

installation instructions

ZONEKIT4

ZONE PERFECT

Cancels: II 920453-0-2 II ZONEKIT-4-1
9-95

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

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SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause 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 and wear safety glasses. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local and state building codes and Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) for special installation requirements.

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.

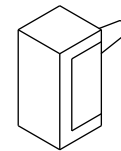
Understand the signal words DANGER, WARNING, and CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used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

INSTALLATION CONSIDERATIONS

1. Install in a non-condensing area with ambients between 32°F and 120°F.



4 ZONE CONTROLLER



DUCT TEMPERATURE SENSOR

Fig. 1—Zone Perfect System

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2. Use vibration isolators (flex connectors) on the zone dampers and duct work to minimize noise.
3. Place dampers away from areas that may be noise sensitive.
4. TXV is required in air conditioning and heat pump applications.
5. Use separate isolated transformer to supply power to Zone Perfect System.
6. Load calculations must be performed to determine equipment size. Equipment selection is matched to block load. It is imperative the equipment is not oversized.
7. Duct work must have its design based off the sum of peaks plus 25 percent oversize. It is imperative the duct work is not under sized.

INTRODUCTION

The Zone Perfect System allows the air conditioning and heating equipment to control temperatures in up to 4 distinct spaces or zones within a building. Each zone has independent temperature settings controlled by a thermostat.

NOTE: Thermostats are purchased separately.

The comfort temperature settings can change automatically through the use of schedules if programmable thermostats are selected. This allows Zone Perfect to change temperature settings in zones to reflect occupancy or usage. For example, it can condition the bedrooms in a home from 5:00 PM through 7:00 AM or the kitchen from 3:00 PM through 6:00 PM. The Zone Perfect System uses motorized air volume control dampers (also called zone dampers) to regulate flow of conditioned air into zones. In this manner Zone Perfect can selectively heat or cool certain portions of a building depending upon space temperature requirements.

INSTALLATION

I. CHECK EQUIPMENT AND JOBSITE

A. Inspect Equipment

File claim with shipping company prior to installation if shipment is damaged or incomplete.

II. WIRING

WARNING: To prevent personal injury or possible equipment damage, disconnect the power supply before routing wire.

All wiring must comply with local, state, and national codes.

NOTE: Use No. 22 AWG color-coded, insulated (35°C min) wire. If thermostats are to be located more than 100 ft from the Zone Perfect Center as measured along control voltage wires, use No. 18 AWG colored-coded wires to avoid excessive voltage drop. All wiring is run back to the Zone Perfect Center. Keep wires a minimum of 12 in. from any AC voltage.

III. INSTALL ZONE PERFECT

NOTE: Zone Perfect is approved for indoor use only and should never be installed with any of its components exposed to the elements. The enclosure must be installed with center to help prevent damage from other sources. Do not mount Zone Perfect Center where it will be accessible to children. Do not locate center in areas of home that are noise sensitive since relays are energized and de-energized during operation and may be an annoyance. Install Zone Perfect in an area with a temperature range between 32°F and 120°F.

Install Zone Perfect Center in either a vertical or horizontal position. Locate in an area that is easily accessible in case servicing should be required.

NOTE: Four vent bushings and 2 open bushings have been supplied. Snap the bushings in the 1-in. diameter holes that are to be used for wiring and the vent bushings in remaining holes.

CAUTION: To prevent possible damage to the Zone Perfect Center, do not mount on plenum, duct work, or flush against furnace.

1. Remove Zone Perfect Center cover. (See Fig. 2.)
2. Mount back plate to wall using screws and wall anchors provided.
3. Level back plate and tighten screws.

IV. INSTALL ZONE DAMPERS

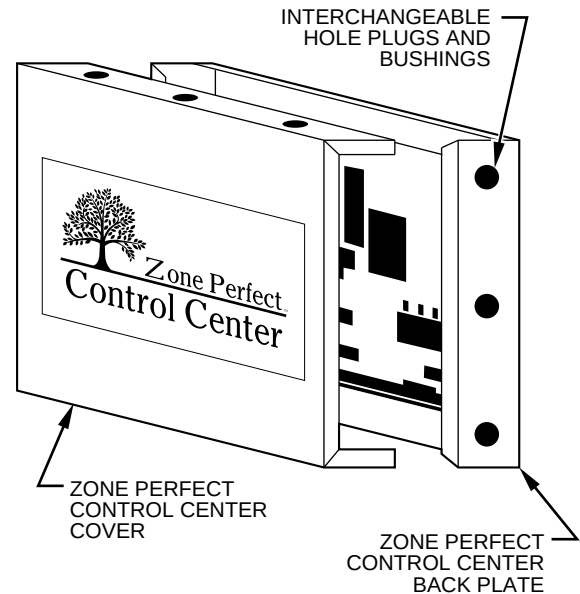
IMPORTANT: If conditions exist for condensate to form on duct work or damper, motor must be positioned for adequate draining. (See Fig. 3.)

NOTE: If a multi-damper enabler is used to link dampers together, then add 5va per damper to transformer power supply rating. Reference multi-damper enabler Installation Instructions. Zone dampers may be installed in any direction.

Install dampers so actuator is visible for inspection and accessible in the event it would ever need service. The black mark on the end of damper shaft represents position of damper blade.

NOTE: Insulate damper using 1-1/2-in. insulation (check local codes). In areas where excessive condensing may occur, carefully insulate over actuator assembly. Make sure insulation does not interfere with operation of actuator.

Before installing duct work, check for proper damper operation. Apply 24 vac between COM and OPN to open the damper and COM and CLS to close the damper. (See Fig. 4.) The damper will modulate counter-clockwise to open and clockwise to close.

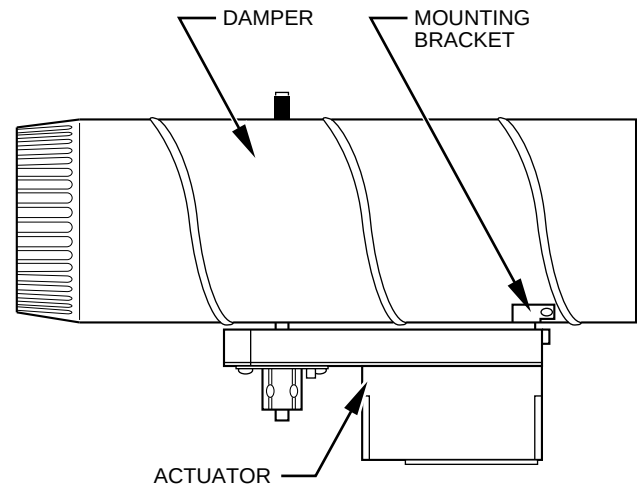


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Fig. 2—Zone Perfect Center

If in an emergency it becomes necessary to force a damper open manually, press in the red quick blade release button with 1 hand and turn the mounting hub to reposition the damper shaft. Release the button to hold the damper shaft in the new position.

To avoid noise and vibration, do not hard mount dampers to any solid structure such as joists.



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Fig. 3—Damper Motor Positioning

A. Round Metal Duct Work

IMPORTANT: If application exists with all metal duct work without insulation, flex connectors must be used on each end of zone dampers to avoid noise and vibration.

1. Crimp end of branch duct.
2. Slip end of zone damper over end of duct work. Use self-tapping sheet metal screw to secure. (See Fig. 5.)
3. Properly seal joint using duct tape, mastic, or other approved method. Do not allow mastic to come into contact with actuator.
4. Insulate damper using 1-1/2-in. to 2-in. insulation. (Check local codes.) (See Fig. 6.)

NOTE: All zone dampers and duct work must be properly supported according to local codes or SMACNA standards.

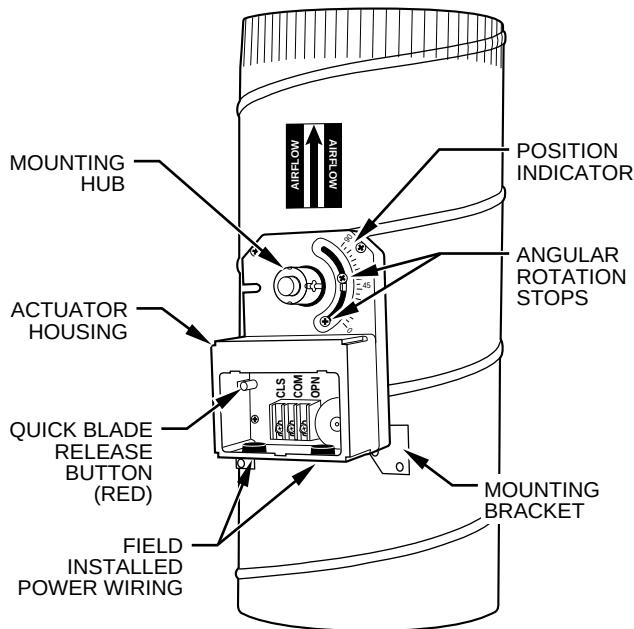


Fig. 4—Damper 24-vac Connections

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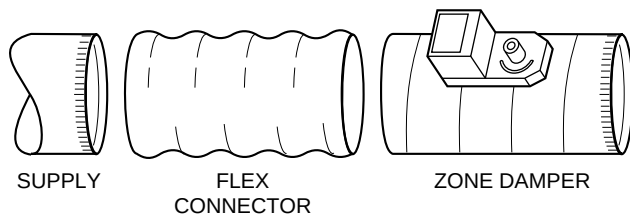


Fig. 5—Round Metal Duct Work

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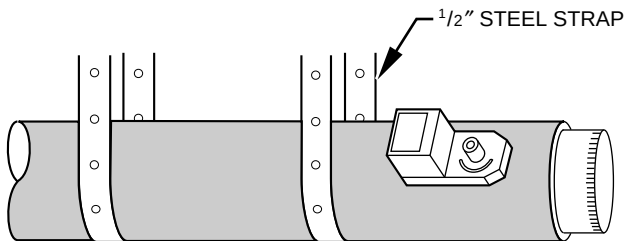


Fig. 6—Insulated Round Metal Duct Work

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B. Rectangular Metal Duct Work

1. Make connections using S-lock and drives. (See Fig. 7.)
2. Properly seal joint using duct tape, mastic, or other approved method. Do not allow mastic to come into contact with actuator.
3. Insulate damper using 1-1/2-in. to 2-in. insulation. (Check local codes.) (See Fig. 8.)

NOTE: All zone dampers and duct work must be properly supported according to local codes or SMACNA standards.

