SERVICE MANUAL

CM 12

Unit Serial Number Range: 0211XXXXC12 to Present

MOVINCOOL®
THE #1 SPOT COOLING SOLUTION

DocID: 00G00088EB

SERIAL NUMBER LOCATION AND IDENTIFICATION

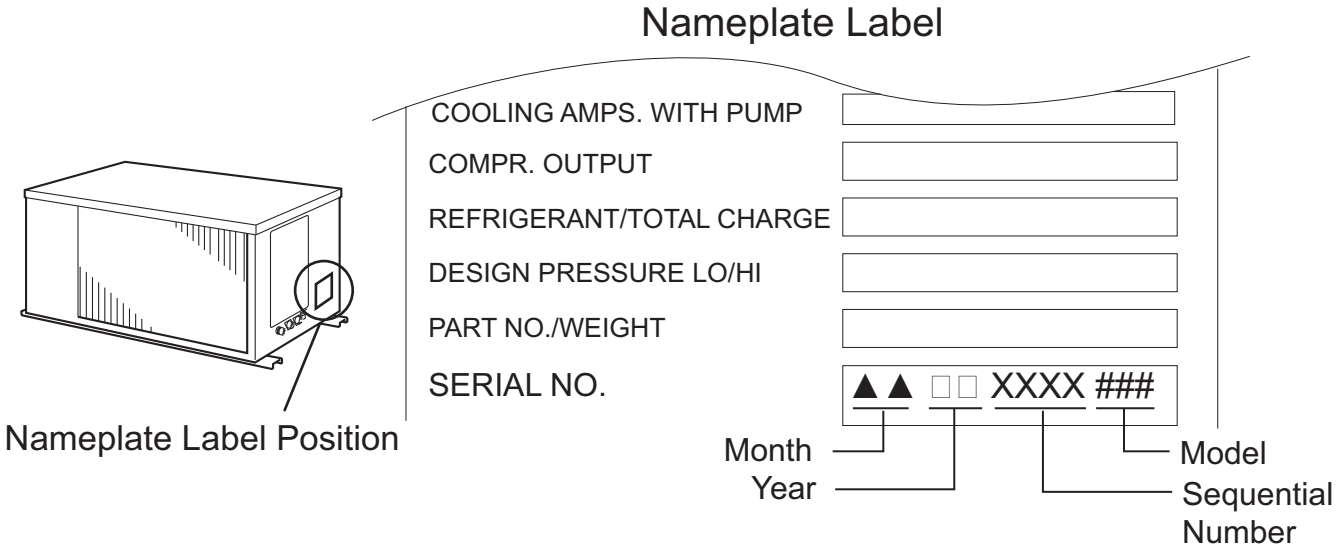


Table of Contents

Operation Section

6. CONNECTION AND SETTING

Repair Section

7. TROUBLESHOOTING

8. DISASSEMBLY

9. REFRIGERATION SYSTEM REPAIR

10. REASSEMBLY

1. PRECAUTIONS FOR SAFETY

1.1 Foreword

- This manual has been published to service the MovinCool CM 12. Please use this service manual only when servicing the CM 12.

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.

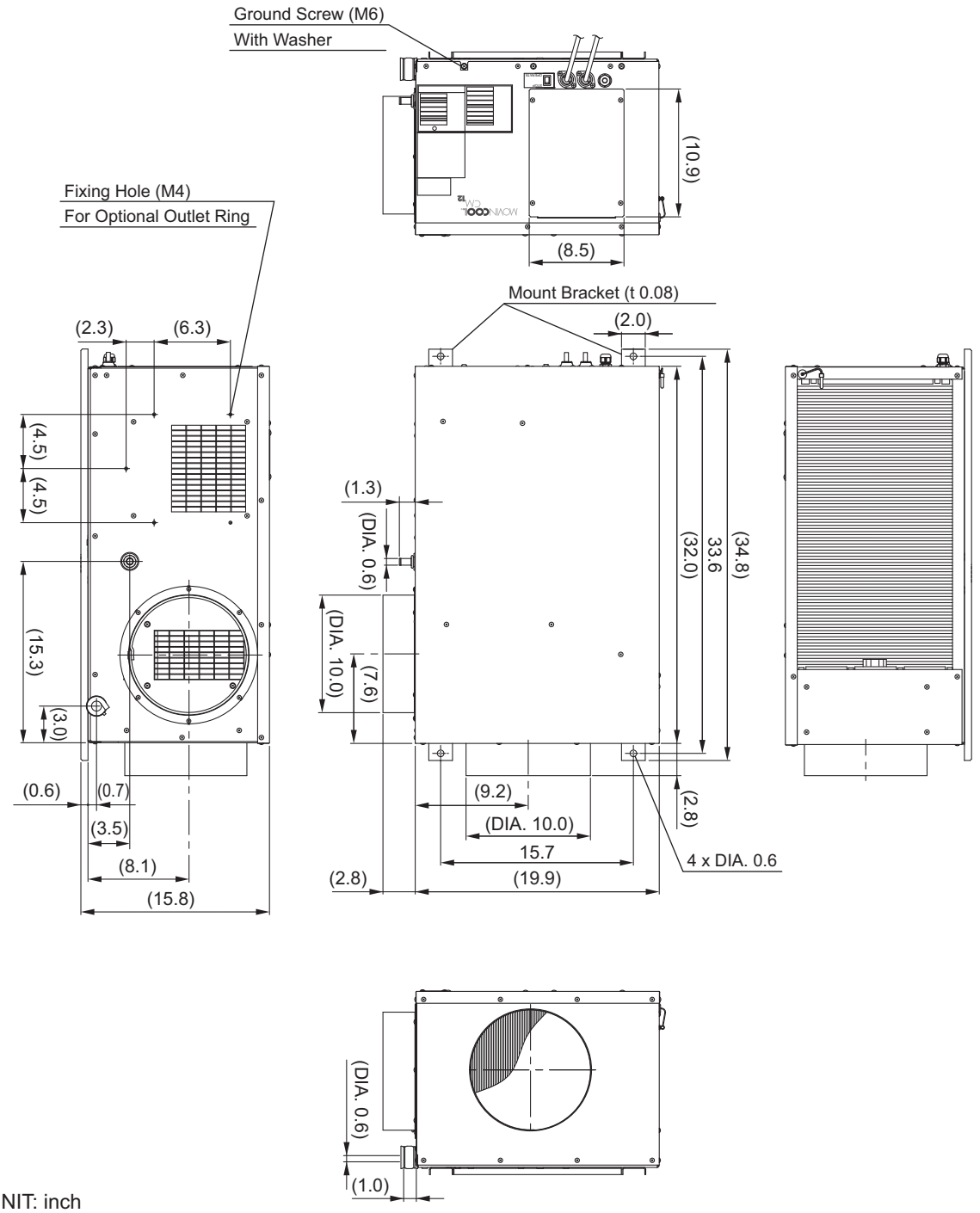
1.3 General Precautions

⚠ 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.**
- **Before replacing any refrigeration components, recover the refrigerant using standard recovery procedures and equipment.**
- **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.**
- **Disconnect power before servicing unit.**
- **Be careful of any sharp edges when working on unit.**

2. CONSTRUCTION

2.1 Exterior Dimensions



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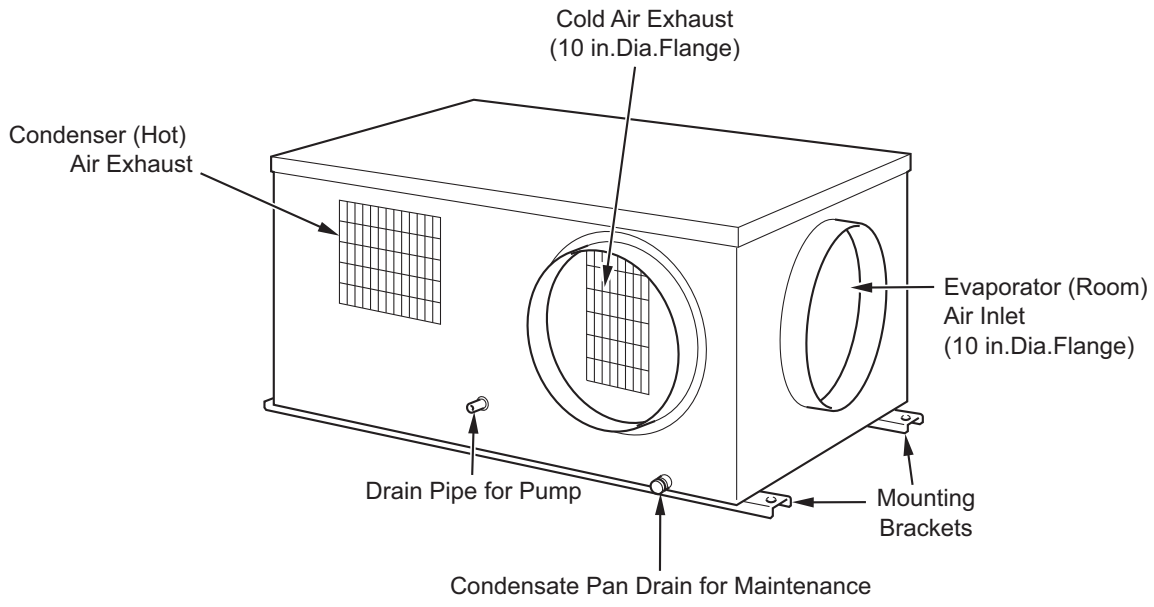
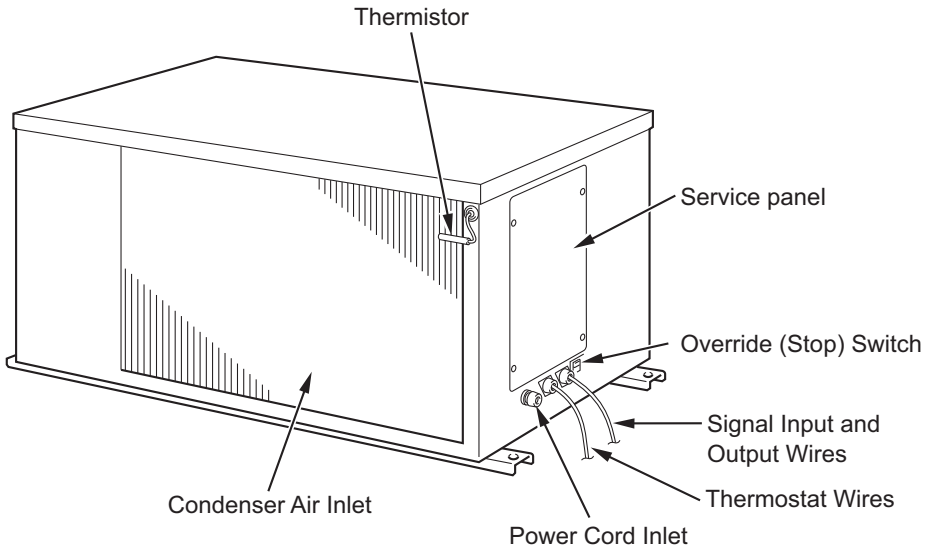
2.2 Exterior Overview





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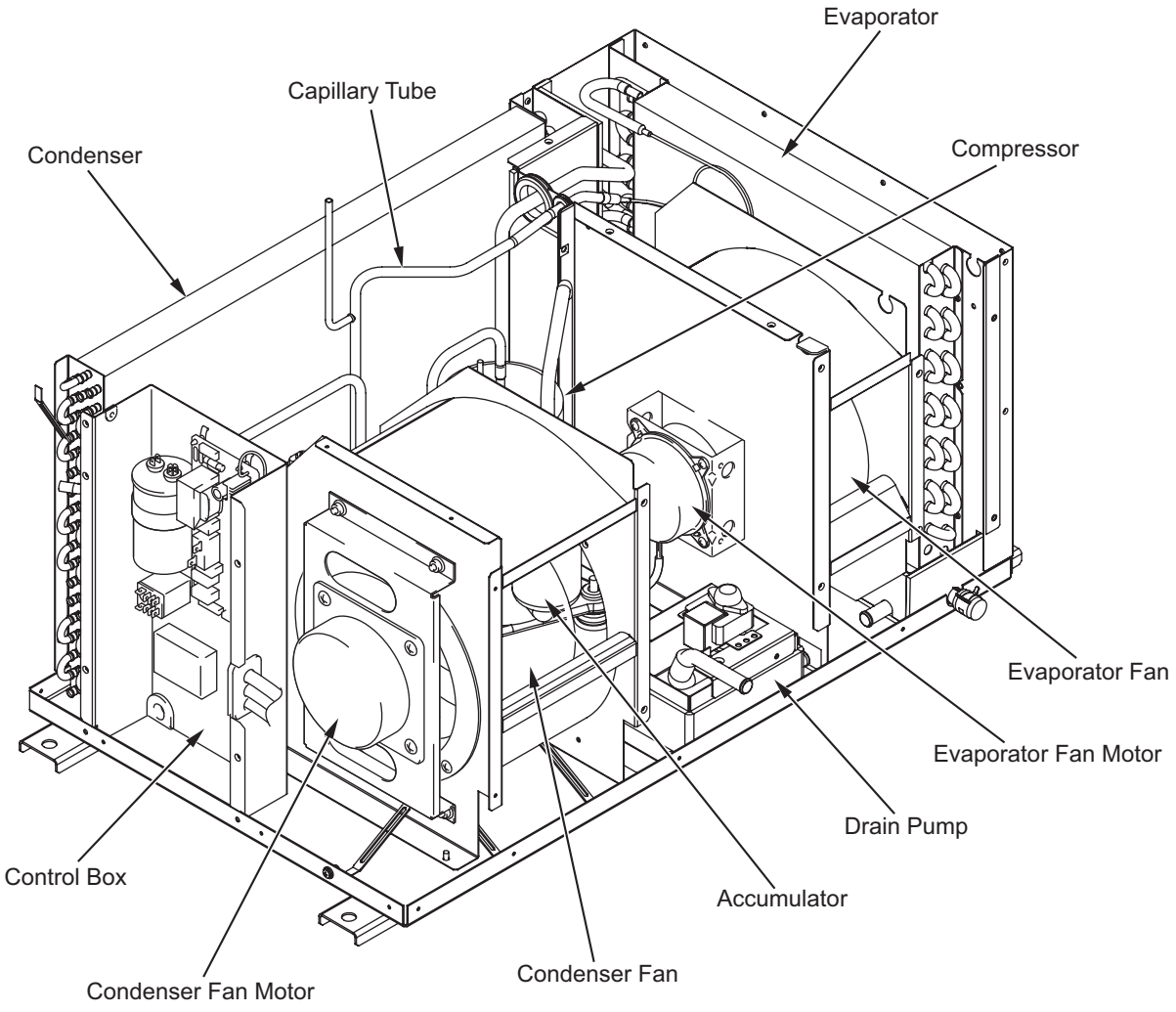
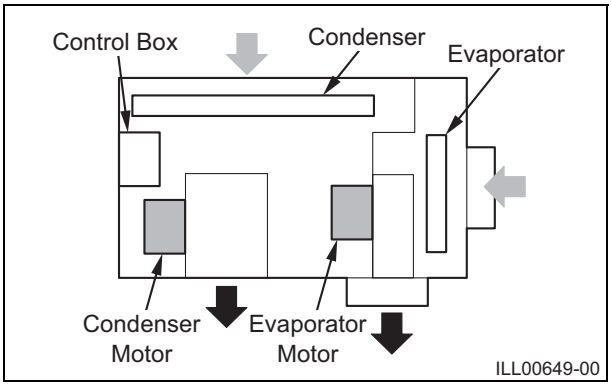
2.3 Internal Structure



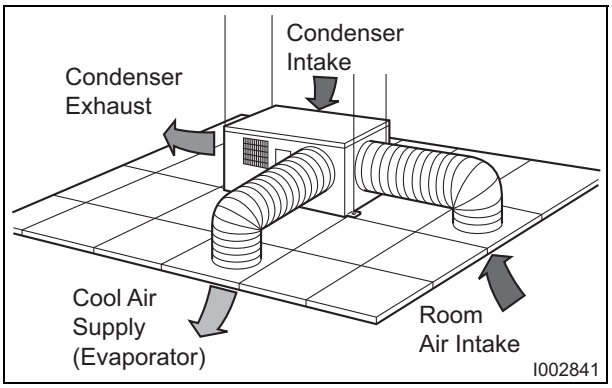
2.4 Basic Construction

- The MovinCool CM 12 is compact in construction due to the condenser and evaporator being enclosed in one unit. The interior of the unit is divided into two sections. One section contains the evaporator which cools room interior air. The other section is comprised of the condenser, compressor and control box.



2.5 Air Flow

- Air drawn from the rear face passes over the condenser which extracts heat from the refrigerant. The hot air is blown out through the front exhaust air vent. Air taken in from the right side face is cooled by the evaporator and then blown through the front cool air duct.



3. SPECIFICATIONS

3.1 Technical Specifications

ITEM			SPECIFICATIONS
Electronic Features	Control		Millivolt Thermostat (Field supplied)
Electrical Characteristics	Voltage Requirement		Single-Phase, 115 V, 60 Hz
	Operating Voltage Range	Max.	127 V
		Min.	104 V
	Starting Current		50 A
	Recommended Fuse Size		15 A
	FLA		11.2 A
	MCA		14.9 A
	MOP		20 A
	LRA		50 A
Cooling Capacity and Power Consumption			
Evaporator: 80°F (27°C), 50% RH Condenser: 95°F (35°C), 50% RH	Total Cooling Capacity *1		10500 Btu/h (3090 W)
	Sensible Cooling Capacity *1		7200 Btu/h (2100 W)
	Power Consumption *1		1.23 kW
	Current Consumption *1		11.2 A
	EER		8.5
	Power Factor		96%
Evaporator: 72°F (22°C), 50% RH Condenser: 95°F (35°C), 50% RH	Total Cooling Capacity *1		9300 Btu/h (2730 W)
	Sensible Cooling Capacity *1		7000 Btu/h (2040 W)
	Power Consumption *1		1.22 kW
	Current Consumption *1		11.1 A
	EER		7.6
	Power Factor		96%
Compressor	Type		Hermetic Rotary
	Output		0.91 kW
Evaporator	Type of Evaporator		Plate Fin
	Type of Fan		Centrifugal Fan
	Air Flow	High	324 CFM (550 m^3/h)
		Low	228 CFM (390 m^3/h)
	Max. External Static Pressure		0.16 IWG (40 Pa)
	Motor Output	High	0.04 kW
		Low	0.01 kW

