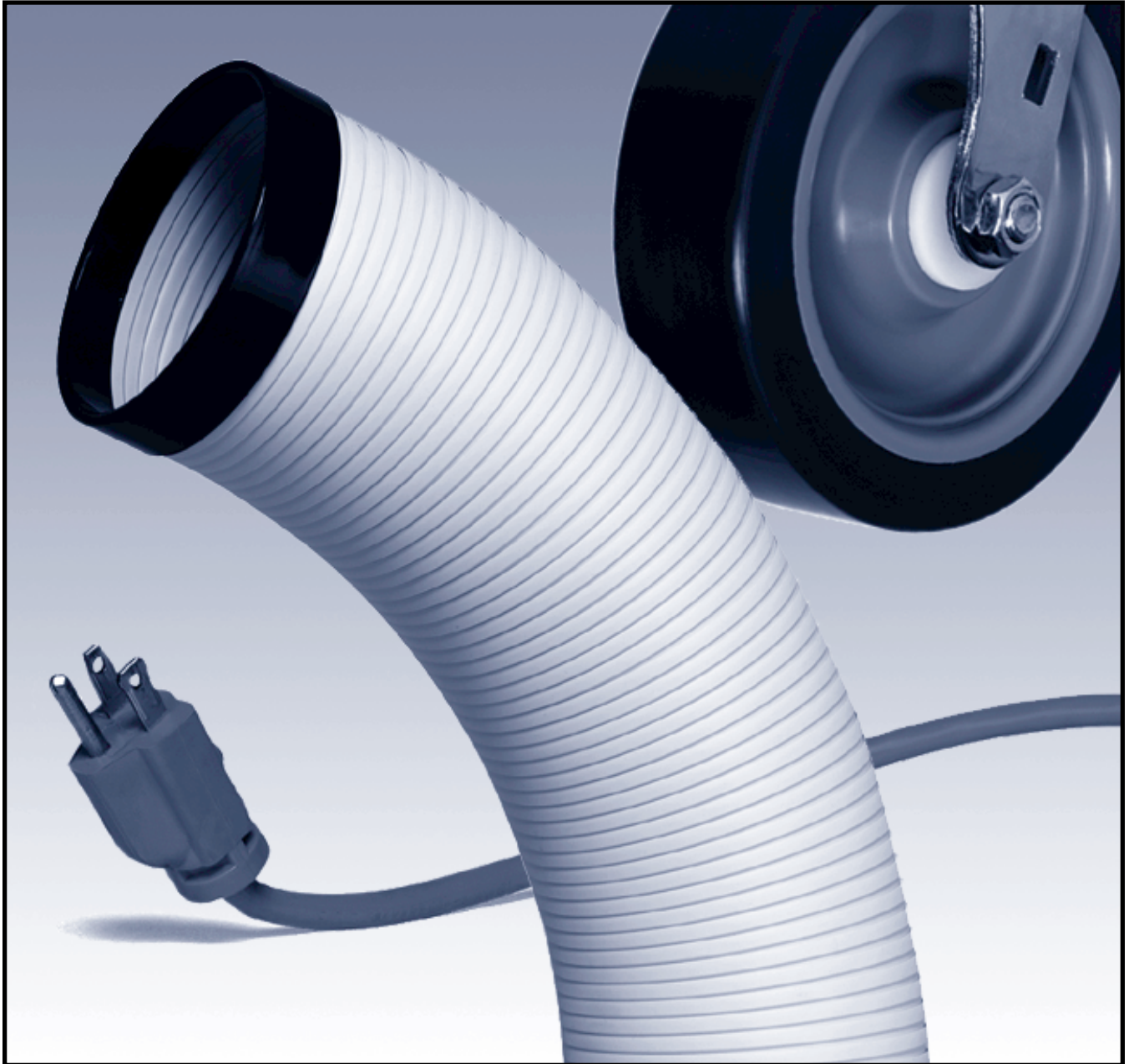


# SERVICE MANUAL

## OFFICE PRO 24



DENSO SALES CALIFORNIA, INC.  
REGISTERED TO ISO 9002  
FILE NO. A5537

**MOVINCOOL**<sup>®</sup>  
Pioneering New Solutions With Portable Air-Conditioning

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# SERVICE **MANUAL**

OFFICE PRO 24



# FOREWORD

This manual has been published to service the MovinCool Office Pro 24. Please use this service manual only when servicing the Office Pro 24.

## 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.

## GENERAL PRECAUTIONS

### **⚠WARNINGS:**

- 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, 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.



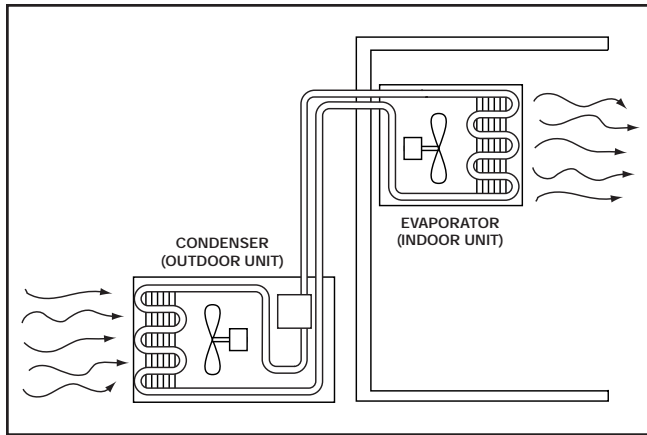
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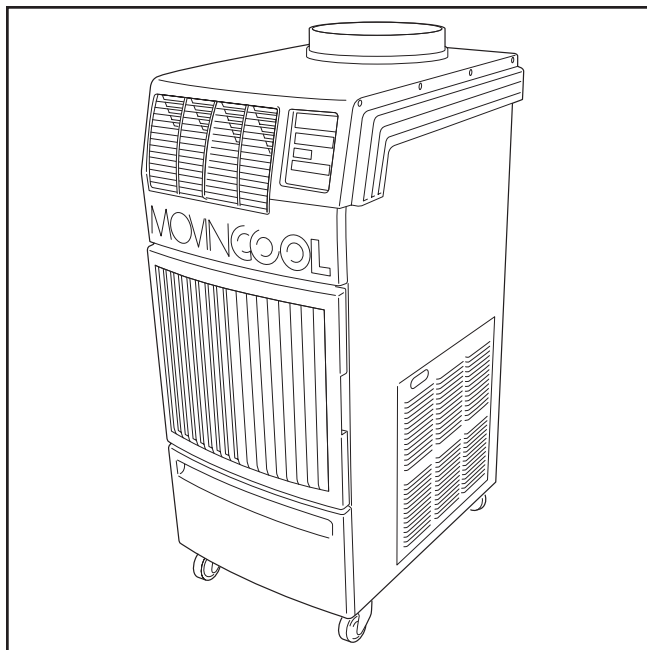


# GENERAL DESCRIPTION



Conventional Air Conditioner

Generally speaking, 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 Spot Cooling System is a spot cooler which directs cool air to particular areas or objects. MovinCool Spot Cooling Systems have the following features:



