CFTCH
Residential ComfortChoice

Carrier®
Turn to the Experts℠

Installation and Start−Up Instructions

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, for information or assistance. The qualified installer 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. 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 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 **may** result in minor personal injury or product and property damage. Note is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

INTRODUCTION

The ComfortChoice System allows your utility to control air conditioning and heating demands. You have the *Choice* to accept or override utility control.

The programmable thermostat temperature settings can change automatically through the use of schedules. This allows

ComfortChoice to change temperature settings to reflect occupancy or usage.

- Thermostat—Each installation has 1 thermostat. This is the command center for the system.
- Utility I/O board—The Utility I/O board communicates to the thermostat and provides 24 vac outputs to the Air Handling equipment.
- Radio—The two-way radio provides system access via wireless radio frequency communications.
- Auxiliary Load Controller—Optional component to facilitate utility auxiliary curtailment or optionally control a residential device remotely through combined wireless/internet capability.

INSTALLATION CONSIDERATIONS

These instructions cover the physical installation and start up of the ComfortChoice system. Use this instruction manual to guide the actual installation process after all the air side decisions have been made.

1. Install thermostat in non-condensing areas with ambients between 32°F and 104°F (0°C to 40°C). Install the Utility I/O board in non-condensing areas with ambients between -4°F and 158°F (-20°C to 70°C). The auxiliary load controller can be mounted outdoors if used with the proper conduit fittings (follow local code requirements).

2. **The use of separate isolated transformer is required if the existing system transformer is less than 40 va.** The ComfortChoice HVAC system can be powered from the system transformer in most applications. If the thermostat blanks or the electronics turn off when the system is active connect a separate (field supplied) 40 va class 2 isolation transformer to the 24 vac and C terminals to power the electronics.

INSTALLATION

Step 1 — Check Equipment and Job Site

INSPECT EQUIPMENT—File claim with shipping company, prior to installation, if shipment is damaged or incomplete.

Step 2 — Component Location and Wiring Considerations

⚠ **WARNING**

PERSONAL INJURY AND UNIT DAMAGE HAZARD

Failure to follow this warning could result in personal injury and unit damage.

Disconnect power supply before routing wire.

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

LOCATING UTILITY I/O BOARD—All wiring is run back to the ComfortChoice Utility I/O board. Select a location near the furnace or fan coil where wiring from the thermostat and the equipment itself can come together easily.

The ComfortChoice I/O board and User Interface are approved for indoor use only and should never be installed with these components exposed to the elements. The Utility I/O board may be installed in any area where the temperature remains between -4°F and 158°F (-20°C to 70°F), and there is no condensation. The cover must be installed to prevent damage from other sources. Do not locate where it will be accessible to children. Avoid areas in which the sound of relays energizing on the Utility I/O board may be an annoyance. The Utility I/O board must be mounted with the antenna positioned vertically. Wiring access is likely the most important consideration.

⚠ **CAUTION**

UNIT OPERATION AND SAFETY HAZARD

Failure to follow this caution may damage equipment.

To prevent possible damage to Utility I/O board, do not mount on plenum, duct work, or flush against furnace or air handler.

LOCATING THERMOSTAT

The thermostat is the command center for the ComfortChoice system. It should be located where it is easily accessible and visible to user.

For accurate temperature measurement, the following guidelines should be followed:

Thermostat should be mounted:

- Approximately 5 ft (1.5m) from floor.
- Close to the center-preferably on an inside wall.
- On a section of wall without pipes or duct work.

Thermostat should NOT be mounted:

- Close to a window, on an outside wall, or next to a door leading to the outside.
- Where it will be exposed to direct light and heat from a lamp, sun, fireplace, or other temperature-radiating object which may cause a false reading.
- Close to or in direct airflow from supply registers and return-air grilles.
- In areas with poor air circulation, such as behind a door or in an alcove.

LOCATING AUXILIARY LOAD CONTROLLER

The Auxiliary Load Controller can be mounted indoors or outdoors. The cover must be installed to prevent damage to the device. Do not locate where it will be accessible to children. Avoid areas where the sound of the contactor energizing may be an annoyance. The Auxiliary Load Controller should not be mounted in direct sunlight.

WIRING CONSIDERATIONS

All wiring in the ComfortChoice system may be unshielded. Ordinary thermostat wire is ideal for all connections except the line connections on the auxiliary load controller. Use 22 gauge or larger for normal wiring. Lengths over 100 ft should use 20 gauge or larger wire. Use 12 gauge wire for the "L1 IN", "L1 OUT", "L2 IN", and "L2 OUT" connections on the auxiliary load controllers.

The thermostat requires 2 conductors.

The connection to equipment (furnace or fan coil) could require as many as 8 conductors for a multi-stage installation. The *optional* outdoor air temperature (OAT) sensor requires 2 conductors. The OAT sensor may be able to be connected at the outdoor unit using existing wiring.

Cables with excess conductors are acceptable. Cut off or fold back and tape any unneeded conductors.

Plan the routing of wiring early to avoid possible problems later on.

Remember all wires converge at the Utility I/O board, so its location is important.

Step 3 — Install Components

INSTALL UTILITY I/O BOARD

The Utility I/O board is designed so that wires can enter it from behind, above, or below. Plan wire routing before mounting Utility I/O Board.

1. Remove cover to access mounting holes (remove the system cover from the left side first).
2. Mount back plate to wall using screws and wall anchors provided.
3. Level back plate and tighten screws.
4. Connect included antenna by screwing the threaded end to the Utility I/O board radio.

INSTALL THERMOSTAT

⚠ CAUTION

EQUIPMENT DAMAGE AND SAFETY HAZARD

Failure to follow this caution WILL damage equipment.

Ensure that the system power is off. Disconnect existing thermostat wires from existing thermostat and equipment prior to connecting existing thermostat wires to the ComfortChoice thermostat.

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1. Open thermostat rear door (mounting base) to expose mounting holes. Press back half of the right end inward and then pull front and back halves apart at the right end to open.
   a. Remove hinged cover by snapping apart its hinge.
   b. Separate the main body from the mounting plate by snapping its hinge apart.
   c. Mount base before wiring and attaching remaining parts.
2. Route thermostat wires through large hole in mounting base. Level mounting base against wall and mark wall through 2 mounting holes. Any thermostat cable of 2 or more conductors may be used. Shielded cable is not needed.
3. Drill two 3/16-in. holes in wall where marked.
4. Secure mounting base to wall with 2 screws and anchors provided, making sure all wires extend through hole in mounting base.
5. Adjust length and routing of each wire to reach proper terminal and connector block on mounting base with 1/4 in. of extra wire. Strip only 1/4 in. of insulation from each wire to prevent adjacent wires from shorting together when connected.
6. Match and connect 2 wires to proper terminals of the connector blocks. Recommended connection is RED to V+ and GREEN to VG.