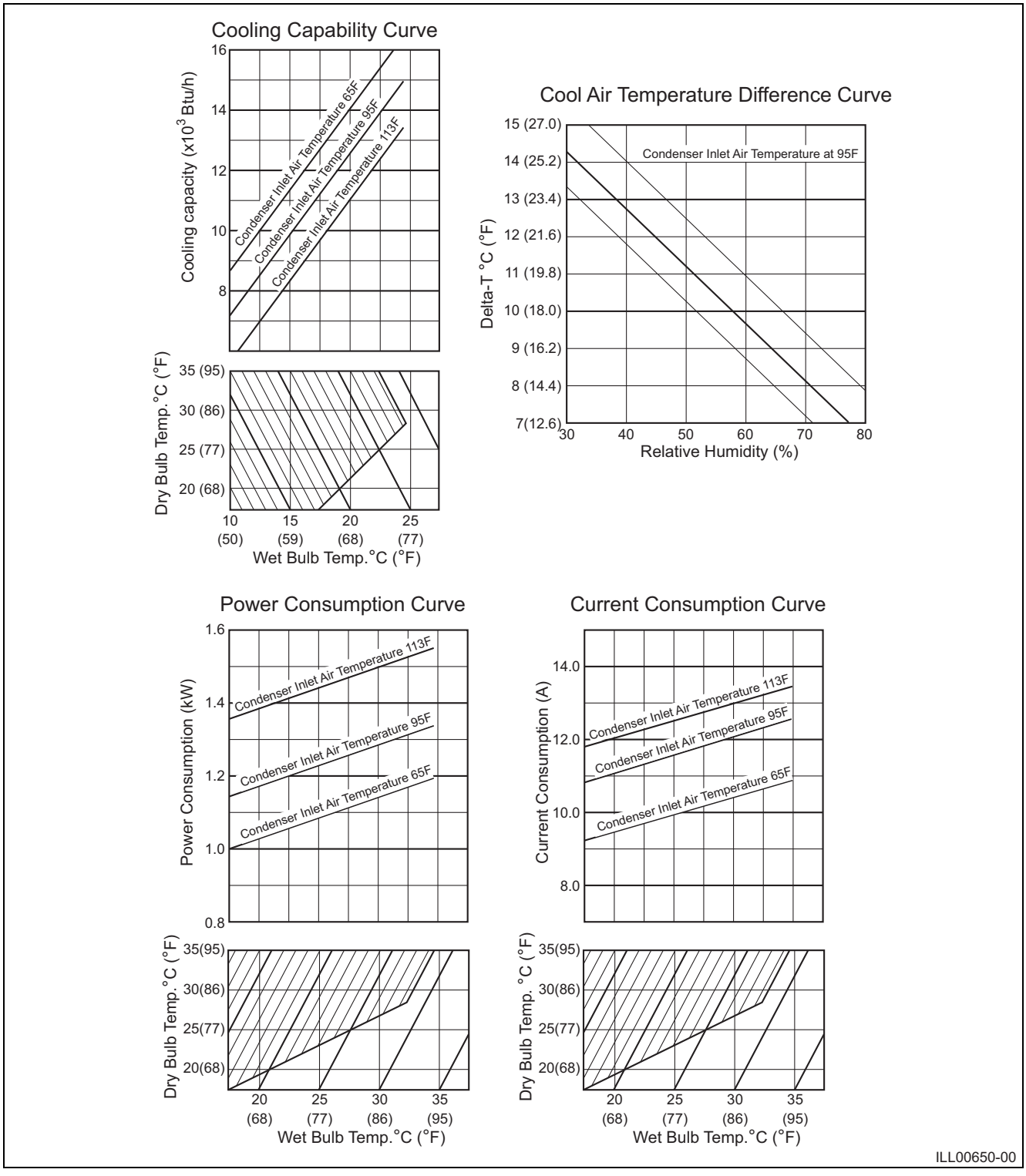
ITEM			SPECIFICATIONS
Condenser	Type of Condenser		Plate Fin
	Type of Fan		Centrifugal Fan
	Air Flow	High	700 CFM (1190 m^3/h)
		Low	370 CFM (630 m^3/h)
	Max. External Static Pressure		0.12 IWG (30 Pa)
	Motor Output	High	0.09 kW
		Low	0.06 kW
Refrigerant	Refrigerant Control		Capillary Tube
	Type		R-410A
	Amount		1.59 lb (0.72 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 max. with resistive load
Dimension	W × D × H	Without Flange and Mounting Bracket	32.0 ×19.9 × 15.2 in (813 × 505 × 386 mm)
		With Flange and Mounting Bracket	34.8 × 22.7 × 15.8 in (884 × 577 × 401 mm)
Weight	Net		123 lb (56 kg)
	Shipping		137 lb (62 kg)
Condensate Pump Capacity	Pump Rate		5.0 gal/h (19 L/h)
	Max. Head		4 ft (1.2 m)
Operating Condition Range *2	Evaporator Air Inlet	Max.	95°F (35°C), 50% RH
		Min.	65°F (18°C), 50% RH
	Condenser Air Inlet	Max.	113°F (45°C)
		Min.	65°F (18°C)
Maximum Duct Length *3	Cold Duct		20 ft (6.1 m)
	Hot Duct		10 ft (3.0 m)
Maximum Sound Level *4	High		52 dB(A)
	Low		52 dB(A)
Safety Devices	Compressor Overload Protector		Included
	Fan Motor Overload Protector		Included
	Freeze Protection Thermistor		Included
	Full Drain Pan Switch		Included
	Automatic Restart (Power Interruption)		Included
	High Pressure Interruption		Included
	Compressor Time Delay		120 sec
	Signal Input/Output		Included
Control Devices	Temperature Control		Included
	Two Speed Fan		Included

- Specifications are subject to change without notice.

< NOTE >

*1 : With two 6-foot (1.8 m) ducts containing one 90° bend each, supply grill and return grill with filter [0.16 IWG (40 Pa) external static pressure] on high fan speed.
*2 : When ambient temperature is lower than 65°F (18°C), operation may be interrupted due to anti-freeze protection activation.
*3 : Confirm pressure drop of duct, grills, and filter with manufacture's specifications.
*4 : Measured at 3 feet (1.0 m) under the ceiling with evaporator duct and ceiling tile.

3.2 Characteristics



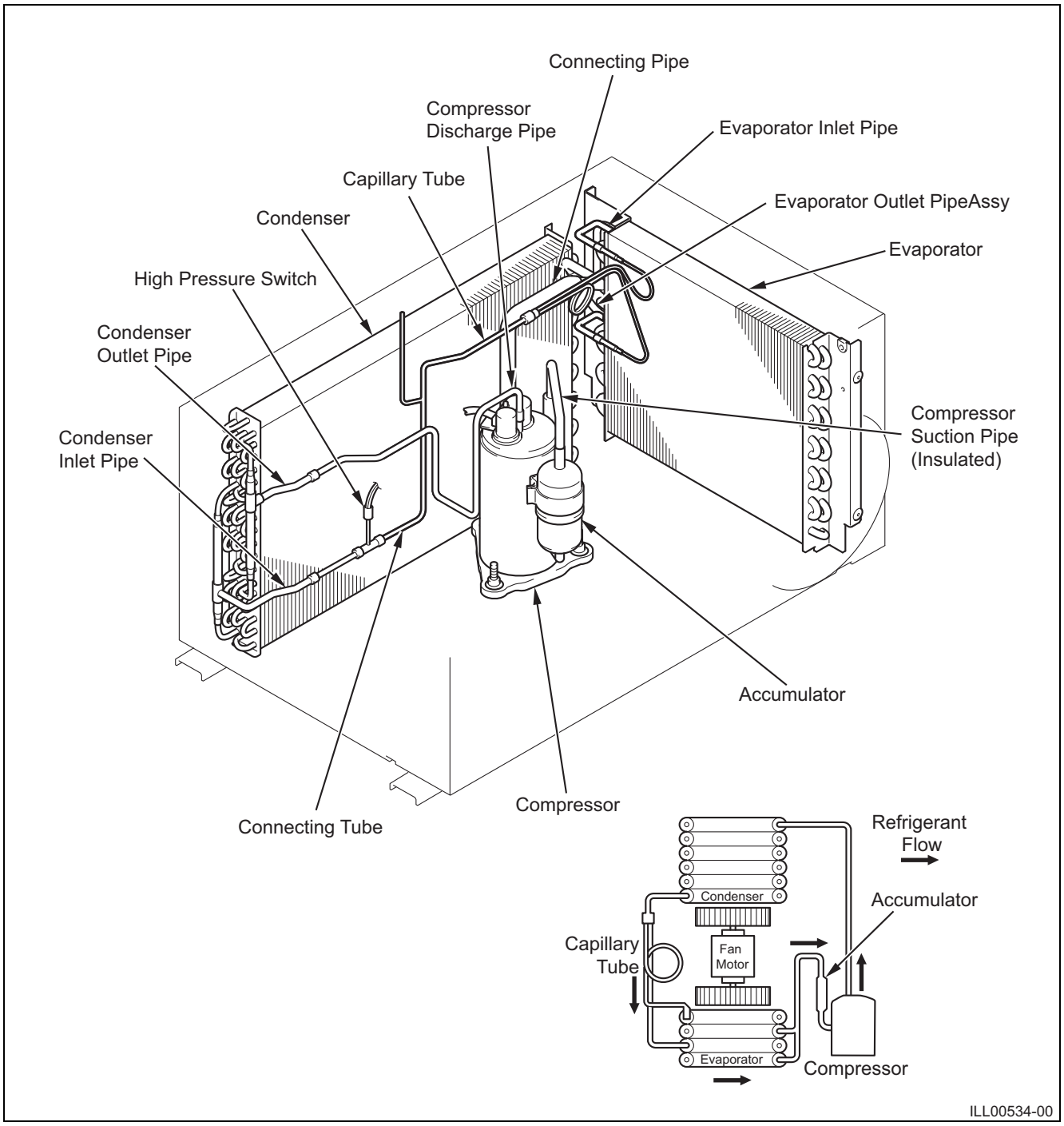
4. REFRIGERATION SYSTEM

4.1 Refrigeration System Construction

The component parts of the refrigeration system include the following:

• Compressor, Evaporator, Condenser, Accumulator, Capillary tube, High pressure switch

These parts are all connected by copper tubing. All the connections have been brazed.

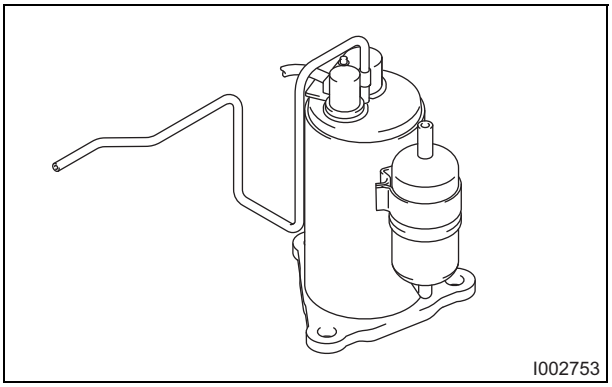


4.2 Compressor

- 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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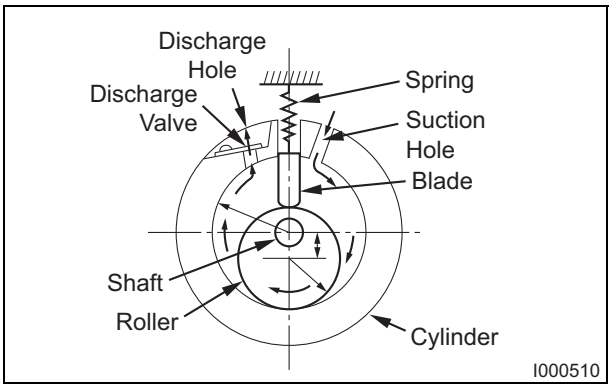
(2) Basic compressor operation

- 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.



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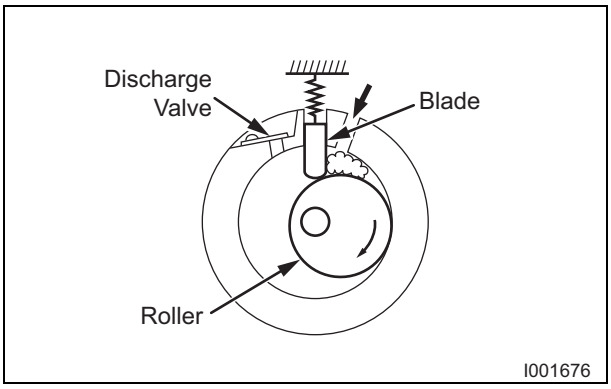
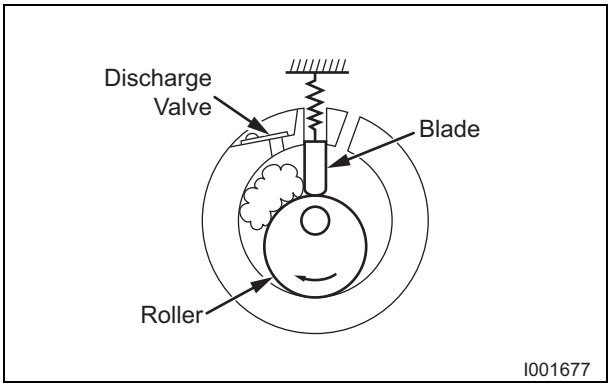
(3) Operation



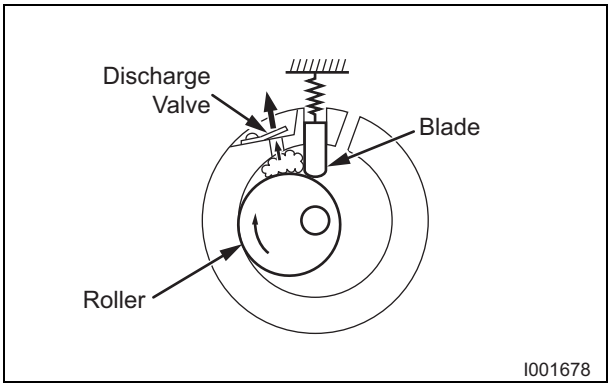
1) Start of compression

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.



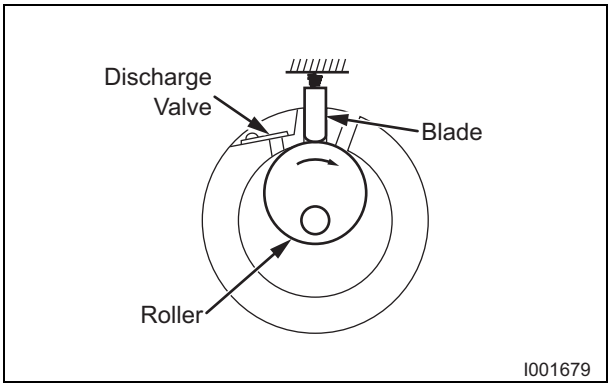
2) Suction and compression

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

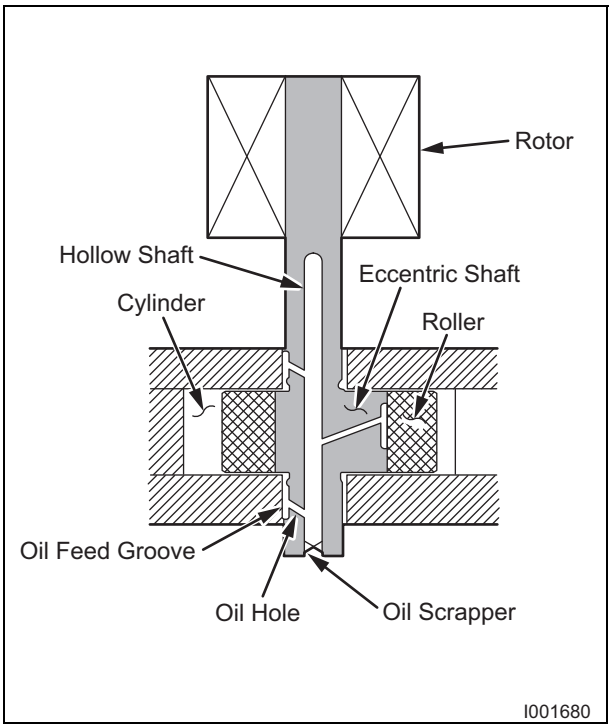
1) The pressure in the cylinder exceeds that in the discharge chamber, and the discharge valve opens.
2) On the suction side, refrigerant suction continues.



4) Completion of compression

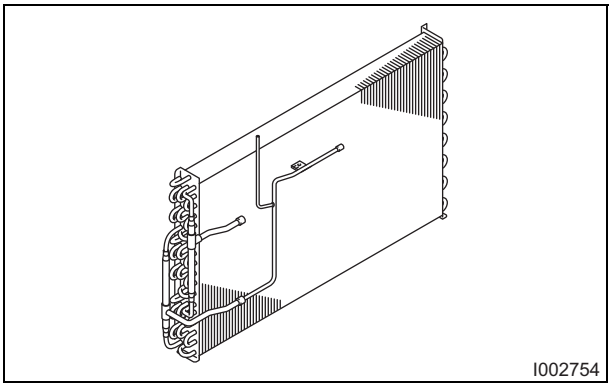
1) When compression is completed, all of the refrigerant has been drawn from the suction chamber.
2) Operation then returns to step 1) (Start of compression) and the above process of suction and compression continues repeatedly in succession.

(4) Compressor lubrication



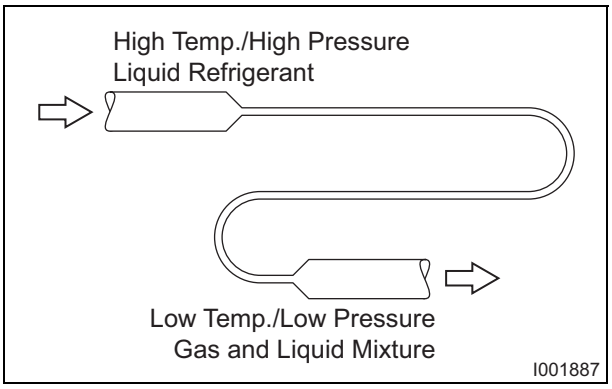
- The lubrication system is comprised of a hollow shaft, an oil scraper mounted at the end face, hollow shaft, a shaft journal (shaft bearing), and the lubrication groove for the shaft journal. The lubrication groove is wider than the oil hole. When the shaft turns, oil is scraped upward by the oil scraper 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



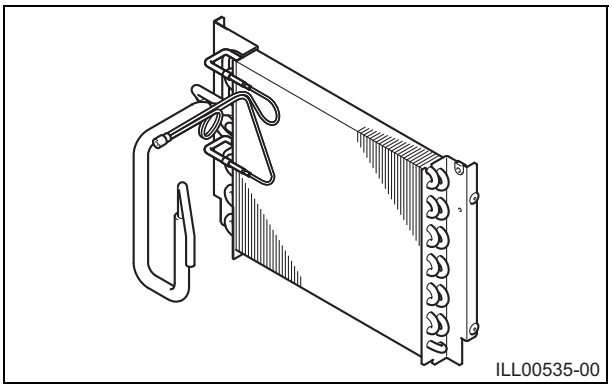
- The condenser is a heat exchanger with copper tubes that are covered with thin aluminum projections called plate fins.
- Heat is given off and absorbed by air being pulled across the condenser fins by the centrifugal fan and then expelled through the exhaust air duct.

4.4 Capillary Tube



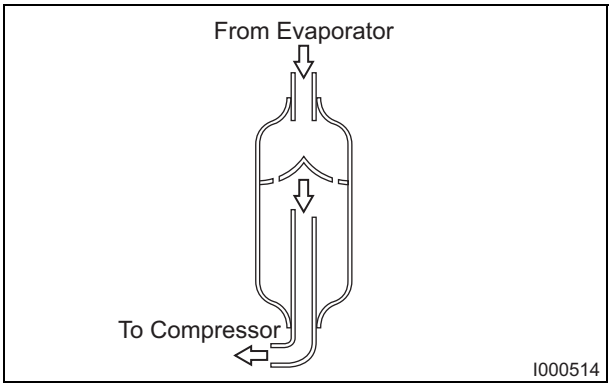
- The capillary tube is a long thin tube utilizing line flow resistance to serve as an expansion valve. The length and the inner diameter of the capillary tube are determined by the capacity of the refrigeration system, specified operating conditions, and the amount of refrigerant. The capillary tube causes the high pressure, high temperature liquid refrigerant sent from the condenser to expand 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 respectively, causing it to evaporate easily.

4.5 Evaporator



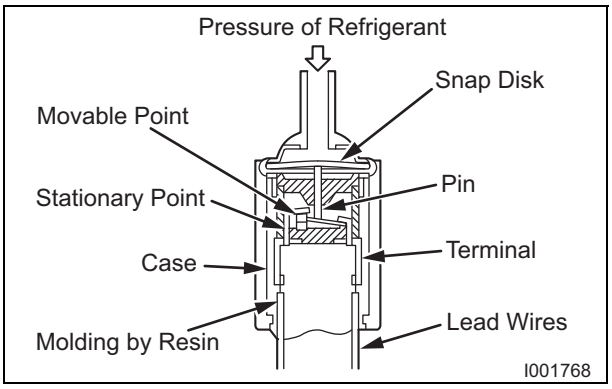
- The evaporator is a heat exchanger covered with plate fins. Heat is removed from the air being pulled across the evaporator by the centrifugal fan and the resulting cool air is expelled through the cool air vent.

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.