Office Pro 24

## 1. Compact Design

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

## 2. Easy Transportation and Installation

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

## 3. Energy Conservation

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

# GENERAL DESCRIPTION

# CONSTRUCTION, SPECIFICATIONS, and DATA

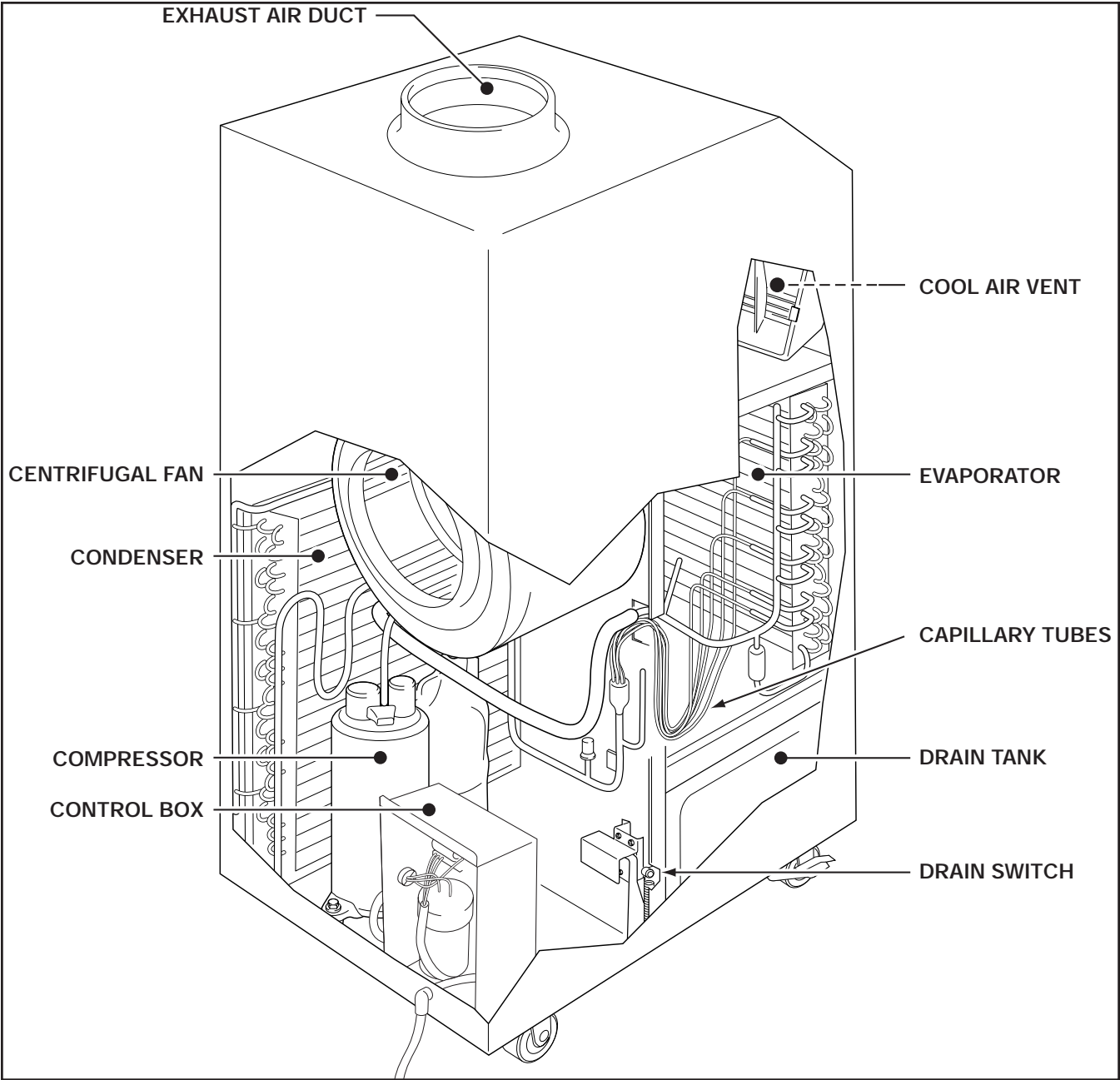


Figure 2-1: Construction of Office Pro 24

# CONSTRUCTION, SPECIFICATIONS, and DATA

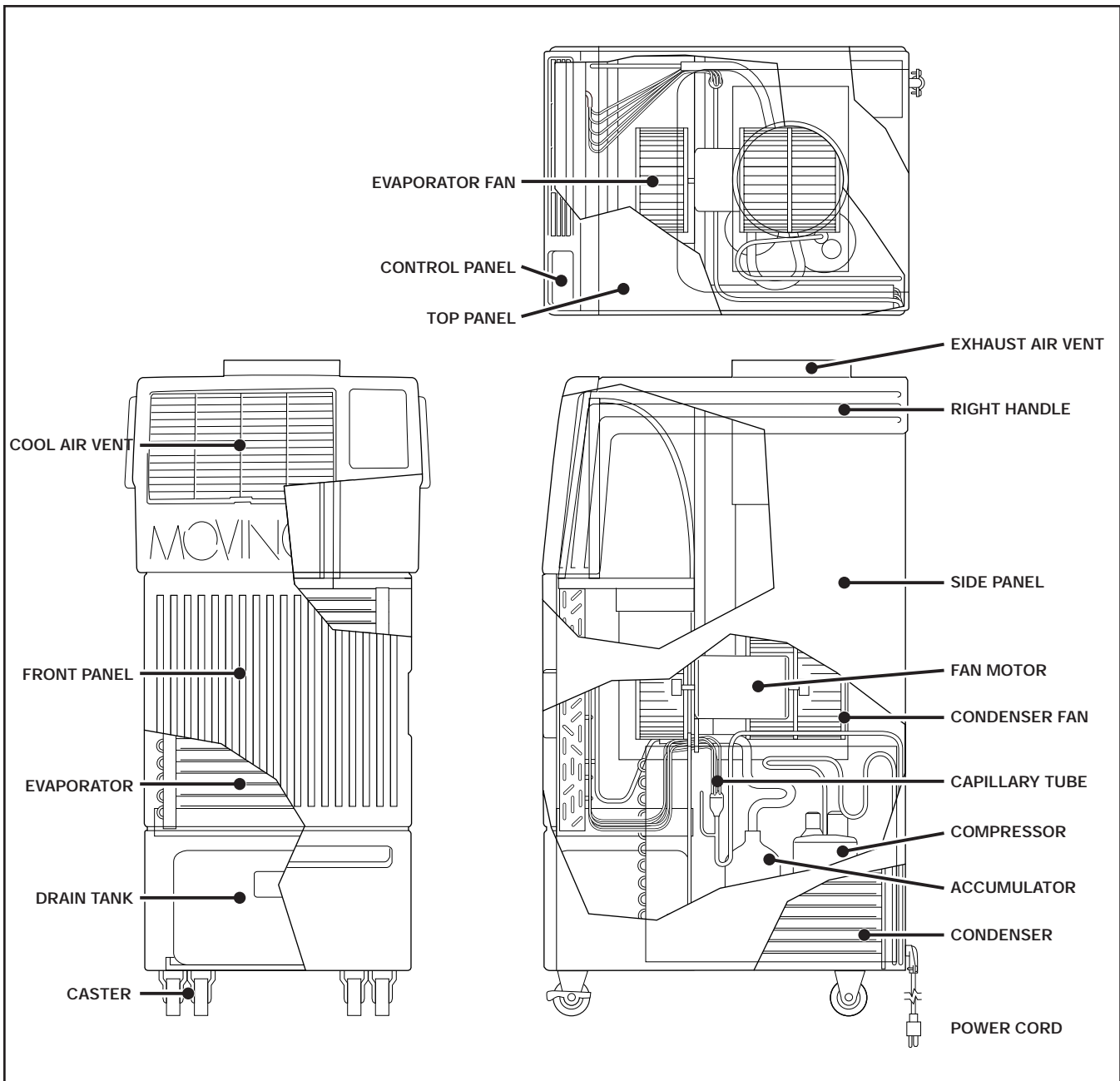


Figure 2-2: Construction Diagram

# CONSTRUCTION, SPECIFICATIONS, and DATA

## 1. Basic Construction

The MovinCool Spot Cooling System 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, while the lower front face contains the drain tank. The rear section contains the condenser, the compressor and the control box.

## 2. 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, while the exhaust air duct is protected by wire mesh.

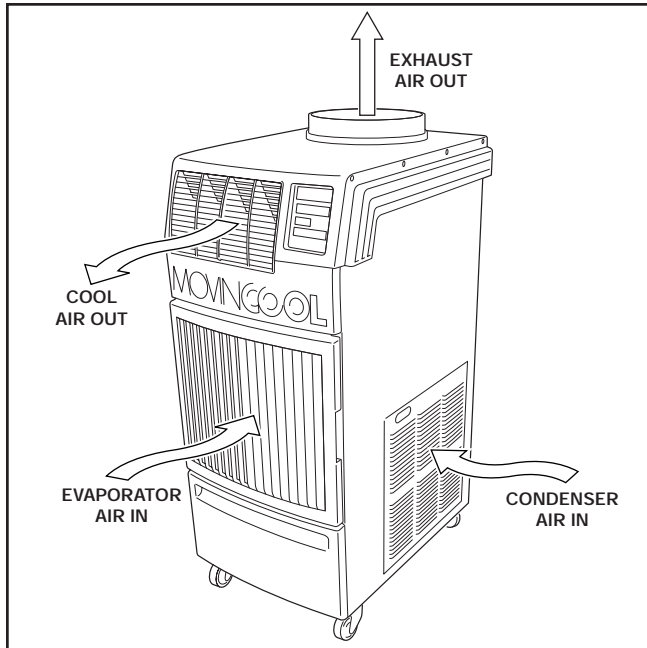


Figure 2-3: Air Flow

## 3. Compressor and Fans

The compressor is hermetically sealed. A two-speed fan motor is used with two centrifugal fans to draw air across the evaporator and condenser.

## 4. Drain Tank

The capacity of the drain tank is 5.0 gallons (19 liters). The unit is equipped with a "Tank Full" LED and a device to automatically stop the operation of the unit when the drain tank reaches a level of approximately 4.0 gallons (15 liters).

# CONSTRUCTION, SPECIFICATIONS, and DATA

## Rating Conditions

dry bulb .....	95° F (35° C)
