

SERVICE MANUAL

OFFICE PRO 63

SERIAL NUMBER FROM JANUARY 2008 (0108) TO PRESENT



MOVINCOOL®
THE #1 SPOT COOLING SOLUTION

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1. PRECAUTIONS FOR SAFETY

1.1 Foreword

- This manual has been published to service the MovinCool Office Pro 63. Please use this service manual only when servicing the Office Pro 63.

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

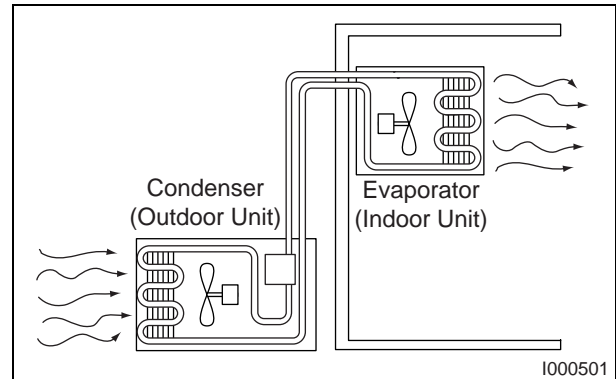
- **All electrical work if necessary, should only be performed by qualified electrical personnel. Repair to electrical components by non-certified technicians may result in personal injury and/or damage to the unit. All electrical components replaced must be genuine MovinCool parts, purchased from an 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 proper electrical outlet for MovinCool units must be equipped with a “UL” approved ground-fault 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. GENERAL DESCRIPTION

2.1 Spot Cooler

- In general, conventional air conditioners cool the entire enclosed environment. They act as “heat exchangers”, requiring an interior unit (evaporator) to blow cool air into the interior and an exterior unit (condenser) to exhaust exchanged heat to the outdoors.
- Unlike conventional air conditioners, the MovinCool Office Pro 63 is a spot cooler which directs cool air to particular areas or objects.

MovinCool Office Pro 63 has the following features:



2.2 Compact Design

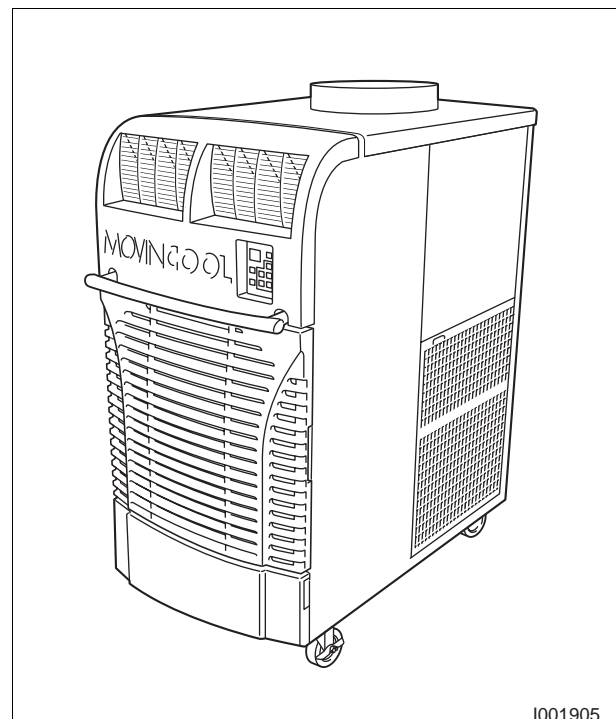
- The innovative design of MovinCool Office Pro 63 has resulted in one compact unit, replacing the need for two separate units.

2.3 Easy Transportation and Installation

- With the whole cooling system built into one compact unit, MovinCool Office Pro 63 requires no piping and can be easily transported and installed.

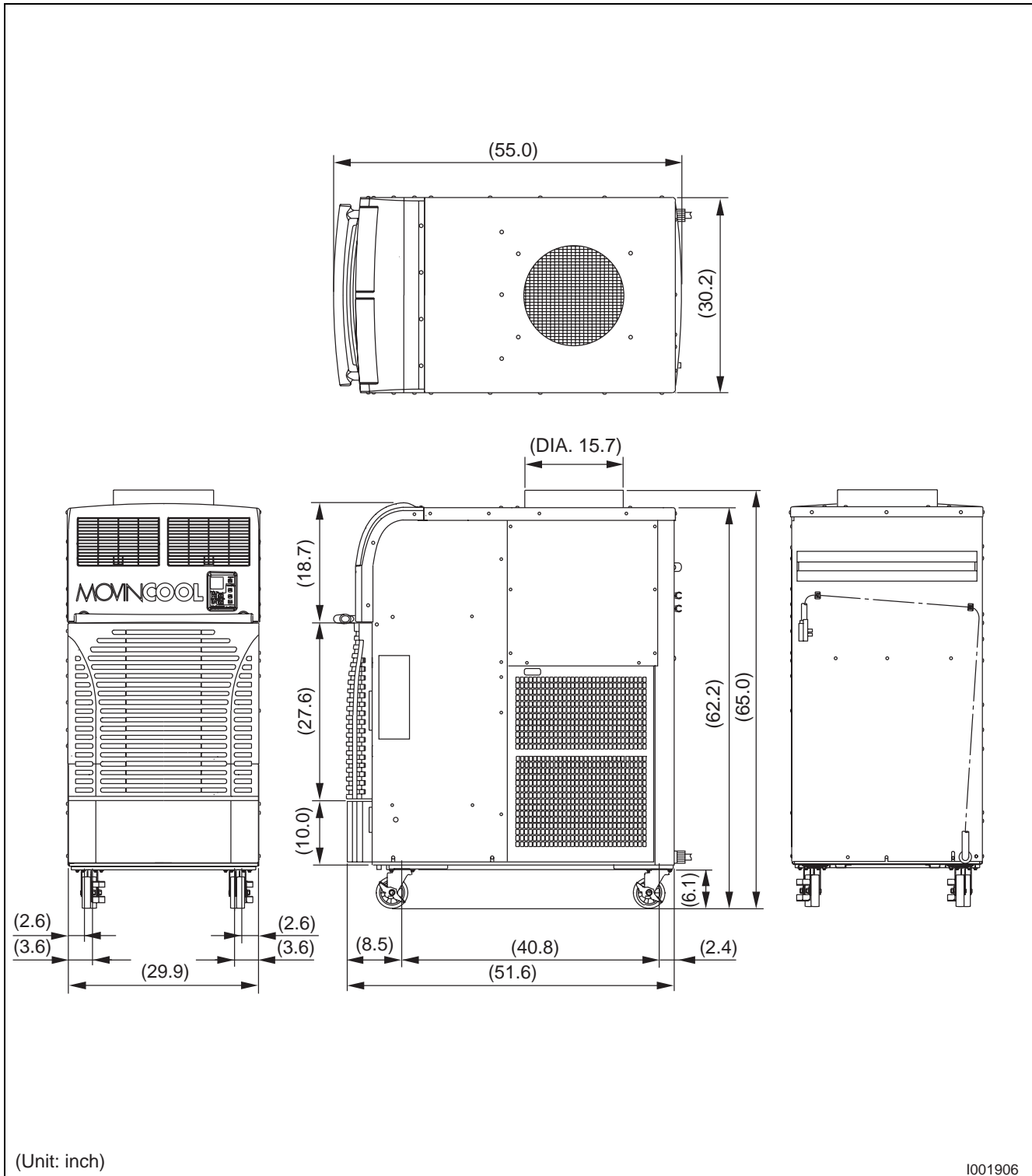
2.4 Energy Conservation

- MovinCool Office Pro 63 is economical because it cools only the area or objects which need to be cooled.

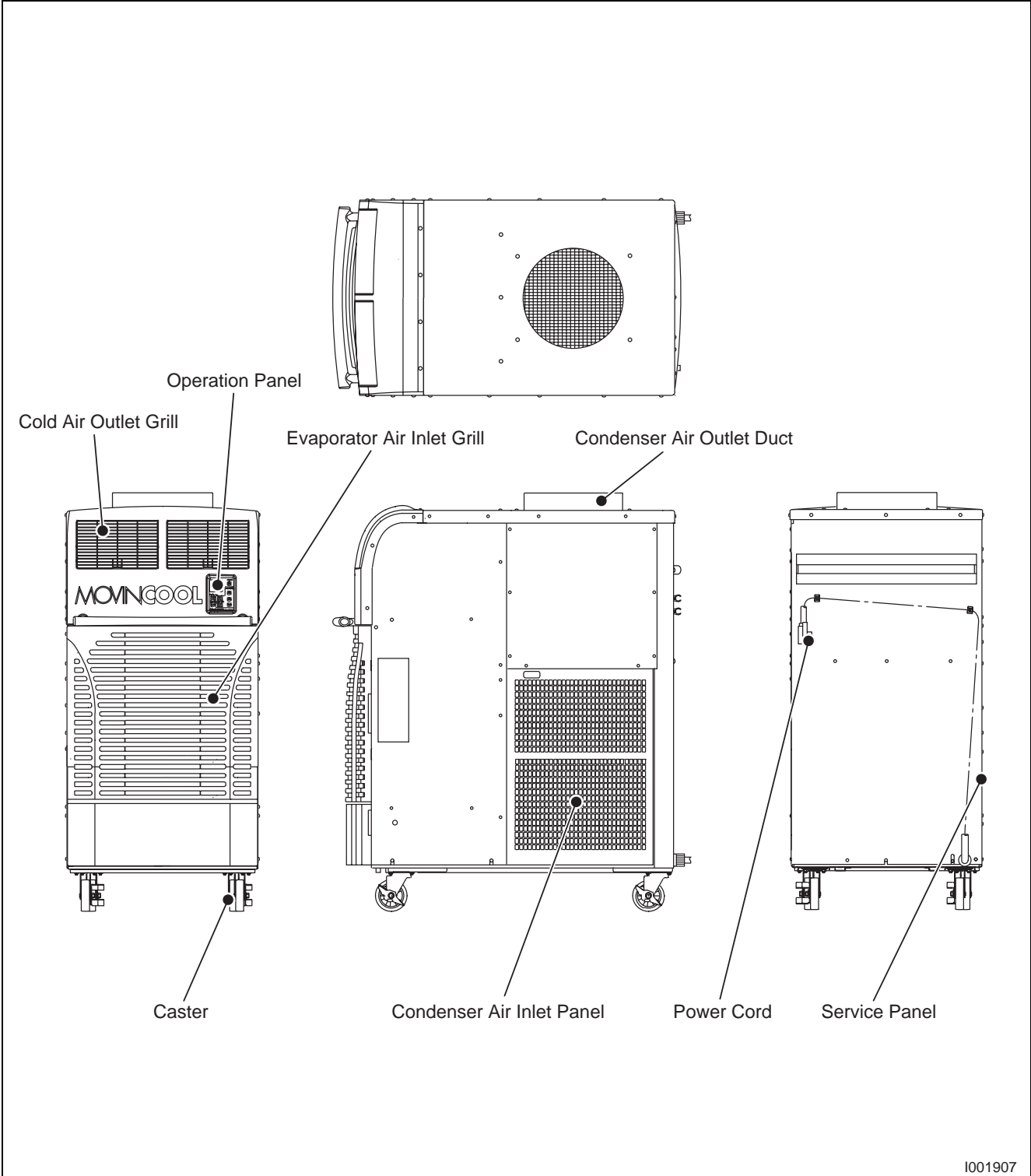


3. CONSTRUCTION

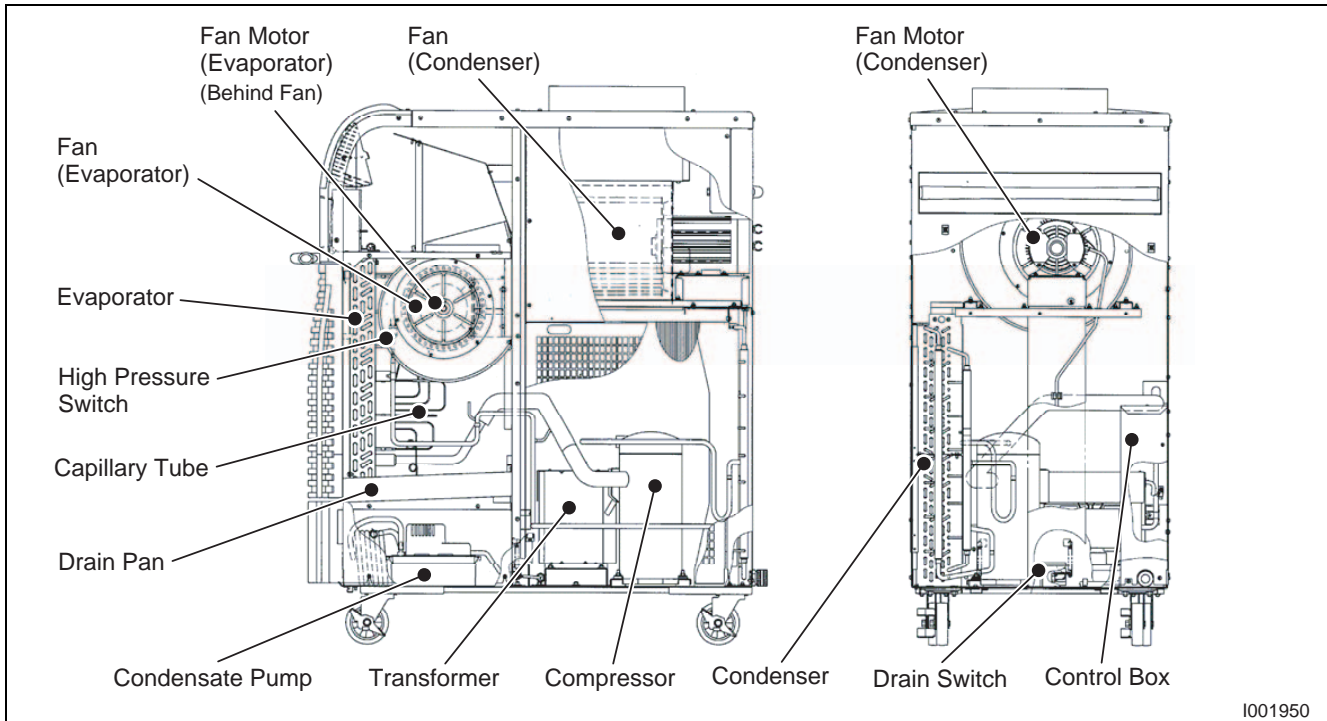
3.1 Exterior Dimensions



3.2 Exterior Components



3.3 Internal Structure



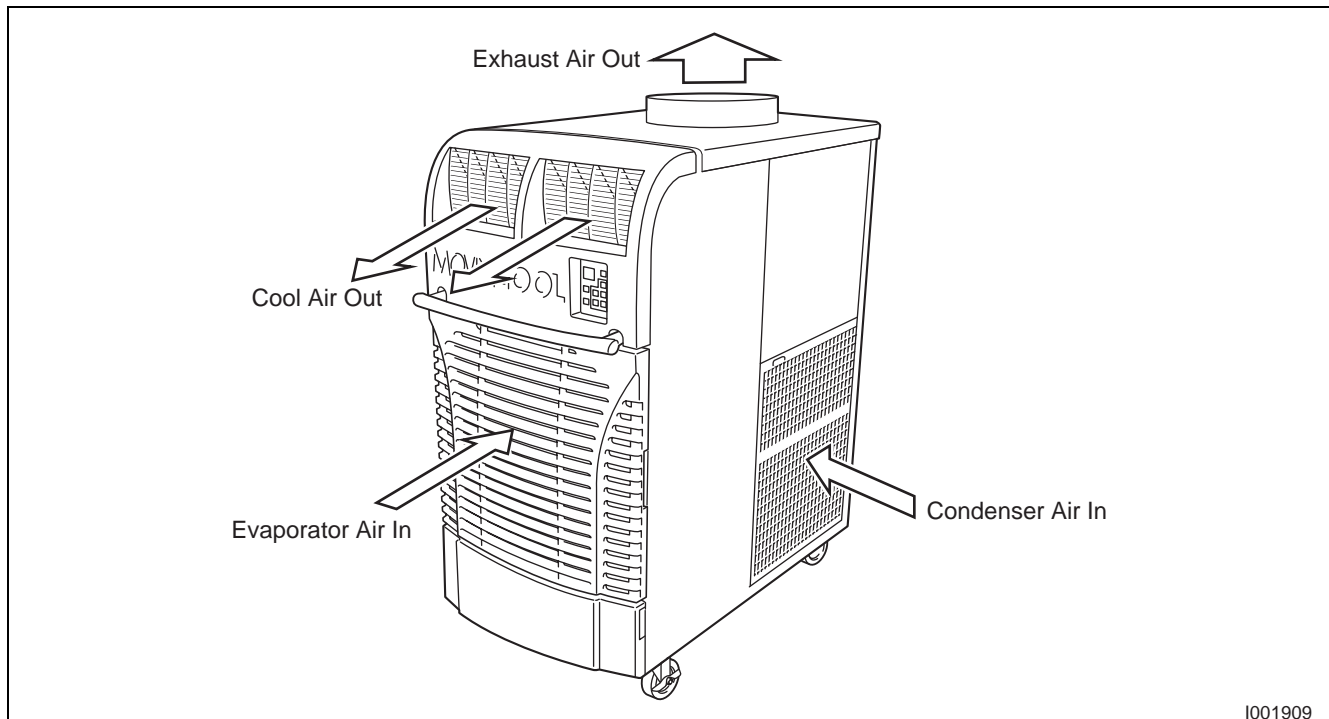
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3.4 Basic Construction

- The MovinCool Office Pro 63 is compact in construction because the condenser and the evaporator are enclosed in one unit. The interior is divided into three sections. The upper front face is equipped with the evaporator, and the lower front face contains the condensate pump and optional drain tanks. The rear section contains the condenser, the compressor, the transformer and the control box.

3.5 Air Flow

- Air drawn from the right side face passes through the condenser which extracts the heat. This hot air is blown out through the upper exhaust air duct. Air taken in from the front face is cooled by the evaporator and then blown through the cool air vent. All the air inlets are equipped with filters, and the exhaust air duct is protected by metal grill.



3.6 Electrical System

- The MovinCool Office Pro 63 is equipped with a compressor operated at 460 V, 3 phase and a dry-type distribution transformer operated 460 V, single phase at primary side and 230 V single phase at secondary side which supply power source for fan motors, relay board, and condensate pump.

3.7 Compressor and Fans

- The compressor is hermetically sealed. Two sets of a two-speed fan motor with a centrifugal fan are used to draw air across the evaporator and condenser.

3.8 Transformer

- The transformer is a dry-type distribution transformer rated 5 KVA at 460 V primary side and 230 V secondary side.

3.9 Condensate Pump

- The condensate pump and a 20 ft (6 m) drain hose are included with the Office Pro 63 to provide continuous operation without the need of the drain tanks. The condensate pump has a maximum head lift of 17 ft (5.2 m) at system operated voltage of 460 VAC.

3.10 Drain Tanks (optional)

- A set of two 5.0 gal (19 L) drain tanks are supplied as optional accessory for Office Pro 63. When drain tanks are used instead of condensate pump, the condensate (water) is collected into both tanks. The drain switch activates and stops the operation when tanks reach the level of approximately 8.0 gal (30 L).

4. SPECIFICATIONS

4.1 Technical Specifications

ITEM		SPECIFICATIONS	
Electronic Features	Control Panel	Electronic	
	Thermostat Control	Electronic	
Cooling Capacity* ¹	Capacity	60000 Btu/h (17585 W)	
Refrigerant Circuit	Compressor	Compression Type	Hermetic Scroll
		Motor Rated Output at 460 V	3.89 kW
	Evaporator	Plate Fin	
	Condenser	Plate Fin	
	Refrigerant Control	Capillary Tube	
Refrigerant/Enclosed quantity		R-410 A/4.41 lb (2.00 kg)	
Ventilation Equipment For Evaporator	Fan Type	Centrifugal	
	Max. Air Flow-high/low	1940/1770 CFM (3300/3000 m ³ /h)	
	Motor Rated Output-high/low at 230 V	0.60/0.33 kW	
	Max. External Static Pressure	0.9 IWG (224 Pa)	
Ventilation Equipment For Condenser	Fan Type	Centrifugal	
	Max. Air Flow - high/low	2830/2650 CFM (4810/4500 m ³ /h)	
	Motor Rated Output-high/low at 230 V	1.2/0.92 kW	
	Max. External Static Pressure	0.85 IWG (212 Pa)	
Electronic Characteristics	Power Requirement	460 V, 3 PH, 60 Hz	
	MIN. MAX. Voltage	MIN 414 V, MAX 506 V	
	Current Consumption* ¹	9.5 A	
	Total Power Consumption* ¹	6.6 kW	
	Power Factor* ¹	87 %	
	Starting Current	65 A	
Recommended Fuse size		20 A	
Power Cord	NEMA Plug Configuration	L16-20	
	Gage x Length	12 AWG (4-core) x 6 ft	
Signal Connection	Fire Alarm Input	<ul style="list-style-type: none"> • Dry contact type (recommended) • No-Voltage Contact Input/Contact resistance Less than 100 ohm 	
	Warning Signal Output	2 A at 30 V (DC/AC) or less (resistive load)	
Net weight		705 lb (320 kg)	

ITEM		SPECIFICATIONS
Operating Condition	Inlet air: Maximum	105 °F (41 °C), 50 %RH
	Inlet air: Minimum	65 °F (18.3 °C), 50 %RH
Sound Level* ² * ³	With Condenser Duct-high/low	69/67 dB(A)
	Without Condenser Duct-high/low	71/69 dB(A)
Max. Duct Equivalent Length-Per Cold Duct Hose/Hot Duct Hose		40/100 ft (12.1/30.5 m)
Condensate Pump		1/30 HP, 230 V, 0.5 A, 75 W, Discharge: 3/8 in (9.53 mm) OD barbed

- Specifications are subject to change without notice.

