

AVPTC

AIR HANDLER INSTALLATION INSTRUCTIONS



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5151 San Felipe, Suite 500, Houston, TX 77056
www.goodmanmfg.com -or- www.amana-hac.com
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THIS PRODUCT CONTAINS ELECTRONIC COMPONENTS WHICH REQUIRE A DEFINITE GROUND. PROVISIONS ARE MADE FOR CONNECTION OF THE GROUND. A DEDICATED GROUND FROM THE MAIN POWER SUPPLY OR AN EARTH GROUND MUST BE PROVIDED.

NOTICE

IF A "1 FLASH" ERROR CODE OR AN "Ec" HTR TOO LARGE ERROR IS ENCOUNTERED ON STARTUP, VERIFY THAT THE ELECTRIC HEATER DIP SWITCHES HAVE BEEN SET TO THE APPROPRIATE HEATER SIZE. SEE PAGES 12 AND 13 FOR THE DIP SWITCH SETTINGS AND HEATER KIT AIRFLOW DELIVERY.

INTRODUCTION

This booklet contains the installation and operating instructions for your air handler. All warnings and precautions within this booklet must be observed. Improper installation can result in unsatisfactory operation or dangerous conditions and void the warranty. Read this booklet and any instructions packaged with accessories prior to installation. Give this booklet to the user and explain its provisions. The user should retain this booklet for future reference.

NOTE: Upon start up in communicating mode the circuit board will display a "1 Flash" error code on the diagnostic LED and an "Ec" HTR TO LARGE error at the communicating display. This is an indication that the dip switches on the control board need to be configured in accordance with the Electric Heating Airflow Table on page 13 of this manual. Configuring the dip switches and resetting power to the unit will clear the error code.

ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS

NOTE: Discharge body's static electricity before touching unit. An electrostatic discharge can adversely affect electrical components.

Use the following precautions during modular blower installation and servicing to protect the integrated control module from damage. By putting the modular blower, the control, and the person at the same electrostatic potential, these steps will help avoid exposing the integrated control module to electrostatic discharge. This procedure is applicable to both installed and uninstalled (ungrounded) blowers.

1. Disconnect all power to the blower. Do not touch the integrated control module or any wire connected to the control prior to discharging your body's electrostatic charge to ground.
2. Firmly touch a clean, unpainted, metal surface of the modular blower near the control. Any tools held in a person's hand during grounding will be discharged.

3. Service integrated control module or connecting wiring following the discharge process in step 2. Use caution not to recharge your body with static electricity; (i.e., do not move or shuffle your feet, do not touch ungrounded objects, etc.). If you come in contact with an ungrounded object, repeat step 2 before touching control or wires.
4. Discharge your body to ground before removing a new control from its container. Follow steps 1 through 3 if installing the control on a blower. Return any old or new controls to their containers before touching any ungrounded object.

IMPORTANT NOTE TO THE OWNER REGARDING PRODUCT WARRANTY

Your warranty certificate is supplied as a separate document with the unit installed by your contractor. Read the limited warranty certificate carefully to determine what is and is not covered and keep the warranty certificate in a safe place. If you are unable to locate the warranty certificate please contact your installing contractor or contact customer service (877-254-4729) to obtain a copy.

IMPORTANT: To register your Goodman brand unit, go to www.goodmanmfg.com. Click on the word "Warranty" located on the left side of the home page. Next, click on the word "Product Registration" located on the left side of the Warranty page and complete the forms in the manner indicated on the Product Registration page.

To register your Amana® brand unit, go to www.amana-hac.com. Click on the word "Warranty" located on the top right of the home page. Next, click on the word "Product Registration" located on the left side of the Warranty page and complete the forms in the manner indicated on the Product Registration page.

Product limited warranty certificates for models currently in production can be viewed at www.goodmanmfg.com or www.amana-hac.com. If your model is not currently in production or does not appear on the website, please contact your installing contractor or contact customer service (877-254-4729) to obtain a copy of your warranty certificate.

Each product overview page contains a Product Warranty link; by clicking on it you will be able to view the limited warranty coverage for that specific product. To view warranty registration information, click on the Product Warranty text on the left navigation panel on the home page of each website. The Online Product Registration pages are located in this same section.



CHECKING PRODUCT RECEIVED

Upon receiving the unit, inspect it for damage from shipment. Claims for damage, either shipping or concealed, should be filed immediately with the shipping company. Check the unit model number, specifications, electrical characteristics and accessories to determine if they are correct. In the event an incorrect unit is shipped, it must be returned to the supplier and must NOT be installed. The manufacturer assumes no responsibility for installation of incorrectly shipped units.

REPLACEMENT PARTS

ORDERING PARTS

When reporting shortages or damages, or ordering repair parts, give the complete unit model and serial numbers as stamped on the unit's nameplate.

Replacement parts for this appliance are available through your contractor or local distributor. For the location of your nearest distributor, consult the white business pages, the yellow page section of the local telephone book or contact:

CONSUMER AFFAIRS
GOODMAN MANUFACTURING COMPANY, L.P.
7401 SECURITY WAY
HOUSTON, TEXAS 77040
877-254-4729

IMPORTANT SAFETY INSTRUCTIONS

RECOGNIZE SAFETY SYMBOLS, WORDS, AND LABELS

The following symbols and labels are used throughout this manual to indicate immediate or potential hazards. It is the owner's responsibility to read and comply with all safety information and instructions accompanying these symbols. Failure to heed safety information increases the risk of property damage, product damage, personal injury or death.



WARNING

HIGH VOLTAGE!

DISCONNECT ALL POWER BEFORE SERVICING.
MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



WARNING

ONLY INDIVIDUALS MEETING THE REQUIREMENTS OF AN "ENTRY LEVEL TECHNICIAN", AT A MINIMUM, AS SPECIFIED BY THE AIR CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI) MAY USE THIS INFORMATION. ATTEMPTING TO INSTALL OR REPAIR THIS UNIT WITHOUT SUCH BACKGROUND MAY RESULT IN PRODUCT DAMAGE, PERSONAL INJURY, OR DEATH.



WARNING

To avoid property damage, personal injury or death due to electrical shock, this unit **MUST** have an uninterrupted, unbroken electrical ground. The electrical ground circuit may consist of an appropriately sized electrical wire connecting the ground lug in the unit control box to the building electrical service panel.

Other methods of grounding are permitted if performed in accordance with the National Electric Code (NEC)/American National Standards Institute (ANSI)/National Fire Protection Association (NFPA) 70 and local/state codes. In Canada, electrical grounding is to be in accordance with the Canadian Electric Code (CSA) C22.1.



WARNING

This product is factory-shipped for use with 208/240/1/60 electrical power supply. **DO NOT** reconfigure this air handler to operate with any other power supply.



CAUTION

When installing or servicing this equipment, safety clothing, including hand and eye protection, is strongly recommended. If installing in an area that has special safety requirements (hard hats, etc.), observe these requirements.



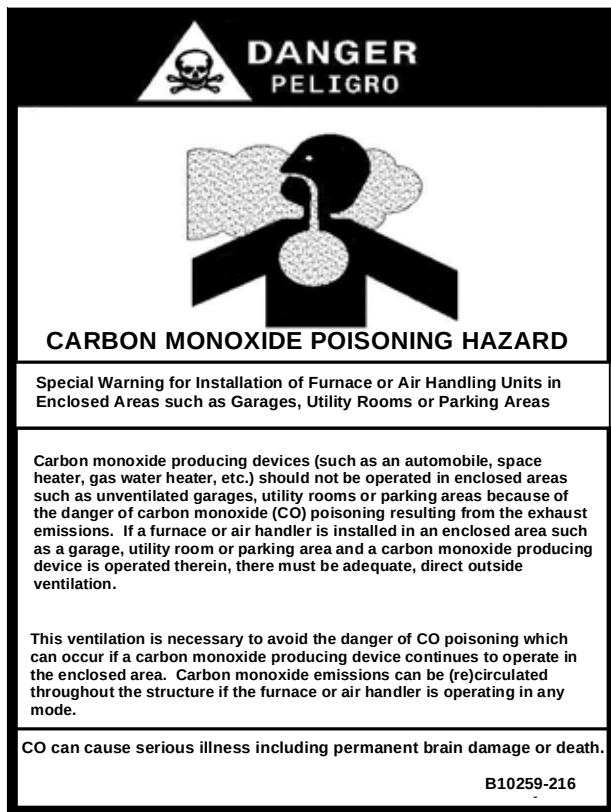
WARNING

Do not connect to or use any device that is not design-certified by Goodman for use with this unit. Serious property damage, personal injury, reduced unit performance and/or hazardous conditions may result from the use of such non-approved devices.



WARNING

To prevent the risk of property damage, personal injury, or death, do not store combustible materials or use gasoline or other flammable liquids or vapors in the vicinity of this unit.



CODES & REGULATIONS

This product is designed and manufactured to comply with national codes. Installation in accordance with such codes and/or prevailing local codes/regulations is the responsibility of the installer. The manufacturer assumes no responsibility for equipment installed in violation of any codes or regulations.

The United States Environmental Protection Agency (EPA) has issued various regulations regarding the introduction and disposal of refrigerants. Failure to follow these regulations may harm the environment and can lead to the imposition of substantial fines. Should you have any questions please contact the local office of the EPA.

If replacing an air handler, the system must be manufacturer approved and Air Conditioning, Heating and Refrigeration Institute (AHRI) matched. **NOTE:** Installation of unmatched systems is strongly discouraged.

FEATURES

This air handler is a part of the ComfortNet™ family of products. It may be installed as part of a “non-communicating” system using a standard 24 VAC thermostat. However, with the CTK0*AA ComfortNet thermostat kit, this air handler may be installed as part of a digitally communicating system. The ComfortNet system provides automatic airflow configuration, enhanced setup features, and enhanced diagnostics. It also reduces the number of thermostat wires to a maximum of four and a minimum of two.

PRE-INSTALLATION INSTRUCTIONS

Carefully read all instructions for the installation prior to installing product. Make sure each step or procedure is understood and any special considerations are taken into account before starting installation. Assemble all tools, hardware and supplies needed to complete the installation. Some items may need to be purchased locally. Make sure everything needed to install the product is on hand before starting.

LOCATION

NOTE: Air handlers are designed for *indoor installation only*.

Give special consideration to minimizing the length of refrigerant tubing when installing air handlers. Refer to Remote Cooling/Heat Pump Service Manual TP-107 Long Line Set Application R-410A for guidelines. The unit clearance from a combustible surface may be 0". However, service clearance is to take precedence. In addition allow a minimum of 24" in front of the unit for service clearance.

If the unit is located in an area with high ambient temperature and/or high humidity, the air handler may be subject to nuisance sweating of the casing. On these installations, a wrap of 2" fiberglass insulation with a vapor barrier is recommended.

Do not install the air handler in a location that violates the instructions provided with the condenser.

Consult all appropriate regulatory codes prior to determining final clearances. When installing this unit in an area that may become wet, elevate the unit with a sturdy, non-porous material. In installations that may lead to physical damage (i.e. a garage) it is advised to install a protective barrier to prevent such damage.

DUCTWORK

This air handler is designed for a complete supply and return ductwork system.



CAUTION

Do not operate this product without all the ductwork attached.