NOTE: There should be a minimum of 4 ft between zone damper and first branch duct if more than 1 branch duct is downstream of zone damper.

C. Round Flexible Duct Work

1. Slip 1 end of flexible duct work over 1 end of zone damper. (See Fig. 9.)
2. Secure flexible duct to zone damper using SMACNA or other approved method.
3. Properly seal joint using duct tape, mastic, or other approved method. Do not allow mastic to come into contact with actuator.

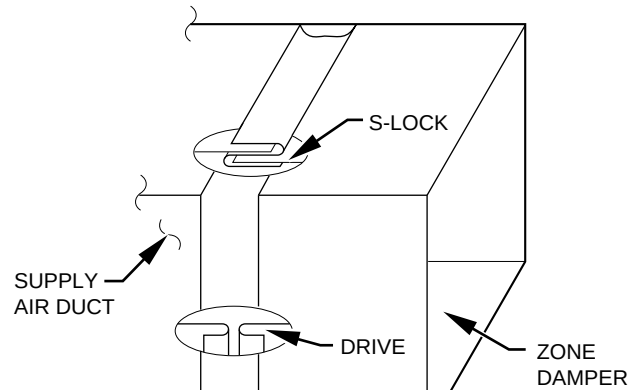


Fig. 7—Rectangular Metal Duct Work

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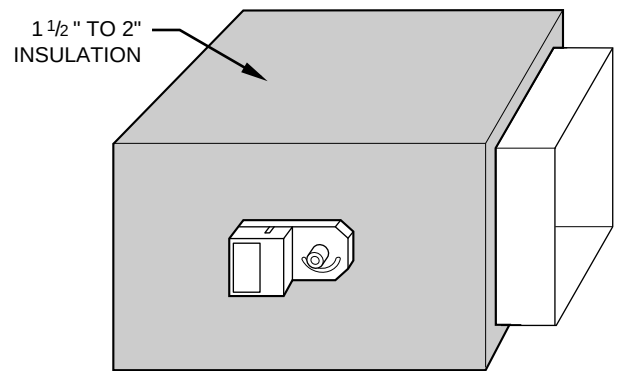


Fig. 8—Insulated Rectangular Metal Duct Work

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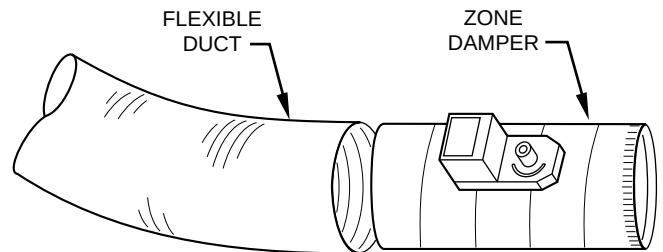


Fig. 9—Round Flexible Duct Work

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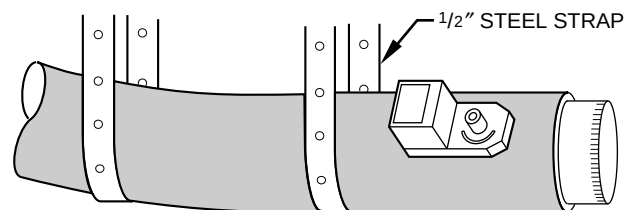


Fig. 10—Insulated Round Flexible Duct Work

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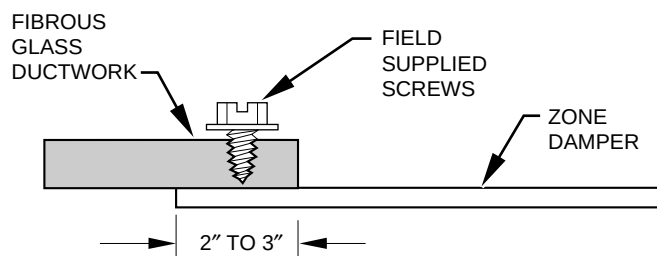
4. Insulate damper using 1-1/2-in. to 2-in. insulation. (Check local codes.) (See Fig. 10.)

NOTE: All zone dampers and duct work must be properly supported according to local codes or SMACNA standards.

D. Rectangular Fibrous Glass Duct Work

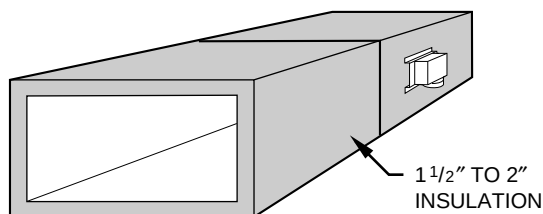
1. Insert 1 end of zone damper into 1 end of fibrous glass duct work approximately 2 to 3 in. (See Fig. 11.)
2. Screw field-supplied screws and tabs into zone damper.

3. Properly seal joint using duct tape, mastic, or other approved method. Do not allow mastic to come into contact with actuator.
4. Insulate damper using 1-1/2-in. to 2-in. insulation. (Check local codes.) (See Fig. 12.)



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Fig. 11—Rectangular Fibrous Glass Duct Work



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Fig. 12—Insulated Rectangular Fibrous Glass Duct Work

V. INSTALL BAROMETRIC BYPASS DAMPER

NOTE: The barometric bypass damper is a critical part of the Zone Perfect System for control of minimum airflow and noise reduction. It is recommended that bypass be installed.

The bypass should be installed according to local codes and SMACNA standards. Be sure bypass is properly supported.

For proper installation, refer to Installation Instructions packaged with barometric bypass.

CAUTION: Failure to properly install bypass damper can cause permanent damage to HVAC equipment. For single-speed furnace applications, bypass air must never exceed 25 percent. (A dump zone may be preferred over a direct return method for bypass installation.)

VI. INSTALL DUCT TEMPERATURE SENSOR

Locate duct temperature sensor in main supply trunk after heating and cooling coil and before bypass damper and before first branch. The duct temperature sensor must be radiant shielded to prevent heat from affecting correct air temperature.

1. Drill a 7/8-in. hole at location in unit where sensor will be installed.
2. Remove cover and insert sensor probe through 7/8-in. hole.
3. Drill two 1/16-in. holes to accept No. 6 screws through pre-drilled holes in duct temperature sensor back plate.
4. Use 2 No. 6 sheet metal screws included with sensor to mount duct temperature sensor back plate to unit.
5. Insert 2-conductor wiring through 1 of the pre-drilled holes in side of back plate.
6. Connect sensor to 2-wire conductor using provided wire nuts. (See Fig. 13 for connection to Zone Perfect Center.)

VII. INSTALL DX COIL SENSOR

The Dx coil temperature sensor is recommended for use in heat pump with fan coil applications only. The sensor should be installed between Dx coil and electric heaters. It measures Dx coil

temperature through a solid temperature sensor and adds extra protection for high/low temperature limits. The Dx coil sensor interfaces to Zone Perfect Center on terminal P14. (See Fig. 13.) To activate Dx coil temperature sensor, remove factory-supplied resistor from Dx terminal block and replace with sensor leads. When activated, the Dx sensor works in parallel with duct sensor when in cooling mode. In cooling mode, it has LAT set points of 50°F to 45°F. In heating mode, it has LAT set points of 105°F to 110°F. This is non-adjustable.

SEQUENCE OF OPERATION

I. HEATING AND COOLING COMFORT SETPOINTS

If zone space temperature is between heating and cooling setpoints for zone, then zone is said to be "satisfied" with respect to its zone temperatures. When a zone is "satisfied," heating or cooling equipment will not turn on to condition space. For example, if cooling setpoint is 76°F and heating setpoint is 72°F, then a space temperature of 73°F is assumed to be satisfactory and no heating or cooling of zone is required. If space temperature in a zone falls below heating setpoint, then that zone needs to have heat added to zone which will raise space temperature back to heating setpoint. For example, if heating setpoint is 72°F and space temperature is 70°F, then space temperature must be raised 2 degrees in order for zone to be satisfied. In this case, temperature "heating demand" for zone is 2°F (72°F minus 70°F).

If space temperature in a zone rises above cooling setpoint, then that zone needs to have heat removed from zone which will lower space temperature back to cooling setpoint. For example, if cooling setpoint is 76°F and space temperature is 78°F, space temperature must be lowered 2 degrees in order for zone to be satisfied. In this case, "cooling demand" for zone is 2°F (78°F minus 76°F).

TABLE 1—COOLING AND HEATING DEMAND

TEMPERATURE	DEMANDS
78°F-80°F	Cooling required to satisfy zone demand if temperature rises above cooling setpoint.
76°F	Cooling setpoint
74°F-76°F	No heating or cooling required between setpoints
72°F	Heating setpoint
68°F-70°F	Heating required to satisfy zone demand if temperature falls below heating setpoint.

II. SEQUENCE OF EVENTS FOR A NORMAL HEATING OR COOLING CYCLE

Given comfort setpoints and space temperature for zones within system, Zone Perfect thermostats will determine if active heating or cooling is required. If so, the Zone Perfect system will perform the following:

- Make sure all zone dampers are fully open.
- Energize HVAC equipment fan.
- Energize heating or cooling equipment. The equipment may be a compressor, furnace, strip heater, etc.
- Set zone damper to open or closed position based upon individual zone demand.
- Energize additional stages of heating or cooling if demand warrants.
- Turn off heating or cooling equipment when all zones are satisfied.
- Open all zone dampers when equipment is turned off (after 90-sec delay).

This is the basic sequence of operation for the Zone Perfect System. The actual control of dampers, HVAC equipment, and system fan will change with configuration of system. Depending upon configuration, Zone Perfect can control heat pumps, furnaces, and dual fuel (this may require a third party relay interface depending on equipment configuration) applications.

TABLE 2—AVAILABLE HEATING AND COOLING STAGES VERSUS SYSTEM TYPE

TYPE OF HVAC EQUIPMENT USED	COOLING STAGE 1	COOLING STAGE 2	REVERSING VALVE O	HEAT STAGE 1	HEAT STAGE 2	REVERSING VALVE O
Single-Stage Heat Pump	Y1	—	Energized	Y1/W1	W2	De-energized
2-Stage Heat Pump	Y1	Y2	Energized	Y1/W1	W2	De-energized
Cooling Only, any Heater Type	Y1	Y2	—	W1	W2	—

III. SELECTION OF A SYSTEM MODE

The first step in any heating or cooling cycle requires Zone Perfect to receive an input from any thermostat located in a zone. Zone Perfect will then prepare to operate heating or cooling equipment to reduce demand based on input from thermostat.