wet bulb .....	83° F (28.2° C)
humidity .....	(60%)

## Specifications

power frequency .....	60Hz
line voltage .....	single phase 208/230V
power consumption .....	2.7 Kw
current consumption .....	13.1/11.8 Amps
power factor .....	99%
starting current .....	32.9A
power wiring .....	12 (3-core) AWG

## Cooling Unit

cooling capability .....	6,000 Kcal/hr
	24,000 BTU/hr
cooling system .....	direct expansion

## Blower

type of fan .....	centrifugal fan
air volume:	
Evaporator (High speed) .....	632 ft <sup>3</sup> /min (1068 m <sup>3</sup> /h)
Condenser (High speed) .....	867 ft <sup>3</sup> /min (1465 m <sup>3</sup> /h)
motor output	
(High) .....	0.48 Kw
(Low) .....	0.41 Kw

## Compressor

type .....	rotary
output .....	1.4 Kw
refrigerant type .....	R-22
refrigerant capacity .....	2.17 lbs (0.96 kg)

## Safety Devices

compressor overload protector .....	included
fan motor protector .....	included
anti-freezing thermistor .....	included
full drain tank switch .....	included
automatic restart (power interruption) .....	included
compressor time delay program .....	included

## Dimensions & Weight

W x D x H (in) .....	21.2" x 27.4" x 47.25"
W x D x H (mm) .....	538 x 696 x 1200
weight (lbs/kg) .....	210 / 95

## Operating Conditions

inlet air (relative humidity) .....	95° F (35° C), ≤ 60%
	65° F (18.3° C), ≥ 50%

## Control Devices

temperature control .....	included
programmable timer .....	included
two speed fan .....	included