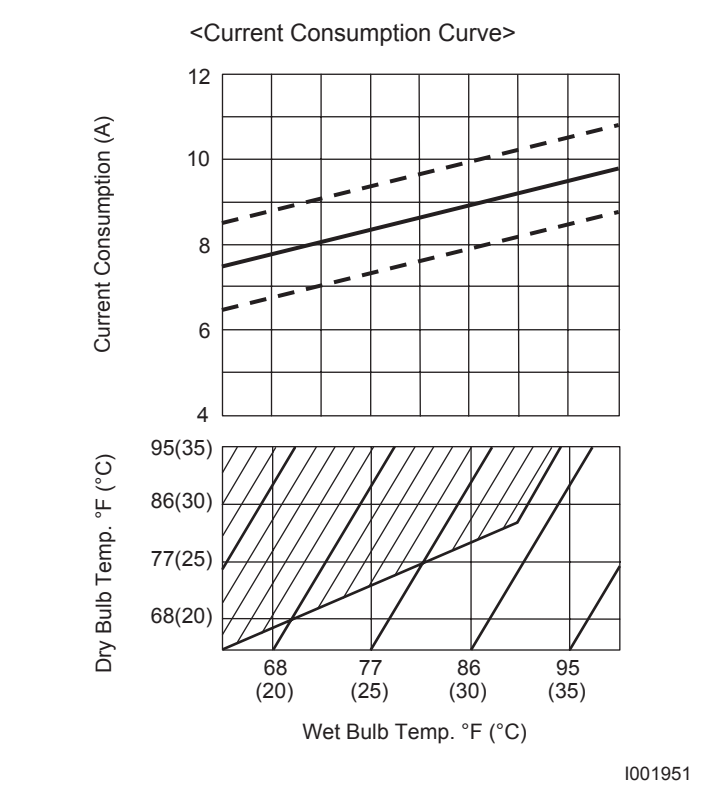
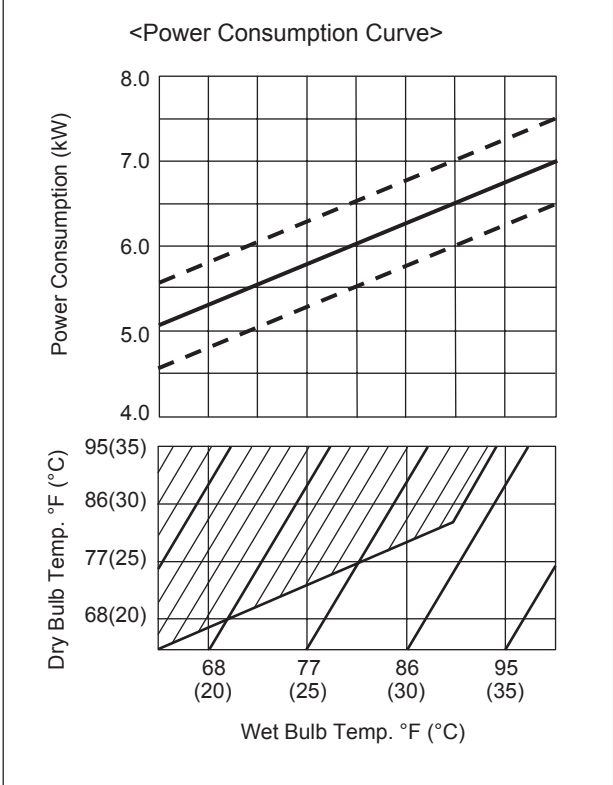
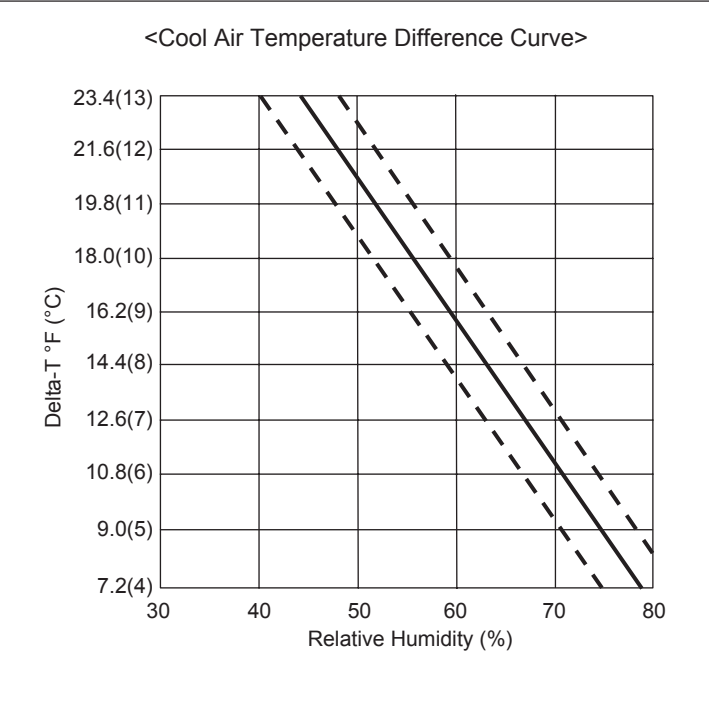
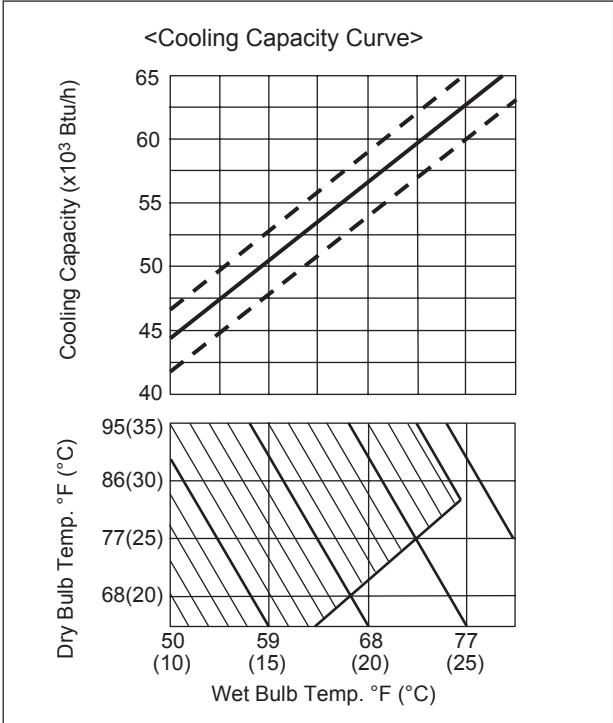
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*1 : Rating Condition: 95 °F (35 °C), 60 %RH

*2 : Measured at 3.28 ft (1 m) from surface of unit.

*3 : Internal dry-type distribution transformer may produce a humming noise up to 31 dB(A) at maximum operated voltage (506 V) during stand-by state.

4.2 Characteristics



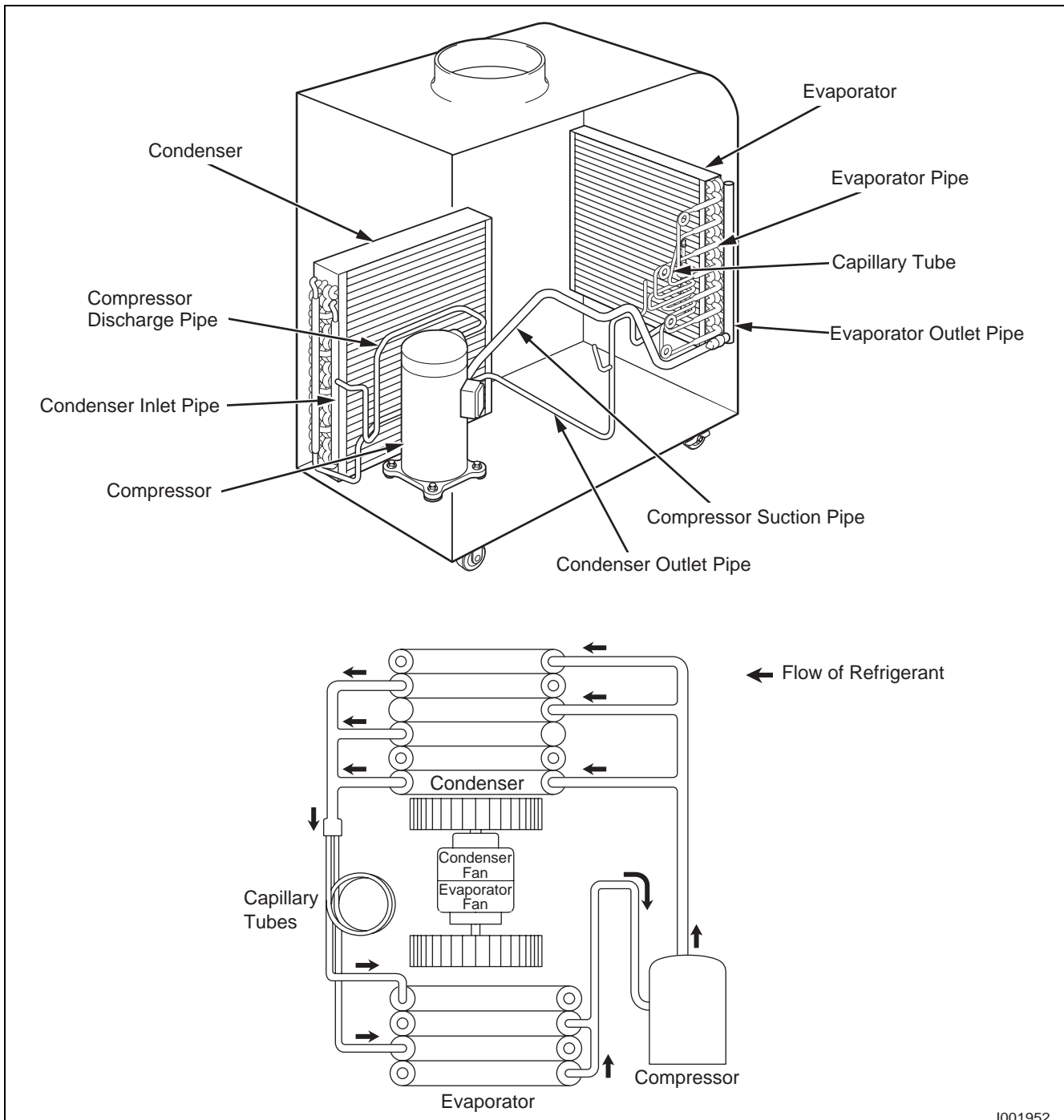
5. REFRIGERANT SYSTEM

5.1 Refrigerant System Construction

The component parts of the refrigerant system include the following:

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

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



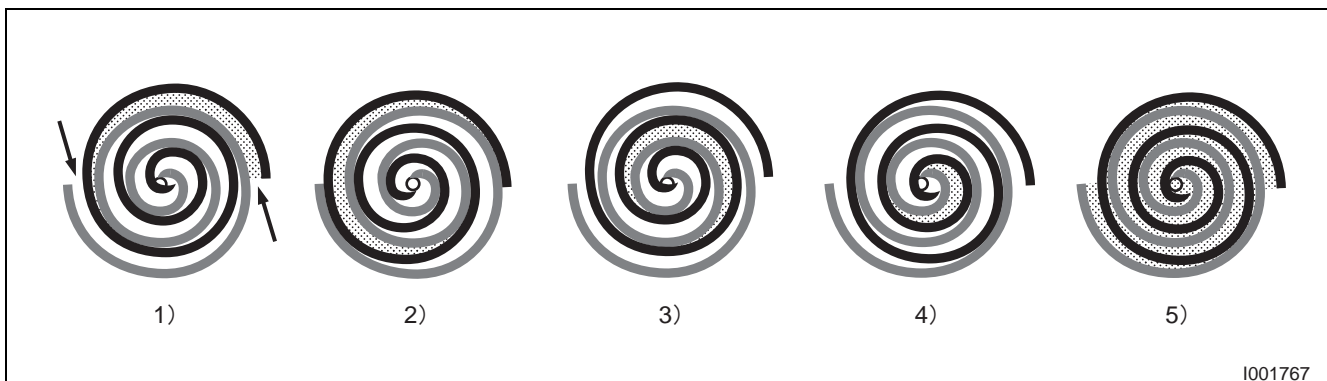
5.2 Compressor

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

(1) Compressor theory of operation

- The scroll utilizes an involuted spiral which, when matched with a mating scroll form, generates a series of crescent-shaped gas pockets between the two members. During compression, one scroll remains stationary (fixed scroll) while the other form (orbiting scroll) is allowed to orbit (but not rotate) around the first form. As this motion occurs, the pockets between the two forms are slowly pushed to the center of the two scrolls while simultaneously being reduced in volume. When the pocket reaches the center of the scroll form, the gas, which is now at a high pressure, is discharged out of a port located at the center. During compression, several pockets are being compressed simultaneously, resulting in a very smooth process. Both the suction process (outer portion of the scroll members) and the discharge process (inner portion) are continuous.

(2) Compressor operation



- 1) Compression in the scroll is created by the interaction of an orbiting spiral and a stationary spiral. Gas enters the outer openings as one of the spirals orbits.
- 2) The open passages are sealed off as gas is drawn into the spiral.
- 3) As the spiral continues to orbit, the gas is compressed into two increasingly smaller pockets.
- 4) By the time the gas arrives at the center port, discharge pressure has been reached.
- 5) Actually, during operation, all six gas passages are in various stages of compression at all times, resulting in nearly continuous suction and discharge.

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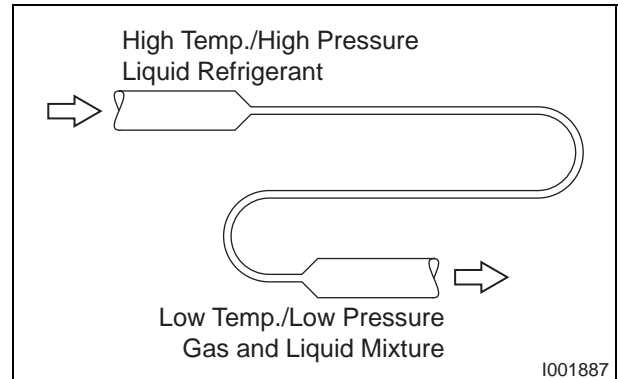
When the compressor shuts off, the compressor motor may run backward for a moment or two until internal pressures is equalized. This has no effect on compressor durability but may cause an unexpected sound after the compressor is turned off and should not be diagnosed as a malfunction.

5.3 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.

5.4 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.

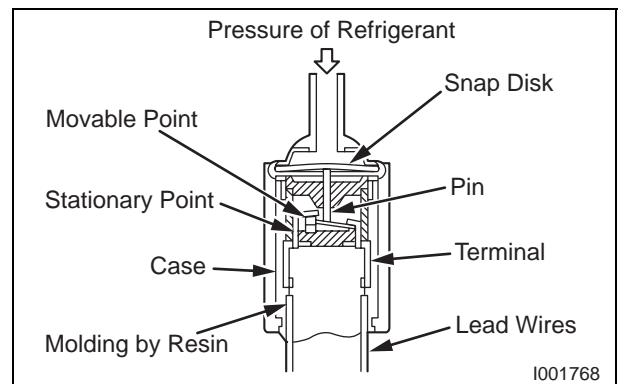


5.5 Evaporator

- The evaporator, like the condenser, 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.

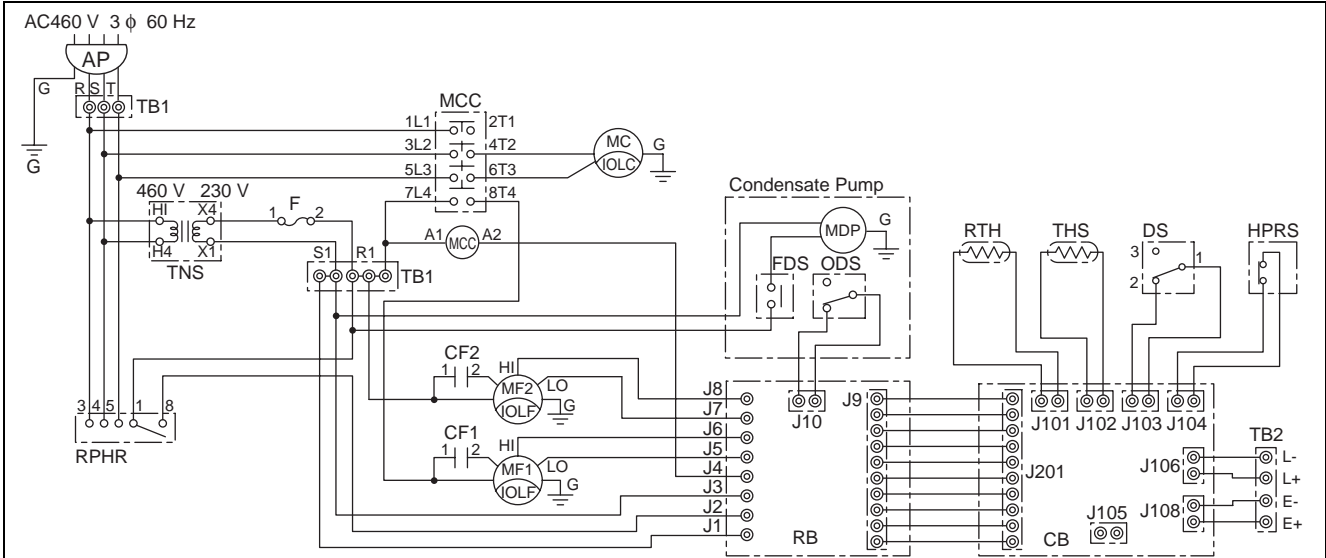
5.6 High Pressure Switch

- The high pressure switch prevents the condenser and compressor from being damaged by excessively 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 control board (J104 connector) which turns the compressor off.
- Possible causes of this trouble include:
 - The condenser air filter is dirty, restricting air flow.
 - The condenser blower is defective.



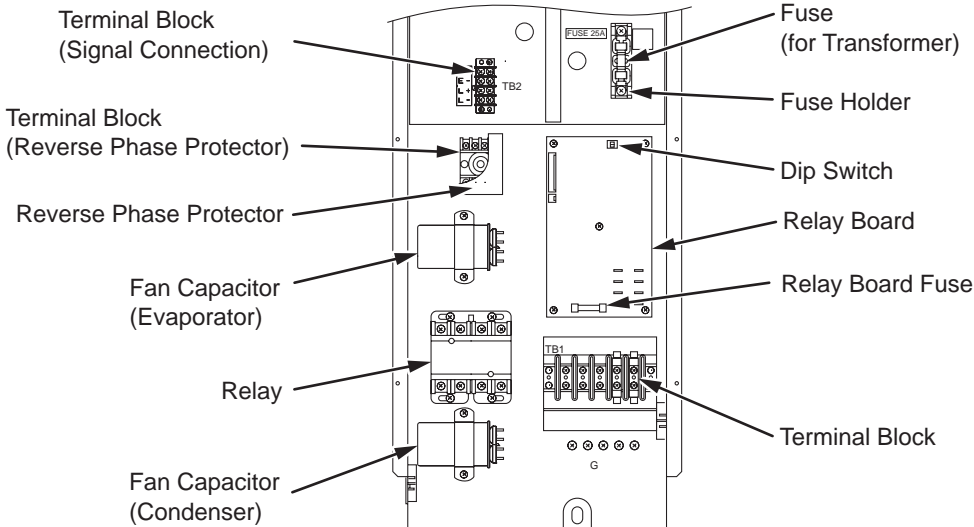
6. ELECTRICAL SYSTEM

6.1 Circuit Diagram and Control Box



A P	Attachment Plug
T B 1	Terminal Block
T B 2	Terminal Block
C B	Control Board
R B	Relay Board
M F 1	Condenser Fan Motor
M F 2	Evaporator Fan Motor
M C	Compressor Motor
C F 1	Capacitor for Condenser Motor
C F 2	Capacitor for Evaporator Motor
R P H R	Phase Reversal Relay
T N S	Transformer

I O L F	Inner Overload Relay of Fan Motor
I O L C	Inner Overload Relay of Compressor
D S	Full Drain Warning Switch
T H S	Freeze Protection Thermistor
R T H	Room Thermistor
G	Grounding
H P R S	High Pressure Switch
M C C	Relay for Compressor and Condenser Fan Motor
M D P	Condensate Pump Motor
F D S	Drain Float Switch
O D S	Drain Overflow Switch
F	Fuse (25 A)



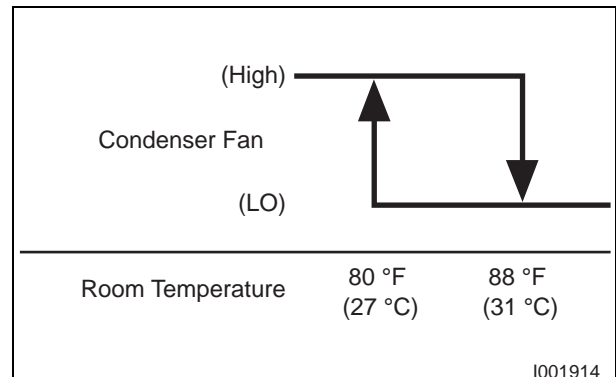
6.2 Basic Operation of The Office Pro 63 Electrical Circuit

- There are three basic components used to control the operation of the Office Pro 63 electrical system:
 - Transformer
 - Control panel assembly
 - Control box
- The control panel assembly contains the control panel, control board (with inputs for the freeze and room temperature thermistors), drain switch, high pressure switch and a microprocessor.