The zones' demand switch determines how many thermostats must have same demand (heating or cooling) before equipment will be allowed to operate. The switch can be set to allow demand from 1 to 4. (See page 10, C.)

NOTE: Never use 4 demands to bring on system equipment. For normal operation, have any 1 thermostat bring on equipment, then set both switches down or to OFF. If this is not set correctly, heating or cooling equipment will not come on.

IV. PRE-POSITIONING DAMPERS AND STARTING THE SYSTEM FAN

In order to minimize noise and enhance system operation, Zone Perfect maintains fully open zone dampers prior to starting system fan or heating/cooling equipment. The intent is to provide HVAC equipment with unrestricted duct work and to reduce pressure surges. Zone Perfect also fully opens dampers whenever a heating or cooling cycle is completed (this is done after a 90-sec delay). All zone dampers will remain fully open until next heating or cooling cycle.

The other reason for opening dampers is to provide unrestricted duct work to other equipment which is not directly controlled by Zone Perfect. One example may be Heat Recovery Ventilator. If Zone Perfect is not actively controlling HVAC system, then it must not impose any control influences (such as closed zone dampers) on system and prevent proper operation of other devices.

For continuous fan operation, only zone 1 thermostat controls this operation. When zone 1 thermostat has fan selector switch in AUTO position, fan will operate only when heating and cooling equipment is operating. When zone 1 thermostat has fan selector switch in ON position, fan will operate continuously. Zones 2, 3, and 4 will not control this. Do not hook up G terminal on zones 2, 3, and 4 thermostats.

V. OPERATING HEATING AND COOLING EQUIPMENT

Before any heating or cooling equipment is started, Zone Perfect must first choose between heating or cooling. For most of the year there is little question as to the need for heat or cooling. But for portions of the year, particularly during mid-season, a building may have simultaneous needs for both heating and cooling.

Zone Perfect will select equipment mode which has greatest number of zone demands.

VI. HVAC EQUIPMENT CONNECTIONS

The Zone Perfect relay outputs are shown in Table 2. The Y1 and Y2 contacts are used for compressor contactor only. Zone Perfect operates heat pumps by energizing compressor contactor and controlling reversing valve through "O" relay output. A heat pump thermostat is not needed to control a heat pump with Zone Perfect. The W1 and W2 contacts are always used for heat sources. These are heating only units such as furnaces, strip heaters, etc. The relay outputs for Zone Perfect are shown in Table 2.

Automatic changeover allows Zone Perfect to switch between heating and cooling even if current system demand has not been satisfied. For example, if Zone Perfect is providing heat, automatic

changeover allows Zone Perfect to look at any cooling inputs which may also exist in building. If cooling demand exceeds heating demand for 30 minutes, Zone Perfect will stop providing heat and will switch into a cooling mode. Once cooling demand is satisfied (or automatic changeover dictates a switch), Zone Perfect will revert back to a heating mode in order to try and satisfy demand. If there is a tie, heating demand wins.

VII. DUCT TEMPERATURE OPTIMIZER OPTION (DLOPT)

As the Zone Perfect system operates through a heating or cooling cycle, zone demands will change. This changes actual load that is applied to HVAC equipment. In cooling mode, if zone airflows decrease, cooling equipment will tend to lower supply-air temperatures which could tend to exceed LAT trip limits. Conversely, heating equipment will tend to raise supply-air temperatures which could exceed high trip limits. With duct temperature optimizer selected (DLOPT selected on control center board), Zone Perfect will detect this condition and take corrective action. The first step taken by Zone Perfect will be to start turning off extra stages of equipment. This will continue until either leaving air temperature (LAT) problem is corrected or system is operating on first stage only.

This control helps Zone Perfect System cope with installations where air conditioning system may suffer from poor duct work, improperly sized heating or cooling equipment, and/or improper settings of barometric bypass damper. This control is especially useful in retrofit applications where size and routing of duct work may not be entirely known or satisfactory.

The duct temperature optimizer works by controlling how cold or hot the air inside supply air duct gets. By monitoring the temperature of air inside supply air system, Zone Perfect can determine how well the particular HVAC system is performing at any given time.

Whenever Zone Perfect is providing heating or cooling, the zone within the building that is asking for conditioned air will always have its damper fully open. The other zones in the system may or may not have open dampers depending upon their particular needs. If duct work is too small or air conditioner/heater is too large, then the zone requiring conditioned air may not be able to take enough air to allow your equipment to operate properly. Zone Perfect will detect this and open closed dampers slightly to allow equipment to continue to operate. In practice this works well since most areas in a home have similar demands and the air placed in extra zones tends to temper space temperature.

The duct temperature optimizer may be disabled on control center. The factory jumper is set to ON position. Using this control option is highly recommended. The cooling temperature limit is not adjustable. It is set at 50°F for second stage and 45°F for first stage. The heating LAT is adjustable. A section showing an adjustment for heating LAT is on page 10. It is very important that this temperature is properly set. For gas or oil furnaces, temperature limit will be in higher temperature range. For heat pumps, temperature setting should always be in lower temperature range. See page 10, D to ensure heating equipment will operate efficiently.

In a situation where 1 zone seems to have poor duct work, then the Zone Perfect system is capable of reverting back to a fully-open,

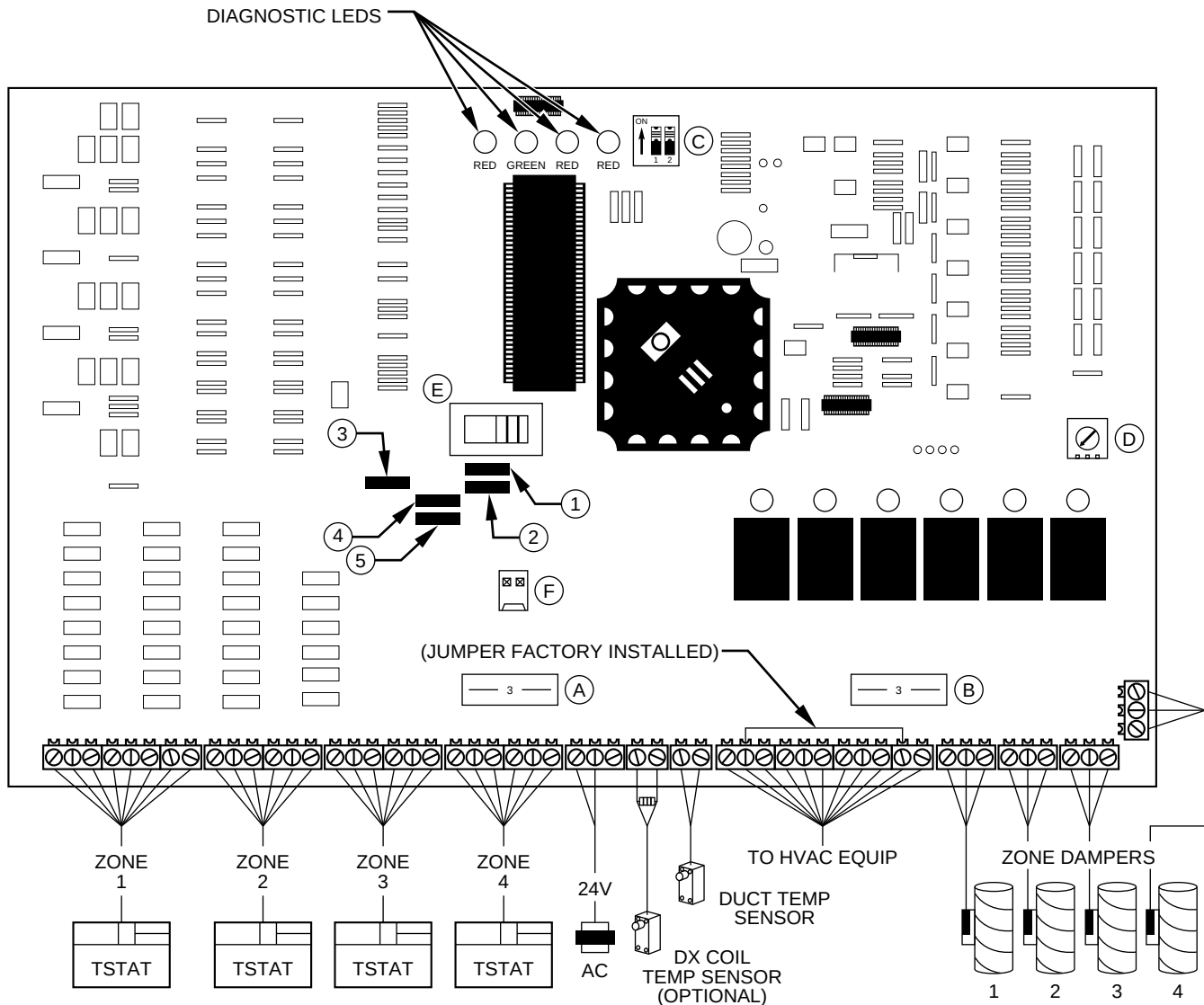


Fig. 13—Zone Perfect Circuit Board

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constant-volume system (just like HVAC systems normally found in a home). If this condition persists, it should always be looked upon as an indication of a HVAC system design problem, not a Zone Perfect problem.

VIII. ELECTRONIC THERMOSTAT CONNECTION WITH ZONE PERFECT CONTROL

Corporate-made, non-programmable and programmable thermostats can be connected to the Zone Perfect system. See pre-sale literature for thermostat part numbers.

NOTE: The zone control board is only capable of 2-stage heat and 2-stage cool operation. Fig. 14 and 15 will reflect these applications only. Review and understand the following items before installing.

THERMOSTAT SETUP

1. Thermostat will not operate unless both R and C are connected to zone module input.
2. If selected thermostat is a heat pump (HP) or 2-speed (2S) model, convert thermostat to air conditioning operation. This will assure that Y signals are generated for cooling, and W signals are generated for heating from thermostat to zone module input. The thermostat O/W2 output will now be the second-stage heat call. If installation is a heat pump system, zone control board will provide proper output signal to heat pump.

3. Select "Zoning" option on thermostat. This will disable Timeguard and 4-cycle per hour (cph) protection built into thermostat. Let zone control board perform Timeguard and cycle protection. Refer to thermostat Installation Instruction under Zoning for more detail.
4. The zone 1 thermostat is the only thermostat that can control continuous fan operation with zoning. Connect G between zone 1 thermostat and zone 1 input on zone control module.
5. Follow all safety and installation instruction consideration outlined in thermostat Installation Instructions.