# CONSTRUCTION, SPECIFICATIONS, and DATA

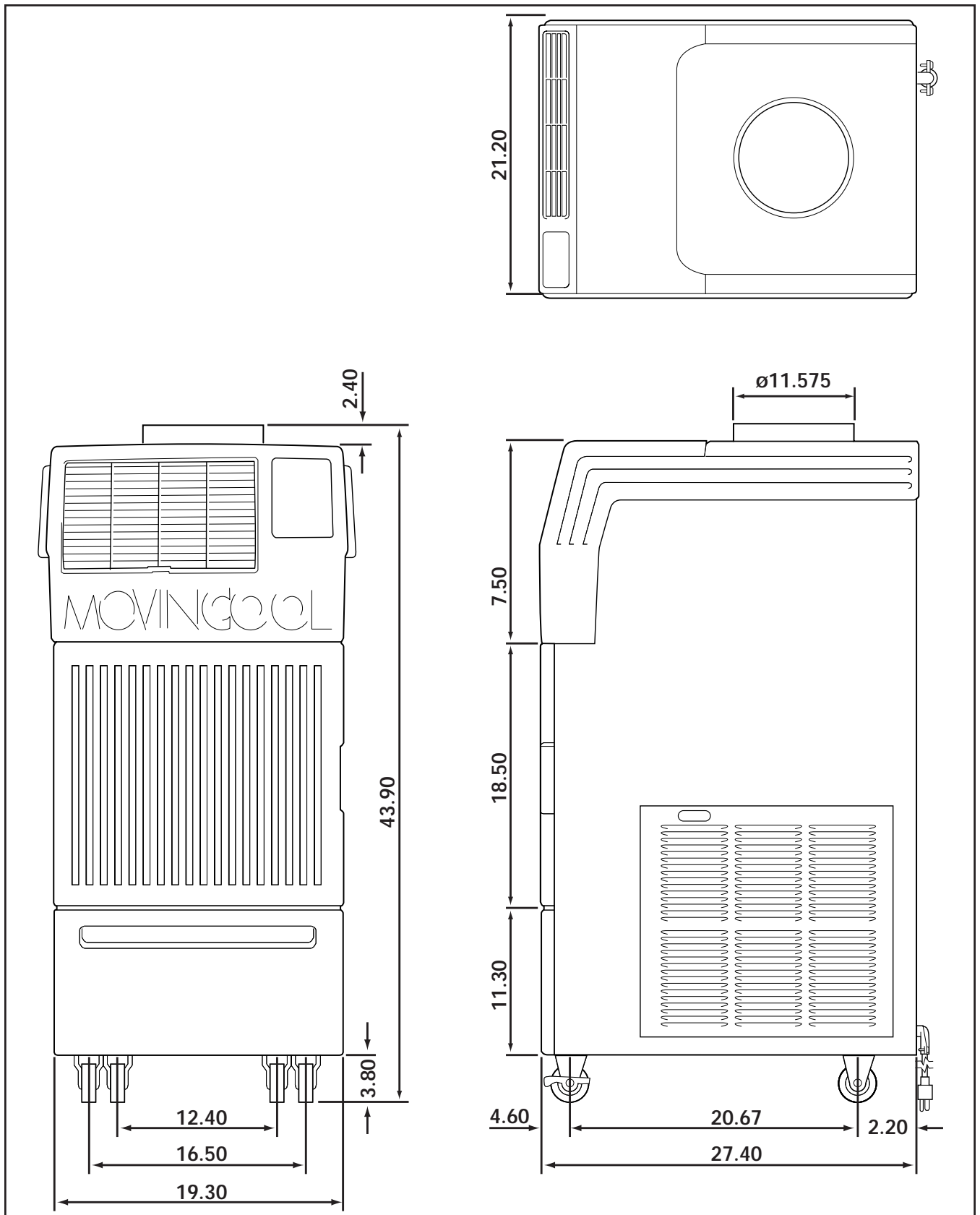
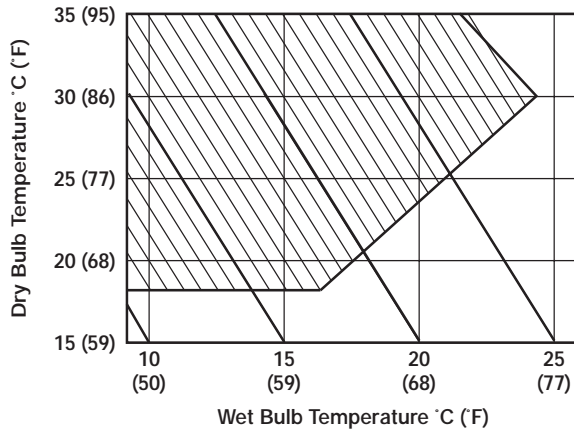
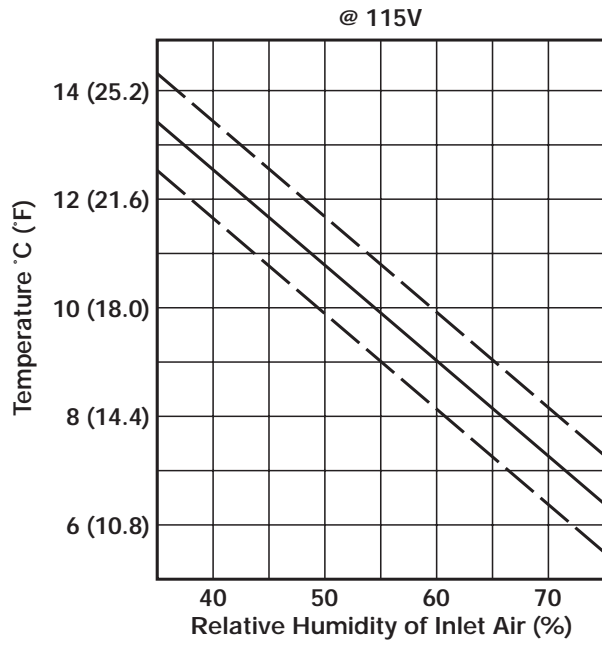
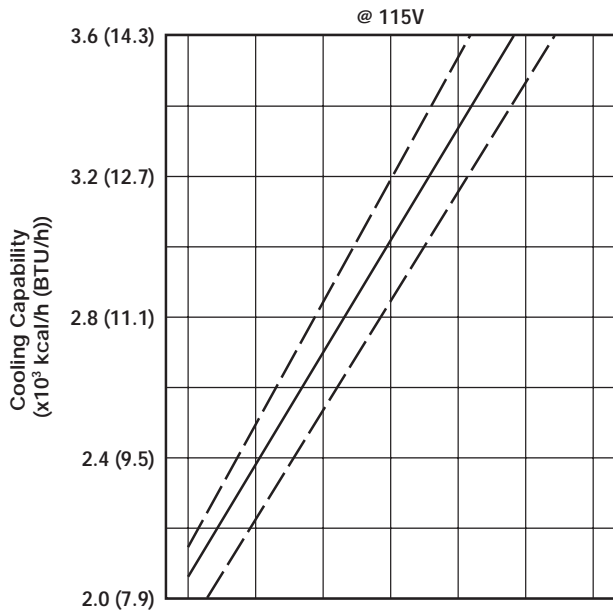


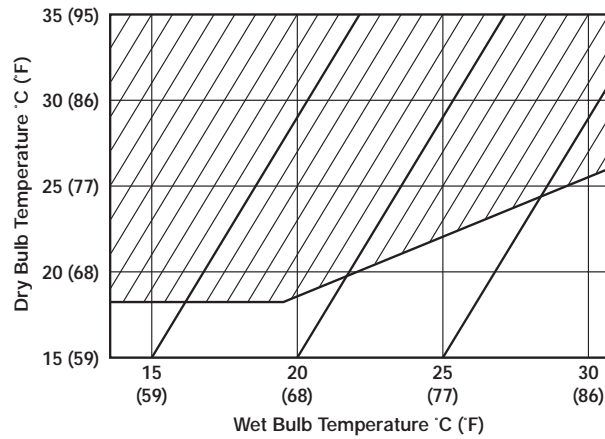
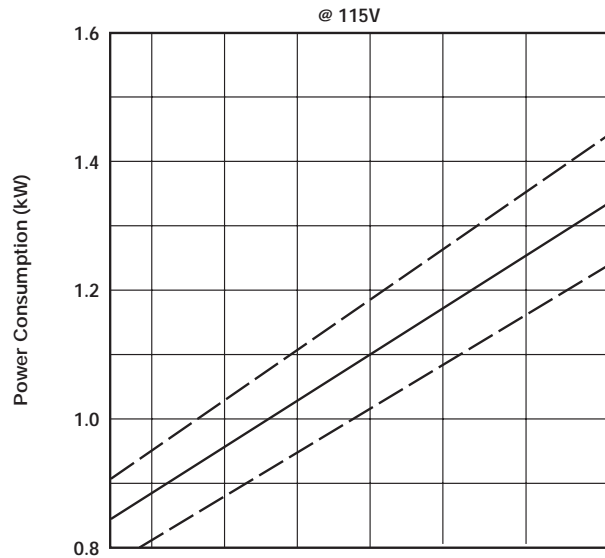
Figure 2-4: Exterior Dimensions (units: inches)