(1) Fan mode

High Fan Mode

- When the FAN MODE button on the control panel is pressed, the microprocessor turns on “FAN HI” “COOL OFF” indication of LCD and activates both the fan on relay and fan mode relay. This sends line voltage (230 VAC) from the fan on relay to the N.O. (normally open) contacts of the fan mode relay. This output is connected to the J8 terminal (relay board) where the high speed wire of the fan motor is connected.
- When this button is pressed again, fan turns to low mode (see below). Press again, fan stops.
- High fan mode is automatically switched depending on room temperature. When room temperature is decreased down to 80 °F (27 °C) or below, fan mode is switched to HIGH. When room temperature is increased to 88 °F (31 °C) or higher, fan mode is switched from HIGH to LO.

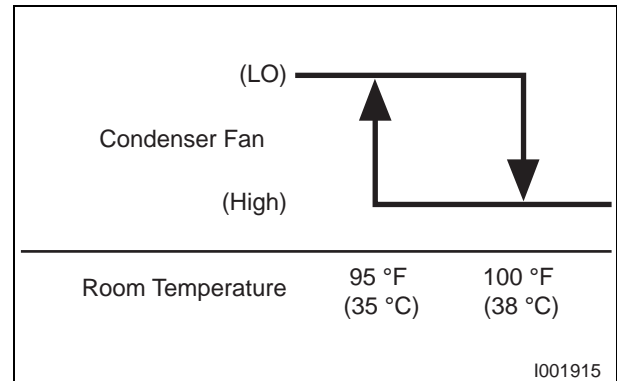


Low Fan Mode

- When the FAN MODE button on the control panel is pressed again, the microprocessor turns on “FAN LO” “COOL OFF” indication of LCD and activates both the fan on relay and fan mode relay. This sends line voltage (230 VAC) from the fan on relay to the N.C. (normally closed) contacts of the fan mode relay. This output is connected to the J7 terminal (relay board) where the low speed wire of the fan motor is connected.
- When this button is pressed again, fan stops.

(2) Cool mode

- In addition to fan mode (as described above), when the COOL ON/OFF button on the control panel is pressed, the microprocessor turns on “COOL ON” indication of LCD and if the temperature set point is less than the current room temperature, activates the compressor relay (relay board) after 120 sec delay. This sends line voltage (230 VAC) to the J4 terminal (relay board) and compressor auxiliary relay is excited. Then compressor and condenser fan motor turn on (Cooling Operation).
- Condenser fan mode is automatically switched depending on room temperature. When room temperature is approximately. 100 °F (38 °C) or greater, fan mode is switched LO to HIGH. When room temperature is approximately. 95 °F (35 °C), fan mode is switched HI to LO.



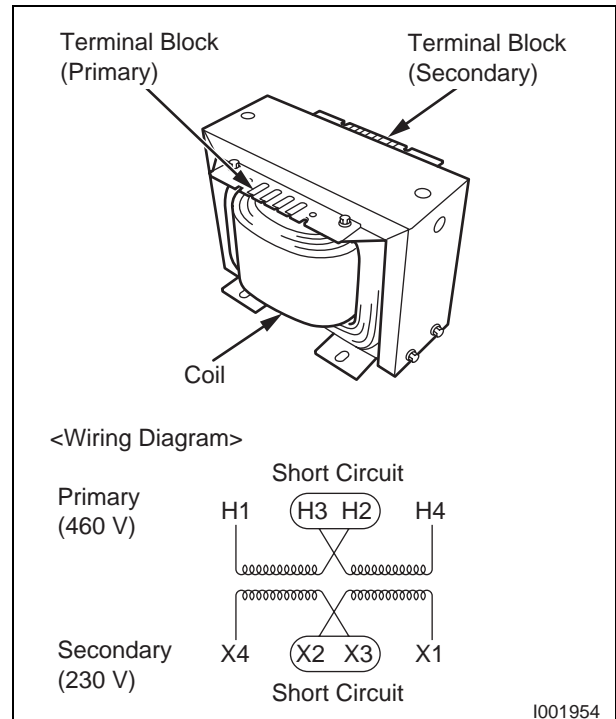
6.3 Transformer

- A dry-type transformer rated 5 KVA is equipped within the unit to provide step down voltage from 460 V single phase to 230 V single phase.
- The terminal connection of the primary side of the transformer are labeled H1, H2, H3, and H4. Terminals H2 and H3 are shorted together to provide a series connection for 460 V application. Terminals H1 and H4 are connected to 460 V power source to supply power to secondary side.
- Terminals X2 and X3 of the secondary side are also shorted together to provide 230 V output between terminals X4 and X1.

Specifications:

Distribution transformer

- Type: Dry type
- Rated VA: 5000 VA
- Power Requirement: 1 PH, 60 Hz
- Primary Voltage: 460 V
- Secondary voltage: 230 V



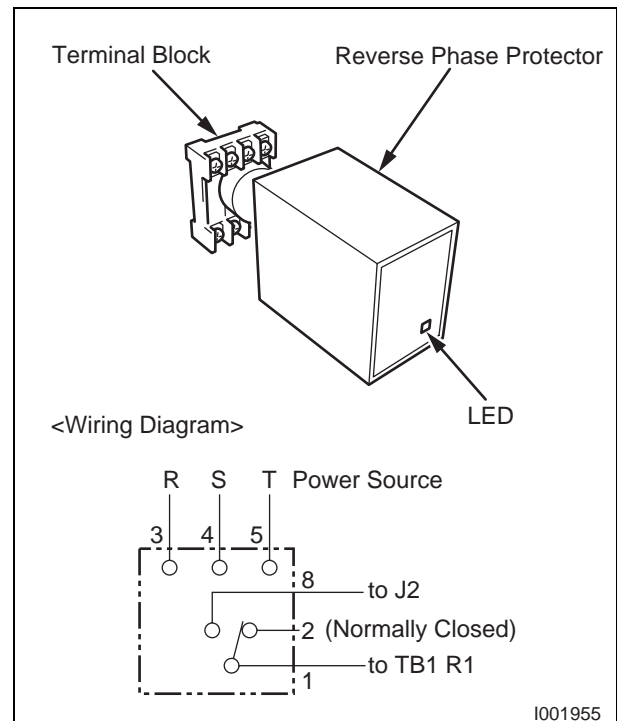
6.4 Control Box

(1) Reverse Phase Protector

- The Reverse Phase Protector is operated at nominal voltage of 440 VAC to 480 VAC. The reverse phase protector is mounted on a plug-in socket terminal block where it can easily be plugged-in or removed during service.
- The internal relay of a reverse phase protector is energized and LED is on when the phase sequence is correct. If the phases are reverse, the out put relay will not energize.
- The reverse phase protector is reset automatically upon correction of the fault.

Specifications:

- Rated Line Voltage: 440/480 V
- Rated Output: 8 A resistive at 240 V
- Mounting: Plug-in socket (8 pin, octal plug)



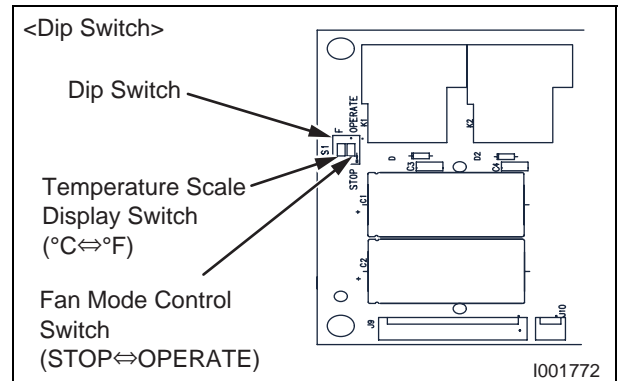
(2) Capacitors

- The capacitors are used to temporarily boost the power output available to the fan motor at start-up.
- The specifications of each capacitor are listed below:

Capacitor Application	Voltage	Rating Capacitance
Evaporator Fan Motor	440 VAC	15 μ F
Condenser Fan Motor	370 VAC	25 μ F

(3) Relay board

- The relay board receives signals and outputs from the control board that contains a microprocessor. The relay board contains the compressor, fan on and fan mode (speed) relays.
- It also contains a step-down transformer that converts the line voltage (230 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.
- The DIP switch is used to change the fan mode operation from stop to operate and change both the set point and room temperature display from Fahrenheit to Celsius.



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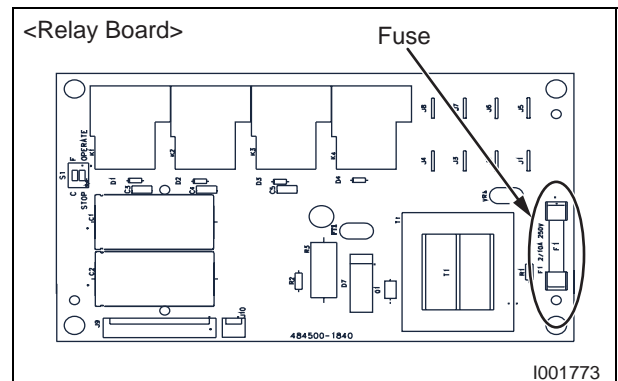
The relay board must be serviced as a complete assembly. It has only one serviceable component, the fuse. (see below)

(4) Relay board fuse

- This fuse provides protection against damage to the step-down transformer. It must be replaced with the exact type of fuse or an equivalent.

Specifications:

- 2/10 A, 250 V



⚠ CAUTION

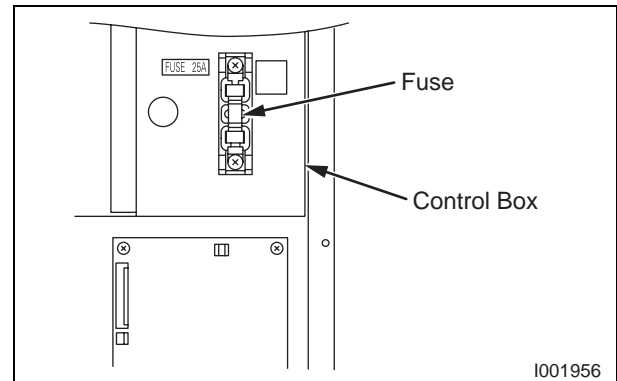
Failure to use the exact type of fuse could result in damage to the unit and/or to components. It could also void the warranty of the unit.

(5) Fuse (For Transformer)

- This fuse provides protection against damage to the transformer. The fuse is located in the secondary circuit of the transformer.
- It must be replaced with the exact type of fuse or an equivalent.

Specifications:

- Time delay type
- Class cc
- Rated volt: 600 V
- Rated amp: 15 A
- UL listed



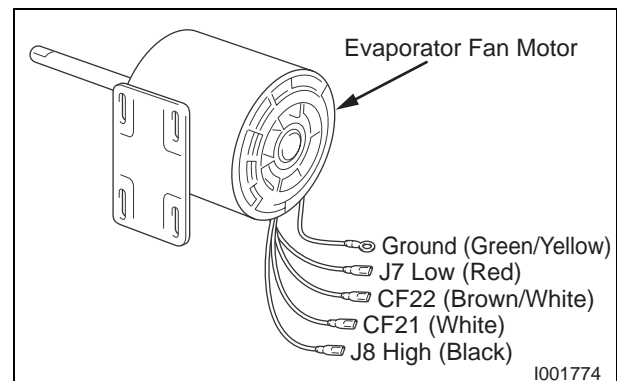
6.5 Fan Motor

(1) For evaporator

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

Specifications:

- Rated Voltage: 230 V, 60 Hz
- Rated Output: High-590 W, Low-360 W

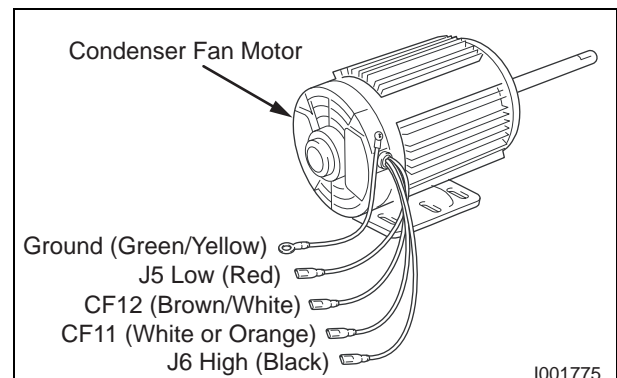


(2) For condenser

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

Specifications:

- Rated Voltage: 230 V, 60 Hz
- Rated Output: High-1195 W, Low-932 W



6.6 Compressor Motor

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

Specifications:

- Rated Voltage: 460 V, 60 Hz
- Rated Output: 3890 W

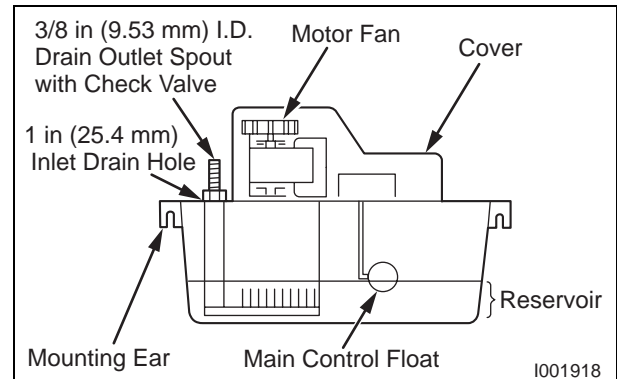
< NOTE >

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

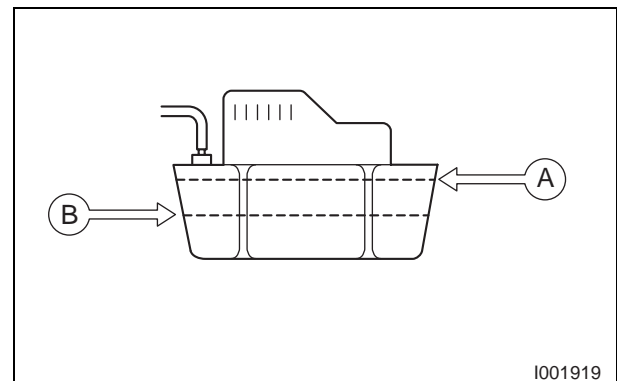
6.7 Condensate Pump

- The Office Pro 63 is equipped with a condensate pump, which collects the water that forms on the evaporator during normal cooling operation and eliminates the need for a drain tanks.

- When the water collects to level (A) in the pump reservoir, the condensate pump begins to operate and discharge the water. During condensate pump operating period the compressor cycles off.



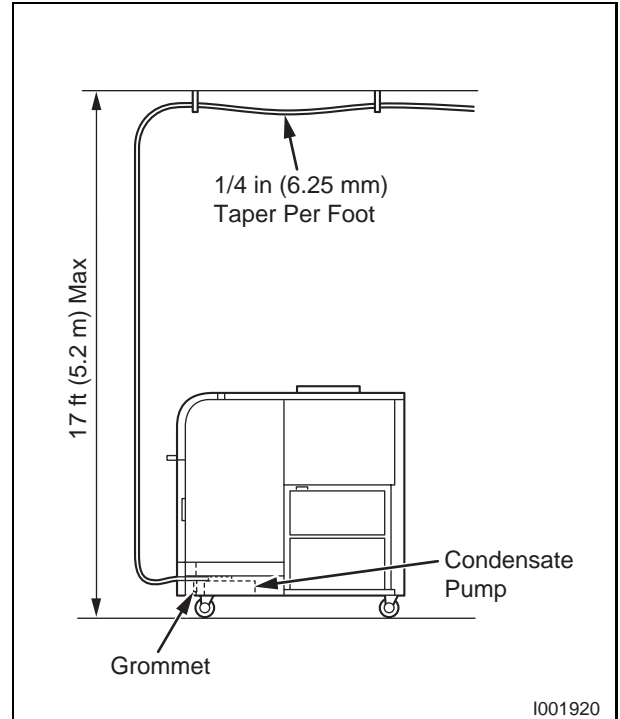
- When the water level drops below level (B), the condensate pump stops and compressor restarts after delay time has expired.



< NOTE >

- If for any reason the water level exceeds that of level (A) in the pump reservoir, an overflow drain switch stops the compressor operation.
- If the fan mode control DIP switch has been set from the cool to the stop position, the fan also turns off while the condensate pump is discharging the water.

- To insure proper drainage, locate the highest vertical position, no more than 17 ft (5.2 m) at 460 VAC, and run the drain hose on a downward slope at a minimum rate of 1/4 in (6.25 mm) per foot.

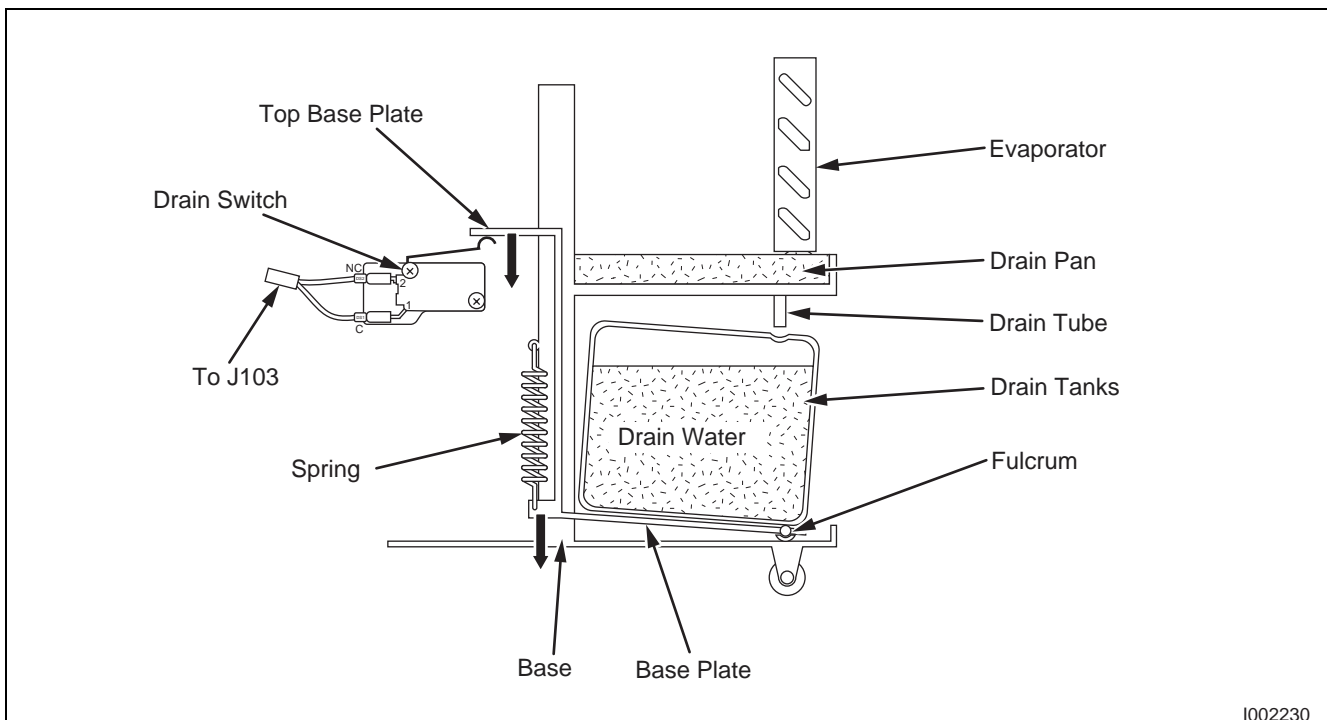


< NOTE >

The condensate pump maximum lift is 17 ft (5.2 m) at 460 VAC. Please check the drainage performance after installation. It is important that the drainage line from the condensate pump is free of kinks and is not pinched. Power fluctuation or low voltage could result in incorrect drainage.