To ensure correct system performance, the ductwork is to be sized to accommodate 375-425 CFM per ton of cooling with the static pressure not to exceed .5" WC. Inadequate duct work that restricts airflow can result in improper performance and compressor or heater failure. Ductwork is to be constructed in a manner that limits restrictions and maintains suitable air velocity. Ductwork is to be sealed to the unit in a manner that will prevent leakage.

RETURN DUCTWORK

DO NOT TERMINATE THE RETURN DUCTWORK IN AN AREA THAT CAN INTRODUCE TOXIC, OR OBJECTIONABLE FUMES/ODORS INTO THE DUCTWORK. The return ductwork is to be introduced into the air handler bottom (upflow configuration).

RETURN AIR FILTERS

Each installation must include a return air filter. This filtering may be performed at the air handler or externally such as a return air filter grille. Air handlers mounted in the downflow orientation, including "B" series, require external filtering. A washable filter is available as an accessory. To ensure optimum performance frequent filter cleaning is advised. Refer to *Air Filter Accessory* table for the appropriate filter.

AVPTC	Filter Number	Qty Required
1830	FIL 36-42 (19" x 21")	1
3137 4260	FIL 48-61 (21-1/2" x 23")	1

Air Filter Accessories

ELECTRIC HEAT

Refer to this manual in combination with the instructions provided with the heat kit for the correct installation procedure. The air handlers listed in this manual do not have factory installed electric heat. Electric heat is available as an accessory. If installing this option, the **ONLY** heat kits that can be used are the HKR series.

NOTE: The Amana® brand EHK, ECB, EDB, and EDK kits are **NOT** approved for use with these air handlers.

HKR INSTALLATION

Follow instructions listed in Installation and Operating Instructions shipped with the heat kit.

ELECTRICAL SUPPLY WIRE AND MOP



CAUTION

FIRE HAZARD!

To avoid the risk of property damage, personal injury or fire, use only copper conductors.



WARNING

HIGH VOLTAGE!

Disconnect ALL power before servicing. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.



WARNING

HIGH VOLTAGE!

To avoid property damage, personal injury or death due to electrical shock, this unit **MUST** have an **uninterrupted, unbroken electrical ground**. The electrical ground circuit may consist of an appropriately sized electrical wire connecting the ground lug in the unit control box to the building electrical service panel.

Other methods of grounding are permitted if performed in accordance with the National Electric Code (NEC)/American National Standards Institute (ANSI)/National Fire Protection Association (NFPA) 70 and local/state codes. In Canada, electrical grounding is to be in accordance with the Canadian Electric Code (CSA) C22.1.

BUILDING ELECTRICAL SERVICE INSPECTION

This unit is designed for single-phase electrical supply. DO NOT OPERATE ON A THREE-PHASE POWER SUPPLY. Measure the power supply to the unit. The supply voltage **must** be in agreement with the unit nameplate power requirements and within the range specified below.

Power Supply Voltage		
Nominal Input	Minimum Voltage	Maximum Voltage
208/240	187	253

WIRE SIZING

Wire size is important to the operation of your equipment. Use the following check list when selecting the appropriate wire size for your unit.

- Wire size must carry the Minimum Circuit Ampacity (MCA).
- Refer to the NEC (USA) or CSA (Canada) for wire sizing. The unit MCA for the air handler and the optional electric heat kit can be found on the unit Series and Rating Plate.
- Wire size allows for no more than a 2% voltage drop from the building breaker/fuse panel to the unit.

Refer to the latest edition of the National Electric Code or in Canada the Canadian Electric Code when determining the correct wire size. The following table shows the current carrying capabilities for copper conductors rated at 75°C with a 2% voltage drop. Use the table below to determine the voltage drop per foot of various conductors.

Maximum Allowable Length in Feet to Limit Voltage Drop to 2%*								
Wire Size (AWG)	Minimum Circuit Ampacity (MCA)							
	10	15	20	25	30	35	40	45
14	75	50	37	NR	NR	NR	NR	NR
12	118	79	59	47	NR	NR	NR	NR
10	188	125	95	75	63	54	NR	NR
8	301	201	150	120	100	86	75	68
6	471	314	235	188	157	134	118	110

*Based on NEC 1996

MAXIMUM OVERCURRENT PROTECTION (MOP)

Every installation must include an NEC (USA) or CEC (Canada) approved overcurrent protection device. Also, check with local or state codes for any special regional requirements.

Protection can be in the form of fusing or HACR style circuit breakers. The Series and Rating Plate can be used as a guide for selecting the MAXIMUM overcurrent device.

NOTE: Fuses or circuit breakers are to be sized larger than the equipment MCA but not to exceed the MOP.

ELECTRICAL CONNECTIONS

Consult the local power company and local codes before installing this unit. All wiring must be in accordance with the National Electrical Code as well as all local codes. Knockouts have been provided on side and top of the cabinet for the installation of the electrical conduit. If the knockouts on the cabinet sides are used for electrical conduit, an adapter ring must be used in order to meet UL1995 safety requirements. Use Minimum Circuit Ampacity and type of wire to determine proper wire size. The unit **MUST** be properly grounded. A ground lug is provided in the unit.

Check all factory connections before connecting electrical power to unit to ensure none were loosened or disconnected during shipping and handling.

 **WARNING**

HIGH VOLTAGE!

TO PREVENT PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK, DISCONNECT THE ELECTRICAL POWER BEFORE ELECTRICALLY CONNECTING THE UNIT.



 **WARNING**

TO AVOID THE RISK OF FIRE OR EQUIPMENT DAMAGE, USE COPPER CONDUCTORS.

 **CAUTION**

TO AVOID THE RISK OF PERSONAL INJURY, WIRING TO THE UNIT MUST BE PROPERLY POLARIZED AND GROUNDED.

WARNING

ALL WIRING MUST COMPLY WITH APPLICABLE LOCAL AND NATIONAL CODES. TYPE AND LOCATION OF FUSED DISCONNECT SWITCH(ES) MUST COMPLY WITH ALL APPLICABLE CODES AND PROVIDE OVERCURRENT PROTECTION AS SHOWN ON THE NAMEPLATE.

208/230 VOLT LINE CONNECTIONS

If heater kits will not be installed, remove the proper size knockout for the electrical conduit connection. Connect electrical conduit to the unit using two washers to make an approved connection.

The power supply wires must be connected to the red and black power wiring. Two wire nuts are provided in the bag assembly for this connection. Wrap the wire nuts with electrical tape. (Insulated crimp type connectors, field supplied, may be substituted for the wire nuts and electrical tape provided proper size connectors are used.) A ground wire **MUST** be connected to the ground lug inside the unit.

AIR HANDLER ONLY (NON-HEAT KIT MODELS)

The building supply connects to the stripped black and red wires contained in the air handler electrical compartment cavity. A ground screw is also contained in this area. Attach the supply wires to the air handler conductors as shown in the unit wiring diagram using appropriately sized solderless connectors or other NEC or CEC approved means.

AIR HANDLER WITH NON-CIRCUIT BREAKER HEAT KITS

A terminal block is provided with the HKR kit to attach the power supply and air handler connections. Follow the HKR Installation Manual and wiring diagram for complete wiring details.

AIR HANDLER WITH HEAT KITS CONTAINING A CIRCUIT BREAKER

HKR models with a "C" suffix contain a circuit breaker(s). The air handler has a plastic cover on the access panel that will require either one or both sections to be removed to allow the heat kit circuit breaker(s) to be installed. See the HKR Installation Instructions for further details. The air handler wires and supply wires are installed directly onto the HKR circuit breaker(s) as shown in the HKR Installation Manual and wiring diagram.

OPERATION ON 208 VOLT SUPPLY

The unit transformer is factory connected for 240 V operation. If unit is to operate on 208 V, disconnect the red wire from terminal 3 of the unit transformer and connect them to terminal 2 of the unit transformer.

LOW VOLTAGE WIRING

Low voltage wiring connections are made at the top of the cabinet. See the *24 Volt Thermostat Wiring* section of this manual for typical low voltage wiring connections. A minimum 18 AWG wire must be used for installations up to 100 feet.

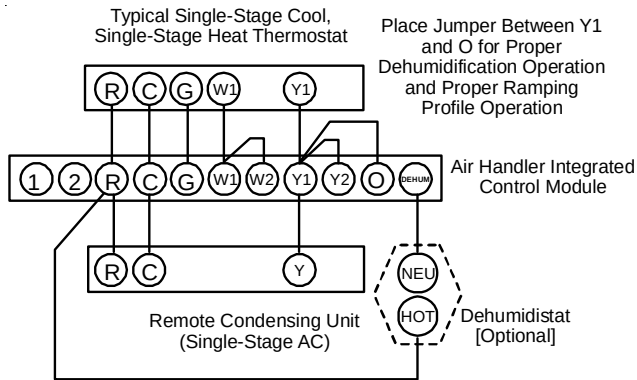
24 VOLT THERMOSTAT WIRING - NON-COMMUNICATING THERMOSTAT CONNECTIONS

NOTE: Wire routing must not interfere with the circulator blower operation or routine maintenance.

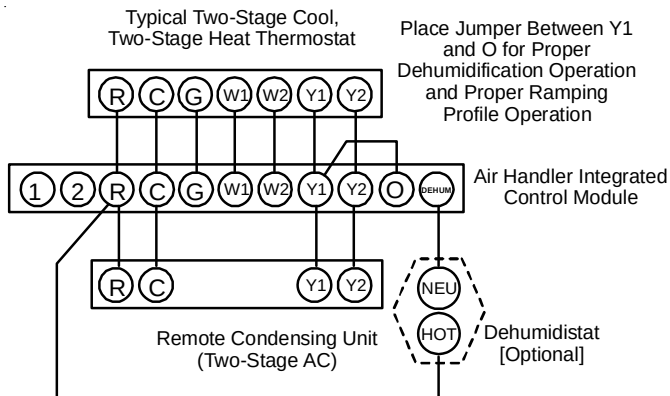
The air handler's integrated control module provides terminals for "Y1" and "Y2" and "W1" and "W2" thermostat connections. This allows the air handler to support the systems shown in the table below. Refer to the following figures for typical connections to the integrated control module. Thermostat wiring entrance holes are located in the top of the blower. Wire routing must not interfere with circulator blower operation or routine maintenance.

COOLING	HEAT PUMP HEATING	ELECTRIC HEATING
1-STAGE	-----	1- or 2-STAGE
2-STAGE	-----	1- or 2-STAGE
1-STAGE	1-STAGE	-----
2-STAGE	2-STAGE	-----
1-STAGE	1-STAGE	1- or 2-STAGE
2-STAGE	2-STAGE	1- or 2-STAGE

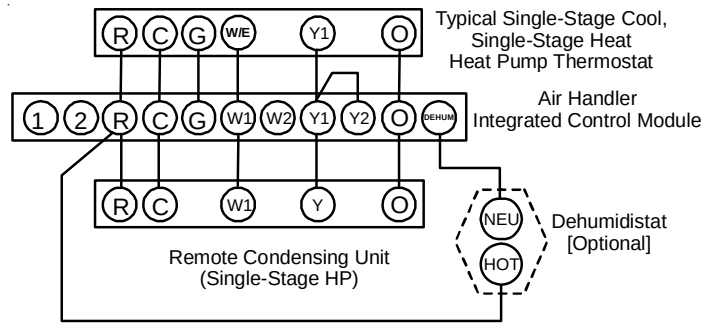
NOTE: A removable plug connector is provided with the control to make thermostat wire connections. This plug may be removed, wire connections made to the plug, and replaced. It is **strongly** recommended that multiple wires into a single terminal be twisted together prior to inserting into the plug connector. Failure to do so may result in intermittent operation.