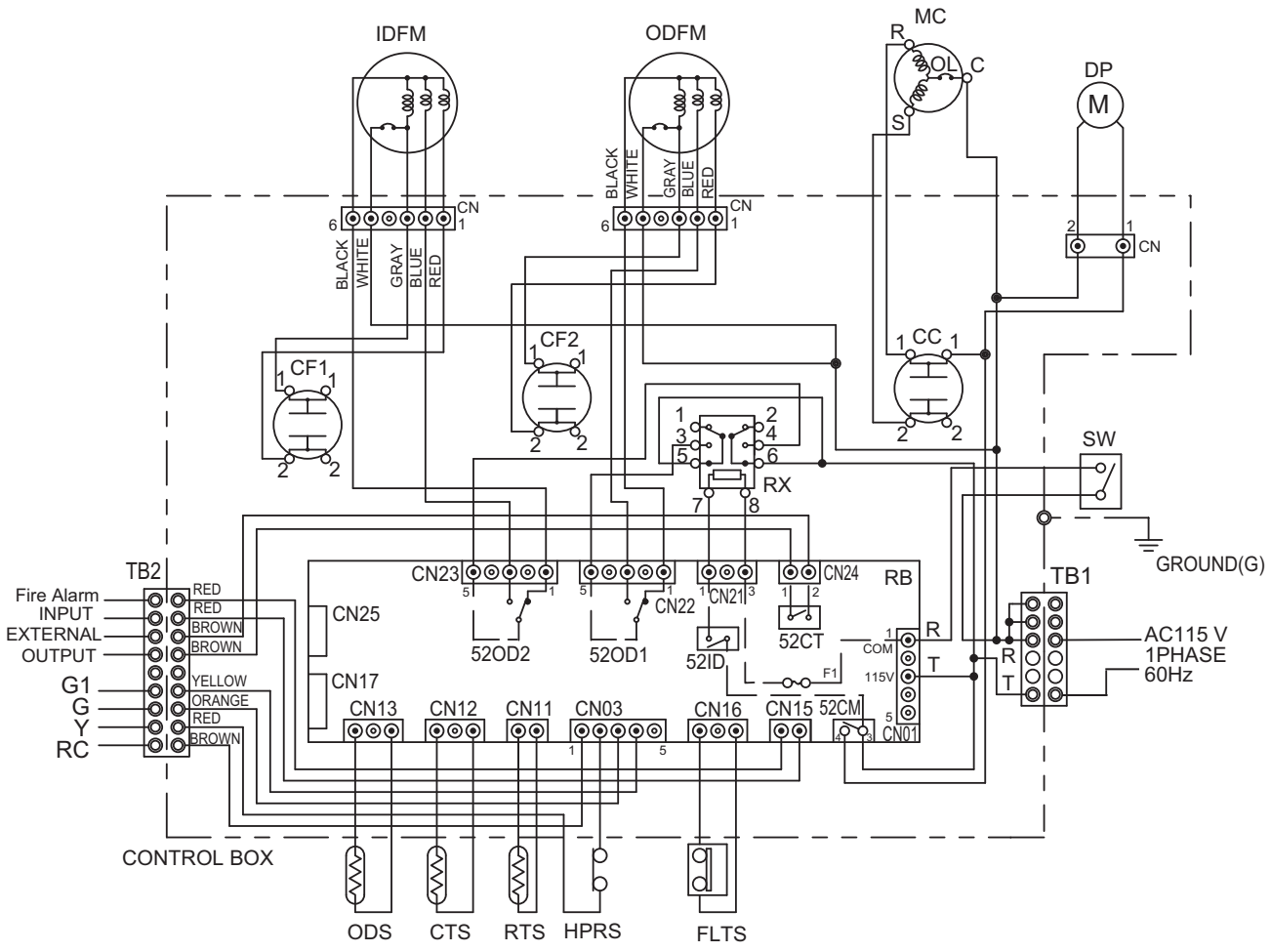
4.7 High-Pressure Switch



- 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



TB1	Terminal Block 1	RTS	Room Thermistor (Evaporator Inlet Air Thermistor)
TB2	Terminal Block 2	CF1	Capacitor For IDFM (Capacitor For Evaporator Fan Motor)
RB	Relay Board	CF2	Capacitor For ODFM (Capacitor For Condenser Fan Motor)
IDFM	Indoor Fan Motor (Evaporator Fan Motor)	CC	Capacitor For Compressor
ODFM	Outdoor Fan Motor (Condenser Fan Motor)	OL	Overload Protector
MC	Compressor Motor	DP	Drain Pump
RX	Auxiliary Relay	SW	Switch For Emergency (Override (Stop) Switch)
ODS	Outdoor Thermistor (Condenser Inlet Air Thermistor)	FLTS	Float Switch
CTS	Freeze Protection Thermistor	G	Ground
		HPRS	High Pressure Switch

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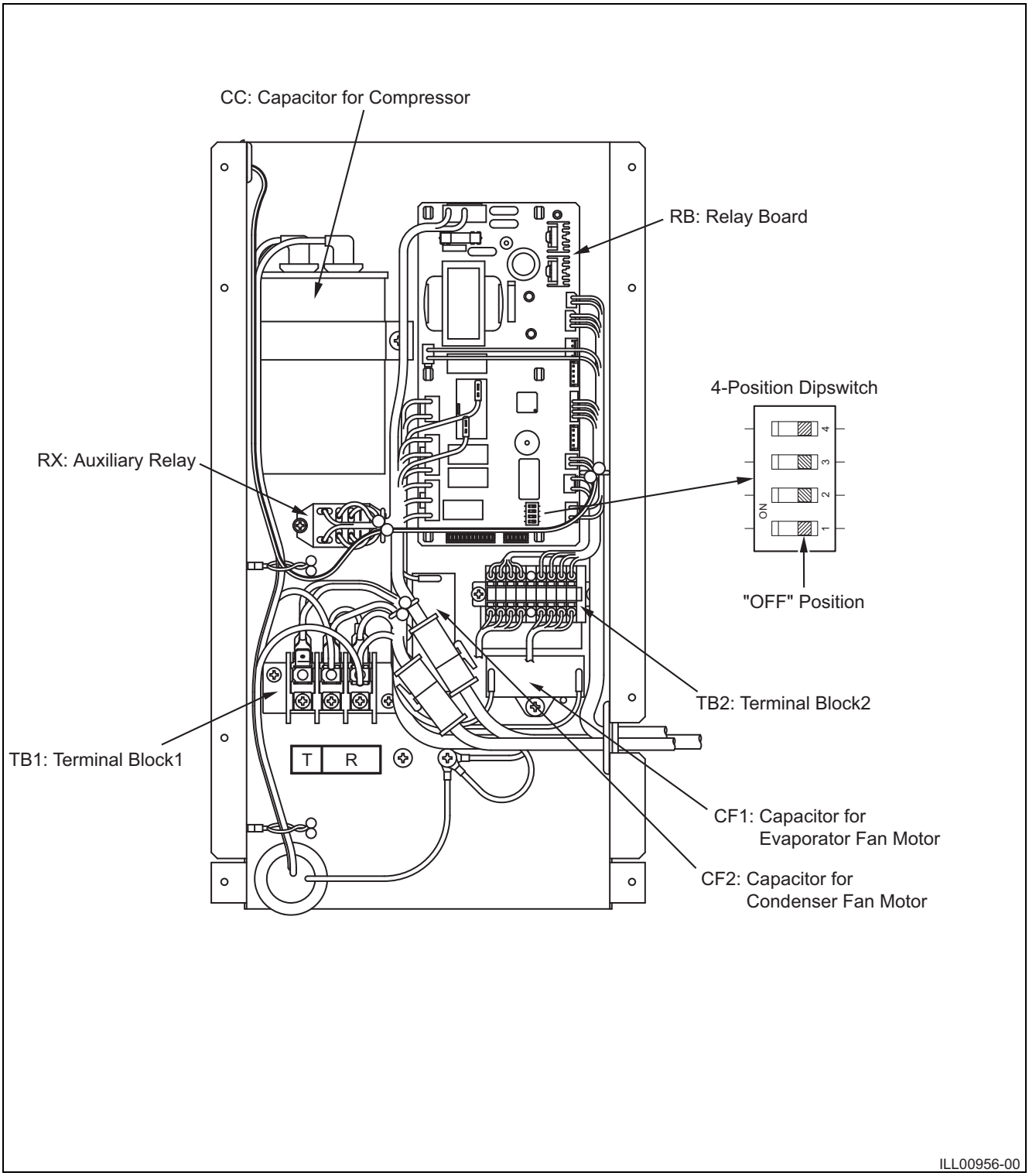
5.2 Control Box

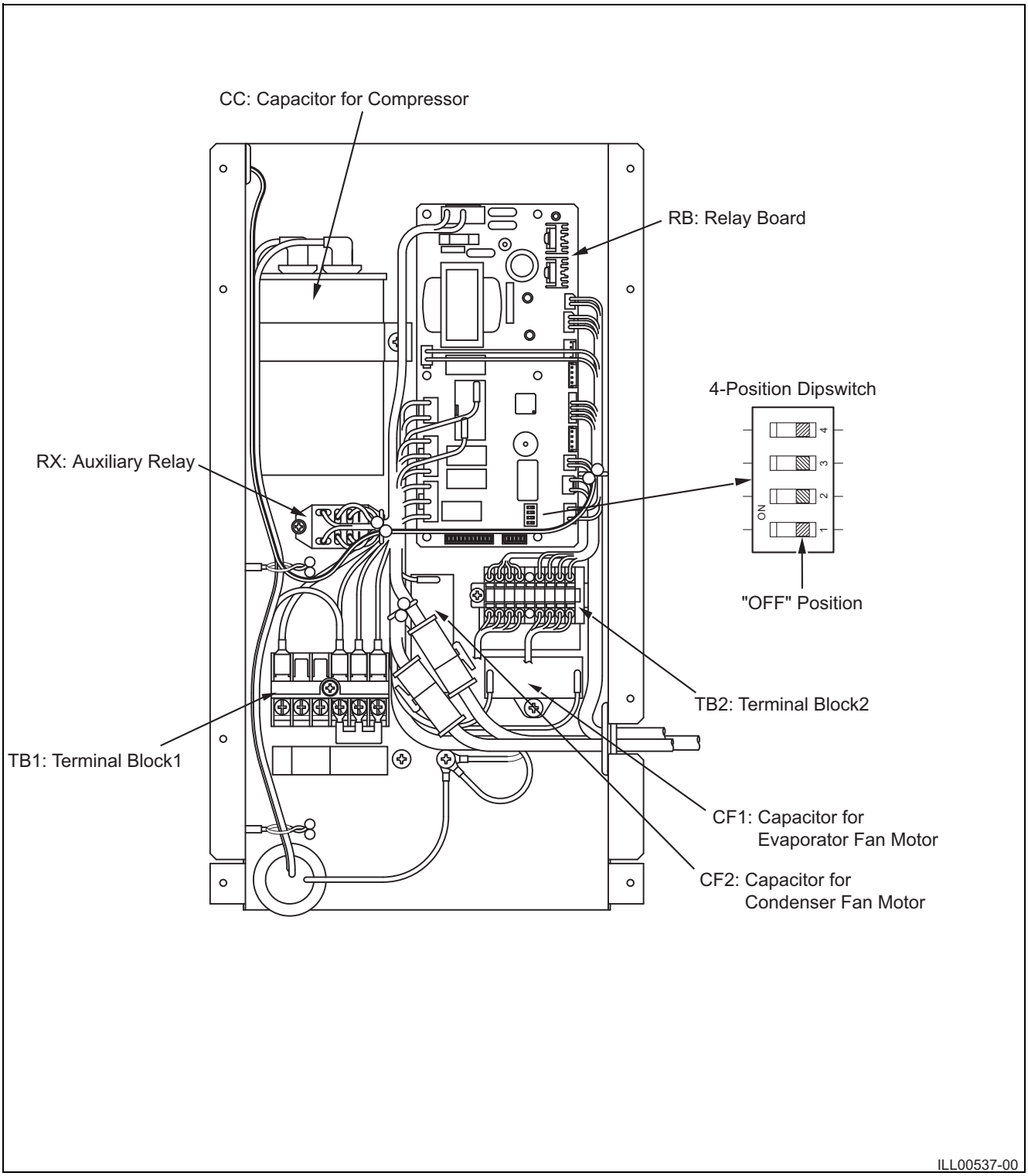
(1) For unit serial number from 0415XXXXC12 to Present*

*:Please refer to page 2 for the position of the name plate showing the serial number on the unit.



(2) For unit serial number from 0211XXXXC12 to 0315XXXXC12*

*:Please refer to page 2 for the position of the name plate showing the serial number on the unit.



5.3 Operation

(1) Basic operation

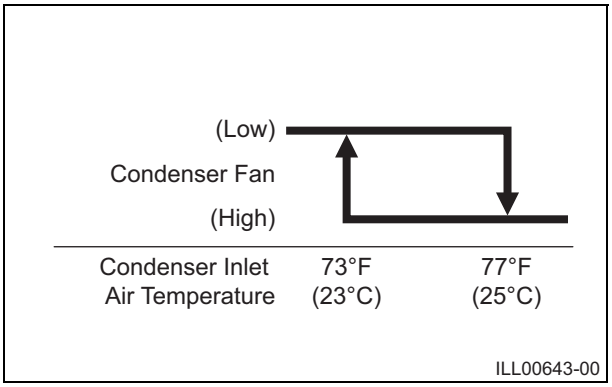
- When a Y signal is input, the 52CM relay located on the relay board comes ON, and the compressor operates.
- When a G signal is input, both the 52ID relay and the RX (auxiliary relay) come ON, and the evaporator and condenser fans operate. However, when the G signal is OFF, both the 52CM and 52ID relays go OFF, stopping the compressor as well as the fans.

(2) Evaporator fan speed control

- With a G signal on, the fan will start at high speed. When a G1 signal is input, relay 52ID will become active and fan speed changes from high to low.

(3) Condenser fan speed control (Air Volume Control)

- Condenser fan air volume is controlled by the ODS (condenser inlet air thermistor).
- When condenser inlet air temperature is approx. 77 °F (25 °C) or greater...
  Condenser fan speed switches to high.
- When condenser inlet air temperature is approx. 73 °F (23 °C) or less...
  Condenser fan speed switches to low.



< NOTE >

However, when the 52ID relay is ON and the ODS temperature is 73 °F (23 °C) or less, the condenser fan will switch to low speed after running in high speed for 5 seconds.

(4) Anti-frost control

- Anti-frost controls turns the 52CM relay on in accordance with the Freeze Protection Thermistor (CTS) temperature in order to turn the compressor on and off to prevent a decrease in cooling performance resulting from a buildup of frost on the evaporator.
- Compressor off conditions: Freeze protection thermistor (CTS) temperature ≤ 30 °F (-1 °C)
- Compressor on (recovery) conditions: CTS temperature ≥ 50 °F (10 °C) and continuous anti-frost control for 15 minutes.

(5) Compressor protection (Compressor time delay control)

- Compressor protection consists of a time delay program within the microprocessor which 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 when the compressor is turned on by either the COOL ON/OFF button (after the Y signal goes OFF once and then comes back ON), or power interruption restart. (automatic recovery)

Specifications:
- Time Delay: 120 sec.

(6) Automatic restart after power interruption (Automatic Recovery Function)

- The program within the CM 12 microprocessor contains a feature that will automatically restart the unit after power is lost and then regained. The unit also has memory in order to return itself back to the operating mode (either manual or preset program) it was in prior to the loss of power. Any “preset” program will also be retained in the memory in the event power loss occurs.

5.4 Relay Board

- The relay board controls the components such as the compressor and fan motor based on the signals received from the millivolt wall thermostat and other sensors on the unit.
- It also contains a step-down transformer that converts the line voltage (115 VAC) to 12 V.
- This 12 V is then converted from AC to DC and used for relay coil activation. The 12 V (DC) power is sent to the control panel assembly where it is further reduced to 5 V for the system logic.
- The relay board also contains the DIP switch.

< NOTE >

The relay board must be serviced as a complete assembly. It has only one serviceable component, the fuse. (see below)

(1) Relay board fuse

- 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

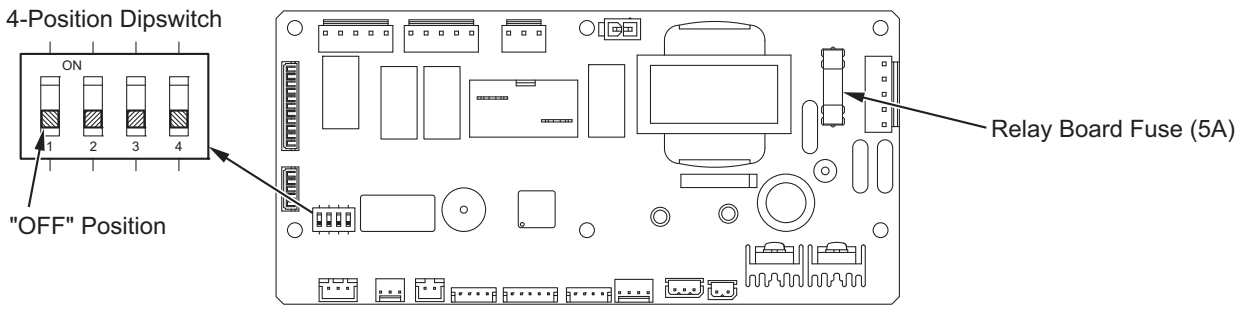
⚠ CAUTION

Failure to use the exact type of fuse could result in damage to the unit and/or to components. It could also void the warranty of the unit.

(2) 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:

Switch	Setting Name	Function
DSW4	Alarm Setting	When DSW 4 is ON, the buzzer sound function is disabled.
DSW3	Compressor Time Delay Cut	When DSW 3 is ON, the compressor delay timer function is disabled.
DSW2	Cooling Test Operation	When DSW 2 is ON, the compressor, evaporator and condenser fan motor will turn ON. This function is used for test purposes and verification.
DSW1	Discharge Air Test Operation	When DSW 1 is ON, the evaporator and condenser fan motor will turn ON. This function is used for test purposes and verification.



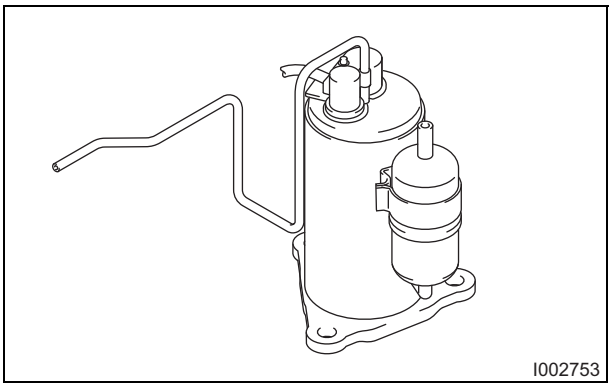
5.5 Compressor

(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: 890 W

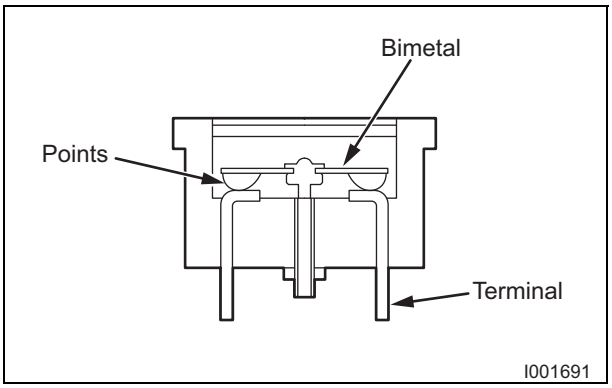


(2) Compressor overload relay

- 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 buildup in the compressor.

Specifications:

	Temperature	Overcurrent
Contact Open	302°F (150°C)	17 A 30 min (at 212°F (100°C))
Contact Close	142°F (61°C)	



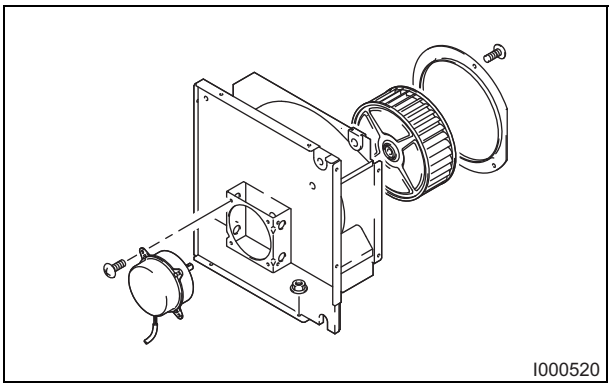
5.6 Fan Motor

(1) Evaporator Fan Motor

• The evaporator fan motor is a single phase, induction type two-speed motor.

Specifications:

- Rated Voltage: 115 V, 60 Hz
- Rated Output: High - 44.5 W, Low - 14.3 W
- Rotational Speed: High - 1100 rpm, Low - 760 rpm


I000520

< NOTE >

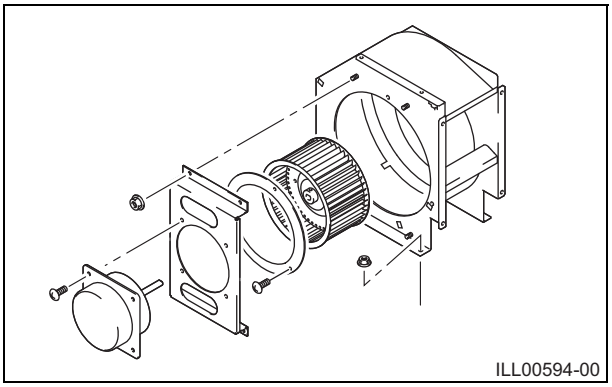
An internal overload relay is used to protect the fan motor. This relay is built into the fan motor and interrupts the flow of current when there is an over current situation, or if there is an abnormally high temperature buildup in the fan motor.

(2) Condenser Fan Motor

• The condenser fan motor is a single phase, induction type two-speed motor.

