



38YD Two-Speed Heat Pump

Installation and Start-up Instructions

NOTE: Read the entire instruction manual before starting the installation.

SAFETY CONSIDERATION

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and the National Electrical Code (NEC) for special installation requirements.

It is important to recognize safety information. This is the safety-alert symbol . When you see this symbol on the unit or in instructions and manuals, be alert to the potential for personal injury.

Understand the signal word—DANGER, WARNING, or CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which will result in severe personal injury or death. WARNING signifies hazards that could result in personal injury or death. CAUTION is used to identify unsafe practices, which would result in minor personal injury or product and property damage.

▲ WARNING

Before installing or servicing system, always turn off main power to system. There may be more than 1 disconnect switch. Turn off accessory heater power if applicable. Electrical shock can cause personal injury or death.

INSTALLATION

Step 1—Check Equipment and Jobsite

UNPACK UNIT — Move to final location. Remove carton taking care not to damage unit.

INSPECT EQUIPMENT — File claim with shipping company, prior to installation, if shipment is damaged or incomplete. Locate unit rating plate on unit corner panel. It contains information needed to properly install unit. Check rating plate to be sure unit matches job specifications.

Step 2—Install on a Solid, Level Mounting Pad

If conditions or local codes require the unit be attached to pad, tie down bolts should be used and fastened through knockouts provided in unit base pan. Refer to unit mounting pattern in Fig. 2 to determine base pan size and knockout hole location.

When installing, allow sufficient space for airflow clearance, wiring, refrigerant piping, and service. Allow 30-in. (762mm) clearance to service end of unit and 48 in. (1219mm) above unit.

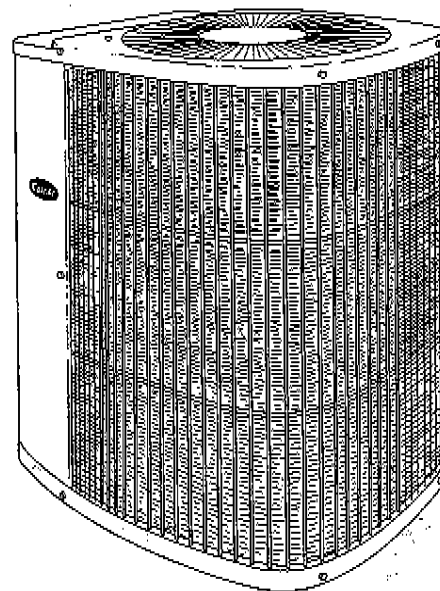


Fig. 1—Model 38YD

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For proper airflow, a 6-in. (52mm) clearance on 1 side of unit and 12 in. (305mm) on all remaining sides must be maintained. Maintain a distance of 24 in. (610mm) between heat pumps. Position so snow or ice from roof or eaves cannot fall directly on unit.

On rooftop applications, locate unit at least 6 in. (152mm) above roof surface. Where possible, place unit above a load-bearing wall. Arrange supporting members to adequately support unit and minimize transmission of vibration to building. Consult local codes governing rooftop applications.

▲ CAUTION

For proper unit operation and reliability, the 38YD heat pump must be installed with the factory-supplied balance port, hard shut-off TXV. Do not install with evaporator coils having capillary tube metering devices.

Step 3—Elevate Unit

For proper drainage, the heat pump must be raised off the mounting surface. Fig. 3 shows unit with accessory heat pump feet installed. Use accessory heat pump rack in areas where prolonged subfreezing temperatures or heavy snow occur. Refer to separate installation instructions packaged with accessories.

Step 4—Remove Indoor AccuRater® Piston

NOTE: An indoor TXV is required. Refer to presale literature for proper part no.

After removing existing AccuRater® from indoor coil, install required accessory TXV kit. (See Fig. 4 and 5.) If unit is installed with a FK4A fan coil, no TXV change is necessary. The FK4A and FK4A fan coils come factory equipped with proper TXV.

Install TXV kit to indoor coil as follows:

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

UNIT SIZE	MINIMUM MOUNTING PAD DIMENSIONS
36, 48, 60	26" x 32"

NOTES.

1. ALLOW 30" CLEARANCE TO SERVICE SIDE OF UNIT, 48" ABOVE UNIT, 6" ON ONE SIDE, 12" ON REMAINING SIDE, AND 24" BETWEEN UNITS FOR PROPER AIRFLOW.
2. MINIMUM OUTDOOR OPERATING AMBIENT IN COOLING MODE IS 55°F, MAX, 125°F.
4. CENTER OF GRAVITY 
5. SERIES DESIGNATION IS THE 13TH POSITION OF THE UNIT MODEL NUMBER.