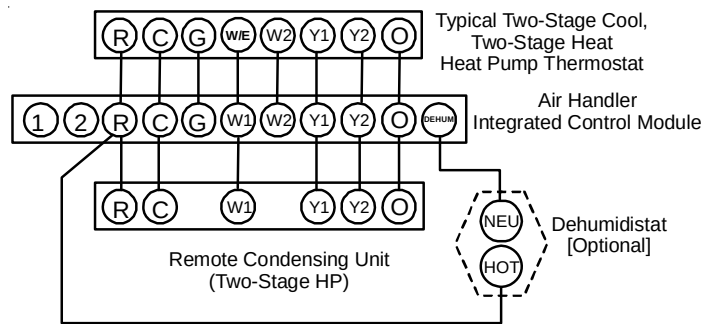
Typical Single-Stage Cooling with Single-Stage Heating



Typical Two-Stage Cooling with Two-Stage Heating



Typical Single-Stage Heat Pump with Auxiliary/Emergency Heating



Typical Two Stage Heat Pump heating and Auxiliary/Emergency Heating

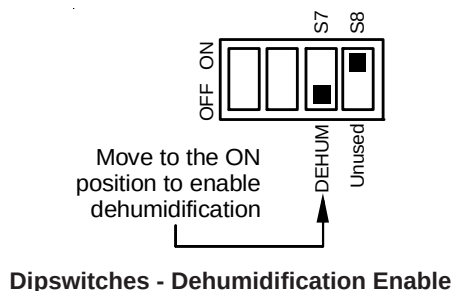
24 VOLT DEHUMIDISTAT WIRING - NON-COMMUNICATING THERMOSTAT CONNECTIONS

The optional usage of a dehumidistat allows the air handler's circulator blower to operate at a slightly lower speed during a combined thermostat call for cooling and dehumidistat call for dehumidification. This lower blower speed enhances dehumidification of the conditioned air as it passes through the AC coil. For proper function, a dehumidistat applied to this air handler must operate on 24 VAC and utilize a switch which *opens on humidity rise*.

To install/connect a dehumidistat:

1. Turn OFF power to air handler.
2. Secure the dehumidistat neutral wire (typically the white lead) to the screw terminal marked "DEHUM" on the air handler's integrated control module.
3. Secure the dehumidistat hot wire (typically the black lead) to the screw terminal marked "R" on the air handler's integrated control module.
4. Secure the dehumidistat ground wire (typically the green lead) to the ground screw on the air handler. **NOTE:** Ground wire may not be present on all dehumidistats.
5. Turn ON power to air handler.

To enable the dehumidification function, move the dehumidification dipswitch from OFF to ON. See following figure.



REFRIGERANT LINES



WARNING

This product is factory-shipped under pressure. Follow these instructions to prevent injury.



WARNING

A quenching cloth is strongly recommended to prevent scorching or marring of the equipment finish when welding close to the painted surfaces. Use brazing alloy of 5% minimum silver content.

TUBING PREPARATION

All cut ends are to be round, burr free, and clean. Failure to follow this practice increases the chances for refrigerant leaks. The suction line is spun closed and requires pipe cutters to remove the closed end.

POST BRAZING

Quench all welded joints with water or a wet rag.

PIPING SIZE

For the correct tubing size, follow the specification for the condenser/heat pump.

SPECIAL INSTRUCTIONS

This coil comes equipped with a thermostatic expansion valve (TXV) for refrigerant management.

IMPORTANT NOTE: Torch heat required to braze tubes of various sizes is proportional to the size of the tube. Tubes of smaller size require less heat to bring the tube to brazing temperature before adding brazing alloy. Applying too much heat to any tube can melt the tube. Service personnel must use the appropriate heat level for the size of the tube being brazed.

NOTE: The use of a heat shield when brazing is recommended to avoid burning the serial plate or the finish on the unit. HEAT TRAP OR WET RAGS SHOULD BE USED TO PROTECT HEAT SENSITIVE COMPONENTS SUCH AS SERVICE VALVES AND TXV VALVES.

IMPORTANT NOTE: Sensing bulbs are not permanently installed at the factory to prevent accidental damage during brazing. Be sure to follow this checklist step-by-step to ensure the sensing bulb is not damaged during installation.

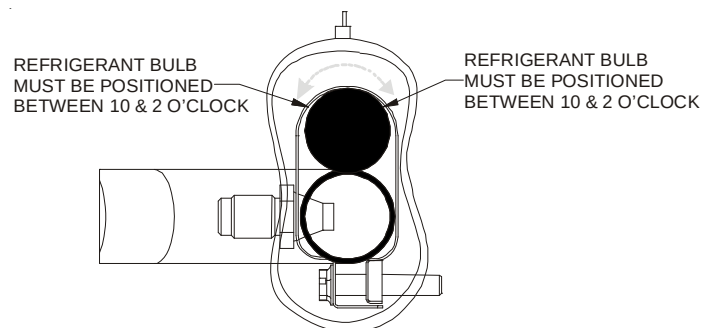
1. Loosen the 13/16 nut **1 TURN ONLY**. No pressure loss indicates possible leak.
2. Remove the nut and discard the cap.
3. Follow the instructions on the caution label, and remove the two mounting screws on the lower access panel. Then remove the lower access panel.
4. Remove the large front panel and remove the sensing bulb from suction manifold. TO PREVENT DAMAGE TO SENSING BULB, ENSURE BULB IS NOT NEAR FLAME OR IN CONTACT WITH SUCTION LINE OR MANIFOLD DURING BRAZING.
5. Use a tube cutter to remove the spin closure on the suction line.



CAUTION

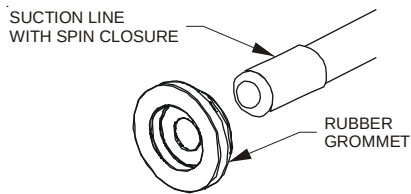
Excessive torque can cause orifices to stick. Use the proper torque settings when tightening orifices.

6. Replace sensing bulb to horizontal portion of suction line just inside cabinet. Place bulb parallel with suction line between 10 o'clock and 2 o'clock position. Secure bulb to line with strapping provided in literature envelope. Insulate sensing bulb to line with self-adhesive insulation provided in the envelope. See the following figures for correct bulb placement and strapping information.



NOTE: The sensing bulb must be permanently located. A heat shield, heat trap, or wet rag must be used during brazing to prevent damage to the TXV valve.

- Replace access panels, suction line grommet, insulation and all screws.



Suction Line Grommet

AIRFLOW CONVERSIONS

DOWNFLOW CONVERSION

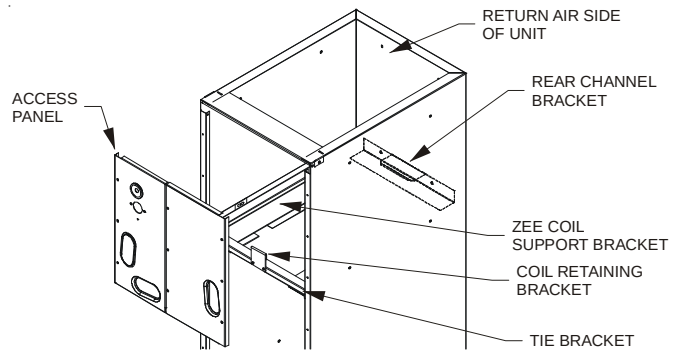
Conversion to downflow MUST be performed in an area that allows access to all sides prior to placing the air handler in its final location. To prevent the evaporator coil pan from “sweating”, a drain pan insulation (DPI) accessory kit is to be used when performing this conversion. **NOTE:** The DPI kit is not supplied with this product and is to be purchased separately. See the following *Drain Pan Insulation Kit* table for the correct DPI kit.

AVPTC Model	Insulation Kit
1830	DPI36-42/20
3137 4260	DPI48-61/-20

Drain Pan Insulation Kits

Refer to Figures *Downflow Conversion - Conversion Preparation*, *Downflow Conversion - Insulation Retainers*, and *Downflow Conversion - Conversion Completion* for the location of the components referenced in the following steps. Figure *Downflow Conversion - Conversion Preparation* illustrates the new installation location for the removed components.

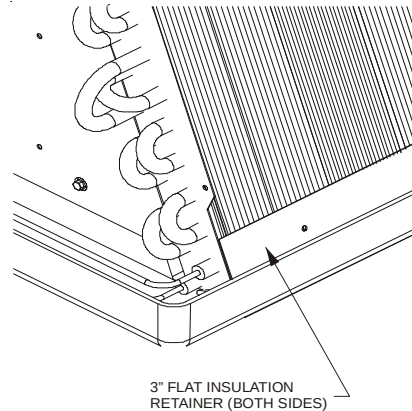
- Before inverting the air handler, remove all access panels, the coil rear channel bracket, and the filter close-off panel.
- Remove the evaporator coil and the horizontal drain pan. Discard horizontal drain pan.
- Install the provided plastic plug into the vacated access panel.
- Remove the two (2) zee coil support brackets and insulation retaining brackets.
- Remove the tie bracket.
- Install the DPI Insulation Kit onto the bottom of the drain pan.



NOTE: The filter provision is not applicable in THIS downflow application.

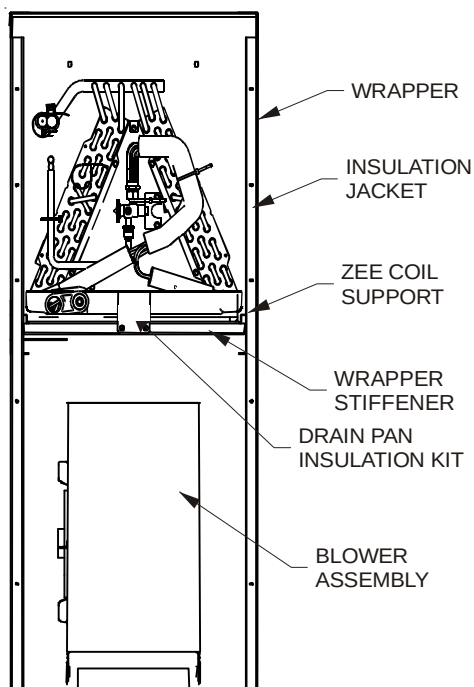
Downflow Conversion - Conversion Preparation

- Install the zee coil supports and the wrapper stiffeners.
- Install the tie bracket.
- Install the rear channel bracket.
- To prevent possible condensate “blow off” the insulation retainers are to be laid into the evaporator coil pan as shown.



Downflow Conversion - Insulation Retainers

To complete the conversion, slide the evaporator coil into the chassis and attach the three (3) access panels.



Downflow Conversion - Conversion Completion

NOTE: When converted to downflow position the coil may protrude above the cabinet on some models.