# DATA



**Cooling Capacity Curve**

**Cool Air Temperature Difference Curve**



**Power Consumption Curve**



# REFRIGERANT SYSTEM

1. The component parts of the refrigerant system include the following:

- Compressor
- Evaporator
- Condenser
- Accumulator
- Capillary tube

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

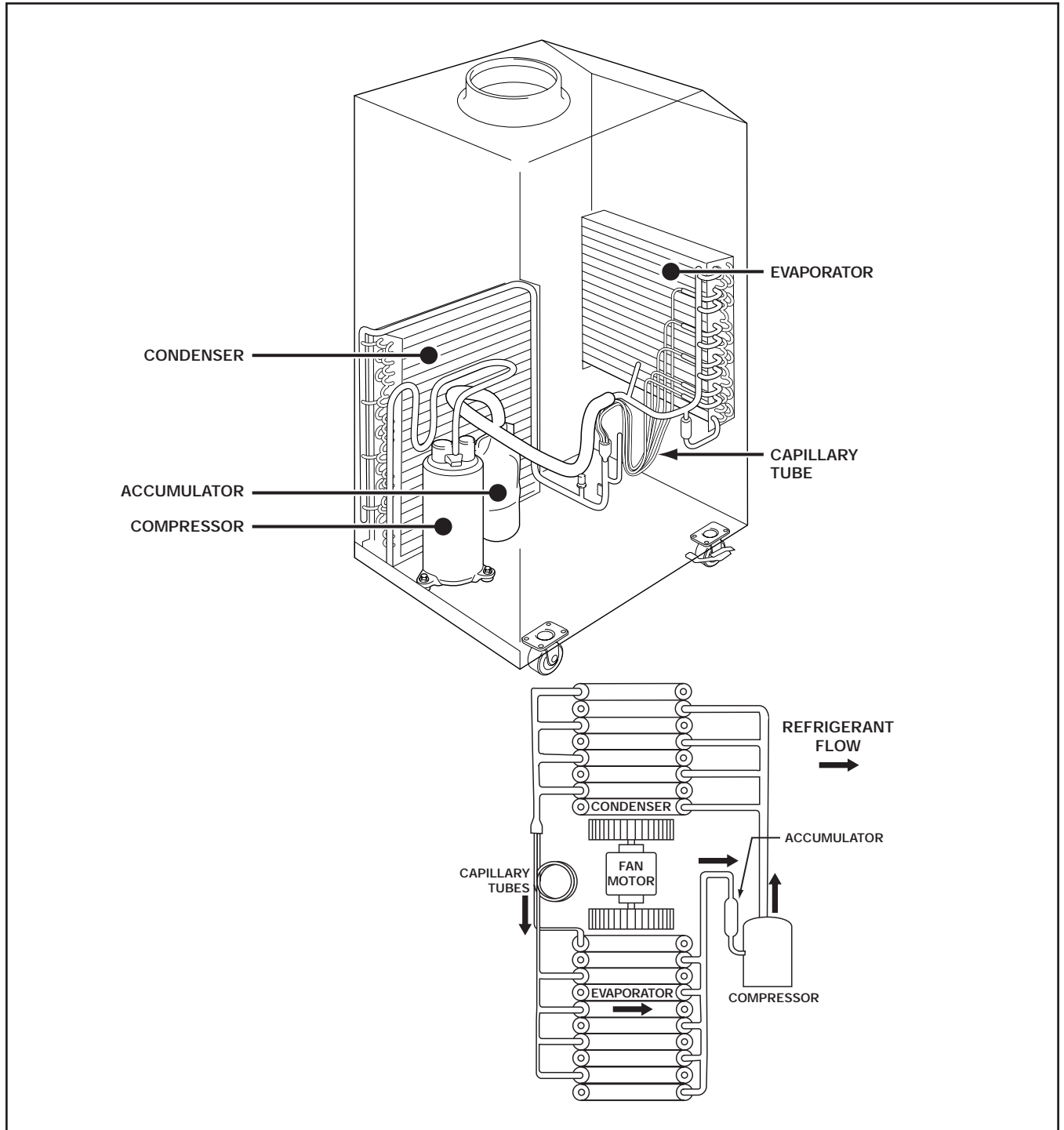


Figure 3-1: Refrigerant System

# REFRIGERANT SYSTEM

## 2. Compressor

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

### A. 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 of the compressor (compression mechanism) rotates to compress the refrigerant.

### B. 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. It 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 that of the refrigerant on the discharge side. This design prevents the backward flow of discharge gas.

## 3. Condenser

The condenser is a heat exchanger with copper tubes that are covered with thin aluminum projections called spine 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.

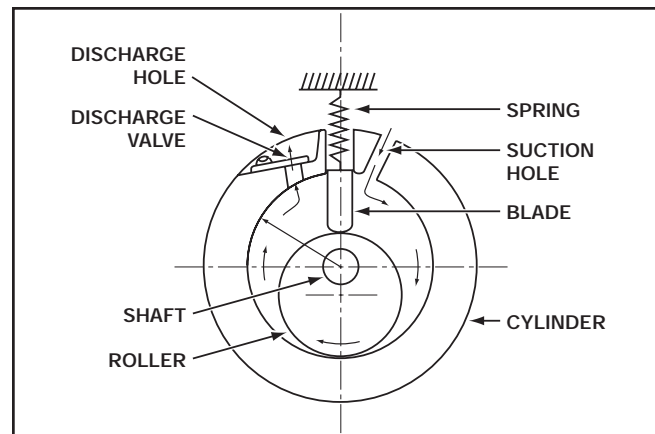


Figure 3-2: Compressor Operation

# REFRIGERANT SYSTEM

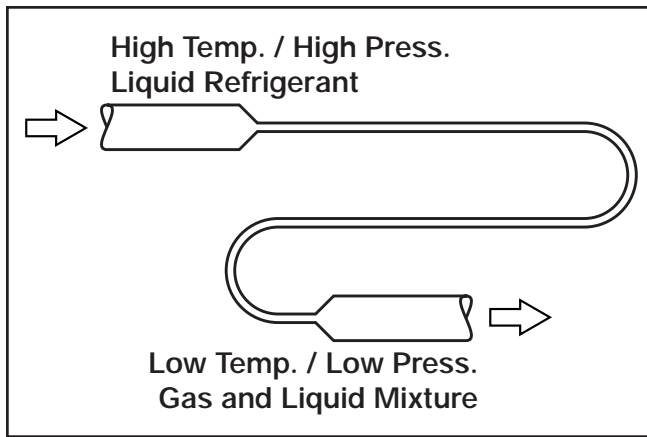


Figure 3-3: Capillary Tube

## 4. Capillary Tubes

The capillary tubes are a long thin tubes utilizing line flow resistance to serve as an expansion valve. The length and the inner diameter of the capillary tubes are determined by the capacity of the refrigeration system, specified operating conditions, and the amount of refrigerant.