⚠ CAUTION

UNIT DAMAGE AND SAFETY HAZARD

Failure to follow this caution may damage equipment.

Improper wiring or installation may damage the thermostat. Check to make sure wiring is correct before proceeding with installation or turning on unit.

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7. Push any excess wire into wall and against mounting base. Seal hole in wall to prevent air leaks. Leaks can affect operation.
8. Snap hinge back together.
9. Close thermostat assembly making sure pins on back of circuit board align with sockets in connector.

INSTALL AUXILIARY LOAD CONTROLLER

The Auxiliary Load Controller (Part Number CFTCHCCPAX01) is designed so that wires can enter from the top and bottom. The module can also be mounted sideways if necessary. Plan wire routing before mounting the Load Controller module. **For outdoor use, weather proof conduit fittings (field supplied) must be used where wires enter or exit the module.** Follow local code requirements when selecting the required conduit fittings.

1. Remove the Load Controller cover by removing the 4 screws located on the corners of the box.
2. Determine the desired location for the incoming AC power lines, the location of the wires to the auxiliary device to be controlled, and the location of the wires to the Utility I/O board.
3. Remove the desired conduit plugs with a screwdriver and hammer.
4. Mount the Load Controller module to wall using screws and wall anchors provided. The module can be mounted at the corner holes or by the included mounting clips. A mounting template is included.
5. Attach the appropriate conduit fittings to the module (follow local code requirements).
6. Wire the Load Controller as shown in Figure 12 using the included wire nuts. Be sure to connect the ground leads of the incoming AC power line and the auxiliary device. The wires in the Load Controller are labeled power "IN" from main power source and power "OUT" to the auxiliary load. The control wires from the Utility I/O board are both labeled "24VAC". The polarity of the control leads is not important.
7. Reinstall the box cover. Do not over tighten the screws.

Step 4 — Final Wiring

Bring all Utility I/O board wires together at Utility I/O board. Make all connections as indicated on Fig. 1.

Figures 2 through 11 show the connection between the Utility I/O board and the HVAC equipment. Select proper diagram for your equipment and connect accordingly. This connection will require as few as 4 or as many as 7 conductors.

Figure 12 shows the connections to the Auxiliary Load Controller.

NOTE: Wiring diagrams appear near the end of this document.

NOTE: It is good practice to mark each wire as the final connection is made. This will preserve its identity if it is ever disconnected.

Wiring Considerations

ComfortChoice treats all furnaces as if they were 2-stage. For single stage equipment, connect to W. The same holds true for auxiliary heat in fan coils.

With any 2-stage furnace, configure the furnace so that low heat is controlled by W and high heat is controlled by W and W2 together.

All 2-stage air conditioners and heat pumps need to be configured so that Y controls low speed and Y and Y2 together control high speed in both heating and cooling.

Step 5 — Understanding Sequence of Operations

TEMPERATURE SET POINTS

The ComfortChoice System uses 2 temperature set points, the higher for cooling and the lower for heating. A minimum difference of 2°F is normally enforced between heating and cooling set points, although this value may be adjusted by the installer. Each set point may be manually adjusted or controlled by a programmed time schedule established by the home owner.
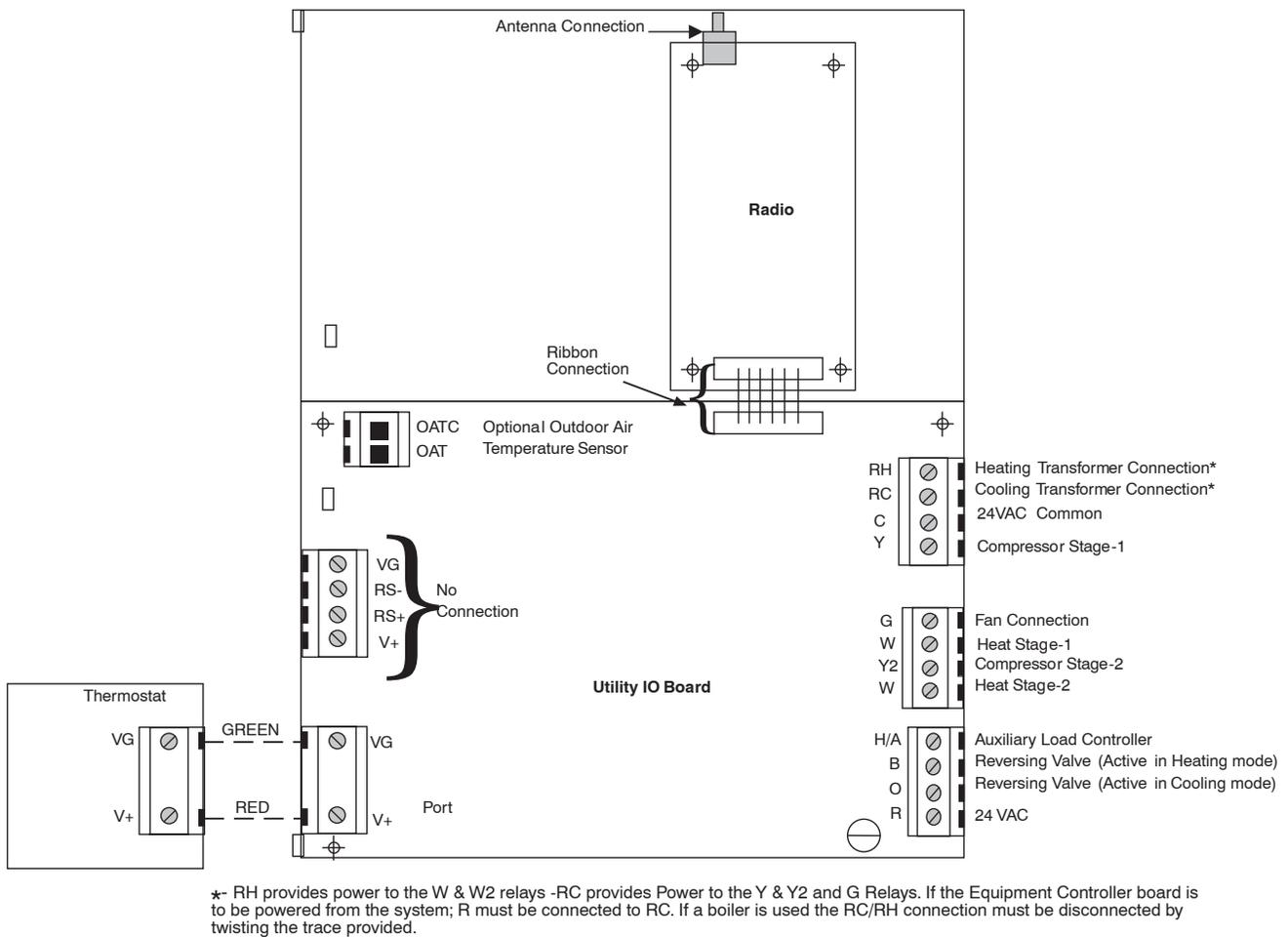
Fig. 1 – System Wiring Diagram

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*- RH provides power to the W & W2 relays -RC provides Power to the Y & Y2 and G Relays. If the Equipment Controller board is to be powered from the system; R must be connected to RC. If a boiler is used the RC/RH connection must be disconnected by twisting the trace provided.