Specifications:

- Rated Voltage: 115 V, 60 Hz
- Rated Output: High - 91.2 W, Low - 68.7 W
- Rotational Speed: High - 1100 rpm, Low - 975 rpm

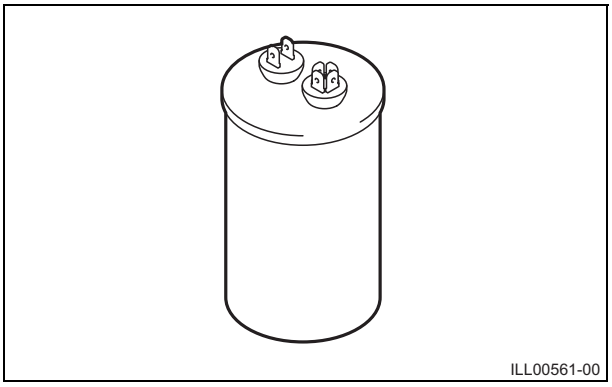

ILL00594-00

< 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 buildup in the fan motor.

5.7 Capacitor

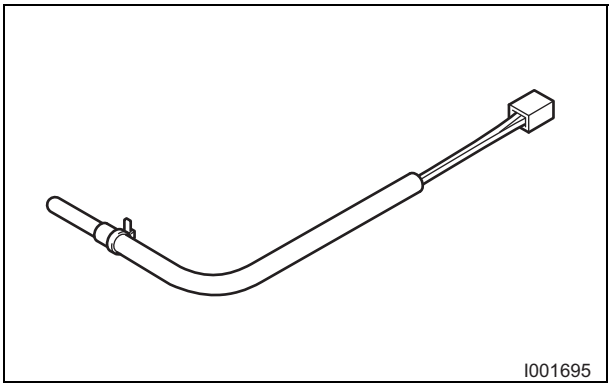
- The capacitor is used to improve the rotational power of the fan motors and compressor at startup. The specification for each capacitor is shown below.



Capacitor	Rated Voltage	Capacitance
Evaporator Fan Motor	250 V	7 µF
Condenser Fan Motor	220 V	9 µF
Compressor	370 V	60 µF

5.8 Temperature Thermistor

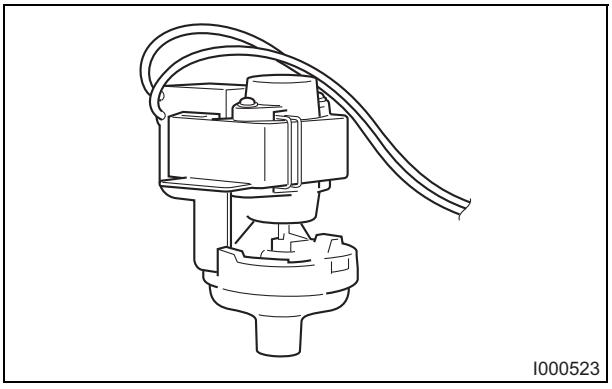
- The evaporator inlet air thermistor (RTS) is installed upstream of the evaporator, and detects evaporator inlet temperature as a resistance value.
- The freeze protection thermistor (CTS) is installed in the evaporator outlet piping, and detects low temperature on the evaporator as a resistance value.



Type	Specification		
	Characteristic	“Short” Detection	“Open” Detection
Evaporator Inlet Air 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

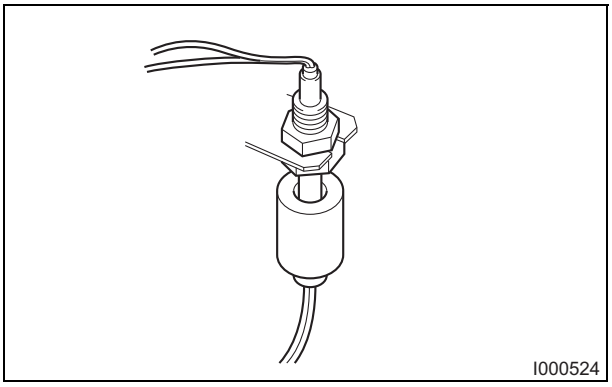
5.9 Drain Pump

- The drain pump evacuates evaporator condensation accumulated in the drain pan. The drain pump turns on when the compressor turns on. The drain pump turns off when the compressor turns off.



5.10 Float Switch

- A float switch is installed in the drain pan. The float switch is a normally closed type switch. If evaporator condensation cannot be evacuated and the drain pan becomes full, the float rises, turning the switch on, which then activates the warning signal output and stops the unit's operation. This prevents the drain pan from overflowing and alerts the user of the situation.


I000524

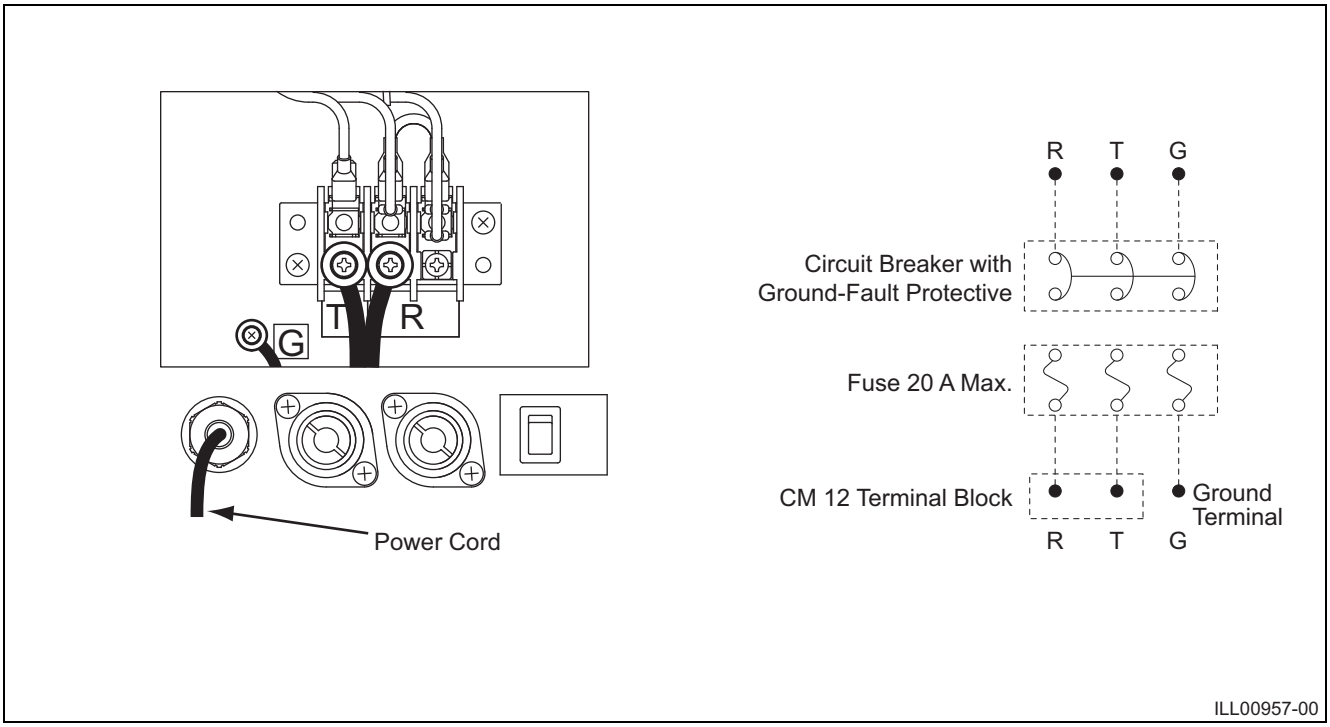
6. CONNECTION AND SETTING

6.1 Power Supply Requirements

- The CM 12 requires a single-phase 115 V, 60 Hz power supply.
- The power supply should be a dedicated single outlet circuit with a UL recognized short-circuit and ground fault protective breaker, and a maximum fuse size of 20 A.

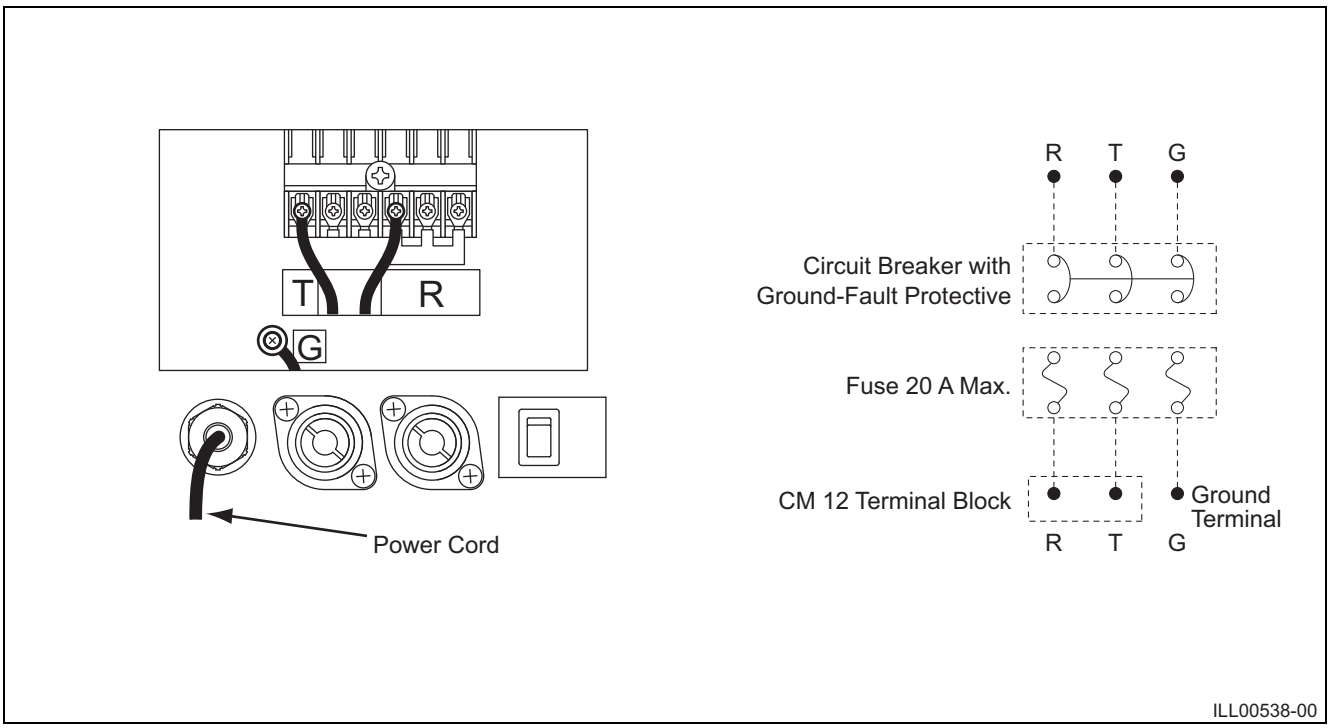
(1) For unit serial number from 0415XXXXC12 to Present*

*:Please refer to page 2 for the position of the name plate showing the serial number on the unit.



(2) For unit serial number from 0211XXXXC12 to 0315XXXXC12*

*:Please refer to page 2 for the position of the name plate showing the serial number on the unit.

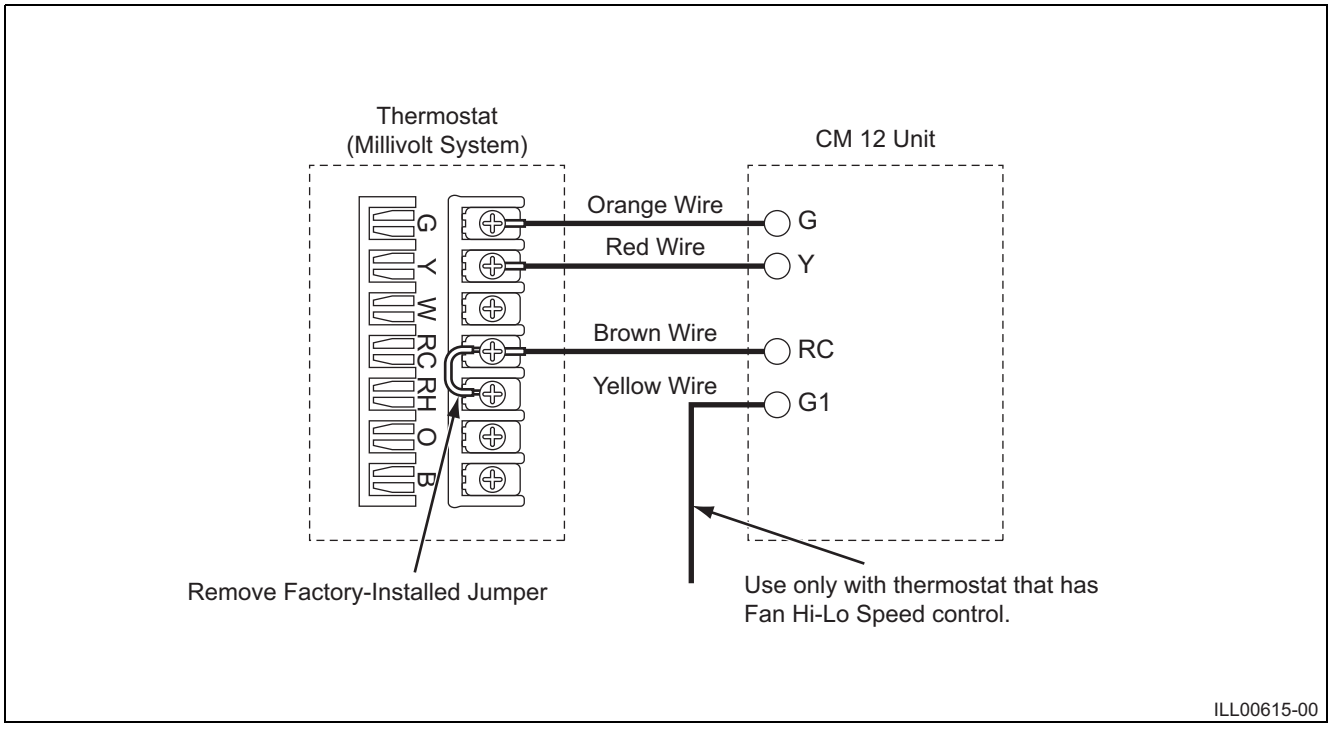


6.2 Millivolt Wall Thermostat Connection

1) Use with a single stage wall thermostat.
   Thermostat type: Millivolt System
2) Set the wall thermostat to cooling system mode, since most wall thermostats are designed for both heating and cooling.
3) Prepare the wire harness for connection from the unit to the thermostat. The recommended wire size is:
   Wire Type: Thermostat cable / Solid wire 16 ~ 26 AWG
4) Identify the thermostat connectors labeled G, G1, Y, and RC.
   G (Fan On/Off), G1 (Fan Speed Hi/Lo), Y (Cooling On/Off) and RC (Cooling Transfer - Common)

Connecting Thermostat to CM 12 Unit

Wall Thermostat Connector Name	CM 12 WIRES		Function
	Label Name	Color	
RC	RC	Brown	Common line for thermostat connection.
Y	Y	Red	When both Y and G signals are ON, the compressor comes ON.
G	G	Orange	When the G signal is ON, the evaporator fan comes ON. (When the signal is OFF, the evaporator fan goes OFF.)
G1	G1	Yellow	When the G1 signal is ON, the evaporator fan speed switches to Lo. (When the signal is OFF, the evaporator fan speed switches to Hi.)



< NOTE >

Use thermostat that is compatible with millivolt system. Do not connect thermostat to AC power source.

5) Install the wall thermostat to the proper location inside the room where it can be conveniently accessed. Do not install the wall thermostat where unusual heating condition may occur (i.e. hot stove, hot pipe, fireplace, direct sunlight, and etc.)

• Most thermostats provide these basic functions:

Fan Mode: On / Auto (Selects the desired fan mode.)
System: Cool / Heater (Selects Cool only.)

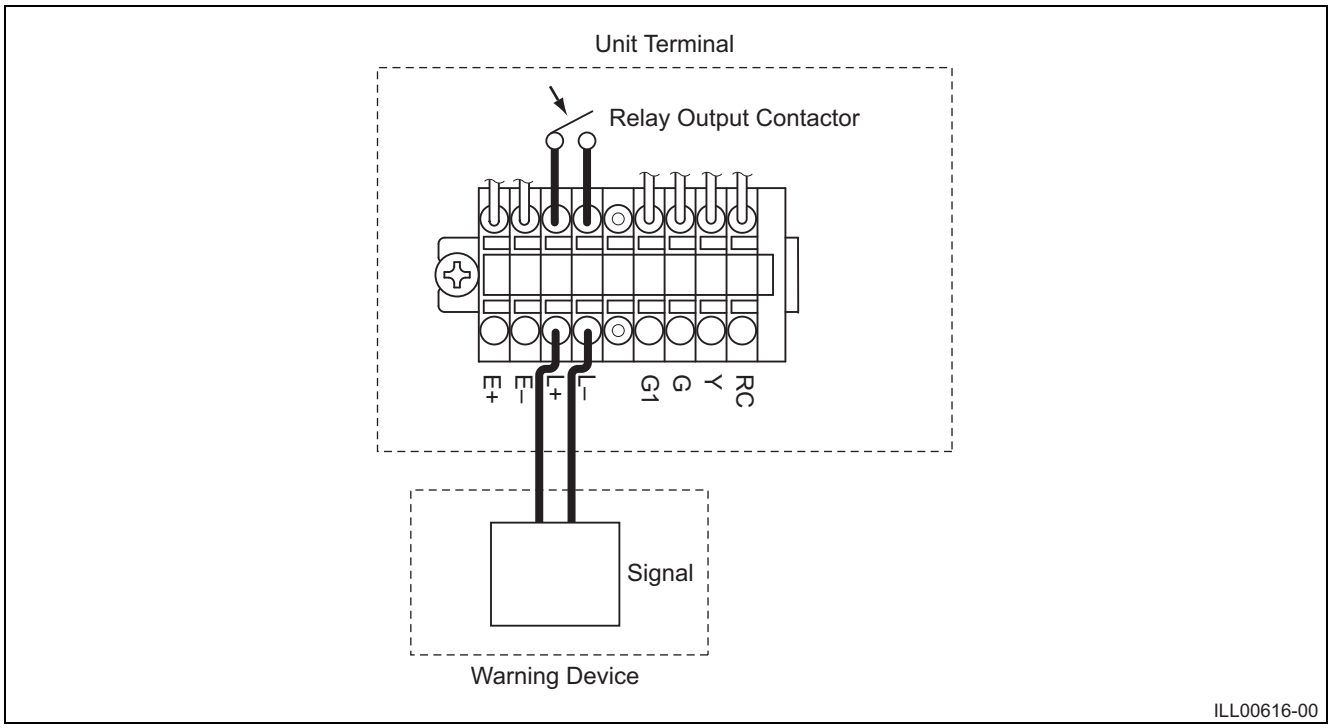
6.3 Warning Signal Connection

• The CM 12's controller is equipped with a warning signal output relay type (Form-C, normally open dry contact), which can be used to monitor the failure condition.

Relay contactor is closed if the following condition has occurred:
- Condensation Overflow
- Temperature Sensor fails
- Cooling Function fails

• The relay output contactor is rated 5 A at 30 VDC or 5 A at 250 VAC (resistive load), and it is compatable with various warning devices such as alarm speakers, light indicators, and etc.

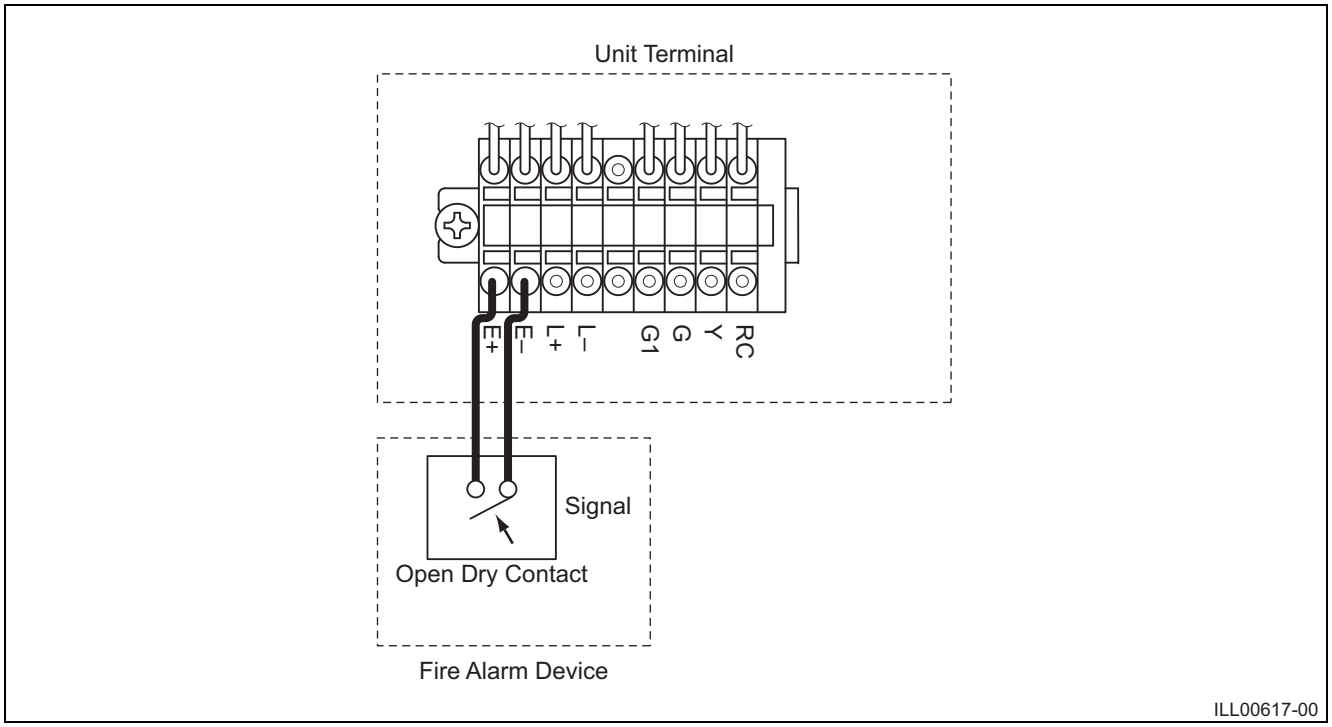
1) Connect the warning device to CM 12 signal wires label L+ and L-.
2) Use recommended warning signal wire size from 16 AWG to 26 AWG for a solid wire, or 16 AWG to 22 AWG for a stranded wire.