ZONE CONTROL BOARD SETUP

1. Configure zone control board jumper for F-STAT (thermostat) option only. Do not use HP-STAT option. When T-STAT Fnc is selected, this will setup control inputs to recognize Y1 and Y2 for first- and second-stage cooling, W1 and W2 for first- and second-stage heating.
2. Configure zone control board for either HT pump or Furnace. When Equipment HT pump mode is selected, a heat pump should be used. The zone control board will provide proper output signal to heat pump. When Furnace mode is selected, a gas/electric furnace should be used.

3. Configure zone control board for either W/FAN or W/O FAN. W/FAN mode should be selected when a heat pump is installed and fan is needed to come on immediately with demand. W/O FAN should be selected when fan is controlled by gas/electric furnace.
4. Configure zone control board for either DTOPT ON or OFF. When DTOPT is ON and a LAT trips occurs, closed dampers will begin opening to try and keep equipment running by maintaining proper air temperatures. However, if LAT temperatures exceed their limits, equipment will start staging down. When DTOPT OFF is selected, equipment will stage down. Closed dampers will not open.

IX. TROUBLESHOOTING (SEE TABLES 3 AND 4.)

This section contains information to assist in troubleshooting problems and errors associated with the Zone Perfect system.

X. SYSTEM CONFIGURATION, DIAGRAMS, JUMPERS, AND SWITCHES

SENSORS

The duct temperature sensor and Dx coil sensor are the exact same device. For Zone Perfect to function correctly, either a sensor or a 10k resistor must be attached. Typically the duct temperature sensor is always installed to sense the LAT. See Fig. 13 for location.

The Dx Coil Sensor is optional and the Zone Perfect I/O center comes from the factory with a 10k resistor in its place. By removing resistor and attaching a sensor in its place, the Dx coil function is activated. See Section VII for application/installation and Fig. 13 for location.

LED INDICATORS

There are multiple LEDs on the I/O board to indicate if Zone Perfect is operating properly. Located on the I/O board from left to right are as follows:

RED—ON indicates compressor section failure.

GREEN—Will blink once every sec for normal operation. If an error code appears, the green LED will indicate the one's digit of an error code and the red will indicate the ten's digit. (See Table 3.) For example, 1 green with 2 red flashes = Duct Sensor Error. **RED**—ON indicates an error has occurred, will alternate with green LED for code.

RED—ON indicates emergency heat is energized.

TIME GUARD

Zone Perfect provides equipment protection with an internal 5 minute time guard delay. This delay is present upon initial power up. There is also a 5-minute time guard delay for all cooling (Y1) and heat pump modes. The Time Guard can be cleared by using the comprotect override feature. (See page 10, F.) Second stage (Y2) and (W2) will also have a 5-minute delay between stages and cannot be cleared.

MAXIMUM CYCLE RATE

Zone Perfect will allow a maximum of 4 equipment cycles per hr or 1 every 15 min when a heating or cooling mode is activated. When a demand exists, an internal timer will start counting down 15, 14, 13...0 minutes. Once timer expires control will allow a new mode to restart equipment. The internal time, as well as cooling 5-minute time guard can be cleared by using the comprotect override feature.

CARE AND MAINTENANCE

For continuing optimum 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 proper frequency of maintenance. Frequency may vary depending upon geographic areas.

I. LEAVE USER'S MANUAL WITH HOMEOWNER

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

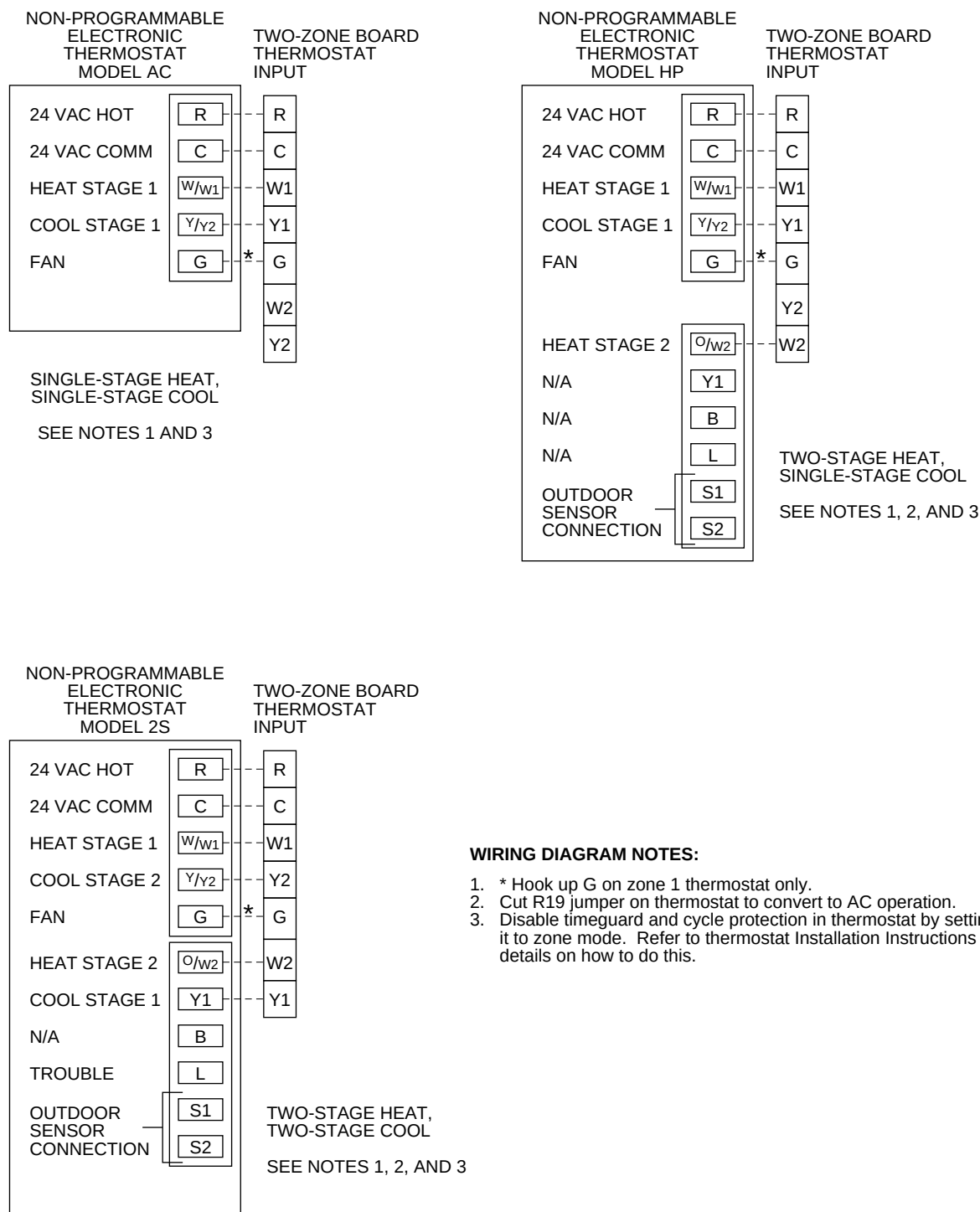


Fig. 14—Corporate-Model, Non-Programmable Thermostat Wiring Diagrams

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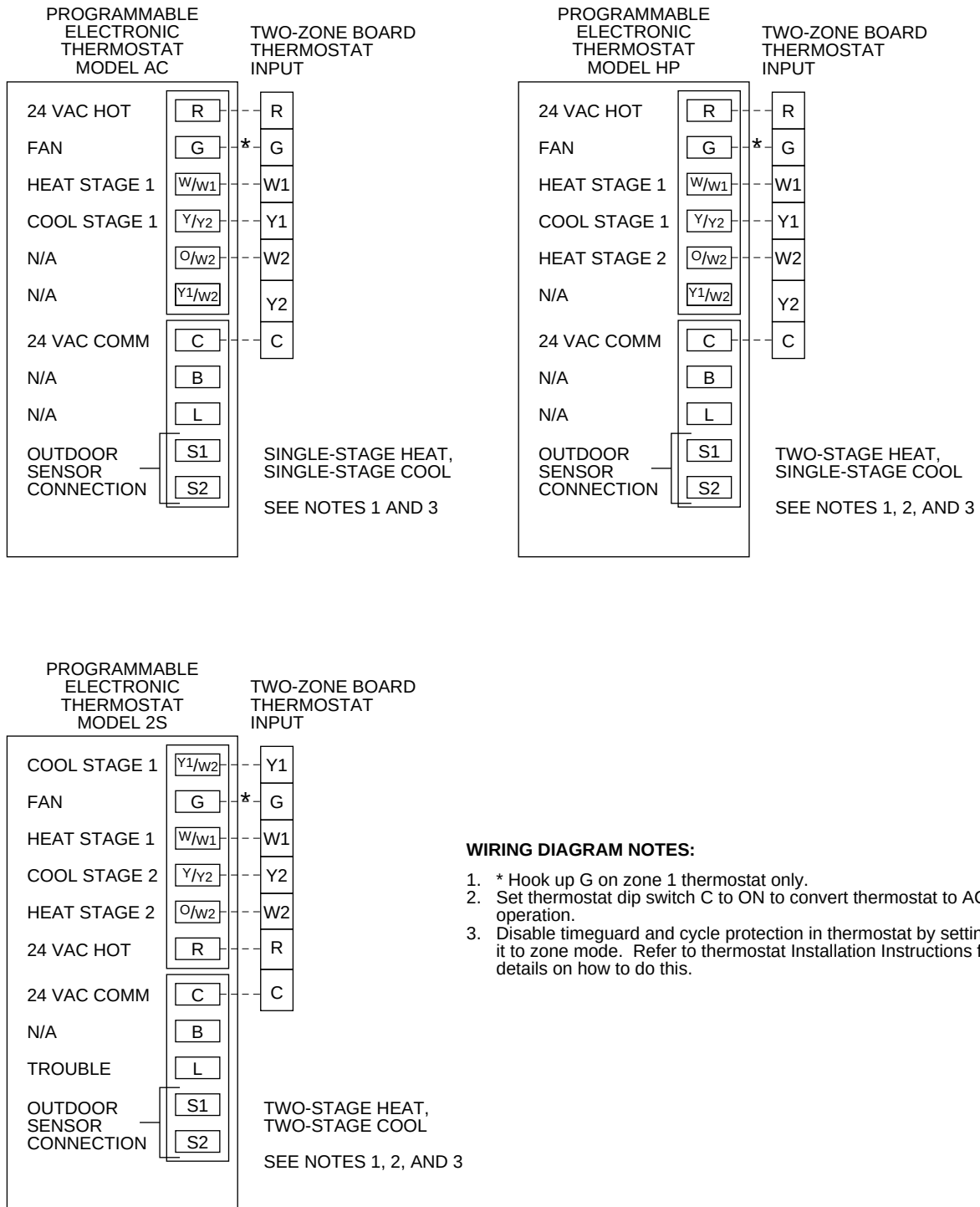


Fig. 15—Corporate-Model, Programmable Thermostat Wiring Diagrams

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①



60 HZ—Electrical standard for U.S.A.



50 HZ—Power generation is 50 cycles per sec. European standard.

②



DTOPT—When supply-air temperatures approach a trip limit, closed dampers open to maintain proper air temperatures.