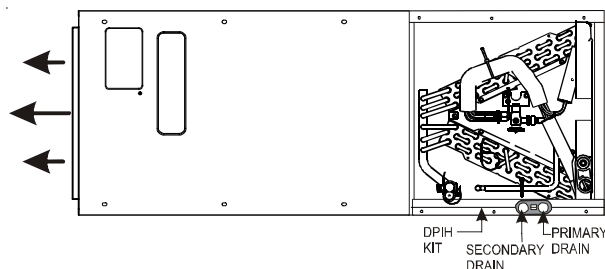
HORIZONTAL CONVERSION

Dedicated Downflow models are not suitable for horizontal application and must not be used for this type of installation. The only field modification required for conversion to “Horizontal Right-Hand” is the removal of the plastic knockouts in the horizontal panel drain connections. To prevent the horizontal drain pan from sweating in high humidity applications, it is recommended that a horizontal drain pan insulation (DPIH) accessory kit be used. **NOTE:** The DPIH insulation kit is not supplied with this product and should be purchased separately. See *Horizontal Drain Pan Insulation Kits* table for the correct DPIH kit.

AVPTC Model	Insulation Kit
1830	DPIH36-42
3137 4260	DPIH48-61

Horizontal Drain Pan Insulation Kits

The following describes converting to “Horizontal Left-Hand”. Conversion to downflow **MUST** be performed in an area that allows access to all sides prior to placing the air handler in its final location. See *Horizontal Left-Hand Conversion* figure below.

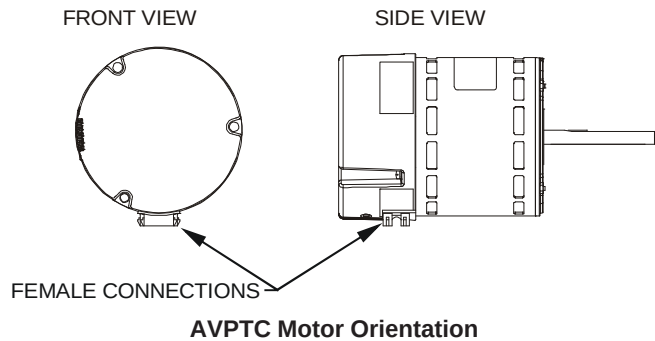


Horizontal Left-Hand Conversion

1. Remove two screws beside the liquid line on the lower access panels. Remove the (3) air handler access panels.
2. Remove the “J” shaped bracket that retains the evaporator coil.
3. Slide out the evaporator coil and horizontal drain pan.
4. Remove the gasket from the horizontal pan drain connections.
5. Remove the oval shaped plastic plug from the left side access panel. Remove the oval shaped rubber gasket seal from the lower right side access panel.
6. The drain connections for the horizontal pan are sealed with a thin coating of plastic. Carefully knock out this plastic seal with a screwdriver and hammer. **Note: The upper drain will become the secondary drain which is mandatory in many municipalities .**
7. Install the plastic plug removed in step 5 to the right side lower access panel and the oval shaped rubber gasket to the lower left access panel.
8. Reinstall the evaporator coil with the horizontal panel on the left side. Note: Push the assembly completely to the rear to ensure the engagement of the upflow pan with the rear channel bracket.
9. Install the “J” bracket (removed in step 2) to support the upflow pan to the tie channel.
10. Attach all panels and the metering device.

AVPTC MOTOR ORIENTATION

If the unit is in the upflow position, there is no need to rotate the motor. If the unit is in the downflow position, loosen motor mount and rotate motor as shown in the *AVPTC Motor Orientation* figure below. Be sure motor is oriented with the female connections on the casing down. If the motor is not oriented with the connections down, water could collect in the motor and may cause premature failure.



CONDENSATE REMOVAL

The coil drain pan has a primary and an optional secondary drain with 3/4" NPT female connections. The connectors required can be 3/4" NPT male either PVC or metal pipe and should be hand tightened to a torque of approximately 37 in-lbs. to prevent damage to the drain pan connection. An insertion depth between .355 to .485 inches (3-5 turns) should be expected at this torque. Use the female (3/4 fpt) threaded fitting that protrudes outside of the enclosure for external connections.

1. Ensure drain pan hole is NOT obstructed.
2. To prevent potential sweating and dripping on to finished space, it may be necessary to insulate the condensate drain line located inside the building. Use Armaflex® or similar material.

A Secondary Condensate Drain Connection has been provided for areas where the building codes require it. Pitch the drain line 1/4" per foot to provide free drainage. Insulate drain lines located inside the building to prevent sweating. Install a condensate trap to ensure proper drainage. If the secondary drain line is required, run the line separately from the primary drain and end it where it can be easily seen.

NOTE: Water coming from this line means the coil primary drain is plugged and needs clearing.



CAUTION

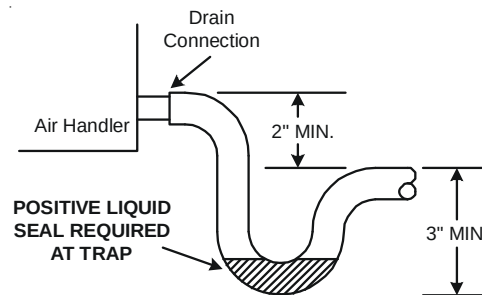
If secondary drain is not installed, the secondary access must be plugged.

The installation must include a "P" style trap that is located as close as is practical to the evaporator coil. See *Condensate Drain Trap* figure for details of a typical condensate line "P" trap.

NOTE: Trapped lines are required by many local codes. In the absence of any prevailing local codes, please refer to the requirements listed in the Uniform Mechanical Building Code.

A drain trap in a **draw-through** application prevents air from being drawn back through the drain line during fan operation thus preventing condensate from draining, and if connected to a sewer line to prevent sewer gases from being drawn into the airstream during blower operation.

Field experience has shown condensate drain traps with an open vertical Tee between the air handler and the condensate drain trap can improve condensate drainage in some applications, but may cause excessive air discharge out of the open Tee. Goodman® does not prohibit this type of drain but we also do not recommend it due to the resulting air leakage. Regardless of the condensate drain design used, it is the installer's responsibility to ensure the condensate drain system is of sufficient design to ensure proper condensate removal from the coil drain pan.



Condensate Drain Trap

Use of a condensate removal pump is permitted when necessary. This condensate pump should have provisions for shutting off the control voltage should a blocked drain occur. A trap must be installed between the unit and the condensate pump.

IMPORTANT NOTE: The evaporator coil is coated with oils that may dissolve styrofoam and certain types of plastics. Therefore, a removal pump or float switch must not contain any of these materials.

Tip: Priming the "P" trap may avoid improper draining at the initial installation and at the beginning of the cooling season.

When coils are installed above ceilings, or in other locations where damage from condensate overflow may occur, it is **MANDATORY** to install a field fabricated auxiliary drain pan under the coil cabinet enclosure. Drain lines from the auxiliary pan must be installed and terminated so that the homeowner can see water discharges.

ACHIEVING 2% LOW LEAKAGE RATE

Ensure that the Neoprene gasket with PSA remains intact on all surfaces that the access panels are secured to. These surfaces are the entire length of the wrapper and areas between the upper tie plate, upper and lower access panels. Be sure that upper access panel breaker insert gasket is intact and also flowrator gasket is installed on the lower access panel. An additional drain hole cover is required.

CIRCULATOR BLOWER

This air handler is equipped with a multi-speed circulator blower. This blower provides ease in adjusting blower speeds. The Specification Sheet applicable to your model provides an airflow table, showing the relationship between airflow (CFM) and external static pressure (E.S.P.), for the proper selection of heating and cooling speeds. The heating blower speed is shipped set at "21 kW", and the cooling blower speed is set at "D". These blower speeds should be

adjusted by the installer to match the installation requirements so as to provide the correct electric heating CFM and correct cooling CFM.

Use the CFM LED (green), adjacent to the integrated control module electric heat connector to obtain an approximate airflow quantity. The green CFM LED blinks once for each 100 CFM of airflow.

1. Determine the tonnage of the cooling system installed with the air handler. If the cooling capacity is in BTU/hr divide it by 12,000 to convert capacity to TONS.

Example: Cooling Capacity of 30,000 BTU/hr.

$$30,000/12,000 = 2.5 \text{ Tons}$$

2. Determine the proper air flow for the cooling system. Most cooling systems are designed to work with air flows between 350 and 450 CFM per ton. Most manufacturers recommend an air flow of about 400 CFM per ton.

Example: 2.5 tons X 400 CFM per ton = 1000 CFM

The cooling system manufacturer's instructions must be checked for required air flow. Any electronic air cleaners or other devices may require a specific airflow; consult installation instructions of those devices for requirements.

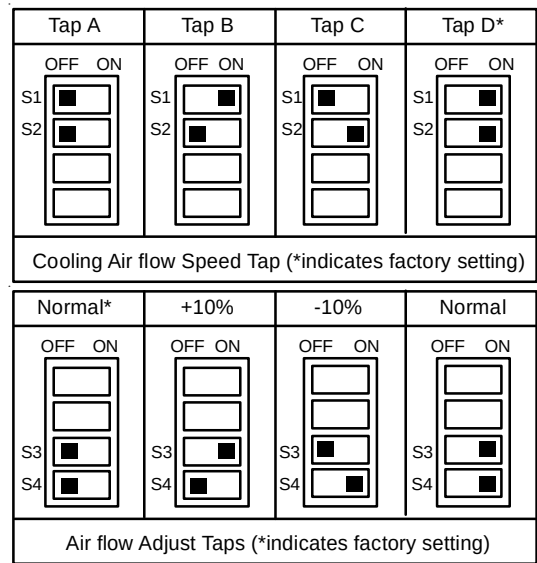
3. Knowing the air handler model, locate the high stage cooling air flow charts in the Specification Sheet applicable to your model. Look up the cooling air flow determined in step 2 and find the required cooling speed and adjustment setting.

Example: An AVPTC183014 air handler installed with a 2.5 ton air conditioning system. The air flow needed is 1000 CFM. Looking at the cooling speed chart for AVPTC183014, find the air flow closest to 1000 CFM. A cooling airflow of 1000 CFM can be attained by setting the cooling speed to "C" and the adjustment to "0" (no adjustment).

4. Locate the blower speed selection DIP switches on the integrated control module. Select the desired "cooling" speed tap by positioning switches 1 and 2 appropriately. Select the desired "adjust" tap by positioning switches 3 and 4 appropriately. Refer to the following *Dipswitches - Cooling Airflow and Airflow Adjust Taps* figure for switch positions and their corresponding taps. Verify CFM by counting the number of times the green CFM LED blinks.

5. Continuous fan speed is 30% of the air handler's maximum airflow capability.

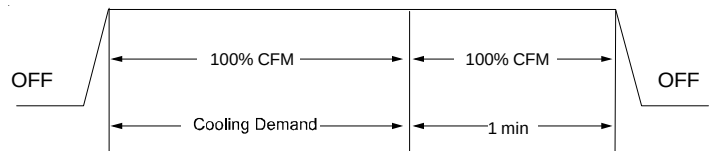
Example: If the air handler's maximum airflow capability is 2000 CFM, the continuous fan speed will be 0.30 x 2000 CFM = 600 CFM.