The ComfortChoice thermostat can also be configured for Heat Only or Cool Only operation. In these modes a single setpoint is used to control a furnace (Heat Only) or an air conditioner (Cool Only).

HEATING AND COOLING COMFORT SET POINTS

If space temperature is between heating and cooling set points, then it is said to be "satisfied" with respect to temperatures. When a space is satisfied, no heating or cooling is required. When the space is satisfied, there is no demand and the equipment is turned off. For example, if cooling set point is 76°F and heating set point is 72°F, then a space temperature of 73°F is assumed to be satisfactory and no heating or cooling of the space is required.

If space temperature falls below heating set point, then that space needs to have heat added which will raise space temperature back to heating set point. For example, if heating set point is 72°F and space temperature is 70°F, then space temperature must be raised 2°F in order for the space to be satisfied. In this case, temperature "heating demand" for zone is 2°F (72° minus 70°F).

Otherwise, if temperature in a space rises above cooling set point, then that space needs to have heat removed which will lower space temperature back to cooling set point. For example, if cooling set point is 76°F and space temperature is 77°F, space temperature must be lowered 1°F in order for space to be satisfied. In this case, cooling demand for space is 1° (77° minus 76°F).

Step 6 — System Configuration

ComfortChoice must be configured to match the type of equipment connected to it. In addition, there are several choices of configuration based on how the user wants the system to operate. Configuration is done by setting the equipment type in the user interface on power up.

Step 7 — Thermostat Configuration

The thermostat is configured via a group of selections made through the keypad in a special configuration mode. Before the equipment is operated, the system must be properly configured. **Make sure this step is not left out.**

Turn on power to the system.

At power up the thermostat displays all segments for a few seconds. This is followed by the selection for system type. The system type shows as follows:

1. AC—1-Stage Air Conditioner
2. HP—1-Stage Heat Pump
3. A2—2-Stage Air Conditioner
4. H2—2-Stage Heat Pump
5. H—Heat Only (2-stages)
6. C—Cool Only (1 stage)

Use the UP and DOWN buttons to cycle through the system types. Once the correct system type is shown on the screen, push the END button to store the configuration.

Power-on check of the thermostat itself can be done by separating the thermostat from its backplate and then reconnecting it by attaching the 2 parts. This will allow observation of the thermostat at power up.

Several installer selected options are set using the thermostat keypad.

These configuration options (switch settings) are intended to be selected at installation and are normally not modified by the home owner. A special procedure allows entry into configuration mode. ComfortChoice will automatically exit this mode if no button is

pressed for 3 minutes. While in the configuration mode, configuration choices can be made.

Not all option numbers are used in the product. Options will only appear on the thermostat if they are used in the particular application.

TO ENTER THE CONFIGURATION MODE:

Press and hold FAN button for approximately 10 seconds until room temperature and set point displays change to 2 numbers. You are now in the configuration mode.

CONFIGURATION OPTIONS:

Option 2—Clean filter timer
Option 4—Fan (G) ON with W
Option 5—Unit type AC, A2, HP, H2, H and C
Option 6—Low ambient cooling lockout temperature
Option 7—Smart recovery
Option 8—Aux heat lockout temperature
Option 13—Temperature offset adjustment
Option 14—Heat/cool dead band adjustment
Option 15—Enable AUTO mode
Option 16—Auto change over timer
Option 17—Equipment cycles per hour
Option 18—Keypad Lockout
Option 20—Serial communications test mode

NOTE: If END button is pressed or if no button is pressed for 60 minutes, ComfortChoice will exit configuration mode and return to normal operation. To re-enter configuration mode, FAN button must be pressed and held for 10 seconds.

While in configuration mode, the large display shows the selection which has been made and the smaller display (COOL set point display) shows current option number. One of these will be flashing.

The up and down buttons are used both to move between available options and to make a selection for each option. When option number (small display) is flashing, the up and down buttons adjust it, moving between available option numbers. After desired option number has been selected, press SET TIME/TEMP button. The large display will now flash, indicating that the up and down buttons now control available choices within that option. Each press of the SET TIME/TEMP button switches between available option (small display) and available selections within each option (large display).

Available options and available selections for each are described below.

OPTION 2—CLEAN FILTER TIMER

Select hr of blower operation (heating, cooling, or fan) before CLEAN FILTER icon is displayed. With OFF selected, icon will never come on, disabling this feature. Time selection can be from 400 to 3600 hr by selecting numbers 1 through 9. (Time is 400X number selected.) Factory default is 2 (800 hr). Recommended selections are: disposable filter—400 to 800 hr, media filter—1200 to 1600 hr, or electronic air cleaner—1600 to 2400 hr of blower operation.

AVAILABLE SELECTIONS:

Use UP and DOWN buttons to alternate between OF (off) and 1 to 9 in steps of 1.

OPTION 4—FAN (G) ON WITH W

This selection determines whether the G (fan) output is to be ON or OFF when any W (furnace or strip heat) output is ON. Most furnaces and fan coils manage their own blowers and do not require a separate G signal. For these applications, select OFF. Some auxiliary heaters require a separate G signal to turn on the blower. In this case, select ON. Factory default is OFF.

AVAILABLE SELECTIONS:

Use UP or DOWN to select OF (off) or ON.

OPTION 5—UNIT TYPE

AC—Single Stage Compressor AC System - 1 heat/1 cool
A2—Two Stage Compressor AC System - 2 heat/2 cool
HP—Single Stage HP System - 2 heat/1 cool
H2—Two Stage Compressor HP System - 2 heat/2 cool
H—2 Stage Furnace - 2 hear/ 0 cool
C—Single Stage Compressor AC System- 0 heat/1 cool

⚠ CAUTION

UNIT OPERATION AND SAFETY HAZARD

Failure to follow this caution may damage equipment.

There is no system default. If the thermostat powers up without a valid HVAC System configuration screen (identified by a -- in the temperature display with all other icons illuminated), the unit will only operate the fan output until a valid selection is made.