When supply-air temperatures approach a trip limit, HVAC equipment will turn off.

③



F STAT—Gas/electric thermostat is installed in each zone. Must be in this position to operate properly.



HP STAT—Do not use.

④



Furnace—Air conditioning equipment installed is a cooling only unit.



HT PUMP—Air conditioning equipment installed is a heat pump.

⑤



W/O FAN—When demand for heating exists, fan is controlled by gas/electric furnace.



W/FAN—When demand for heating exists, fan comes on immediately. (Heat pump only.)

A

Main Fuse—Protects main circuit board from electrical damage (3 amps.)

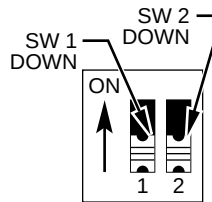
B

Damper Fuse—Protects damper from electrical damage (3 amps.)

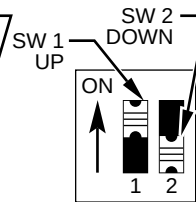
C

Zone Demand Switch—Controls how many areas must need cooling or heating before equipment will come on. Normally should be set on 1.

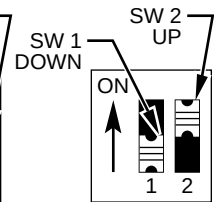
NOTE: Setting MUST be less than total number of thermostats being used. If not set correctly, heating and cooling equipment will not come on.



ANY ONE THERMOSTAT WILL TURN ON EQUIPMENT



2 THERMOSTATS MUST HAVE SAME DEMAND TO TURN ON EQUIPMENT



3 THERMOSTATS MUST HAVE SAME DEMAND TO TURN ON EQUIPMENT

D

High Leaving Air Temperature (LAT), Trip Limit Setting—Temperature sensed by duct temperature sensor. When duct temperature reaches this temperature setting, duct temperature optimizer is enabled. Heating LAT trip limits are adjustable (105-155°F). Cooling limits are fixed at (50-45°F) non-adjustable. If LAT exceeds trip limit setting plus the differential, equipment will shut off.

NOTE: Dx coil sensor recommended for heat pump with fan coil operation. High limits are fixed at second stage off at 105°F and first stage off at 110°F.

NORMAL HEAT PUMP SETTING



110°F
105°F

NORMAL GAS/ELECTRIC SETTING

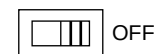


175°F
155°F

ADJUSTABLE TRIP LIMIT SETTING °F	EQUIPMENT SHUT OFF TEMPERATURE °F
155	175
147	164
138	153
130	143
122	132
113	121
105	110

E

Emergency Heat Switch—This switch should remain in the OFF position for normal operation in both furnace and heat pump operation. It should be switched to the ON position only upon heat pump compressor heat failure to provide emergency heat.



F

Comprotec Override—Temporary equipment time delay override, will clear compressor time guard and cycle protection for 1 cycle.



TABLE 3—TROUBLESHOOTING

LED CODES	ERROR DESCRIPTION	ACTION REQUIRED
Green flashes 1 time every second and no other LEDs are flashing.	Normal operation.	None.
Green flashes 1 time and Red flashes 1 time	Duct temperature sensor. First-stage heat limit exceeded; heat will be locked out.	Wait until duct temperature cools below exceeded temperature trip. (Heat leaving air temperature trip limits set at LAT limits POT on central control circuit board; range is 110 to 175°F.)
Green flashes 1 time and Red flashes 2 times	Duct temperature sensor. Second-stage heat limit exceeded; heat will be locked out.	Wait until duct temperature cools below exceeded temperature trip. Range is 105 to 155°F.
Green flashes 1 time and Red flashes 3 times	Duct temperature sensor. First-stage cool limit exceeded; cool will be locked out.	Wait until duct temperature raises above exceeded temperature trip (45°F).
Green flashes 1 time and Red flashes 4 times	Duct temperature sensor. Second-stage cool limit exceeded; cool will be locked out.	Wait until duct temperature raises exceeded temperature trip (50°F).
Green flashes 1 time and Red flashes 5 times	DX temperature sensor. First-stage heat limit exceeded; heat will be locked out.	Wait until Dx temperature cools below exceeded temperature trip. Fixed at 110°F.
Green flashes 2 times and Red flashes 1 time	DX temperature sensor. Second-stage heat limit exceeded; heat will be locked out.	Wait until Dx temperature cools below exceeded temperature trip. Range is 105 to 155°F.
Green flashes 2 times and Red flashes 2 times	DX temperature sensor. First-stage cool limit exceeded; cool will be locked out.	Wait until duct temperature raises above exceeded temperature trip (45°F).
Green flashes 2 times and Red flashes 3 times	DX temperature sensor. Second-stage cool limit exceeded; cool will be locked out.	Wait until duct temperature raises above exceeded temperature trip (50°F).
Green flashes 2 times and Red flashes 4 times	1. Duct temperature sensor. 2. Temperature sensor is shorted.	1. Verify that a duct temperature sensor or a 10K ohm resistor is attached to control center at duct temperature connectors. 2. Replace duct temperature sensor.
Green flashes 2 times and Red flashes 5 times	1. Duct temperature sensor. 2. Temperature sensor is open.	1. Verify that a duct temperature sensor or a 10K ohm resistor is attached to control center at duct temperature connectors. 2. Replace duct temperature sensor.
Green flashes 3 times and Red flashes 1 time	1. Dx temperature sensor. 2. Temperature sensor is shorted.	1. Verify that a Dx temperature sensor or a 10K ohm resistor is attached to control center at duct temperature connectors. 2. Replace Dx temperature sensor.
Green flashes 3 times and Red flashes 2 times	1. Dx temperature sensor. 2. Temperature sensor is open.	1. Verify that a Dx temperature sensor or a 10K ohm resistor is attached to control center at duct temperature connectors. 2. Replace Dx temperature sensor.
Green flashes 3 times and Red flashes 3 times	Damper fuse blown.	1. Check for short circuits on damper wire connections at dampers and control center. 2. Replace damper fuse. 3. Check damper operation. May need to be replaced.
Green flashes 3 times and Red flashes 4 times	Fatal control center circuit board failure.	Replace control center circuit board.

Table 4 shows a temperature/ohm/voltage relationship to help aid in troubleshooting the Zone Perfect System. This table will evaluate both the Duct/Dx Sensor operation. Use a digital multimeter to perform the following:

To verify a sensor is good, disconnect both leads from I/O board and measure resistance through sensor. Match ohm reading to table and compare temperature reading on chart to ambient temperature surrounding sensor (Accuracy should be +/- 5-10 percent). Example: if 10.92k ohms are measured, this equals approximately 73°F.

To verify if I/O board is normal, reattach sensor to I/O board, set meter to 5vdc, and measure voltage across terminal connections. Match voltage reading to temperature reading in chart. The ambient temperature surrounding sensor should be +/- 5-10 percent. Example: 2.61vdc is approximately 73°F.

TABLE 4—TEMPERATURE/OHM/VOLTAGE RELATIONSHIP

TEMP °F	OHMS	VOLTS	TEMP °F	OHMS	VOLTS	TEMP °F	OHMS	VOLTS	TEMP °F	OHMS	VOLTS
30	34367	3.873	73	10921	2.610	117	4042	1.439	160	1693	0.724
32	32654	3.828	75	10449	2.555	118	3889	1.400	162	1637	0.703
34	31030	3.781	77	10000	2.500	120	3743	1.362	163	1582	0.683
36	29498	3.734	79	9571	2.445	122	3603	1.324	165	1530	0.663
37	28052	3.686	81	9164	2.391	124	3469	1.288	167	1480	0.645
39	26686	3.637	82	8776	2.337	126	3340	1.252	169	1431	0.626
41	25396	3.587	84	8407	2.284	127	3217	1.217	171	1385	0.608
43	24171	3.537	86	8056	2.231	129	3099	1.183	172	1340	0.591
45	23013	3.485	88	7720	2.178	131	2986	1.150	174	1297	0.574
46	21918	3.433	90	7401	2.127	133	2878	1.117	176	1255	0.558
48	20883	3.381	91	7096	2.075	135	2774	1.086	178	1215	0.542
50	19903	3.328	93	6806	2.025	136	2675	1.055	180	1177	0.527
52	18972	3.274	95	6530	1.975	138	2579	1.025	181	1140	0.512
54	18090	3.220	97	6266	1.926	140	2488	0.996	183	1104	0.497
55	17255	3.165	99	6014	1.878	142	2400	0.968	185	1010	0.483
57	16464	3.111	100	5774	1.830	144	2315	0.940	187	1037	0.470
59	15714	3.056	102	5546	1.784	145	2235	0.913	189	1005	0.457
61	15000	3.000	104	5327	1.738	147	2157	0.887	190	974	0.444
63	14323	2.944	106	5117	1.692	149	2083	0.862			
64	13681	2.889	108	4918	1.648	151	2011	0.837			
66	13071	2.833	109	4727	1.605	153	1943	0.813			
68	12493	2.777	111	4544	1.562	154	1876	0.790			
70	11942	2.721	113	4370	1.521	156	1813	0.767			
72	11418	2.666	115	4203	1.480	158	1752	0.745			

TABLE 5—WIRING DIAGRAM REFERENCE FOR FIG. 14 AND 15

FAN COIL WITH AIR CONDITIONER			
OUTDOOR UNIT	Indoor Unit (Fig. 14)		
	FA4A FB4A FC4B	FK4A	FK4B
Single-Stage Air Conditioner	A	A	B
Two-Speed Air Conditioner (598A)	C*	D	E
Fan Coil With Heat Pump			
OUTDOOR UNIT	Indoor Unit (Fig. 15)		
	FA4A FB4A FC4B	FK4A	FK4B
Single-Stage Heat Pump	A	A	B
Two-Speed Heat Pump (698A)	C*	D	E

* Latent Capacity Control—Required, field-supplied. See 2-speed Installation Instructions.