The capillary tubes cause 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 tubes. As a result, the temperature and state of the refrigerant become low and mist-like respectively, causing it to evaporate easily.

## 5. Evaporator

The evaporator, like the condenser, is a heat exchanger utilizing 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.

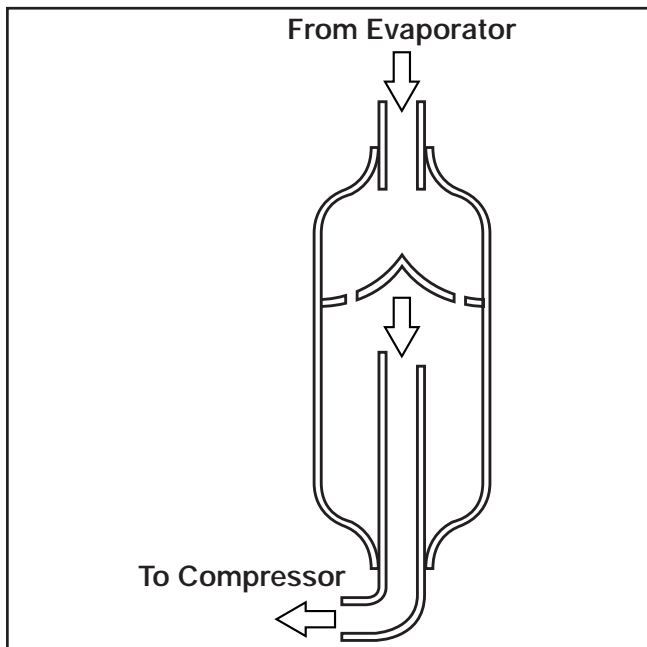


Figure 3-4: Accumulator

## 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 letting only the gas refrigerant enter the compressor. In the accumulator, suction gas is led into a vessel having a cylindrical body, and the gas speed is decreased inside the vessel. This separates the refrigerant contained in the gas by the force of gravity causing it to accumulate at the bottom of the vessel. This protects the compressor from possible damage caused by the intake of liquid refrigerant.