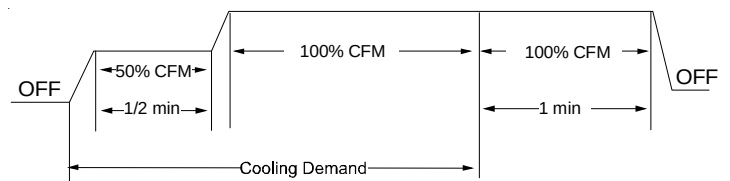
Dipswitches - Cooling Airflow and Airflow Adjust Taps

6. The multi-speed circulator blower also offers several custom ON/OFF ramping profiles. These profiles may be used to enhance cooling performance and increase comfort level. The ramping profiles are selected using DIP switches 5 and 6. Refer to the following *Dipswitches - Cooling Airflow Ramping Profiles* figure for switch positions and their corresponding taps. Refer to the bullet points below for a description of each ramping profile. Verify profile selection by counting the green CFM LED blinks and timing each step of the ramping profile.

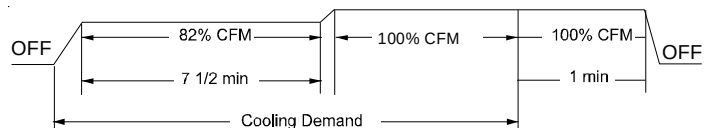
- Profile A provides only an OFF delay of one (1) minute at 100% of the cooling demand airflow.



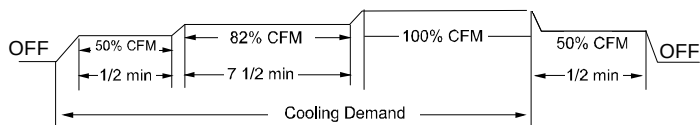
- Profile B ramps up to full cooling demand airflow by first stepping up to 50% of the full demand for 30 seconds. The motor then ramps to 100% of the required airflow. A one (1) minute OFF delay at 100% of the cooling airflow.



- Profile C ramps up to 82% of the full cooling demand airflow and operates there for approximately 7 1/2 minutes. The motor then steps up to the full demand airflow. Profile C also has a one (1) minute 100% OFF delay.



- Profile D ramps up to 50% of the demand for 1/2 minute, then ramps to 82% of the full cooling demand airflow and operates there for approximately 7 1/2 minutes. The motor then steps up to the full demand airflow. Profile D has a 1/2 minute at 50% airflow OFF delay.



Tap A	Tap B	Tap C	Tap D*
OFF ON S5 ☐ ☐ S6 ☐ ☐ ☐ ☐ ☐ ☐	OFF ON S5 ☐ ☐ S6 ☐ ☐ ☐ ☐ ☐ ☐	OFF ON S5 ☐ ☐ S6 ☐ ☐ ☐ ☐ ☐ ☐	OFF ON S5 ☐ ☐ S6 ☐ ☐ ☐ ☐ ☐ ☐

Cooling Air flow Ramping Profiles (*indicates factory setting)

Dipswitches - Cooling Airflow Ramping Profiles

- If an electric heater kit has been installed, determine the heater kilowatt (kW) rating. Find the heater size in the table below. Set dip switches 9, 10, and 11 for the installed heater as shown in the *Dipswitches - Electric Heat Airflow* figure below. The adjust setting (already established by the cooling speed selection) also applies to the electric heater kit airflow. Thus, the electric heater airflow is adjusted by the same amount. Verify selected CFM by counting the green CFM LED blinks.

ELECTRIC HEAT TEMPERATURE RISE:

The heating mode temperature rise is dependent upon the system airflow, the supply voltage, and the heat kit size (kW) selected. Use the supply voltage/temperature rise tables below to determine the temperature rise (°F).

CFM	HEAT KIT NOMINAL kW							
	3	5	6	8	10	15	20	21
600	18	28	35	41				
800	13	21	26	31	42			
1000	11	17	21	25	34	50		
1200	9	14	18	21	28	42	56	62
1400	8	12	15	18	24	36	48	53
1600	7	10	13	15	21	31	42	46
1800	6	9	12	14	19	28	37	41
2000	5	8	11	12	17	25	34	37

230/1/60 Supply Voltage - Temperature Rise Table °F

CFM	HEAT KIT NOMINAL kW							
	3	5	6	8	10	15	20	21
600	17	27	34	39				
800	13	20	25	30	40			
1000	10	16	20	24	32	48		
1200	8	13	17	20	27	40	53	59
1400	7	11	14	17	23	34	46	51
1600	6	10	13	15	20	30	40	44
1800	6	9	11	13	18	27	36	39
2000	5	8	10	12	16	24	32	35

220/1/60 Supply Voltage - Temperature Rise Table °F

CFM	HEAT KIT NOMINAL kW							
	3	5	6	8	10	15	20	21
600	16	25	32	37				
800	12	19	24	38	38			
1000	10	15	19	22	30	46		
1200	8	13	16	19	25	38	51	56
1400	7	11	14	16	22	33	43	48
1600	6	9	12	14	19	28	38	42
1800	5	8	11	12	17	25	34	37
2000	5	8	10	11	15	23	30	34

208/1/60 Supply Voltage - Temperature Rise Table °F

21 kW*	20 kW	15 kW	10 kW	8 kW	6 kW	5 kW	3 kW
OFF ON S9 ☐ ☐ S10 ☐ ☐ S11 ☐ ☐	OFF ON S9 ☐ ☐ S10 ☐ ☐ S11 ☐ ☐	OFF ON S9 ☐ ☐ S10 ☐ ☐ S11 ☐ ☐	OFF ON S9 ☐ ☐ S10 ☐ ☐ S11 ☐ ☐	OFF ON S9 ☐ ☐ S10 ☐ ☐ S11 ☐ ☐	OFF ON S9 ☐ ☐ S10 ☐ ☐ S11 ☐ ☐	OFF ON S9 ☐ ☐ S10 ☐ ☐ S11 ☐ ☐	OFF ON S9 ☐ ☐ S10 ☐ ☐ S11 ☐ ☐

Electric Heating Air Flow (*indicates factory setting)

NOTE: Upon start up in communicating mode the circuit board will display a "1 Flash" error code on the diagnostic LED and an "Ec" HTR TO LARGE error at the communicating display. This is an indication that the dip switches on the control board need to be configured in accordance with the Electric Heating Airflow Table on the following page of this manual. Configuring the dip switches and resetting power to the unit will clear the error code.

NOTE: For installations not indicated in the preceding Temperature Rise Tables, the following formula is to be used:

$$TR = (kW \times 3412) \times (\text{Voltage Correction}) \times (1.08 \times CFM)$$

Where: TR = Temperature Rise

kW = Heater Kit Actual kW

3412 = Btu per kW

Voltage Correction = .96 (230 Supply Volts)

= .92 (220 Supply Volts)

= .87 (208 Supply Volts)

1.08 = Constant

CFM = Measured Airflow

NOTE: The Temperature Rise Tables can also be used to determine the air handler airflow delivery. When using these tables for this purpose set the room thermostat to maximum heat and allow the system to reach steady state conditions. Insert two thermometers, one in the return air and one in the supply air. The temperature rise is the supply air temperature minus the room air temperature.

Use HKR specification sheets to determine the HKR available for a given air handler.

Speed Selection Dip Switches

Cool Selection Switches			Adjust Selection Switches		
Tap	1	2	TRIM	3	4
A	OFF	OFF	0%	OFF	OFF
B	ON	OFF	+ 10%	ON	OFF
C	OFF	ON	- 10%	OFF	ON
D	ON	ON	0%	ON	ON

TO SET AIRFLOW:

1. Select appropriate model from Cooling/Heat Pump Airflow Table. Based on desired Airflow for your application select corresponding tap (A,B,C or D). Set dip switches 1 & 2 to the appropriate ON/OFF positions.

2. Select appropriate Airflow adjustment factor for application (0%, +10%, -10%). Set dip switches 3 & 4 to the appropriate ON/OFF positions.

3. If installed with Heater Kit:

Using Electric Heat Airflow Table, set dip switches 9, 10 and 11 to the appropriate ON/OFF positions based on Heater kit installed.

If installed without Heater Kit:

Ensure dip switches 9, 10 and 11 are set to a valid heater kit selection. Example: The only valid heater kits for AVPTC183014* applications are 3, 5, 6, 8 and 10 kW.

Failure to do so will result in a Heater Kit error code.

TO SET COMFORT MODE:

Select desired Comfort Mode profile (see profiles above). Set switches 5 and 6 to the appropriate ON/OFF positions.

Profiles	Pre-Run	Short-Run	Off Delay	Profile Selection Switches	
A	-----	-----	60 sec/100%	5	6
B	-----	30 sec/50%	60 sec/100%	ON	OFF
C	-----	7.5 mins/82%	60 sec/100%	OFF	ON
D	30 sec/50%	7.5 mins/82%	30 sec/50%	ON	ON

Cooling/Heat Pump Airflow Table

Model	Tap	Low Stage Cool	High Stage Cool
AVPTC183014*	A	420	630
	B	560	840
	C	700	1040
AVPTC313714*	A	410	610
	B	560	830
	C	700	1040
	D	830	1240
AVPTC426014*	A	810	1210
	B	940	1410
	C	1050	1560
	D	1210	1800

NOTE: Airflow data shown applies to non-communicating mode operation only. For a fully communicating system, please see the outdoor unit's installation instructions for cooling and heat pump airflow data. See ComfortNet™ System - Airflow Consideration section for details.

Electric Heat Airflow Table

Htr kW	9	10	11	AVPTC 183014*	AVPTC 313714*	AVPTC 426014*
3	ON	ON	ON	630	610	600
5	ON	ON	OFF	730	710	680
6	ON	OFF	ON	840	840	790
8	ON	OFF	OFF	1080	1060	990
10	OFF	ON	ON	1270	1260	1190
15	OFF	ON	OFF	NR	1470	1390
20	OFF	OFF	ON	NR	NR	1580
21	OFF	OFF	OFF	NR	NR	1580

NOTE: Airflow data shown applies to the emergency heat mode (electric heat only) in either non-communicating mode operation or fully communicating mode operation.

NOTE: Airflow blink codes are approximations of actual airflow.

Heat Kit Selection

MODELS	HKR-03*	HKR-05*/-05C*	HKR-06*	HKR-08*/-08C*	HKR-10*/-10C*	HKR-15C	HKR-20C	HKR-21C
AVPTC183014A*	X	X	X	X1	X1	---	---	---
AVPTC313714A*	X	X	X	X1	X1	X2	---	---
AVPTC426014A*	X	X	X	X	X	X	X3	X3

* Revision level that may or may not be designated.

C Circuit breaker option.

NOTE:

When 8kW and 10kW heat kits are used with an AVPTC1830 and AVPTC3137, matched with 2- ton outdoor unit, see Note 1 below.

¹ Set Heater Kit dip switches 9, 10 and 11 to 6kW setting (9-ON, 10-OFF, 11-ON) to obtain 840 CFM.

² This heater kit can only be used for '1000 CFM or higher' applications.

³ This heater kit can only be used for '1200 CFM or higher' applications.

TROUBLESHOOTING

ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS

NOTE: Discharge body's static electricity before touching unit. An electrostatic discharge can adversely affect electrical components.

Use the following precautions during air handler installation and servicing to protect the integrated control module from damage. By putting the air handler, the control, and the person at the same electrostatic potential, these steps will help avoid exposing the integrated control module to electrostatic discharge. This procedure is applicable to both installed and uninstalled (ungrounded) blowers.