TABLE 6—WIRING DIAGRAM REFERENCE FOR FIG. 18

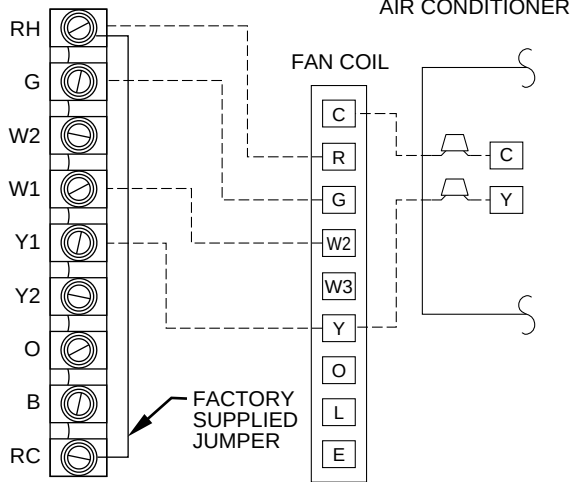
FURNACE WITH AIR CONDITIONER							
OUTDOOR UNIT	Indoor Unit (Fig. 18)						
	398B	320 321	373LAD 383KAD 394HAD 396HAD 349HAZ 398AAZ 399AAZ	395CAV 376CAV 383KAV 373LAV 398AAV 399AAV 349MAV	350 340 490	355	330 331
Single-Speed Air Conditioner	A* B		B	B	B	I	I
Two-Speed Air Conditioner (598A)	C† D*	E F*	G‡	H‡	H‡	J	J

* KGATT0101VSP (Optional) 2-stage relay kit—May help to control over-conditioning.

† KSAIF01012SP B Furnace Interface kit—This is required to allow 2-speed outdoor units to select indoor airflow.

‡ Latent Capacity Control—Required, field-supplied. See 2-speed Installation Instructions.

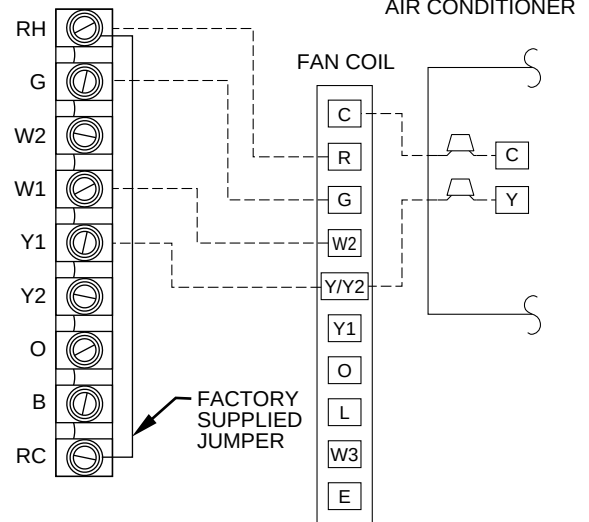
ZONE PERFECT SYSTEM



A

A94176

ZONE PERFECT SYSTEM

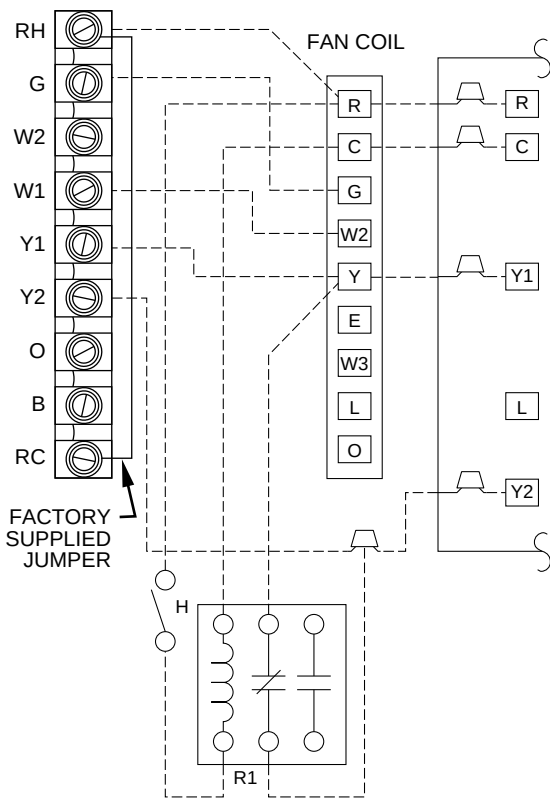


B

A94177

ZONE PERFECT SYSTEM

2-SPEED AIR CONDITIONER



Latent Capacity Control (LCC)

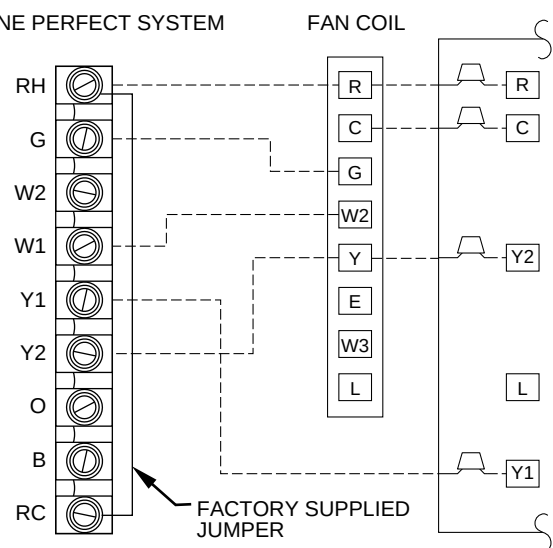
C

R1 = Relay DPST, Pilot Duty,
24V coil (HN61KK324) or Equivalent.
H = Humidistat, opens on humidity
rise (HL38MG026)

A94178

ZONE PERFECT SYSTEM

2-SPEED AIR CONDITIONER

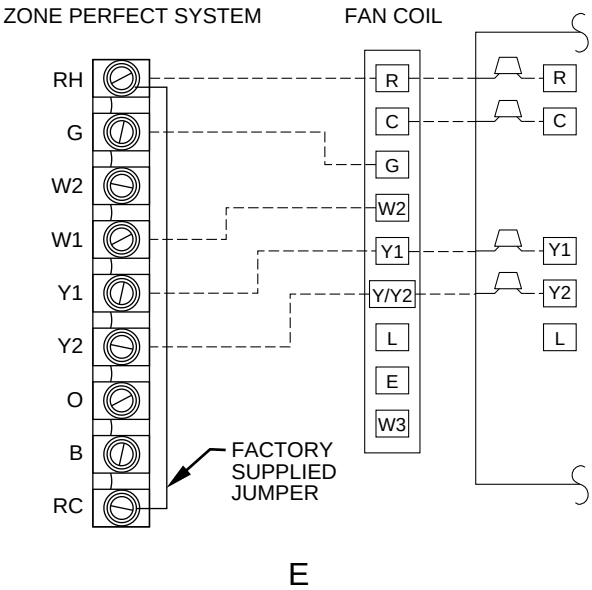


D

A94179

Fig. 16—Wiring Diagrams (Fan Coil with Air Conditioner)