AVAILABLE SELECTIONS:

Use UP or DOWN to select AC, A2, HP, H or C.

OPTION 6—COOLING LOCKOUT TEMPERATURE

This option allows selection of the outdoor temperature below which cooling is not allowed. Option 6 will allow the selection of 45, 50 or 55°F. For all residential equipment, select 55°F. Factory default is 55.

AVAILABLE SELECTIONS:

Use the UP and DOWN buttons to move between OF (off), 45, 50 and 55.

OPTION 7—SMART RECOVERY

Smart recovery is a function that shall transition the room to the next programmed setpoints as energy efficiently as possible.

ON

When the HOLD function is off and HEAT, EHEAT, or AUTO mode is selected, and if there is a program schedule change within the next 90 minutes and the next programmed heat setpoint is greater than the current heat setpoint, heating smart recovery is activated. When the HOLD function is off and COOL or AUTO mode is selected, and if there is a program schedule change within the next 90 minutes and the next programmed cool setpoint is less than the current cool setpoint, cooling smart recovery is activated. During smart recovery, the thermostat shall ramp the setpoint in a straight line from the current setpoint to the next setpoint 1/16°F increment starting 90 minutes before the next programmed time. If the hold button is pressed, the setpoints are held at their current displayed values (i.e. values between 75.0 and 75.9 would result in a setpoint of 75.0)

OFF

At the programmed time, the setpoints shall be changed to the next programmed settings.

Default = On

AVAILABLE SELECTIONS

Use UP and DOWN buttons to select between OF (off) and ON.

OPTION 8—AUX HEAT LOCKOUT TEMPERATURE

This option allows selection of the outdoor temperature above which auxiliary heating is not allowed. This option is only available on HP or H2 Systems.

Option 8 will allow the selection of 5 to 55°F and OF (off).

Default: Factory default is OFF.

AVAILABLE SELECTIONS:

Use the UP and DOWN buttons to move between OF and 5 to 55.

Table 1 – Outputs vs Stages

System Type	Cool 2	Cool 1	Heat 1	Heat 2	Heat 3	Heat 4	Heat 5
1−Stage AC (AC)	N/A	Y	W	W, W2	N/A	N/A	N/A
2−Stage AC (A2)	Y, Y2	Y	W	W, W2	N/A	N/A	N/A
1−Stage HP (HP)	N/A	Y, O	Y	Y, W	Y, W, W2	N/A	N/A
2−Stage HP (H2)	Y, Y2, O	Y, O	Y	Y, Y2	Y, Y2, W	Y, Y2, W, W2	N/A
2−Stage Furnace (H)	N/A	N/A	W	W, W2	N/A	N/A	N/A
2−Stage AC (C)	N/A	Y	N/A	N/A	N/A	N/A	N/A

OPTION 13—TEMPERATURE OFFSET ADJUSTMENT

Temperature reading can be independently offset by up to ±5°F. The UP and DOWN buttons select an offset value between -5 and +5°F in 1°F steps. The offset number is added to the actual temperature to produce the offset temperature, which is displayed and used by the system. Factory default value is 0.

AVAILABLE SELECTIONS:

Use UP and DOWN buttons to move between -5 and +5 in steps of 5.

OPTION 14—HEAT/COOL DEADBAND ADJUSTMENT

The minimum allowable difference between the heat and cool set points can be selected to any value between 0° and 6°F. The factory default value is 2. Higher numbers provide less precise temperature control but save energy. Lower numbers provide comfort with more energy use.

AVAILABLE SELECTIONS:

Use UP and DOWN buttons to move between 0 and 6 in steps of 1.

OPTION 15—ENABLE AUTO MODE

In some applications, auto changeover from heat to cool may not be desired. Option 15 selects ON or OF (off) for auto changeover. When OF, the AUTO mode icon never appears, disabling the AUTO mode. Factory default is ON.

AVAILABLE SELECTIONS:

Use UP or DOWN buttons to alternate between OF (off) and ON.

OPTION 16—SELECT AUTO CHANGEOVER TIME

This option selects 5 to 30 minute time delay between heat and cool while in auto changeover mode. System must have no demand in current mode for selected time before changeover between heating and cooling is allowed. Factory default is 30 minutes.

AVAILABLE SELECTIONS:

Use UP and DOWN buttons to move between 5 and 30 in steps of 5.

OPTION 17—EQUIPMENT CYCLES PER HOUR

This option selects the maximum number of equipment cycles per hour. The installer can select between two, three, or four cycles per hour corresponding to 30, 20, or 15 minute cycle timers, respectively.

AVAILABLE SELECTIONS:

Required Liquid-Line Temperature (°F)

Use the UP and DOWN buttons to move between 2, 3, and 4.

OPTION 18—KEYPAD LOCKOUT

This option allows the installer to lockout the keypad until the correct combination of keys is pressed. If the keypad lockout option is set to ON, then the keypad is locked out until the following key sequence is pressed: MODE, COPY PREVIOUS DAY, SET TIME/TEMP, and HOLD. This sequence must be completed within a 10 second period. After this combination of keys is entered, the keypad is unlocked until the user has stopped pressing keys for three minutes. After the three minute time-out, the keypad will lock again.

AVAILABLE SELECTIONS:

Use UP and DOWN buttons to select between OF (off) and ON.

OPTION 20—SERIAL COMMUNICATIONS TEST MODE SE:

With this installer setup switch selected, the product will initiate a wireless/modem message to facilitate end to end testing of the wireless/modem connection. The user interface (TSTAT) will communicate to the Utility I/O board to send a wireless message to itself. The Utility I/O board will monitor the status of the message and send this information back to the user interface. When a test message is in progress, "Li" will be shown in the room temperature display. The clock display will increment indicating how long the test has been in progress. If the last test message was successfully sent and received by the wireless/modem connection, "PAS" will be displayed in the clock location. If the last message was not successfully sent and received, F1 or F2 will be displayed in the clock location. (F1—cannot send message; F2—message sent, no reply.) A maximum of three test messages will be sent. To send additional test messages, this software switch must be manually set to ON by the installer.

AVAILABLE SELECTIONS:

Use UP and DOWN buttons to select between OF (off) and SE (serial test).

SYSTEM STARTUP AND CHECKOUT

ComfortChoice is designed with built-in checkout capability for the equipment. Use the sequence below for trouble free setup.

Step 1 — Enable Installer Setup Mode

Select installer setup mode by holding the fan key for 10 seconds. To enter installer setup, hold the fan key for another 10 seconds to enter installer test mode. **This mode is indicated by InSt appearing in the thermostat clock display.** In this mode several special features are available to assist in the setup/checkout process:

  a. The FAN button turns the blower ON or OFF.
  b. The MODE button operates HEAT, COOL, or EHEAT for 4 minutes and then returns automatically to OFF.
  c. When operating in HEAT mode the SET TIME/TEMP button toggles the auxiliary relay ON or OFF, if present. The AUX SETBACK icon on the User Interface is on when the auxiliary relay is de-energized and off when the relay is energized.
  d. Press END to exit installer test.