6.8 Drain Switch

- The Office Pro 63 is equipped with a drain tank switch. When the drain tanks accumulate approximately 8.0 gal (30 L) of condensate (water) in the drain tanks, the drain tank switch sends a signal to the microprocessor. The microprocessor stops all operation of the unit, flashes the "TANK FULL" LED, indicates "TANK FL" on the LCD and closes the contact of output signal.
- This system utilizes a 0.1 A, 125/250 VAC micro-switch for this function. When drain water accumulates approximately 8.0 gal (30 L) in the drain tanks, the drain tank base plate, which is supported at its fulcrum, is pushed down in the arrow direction as shown in the figure below.
- When the drain tank base plate is forced down, the top of the drain tank base plate turns off the contacts #1-#2 of the micro switch. This causes the ground signal at the J103 connector of the control panel assembly to go open. When the microprocessor detects this event, it shuts the unit off, flashes the "TANK FULL" LED, indicates "TANK FL" on the LCD and closes the contact of output signal.
- When the drain tanks is removed (or the drain tanks is emptied), the top of the drain tank base plate returns to its original position from the tension of the coil spring. Then contacts #1-#2 of the drain tank switch close. This provides a ground to the microprocessor through the J103 connector.



(1) How to re-start the unit

- If the LCD indicates “PROGRAM ON”, press the COOL ON/OFF button to continue running the program. If the LCD indicates “PROGRAM ON” continuously (program activated), no further steps are necessary. If no program exists or the program was deactivated, press the FAN MODE button or the COOL ON/OFF button. The unit returns to the previous temperature set point.

6.9 Automatic Restart after Power Interruption

- The program within the microprocessor of the Office Pro 63 contains a feature that automatically restarts 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. All preset programs are retained in the memory in the event power loss occurs.

6.10 Compressor Protection

- There is a time delay program within the microprocessor. This prevents a heavy load from being applied on 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, temperature set point (thermostatic control), power interruption restart or condensate pump (optional) operation.

Specifications:

Time delay
- 120 ± 20 sec.

6.11 Temperature Control

- The compressor operation cool mode is controlled by the microprocessor which receives input signals from the room temperature thermistor (evaporator inlet air) and the setting of the temperature set point. The temperature set point (desired room temperature) can be adjusted by pressing the Δ/∇ buttons on the control panel. The adjustment range of the temperature set point is 65 °F to 90 °F (18 °C to 32 °C).

6.12 Fan Mode Control Switch

- The fan motor operation is controlled by relays on the relay board through a microprocessor in the control panel assembly. The fan program in the microprocessor can be changed by a DIP switch on the left side of the relay board located in the control box.
- There are two settings:

(1) Cool to stop

- When the DIP switch is set in the downward or STOP position, the microprocessor controls the fan motor using the same room temperature thermistor that it uses to control the compressor. In this case, both the fan and the compressor stop when the microprocessor receives a sufficiently low intake air (room temperature) signal from the thermistor (equal to or less than the set point). When the temperature increases (exceeds the set point) the microprocessor restarts the fan and compressor automatically. However, if the unit has been off for less than 120 sec, the fan starts before the compressor (time delay feature).

(2) Cool to operate

- When the DIP switch is set to the upward or OPERATE position, the microprocessor controls the fan operation using control panel inputs only. The fan operates continuously during fan only and cool modes. (This is the factory default setting.)

6.13 Temperature Scale Display Switch

- When the DIP switch is set in the down or “°C” position, the set point and room temperature are displayed in degrees Celsius. “°C” is indicated on the LCD. When the DIP switch is set in the up or “°F” position, the set point and room temperature are displayed in degrees Fahrenheit . “°F” is indicated on the LCD. (This is the factory default setting.)

6.14 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 condition.

Relay contactor is closed when the following condition has occurred:

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

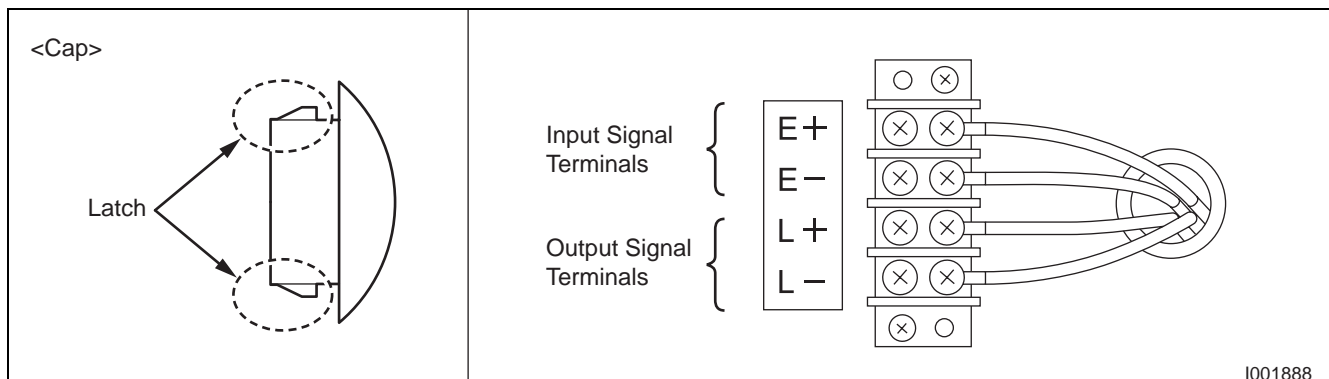
- Remove service panel from the rear of the unit.
- Squeeze the inner latches and push out the black cap from inside the panel. (See drawing of cap and inner latch shapes.)
- Use recommended warning signal wire size from 16 AWG to 26 AWG or a solid wire, or 16 AWG to 22 AWG for a stranded wire with ring terminal for #6 stud size.
- Connect warning device to terminal L+ and L- according to its polarities.

6.15 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 until it has been reset.

Connecting fire alarm control panel to controller

- Remove service panel from the rear of the unit.
- Squeeze the inner latches and push out the black cap from inside the panel. (See drawing of Cap and inner latch shapes.)
- 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.
- Connect warning device to terminal E+ and E- according to its polarities.



7. TROUBLESHOOTING

7.1 Troubleshooting

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

(1) Inspection of power source voltage

- Check the voltage of the power source.
 - Three phase 460 V (60 Hz)
- Check the phase sequence of the power source.

< NOTE >

If the phase sequence is reversed, control panel display turns off. In this case, exchange any two wires out of the three wires to correct the phase sequence.

- 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 it as described in the OPERATION MANUAL supplied with the unit.

(3) Inspection of condensate pump

- Remove any dirt or debris which may collect in the bottom of the reservoir tank.
- On a monthly basis, check the condensate drain hose for kinks, blockage or any other damage that may obstruct condensate pump from draining properly.
- Make sure that motor's cover is closed to keep electrical parts free of dust, dirt and any other foreign material.
- Condensate pump overflow switch can stop the compressor operation if the pump is malfunction. To test the condensate pump overflow switch, pinch the drain outlet hose and pour water into the reservoir inlet drain hole. Continue to fill the reservoir until the rising water lifts the overflow switch and stops the operation. If the compressor continues to operate when the reservoir is full, check your installation procedure. After testing is completed, release the drain outlet hose to enable the condensate pump to empty its reservoir. Make sure the 9 in (230 mm) section of hose is installed into the inlet drain hole of the pump reservoir.

(4) Inspection of drain tanks (optional)

- Make sure tank is fully drained.

< NOTE >

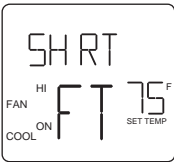
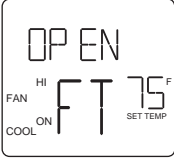
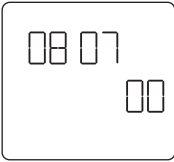
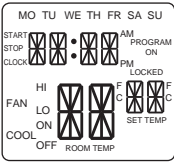
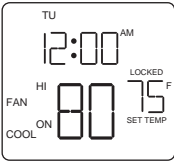
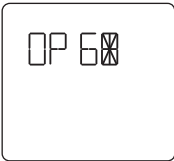

If the fan mode control DIP switch is set to the stop position, the entire unit (including fan operation) turns off.


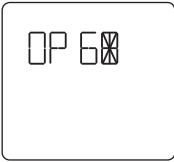
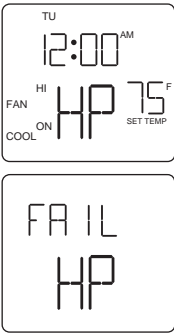
The following pages (page 34 to 42) are self-diagnostic codes and troubleshooting information. Detailed information is contained in the OPERATION MANUAL supplied with the unit.

7.2 Self-Diagnostic Codes

- Self-diagnostic codes are displayed on the control board under the following conditions and clear method is as follows.

LCD Display	Description	Condition	Reset/Remedy
	Drain tanks is full	When the drain tanks (optional) is filled with drain water. ("TANK FL" LED flashes and signal output (J106) turns on.)	1) Drain away. (LCD indicates "TANK") 2) Press ON/OFF button.
	Condensate pump problem	When condensate pump is damaged or broken. (J8 input of relay board turns to open and signal output (J106) turns on.)	1) Fix the condensate pump. 2) Reset the system. To RESET: Press ON/OFF and HI/LO buttons on the control box simultaneously for 5 sec.
	Defect (short or open) of room thermistor	When room thermistor (connecting to J101) becomes short or open. (Signal output (J106) turns on.)	Disconnect and reconnect the room thermistor. If it doesn't work, then change it.

LCD Display	Description	Condition	Reset/Remedy
 	Defect (short or open) of freeze protection thermistor	When freeze protection thermistor (connecting to J102) becomes short or open. (Signal output (J106) turns on.)	Disconnect and reconnect the freeze protection thermistor. If it doesn't work, then change it.
	Show running hours	Press ON/OFF and ▽ buttons simultaneously for 3 sec, total operation hours of compressor is indicated by 6-digit (hours). Example in left: 807 h	After 5 sec., display goes back to normal mode.
	Show LCD and LED all on mode	Press HI/LO and △ buttons simultaneously for 3 sec. (To check LCD segments and LED display.)	After 5 sec., display goes back to normal mode.
	Key lock mode (LCD displays "LOCKED".)	Press ENTER and SET CLOCK buttons simultaneously for 5 sec.	Press ENTER and SET CLOCK buttons simultaneously for 5 sec again to cancel the key lock mode.
	Indication of model name	Press ENTER and SET CLOCK buttons simultaneously for 5 sec or turn on.	Reset to normal display automatically after 5 sec.
	Detection of unit stop signal from fire alarm system	Press input signal from fire alarm becomes on. (Unit stops, output signal (J106) turns on and buzzer sounds.)	1) After input signal turns off. 2) Reset the system. To RESET: Press ON/OFF and HI/LO buttons on the control box simultaneously for 5 sec.

LCD Display	Description	Condition	Reset/Remedy												
	<p>Indication of service code</p>	<p>Press ON/OFF and Δ buttons simultaneously for 3 sec. Indication contents is as follows.</p> <table border="1" data-bbox="683 367 1079 577"> <thead> <tr> <th>LCD</th> <th>Description</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>DF</td> <td>Defrost status</td> <td></td> </tr> <tr> <td>FZ</td> <td>Evap. out pipe temperature</td> <td>26\Rightarrow109F ("26"\Leftrightarrow"X9")</td> </tr> <tr> <td>OD</td> <td>Outdoor temperature</td> <td>0 ("00")</td> </tr> </tbody> </table>	LCD	Description	Value	DF	Defrost status		FZ	Evap. out pipe temperature	26 \Rightarrow 109F ("26" \Leftrightarrow "X9")	OD	Outdoor temperature	0 ("00")	<p>1) See page 36 and 37. 2) Press ON /OFF button.</p>
LCD	Description	Value													
DF	Defrost status														
FZ	Evap. out pipe temperature	26 \Rightarrow 109F ("26" \Leftrightarrow "X9")													
OD	Outdoor temperature	0 ("00")													
	<p>Change model setting</p>	<p>For installing new controller PCB, if a different model name appears when the unit is reset or turned on, change model name according to the correct procedure.</p>	<p>1) While pressing Δ and ∇ buttons, plug the power cord. <Condition> LCD indicates current setting model name and buzzer sounds. 2) After setting the model type by pressing Δ and ∇ button, unplug the unit.</p>												
	<p>Activation of high pressure switch</p>	<p>When high pressure switch (connected to J104) activates (=J104 input turns to open) 3 times in 24 h, "HP" is indicated and signal output (J106) turns on. When it activates 10 times in 24 h, "FAIL HP" is indicated and buzzer sounds.</p>	<p>Find the cause of high pressure to address it. Check the following. Ambient air temperature (65 °F (18.3 °C), 50 %RH\Leftrightarrow 95 °F (35 °C), 60 %RH) Air filter (if dirty, wash up.) Condenser fan motor (if not working, replace.) Defect of high pressure switch (if switch is open when unit is off, replace switch.) Reset the system. To RESET: Press ON/OFF and HI/LO buttons on the control box simultaneously for 5 sec.</p>												

7.3 Troubleshooting Chart

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

(1) Insufficient cooling

- Cooling system problem generally results from electrical or mechanical components such as fan motor, compressor, control switch.

< NOTE >

-
- There is a possibility of insufficient cooling due to clogging of the air filter. So make sure to first check if the air filter is clogged or not.
 - Check the power supply because of the possibility of power source failure.
 - Check the installation site for operating temperature and installation space (unobstructed airflow).
-

Symptom		Possible Cause		Remedy
		Checking 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.)
		2. Compressor relay.	Open circuit or insufficient contact.	Replace compressor relay.
		3. Compressor relay on the relay board.	Open circuit or insufficient contact.	Replace relay board.
		4. Voltage.	Low voltage.	Repair power.
Insufficient air volume	No air.	1. Coil resistance of fan motor. (0 ohm or ∞ ohm)	Short or open circuit.	Replace fan motor.
		2. Fan on-off relay on the relay board.	Open circuit or insufficient contact.	Replace relay board.
		3. Fan HI/LO change relay on the relay board.	Open circuit or insufficient 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 it.
		3. Duct connection state.	Improper connection.	Repair duct connection.
		4. Fan motor.	Insufficient rotation.	Replace motor.
		5. Transformer.	Low voltage. (Secondary side)	Replace transformer.

(2) Unit does not start (operate)

< NOTE >

- In this case, there is a possibility of safety device activating due to the clogged air filter. So make sure to first clean the air filter and then start up again to confirm if the problem lies with the air filter.
- Check the installation site for operating temperature and installation space (unobstructed airflow).
- Check the phase sequence of the power source.

If the phase sequence is reversed, the control panel display, and reverse phase protector LED in the control box turn off.

Symptom		Possible Cause		Remedy
		Checking Area	Cause	
Does not operate at all	Control Panel display turns off.	1. Voltage.	Power failure.	Repair power.
		2. Phase sequence of the power source.	Phase sequence is reversed.	Change any 2 of the 3 wires for power source wires.
		3. Ground fault breaker trip.	Ground fault or defective ground fault breaker.	Repair ground fault section.
				Reset or repair breaker.
		4. Fuse.	Fuse blown.	Repair shorting section.
				Replace fuse on the relay board.
		Replace fuse of the transformer secondary side.		
5. Transformer.	Defective transformer.	Replace transformer.		
6. Reverse phase protector.	Open circuit or insufficient contact.	Replace reverse phase protector.		

Symptom		Possible Cause		Remedy
		Checking Area	Cause	
Control panel display turns on	Control Panel display shows error codes.	1. Display code "FL".	Drain tanks (optional) are filled with the drain water.	Discharge the drain water.
			Improper drain switch connection.	Check connection.
			Defective drain switch.	Replace drain switch.
		2. Display code "AS".	Improper routing of drain hose.	Repair drain hose, then reset unit. To RESET: Press ON/OFF and HI/LO buttons on the control box simultaneously for 5 sec.
			Defective condensate pump.	Repair or replace condensate pump, then reset unit. To RESET: Press ON/OFF and HI/LO buttons on the control box simultaneously for 5 sec.
			Missing jumper connector.	Connect jumper connector.
		3. Display code "RT".	Improper room thermistor connection.	Check connection.
			Defective room thermistor (short or open).	Replace room thermistor.
		4. Display code "FT".	Improper freeze protection thermistor connection.	Check connection.
			Defective freeze protection thermistor (short or open).	Replace freeze protection thermistor.
		5. Display code "HP".	Improper high pressure switch connection.	Check connection.
			Defective high pressure switch (short or open).	Replace high pressure switch.
			See "Stops after running a while" of Troubleshooting on page 41.	
		6. Display code "ALRM".	Turn the input signal on and continue it.	1) Check external input signal. 2) Reset the system. To RESET: Press ON/OFF and HI/LO buttons on the control box simultaneously for 5 sec.
7. Display code "FZ".	See "Stops after running a while" of Troubleshooting on page 41.			

Symptom		Possible Cause		Remedy
		Checking Area	Cause	
Stops immediately after starting	Control panel display normally.	1. Fan on-off relay on the relay board.	Open circuit or insufficient contact.	Replace relay board.
		2. Fan HI/LO change relay on the relay board.	Open circuit or insufficient contact.	Replace relay board.
		3. Fan motor insulation resistance.	Insulation failure on fan motor.	Replace fan motor.
		4. Compressor relay.	Open circuit or insufficient contact.	Replace compressor relay.
		5. Compressor relay on the relay board.	Open circuit or insufficient contact.	Replace relay board.
		6. Compressor insulation resistance.	Insulation failure on compressor.	Replace compressor.
		7. Reverse phase protector.	Open circuit or insufficient contact.	Replace reverse phase protector.
Stops after running a while	Control panel display normally.	1. Temperature of fan motor (abnormally high).	Operation of safety device (IOLF) due to fan motor malfunction.	Replace fan motor.
		2. Temperature of compressor (abnormally high).	Operation of safety device (IOLC) due to compressor malfunction.	Replace compressor.
		3. Refrigerant leakage.	Insufficient refrigerant or gas leakage.	Repair and charge refrigerant.
		4. Dirt on evaporator or condenser.	Insufficient cooling of evaporator or condenser.	Clean evaporator or condenser.
		5. Duct connection state.	Improper connection.	Repair duct connection.

(3) Overflow of drain water

Symptom		Possible Cause		Remedy
		Checking Area	Cause	
Overflow from the unit.		1. Drain pan.	Cracks in drain pan.	Check and repair.
		2. Water level in drain pan.	Clogged drain hose.	Check and replace.
		3. Drain hole.	Reversed air flow from drain hole.	Insert a trap on 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.

< NOTE >

Internal dry-type distribution transformer may produce a humming noise up to 31 dB (A) at maximum operated voltage (506 V) during stand-by state.

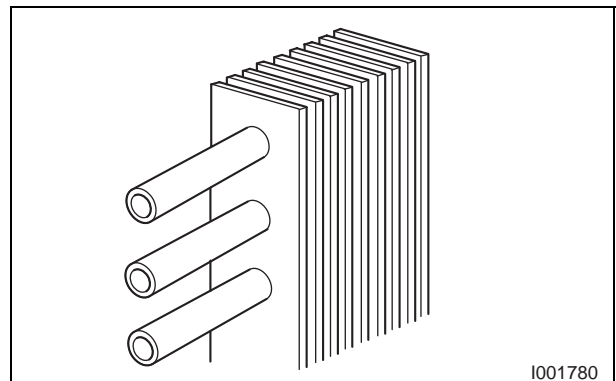
Symptom	Possible Cause		Remedy
	Checking Area	Cause	
Abnormal noise or vibration.	1. Fan.	Fan interference.	Repair interfering section.
		Fan deformation.	Replace fan.
	2. Compressor fixing nuts.	Looseness of nuts.	Tighten nuts further.
	3. Transformer fixing nuts.	Looseness of nuts.	Tighten nuts further.
	4. Piping.	Pipe interference.	Repair interfering section.
	5. Panel fixing screws.	Looseness of screws.	Tighten screws further.

7.4 Basic Inspection

- Perform the following inspection 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.