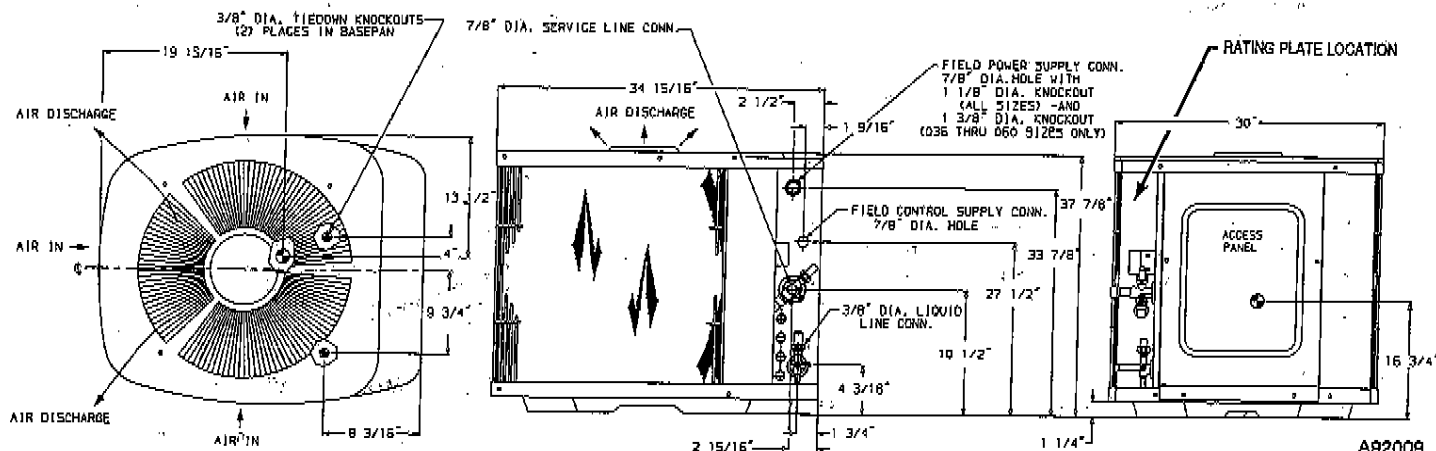


Fig. 2—Unit Reference Drawing

1. Install suction-tube adapter.
2. Install liquid flare-to-sweat adapter.
3. Install TXV on liquid flare-to-sweat adapter.
4. Connect external equalizer tube to fitting on suction-tube adapter.
5. Position sensing bulb on horizontal portion of suction-tube adapter. Secure using supplied hardware. Insulate bulb after installation.
6. Leak-check all connections.

⚠ CAUTION

DO NOT BURY MORE THAN 36 IN. (914mm) OF REFRIGERANT TUBING IN GROUND. If any section of tubing is buried, there must be a 6-in. (152mm) vertical rise to the valve connections on the outdoor unit. If more than the recommended length is buried, refrigerant may migrate to cooler buried section during extended periods of unit shutdown, causing refrigerant slugging and possible compressor damage at start-up.

Step 5—Make Piping Connections

Outdoor units may be connected to indoor sections using accessory tubing package or field-supplied tubing of refrigerant grade, correct size, and condition. The liquid- and vapor-tube diameters can be determined by using Table 1.

⚠ WARNING

Relieve all pressure before refrigerant system repair or final disposal to avoid personal injury or death. Use all service ports and open all flow-control devices, including solenoid valves.

CAUTION

Do not vent refrigerant to atmosphere. Recover during system repair or final unit disposal.

Table 1—Refrigerant Connections and Recommended Liquid- and Vapor-Tube Diameters (In.)

UNIT SIZE	LIQUID		VAPOR	
	Connect Diameter	Tube Diameter	Connect Diameter	Tube Diameter
036, 048	3/8	3/8	7/8	7/8
060	3/8	3/8	7/8	1-1/8

Notes: 1. Tube diameters are for lengths up to 100 equivalent ft.
2. Do not increase or decrease tubing sizes.

Tubing diameters listed with these instructions are adequate for equivalent lengths up to 100 ft. Do not install equivalent interconnecting tubing lengths greater than 100 ft. Do not increase or decrease interconnecting tubing diameters.

If either refrigerant tubing or indoor coil is exposed to atmospheric conditions for longer than 5 minutes, it must be evacuated to 1000 microns to eliminate contamination and moisture in the system.

Run refrigerant tubes as directly as possible, avoiding unnecessary turns and bends. Suspend refrigerant tubes so they do not damage

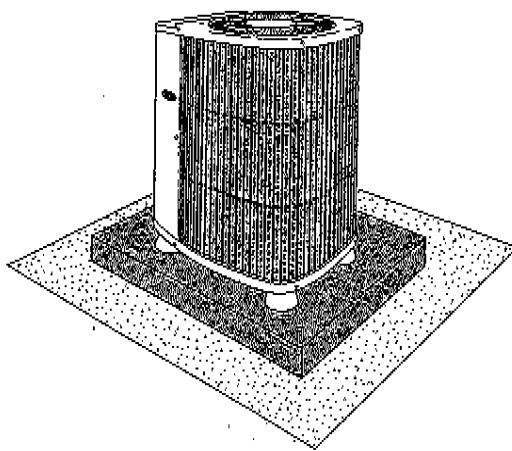


Fig. 3—Accessory Heat Pump Feet

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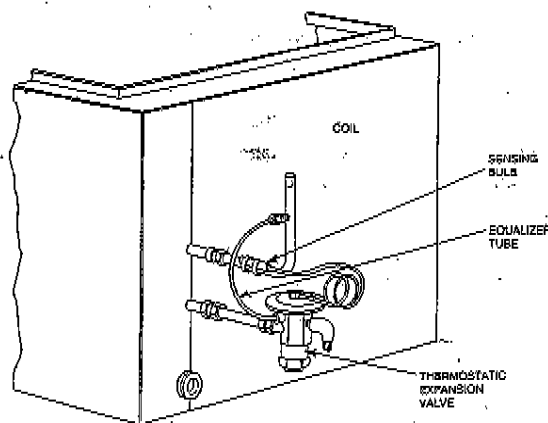


Fig. 4—TXV Installed

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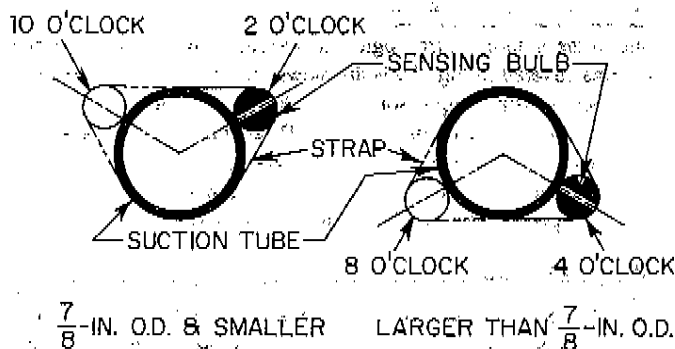


Fig. 5—Positioning of Sensing Bulb

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insulation on vapor tube and do not transmit vibration to structure. Also, when passing refrigerant tubes through wall, seal opening so vibration is not transmitted to structure. Leave some slack in refrigerant tubes between structure and unit to absorb vibration.