# REFRIGERANT SYSTEM

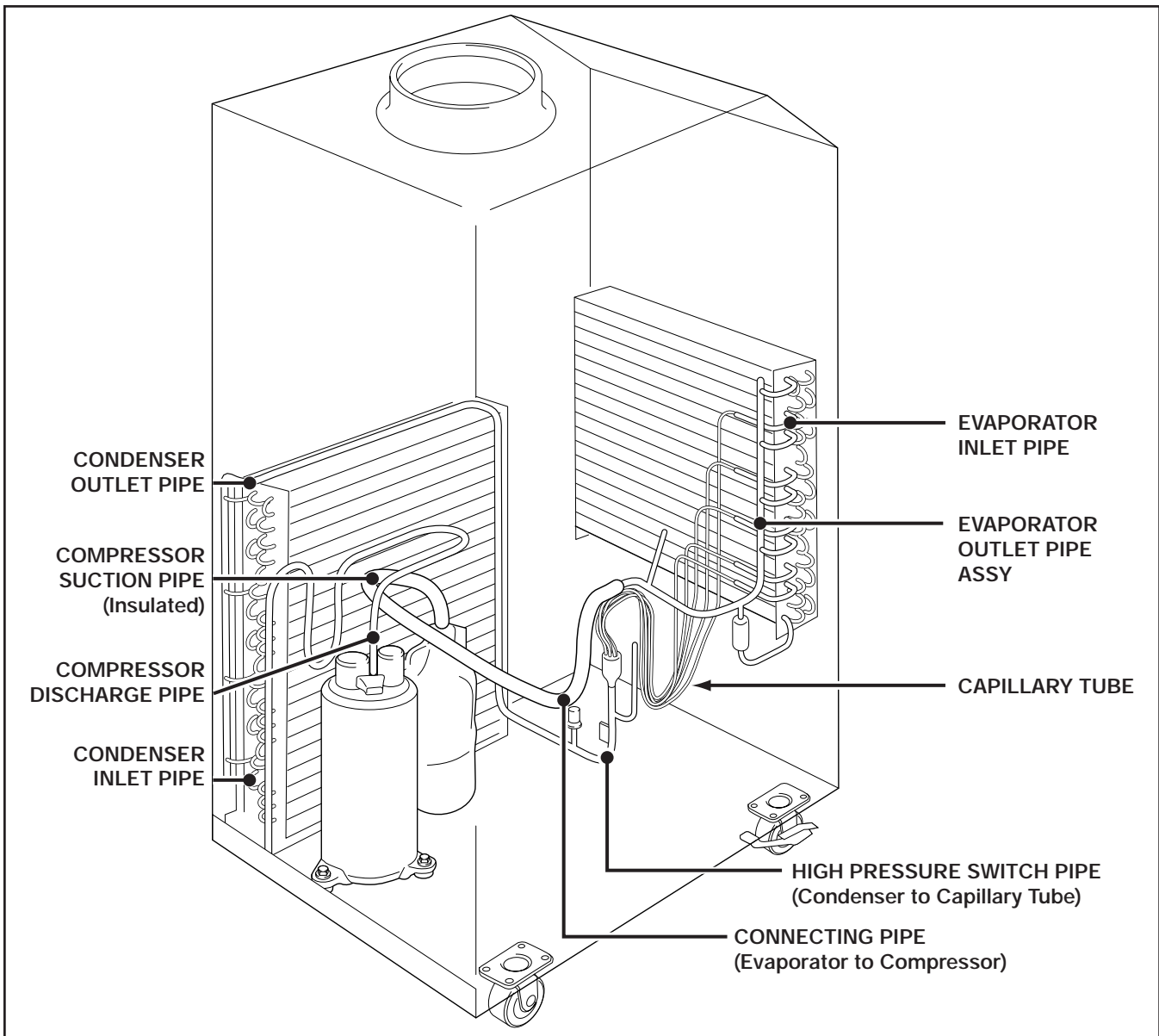


Figure 3-5: Refrigerant System Piping

# ELECTRICAL SYSTEM

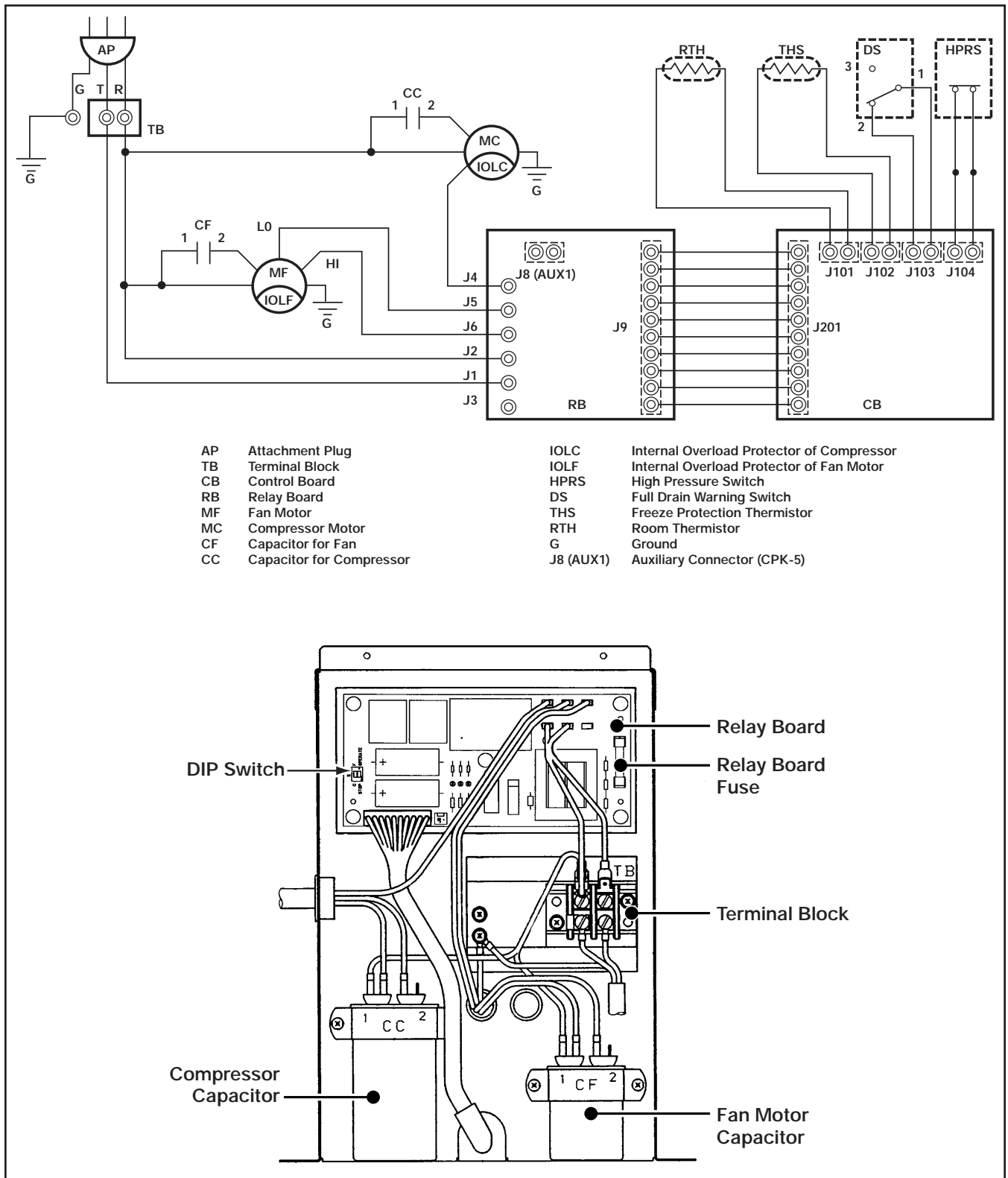


Figure 4-1: Electrical System and Control Box

# ELECTRICAL SYSTEM

## 1. Basic Operation of Office Pro 24 Electrical Circuit

There are two basic components used to control the operation of the Classic Plus 26 Electrical System:

- Control Panel Assembly
- Control Box

The Control Panel Assembly contains the Control Panel, Control Board (with inputs for the freeze and room temperature thermostats), drain switch, and a microprocessor.

### A. Fan "Only" Mode

Low Fan Mode - When the "Low" Fan Mode button on the control panel is pressed, the microprocessor turns on the button's LED and activates the Fan "On" Relay (Relay Board), sending line voltage (208/230 VAC) to the N.C. (Normally Closed) contacts of the fan "mode" relay. This output is connected to the J5 terminal (relay board) where the LOW SPEED wire of the fan motor is connected.

High Fan Mode - When the "High" Fan Mode button on the control panel is pressed, the microprocessor turns on the button's LED and activates both the Fan "On" Relay and Fan "Mode" Relay. This sends line voltage (208/230 V AC) from the Fan "On" Relay to the N.O. (Normally Open) contacts of the Fan "Mode" Relay. This output is connected to the J6 terminal (Relay Board) where the HIGH SPEED wire of the Fan Motor is connected.

### B. Cool Mode - In Addition to Fan "Only" Mode (as described above)

When the Cool On/Off button on the control panel is pressed, the microprocessor turns on the button's LED and if the Temperature Set Point is less than the current room temperature, activates the Compressor Relay (Relay Board). This sends line voltage (208/230 V AC) to the J4 terminal (Relay Board) where the wire from the Compressor wire harness is connected.