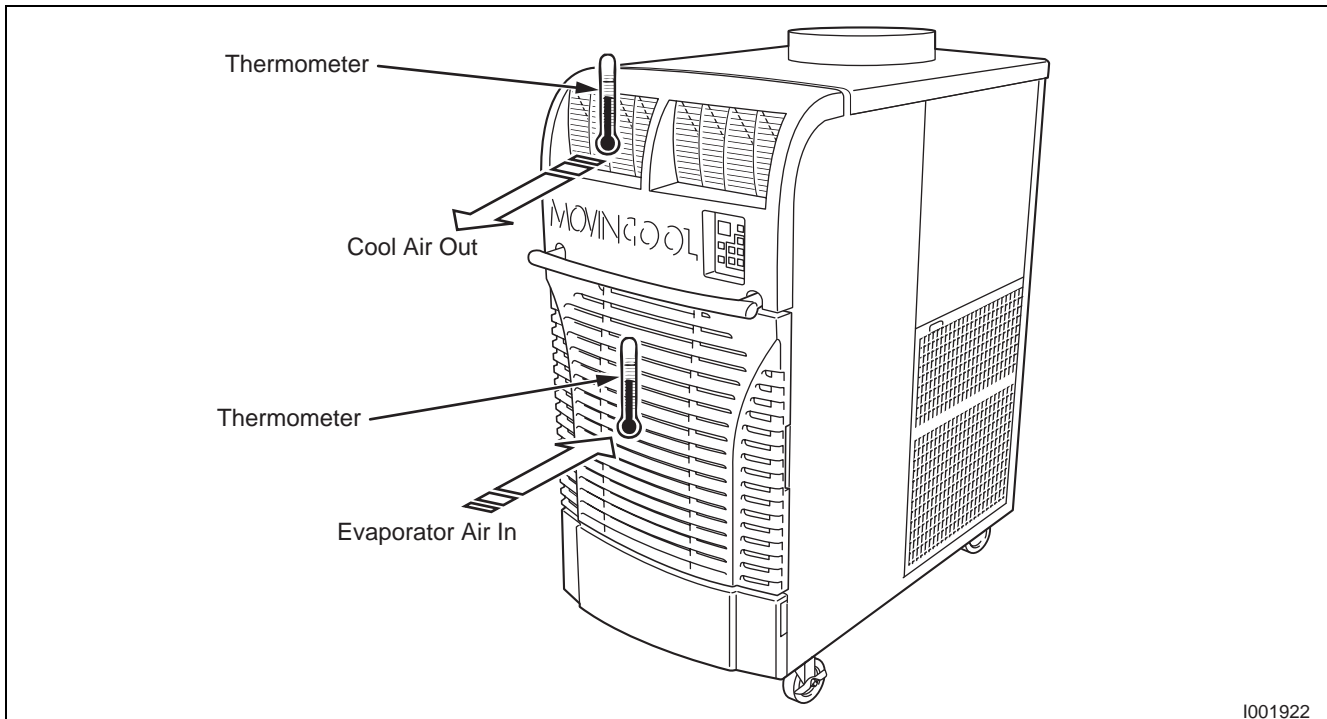


(2) Examination of operating environment

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

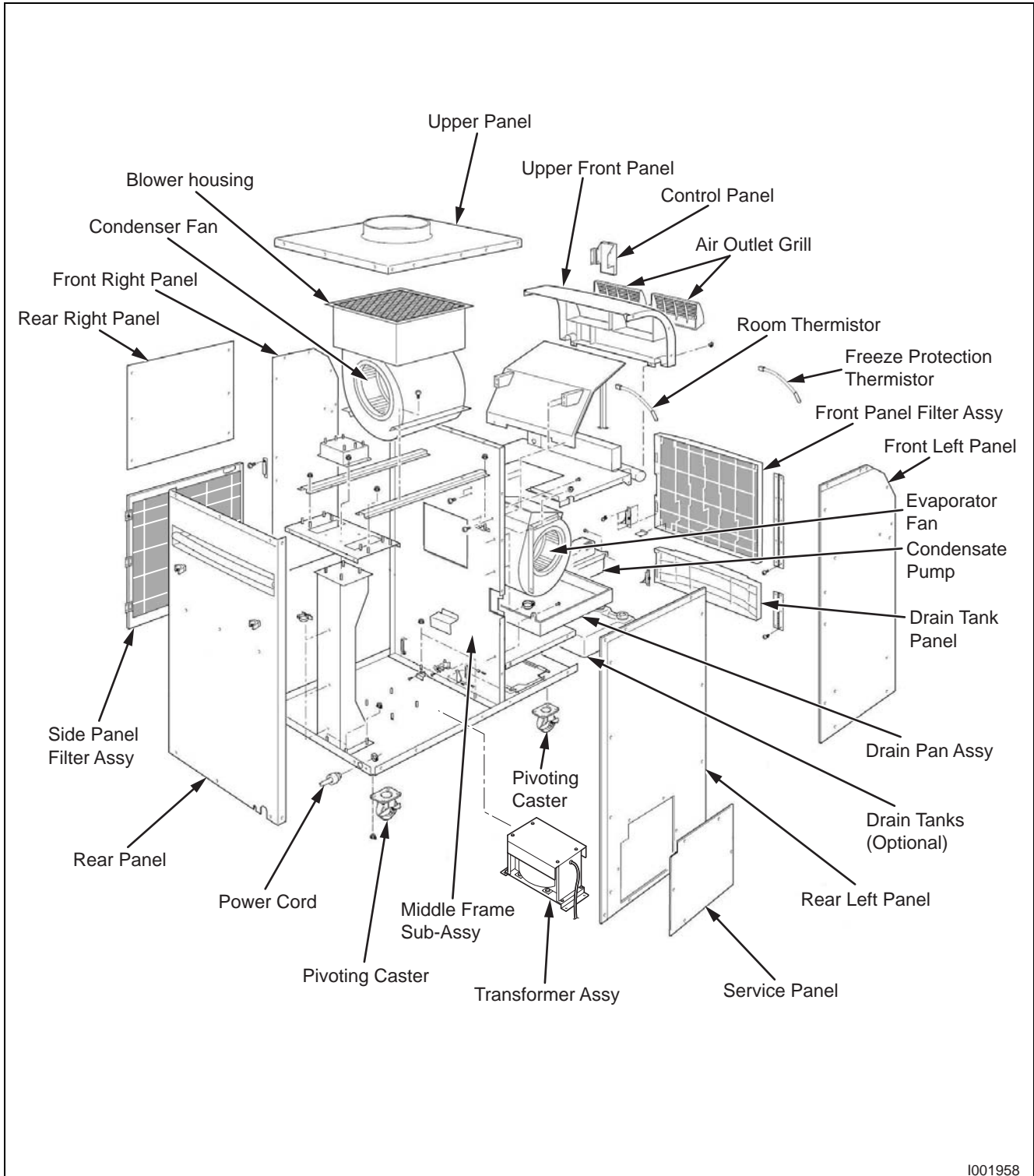
(3) Inspection of cooling capacity performance

- Measure the difference in temperature between the inlet of the evaporator and the cool air vent. If the difference is out of the range given in the graphs on page 15, proceed with the remedy suggested in the troubleshooting chart on page 37 to 42.

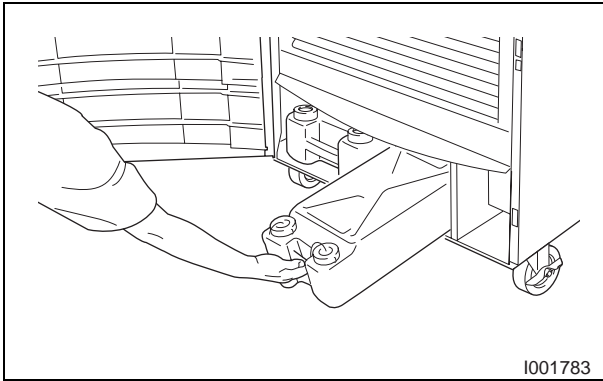


8. DISASSEMBLY

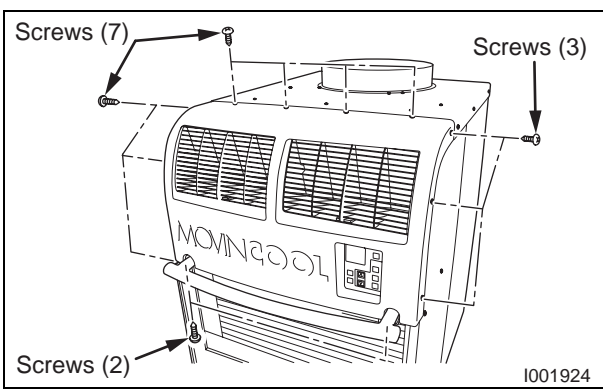
8.1 Parts Construction



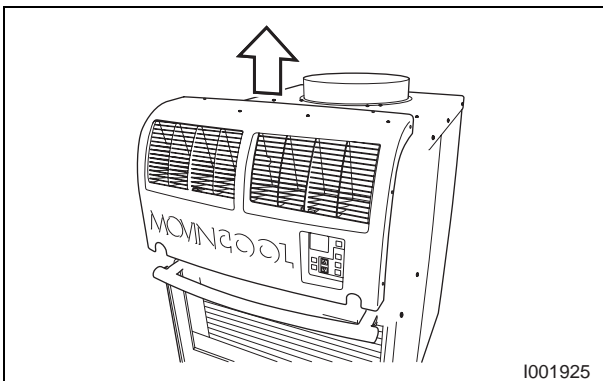
8.2 Disassembly



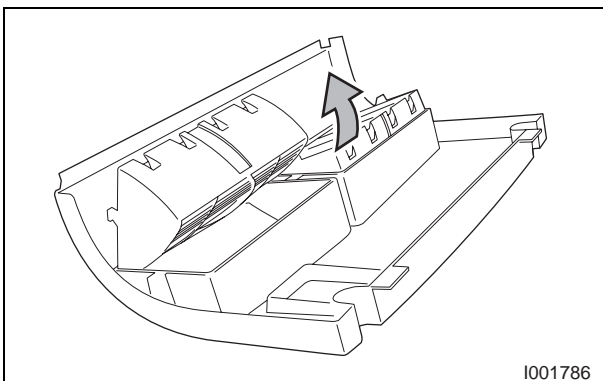
1) Remove drain tanks (optional).



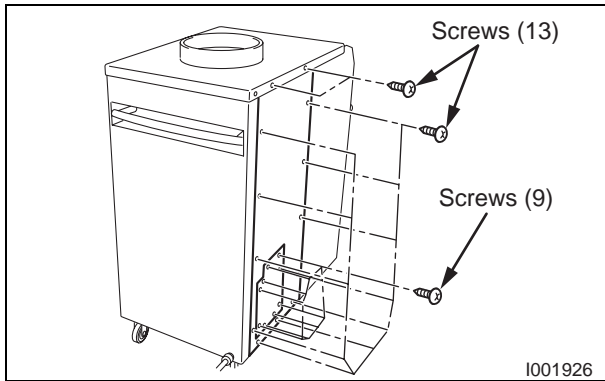
2) Remove twelve (12) screws from upper front panel.



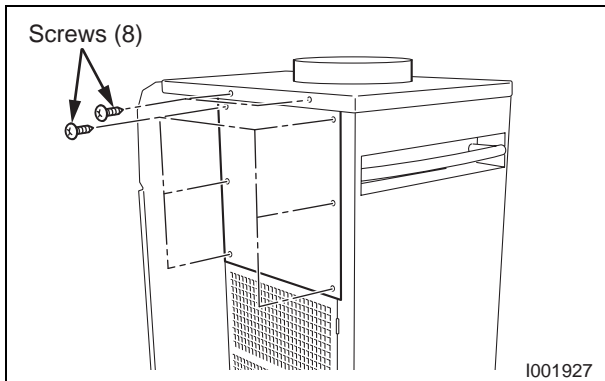
3) Slide upper front panel forward and remove.



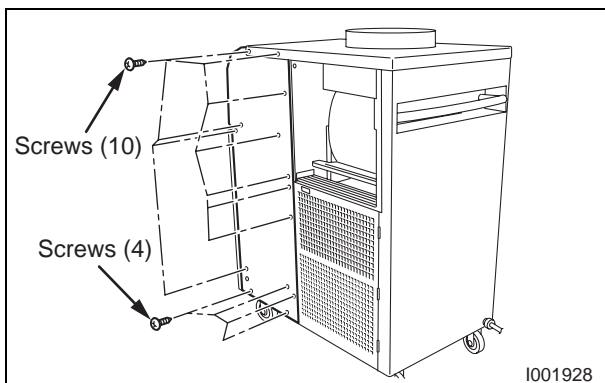
4) Louver can be removed from upper front panel by unsnapping the lock tap and removing the louver from its pivots.



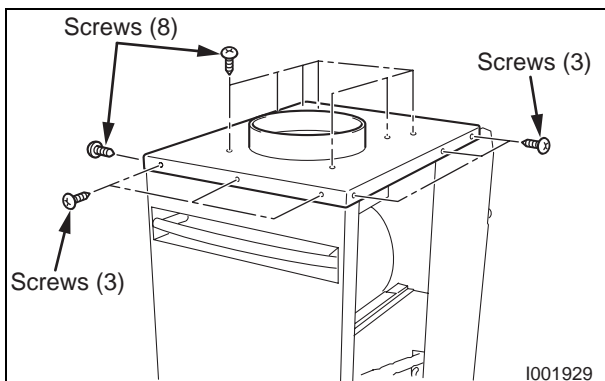
- 5)** Remove nine (9) screws from service panel and thirteen (13) screws from rear left panel.



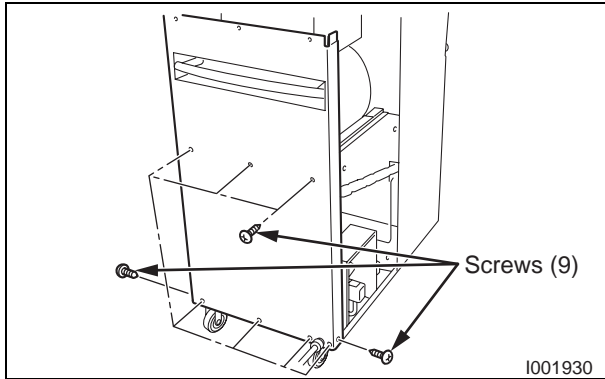
- 6)** Remove eight (8) screws from rear right panel.



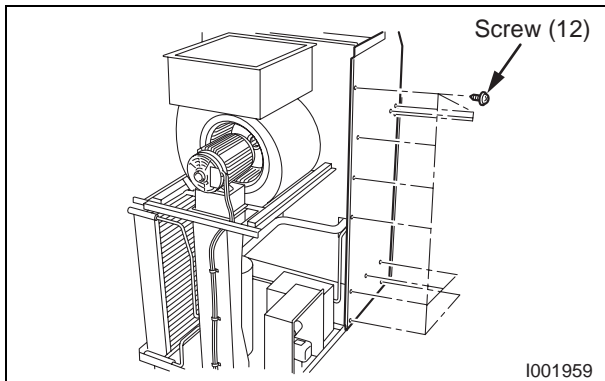
- 7)** Remove fourteen (14) screws from front right panel.



- 8)** Remove fourteen (14) screws from upper panel.



9) Remove nine (9) screws from rear panel.

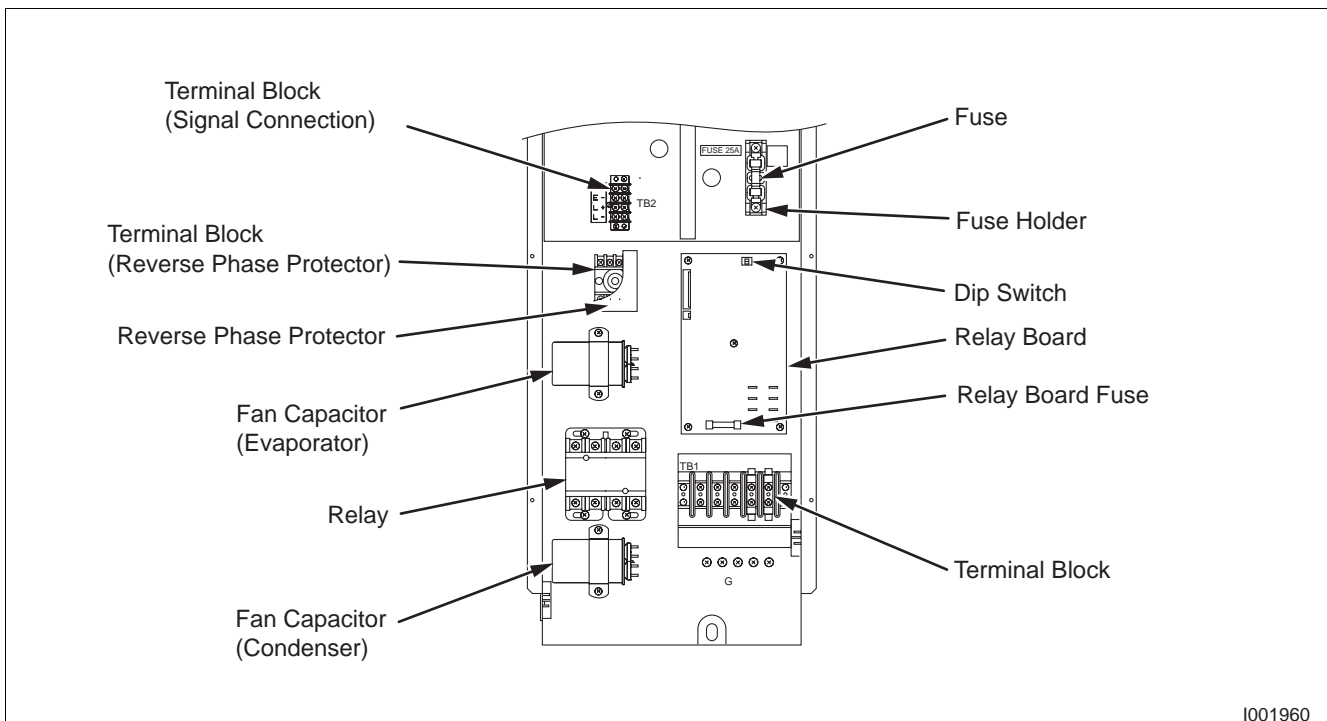


10) Remove twelve (12) screws from front left panel.

8.3 Removal of Electrical Parts

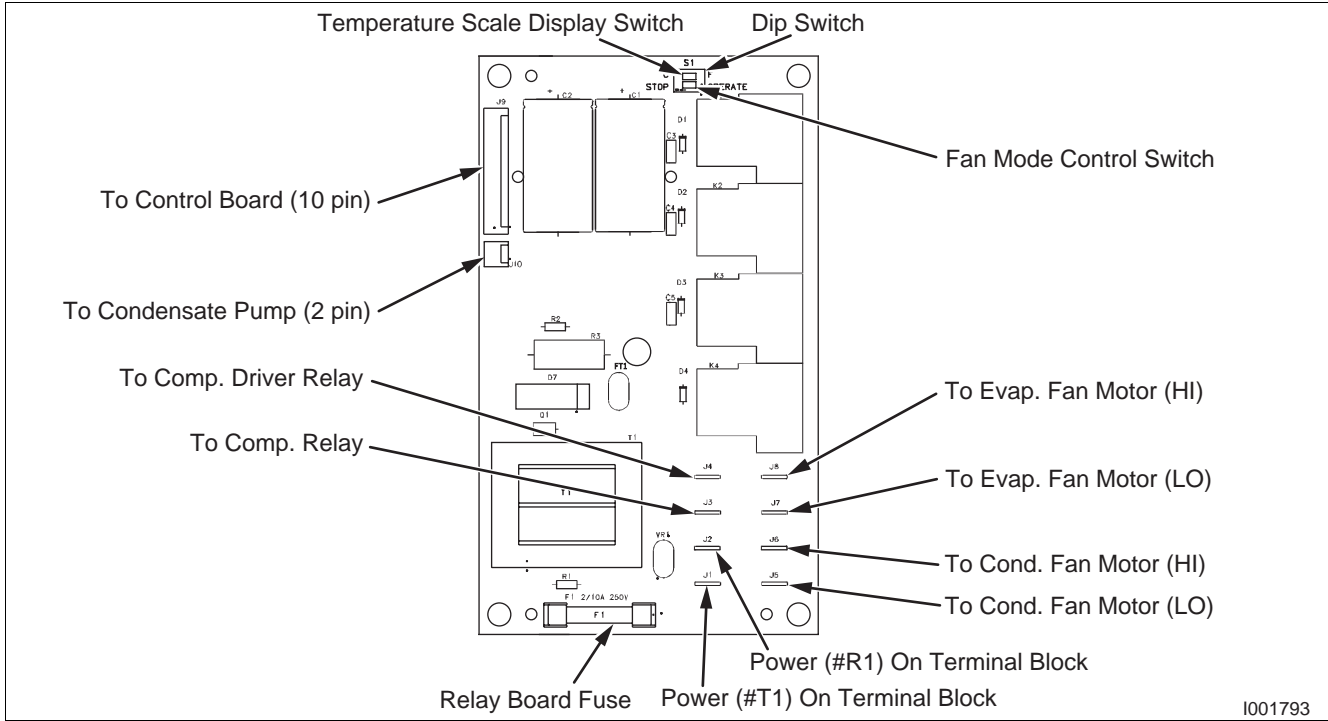
(1) Control box

- 1) Remove nine (9) screws from service panel. (See page 46.)
- 2) Remove electrical parts.
 - Relay: Remove four (4) screws from control box.
 - Reverse phase protector: Pull out reverse phase protector from terminal block.
 - Terminal block: Remove four (4) screws from control box.
 - Terminal block (signal connection): Remove two (2) screws from control box.
 - Terminal block (reverse phase protector): Remove two (2) screws from control box.
 - Capacitor: Remove two (2) screws from control box.
 - Fuse holder : Remove one (1) screw form control box.