OUTDOOR UNITS CONNECTED TO FACTORY-APPROVED INDOOR UNITS

See Product Data Digest for factory-approved indoor units.

Outdoor unit contains correct system refrigerant charge for operation with indoor unit of the same size when connected by 25 ft

(7.62m) of field-supplied or factory-accessory tubing. Check refrigerant charge for maximum efficiency. (See Step 9—Checking Charge.)

REFRIGERANT TUBING — Connect tubing to fittings on outdoor unit vapor- and liquid-service valves. (See Fig. 2.)

⚠ CAUTION

A brazing shield **MUST** be used when tubing sets are being brazed to the service valves to prevent damage to the painted unit surface.

⚠ CAUTION

To avoid valve damage while brazing, service valves must be wrapped with a heat-sinking material such as a wet cloth.

SWEAT CONNECTION — Use refrigerant grade tubing. Service valves are closed from factory and ready for brazing. After wrapping the service valve with a wet cloth, the tubing set can be brazed to the service valve using either silver bearing or non-silver bearing brazing material. Consult local code requirements. Refrigerant tubing and indoor coil are now ready for leak testing. This check should include all field and factory joints.

Step 6—Make Electrical Connections

⚠ WARNING

To avoid personal injury or death, do not supply power to unit with compressor terminal box cover removed.

Be sure field wiring complies with local and national fire, safety and electrical codes, and voltage to system is within limits shown on unit rating plate. Contact local power company for correction of improper voltage. See unit rating plate or Product Data Digest for recommended circuit protection device.

NOTE: Operation of unit on improper line voltage constitutes abuse and could affect unit reliability. See unit rating plate.

NOTE: Use copper wire only between disconnect switch and unit.

NOTE: Install branch circuit disconnect per NEC of adequate size to handle unit starting current. Locate disconnect within sight from and readily accessible from unit, per Section 440-14 of NEC.

ROUTE GROUND AND POWER WIRES

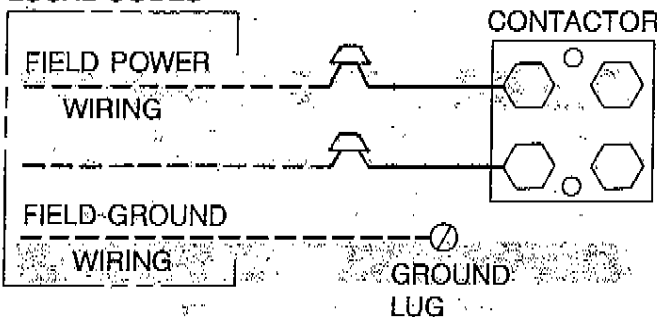
⚠ WARNING

According to NEC, ANSI/NFPA 70 and local codes, the cabinet must have uninterrupted or unbroken ground to minimize personal injury if an electrical fault should occur. The ground may consist of electrical wire or metal conduit when installed in accordance with existing electrical codes. Failure to follow this warning could result in electrical shock, fire, or death.

Remove access panel and control box cover to gain access to unit wiring. Extend wires from disconnect through power wiring hole provided and into unit control box. (See Fig. 2.) Size wires per NEC but not smaller than minimum wire size shown on Product Data Digest.

CONNECT GROUND AND POWER WIRES — Connect ground wire to ground connection in control box for safety. Connect power wiring to leads provided. (See Fig. 6.)

CONNECT CONTROL WIRING — Route 24-v control wires through control wiring grommet and connect to leads provided in unit control box. (See Fig. 6.)

DISCONNECTPER N. E. C. AND/ OR
LOCAL CODES**Fig. 6—Line-Power Connections**

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NOTE: For installation with 58SXB furnaces, see factory-authorized accessory kit instructions.

Use No. 18 AWG color-coded, insulated wires. If thermostat is located more than 100 ft from unit (as measured along the control voltage wires), use No. 16 AWG color-coded wires to avoid excessive voltage drop.

The 38YD outdoor units require a minimum of 27 va, 24-vac control power.

→ **SPEED TAP SELECTION FOR 58SXB FURNACE**

When installing with a 58SXB, an accessory interface kit is required. Refer to presale literature for proper interface kit number. If installed using the speed taps recommended in the kit instructions, a latent capacity control (LCC) is not required. System sensible heat ratio will be 75 percent or less. See Fig. 7B for proper control wiring.

When installing with a 58SXB, a SPST relay with normally closed pilot duty contacts must be installed. (See Fig. 7B.) The relay part number is HN61KK324 or field-supplied equivalent. When energized, the relay contacts opens the Y circuit at the furnace control, allowing Y and W operation during defrost. If the relay is not installed the furnace control will fault out on an illegal thermostat input.

→ **SPEED TAP SELECTION FOR FK4A FAN COILS**

The ICM blower motor speed taps must be adjusted from factory settings. It is highly recommended that the FK4A be left in 3-speed operating mode as shipped. The FK4A fan coil will allow high- and low-speed blower operation to be matched to the capacity of high or low compressor operation. See Table 2 for recommended taps for 38YD applications. If the recommended taps are used, a LCC is not required. System sensible heat ratio will be 75 percent or less. See Fig. 7A for proper control wiring. The 006 low-speed tap settings must be decreased 1 tap setting to assure proper sensible heat ratio.