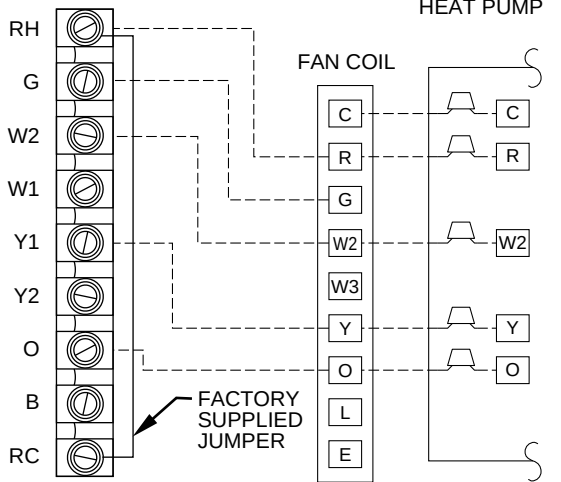
2-SPEED
AIR CONDITIONER



A94180

Fig. 16—Wiring Diagrams (Fan Coil with Air Conditioner) Continued

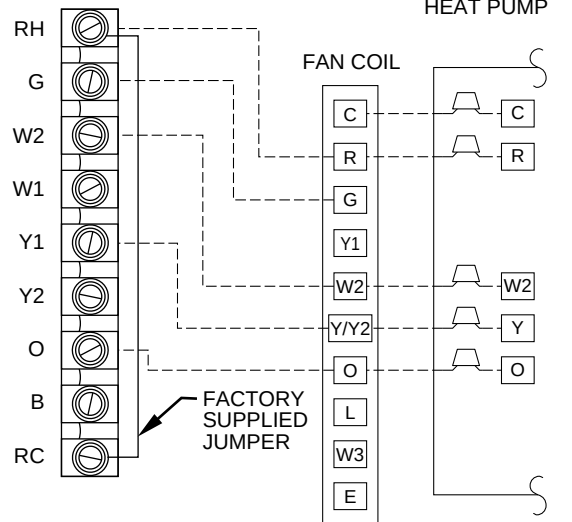
ZONE PERFECT SYSTEM



A

A94181

ZONE PERFECT SYSTEM

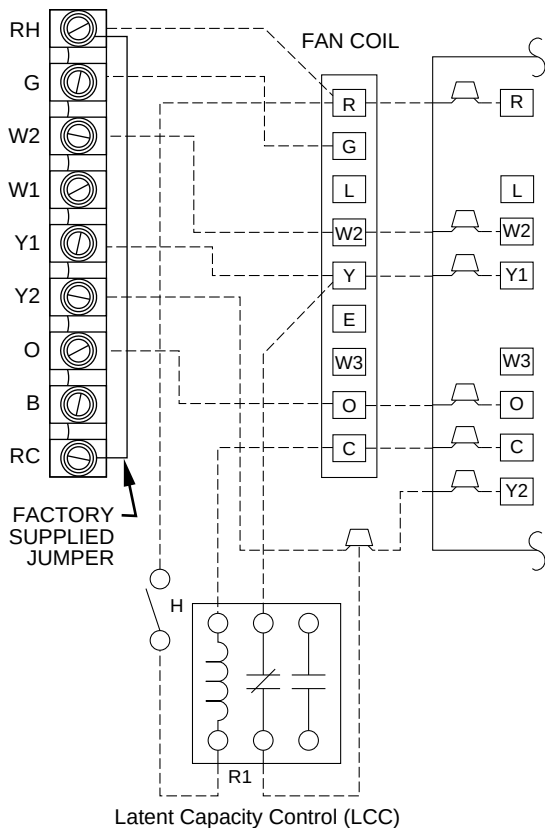


B

A94182

ZONE PERFECT SYSTEM

2-SPEED HEAT PUMP

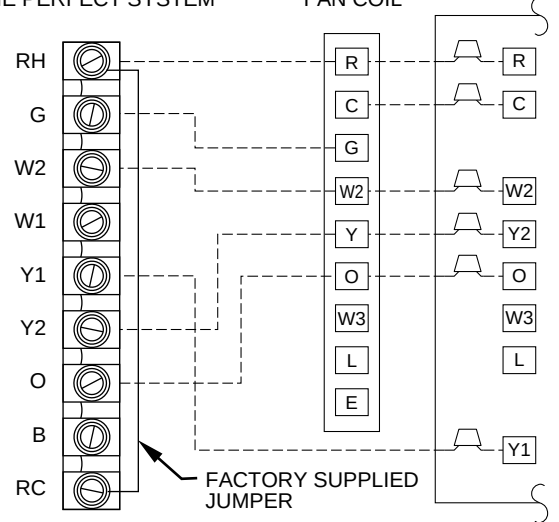


C

A94183

ZONE PERFECT SYSTEM

2-SPEED HEAT PUMP

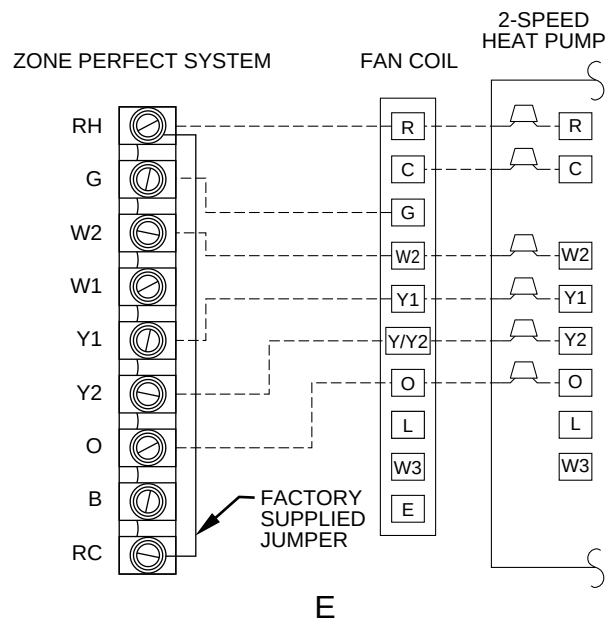


D

A94184

R1 = Relay DPST, Pilot Duty,
24V coil (HN61KK324) or Equivalent.
H = Humidistat, opens on humidity
rise (HL38MG026)

Fig. 17—Wiring Diagrams (Fan Coil with Heat Pump)