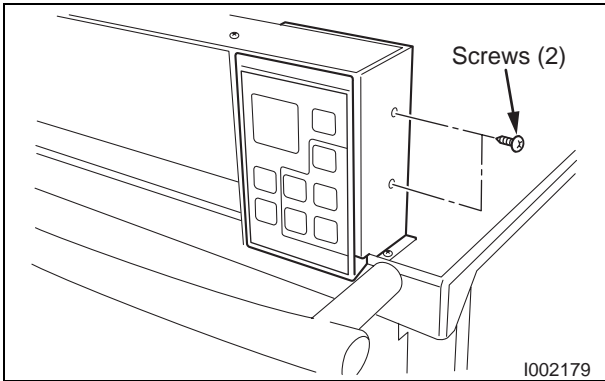
(2) Relay board

- 1) Remove nine (9) screws from service panel. (See page 46.)
- 2) Disconnect ten (10) connectors, and remove five (5) screws from relay board.



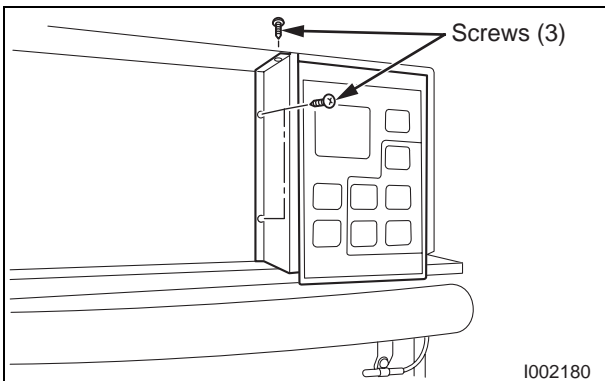
I001793

(3) Control board



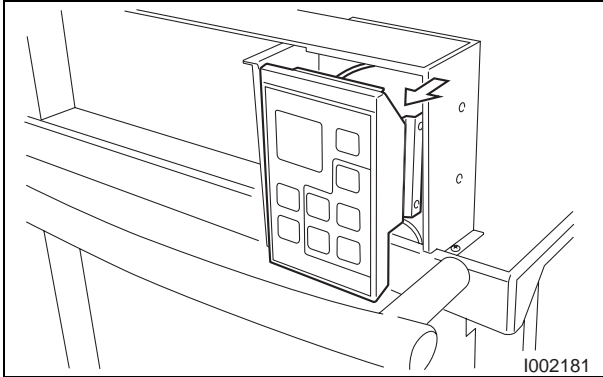
I002179

- 1) Remove two (2) screws from the control panel stay.

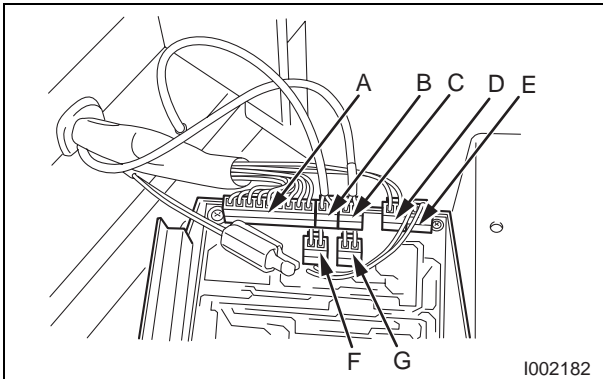


I002180

- 2) Remove three (3) screws from the control panel stay.



3) Slowly slide control panel assembly out of box.

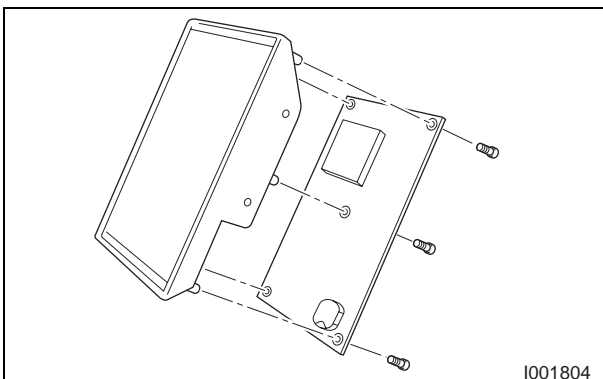


4) Disconnect the following connectors from the control board:

- (A) J201 (10-pin) Wire Harness, Relay Board to Control
- (B) J101 (2-pin) Room Temperature Thermistor
- (C) J102 (2-pin with black tape) Freeze Protection Thermistor
- (D) J103 (2-pin) Drain Tank Switch
- (E) J104 (2-pin) High Pressure Switch
- (F) J106 (2-pin) Output signal terminal
- (G) J108 (2-pin) Input signal terminal

< NOTE >

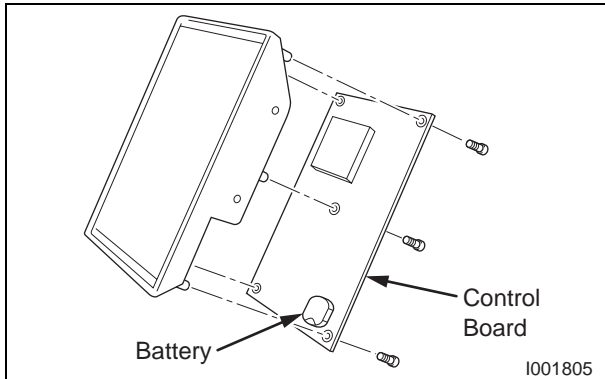
Mark each of the 2-pin connectors with a different color marker to ensure the correct orientation when they are reconnected or label all wire sets with tape. Numbering the wire sets from (A) through (G).



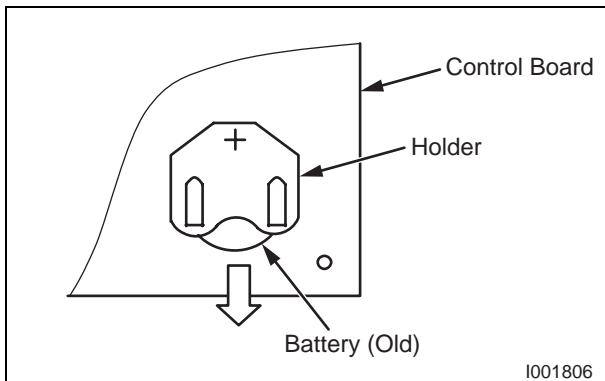
5) Remove the five (5) screws from the control board on the control panel assembly. Remove the control board.

(4) Battery replacement of control board

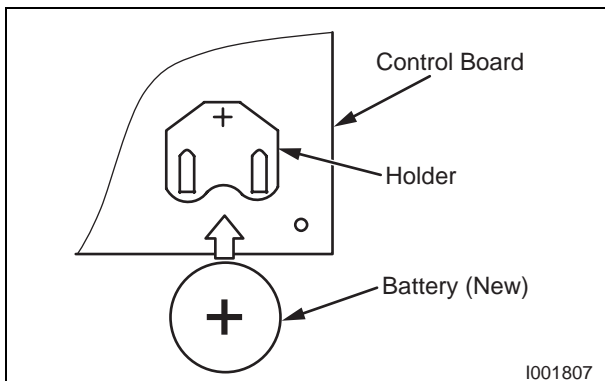
- When the power is unplugged from the unit, and control board is automatically resetting clock and program, it is time to change the battery on the control board to avoid resetting of clock and program.



- 1) Disassemble control board. (See page 49 and 50.)



- 2) See diagram for battery removal.



- 3) Insert new battery securely in the direction shown in the drawing.

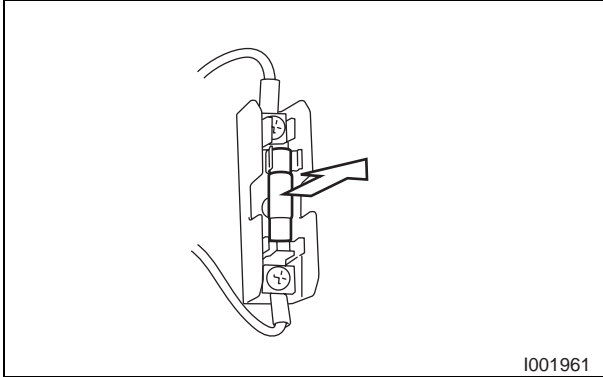
Specifications:

- Type: 3 V CR2450 or equivalent

CAUTION

When inserting the battery, make sure the direction of polarity (plus/minus) is correct (as shown).

(5) Fuse Replacement of Control Box



- 1) See diagram for fuse removal.
- 2) Insert new fuse securely.

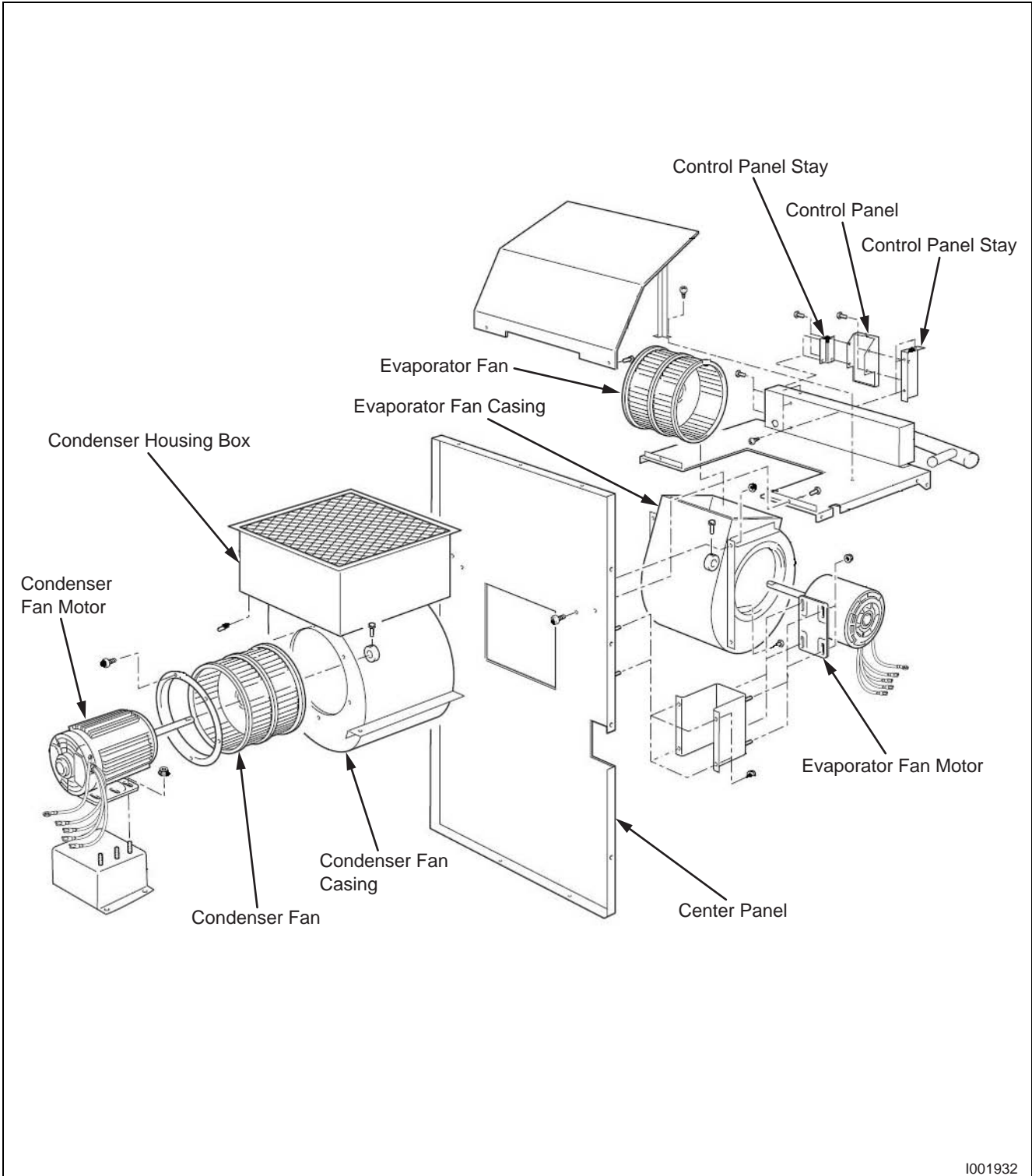
Specifications:

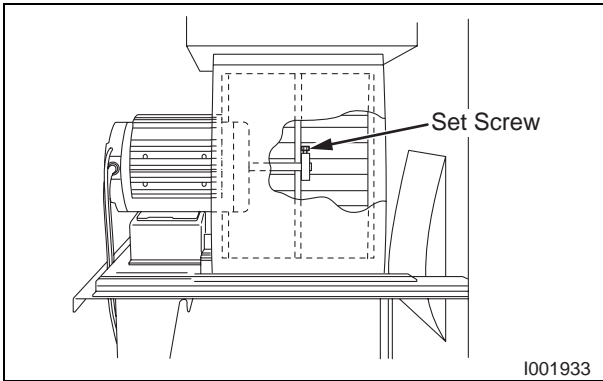
- Time delay type
- Class cc
- Rated volt: 600 V
- Rated current: 15 A
- UL listed

! WARNING

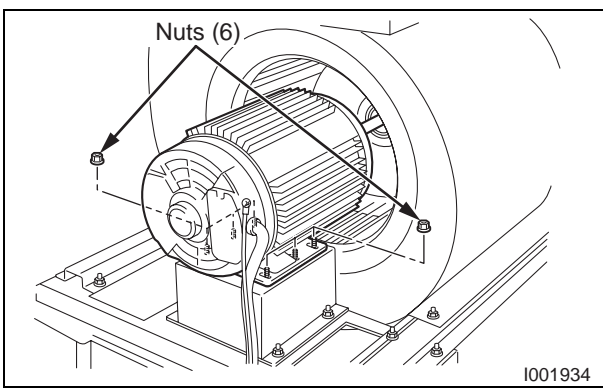
Disconnect power before remove fuse.

8.4 Removal of Blower Assembly

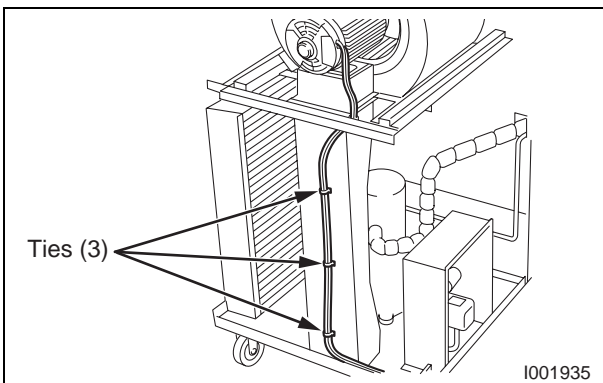


(1) Removal of condenser fan and fan motor

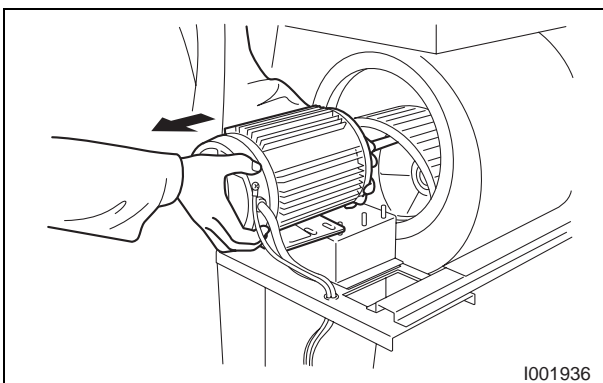
1) Loosen the set screw using a hex key.



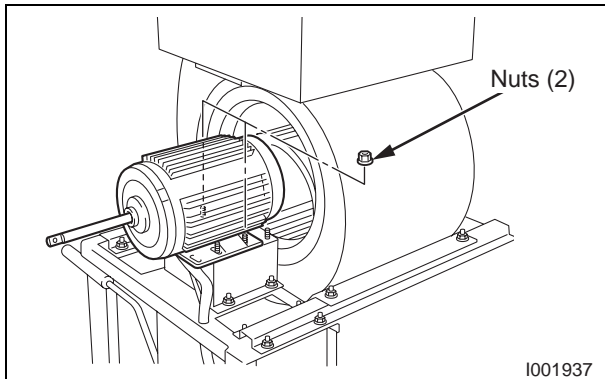
2) Remove six (6) nuts in the location shown.



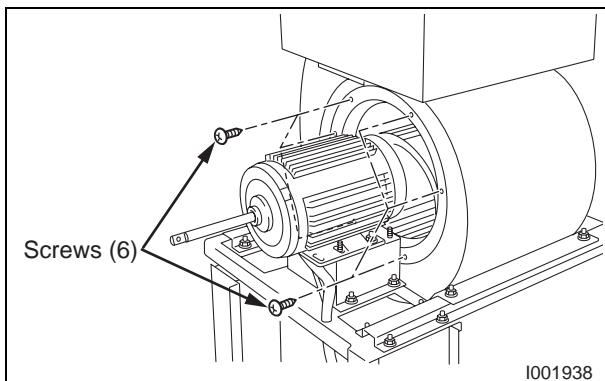
3) Remove fan motor wire from three (3) ties.



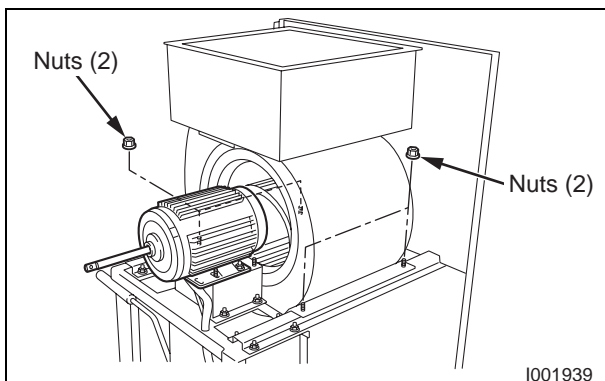
4) Lift fan motor up then pull rear motor backward and remove the fan motor. Centrifugal fan drops into condenser fan housing.



- 5) Turn the fan motor around and place on mounting bracket. Secure condenser fan motor with two (2) nuts.

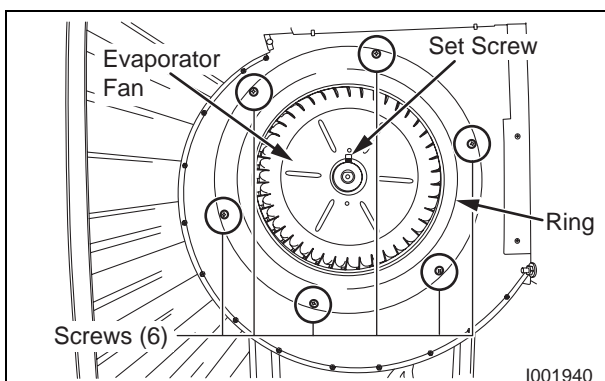


- 6) Remove six (6) screws from ring.

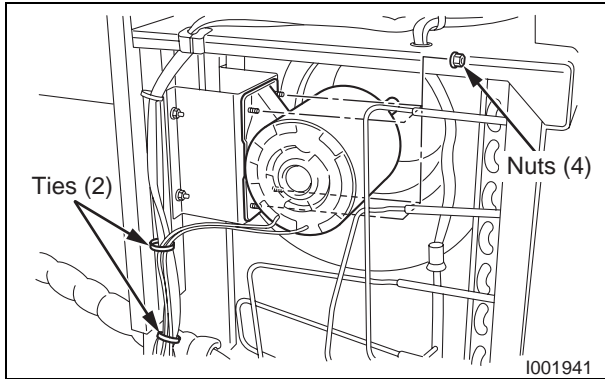


- 7) Loosen four (4) nuts that are securing the fan casing. Lift the enclosure off its mounting. Slide the condenser fan out through opening.

(2) Removal of evaporator fan and fan motor

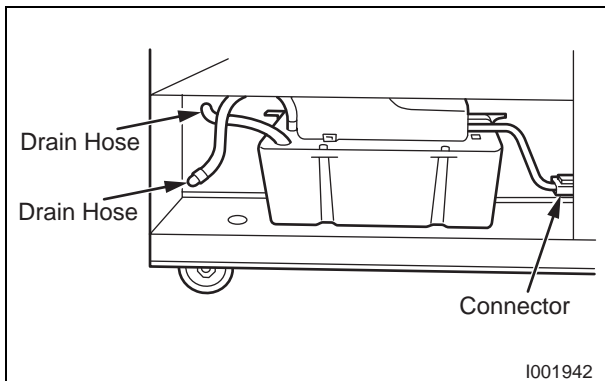


- 1) Loosen the set screw using a hex key. Then remove six (6) screws on the ring. Then remove this ring and evaporator fan.

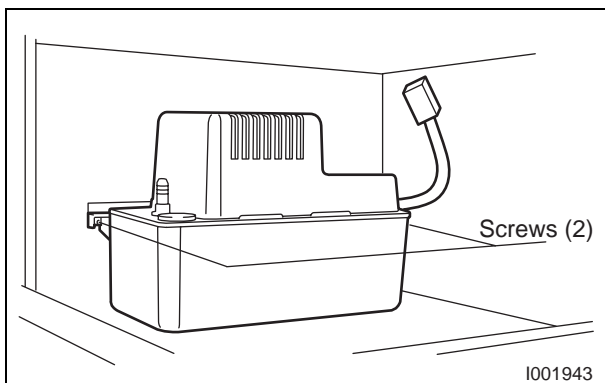


- 2) Remove evaporator fan motor wire and two (2) ties. Remove four (4) nuts from housing while holding fan securely with one hand. Then remove evaporator fan motor.