Table 2—Speed Selection Tap

SYSTEM SIZE	036			048			060		
	HIGH	LOW	HEAT	HIGH	LOW	HEAT	HIGH	LOW	HEAT
FK4A003	7	3	*	—	—	—	—	—	—
FK4A004	7	3	*	—	—	—	—	—	—
FK4A005	7	3	*	10	4	*	—	—	—
FK4A006	4	3	*	6	3	*	7	3	*

High speed is selected using the black tap.

Low speed is selected using the white tap.

Heat speed is selected using the red tap.

* Heat speed selection is dependent on the size of the electric heater installed. Refer to the installer's instructions supplied with the fan coil or the fan coil wiring diagram for complete information concerning the minimum airflow required by heater size and the airflow delivery capability for each motor speed tap.

Step 7—Install Electrical Accessories

Refer to the individual instructions packaged with the kits or accessories when installing.

Available electrical accessories include 2-speed blower and latent capacity control kits. Consult Product Data Digest for proper kit part number and application. See Fig. 7 and Table 3 for typical accessory wiring diagrams.

CAUTION

Low-ambient kits are not available for 2-speed units. Do not attempt to operate in cooling below 55 ° F or modify control system for low-ambient operation. Compressor damage may occur.

→ **LATENT CAPACITY CONTROL (LCC)**

The purpose of an LCC is to provide a dehumidification mode, assuring a 75 percent or less system sensible heat ratio. If the indoor unit installed contains an ICM blower, such as FK4A or 58SXB, no LCC is required. The indoor products which contain ICM blowers have enough cfm range to provide proper airflow for low-speed cooling. If the indoor unit installed has a standard PSC blower, the low-speed airflow available will be too great to assure 75 percent or less system sensible heat ratio. The LCC for standard blower products consist of a standard humidistat, open contacts on humidity rise, and a pilot duty relay with 24v coil.

NOTE: If a LCC is desired, the low-speed airflow must be maintained so that a minimum of 300 cfm/ton can be supplied during high-speed LCC operation.

→ **LCC Operation For Fig. 7C and 7E**

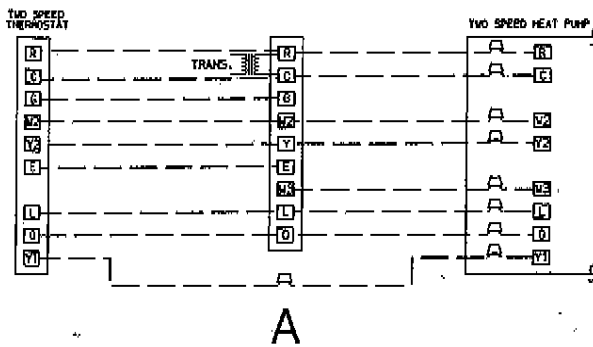
The standard blower operations of systems is covered in Fig. 7C or 7E. The blower runs high speed regardless if compressor operation is high or low speed. When the LCC is wired according to Fig. 7C or 7E, as the humidity rises the humidistat contacts open and de-energize the relay. If the relay is de-energized, the system will operate on high-speed compressor and high-speed airflow until the humidistat closes.

→ **LCC Operation For Fig. 7D**

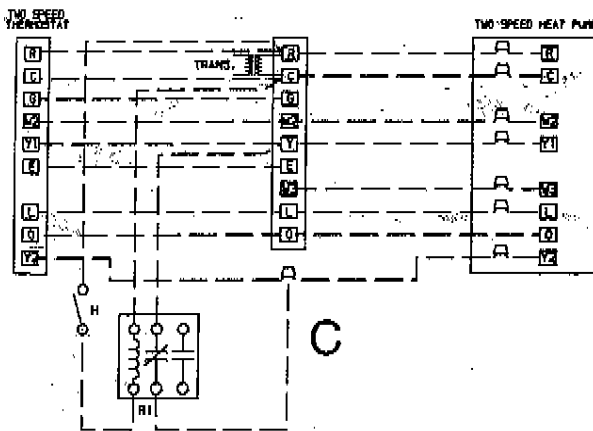
Due to the indoor control logic, the standard blower operation of systems covered in Fig. 7D is the blower run high or low speed in conjunction with compressor high- or low-speed operation. When the LCC is wired according to Fig. 7D, as the humidity rises the humidistat contacts open and de-energizes the relay. If the relay is de-energized the system will operate on high-speed compressor and low-speed airflow until the humidistat closes.

Step 8—Start-up

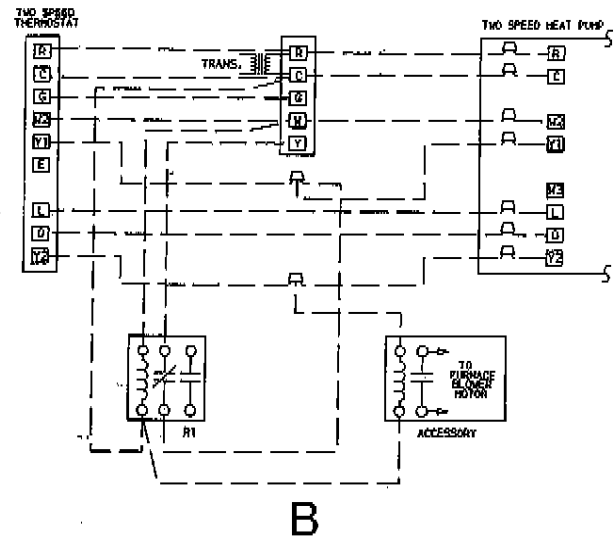
1. The 38YD is equipped with a crankcase heater which operates at temperatures less than 75 ° F. If the outdoor temperature is less than 75 ° F, energize crankcase heater 24 hours before starting unit. To energize heater only, set indoor thermostat at the OFF position and close the line power disconnect to the unit.
2. Fully back seat (open) liquid- and vapor-tube service valves.
3. Unit is shipped with valve stem(s) front seated, and caps installed. Replace stem caps after system is opened to refrigerant flow (back seated). Replace caps finger tight and tighten additional 1/12 turn (20 ft-lb torque) with wrench.
4. Close electrical disconnects to energize system.