If the RESET FILTER button is pressed and the "clean filter" icon is not on, the clean filter timer shall be reset.

OPERATIONAL INFORMATION

Five-minute Compressor Timeguard

This timer prevents the compressor from starting unless it has been off for at least 5 minutes. It can be defeated for 1 cycle by simultaneously pressing the FAN mode button and the UP button. It is not active in the installer setup mode.

Cycle Timer

This timer prevents the start of the next cycle until 15, 20, or 30 minutes after the start of the present cycle. The Cycle Timer delay

is adjusted with Option 17. Its function is to limit the number of equipment cycles per hour. . It is defeated for 1 cycle when the set point is manually changed to provide fast response to set point change. It can also be defeated for 1 cycle by simultaneously pressing the FAN mode and UP buttons.

Staging Timer

In multistage heating or cooling this timer prevents any higher stage from coming on until the previous stage has been on for 10 minutes. The timer is extended to 15 minutes for heat pump auxiliary heat and dual fuel furnace operation.

Minimum On Time

When a cooling or heating stage is turned on, it will remain on for at least 3 minutes. These timers are canceled when set points are changed.

Heat/Cool Set Point Difference

The deadband between heating and cooling set points is selected by configuration Option 14. This deadband is maintained by allowing one set point to "push" the other to maintain the required minimum difference. This is true in programming of schedules and adjustment of set points in operation.

Auto Changeover

When the auto changeover mode is selected, a change from heat to cool or cool to heat cannot occur until a demand exists in the new mode and no demand has appeared in the old mode for the amount of time selected by configuration Option 16. Note that this means that for changeover to occur, the old mode must be and remain satisfied for the selected changeover time. Use the 30 minute setting for installations which should change modes only twice per day. The 5 minute setting will allow simultaneous heating and cooling demands to be serviced.

Emergency Heat Mode

When system is configured for a heat pump and EHEAT mode is selected, Y outputs are disabled and W outputs only are used for heat.

Power-On Check

When power is first applied to the system the large display indicates the equipment type selected as follows: (If -- appears, the equipment type must be selected with the UP/DOWN keys.)

1. AC—1-Stage Air Conditioner
2. HP—1-Stage Heat Pump
3. A2—2-Stage Air Conditioner
4. H2—2-Stage Heat Pump
5. H—2 Stage Furnace
6. C—1 Stage Air Conditioner

PIN Number Display

The wireless modem PIN number may be displayed by pressing and holding the END button for 10 seconds until the display goes blank. The PIN number will then be displayed across the room air, cool setpoint and clock locations. The thermostat will return to normal operation after 15 seconds.

NOTE: The PIN number will not be displayed if in software configuration, installer test or programming modes.

Other Messages

Small Arrow—A small arrow is located to the left of the HEAT and COOL icons which are located under the two setpoint displays. These indicate when cooling or heating equipment is actually operating. When arrows flash, equipment is waiting to come on but is being held off by compressor timeguard or cycle timer.

There is also a small arrow to the right of the fan mode ON icon. During an unoccupied mode (DAY, SLEEP) the fan selection will be allowed to change from AUTO to ON, but when ON is selected and the equipment is not running, the small arrow icon next to the ON icon will be turned on. This is a feedback to the user that the fan is not running because the current period is unoccupied and the equipment is not running.

Outputs vs. Stages

Table 1 lists the active outputs for each stage of each possible system configuration. G is not shown.

For 1-stage furnaces and auxiliary heat connect to W and leave W2 open.

For single speed compressors, connect to Y and leave Y2 open.

Step 1 — Quick Start

The quick start procedure outlined below will allow you to use your system before you learn all the details of system operation. This setup may be done by the installer. For the best comfort and energy-saving results, we recommend that you read through the Owner's Guide and set up the system to match the end-user's schedule and comfort requirements.

To begin, locate the thermostat and follow the steps outlined below.

Set current day and time. (This step is only necessary if the time has not been automatically set by the Radio. If time has been received from the radio, the keys to change the time and day are disabled.) If time has been received from the radio, the keys to change the day are disabled and the time can only be changed within a 4 hour window for time zone correction. The ComfortChoice system is designed to automatically correct for time zones, however depending on wireless coverage the system may not receive a time zone correction immediately.

1. Press CHANGE DAY button until current day of the week is shown.
2. Press SET TIME/TEMP button until the TIME icon flashes.
3. Press UP or DOWN buttons until the desired time is shown, making sure that the AM or PM time is correct.
4. Press END key to exit.

Select system Mode:

1. Press MODE button to select HEAT or COOL.
2. Press HOLD button to turn on HOLD icon.
3. Press UP or DOWN button until the desired temperature is displayed.

Step 2 — Quick Programming of Comfort Schedules

The following is a brief overview of how to access and program schedules in your new system. We highly recommend that you read and follow the programming information provided in the Owner's Guide for detail step-by-step instructions.

Before proceeding, set the correct Time and Day at the thermostat. See Quick Start section above.

If you followed the above Quick Start procedure in selecting the system mode, you will need to reverse the HOLD function before proceeding. Simply press HOLD button to remove the icon from the display.

During the programming process, you will have access to 4 program time periods; WAKE, DAY, EVE, and SLEEP. You will be able to select program start times and the heat/cool set points for each time period. Use the Keypad to enter and move around inside the program. Use the temperature UP and DOWN buttons to adjust the start times and to raise and lower set points. When inside the program, the blinking icon indicates that a setting may now be changed.

1. Decide on a program schedule that you desire. Table 2 is an example of what already exists in the User Interface as the Energy Star recommended settings.

Table 2 – Default Program Schedule

	Time	Cool	Heat
WAKE	6:00 A.M.	78	68
DAY	8:00 A.M.	85	60
EVE	5:00 P.M.	78	68
SLEEP	10:00 P.M.	82	60

2. To begin programming, press PROGRAM button.

3. Press CHANGE DAY button until Monday (Mo) is displayed.

4. Press PROGRAM button until the WAKE period is displayed.

5. Press SET TIME/TEMP button until the TIME icon is flashing.

6. Start programming the WAKE start time. Press the UP or DOWN button until the desired starting time is displayed, make sure that the AM is correct.

7. Press SET TIME/TEMP button until the HEAT icon is flashing. Press UP or DOWN button until the desired heating temperature for that period is displayed.