6.4 Fire Alarm Control Panel Connection

- The CM 12's controller is equipped with a normally 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 power source is reset or turns the wall thermostat off and on.

1) Connect the fire alarm signal wires to CM 12 signal wires label E+ and E-.
2) Use recommended fire alarm signal wire size from 16 AWG to 26 AWG for a solid wire, or 16 AWG to 22 AWG for a stranded wire.



7. TROUBLESHOOTING

7.1 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 voltages may remain in the unit immediately after the power is disconnected.

(1) Inspection of power source voltage

• Check the voltage of the power source.
  - Single-phase 115V (60Hz)
• Check the operation and condition of the fuse or circuit breaker in the power source.

(2) Inspection of air filters

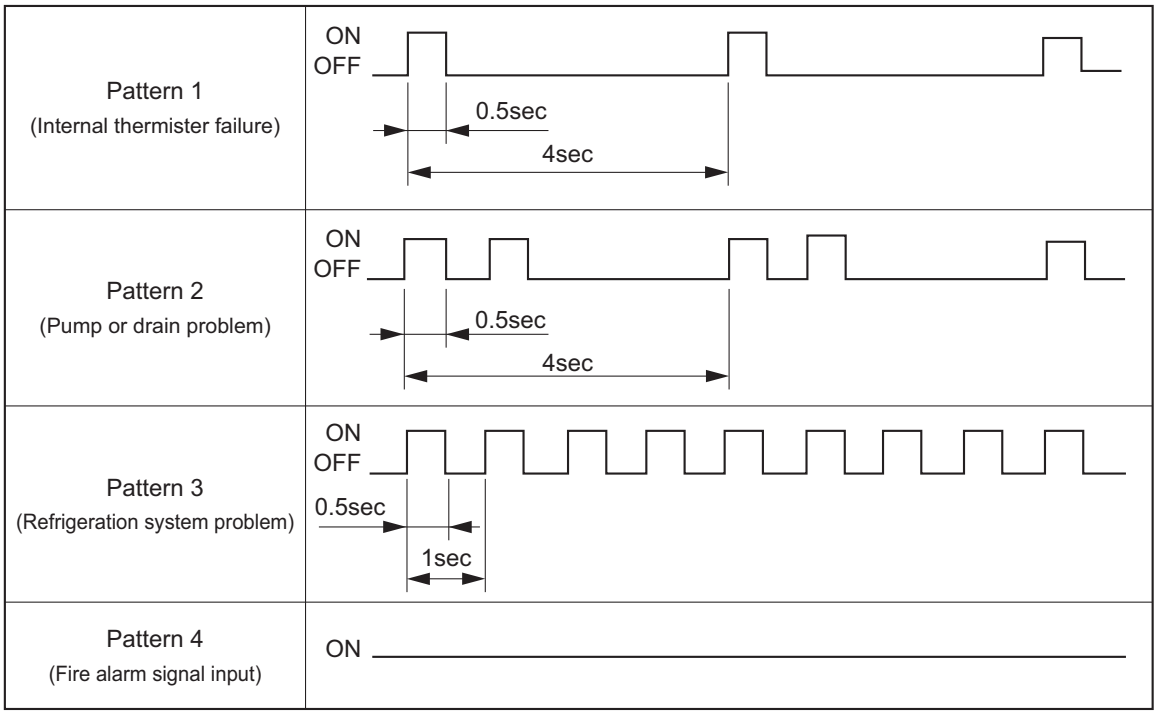
• Remove the air filters and check the element. If the elements dirty, wash the filters as described in the OPERATION MANUAL which supplied with the unit.

7.2 Alarm

- An alarm is emitted when a system abnormality is detected, stopping the system. The type of abnormality can be recognized by the alarm pattern.
- The CM 12 controller is equipped with a warning signal output-type relay (Form-C, normally open dry contact), which can be used for monitoring the CM 12 abnormality conditions. The relay contactor is closed when the following conditions have occurred:
  - Temperature sensor failure
  - Condensation overflow
  - Cooling function failure
- The relay output is rated for 5 A at 30 VDC or 5 A at 250 VAC (resistive load). The relay can be used to connect to warning devices with compatible outputs such as alarm speakers, light indicators, etc.

< NOTE >

However,when dipswitch no. 4 on the relay board is OFF, an alarm will not sound.



Alarm Pattern	Cause	Detection Details
1	Temperature sensor failure (Thermistor short / failure)	When an abnormality is detected in either RTS, CTS, or ODS. Detection value: Below 136.5 k ohm (93.2 °F (34 °C)) or above 566 k ohm (181.4 °F (83 °C)).
2	Condensation overflow (Water leak detection)	When the float switch is ON continuously for 60 seconds.
3	Cooling function failure (Refrigeration cycle abnormality)	When the following occurs 3 times. When 20 minutes from the start of operation has elapsed, RTS - CTS < 23 °F (5 °C) continuously for 1 minute.
4	Fire alarm	When receiving fire alarm signal input.

7.3 Troubleshooting Chart

- To accurately troubleshooting 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) Unit does not operate or stops operation

Condition	Alarm Pattern	Check Area	Possible Cause	Remedy
Unit does not operate.		Voltage	Power failure.	Repair power supply.
				Turn the circuit breaker on.
		Ground fault breaker trip	Ground fault or defective ground fault.	Repair ground fault section.
				Reset or repair circuit breaker.
		Fuse	Fuse is blown.	Replace fuse on the relay board.
		Wall thermostat	Incorrect connection.	Connect the wires correctly.
			Battery depleted by the thermostat.	Change battery.
		Override (Stop) switch	Override (Stop) switch is in the STOP position.	Turn the override (stop) switch to OPERATE.
		High pressure switch	Dust buildup on the surface of the condenser air inlet.	Remove dust with a vacuum cleaner.
			Loose high pressure switch connection.	Reconnect the high pressure switch and check the connection.
			Defective high pressure switch (short or open).	Replace high pressure switch.
			Operating outside of the operating temperature range.	Check environmental condition. Do not operate the unit outside the operating condition range. (See page 12.)
			Refrigerant is over charged in the field.	Charge the correct amount of refrigerant. (See page 69.)
	1	Thermistor	Defective thermistor (short or open).	Replace thermistor.
			Loose thermistor connection.	Reconnect the thermistor and check the connection.

Condition	Alarm Pattern	Check Area	Possible Cause	Remedy
Unit does not operate.	2	Drain hose	Drain hose clogged (for internal drain pump).	Remove any blockage or excessive kinks preventing water flow. RESET*1.
			Drain hose trap position is too high to pump up condensation water (for internal drain pump).	Improve hose installation. (Refer to the operation manual of this unit.) RESET*1.
		Internal drain pump	Internal drain pump is not working.	Reconnect the internal drain pump and check connection. RESET*1. If the internal drain pump still does not work, replace it.
	3	Refrigeration system	Refrigeration system problem.	Check for leakage. Check compressor relay. Check for refrigerant blockage. RESET*1.
	4	Fire alarm system	Signal is input from the fire alarm.	Check the fire alarm system and confirm there is no signal input to the unit, then RESET*1.

< NOTE >

*1 :To RESET, reset power source or turn the wall thermostat off and on.

(2) Insufficient cooling

Condition	Check Area	Possible Cause	Remedy
Unit operates.	Air is not cool.	Compressor start delay (120 seconds) is activated.	Compressor starts after 120 seconds automatically.
		Freeze protection is activated. Condition: Compressor stops while the condenser fan runs. Compressor starts automatically when evaporator outlet pipe temperature rises more than 60 °F (15.6 °C).	Clean the filter on the evaporator inlet air grill.
			Make sure evaporator fan external static pressure and evaporator inlet air temperature are within operating condition range. (See page 11 to 12).
		High pressure switch is activated. Condition: Compressor stops while the condenser fan runs. During this time, the compressor may cycle on and off periodically. 1. Dust buildup on the surface of the condenser air inlet. 2. Operating outside of the operating temperature range. 3. Loose high-pressure switch connection. 4. Defective high-pressure switch (short or open). 5. Refrigerant is over charged in the field.	1. Remove dust with a vacuum cleaner. 2. Check environmental condition. Do not operate the unit outside the operating condition range. (See page 12.) 3. Reconnect the high pressure switch and check the connection. 4. Replace high pressure switch. 5. Charge the correct amount of refrigerant. (See page 69.)
	Insufficient air volume	Air filter is clogged.	Clean or replace air filter.
		Condenser air intake or outlet in the ceiling is blocked.	Check for any blockage and remove it.
		Dust buildup on the surface of the condenser air intake.	Remove dust with a vacuum cleaner.
		Leak or clogged on the duct connection.	Repair duct connection.
		Using longer duct length or smaller duct diameter than recommended.	Change the duct to proper size.
		Fan is locked.	Check for any foreign object causing fan lock.
		Operating outside of the operating temperature range.	Check environmental condition. Do not operate the unit outside the operating condition range. (See page 12.)

7.4 Basic Inspection

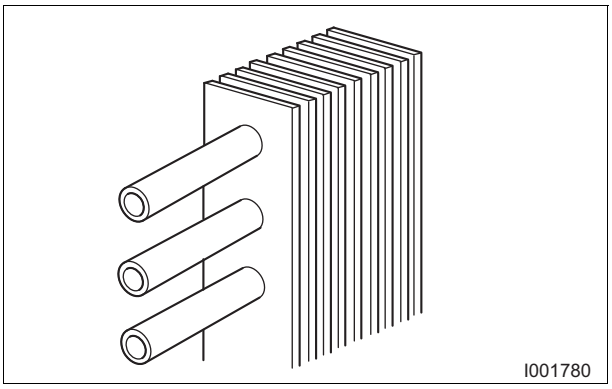
• Perform the following inspections before disassembly.

(1) Power supply voltage inspection

• Check the power supply voltage.
  - Single phase 115 V (60 Hz)
• Check the operation and condition of the fuse or circuit breaker for the power source.

(2) Inspection of plate fins

• 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.

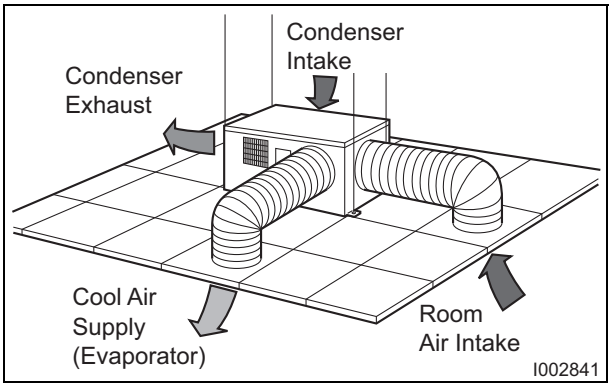


(3) Operating environment inspection

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

(4) Operating environment examination

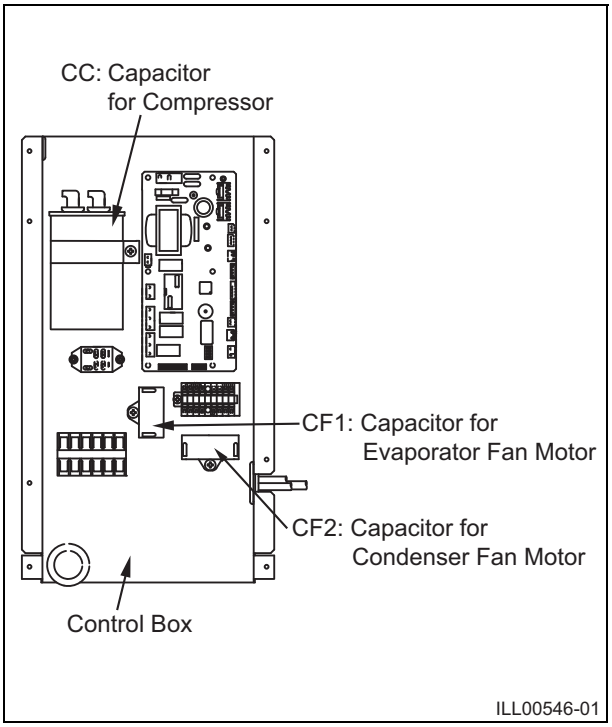
• Measure the temperature difference between the evaporator inlet and the cooling air duct outlet. If the difference is out of the range shown in the graphs on page 14, proceed with the remedy suggested in the troubleshooting chart on page 39.



7.5 Inspection of Capacitor (For Fan Motor and Compressor)

(1) Ohm-meter method

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



(2) Capacitance tester method

- Using a capacitance tester and the chart on page 29, test the capacitor for the value indicated. If the value tested is not within 10 % of indicated capacitance, replace the capacitor.

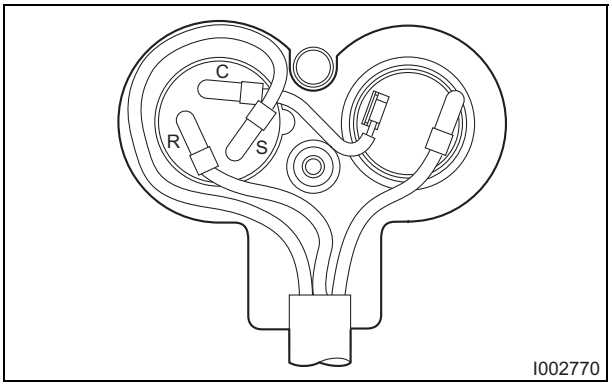
Capacitor Application	Voltage	Rating Capacitance
Evaporator Fan Motor	250 V	8 µF
Condenser Fan Motor	250 V	14 µF
Compressor	450 V	60 µF

⚠ WARNING

- **Properly discharge the capacitor(s) before testing and after testing has been completed.**
- **Failure to do so could cause damage to test equipment or the unit and/or result in personal injury (electrical shock) or death.**

7.6 Inspection of Compressor

(1) Compressor motor

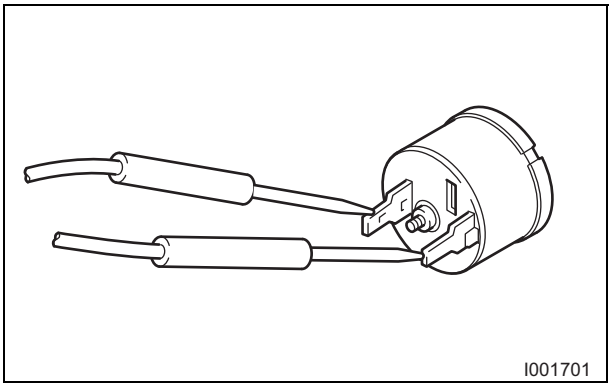


- Measure resistance across the terminals of the compressor motor.
- Between terminals (at 77 °F (25 °C))
  - R-C Approx. 0.49 - 0.8 ohm
  - C-S Approx. 1.9 - 3.3 ohm
- If the measured resistance is not equal to the standard values listed above, replace the compressor. The compressor has an external overload relay. The overload relay should be operational if the above resistance is obtained under normal temperature. For overload relay specifications, see chart on page 27.

(2) Overload relay

- 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.

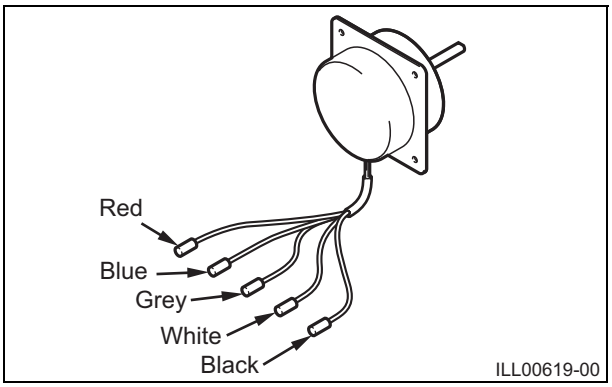
7.7 Inspection of Fan Motor

(1) Evaporator fan motor

- Measure resistance across the terminals of the fan motor.
- Between terminals (at 77 °F (25 °C))
  - Black-White Approx. 24.5 ohm
  - Black-Blue Approx. 36.5 ohm
  - Black-Red Approx. 39.0 ohm
- If the measured resistance is not equal to the standard values listed above, replace the fan motor.

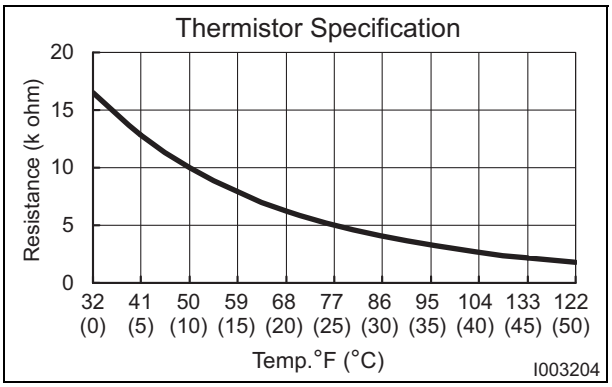
(2) Condenser fan motor

- Measure resistance across the terminals of the fan motor.
- Between terminals (at 77 °F (25 °C))
  - Black-White Approx. 8.8 ohm
  - Black-Blue Approx. 7.0 ohm
  - Black-Red Approx. 18.6 ohm
- If the measured resistance is not equal to the standard values listed above, replace the fan motor.



7.8 Inspection of Thermistor

- Using an Ohm-meter, check the resistance value across the 2-pin connector. At normal temperature (77 °F (25 °C)) all thermistors (evaporator inlet air, freeze protection, or condenser inlet air) should measure approximately 5 k ohm.
- Thermistors:
  - Evaporator inlet air thermistor (RTS)
  - Condenser inlet air thermistor (ODS)
  - Freeze protection thermistor (CTS)



7.9 Inspection of Wiring Connection

- Refer to the wiring diagrams on page 21 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.

7.10 Refrigeration System Inspection

- In most cases, the probable cause for insufficient cooling is a clogged system, 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. In such cases, change the part in question.