# ELECTRICAL SYSTEM

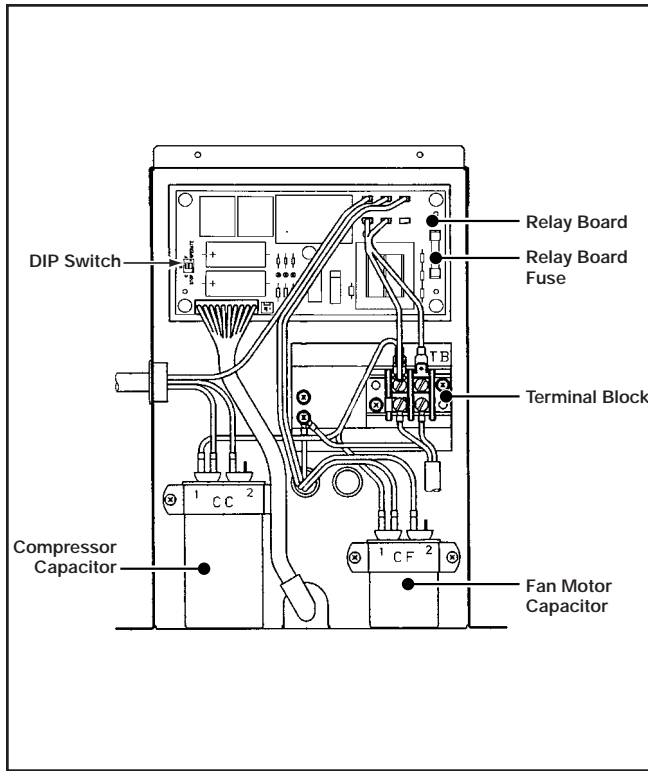


Figure 4-2: Control Box

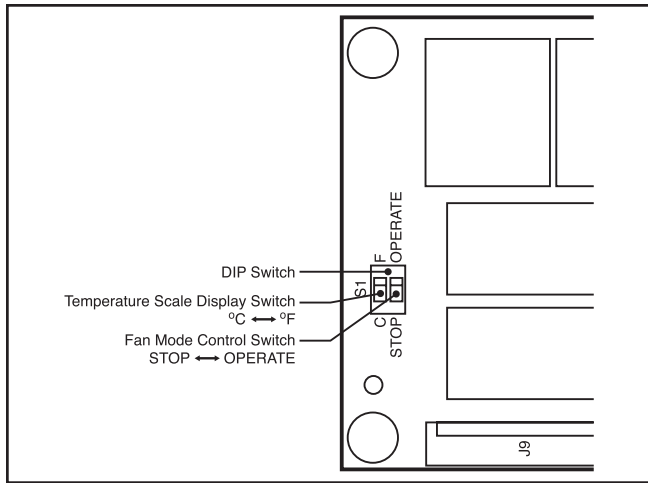


Figure 4-3: DIP Switch

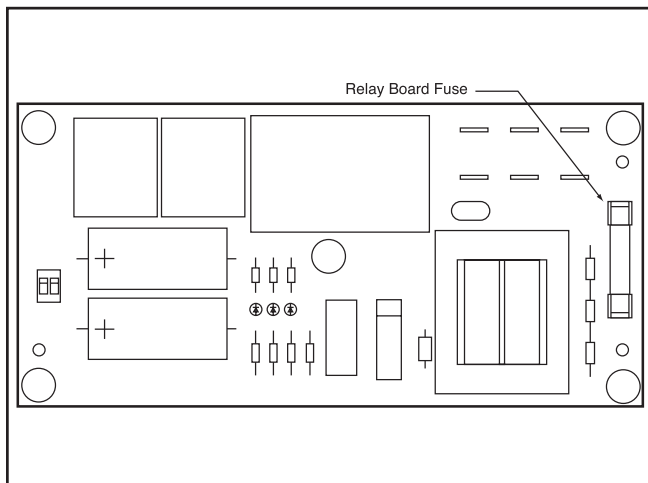


Figure 4-4: Relay Board

## 2. Control Box

### A. Capacitors

The capacitors are used to temporarily boost the power output available to the fan motor and the compressor at start-up.

The specifications of each capacitor are listed below:

CAPACITOR APPLICATION	VOLTAGE RATING	CAPACITANCE (μf)
Fan Motor	440	12.5
Compressor	440	50

### B. Relay Board

The Relay Board receives signals and outputs from the control board that contains a micro-processor. 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 16 volts. This is then converted from AC to DC and used for relay coil activation. The 16V (DC) power is sent to the Control Panel Assembly where it is further reduced to 5 volts 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 the Set Point temperature display from °F to °C.

**NOTE: The relay board must be serviced as a complete assembly. It has only one serviceable component, the fuse.**

#### (a) Relay Board Fuse

**NOTE: The relay board fuse is the only serviceable component on the relay board assembly.**

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

Fuse Specifications: 2/10A 250V

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





## 6. Drain Switch

The Office Pro 24 is equipped with a drain tank switch. When the drain tank accumulates approximately 4.0 gallons (15 liters) of condensate (water) in the drain tank, the drain tank switch sends a signal to the microprocessor. The microprocessor stops all operation of the unit and flashes the "Tank Full" LED.

This system utilizes a .1 AMP, 250 VAC micro-switch for this function. When drain water accumulates approximately 4.0 gallons (15 liters) in the drain tank, 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 and flashes the "Tank Full" LED.

When the drain tank is removed (or the drain tank 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.

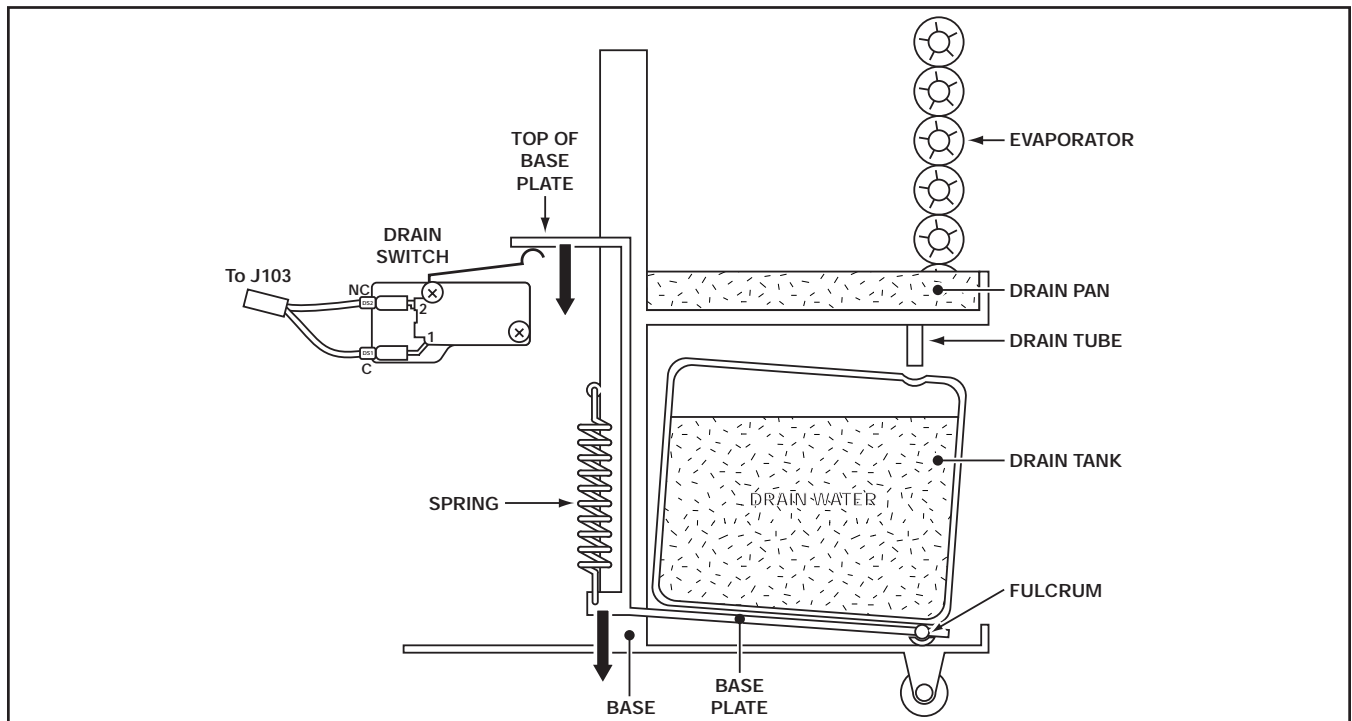


Figure 4-6: Operation of Drain Switch

## 7. How to Re-start the Unit

If the program "Run" LED is flashing, press the "Cool On/Off" button to continue running the program. If the program "Run" LED is illuminated continuously (program activated), no further steps are necessary. If no program exists or the program was "deactivated", press one of the fan mode buttons or the "Cool On/Off" button. The unit will return to the previous Temperature Set Point.

## 8. Condensate Pump Kit (optional)

The Office Pro 24 model comes standard with a drain tank, which collects the water that forms on the evaporator during normal cooling operation. If the MovinCool unit is required to operate continuously without periodic emptying of this tank, a condensate pump may be needed. A condensate pump kit (CPK-5) is available for the Office Pro 24 model.

## 9. Automatic Restart after Power Interruption

The program within the microprocessor of the Office Pro 24 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.