8. Press SET TIME/TEMP button until the COOL icon is flashing. Press UP or DOWN button until the desired cooling temperature for that period is displayed. You have now programmed the time and desired heating and cooling temperatures for Monday, in the WAKE time period.

9. Press PROGRAM button to change from WAKE to the DAY period. Repeat steps 6 through 11 for programming the time and desired heating and cooling temperatures for Monday, in the DAY time period. Use PROGRAM button again to select EVE and SLEEP, and repeat procedure.

10. After Monday is completely programmed, you may select COPY DAY and advance to Tuesday. You can now press CHANGE PREVIOUS DAY button and copy the program schedule from Monday into Tuesday. This can be repeated as needed for each remaining day in the week. If copying the previous day is not desired, you may individually program each day using the CHANGE DAY button and repeating steps 5 through 10. Press END button to exit programming mode.

Programming the Auxiliary Device Schedule

In addition to the primary program schedule, the Utility I/O Board may provide an AUX relay for auxiliary control capability. The auxiliary device program schedule allows the user to automatically control an auxiliary residential device with 4 program periods throughout the day. Each period allows the user to set the start time and the desired state of the auxiliary device (either ON or OFF) for that period. The program schedule for weekdays and weekends can be set independently.

During the programming process, the keypad can be used to enter and move around inside the program. Use the temperature UP and DOWN buttons to adjust the start times and to select the relay state. When inside the program, the blinking icon indicates that a setting may now be changed.

1. Decide on a program schedule that you desire. Table 3 is an example of an auxiliary program schedule.

2. To begin programming the auxiliary schedule, press and hold the PROGRAM button for at least 10 seconds. When auxiliary programming mode is active the display will show the current program period (P1, P2, P3, or P4) in place of the room temperature display. (Auxiliary programming mode can also be entered from the normal program mode by holding the PROGRAM button for at least 10 seconds.)

3. Press the PROGRAM button until P1 is displayed.

4. Press CHANGE DAY until the weekday icons (Mo Tu Wed Thur Fri) are on.

5. Press SET TIME/TEMP until the TIME icon is flashing.

6. Set the desired start time for period 1 (P1) by pressing the UP or DOWN buttons.

7. Press SET TIME/TEMP so that the relay state (either "On" or "OF") is flashing in the Cool Setpoint location.

8. Press the UP or DOWN button to toggle the relay state for the current period On or OF (Off).

9. Press PROGRAM to change from P1 to P2. Repeat steps 5 through 8 to set the start time for P2.

10. Use the PROGRAM button to select the next period and repeat the procedure.

11. After the 4 weekday periods are programmed, press CHANGE DAY to display the SAT and SUN icons. Repeat the procedure to program the weekend auxiliary schedule.

12. Press the END button to exit programming mode.

Table 3 – Auxiliary Device Program Schedule

Program Period	Time	Aux Relay
P1	4:00 A.M.	On
P2	9:00 A.M.	Off
P3	3:00 P.M.	On
P4	11:00 P.M.	On

Step 3 — Hold Function

At the User Interface:

Pressing HOLD butting activates and deactivates HOLD function.

When HOLD function is active, HOLD icon is displayed, and the current set points will be used until the user cancels the HOLD function. The HOLD function prevents the set points from changing according to the program schedule. Cancelling the HOLD function changes the set points to whatever is in the program schedule for that period of the day.

Step 4 — Troubleshooting

ERROR MESSAGES

Several error messages are provided. They appear on the large display and alternate with the normal room temperature data at a 2 second rate. These are:

1. '- -' THERMISTOR FAILURE
   A '- -' will be displayed if the temperature sensing element on the thermostat has been damaged and can not measure room temperature. The thermostat must be replaced.

2. E1—COMMUNICATION FAILURE
   An E1 will be displayed if the thermostat cannot communicate with the Utility I/O board. Check and make sure V+ and Vg are wired correctly between the thermostat and Utility I/O board. This error message may sometimes take up to 30 seconds before it is displayed. After the problem has been fixed, cycle power to ensure that all errors have cleared.

3. E3—OUTDOOR AIR TEMPERATURE SENSOR FAILURE
   An E3 will be displayed if the outdoor air temperature sensor is open, or if it is reading below -38°F or above 138°F. This error will also occur if the following features are active and the Utility I/O board cannot detect the outdoor air temperature sensor: Option 6—Cooling Lockout
   Option 8—Aux heat lockout.

4. E4—NONVOLATILE MEMORY FAILURE
   An E4 will be displayed if the configuration and program schedules cannot be read. This is usually the result of a microprocessor failure. If cycling power does not reset this error, the thermostat must be replaced.

Error Codes—Utility I/O Board

Error codes for the Utility I/O board are indicated by the flash rate of the on board LED. The slow flash rate is the first digit, and the fast flash rate is the second. During normal operation the flash rate of the LED will be 1 second on, 1 second off.

23—Flash Memory Error. Replace the Utility I/O Board.

25—EEProm (Memory) Error. Replace the Utility I/O board.

27—RAM Memory Error. Replace the Utility I/O Board.

32—Device out of range. Check antenna connection.

34—No communications with thermostat. Check connections between the I/O board and the thermostat.

36—No communications with the Radio. Check cable connection between the Radio and the Utility I/O board.