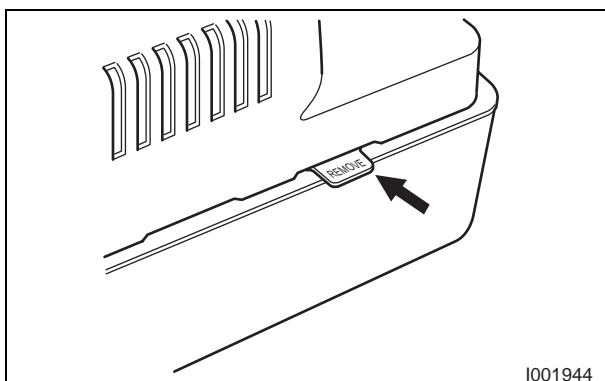
8.5 Removal of Condensate Pump



- 1) Remove fourteen (14) screws from front right panel. (See page 46)
- 2) Remove the two (2) drain hoses.
- 3) Disconnect condensate pump connector.

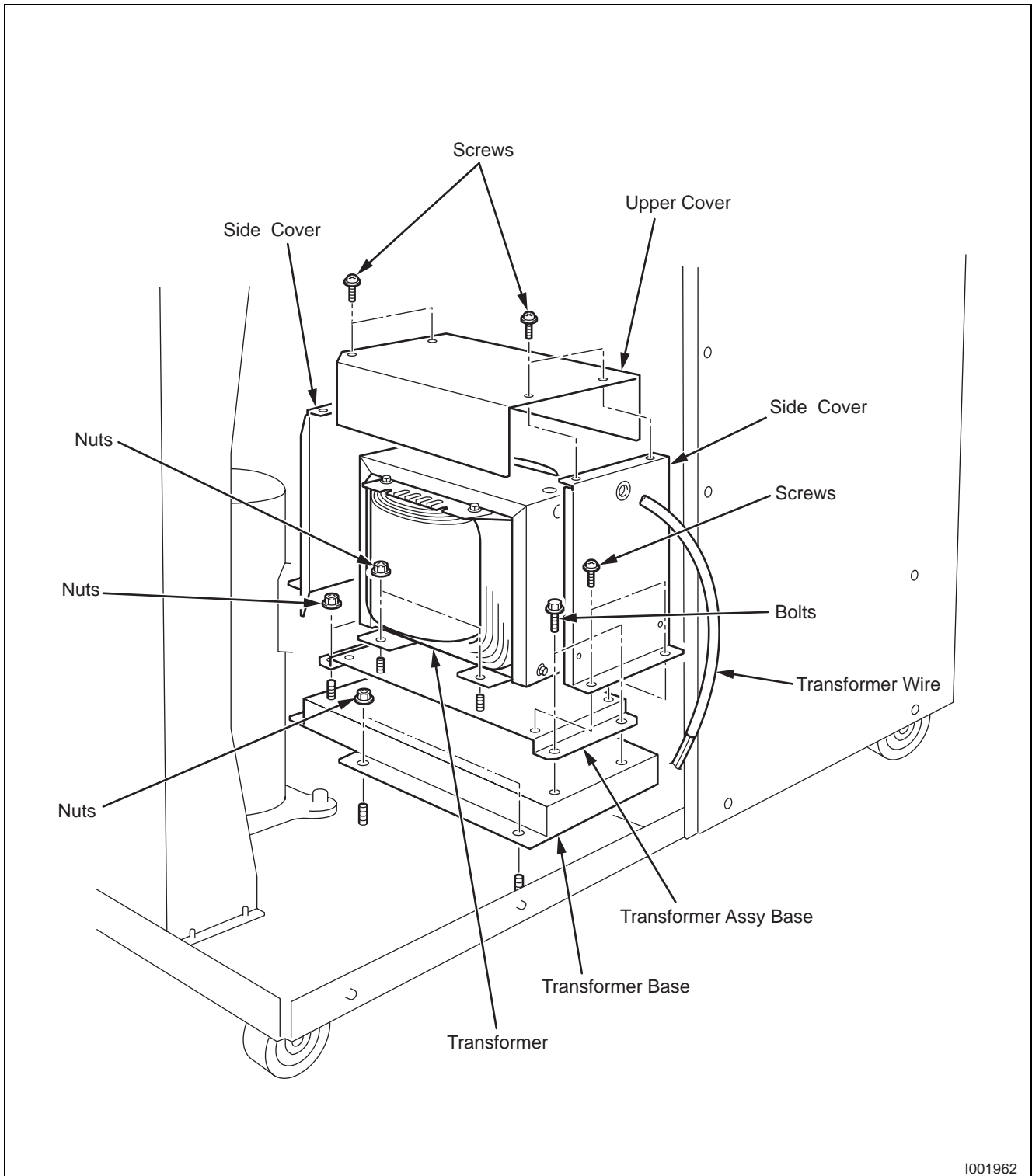


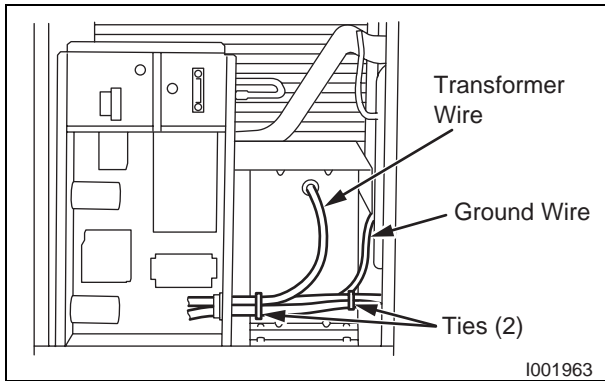
- 4) Remove two (2) screws from condensate pump.



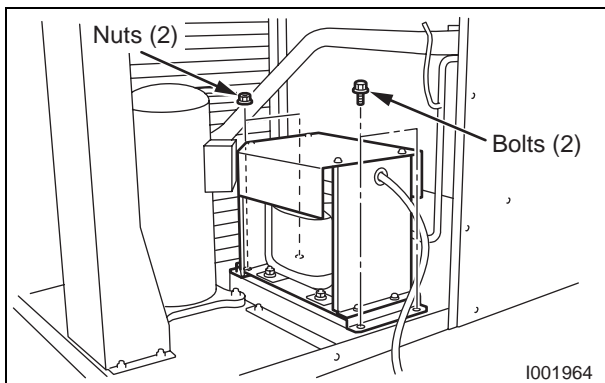
- 5) Remove tab from condensate pump.

8.6 Removal of Transformer

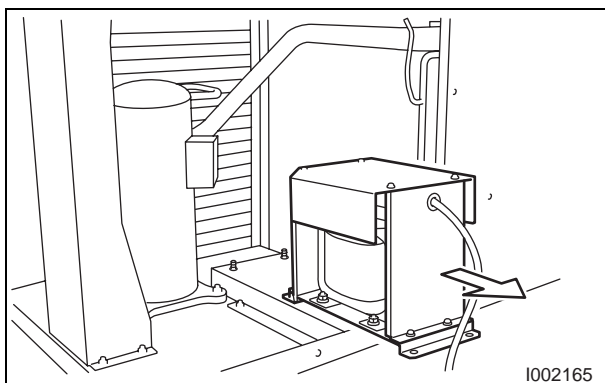




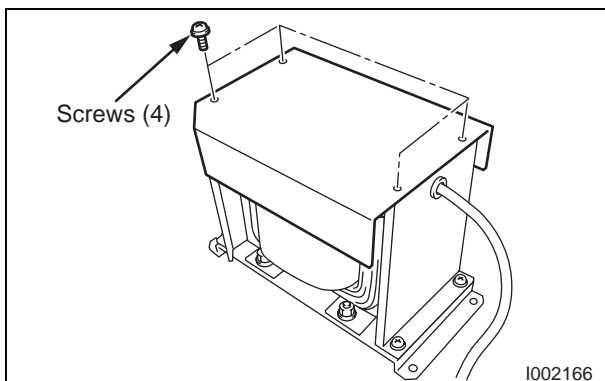
- 1) Remove the transformer wires and pipe connect ground wire. Then remove two (2) ties.



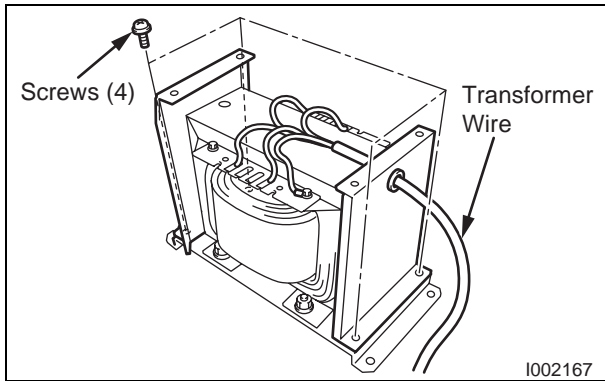
- 2) Remove two (2) bolts and two (2) nuts from transformer assemble frame.



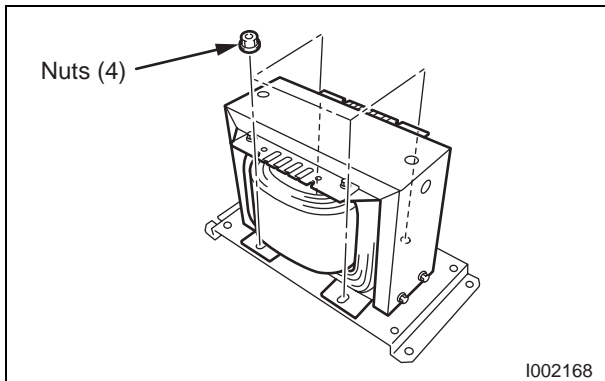
- 3) Slide the transformer assembly out of the unit and remove.



- 4) Remove four (4) screws from transformer upper cover.



- 5)** Remove four (4) screws from transformer side covers. Then remove transformer wire.

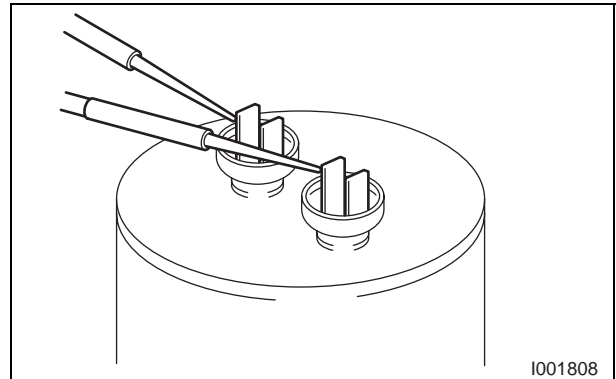


- 6)** Remove four (4) nuts from transformer.

8.7 Inspection of Capacitor (for Fan Motor and Compressor)

(1) Ohmmeter 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

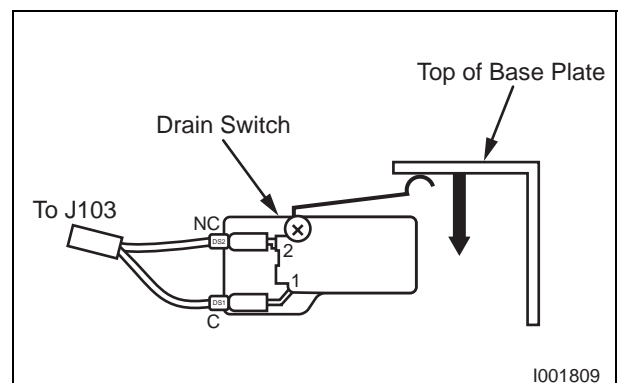
- Using a capacitance tester and the chart on page 23, test the capacitor for the value indicated. If the value tested is not within 10 % of indicated capacitance, replace the capacitor.

⚠ 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.**

8.8 Inspection of Drain Switch

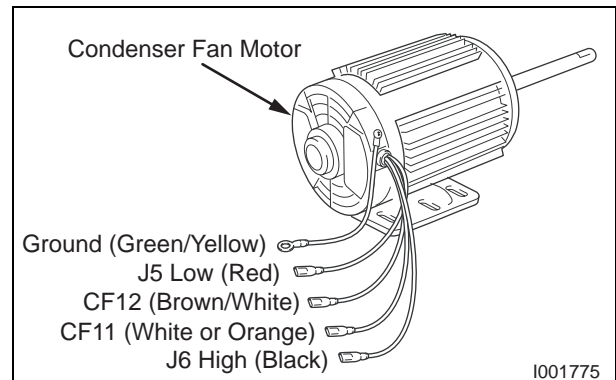
- Check for continuity between terminals 1 and 2 when drain switch is pressed. With drain switch depressed, there is no continuity between terminals 1 and 2. Replace drain switch if continuity does not satisfy the above condition.



8.9 Inspection of Fan Motor

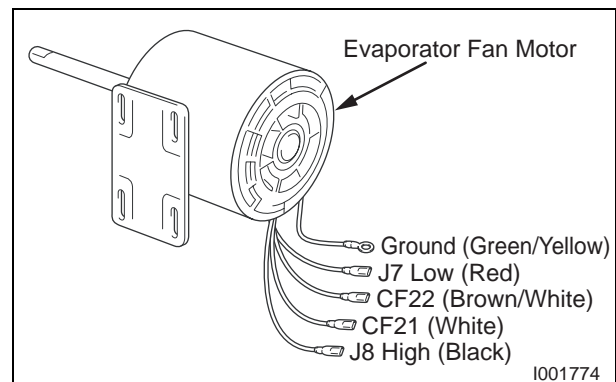
(1) Condenser fan motor

- Measure resistance across the terminals of the fan motor. (All terminals must be disconnected from the unit.)
- Between terminals (at 77 °F (25 °C))
 - J6-CF11 Approx. 3.5 ohm
 - J6-CF12 Approx. 6.0 ohm
 - CF11-CF12 Approx. 9.1 ohm
- If the measured resistance is not equal to these standard values, replace the fan motor.



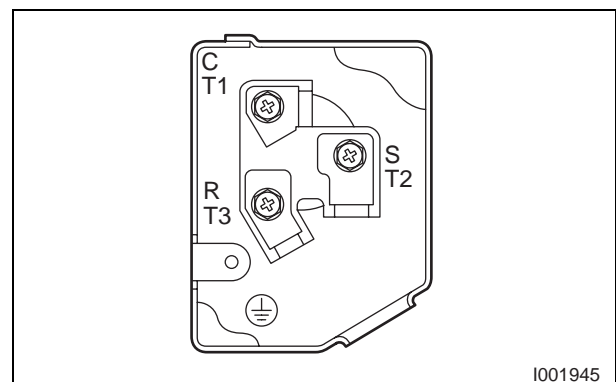
(2) Evaporator fan motor

- Measure resistance across the terminals of the fan motor. (All terminals must be disconnected from the unit.)
- Between terminals (at 77 °F (25 °C))
 - J8-CF21 Approx. 7.6 ohm
 - J8-CF22 Approx. 10.4 ohm
 - CF21-CF22 Approx. 17.7 ohm
- If the measured resistance is not equal to these standard values, replace the fan motor.



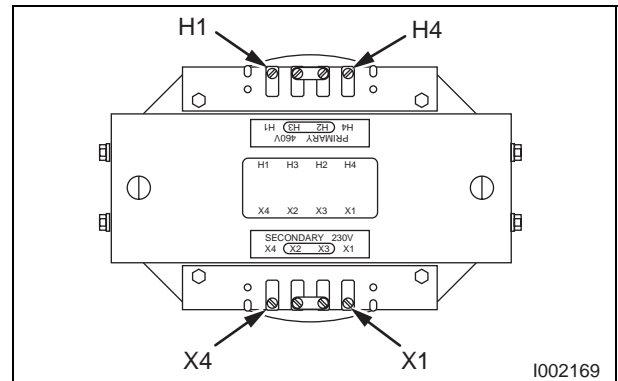
8.10 Inspection of Compressor Motor

- Measure resistance across the terminals of the compressor motor. (All terminals must be disconnected from the unit.)
- Between terminals (at 77 °F (25 °C))
 - R-C Approx. 0.4 ohm
 - C-S Approx. 0.6 ohm
 - S-R Approx. 0.9 ohm
- If the measured resistance is not equal to these standard values, replace the compressor. The overload relay is internal to the compressor.



8.11 Inspection of Transformer

- Measure resistance across the terminals of the transformer.
(All terminals must be disconnected from the unit.)
- Between terminals (at 77 °F (25 °C))
 - H1-H4 Approx. 0.3 ohm
 - X1-X4 Approx. 0.3 ohm
 - X1-H4 Approx. Open
- If the measured resistance is not equal to these standard values, replace the transformer.



8.12 Inspection of Wiring Connection

- Refer to the Wiring Diagrams on page 19 and check for connection of each wire.

8.13 Inspection of Thermistor

- Using an Ohm-meter, check the resistance value across the 2-pin connector. At normal temperature (77 °F (25 °C)) either thermistor (room or freeze) should measure approximately 10 k ohm.

8.14 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) Inspection of clogged system

- Check the component parts of the refrigerant system, including piping, that could be clogged with refrigerant. If clogged with refrigerant, only the clogged part is frosted partially. In such a case, change the part in question.

(2) Inspection of refrigerant leak

- Carefully check all connections, and each component for leaks whenever the refrigerant system is installed or repaired. Use an electronic gas leak tester to inspect the system.

(3) Insufficient refrigerant

- In case the unit is judged to be deficient in cooling capacity, make sure to perform the inspections in 64. 9.1 (1) and 64. 9.1 (2) to confirm the cause of trouble. Then, charge the system with refrigerant to the specified amount.

9. REFRIGERANT SYSTEM REPAIR

9.1 Repair of Refrigerant System

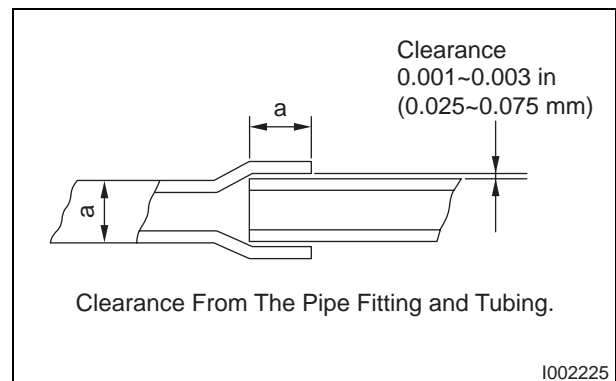
- In case there is a leak, obstruction, or trouble in the refrigerant system of the Office Pro 63, replace or repair the part in question. After replacing any component all connections must be brazed.

(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.



(3) Cleaning brazing filler metal and pipe

- When the refrigerant 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

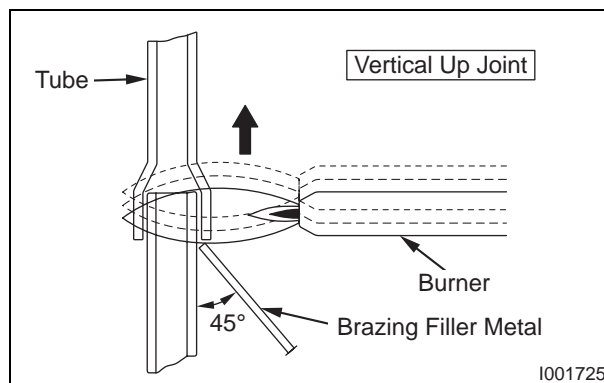
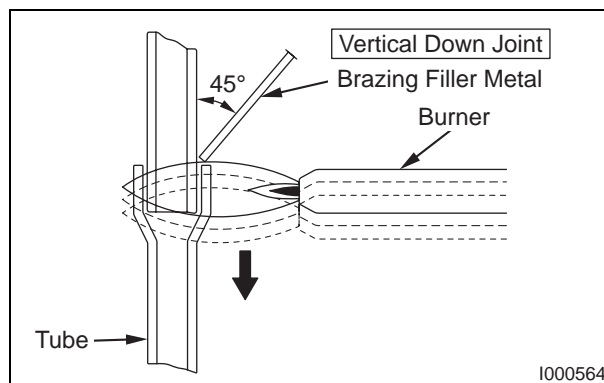
- During brazing, the inside of the pipe undergoes an oxidative reaction due to the brazing flame. Introduce dry nitrogen gas (0.27 gal/min (1 L/min); adjust with the flow regulator) through the pinch-off tube of the refrigerant.

