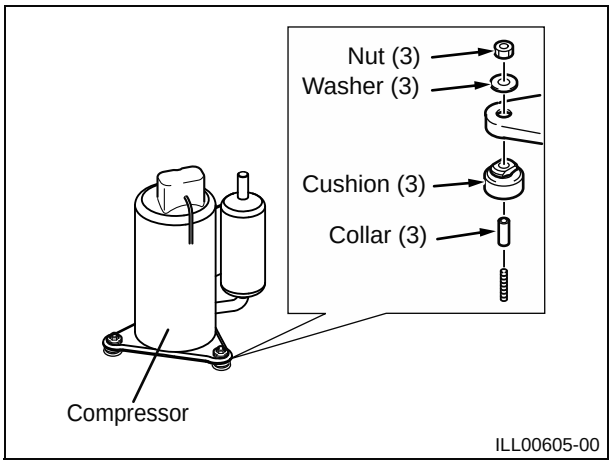
4) Ensure that a gas leak is not present at the pinched off portion and the brazed end.

11. REASSEMBLY

11.1 Reassembly of Unit

- Reassemble the unit in the reverse order of removal. Described below are the parts that require special care in reassembling the unit. Perform all wiring or rewiring as referenced in the wiring diagram.

11.2 Compressor Installation



1) Install three (3) cushions and three (3) collars to the bolts and mount the supplied compressor to the unit.

< NOTE >

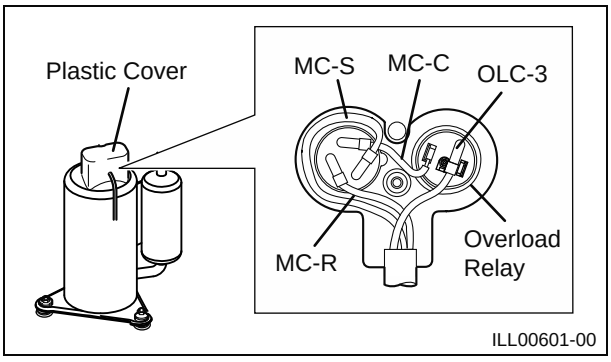
Cushions and collars are packaged in the supplied compressor assembly.

2) Insert three (3) washers and tighten three (3) nuts.

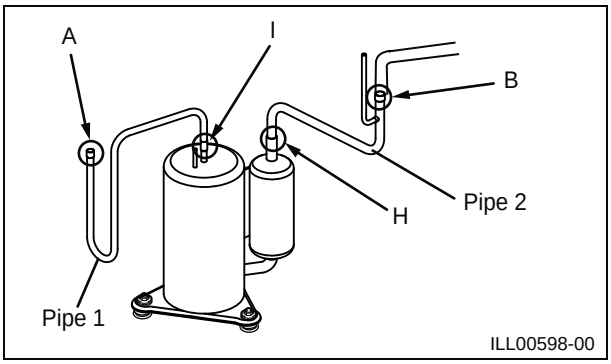
⚠ CAUTION

- Tightening torque:

  8.3 ± 2.1 ft•lbf (11.3 ± 2.9 N•m)



3) Remove the plastic cover, wires and overload relay from the compressor before brazing.

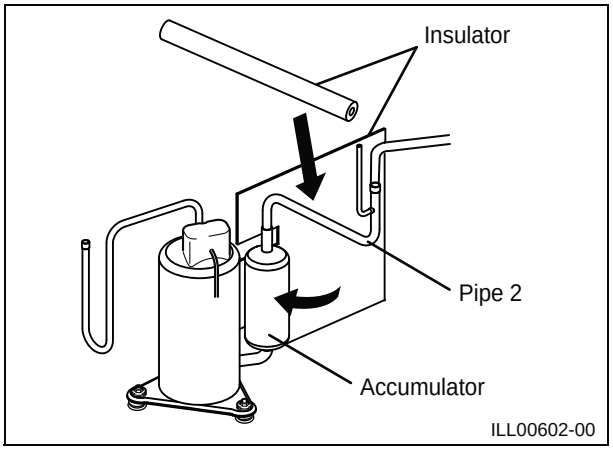


4) Braze pipe 1 at point A and I, then braze pipe 2 at point B and H.

< NOTE >

Pipe 1 and pipe 2 are packaged in the supplied compressor assembly.

5) Re-install overload relay, wires, and plastic cover after brazing.

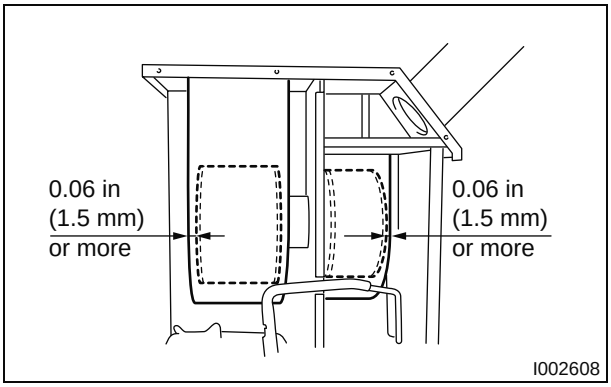


5) Apply insulators to the accumulator and pipe 2.

< NOTE >

Insulators are packaged in the supplied compressor assembly.

11.3 Fan Assembly



- Install the evaporator fan and condenser fan.

  Allow a clearance of 0.06 inch (1.5 mm) or more between the evaporator fan and the fan casing.

⚠ CAUTION

- Tightening torque:
  - 10.69 ± 1.04 ft•lbf (14.5 ± 1.4 N•m)

11.4 Wiring Notice

- Secure the wires using clamps so that they do not come into contact with the edges of the structure, etc. Secure the wires using clamps in the same position they were before removal.

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