1. Disconnect all power to the blower. Do not touch the integrated control module or any wire connected to the control prior to discharging your body's electrostatic charge to ground.
2. Firmly touch a clean, unpainted, metal surface of the modular blower near the control. Any tools held in a person's hand during grounding will be discharged.
3. Service integrated control module or connecting wiring following the discharge process in step 2. Use caution not to recharge your body with static electricity; (i.e., do not move or shuffle your feet, do not touch ungrounded objects, etc.). If you come in contact with an ungrounded object, repeat step 2 before touching control or wires.
4. Discharge your body to ground before removing a new control from its container. Follow steps 1 through 3 if installing the control on a blower. Return any old or new controls to their containers before touching any ungrounded object.

DIAGNOSTIC CHART

**WARNING**

HIGH VOLTAGE!

TO AVOID PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK, DISCONNECT ELECTRICAL POWER BEFORE PERFORMING ANY SERVICE OR MAINTENANCE.



Refer to the *Troubleshooting Chart* at the end of this manual for assistance in determining the source of unit operational problems. The red diagnostic LED blinks to assist in troubleshooting the unit. The number of blinks refers to a specific fault code.

FAULT RECALL

The integrated control module is equipped with a momentary push-button switch that can be used to display the last six faults on the red diagnostic LED. The control must be in Standby Mode (no thermostat inputs) to use the feature. Depress the push-button for approximately two seconds and less than five seconds. The LED display will then display the six most recent faults beginning with the most recent fault and decrementing to the least recent fault. The faults may be cleared by depressing the button for greater than five seconds.

NOTE: Consecutively repeated faults are displayed a maximum of three times. Example: A clogged return air filter causes the air handler's motor to repeatedly enter a limiting condition. The control will only store this fault the first three *consecutive* times the fault occurs.

COMFORTNET™ SYSTEM

OVERVIEW

The ComfortNet system is a system that includes a ComfortNet compatible air handler and air conditioner or heat pump with a CTK0*AA thermostat. Any other system configurations are considered invalid ComfortNet systems and must be connected as a traditional (or non-communicating) system (see *Electrical*).

A ComfortNet heating/air conditioning system differs from a non-communicating/traditional system in the manner in which the indoor unit, outdoor unit and thermostat interact with one another. In a traditional system, the thermostat sends commands to the indoor and outdoor units via analog 24 VAC signals. It is a one-way communication path in that the indoor and outdoor units typically do not return information to the thermostat.

On the other hand, the indoor unit, outdoor unit, and thermostat comprising a ComfortNet system "communicate" digitally with one another. It is now a two-way communications path. The thermostat still sends commands to the indoor and outdoor units. However, the thermostat may also request and receive information from both the indoor and outdoor units. This information may be displayed on the ComfortNet thermostat. The indoor and outdoor units also interact with one another. The outdoor unit may send commands to or request information from the indoor unit. This two-way digital communications between the thermostat and subsystems (indoor/outdoor unit) and between subsystems is the key to unlocking the benefits and features of the ComfortNet system.

Two-way digital communications is accomplished using only two wires. The thermostat and subsystem controls are powered with 24 VAC. Thus, a maximum of 4 wires between the equipment and thermostat is all that is required to operate the system.

AIRFLOW CONSIDERATION

Airflow demands are managed differently in a fully communicating system than they are in a non-communicating wired system. The system operating mode (as determined by the thermostat) determines which unit calculates the system airflow demand. If the indoor unit is responsible for determining the airflow demand, it calculates the demand and sends it to the ECM motor. If the outdoor unit or thermostat is responsible for determining the demand, it calculates the demand and transmits the demand along with a fan request to the indoor unit. The indoor unit then sends the demand to the ECM motor. The table below lists the various ComfortNet systems, the operating mode, and airflow demand source.

System	System Operating Mode	Airflow Demand Source
Air Conditioner + Air Handler	Cooling	Air Conditioner
	Heating	Air Handler
	Continuous Fan	Thermostat
Heat Pump + Air Handler	Cooling	Heat Pump
	Heat Pump Heating Only	Heat Pump
	HP + Electric Heat Strips	> of Heat Pump or Air Handler Demand
	Electric Heat Strips Only	Air Handler
	Continuous Fan	Thermostat

For example, assume the system is a heat pump matched with an air handler. With a call for low stage cooling, the heat pump will calculate the system's low stage cooling airflow demand. The heat pump will then send a fan request along with the low stage cooling airflow demand to the air handler. Once received, the air handler will send the low stage cooling airflow demand to the ECM motor. The ECM motor then delivers the low stage cooling airflow. See the applicable ComfortNet air conditioner or heat pump installation manual for the airflow delivered during cooling or heat pump heating.

In continuous fan mode, the CTK0*AA thermostat provides the airflow demand. The thermostat may be configured for a low, medium, or high continuous fan speed. The low, medium, and high fan speeds correspond to 25%, 50% and 75%, respectively, of the air handlers' maximum airflow capability. During continuous fan operation, the thermostat sends a fan request along with the continuous fan demand to the air handler. The air handler, in turn, sends the demand to the ECM motor. The ECM motor delivers the requested continuous fan airflow.

CTK0*AA WIRING

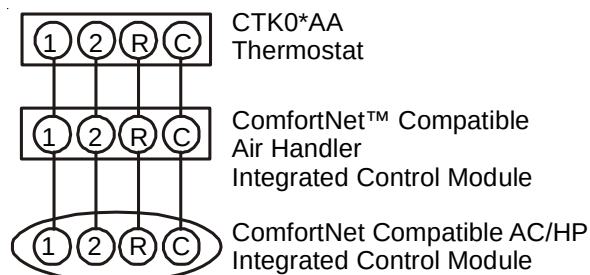
NOTE: Refer to section Electrical Connections for 208/230 volt line connections to the air handler.

NOTE: A removable plug connector is provided with the control to make thermostat wire connections. This plug may be removed, wire connections made to the plug, and replaced. It is strongly recommended that multiple wires into a single terminal be twisted together prior to inserting into the plug connector. Failure to do so may result in intermittent operation.

Typical 18 AWG thermostat wire may be used to wire the system components. One hundred (100) feet is the maximum length of wire between indoor unit and outdoor unit, or between indoor unit and thermostat.

FOUR-WIRE INDOOR AND OUTDOOR WIRING

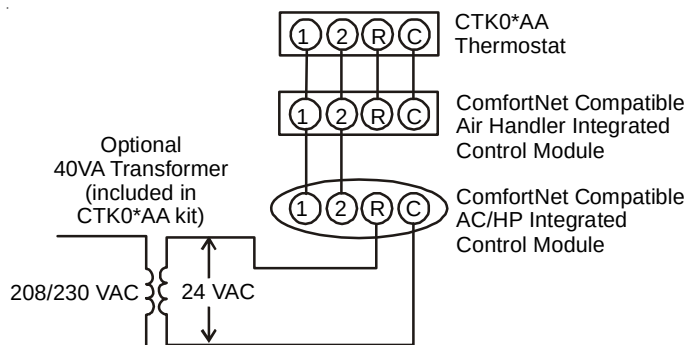
Typical wiring will consist of four wires between the indoor unit and outdoor unit and between the indoor unit and thermostat. The required wires are: (a) data lines, 1 and 2; (b) thermostat "R" (24 VAC hot) and "C" (24 VAC common).



System Wiring Using Four-Wires

TWO-WIRE OUTDOOR, FOUR-WIRE INDOOR WIRING

Two wires only may be utilized between the indoor and outdoor units. For this wiring scheme, only the data lines, 1 and 2, are required between the indoor and outdoor units. A 40VA, 208/230 VAC to 24 VAC transformer must be installed in the outdoor unit to provide 24 VAC power to the outdoor unit's electronic control. The transformer is included with the CTK0*AA kit. See kit instructions for mounting and wiring instructions. Four wires are required between the indoor unit and thermostat.



System Wiring using Two-Wires between Air Handler and AC/HP and Four-Wires between Air Handler and Thermostat

COMFORTNET™ SYSTEM ADVANCED FEATURES

Refer to the communicating thermostat installation manual for information on accessing advanced features and menus.

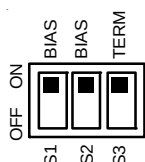
DIAGNOSTICS

Accessing the air handler's diagnostics menu provides ready access to the last six faults detected by the air handler. Faults are stored most recent to least recent. Any consecutively repeated fault is stored a maximum of three times. Example: A clogged return air filter causes the air handler's motor to repeatedly enter a limiting condition. The control will only store this fault the first three *consecutive* times the fault occurs. Navigate to the diagnostics menu as described above in *Accessing and Navigating the Advanced Features Menus*.

NOTE: It is highly recommended that the fault history be cleared when performing maintenance or servicing the air handler.

NETWORK TROUBLESHOOTING

NOTE: Indoor Unit BIAS and TERMINATION Dipswitches are factory set and should not be changed.



Dipswitches - Indoor Unit BIAS and TERMINATION

The ComfortNet system is a fully communicating system, and thus, constitutes a network. Occasionally the need to troubleshoot the network may arise. The integrated air handler control has some on-board tools that may be used to troubleshoot the network. These tools are: red communications LED, green receive (Rx) LED, and learn button. Refer to the *Communications Troubleshooting Chart* at the end of this manual for error codes, possible causes and corrective actions

- Red communications LED – Indicates the status of the network. The table below indicates the LED status and the corresponding potential problem.
- Green receive LED – Indicates network traffic. The table below indicates the LED status and the corresponding potential problem.
- Learn button – Used to reset the network. Depress the button for approximately 2 seconds to reset the network.

SYSTEM TROUBLESHOOTING

NOTE: Refer to the instructions accompanying the ComfortNet compatible outdoor AC/HP unit for troubleshooting information.

Refer to the *Troubleshooting Chart* at the end of this manual for a listing of possible air handler error codes, possible causes and corrective actions.

START-UP PROCEDURE

- Prior to start-up, ensure that all electrical connections are properly sized and tightened.
- All panels must be in place and secured. For Air Tight application, neoprene gasket must be positioned at prescribed locations to achieve 2% leakage.
- Tubing must be leak free.
- Unit should be elevated, trapped and pitched to allow for drainage.
- Low voltage wiring is connected.
- Auxiliary drain is installed when necessary and pitched to allow for drainage.
- Drain pan and drain tubing has been leak checked.
- Return and supply ducts are sealed.
- Unit is elevated when installed in a garage or where flammable vapors may be present.
- Unit is protected from vehicular or other physical damage.
- Return air is not obtained from any areas where there may be objectionable odors, flammable vapors or products of combustion such as carbon monoxide (CO), which may cause serious personal injury or death.

REGULAR MAINTENANCE



WARNING

HIGH VOLTAGE!

Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.



The only item to be maintained on a regular basis by the user is the circulating air filter(s). Filter should be cleaned or replaced regularly. A certified service technician must perform all other services.

NOTE: THESE INSTRUCTIONS ARE SPECIFICALLY FOR AVPTC MODELS. DO **NOT** USE THESE DIAGRAMS FOR ANY OTHER MODELS. SEE SEPARATE INSTALLATION AND OPERATING INSTRUCTIONS FOR ATUF, ARUF, ARPT, ADPF, AND ASPF MODELS.

NOTICE: THIS PRODUCT CONTAINS ELECTRONIC COMPONENTS WHICH REQUIRE A DEFINITE GROUND. PROVISIONS ARE MADE FOR CONNECTION OF THE GROUND. A DEDICATED GROUND FROM THE MAIN POWER SUPPLY OR AN EARTH GROUND MUST BE PROVIDED.