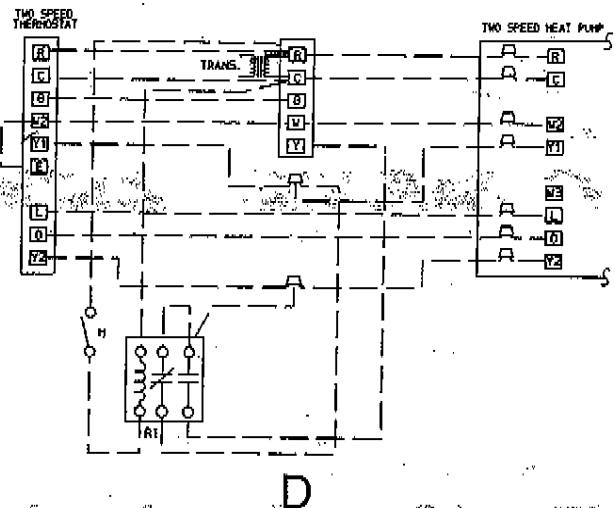
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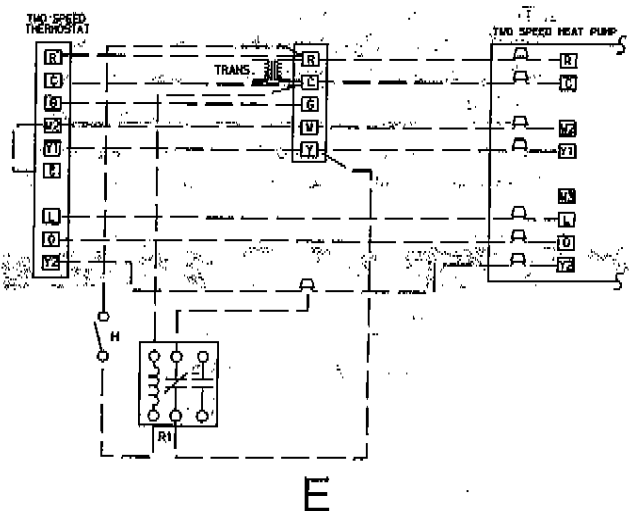
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Legend

Trans=24 vac low voltage transformer, 40 va minimum

H=Humidistat, opens on increasing humidity, typical wall mount (HL38MG026)

R1=Relay, SPDT contacts, pilot duty, 24 vac coil (HN61KK324)

Latent capacity control recommended where shown only.

Fig. 7—Typical Circuit Connections

Table 3—Wiring Diagram Reference

OUTDOOR UNIT	WIRING DIAGRAM				
	A	B	C	D	E
	Indoor Units Covered				
38YD	FK4A	58SXB	FB4A FC4A	58WAV 58ZAV 58PAP 58RAP 58SXC 58DXC 58EJA 58SSC 58DHC	58GFA 58DFA 58PAV 58RAV58EFA 58SXA 58DXA

5. Set room thermostat at desired temperature. The factory accessory indoor thermostats are 2 stage, with approximately 2 ° F difference between stages. Be sure the set point is below indoor ambient and is low enough to energize desired speed.

NOTE: Accessory electronic indoor thermostat requires anticipation to be programmed. Please refer to thermostat Installation Instructions. Refer to Product Data Digest for approved thermostats.

6. Set room thermostat at COOL or HEAT and fan switch at FAN or AUTO, as desired. Wait for the appropriate time delay(s) and account for the 2-minute minimum low-speed run time. Operate unit for 15 minutes. Check refrigerant charge.

Step 9—Checking Charge

⚠ CAUTION

Do not vent refrigerant to atmosphere. Recover during system repair or final unit disposal.

Factory charge is shown on unit rating plate. (See Fig. 2.)

NOTE: When the 2-speed unit is operating at low speed, the system's vapor (suction) pressure will be higher than a standard single-speed system or high-speed cooling operation. This normal operation is due to the reduced capacity operating with typically larger indoor and outdoor coils.

⚠ WARNING

Service valve gage ports are not equipped with Schrader valves. To prevent personal injury, make sure gage manifold is connected to the valve gage ports before moving valves off fully back seated position. Wear safety glasses and gloves when handling refrigerant.

Adjust charge in both heating and cooling by following procedure shown on the charging tables located on unit information plate (back side of access panel).

⚠ CAUTION

Compressor damage may occur if system is overcharged.

SYSTEM FUNCTIONS

The 38YD 2-speed heat pump's control system has special functions. The following is an overview of the 2-speed control functions:

Cooling Operation

The SYNERGY 2000 products utilize a 2-stage cooling indoor thermostat. With a call for first stage (Y1) the outdoor fan and low-speed compressor are energized. If low speed cannot satisfy the cooling demand, high speed will be energized (Y1 and Y2) by the second stage of the indoor thermostat. The thermostat has a 2-degree differential between first and second stages. After second

stage is satisfied, the unit will return to low-speed operation, until first stage is satisfied, or until second stage is again required.

Heating Operation

The SYNERGY 2000 products utilize a 2-stage heating indoor thermostat. The first stage of heating is heat pump operation (Y1), auxiliary or back up heat is controlled by second stage (W2). There is a 2 ° F differential between first and second stage. The control determines the speed of heat pump operation, outdoor ambients of 40 ° F or less will be high-speed heat pump operation. Low-speed heat pump operation will occur at 41 ° F or greater. When high-speed heat pump is required, the control will provide a Y2 (24 vac) signal back to the thermostat to energize high-speed indicator LED.