(2) Refrigerant leak

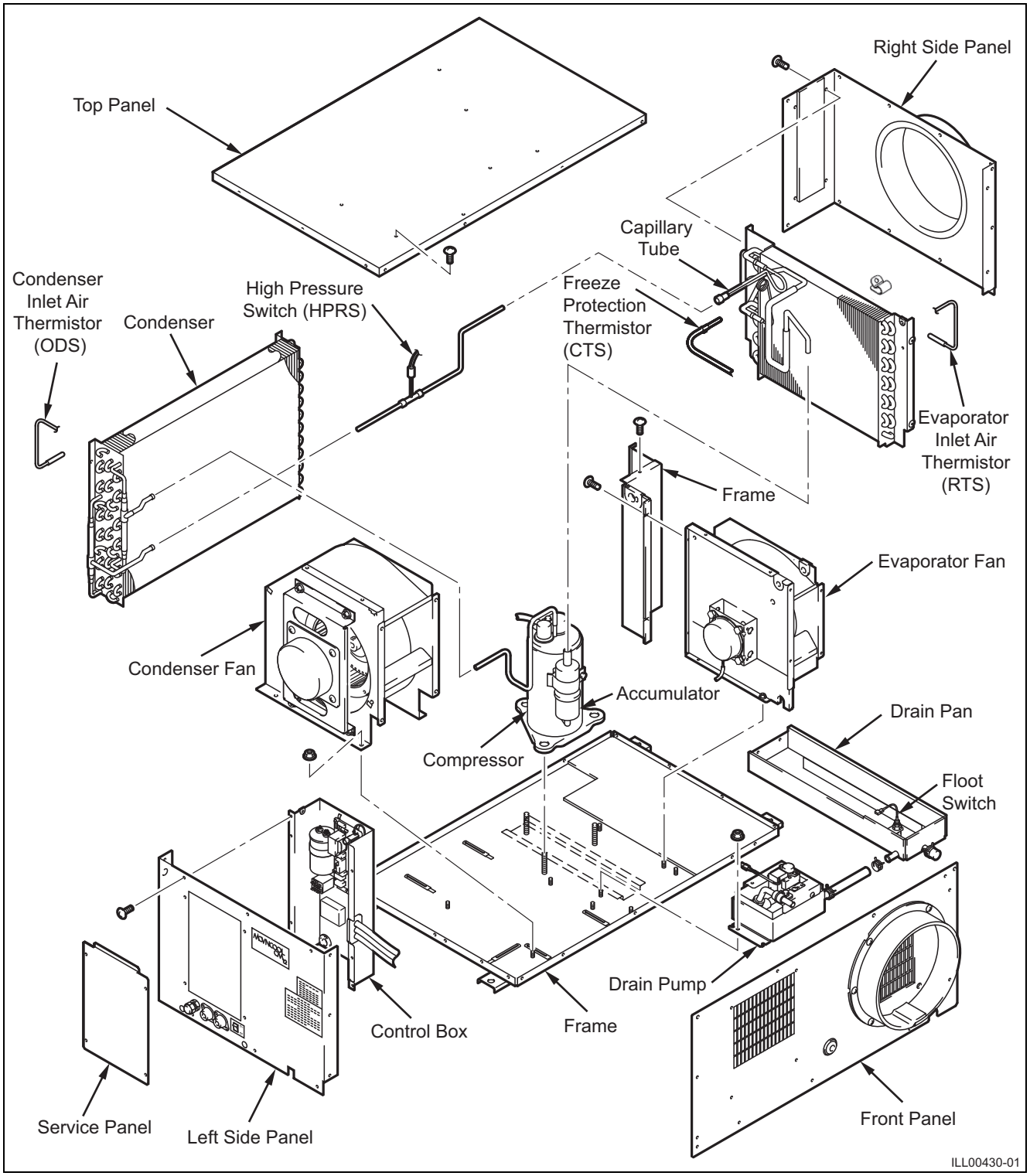
- Carefully check all connections, and each component for leaks whenever the refrigeration system is installed or repaired. Use an electronic gas leak tester to inspect the system. (See page 59 to 70.)

(3) Insufficient refrigerant

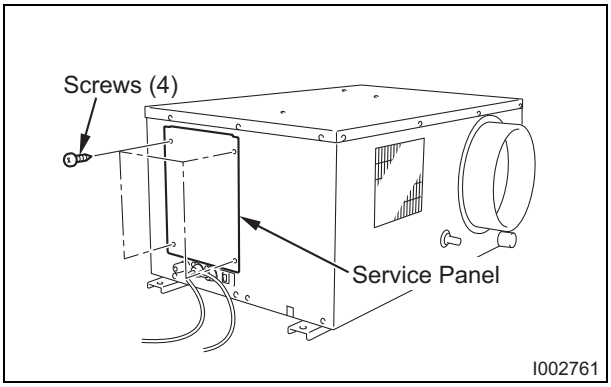
- When the unit is not producing sufficient cooling, follow the troubleshooting chart on page 41 to confirm the cause of the problem. Then, charge the system with the refrigerant to the specified amount as indicated on page 69.

8. DISASSEMBLY

8.1 Parts Construction



8.2 Disassembly

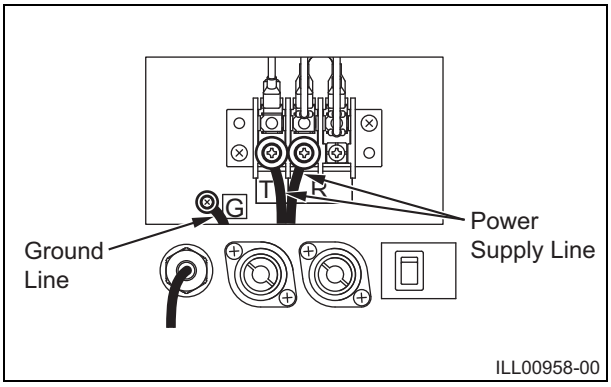


1) Take out the four (4) screws, and then remove the service panel.

2) Disconnect the two power supply lines from the terminal, and disconnect the ground line.

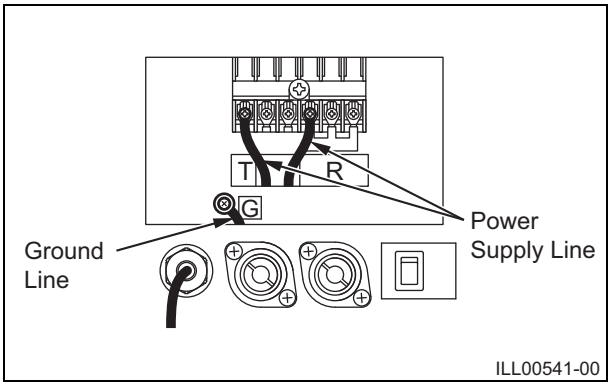
⚠ CAUTION

- Ground tightening torque:
  - 0.74 ± 0.15 ft•lbf (1.0 ± 0.2 N•m)



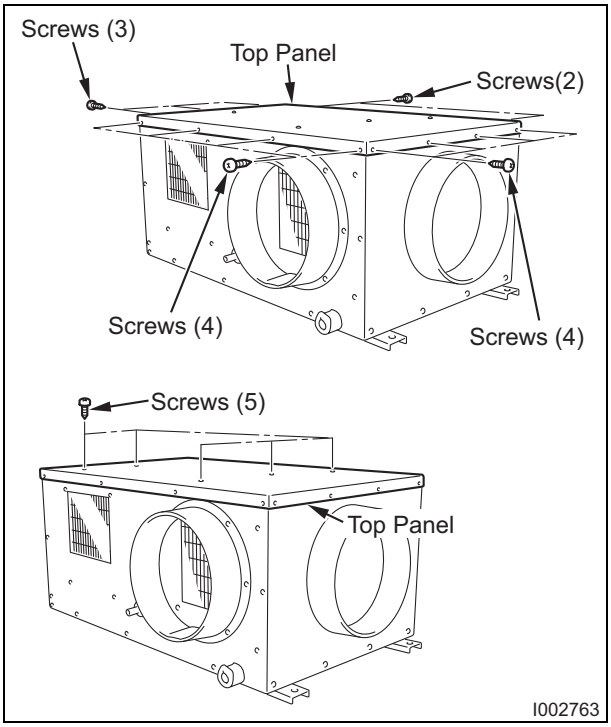
a) For unit serial number from 0415XXXXC12 to Present*

*:Please refer to page 2 for the position of the name plate showing the serial number on the unit.

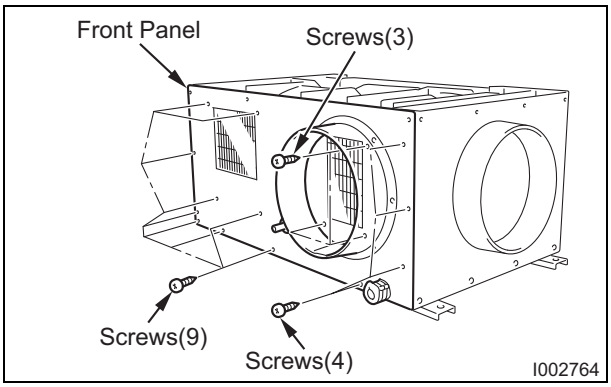


b) For unit serial number from 0211XXXXC12 to 0315XXXXC12*

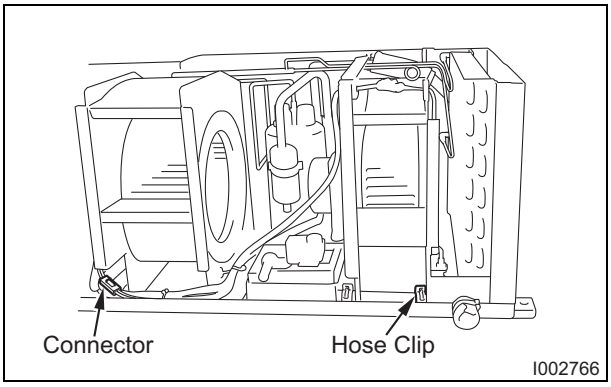
*:Please refer to page 2 for the position of the name plate showing the serial number on the unit.



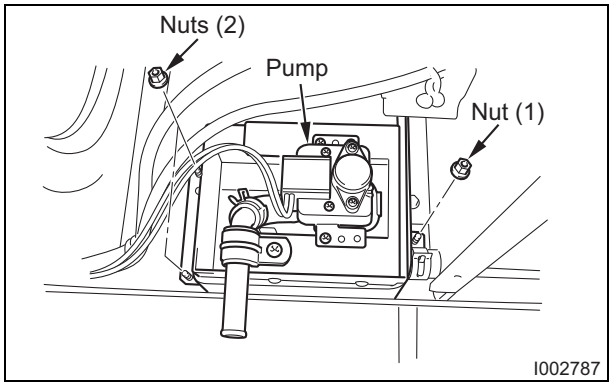
3) Take out the eighteen (18) screws, and then remove the top panel.



4) Take out the sixteen (16) screws, and then remove the front panel.

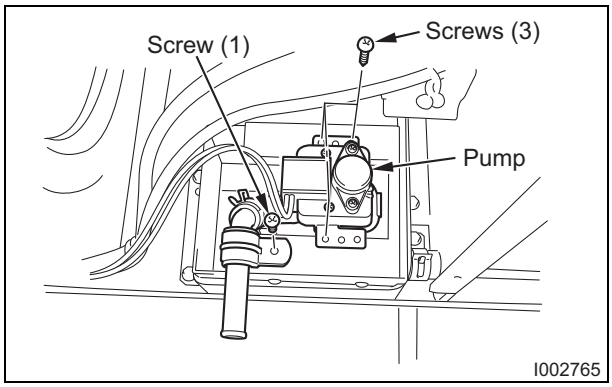


5) After disconnected from the relay connector (white, two-pin), either the drain pump assembly or only the drain pump itself can be removed.



a) To remove the drain pump assembly:

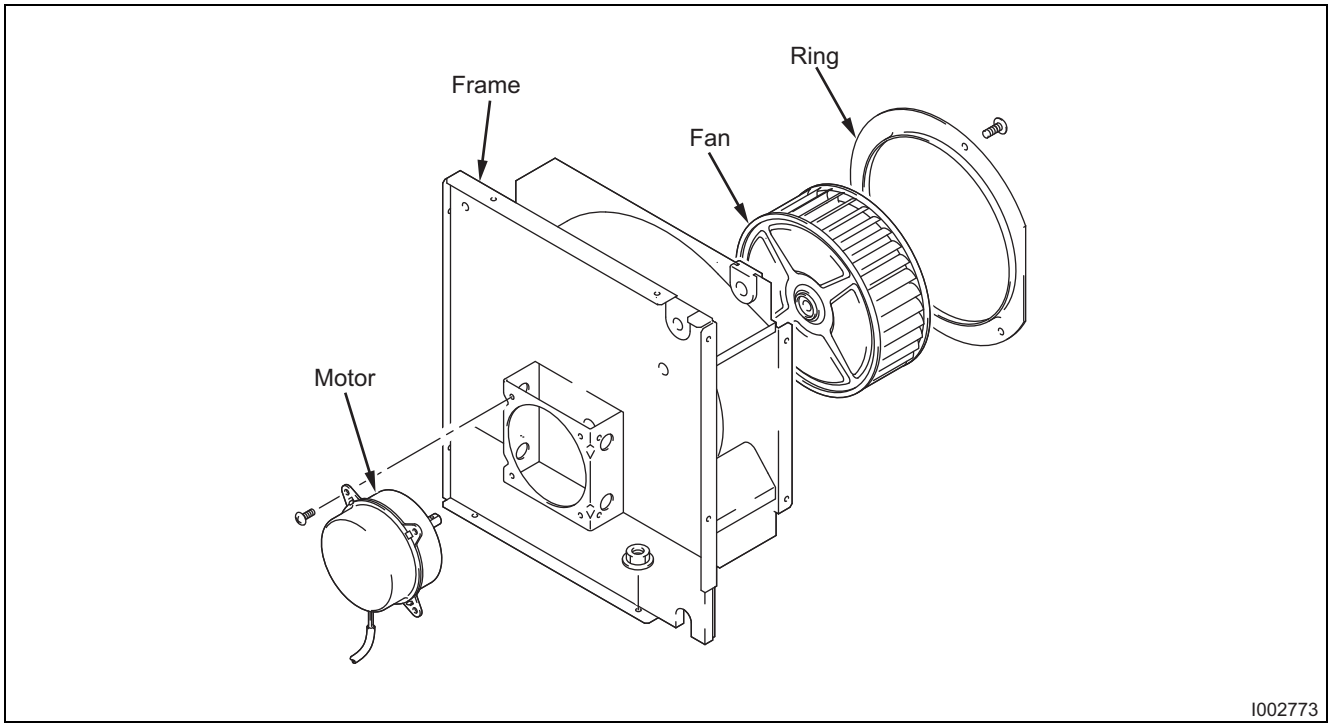
Take off the three (3) nuts, and remove the drain hose.

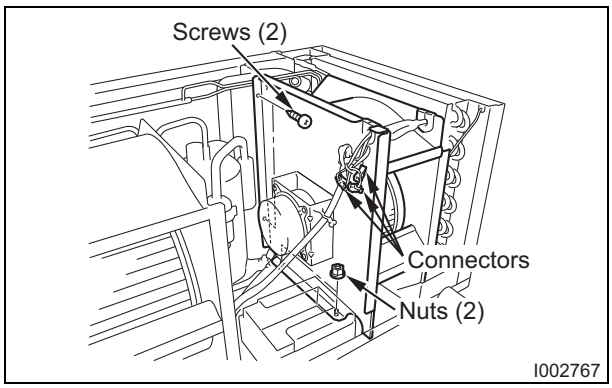


b) To remove the only the drain pump:

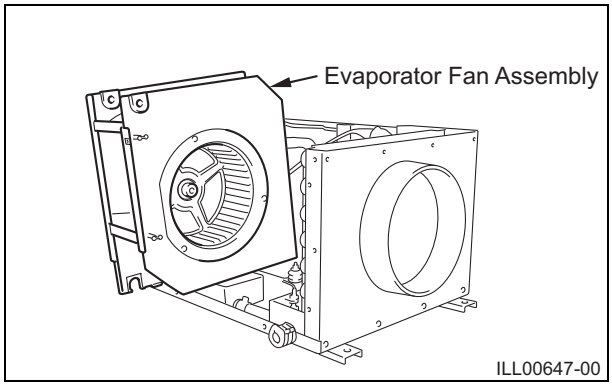
Take out the four (4) screws, and remove the drain pump.

8.3 Removal of Evaporator Fan Assembly

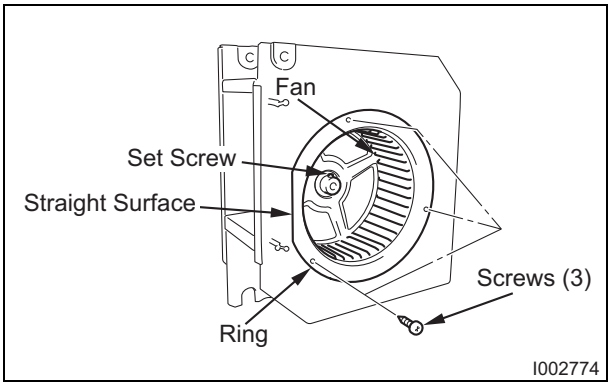




1) Disconnect the three connectors (two white, two-pin connectors; one white, three-pin connector), and then take out the two (2) screws and the two (2) nuts.



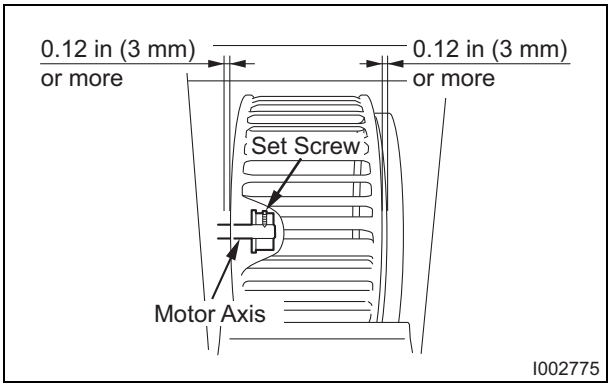
2) Disconnect the motor connector (white, six-pin) from circuit board CN23, and remove the evaporator fan assembly.



3) Take out the three (3) screws, and then remove the ring. Loosen the set screw with an Allen wrench and remove the fan.

⚠ CAUTION

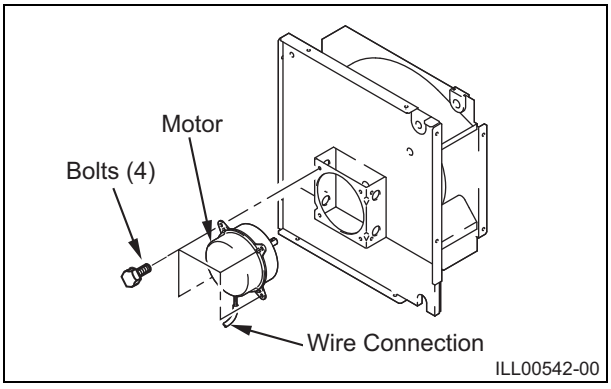
When assembling the ring, ensure that the straight surface of the ring is facing forward.



4) When assembling the fan, ensure that the screws align with the motor axis positioning holes.

⚠ CAUTION

- Tightening torque:
  - 3.7 ± 1.1 ft•lbf (5.0 ± 1.5 N•m)
- Verify the clearance between the fan and case ring. After installing the fan and fan motor, ensure that the clearance between the fan and case ring is at least 0.12 in (3 mm).

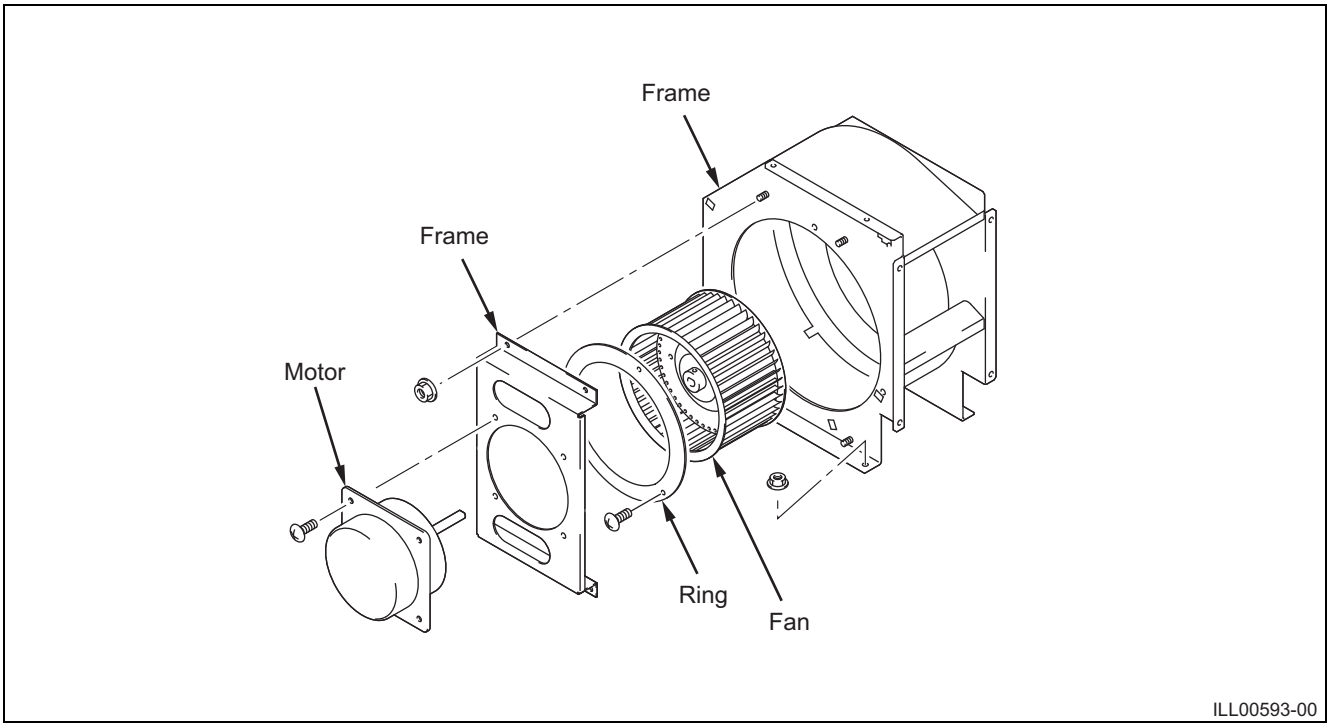


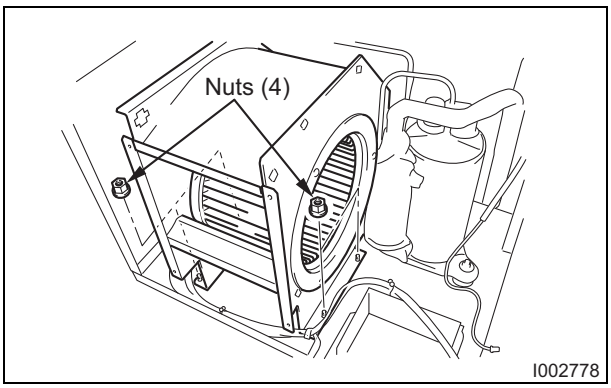
5) Take out the four (4) bolts, and then remove the fan motor.