Table 4 – Temperature/Ohm Relationship

| Temp °F	Ohms	Temp °F	Ohms	Temp °F	Ohms	Temp °F	Ohms
0	85,378	33	31,738	66	13,138	99	5,961
1	82,710	34	30,855	67	12,811	100	5,827
2	80,135	35	30,000	68	12,493	101	5,697
3	77,649	36	29,171	69	12,184	102	5,570
4	75,249	37	28,367	70	11,883	103	5,446
5	72,931	38	27,589	71	11,591	104	5,326
6	70,693	39	26,834	72	11,307	105	5,208
7	68,531	40	26,103	73	11,031	106	5,094
8	66,442	41	25,394	74	10,762	107	4,982
9	64,475	42	24,706	75	10,501	108	4,873
10	62,475	43	24,039	76	10,247	109	4,767
11	60,592	44	23,393	77	10,000	110	4,663
12	58,771	45	22,766	78	9,760	111	4,562
13	57,012	46	22,158	79	9,526	112	4,464
14	55,311	47	21,568	80	9,298	113	4,368
15	53,667	48	20,996	81	9,077	114	4,274
16	52,077	49	20,441	82	8,862	115	4,183
17	50,540	50	19,902	83	8,651	116	4,094
18	49,054	51	19,379	84	8,448	117	4,007
19	47,616	52	18,872	85	8,250	118	3,922
20	46,225	53	18,379	86	8,056	119	3,839
21	44,880	54	17,902	87	7,868	120	3,758
22	43,578	55	17,438	88	7,685	121	3,679
23	42,318	56	16,987	89	7,507	122	3,602
24	41,099	57	16,550	90	7,333	123	3,527
25	39,920	58	16,125	91	7,164	124	3,453
26	38,778	59	15,713	92	7,000	125	3,382
27	37,672	60	15,312	93	6,839	126	3,312
28	36,602	61	14,923	94	6,683	127	3,243
29	35,566	62	14,545	95	6,531	128	3,177
30	34,563	63	14,178	96	6,383	129	3,112
31	33,591	64	13,822	97	6,238	130	3,048
32	32,650	65	13,475	98	6,098		
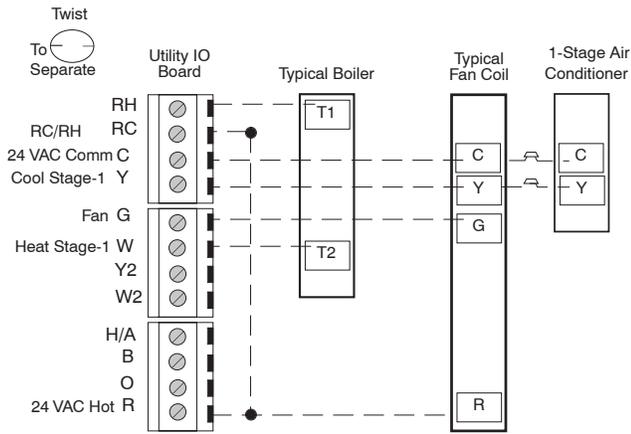
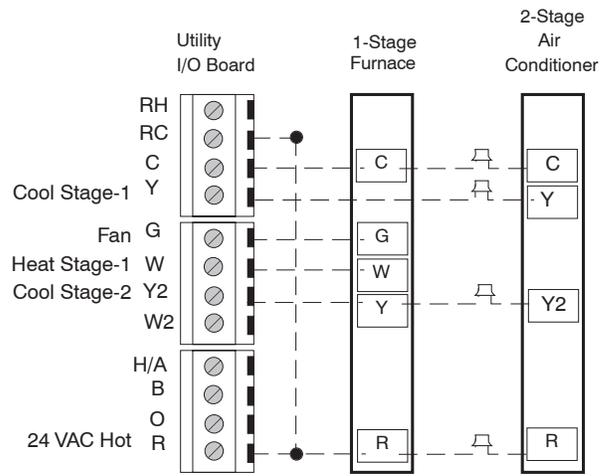**Fig. 2 – 1–Stage Boiler with 1–Stage Air Conditioner**

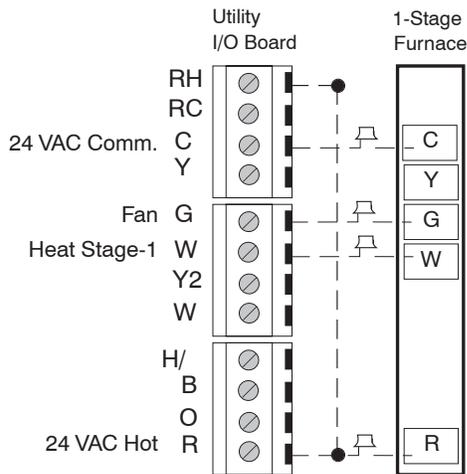**Fig. 5 – 1–Stage Furnace with 2–Stage Air Conditioner**
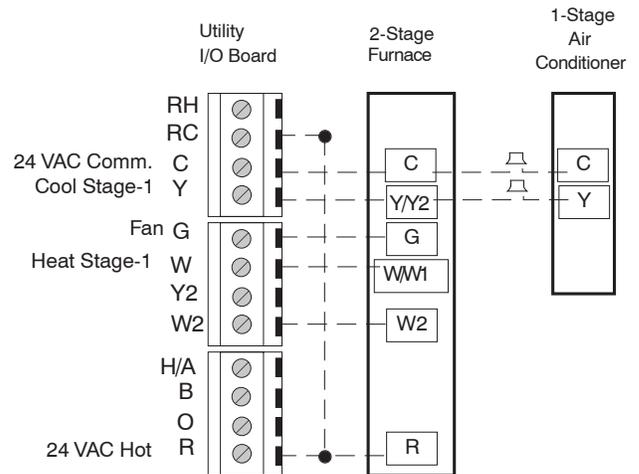