LED Function Lights

When using the factory-authorized indoor thermostats with the 2-speed outdoor units, there are 2 locations where system function LED indicator lights are available. The indoor thermostat provides indicator lights for high- and low-speed operation, system malfunction, and auxiliary heat. The two-speed control board has a LED which provides signals for several system operations. See Table 4 which provides LED functions, indicator locations and definitions. Table 4 provides the order of signal importance if more than 1 signal should occur. The signal to the indoor thermostat is supplied by the low-voltage L lead.

NOTE: A signal (code) will not be sent through the L outdoor to the thermostat unless unit failure has occurred.

Table 4—Function Light Code and Display Location

CODE	T'STAT	UNIT	DEFINITION	*
Constant flash No pause	—	X	No demand Stand by	8
1 flash w/pause	—	X	Low-speed operation	7
2 flashes w/pause	—	X	High-speed operation	6
3 flashes w/pause	X	X	Outdoor thermistor failure	5
4 flashes w/pause	X	X	Coil thermistor failure	4
5 flashes w/pause†	X	X	Pressure switch trip (LM1/LM2)	3
6 flashes w/pause†	X	X	Compressor PTC's out of limit	2
Constant light No Pause No Flash	X	X	Board failure	1

* Function light signal order of importance in case of multiple signal request; 1 is most important.

† Thermostat will show fault only after lockout.

3-Second Time Delay

Any time the control receives a 24-v input, such as Y1 or Y2, there is a 3-sec time delay before the control function is initiated. This helps prevent nuisance trips and thermostat "jiggling".

1-Minute Speed Change Time Delay

When the compressor changes speeds from high to low, or low to high, there is a 1-minute time delay before the compressor will restart. The outdoor fan motor remains running.

5-Minute Time Delay

The 2-speed control logic contains a 5-minute time delay that prevents the unit from short-cycling after a thermostat off cycle or power interruption. The unit can be forced to operate immediately by momentarily touching a jumper between the speed-up terminals of the control board. (See Fig. 8.) The speed-up feature will not bypass any other function or time delay.

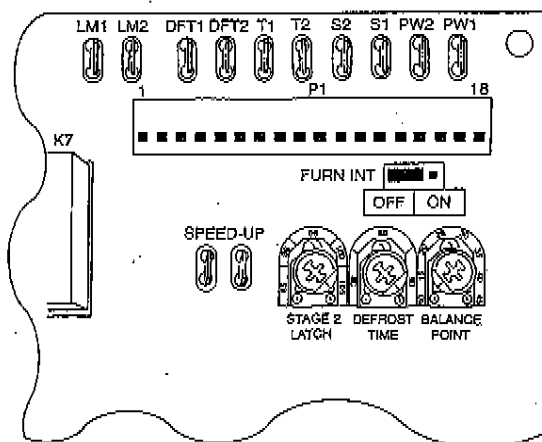


Fig. 8—Two-Speed Control Board

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2-Minute Low-Speed Minimum

If the unit has not operated within the past 30 minutes, upon the next thermostat high or low demand the unit will operate for a minimum of 2 minutes in low speed.

Crankcase Heater Operation

The 2-speed control will energize the crankcase heater during the unit's off-cycle when the outdoor ambient is below 75 ° F.

Outdoor Fan Motor Operation

The 2-speed control will energize the outdoor fan any time the compressor is operating. The outdoor fan will remain energized during the 1-minute speed change time delay and if a pressure switch or compressor PTC overload should trip.

After termination of a defrost cycle, the outdoor fan will delay coming on for 20 sec. This allows the refrigerant system to recover the outdoor coil heat, and minimize the "steam cloud" effect.

The unit is equipped with an integrated control motor (ICM) which varies its speed by receiving a pulse width modulated (PWM) signal. The control provides the ICM with a PWM signal based on high- or low-speed unit operation and outdoor ambient.

The outdoor ICM motor runs at high speed whenever the compressor runs at high speed. When the compressor operates at low speed and the outdoor ambient is less than 87° F the ICM reduces speed to conserve energy.

Second-Stage Latching

When low-speed cooling operation will no longer satisfy the first stage of the indoor thermostat, the indoor temperature will increase (2 degrees) until second-stage is energized. After high-speed cooling satisfies second stage it will return to low-speed cooling operation. If desired, the installer may select to have high-speed cooling unit operation remain energized until the first stage of the indoor thermostat is satisfied. Upon the next call for cooling the unit will return to low-speed operation. This eliminates the temperature droop between the first and second stages of indoor thermostat, holding room temperature closer to setpoint. To utilize this function, the unit capacity should be plotted versus the heat gain of the structure. (See Fig. 9.) This provides the system's balance point, where the structure requires high-speed capacity. The second-stage latching POT should be set at the low-speed balance point or greater.

Second-stage latching can be selected by rotating the potentiometer (POT) to the desired outdoor second-stage latching temperature. (See Fig. 10.) Temperatures that can be selected are 85, 90, 95, 100, and 105 ° F. The POT is factory set at 105 ° F.