⚠ CAUTION

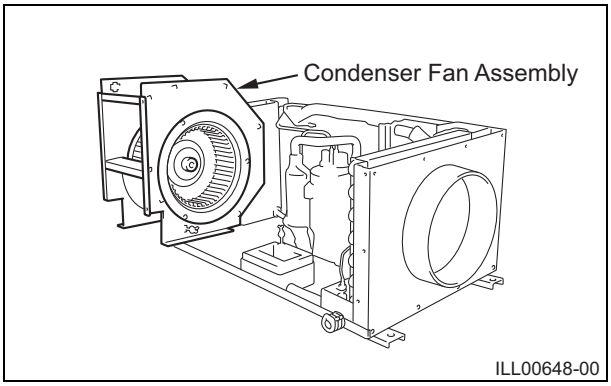
When assembling the motor, ensure that the wire connection ends are facing down.

8.4 Removal of Condenser Fan Assembly

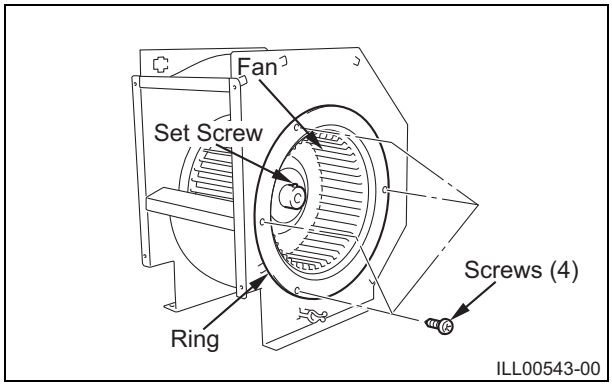




1) Take off the four (4) nuts.



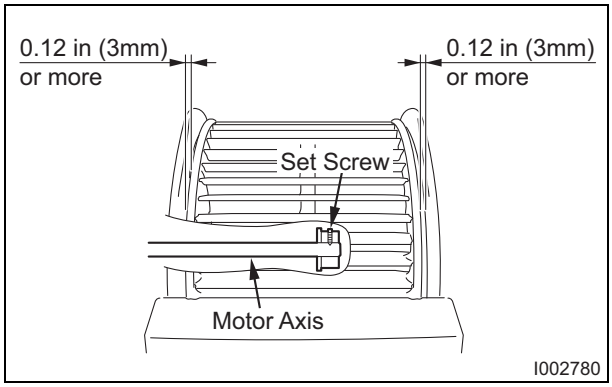
2) Disconnect the motor connector (white, six-pin) from circuit board CN22, and remove the condenser fan assembly.



3) Take out the four (4) screws, and then remove the ring. Loosen the set screw with an Allen wrench and remove the fan.

⚠ CAUTION

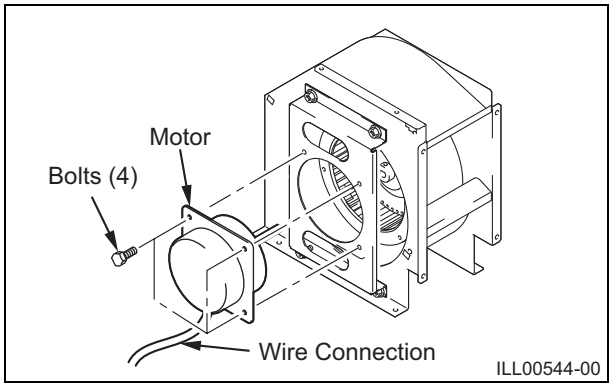
When assembling the ring, ensure that the straight surface of the ring is facing forward.



4) When assembling the fan, ensure that the screws align with the motor axis positioning holes.

⚠ CAUTION

- Tightening torque:
  - 10.80 ± 2.17 ft•lbf (14.7 ± 3.0 N•m)
- Verify the clearance between the fan and case ring. After installing the fan and fan motor, ensure that the clearance between the fan and case ring is at least 0.12 in (3 mm).



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

⚠ CAUTION

When assembling the motor, ensure that the wire connection ends are facing down.

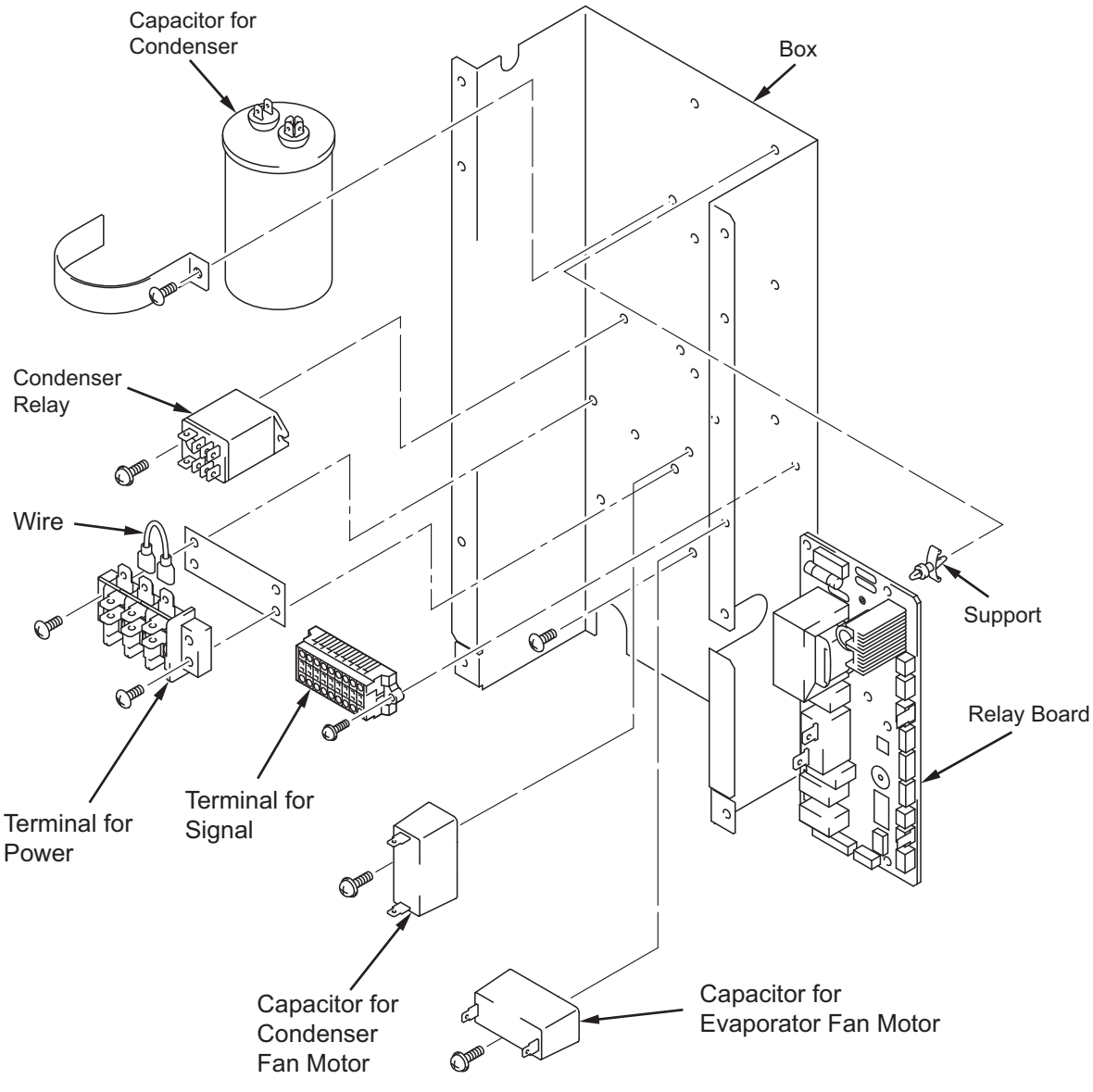
8.5 Removal of Electrical Parts

⚠ WARNING

- **Disconnect the power supply from the CM 12 unit before performing any service. Beware that some residual voltages may remain in the unit immediately after the power is disconnected.**

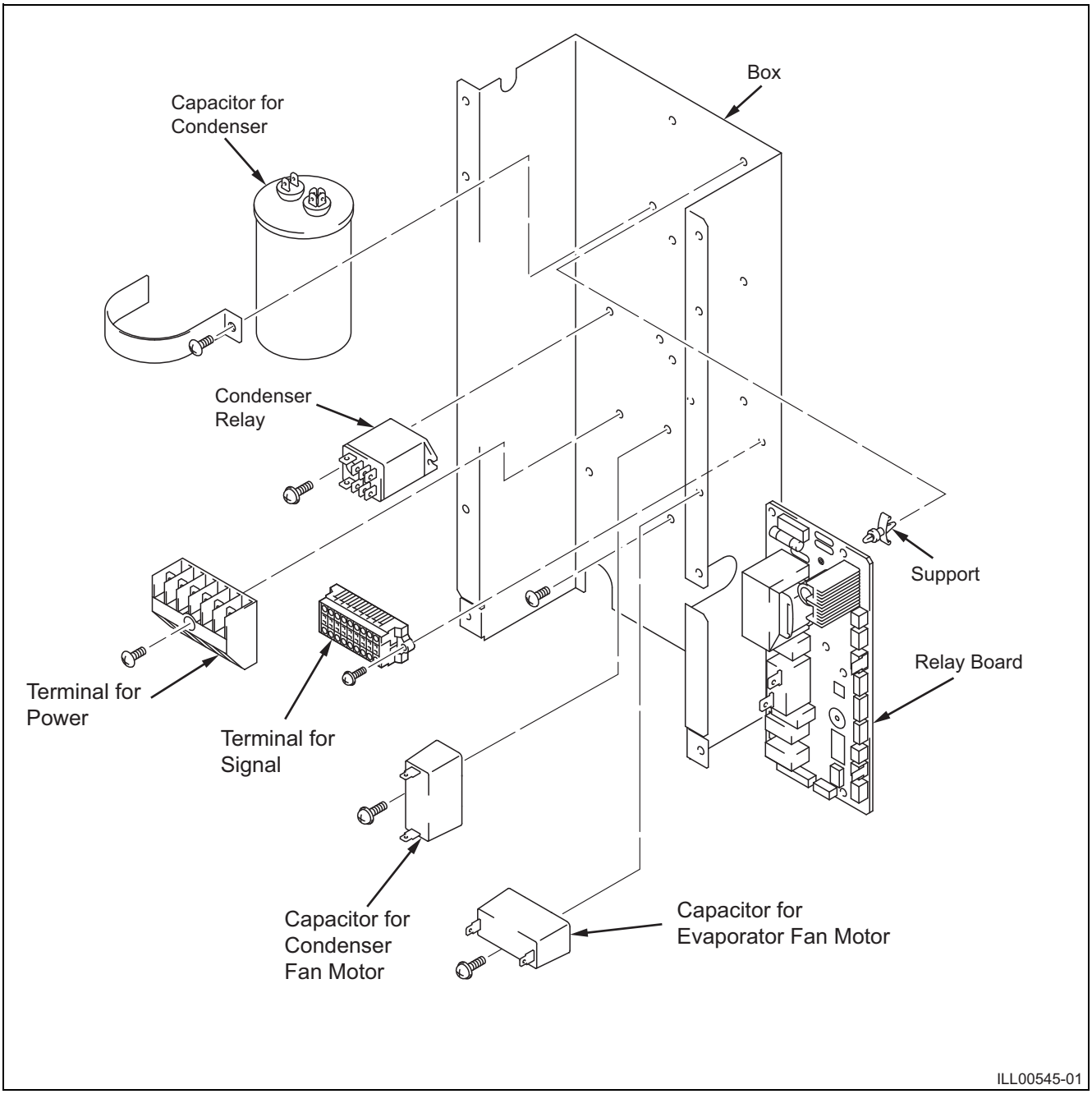
(1) For unit serial number from 0415XXXXC12 to Present*

*:Please refer to page 2 for the position of the name plate showing the serial number on the unit.

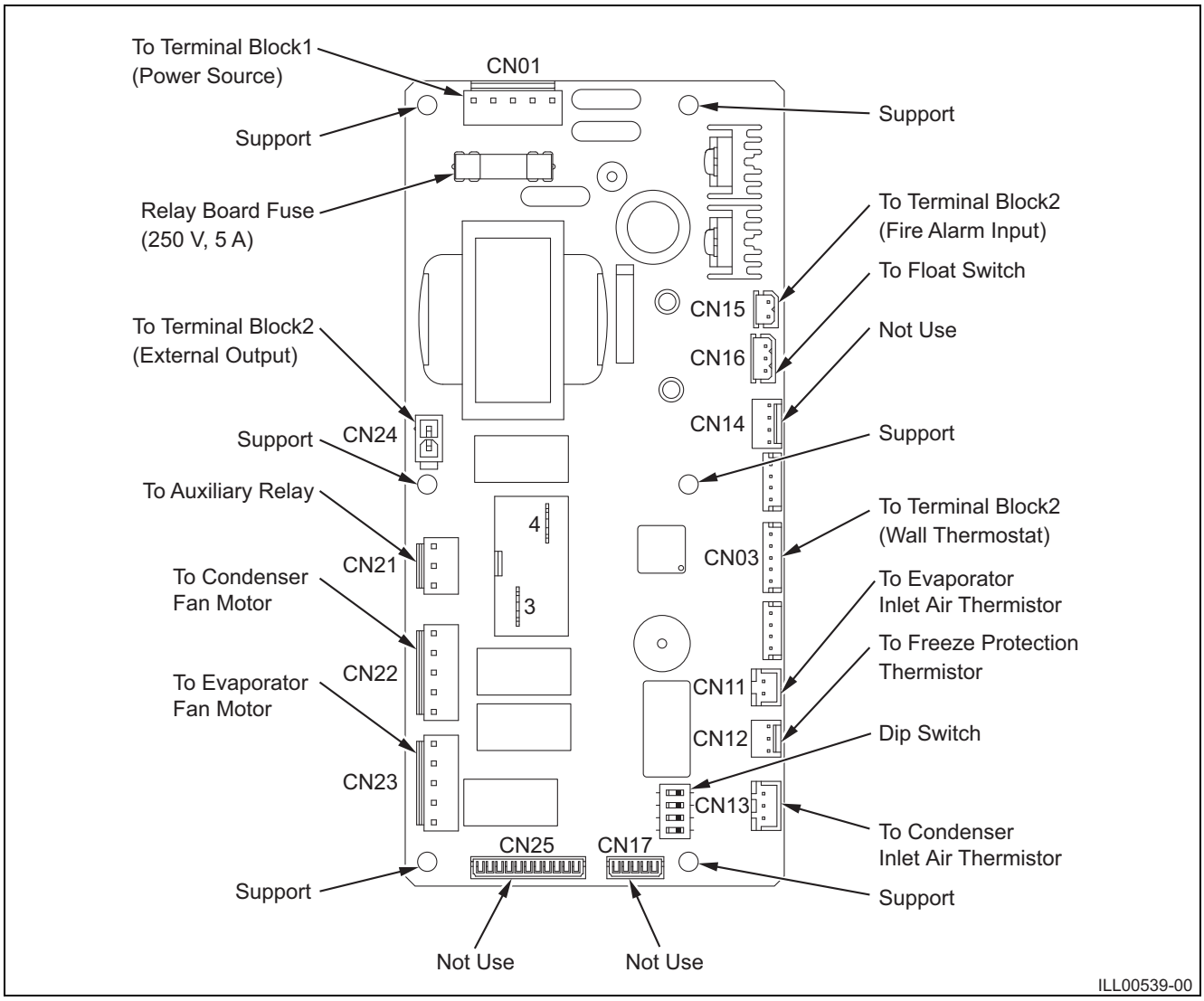


(2) For unit serial number from 0211XXXXC12 to 0315XXXXC12*

*:Please refer to page 2 for the position of the name plate showing the serial number on the unit.



(3) Relay Board



Removal of Relay Board

1) Disconnect the power at the source.
2) Take out the four (4) screws, and then remove the service panel. (See page 48.)
3) Disconnect all connectors from relay board (11 connectors, two connections on the relay and ground wire). Refer to the figure “Relay Board” to identify the relay connections and the connectors marked as CN##. (To ensure easy reinstallation, be sure to label each connector wire as you remove them.)
4) Remove relay board from plastic supports (6 locations). Use needle nose pliers to squeeze all the supports before removing the relay board.

< NOTE >

In case there is no room to remove and replace the relay board, take out the eighteen (18) screws and then remove the top panel.

Replacement of Relay Board

1) Replace the new relay on existing supports (Make sure all stand-offs are aligned horizontally). Change the support if damaged during removal process. Make sure that the dip switches on the new relay board are all set to off positions.
2) Reconnect all 11 connectors to the new relay board and make sure connector label 52CM3 is connected to terminal #3 and connector label 52CM4 is connected to terminal #4 of the relay. Also, connect the ground wire and make sure they are all properly connected. Refer to the figure “Relay Board” to identify the connectors that need to be connected.
3) Reconnect the power at the source and turn on the unit to verify the function and operation of the unit. Turn off the unit.
4) Close the service panel and secure with four (4) screws.

9. REFRIGERATION SYSTEM REPAIR

9.1 Repair of Refrigeration System

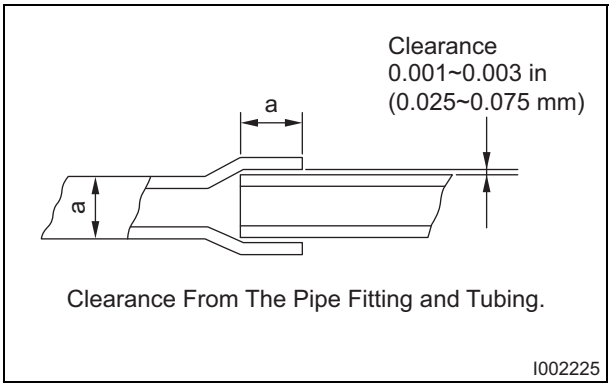
- In case there is a leak, obstruction, or problem in the refrigeration system, replace or repair the part in question. After replacing any component, all connections must be brazed.

(1) Proper brazing techniques

- It is desirable to use a slightly reducing flame. Oxyacetylene is commonly used since it is easy to judge 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 brazing filler metal, oxidization of brazing filler metal, or deterioration due to the overheating of flux.

(2) Brazed fittings and fitting clearance

- In general, the strength of brazing filler metal is lower than that of the base metal. So, the shape and clearance of the brazed fitting are quite important. As for the shape of the 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 it 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 up, exposure to heat may have caused 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 oxide film. Fats and oils may stick to the pipe from handling. All these factors can reduce effectiveness of brazing. It is necessary to eliminate excess brazing filler metal using sand paper and by cleaning thoroughly with a solvent such as trichlene.

⚠ CAUTION

Do not use chlorine cleaner.

(4) Use of dry nitrogen gas

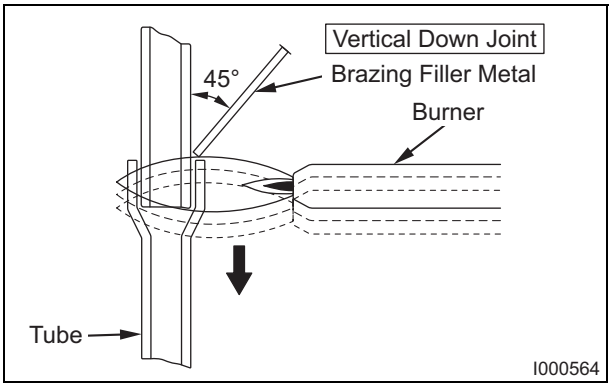
- During brazing, the inside of the pipe undergoes an oxidative reaction due to the brazing flame. Introduce dry nitrogen gas (0.27 gal/min (1 L/min); adjust with the flow regulator) through the pinch-off tube of the refrigerant.