Fig. 3 – 1–Stage Furnace
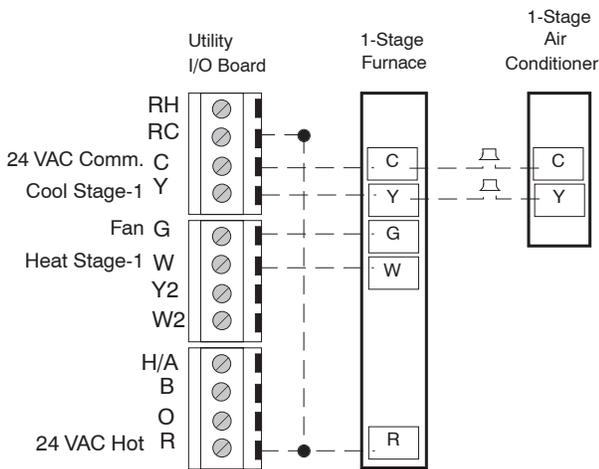

Fig. 6 – 2–Stage Furnace with 1–Stage Air Conditioner
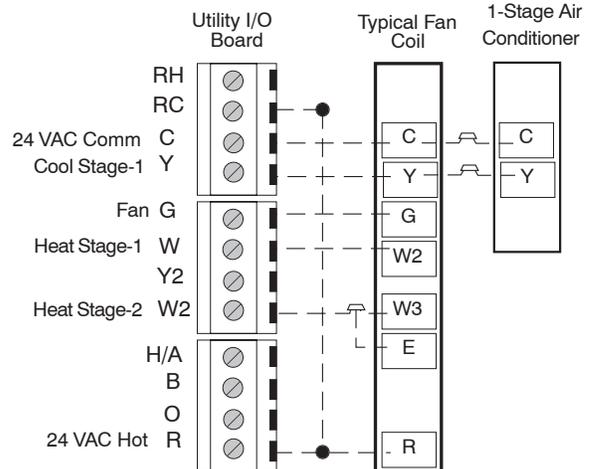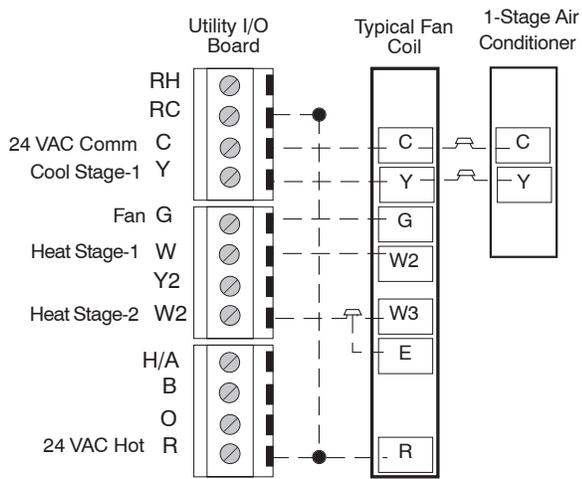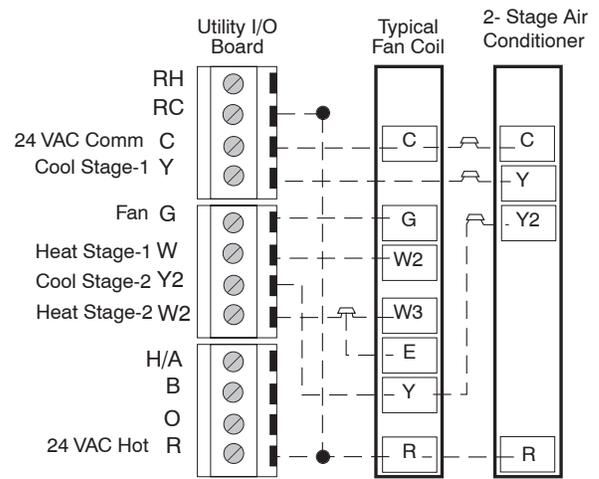

Fig. 4 – 1–Stage Furnace with 1–Stage Air Conditioner
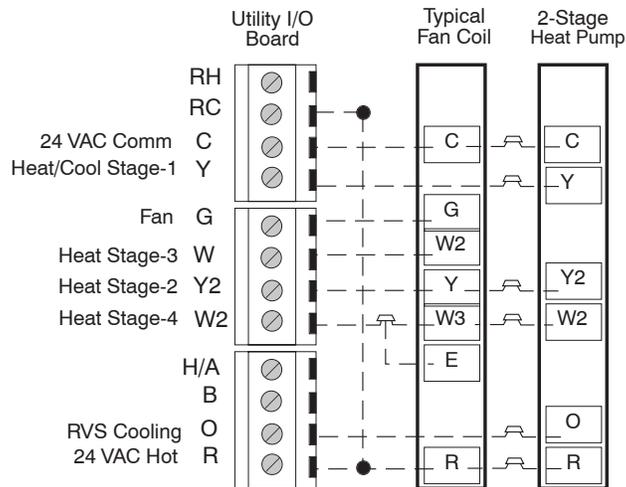

Fig. 7 – Typical Fan Coil with 1–Stage Air Conditioner

Fig. 8 – 2-Stage Furnace with 2-Stage Air Conditioner

Fig. 9 – Typical Fan Coil with 2-Stage Air Conditioner

Fig. 10 – Typical Fan Coil with 2-Stage Heat Pump with Reversing Valve Active in Cooling

Wiring Diagram Note

Connect Utility I/O board 24 vac and RC to furnace R and Utility I/O board C to furnace C. If a separate Utility I/O board transformer is used, connect 24 vac to 24 vac and C terminals on the Utility I/O board and the furnace R to the Utility I/O board RH.
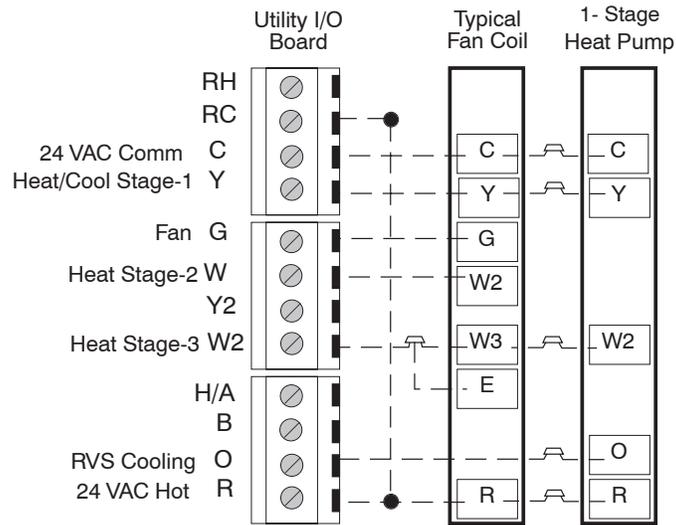
Utility I/O Board — Typical Fan Coil — 1-Stage Heat Pump

RH
RC
24 VAC Comm — C
Heat/Cool Stage-1 — Y
Fan — G
Heat Stage-2 — W
Y2
Heat Stage-3 — W2
H/A
B
RVS Cooling — O
24 VAC Hot — R

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Fig. 11 - Typical Fan Coil with 1-Stage Heat Pump with Reversing Valve Active in Cooling

Utility I/O Board — Auxiliary Load Controller — AC Power Line

RH
RC
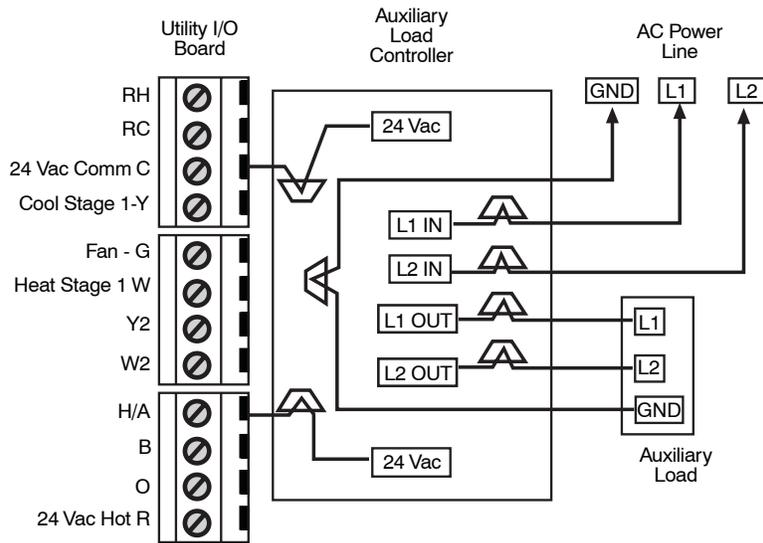24 Vac Comm C
Cool Stage 1-Y
Fan - G
Heat Stage 1 W
Y2
W2
H/A
B
O
24 Vac Hot R

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Fig. 12 - Auxiliary Load Controller Connection Diagram