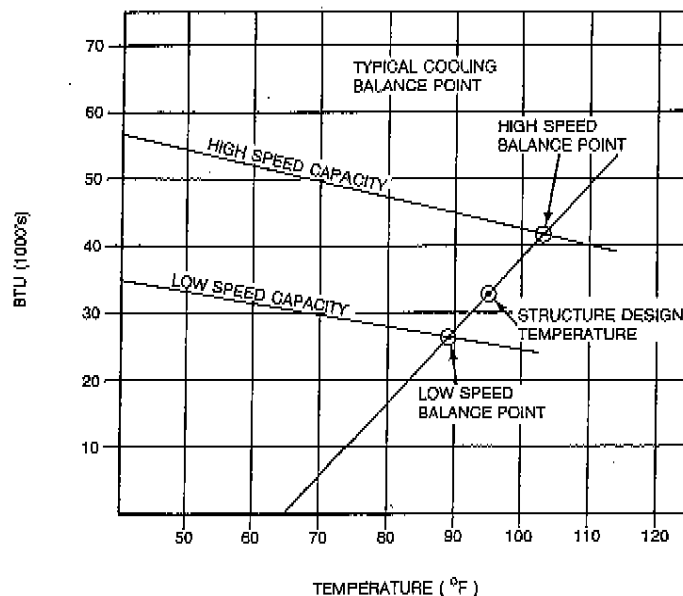


Fig. 9—Typical Cooling Balance Points

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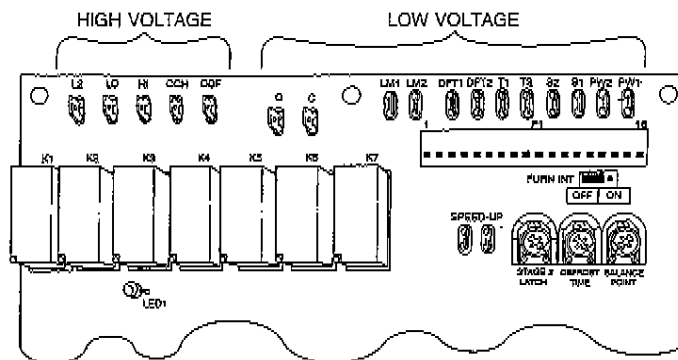


Fig. 10—LED And Potentiometer Location

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Defrost Time Selection

The defrost interval can be field selected, dependent on local or geographical requirements. It is factory set at 90 minutes and can be changed to either 30 or 50 minutes by rotating the defrost time POT. (See Fig. 8.)

Defrost

The 2-speed control logic for the defrost function is the standard time and temperature initiated, time or temperature terminated. Defrost will only occur at outdoor temperatures less than 50 ° F. The control will initiate defrost when the outdoor coil thermistor is 30 ° F (+/- 2 degrees), or less, and the selected defrost time (interval) has been accumulated during unit operation. Termination will occur when the coil thermistor reaches 80 ° F (+/- 5 degrees) or the defrost period reaches a maximum of 10 minutes.

Defrost will always be done in high speed, regardless if unit operation requires low speed. During defrost the unit will operate in high speed, energize the reversing valve O and auxiliary heat W2, and de-energize the outdoor fan. Upon termination there will be a 20-sec delay in the outdoor fan being energized.

Field-Initiated Forced Defrost

By placing a jumper across the speed-up terminals for a minimum of 5 sec, and then removing, the unit will initiate a defrost cycle. (See Fig. 8.) The cycle will occur only if the outdoor ambient is less than 50 ° F, regardless of outdoor coil temperature. The cycle will terminate when the coil thermistor reaches 80 ° F (+/- 5 degrees) or the defrost period reaches a maximum of 10 minutes.

Furnace Interface

This feature provides a heat pump lock-out upon a demand for auxiliary heat W2, and must be used when interfacing a heat pump with a gas/oil furnace. Field selection of the furnace interface option is done by connecting the factory-supplied jumper to the ON position of the 3 terminal connector. (See Fig. 8.)

When the option is selected, the heat pump will be locked out of operation any time there is a thermostat call for W2, or the outdoor ambient is below the balance point POT setting. (See Fig. 8.) When the unit requires defrost, auxiliary heat W2 will be energized like a normal defrost cycle and the control will not lock out heat pump operation. To utilize this function, the economic and/or thermal balance point must be determined. See the appropriate heat pump balance point worksheet available from your local distributor or branch.

Balance Point

This feature can be used in 2 different options; furnace interface or electric heat staging. Please refer to the Furnace Interface section for its application. If the heat pump is installed with a fan coil with multistages of electric heat, this option can be used to stage the banks of heat by outdoor ambient. This eliminates the need for accessory outdoor thermostats.

When using this option to stage electric heat, the first stage will be energized by a W2 demand, second stage will be energized by a W3 demand. Select the W3 desired temperature by rotating the "Balance Point" POT. (See Fig. 8.) Temperatures that may be selected are 10, 15, 20, 25, 30, 35, 40, and 45 ° F. The POT is factory set at 45 ° F.

Compressor PTC Overload Protection

The control senses the resistance of the compressor internal positive temperature coefficient (PTC) overloads. If the resistance of the PTC's is out of range the control will shut off the unit until the resistance range is acceptable. See Table 5 for compressor PTC ranges.

Table 5—Compressor PTC Ranges

COMPRESSOR INTERNAL PTC RESISTANCE	
At 77 F	1.5k to 7.8k ohms
To trip	26k to 34k ohms
To reset	8.4k to 10 k ohms

When the control turns off the outdoor unit due to out of range PTC's, the unit will remain off for 15 minutes, with the outdoor fan running. After 15 minutes the control will check the resistance every 5 minutes until they reach the reset range. During this time, a malfunction signal will appear on the control board. If a PTC trip occurs 3 times the control will lock out the outdoor unit operation and provide a malfunction signal at the control and indoor thermostat.

Pressure Switch Protection

The outdoor unit is equipped with high- and low-pressure switches, wired in series. If a control senses an opening of a pressure switch, the control will provide a 5-minute time delay in outdoor unit operation, with the outdoor fan running. A malfunction signal will appear on the control when a pressure switch

opens. If 3 trips occur within 30 minutes the 2-speed control logic will lock out outdoor unit operation and provide a malfunction signal to the indoor thermostat and 2-speed control.

MAJOR COMPONENTS

2-Speed Control

The 2-speed control board controls the following functions:

- High and low compressor contactor operation
- Outdoor fan motor operation
- Crankcase heater operation
- Compressor protection
- Pressure switch monitoring
- Second-stage latching
- Time delays
- 5-minute time delay speed-up (bypass)
- Time/temperature defrost
- Defrost interval selection
- Furnace interface
- Electric heat staging

Please refer to the Two-Speed System Function section for individual function information.