< NOTE >

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

(5) Vertical Joint

- 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 Cycle Components

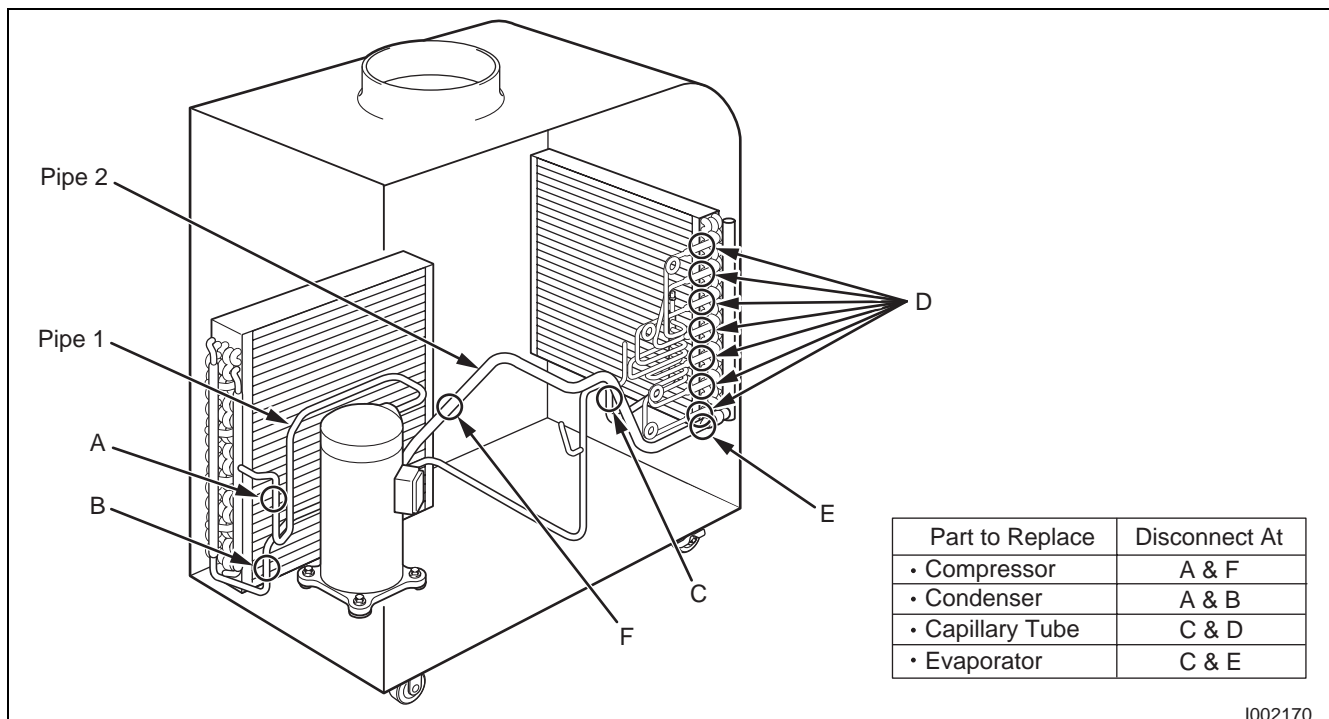
⚠ CAUTION

- Before any refrigeration cycle component can be replaced, it is necessary to recover the refrigerant using standard recovery procedures and equipment.
- 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, etc., to protect them from the flame.

- Evaporator
- Capillary tube
- Condenser
- Compressor
- High Pressure Switch

< NOTE >

When replacement of the compressor, attach the two pipes (Pipe 1, Pipe 2) which are packaged in Compressor Assy as following figure.

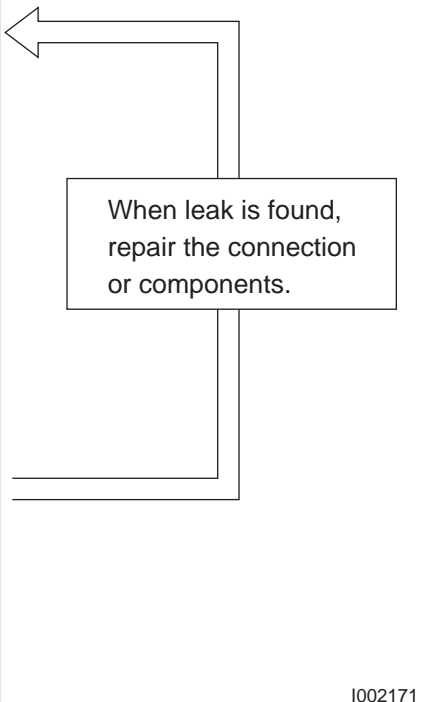


9.3 Charging the System with R-410A Refrigerant

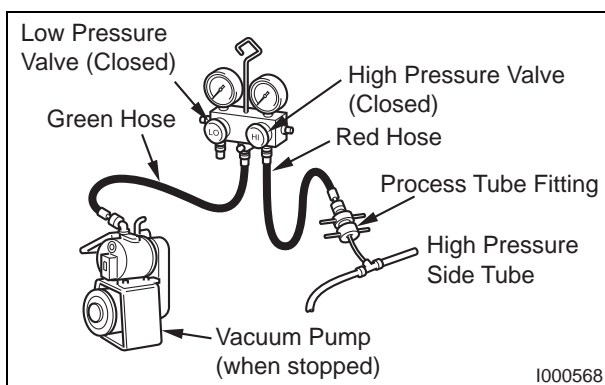
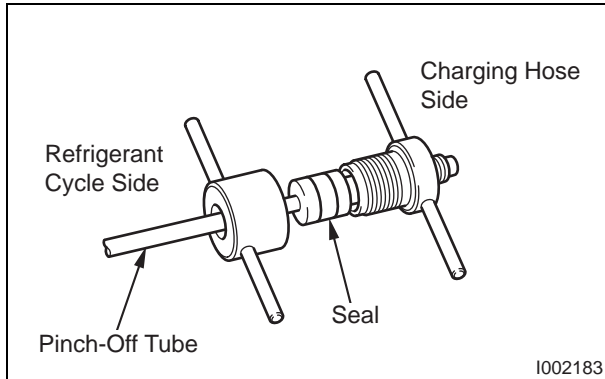
- Always ensure that the refrigerant system has been properly evacuated before charging with the specified amount of R-410A.
- Equipments is only for R-410A.
- Liquid charge (no gas charge).
- Make sure not to use more than 90 % of the initial weight of R-410A in the cylinder.

⚠ WARNING

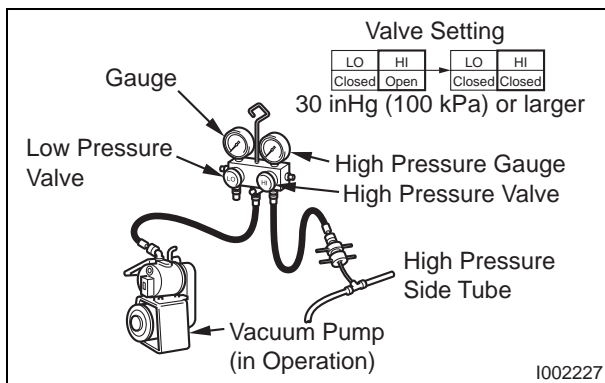
- **When handling refrigerant (R-410A), the following precautions should always be observed:**
 - Always wear proper eye protection while handling refrigerant.
 - Maintain the temperature of the refrigerant container below 104 °F (40 °C).
 - Perform repairs in a properly ventilated area. (Never in an 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. <ul style="list-style-type: none"> • 15 min or more. • 30 inHg (100 kPa) or more of vacuum. 2) Stop evacuating the system. <ul style="list-style-type: none"> • Leave for 5 min. 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. <ul style="list-style-type: none"> • See specifications on page 13. 	
Step 6	Remove manifold gauge.	

(1) Connection of gauge manifold



(2) Evacuation



- 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.

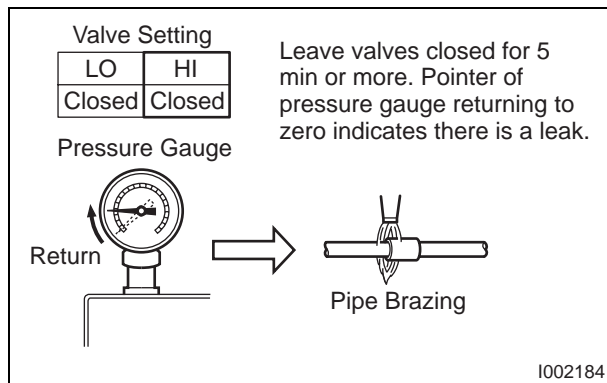
< NOTE >

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.

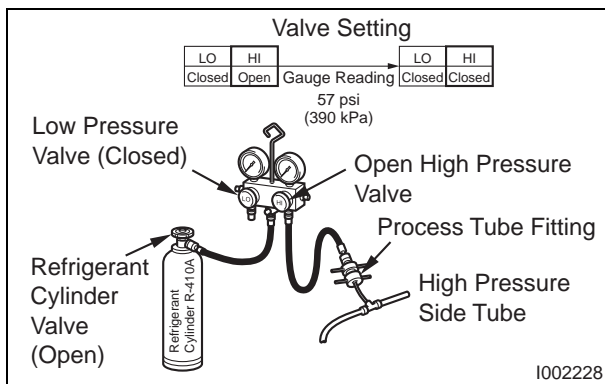
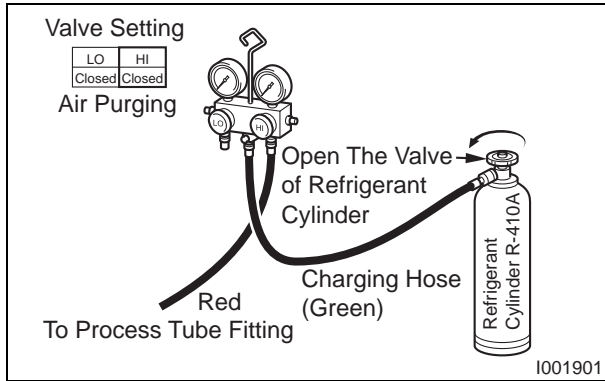
- 1) Open the high pressure valve (HI) of the gauge manifold.
- 2) Turn on the vacuum pump to start evacuation. (Evacuate the system for approximately 15 min.)
- 3) When the low pressure gauge indicates 30 inHg (100 kPa) or larger, turn off the vacuum pump and close the high pressure valves of the gauge manifold.

(3) Checking vacuum



- 1) Leave the high pressure valve and the low pressure valve of the gauge manifold closed for five min 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 leak check according to procedure indicated in the next step. Once leak has been found and repaired evacuate the system once more, and confirm system holds vacuum.

(4) Checking gas leak



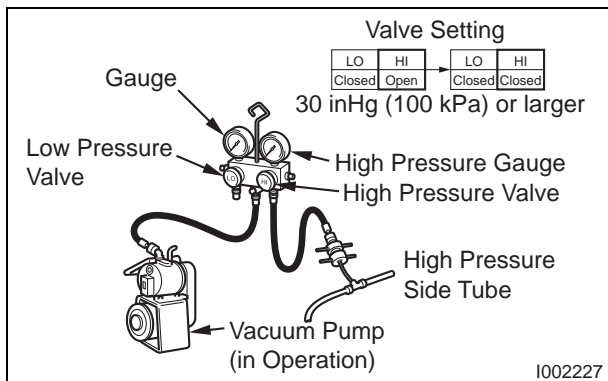
- 1) Remove the charging hose (green) from the vacuum pump, and connect the hose to the refrigerant cylinder (R-410A).
- 2) Loosen the nut on the gauge manifold side of the charging hose (green).
- 3) Open the valve of refrigerant cylinder perform air purging in the charging hose (green). Then tighten the nut.
- 4) Open the high pressure valve of the gauge manifold. Charge the system with refrigerant until the low pressure gauge indicates 57 psi (390 kPa). After charging is complete, close the high pressure valve.
- 5) Open the valve of refrigerant cylinder perform air purging in the charging hose (green). Then tighten the nut.
- 6) Check carefully for gas leaks inside the refrigerant system using the gas leak tester.
- 7) Repair any leak.

⚠ WARNING

Do not attempt any repair on a charged system.

⚠ WARNING

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

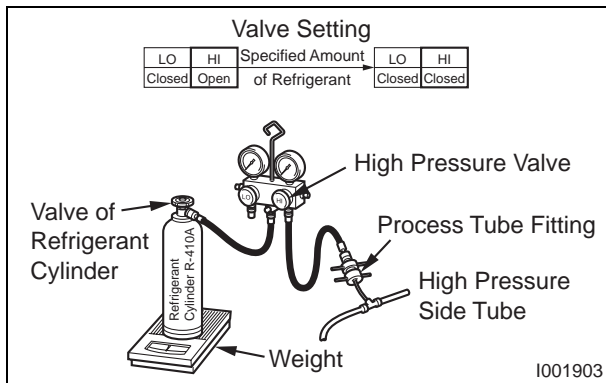
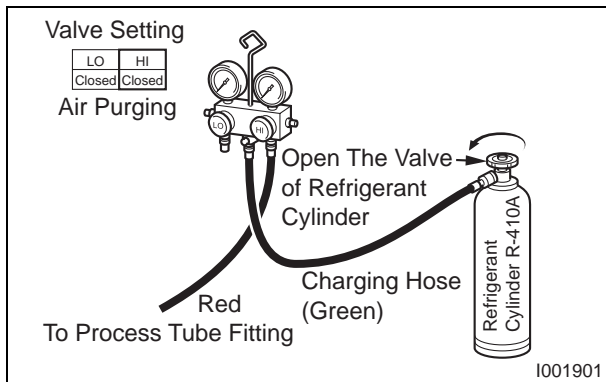
- 2) Using procedure in the "Evacuation", evacuate the system until the low pressure gauge indicates 30 inHg (100 kPa) or larger. (For 15 min or more.)
- 3) After evacuation is complete, close the high and the low pressure valves of the gauge manifold.

⚠ 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.

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).
- 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.

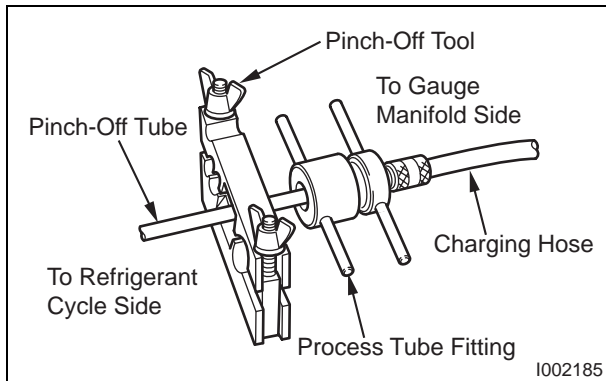
**Standard Amount of Refrigerant: 4.41 lb
(2.00 kg)**

⚠ 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.

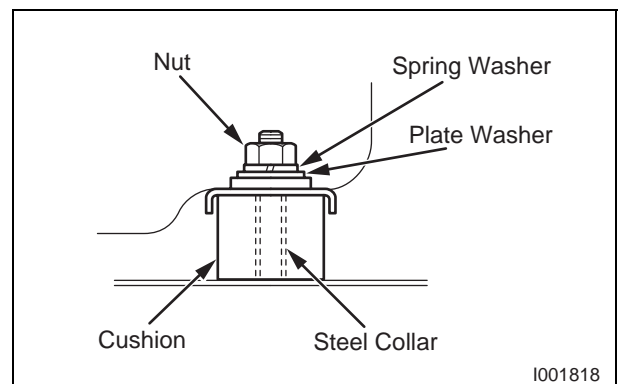
10. REASSEMBLY

10.1 Removal of Unit

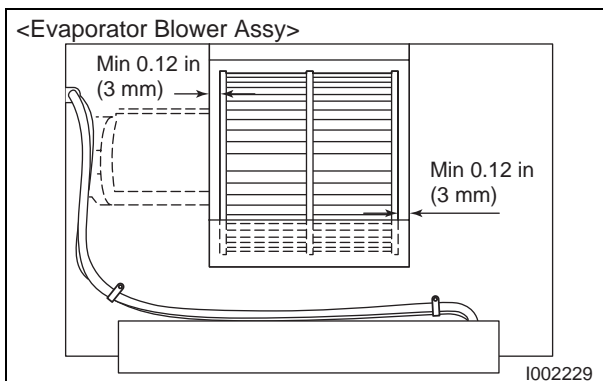
- Reassemble the unit in the reverse order of removal. Described below are the parts that require special care in reassembling the unit. Perform all wiring or rewiring as referenced in the wiring diagram.

10.2 Compressor Mounting

- Mount the compressor on the frame, using cushions, steel collars, spring washers, plate washers and nuts.



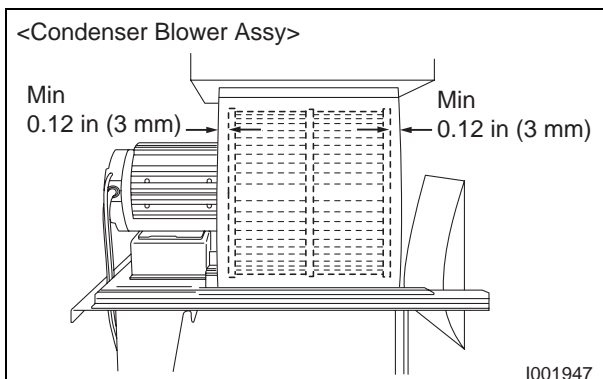
10.3 Blower Assembly



- 1) Install blower fan for evaporator. Allow a clearance of 0.12 in (3 mm) (minimum) on each side of the evaporator fan.

CAUTION

- Tightening torque:
- 10.84 ± 2.17 ft•lbf (15 ± 2.7 N•m)



- 2) Install blower fan for condenser. Allow a clearance of 0.12 in (3 mm) (minimum) on each side of the condenser fan.

CAUTION

- Tightening torque:
- 10.84 ± 2.17 ft•lbf (15 ± 2.7 N•m)

10.4 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.

10.5 Perform the Inspection

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

10.6 Caster Maintenance

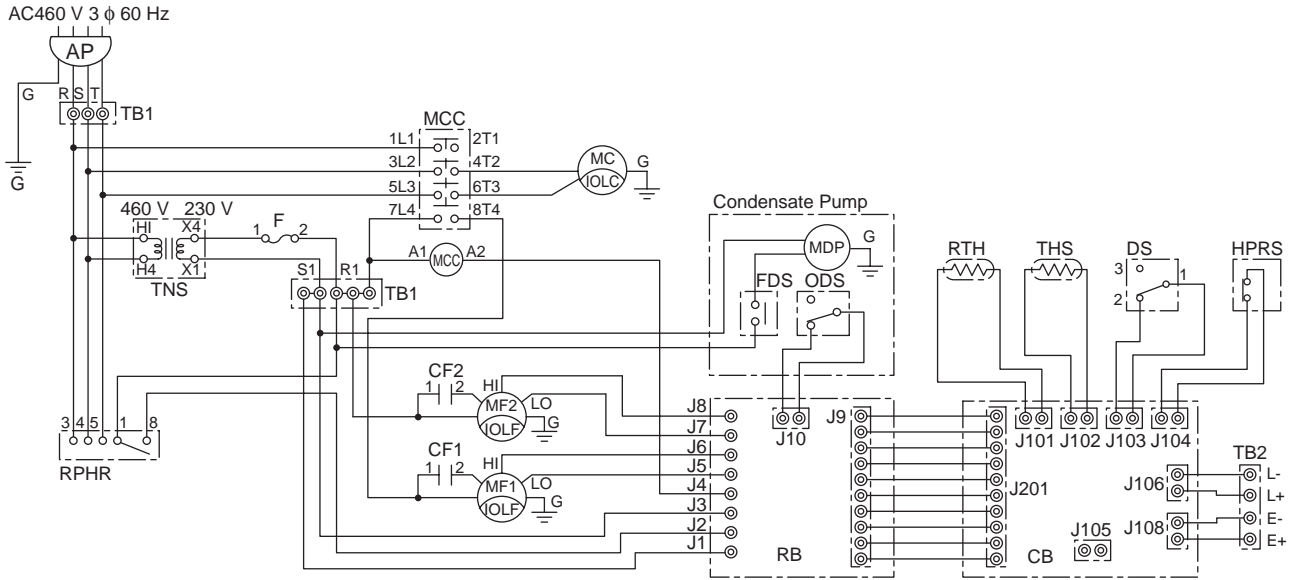
- Lubricate bearings in caster as needed with standard bearing grease using the zerk fitting.

< NOTE >

Casters should roll and swivel freely. Check for dirt or dust build up. Remove dust or dirt build up.

10.7 Schematic

<Wiring Diagram>



A P	Attachment Plug
T B 1	Terminal Block
T B 2	Terminal Block
C B	Control Board
R B	Relay Board
M F 1	Condenser Fan Motor
M F 2	Evaporator Fan Motor
M C	Compressor Motor
C F 1	Capacitor for Condenser Motor
C F 2	Capacitor for Evaporator Motor
R P H R	Phase Reversal Relay
T N S	Transformer

I O L F	Inner Overload Relay of Fan Motor
I O L C	Inner Overload Relay of Compressor
D S	Full Drain Warning Switch
T H S	Freeze Protection Thermistor
R T H	Room Thermistor
G	Grounding
H P R S	High Pressure Switch
M C C	Relay for Compressor and Condenser Fan Motor
M D P	Condensate Pump Motor
F D S	Drain Float Switch
O D S	Drain Overflow Switch
F	Fuse (25 A)

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