AIR HANDLER ADVANCED FEATURES MENUS

CONFIGURATION	
Submenu Item	Indication (for Display Only; not User Modifiable)
Electric Heat Size (HTR KW)	Displays the size in kW of the selected electric heaters.
Motor HP (1/2, 3/4, or 1 MTR HP)	Displays the air handler indoor blower motor horsepower.
Heat ON Delay (HT ON)	Displays the electric heat indoor blower ON delay.
Heat OFF Delay (HT OFF)	Displays the electric heat indoor blower OFF delay.

DIAGNOSTICS		
Submenu Item	Indication/User Modifiable Options	Comments
Fault 1 (FAULT #1)	Most recent fault	For display only
Fault 2 (FAULT #2)	Next most recent fault	For display only
Fault 3 (FAULT #3)	Next most recent fault	For display only
Fault 4 (FAULT #4)	Next most recent fault	For display only
Fault 5 (FAULT #5)	Next most recent fault	For display only
Fault 6 (FAULT #6)	Least recent fault	For display only
Clear Fault History (CLEAR)	NO or YES	Selecting "YES" clears the fault history

NOTE: Consecutively repeated faults are shown a maximum of 3 times

IDENTIFICATION	
Submenu Item	Indication (for Display Only; not User Modifiable)
Model Number (MOD NUM)	Displays the air handler model number
Serial Number (SER NUM)	Displays the air handler serial number (Optional)
Software (SOFTWARE)	Displays the application software revision

SET-UP		
Submenu Item	User Modifiable Options	Comments
Heat Airflow Trim (HT TRM)	-10% to +10% in 2% increments, default is 0%	Trims the electric heating airflow by the selected amount.

STATUS	
Submenu Item	Indication (for Display Only; not User Modifiable)
Mode (MODE)	Displays the current air handler operating mode
CFM (CFM)	Displays the airflow for the current operating mode

COMMUNICATIONS TROUBLESHOOTING CHART

LED	LED Status	Indication	Possible Causes	Corrective Action(s)	Notes & Cautions
Red Communications LED	Off	Normal condition	None	None	None
	1 Flash	Communications Failure	Communications Failure	- Depress Learn Button - Verify that bus BIAS and TERM dipswitches are in the ON position.	- Depress once quickly for a power-up reset - Depress and hold for 2 seconds for an out-of-box reset
	2 Flashes	Out-of-box reset	- Control power up - Learn button depressed	None	None
Green Receive LED	Off	- No power - Communications error	- No power to air handler - Open fuse - Communications error	- Check fuses and circuit breakers; replace/reset - Replace blown fuse - Check for shorts in low voltage wiring in air handler/system - Reset network by depressing learn button - Check data 1/ data 2 voltages	Turn power OFF prior to repair
	1 Steady Flash	No network found	- Broken/ disconnected data wire(s) - Air handler is installed as a non-communicating/ traditional system	- Check communications wiring (data 1/ data 2 wires) - Check wire connections at terminal block - Verify air handler installation type (non-communicating/ traditional or communicating) - Check data 1/ data 2 voltages	- Turn power OFF prior to repair - Verify wires at terminal blocks are securely twisted together prior to inserting into terminal block - Verify data1 and data voltages as described above
	Rapid Flashing	Normal network traffic	Control is "talking" on network as expected	None	None
	On Solid	Data 1/ Data 2 miss-wire	- Data 1 and data 2 wires reversed at air handler, thermostat, or ComfortNet™ compatible outdoor AC/HP - Short between data 1 and data 2 wires - Short between data 1 or data 2 wires and R (24VAC) or C (24VAC common)	- Check communications wiring (data 1/ data 2 wires) - Check wire connections at terminal block - Check data 1/ data 2 voltages	- Turn power OFF prior to repair - Verify wires at terminal blocks are securely twisted together prior to inserting into terminal block - Verify data1 and data voltages as described above

TROUBLESHOOTING CHART

Symptoms of Abnormal Operation (Communicating & Non-communicating Thermostat)	Diagnostic/Status LED Codes	Fault Description	ComfortNet™ Thermostat Only		Possible Causes	Corrective Actions	Notes & Cautions
			Message	Code			
- LED display is ON continuously - Electric heaters fail to energize on a call for W1 or Auxiliary/Emergency heat - Integrated control module LED display provides the indicated error code. - ComfortNet thermostat "Call for Service" icon illuminated - ComfortNet thermostat scrolls "Check Air Handler" message	ON 1 Flash	- Normal operation - Heater kit selected via dipswitches is too large for heater kits specified in shared data set	None	None	- Normal operation - Heater kit selected via dipswitches is too large for heater kits in shared data set	- None - Verify electric heat dipswitch settings - Verify the installed electric heater is valid for the air handler. Check nameplate or Specification Sheet applicable to your model* for allowable heater kit(s). - Verify shared data set is correct for the specific model. Repopulate data using correct memory card if required.	- Normal operation - Turn power OFF prior to repair. - Use memory card for the specific model. - Insert memory card BEFORE turning power ON. Memory card may be removed after data is loaded. - Turn power OFF before removing memory card. - Error code will be cleared once data is loaded.
- Electric heat airflow is higher than expected on a call for W1 or Auxiliary/Emergency heat - Integrated control module LED display provides the indicated error code.	1 Flash	Heater kit selected via dipswitches is too small for heater kits specified in shared data set	HTR TOO SMALL	Ec	Heater kit selected via dipswitches is too small for heater kits in shared data set	- Verify electric heat dipswitch settings - Verify the installed electric heater is valid for the air handler. Check nameplate or Specification Sheet applicable to your model* for allowable heater kit(s). - Verify shared data set is correct for the specific model. Repopulate data using correct memory card if required.	- Turn power OFF prior to repair. - Use memory card for the specific model. - Insert memory card BEFORE turning power ON. Memory card may be removed after data is loaded. - Turn power OFF before removing memory card. - Error code will be cleared once data is loaded.
- Electric heat airflow is higher than expected on a call for W1 or Auxiliary/Emergency heat - Integrated control module LED display provides the indicated error code.	1 Flash	Heater kit selected via dipswitches does not heater kits specified in shared data set	NO HTR MATCH	Ec	Heater kit selected via dipswitches is doesn't match heater kits in shared data set	- Verify electric heat dipswitch settings - Verify the installed electric heater is valid for the air handler. Check nameplate or Specification Sheet applicable to your model* for allowable heater kit(s). - Verify shared data set is correct for the specific model. Repopulate data using correct memory card if required.	- Turn power OFF prior to repair. - Use memory card for the specific model. - Insert memory card BEFORE turning power ON. Memory card may be removed after data is loaded. - Turn power OFF before removing memory card. - Error code will be cleared once data is loaded.
- No air handler operation. - Integrated control module LED display provides the indicated error code. - ComfortNet thermostat displays "Battery Power"	5 Flashes	Open Fuse	Not Displayed	Not Displayed	Short in low voltage wiring	Locate and correct short in low voltage wiring	- Turn power OFF prior to repair. - Replace fuse with 3-amp automotive type
- Air handler fails to operate - Integrated control module LED display provides no signal. - ComfortNet thermostat "Call for Service" icon illuminated - ComfortNet thermostat scrolls "Check Air Handler" message	None	- No 208/230 volt power to air handler or no 24 volt power to integrated control module - Blown fuse or circuit breaker - Integrated control module has an internal fault.	INTERVAL FAULT	EE	- Manual disconnect switch OFF or 24 volt wire improperly connected or loose - Blown fuse or circuit breaker - Integrated control module has an internal fault	- Assure 208/230 volt and 24 volt power to air handler and integrated control module. - Check integrated control module fuse (3A). Replace if necessary. - Check for possible shorts in 208/230 volt and 24 volt circuits. Repair as necessary. - Replace bad integrated control module.	- Turn power OFF prior to repair. - Replace integrated control module fuse with 3A automotive fuse. - Replace integrated control module with correct replacement part - Read precautions in "Electrostatic Discharge" section of manual.

TROUBLESHOOTING CHART

Symptoms of Abnormal Operation (Communicating & Non-communicating Thermostat)	Diagnostic/Status LED Codes	Fault Description	ComfortNet™ Thermostat Only		Possible Causes	Corrective Actions	Notes & Cautions
			Message	Code			
- Air handler fails to operate. - Integrated control module LED display provides indicated error code. - ComfortNet thermostat "Call for Service" icon illuminated. - ComfortNet thermostat scrolls "Check Air Handler" message.	9 Flashes	Data not yet on network.	<i>NO NET DATA</i>	<i>d0</i>	Air handler does not contain any shared data.	Populate shared data set using memory card.	- Turn power OFF prior to repair - Use memory card for the specific model. - Insert memory card - BEFORE turning power ON. Memory card may be removed after data is loaded. - Turn power OFF before removing memory card. - Error code will be cleared once data is loaded.
- Operation different than expected or no operation. - Integrated control module LED display provides indicated error code. - ComfortNet thermostat "Call for Service" icon illuminated. - ComfortNet thermostat scrolls "Check Air Handler" message.	11 Flashes	Invalid memory card data.	<i>INVALID MC DATA</i>	<i>d4</i>	Shared data set on memory card has been rejected by integrated control module	Verify shared data set is correct for the specific model. Re-populate data using correct memory card if required.	- Turn power OFF prior to repair - Use memory card for the specific model. - Insert memory card - BEFORE turning power ON. Memory card may be removed after data is loaded. - Turn power OFF before removing memory card. - Error code will be cleared once data is loaded.