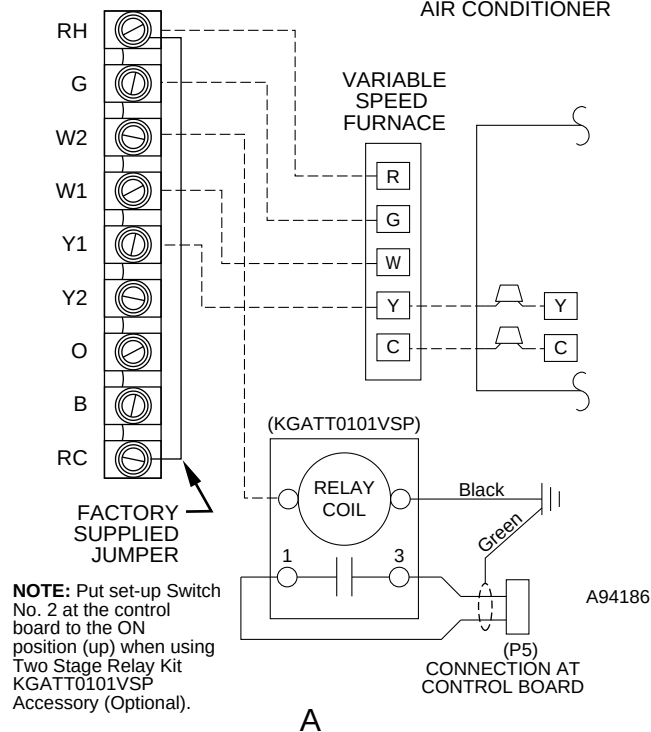


A94185

Fig. 17—Wiring Diagrams (Fan Coil with Heat Pump) Continued

ZONE PERFECT SYSTEM

STANDARD SINGLE-SPEED AIR CONDITIONER



ZONE PERFECT SYSTEM

STANDARD SINGLE-SPEED AIR CONDITIONER

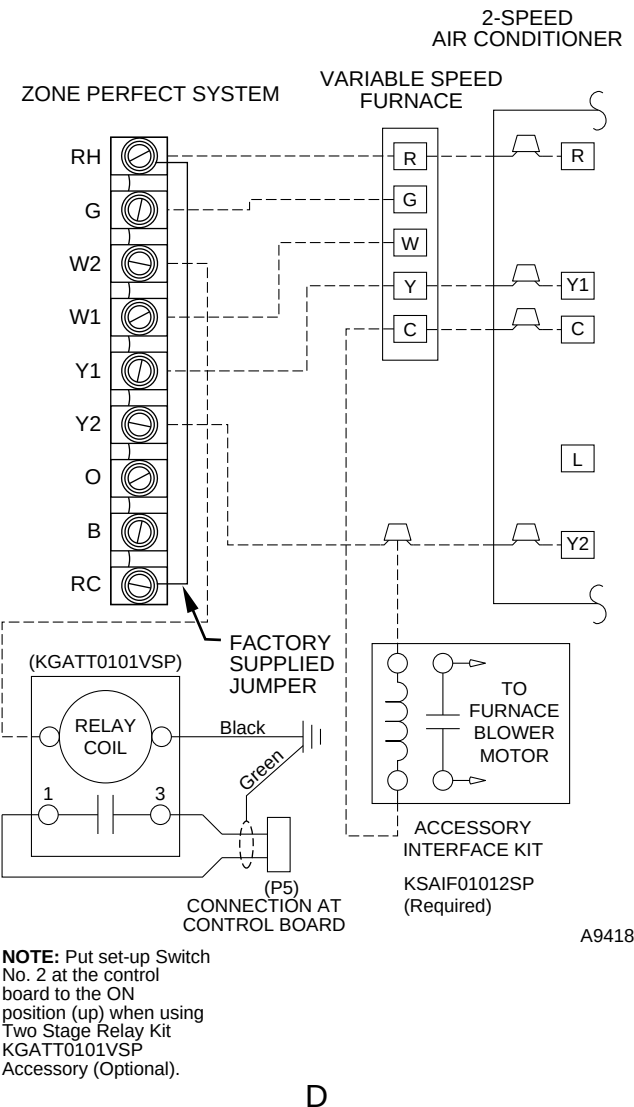
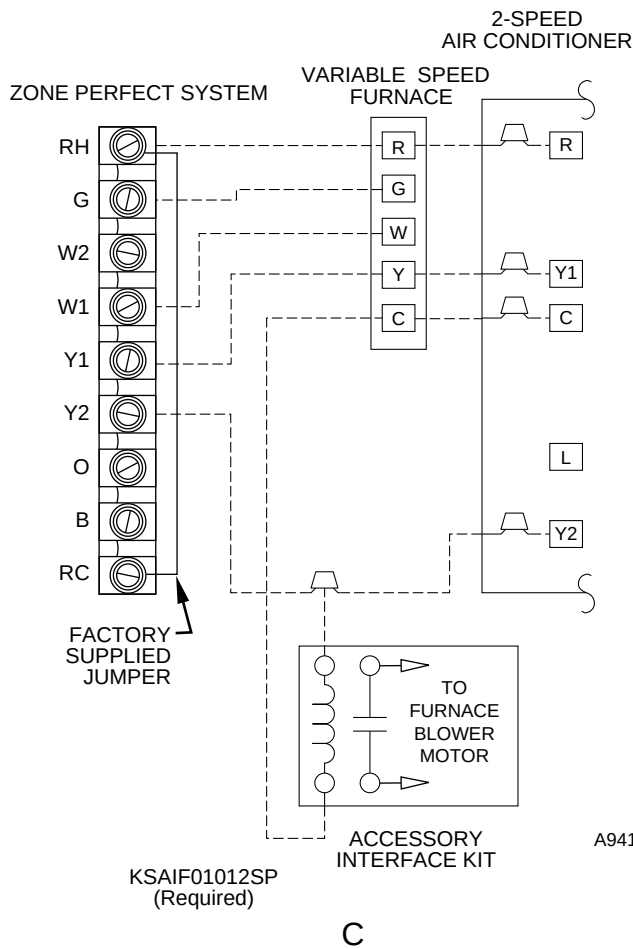
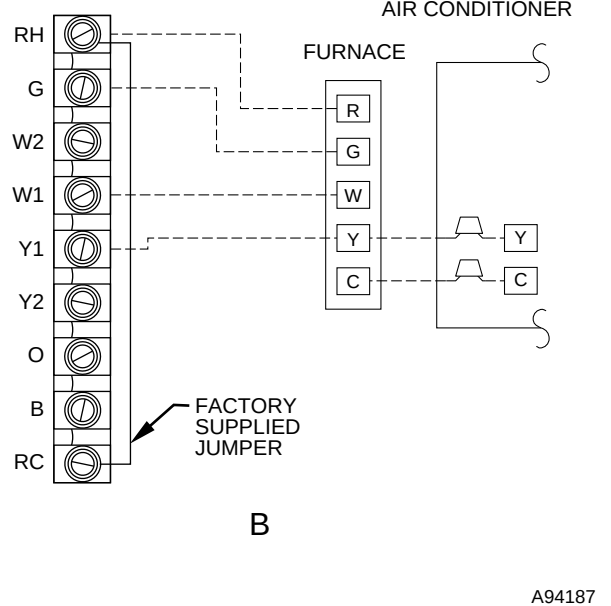
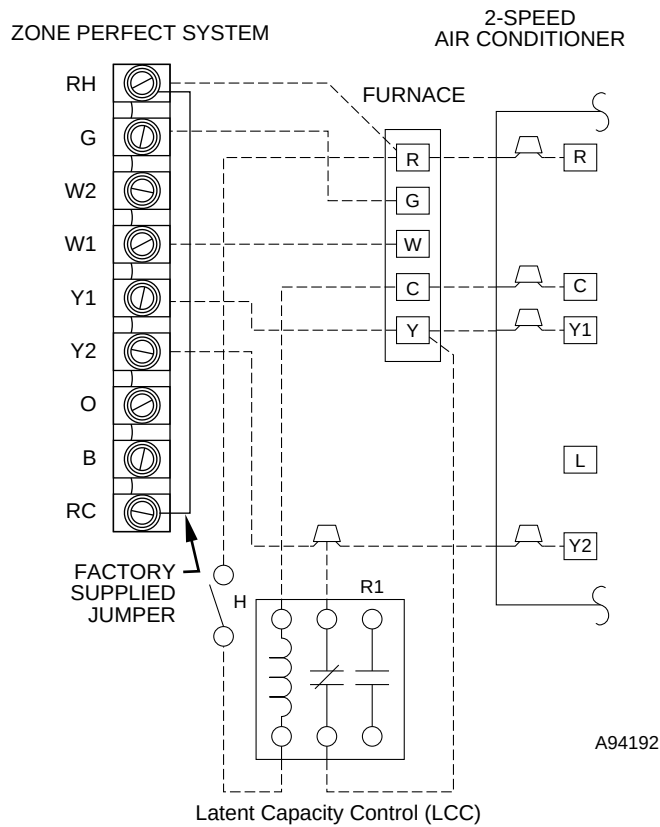
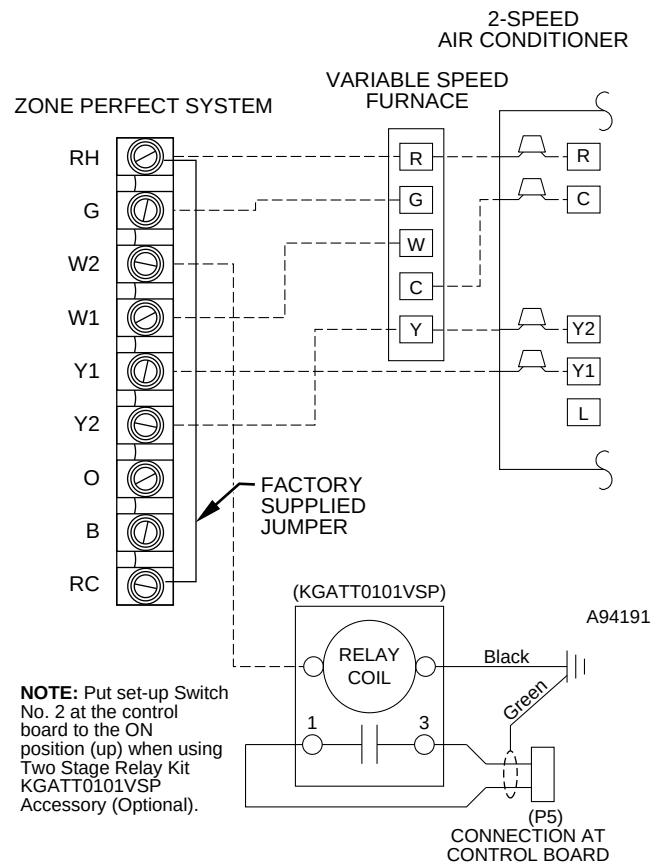
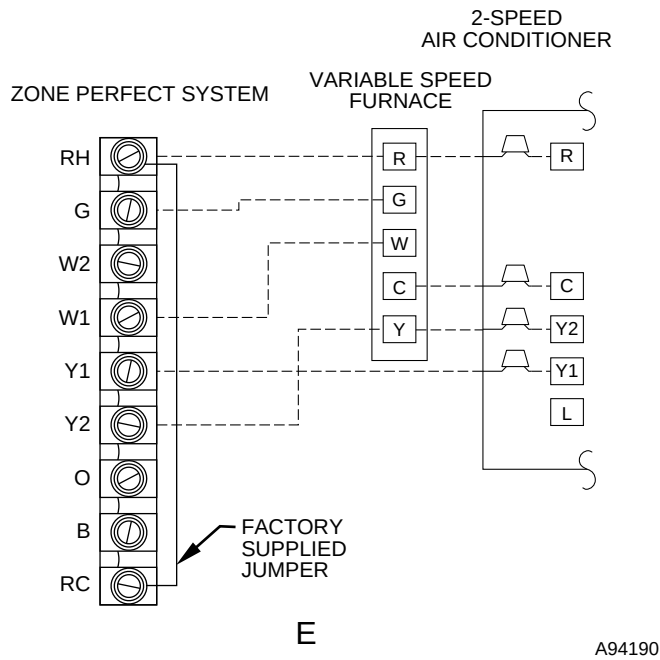
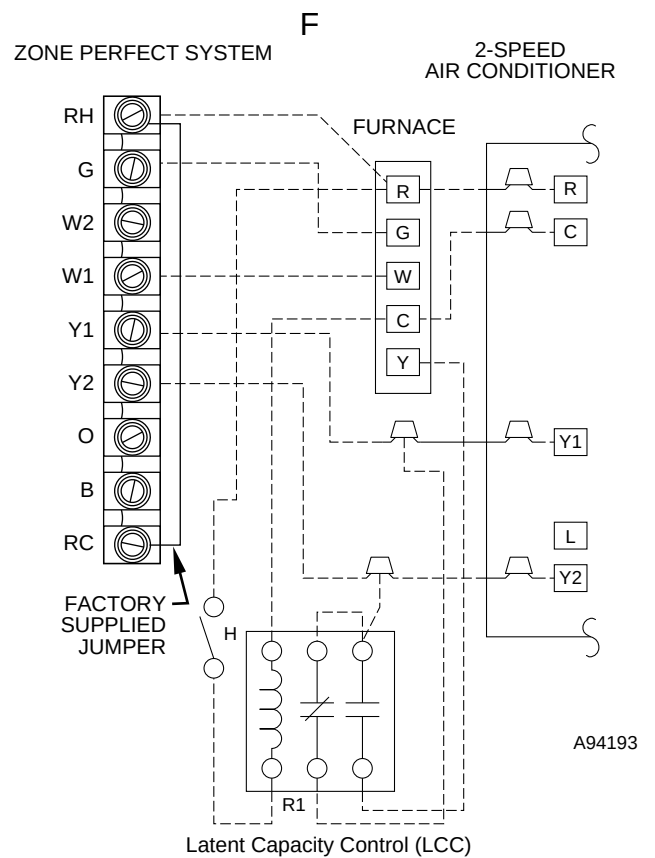


Fig. 18—Wiring Diagrams (Furnace with Air Conditioner)

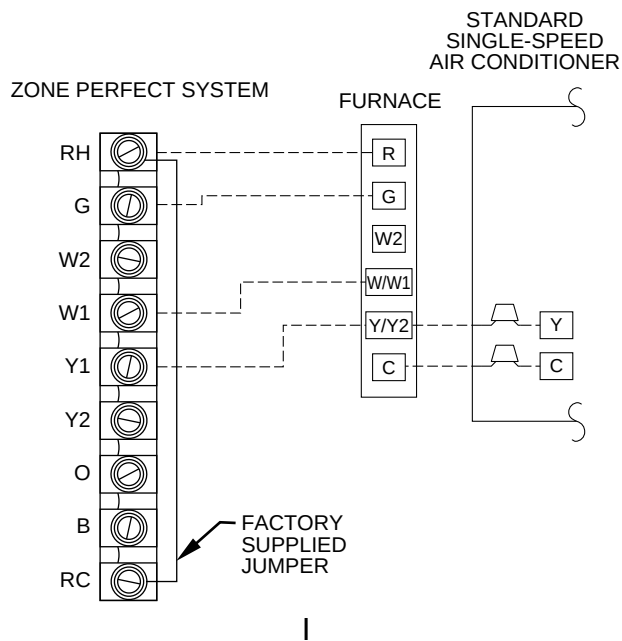


R1 = Relay DPST, Pilot Duty,
24V coil (HN61KK324) or Equivalent.
H = Humidistat, opens on humidity
rise (HL38MG026)

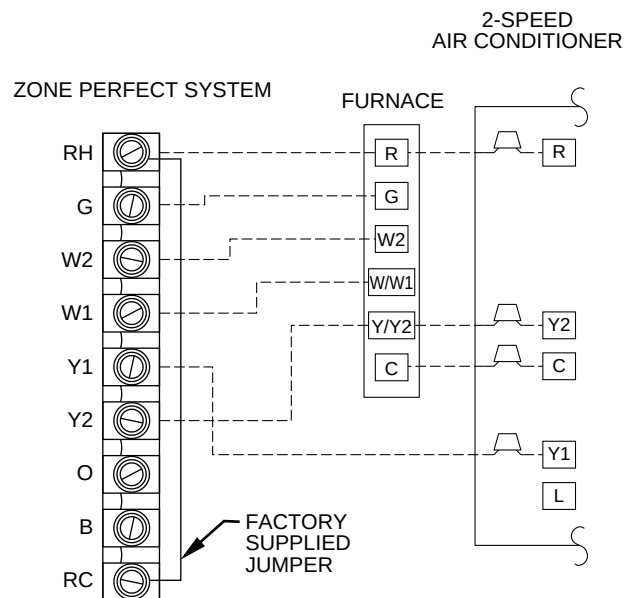


R1 = Relay DPST, Pilot Duty,
24V coil (HN61KK324) or Equivalent.
H = Humidistat, opens on humidity
rise (HL38MG026)

Fig. 18—Wiring Diagrams (Furnace with Air Conditioner) Continued



A94194



NOTE: See Furnace Installation Instructions

(Variable Speed models) – Put set-up Switch No. 2 in the ON position at the furnace control board

(2-Speed models) – Put set-up Switch No. 2 in the ON position, Switch No. 1 must be in the OFF position at the furnace control board

A94195

Fig. 18—Wiring Diagrams (Furnace with Air Conditioner) Continued

SERVICE TRAINING

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