Header Pin Housing

The header pin housing is the plastic assembly which holds the stripped lead ends for field connections. The 2-speed control receives the 24-vac low-voltage control system inputs through the housing/pins. The housing also contains jumpers which the control uses for system configuration; i.e. heat pump versus air conditioning. Please refer to Fig. 11 for header pin housing configurations.

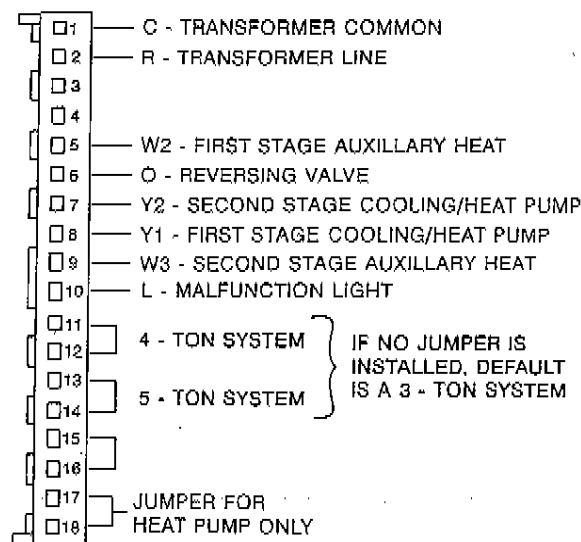


Fig. 11—Header Pin Housing Configuration

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2-Speed Compressor

The 2-speed compressor contains motor windings that provide low-speed 4-pole (1750 rpm) and high-speed 2-pole (3500 rpm) operation. Please refer to Table 6 for appropriate winding resistances. Refer to unit wiring label for winding configuration.

Table 6—Two-Speed Compressor
(Winding Resistance at 70 °F +/- 20° Degrees)

WINDING	3 TON	4 TON	5 TON
T1-T2	.80	.70	.60
T1-T3	3.20	2.20	1.80
T1-T7	1.30	1.00	1.00
T1-T8	3.10	2.20	2.00

The two-speed compressor is protected by an internal pressure relief (IRP) which will relieve discharge gas into the compressor shell when the differential between suction and discharge pressures exceed 500 psi.

The compressor is also protected by 3 positive temperature coefficient (PTC) devices attached to the motor windings. The PTC's resistance is sensed by the 2-speed control. See Table 5 for resistance ranges.

Mechanically Interlocked Contactors

⚠ CAUTION

Do not bypass interlocks of contactors, as compressor damage will occur.

⚠ WARNING

Interlocked contactors coils are 240v, high voltage. Electrical shock can cause personal injury or death.

The 2-speed products are equipped with mechanically interlocked contactors. Each contactor has interconnecting linkage, providing independent interlocks.

The 2-speed control provides the electrical interlock. The contactors are supplied with 240-v coils, which reduces the va requirements of the low-voltage (24 vac) control system.

TEMPERATURE THERMISTORS

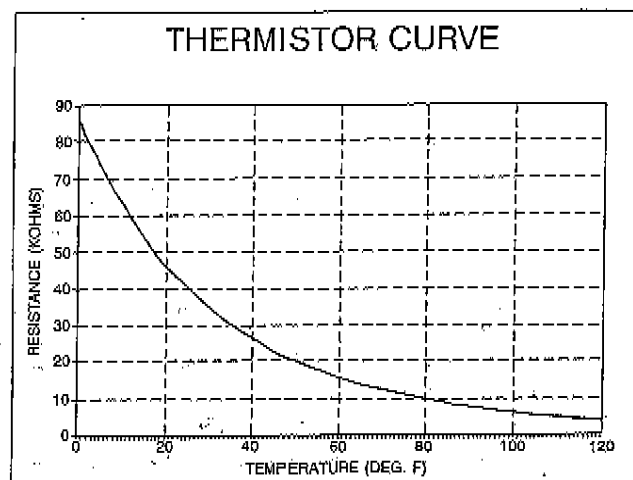
Thermistors are electronic devices which sense temperature. As the temperature increases, the resistance decreases. A thermistor is used to sense outdoor ambient. Refer to Fig. 12 for resistance values versus temperature.

If the outdoor ambient thermistor should fail, a malfunction signal will appear on the indoor thermostat and two-speed control. The control will not initiate second-stage latching; and crankcase heater will be turned on during all off-cycles. Heating will default to high speed and defrost will initiate on demand from coil thermistor.

If the outdoor coil thermistor should fail, a malfunction signal will appear on the indoor thermostat and 2-speed control. The control will defrost every 90 minutes of heating operation and terminate in 10 minutes.

ICM outdoor fan motor

The outdoor integrated control motor (ICM) is a variable speed motor which can operate from 400 to 900 rpm. The motor is a DC



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Fig. 12—Resistance Values Vs. Temperature

permanent magnet type motor with the electronic controls integrated into it's rear cover. The speed at which the motor operates are thus commutated is determined by a pulse width modulated (PWM) signal which is received from the control board.

EMI Filter

An electro-magnetic interference (EMI) filter is installed on the high-voltage input to the ICM to prevent electro-magnetic signals generated by the ICM from interfering with other home appliances such as radios or TV's.

CARE AND MAINTENANCE

For continuing high performance, and to minimize possible equipment failure, it is essential that periodic maintenance be performed on this equipment. Consult your servicing contractor or User's Manual for the proper frequency of maintenance. Frequency of maintenance may vary depending upon geographic areas, such as coastal applications.

Step 1—Leave User's Manual With Homeowner

Explain system operation and maintenance procedures outlined in User's Manual.