TROUBLESHOOTING CHART

Symptoms of Abnormal Operation (Communicating & Non-communicating Thermostat)	Diagnostic/Status LED Codes	Fault Description	ComfortNet™ Thermostat Only Message	Code	Possible Causes	Corrective Actions	Notes & Cautions
- Air handler fails to operate. - Integrated control module LED display provides indicated error code. - ComfortNet thermostat "Call for Service" icon illuminated. - ComfortNet thermostat scrolls "Check Air Handler" message.	6 Flashes	Circulator blower motor is not running when it should be running.	<i>MOTOR NOT RUN</i>	<i>b0</i>	- Loose wiring connection at circulator motor power leads or disconnected. - Failed circulator blower motor.	- Tighten or correct wiring connection. - Check circulator blower motor. Replace if necessary.	- Turn power OFF prior to repair. - Replace circulator motor with correct replacement part.
- Air handler fails to operate. - Integrated control module LED display provides indicated error code. - ComfortNet thermostat "Call for Service" icon illuminated. - ComfortNet thermostat scrolls "Check Air Handler" message.	6 Flashes	Integrated control module has lost communications with circulator blower motor.	<i>MOTOR COMM</i>	<i>b1</i>	- Loose wiring connection at circulator motor control leads. - Failed circulator blower motor. - Failed integrated control module.	- Tighten or correct wiring connection. - Check circulator blower motor. Replace if necessary. - Check integrated control module. Replace if necessary.	- Turn power OFF prior to repair. - Replace circulator motor with correct replacement part. - Replace integrated control module with correct replacement part.
- Air handler fails to operate. - Integrated control module LED display provides indicated error code. - ComfortNet thermostat "Call for Service" icon illuminated. - ComfortNet thermostat scrolls "Check Air Handler" message.	6 Flashes	Circulator blower motor horse power in shared data set does not match circulator blower motor horse power.	<i>MOTOR MISMATCH</i>	<i>b2</i>	- Incorrect circulator blower motor in air handler. - Incorrect shared data set in integrated control module.	- Verify circulator blower motor horse power is the same specified for the specific air handler model. Replace is necessary. - Verify shared data set is correct for the specific model. Repopulate data using correct memory card if required.	- Turn power OFF prior to repair. - Replace motor with correct replacement part. - Use memory card for the specific model. - Insert memory card BEFORE turning power ON. Memory card may be removed after data is loaded. - Turn power OFF before removing memory card. - Error code will be cleared once shared data and motor horse power match.
- Air handler operates at reduced performance. - Airflow delivered is less than expected. - Integrated control module LED display provides b3 error code.	6 Flashes	Circulator blower motor is operating in a power, temperature, or speed limiting condition.	<i>MOTOR LIMITS</i>	<i>b3</i>	- Blocked filters. - Restrictive ductwork. - Undersized ductwork. - High ambient temperatures.	- Check filters for blockage. Clean filters or remove obstruction. - Check ductwork for blockage. Remove obstruction. Verify all registers are fully open. - Verify ductwork is appropriately sized for system. Resize/replace ductwork if necessary. - See "Installation Instructions" for installation requirements.	Turn power OFF prior to repair.
- Air handler fails to operate. - Integrated control module LED display provides indicated error code. - ComfortNet thermostat "Call for Service" icon illuminated. - ComfortNet thermostat scrolls "Check Air Handler" message.	6 Flashes	- Circulator blower motor senses a loss rotor control. - Circulator blower motor senses high current.	<i>MOTOR TRIPS</i>	<i>b4</i>	- Abnormal motor loading, sudden change in speed or torque, sudden blockage of air handler/coil air inlet or outlet. - High loading conditions, blocked filters, very restrictive ductwork, blockage of air handler/coil air inlet or outlet.	Check filters, filter grills/registers, duct system, and air handler/coil air inlet/outlet for blockages.	Turn power OFF prior to repair.

TROUBLESHOOTING CHART

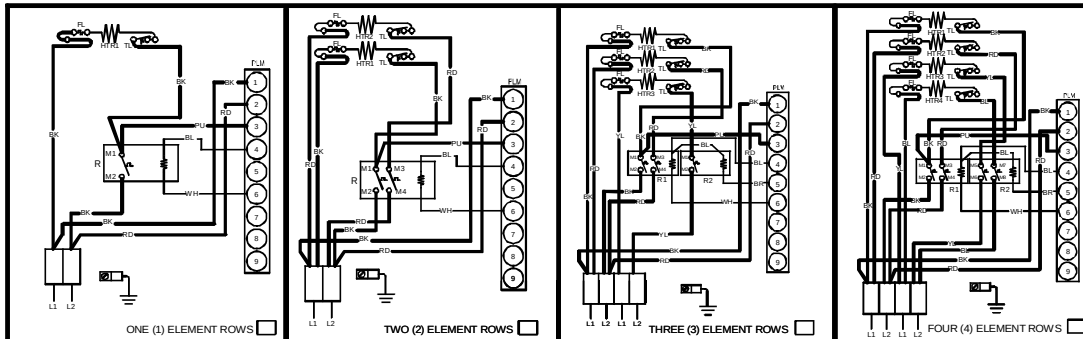
Symptoms of Abnormal Operation (Communicating & Non-communicating Thermostat)		Diagnostic/Status LED Codes	Fault Description	ComfortNet™ Thermostat Only Message Code	Possible Causes	Corrective Actions	Notes & Cautions
- Air handler fails to operate. - Integrated control module LED display provides indicated error code. - ComfortNet™ thermostat "Call for Service" icon illuminated. - ComfortNet thermostat scrolls "Check Air Handler" message.	6 Flashes	Circulator blower motor fails to start 10 consecutive times.	<i>MTR LCKD ROTOR</i>	<i>b5</i>	- Obstruction in circulator blower housing. - Seized circulator blower motor bearings. - Failed circulator blower motor.	- Check circulator blower for obstructions. Remove and repair/replace wheel/motor if necessary. - Check circulator blower motor shaft rotation and motor. Replace motor if necessary.	- Turn power OFF prior to repair. - Replace motor with correct replacement part. - Replace wheel with correct replacement part.
	6 Flashes	- Circulator blower motor shuts down for over or under voltage condition. - Circulator blower motor shuts down due to over temperature condition on power module.	<i>MOTOR VOLTS</i>	<i>b6</i>	- High AC line voltage to air handler. - Low AC line voltage to air handler. - High ambient temperatures.	- Check power to air handler. Verify line voltage to blower is within the range specified on the air handler rating plate. - See "Installation Instructions" for installation requirements.	Turn power OFF prior to repair.
	6 Flashes	- Circulator blower motor does not have enough information to operate properly. - Motor fails to start 40 consecutive times.	<i>MOTOR PARAMS</i>	<i>b7</i>	- Error with integrated control module. - Motor has a locked rotor condition.	- Check integrated control module. Verify control is populated with correct shared data set. See data errors above for details. - Check for locked rotor condition (see error code above for details).	- Turn power OFF prior to repair. - Replace with correct replacement part(s). - Use memory card for the specific model.
	6 Flashes	Airflow is lower than demanded.	<i>LOW ID AIRFLOW</i>	<i>b9</i>	- Blocked filters. - Restrictive ductwork. - Undersized ductwork.	- Check filters for blockage. Clean filters or remove obstruction. - Check ductwork for blockage. Remove obstruction. Verify all registers are fully open. - Verify ductwork is appropriately sized for system. Resize/replace ductwork if necessary.	Turn power OFF prior to repair.

WIRING DIAGRAMS



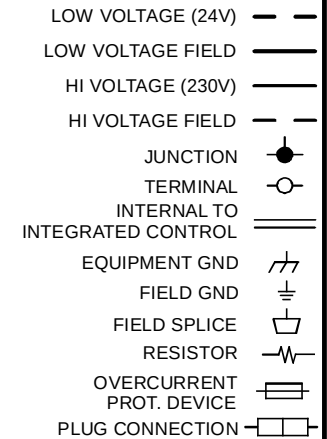
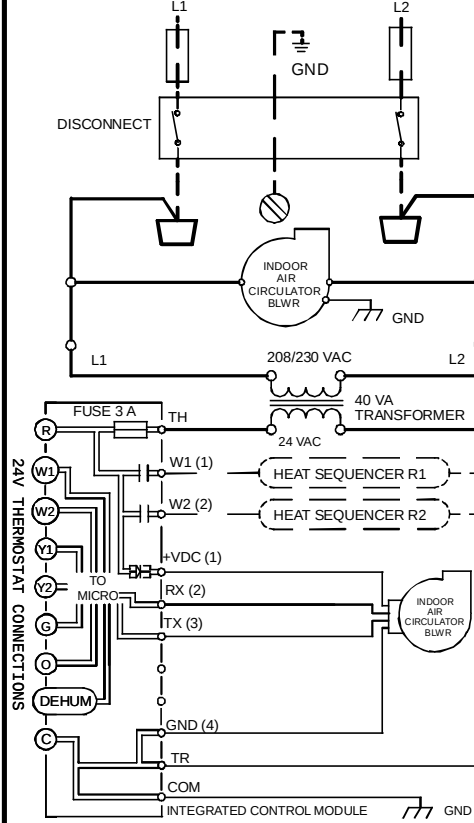
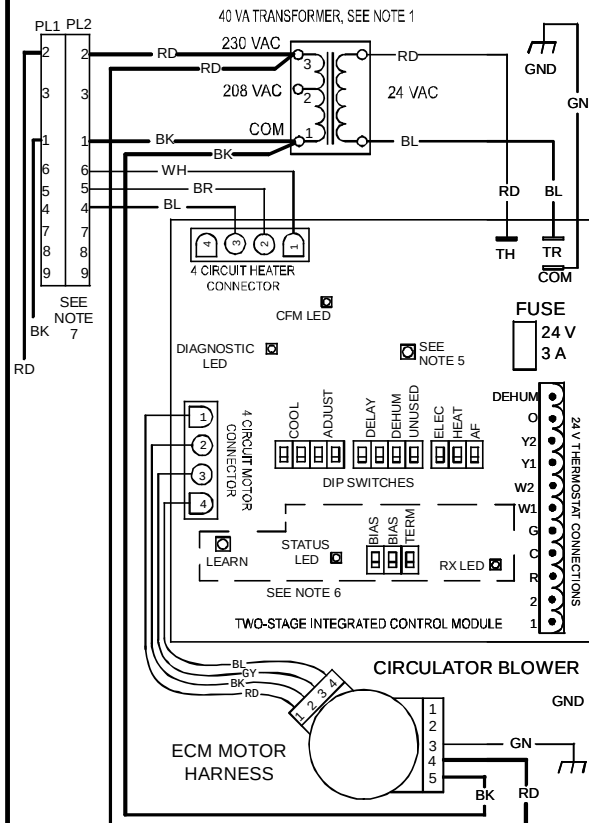
WARNING

HIGH VOLTAGE! DISCONNECT ALL POWER BEFORE SERVICING.
MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO
MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



COLOR CODES:
 PK PINK
 BR BROWN
 WH WHITE
 BL BLUE
 GY GRAY
 RD RED
 YL YELLOW
 OR ORANGE
 PU PURPLE
 GN GREEN
 BK BLACK

NOTE: WHEN INSTALLING HEATER KIT, ENSURE SPEED TAP DOES NOT EXCEED MINIMUM BLOWER SPEED (MBS) SPECIFIED FOR THE AIRHANDLER/HEATER KIT COMBINATION ON THIS UNIT'S S&R PLATE. AFTER INSTALLING OPTIONAL HEAT KIT, MARK AN "X" IN THE ☐ PROVIDED ABOVE. MARK ACCORDING TO NUMBER OF HEATER ELEMENT ROWS IN STALLED. NO MARK INDICATES NO HEAT KIT INSTALLED.



- NOTES:**
1. PLACE RED WIRES ON TRANSFORMER TERMINAL 2 FOR 208 VAC OPERATION.
 2. MANUFACTURER'S SPECIFIED REPLACEMENT PARTS MUST BE USED WHEN SERVICING.
 3. IF ANY OF THE ORIGINAL WIRES AS SUPPLIED WITH THIS UNIT MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105°C. USE COPPER CONDUCTORS ONLY.
 4. UNIT MUST BE PERMANENTLY GROUNDED AND CONFORM TO N.E.C AND LOCAL CODES.
 5. TO RECALL THE LAST 6 FAULTS, MOST RECENT TO LEAST RECENT, DEPRESS SWITCH FOR MORE THAN 2 SECONDS WHILE IN STANDBY (N THERMOSTAT INPUTS)
 6. BIAS AND TERM DIP SWITCHES MUST BE IN "ON" POSITION. RED STATUS LED PROVIDES NETWORK STATUS. GREEN RX LED INDICATES NETWORK TRAFFIC. USE LEARN BUTTON TO RESET NETWORK.
 7. DISCARD CONNECTOR PL1 WHEN INSTALLING OPTIONAL HEAT KIT.

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Wiring is subject to change, always refer to the wiring diagram on the unit for the most up-to-date wiring.