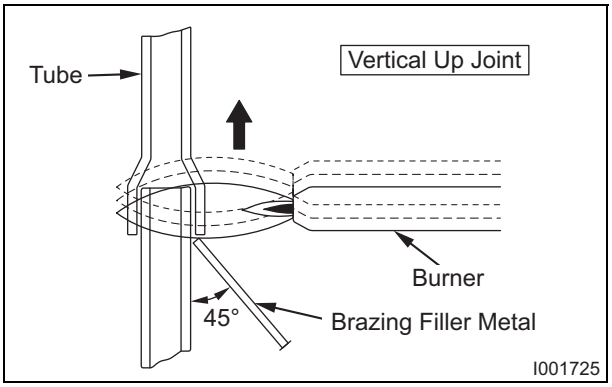
< NOTE >

Take care not to allow dirt, water, oil, etc. to enter into the pipe.

(5) Vertical joints

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





9.2 Removal of Refrigeration System Components

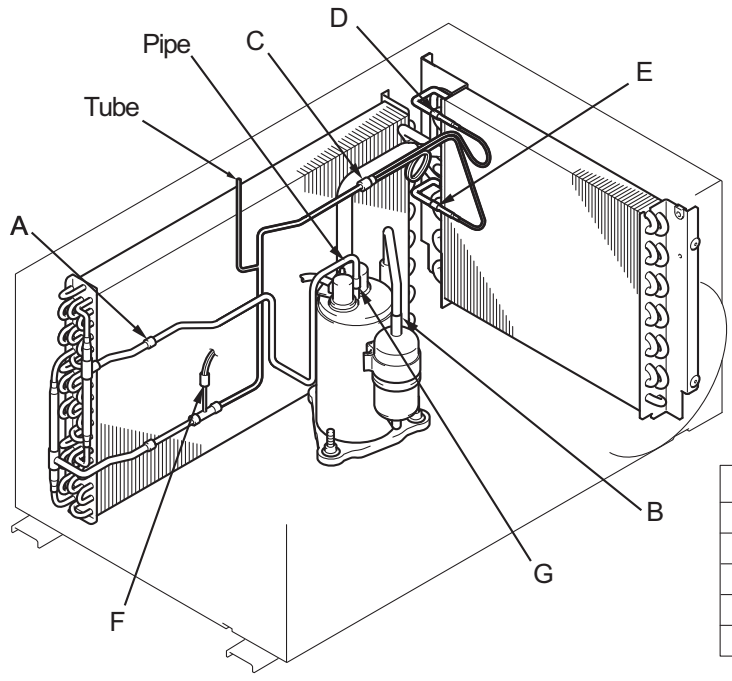
⚠ WARNING

- **Before replacing any refrigeration component, recover the refrigerant using standard recovery procedures and equipment.**
- **When recovering the refrigerant, use the pinch-off tube 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, to protect them from the flame, shield nearby parts with a steel plate, etc.,

- Evaporator
- Capillary tube
- Condenser
- Compressor
- High pressure switch



Part to Replace	Disconnect at
• Compressor	See page 62.
• Condenser	A & C
• Capillary Tube	C, D & E
• Evaporator	B & C
• High Pressure Switch	F

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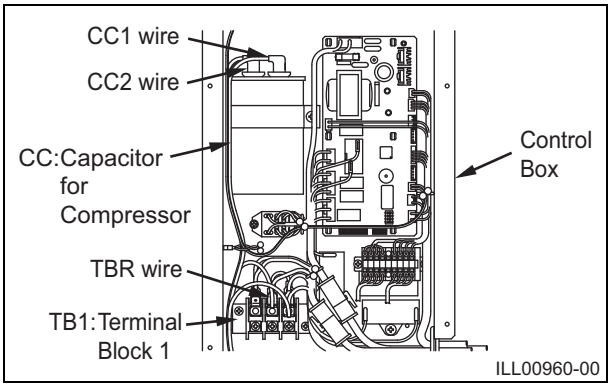
(1) Removal of compressor assembly

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

Disconnect TBR wire (white) from the terminal block 1 in the control box.

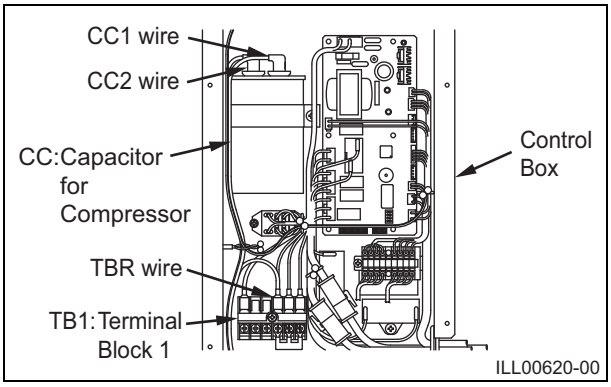
⚠ WARNING

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.



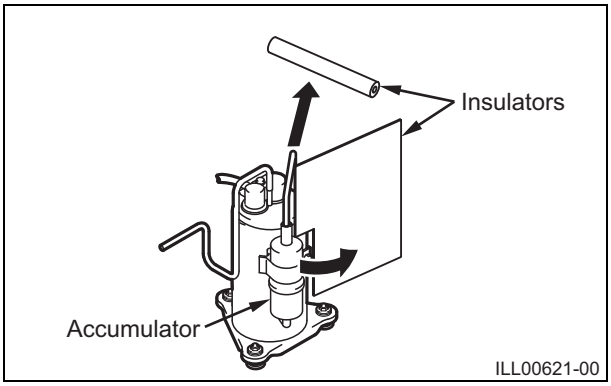
a) For unit serial number from 0415XXXXC12 to Present*

*:Please refer to page 2 for the position of the name plate showing the serial number on the unit.

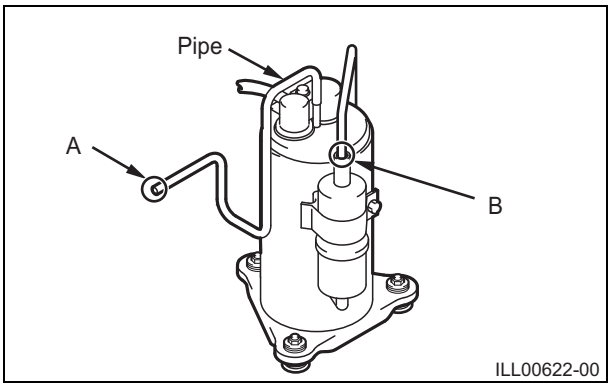


b) For unit serial number from 0211XXXXC12 to 0315XXXXC12*

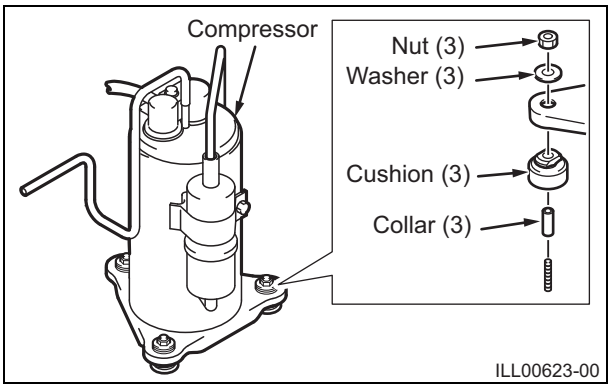
*:Please refer to page 2 for the position of the name plate showing the serial number on the unit.



2) Remove the insulators from pipe and accumulator.



3) Disconnect 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.

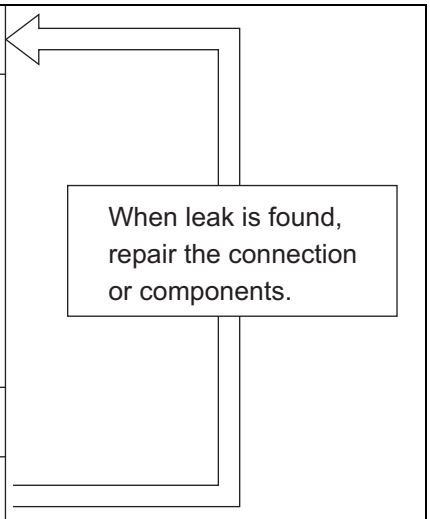
9.3 Charging the System with R-410A Refrigerant

- 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.**
  - **Be careful 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.



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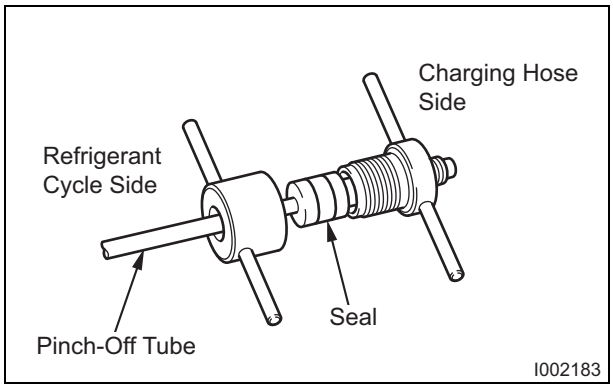
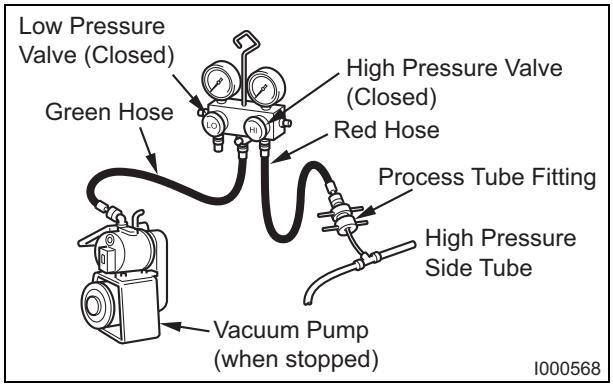
(1) Connection of gauge manifold



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

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



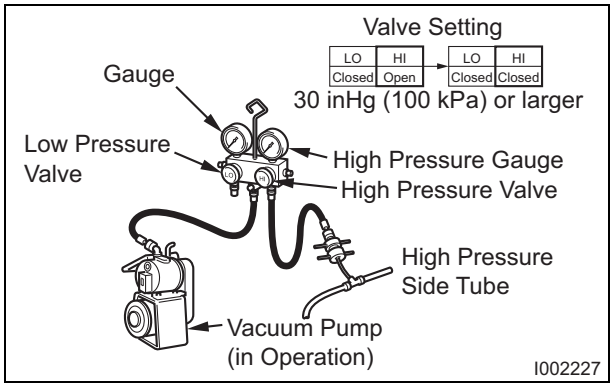
3) Connect the charging hoses (red-high pressure side) for the gauge manifold to the process tube fitting.

< 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

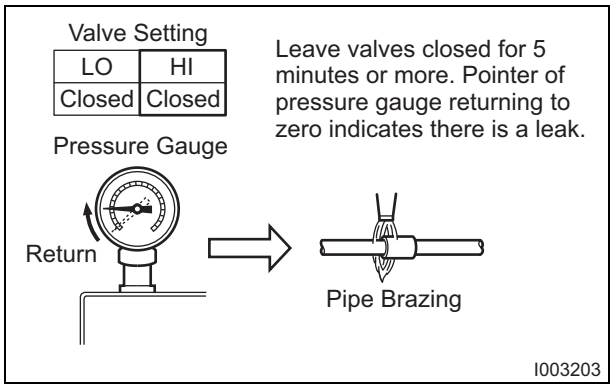


1) Open the high pressure valve (HI) of the gauge manifold.

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

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

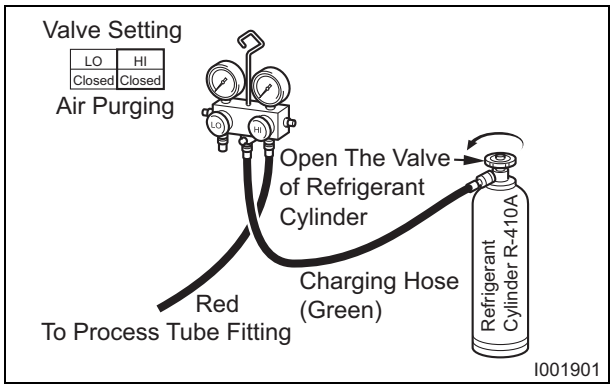
(3) Checking vacuum

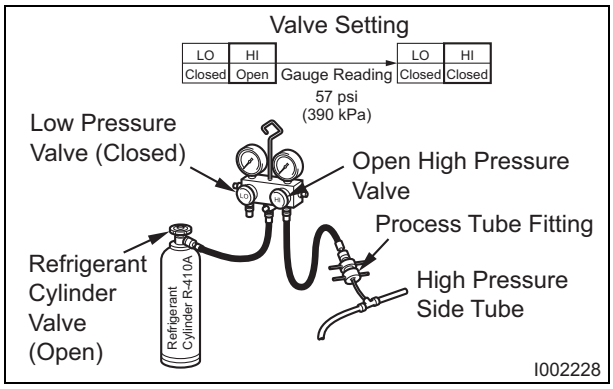


1) Leave the high pressure valve and the low pressure valve of the gauge manifold closed for five minutes or more, and confirm that the gauge pointer does not return to zero.

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.

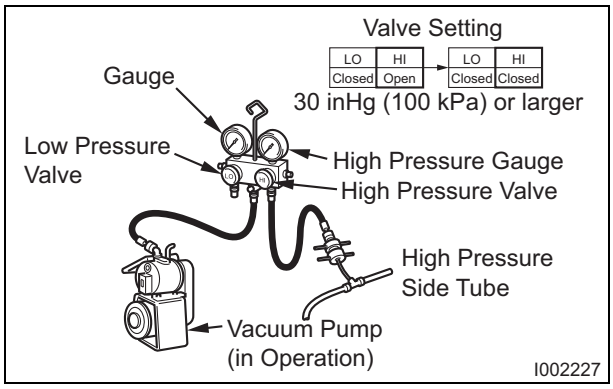
⚠ WARNING

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) Use the procedure under “Evacuation”, evacuate the system until the high pressure gauge indicates 30 inHg (100 kPa) or larger. (For at least 15 minutes.)

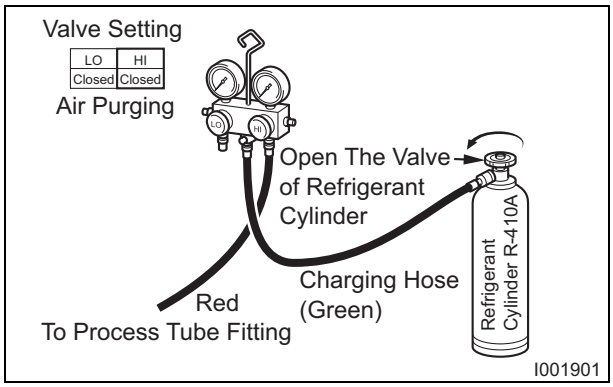
3) After evacuation is complete, close the high and the low pressure valves of the gauge manifold.

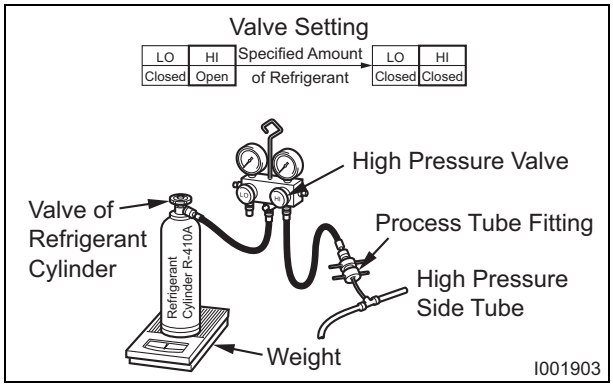
⚠ CAUTION

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.

9.4 Refrigerant Charging Work

(1) Refrigerant charging





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

2) 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 this nut and close the valve of the refrigerant cylinder.

3) 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.

4) 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.

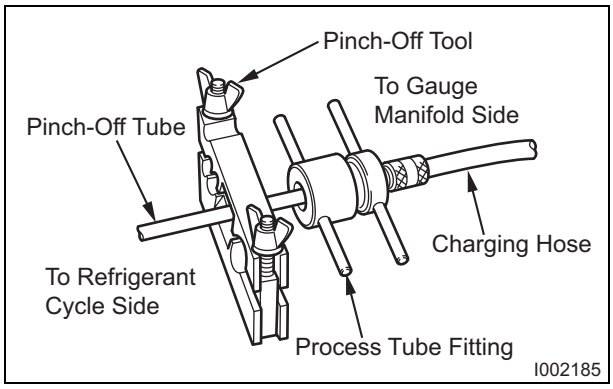
Standard Amount of Refrigerant: 1.23 lb (0.56 kg)

⚠ 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.

5) 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.

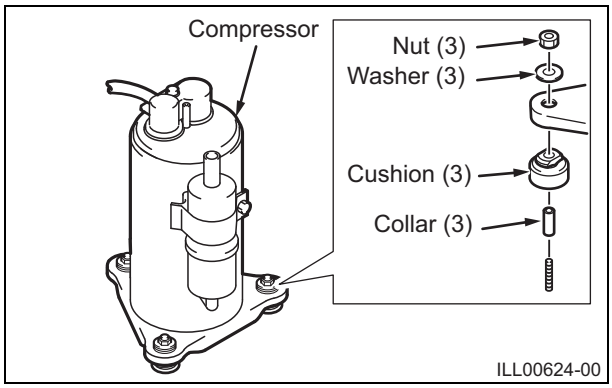
4) Ensure that a gas leak is not present at the pinched off portion and the brazed end.

10. REASSEMBLY

10.1 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.

10.2 Compressor Installation



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

< NOTE >

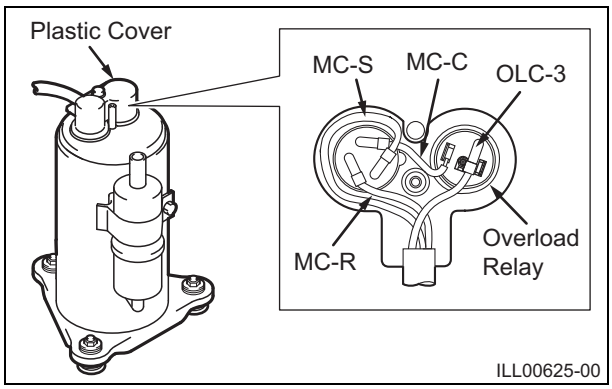
Cushions and collars are packaged in the supplied compressor assembly.

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

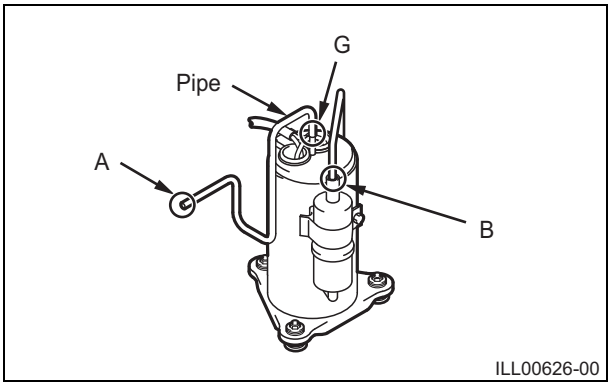
⚠ CAUTION

• 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.

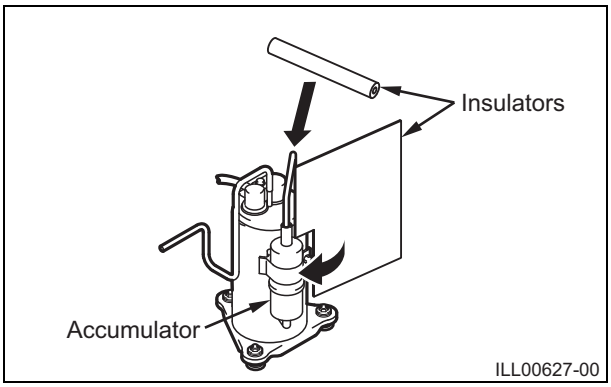


4) Braze pipe at point A and G, then braze at point B.

< NOTE >

Pipe is packaged in the supplied compressor assembly.

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



6) Apply insulators to the accumulator and pipe 2.

< NOTE >

Insulators are packaged in the supplied compressor assembly.

10.3 Evaporator Fan Assembly

- Install evaporator fan. Allow a clearance of 0.12 in (3.0 mm) or more on each side of the evaporator fan. (See page 52.)

10.4 Condenser Fan Assembly

- Install condenser fan. Allow a clearance of 0.12 in (3.0 mm) or more on each side of the condenser fan. (See page 54.)

10.5 Wiring Notice

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

10.6 Perform an Inspection

- Perform an inspection of cooling performance and check for abnormal noise or vibration.

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P/N: SV0068-02 Third Issue: April 2015