



Installation Guide

E3X-T02-U2W

24VAC Thermostat



Overview

The 24VAC Thermostat provides digital temperature control of heating and cooling—with wireless communication to multiple ILLUMRA devices. It is designed for use with most basic gas/electric furnace/air conditioning units, PTHP/PTAC Systems, 4-pipe, or 2-pipe fan coil systems. Solid-state control outputs allow switching of electronic and relay loads of 1.5 amps. This control operates from a single setpoint with automatic changeover between heating and cooling. The fan cycles on/off with calls for heating or cooling or can operate continuously in either low, medium, or high speed. The control can be placed in economy mode or off mode with 40° freeze protection. Economy mode is enabled and disabled by one or more compatible transmitters.

Compatible Devices

- Key Card Access Switch; E3T-C1AWH
- Single Rocker Self-powered Wireless Light Switches; E3T-S1Axx
- Dual Rocker Self-powered Wireless Light Switches; E3T-S2Axx
- Dual Rocker Handheld Remote; E3T-S2Hxx
- SLT Wireless Sensor; E3T-Rxx-2INBP
- Self-powered Wireless Occupancy Sensor; E3T-Mxx-SB24
- More transmitters available

Components Included

The following items are included with this product:

- A -- (1) ILLUMRA 24VAC Thermostat
- B -- (2) Mounting Screws (6/32" x 3/4")
- C -- (1) Self Tapping Screw
- D -- (1) Mounting Bracket

Optional Accessories

- A -- Horizontal Mounting Plate (not included)

Tools Needed for Installation

- Phillips Screwdriver
- Electrical Tape
- Wire Nuts

Programming the Thermostat

CAUTION: ILLUMRA Relay Receivers are to be installed and/or used in compliance with relevant electrical codes and regulations. If you are unsure about any portion of these instructions, please contact a qualified electrician. These devices are intended for indoor use, for permanently installed fixtures, and for dry locations.

Connect the thermostat to a 24VAC power source for initial setup. **DO NOT CONNECT THE OTHER WIRES UNTIL THIS STEP IS COMPLETE. PREVENT ALL OTHER WIRES FROM TOUCHING DURING THIS PROCESS TO AVOID DAMAGE TO THE THERMOSTAT. DAMAGE DUE TO INCORRECT WIRING WILL VOID WARRANTY.** The programming mode has a time limit of 10 minutes. After 10 minutes, the thermostat will resume normal operation. The default values mentioned throughout this section refer to factory programmed settings. If the thermostat has been custom programmed, the defaults may not apply.

NOTE: For programming large numbers of devices, an accessory is available to copy settings from one device to another. Contact ILLUMRA for details.

Access Code 43:

Configuration Mode

- Step 1: Place thermostat into programming mode by pressing and holding the UP and DOWN arrows while sliding the °F/°C switch to the opposite side. 00 will appear on the display. Do not use the °F/°C switch again until done programming.
- Step 2: Press either the up or down arrow button to find the access code 43 then press the fan button.
- Step 3: Press either the up or down arrow button to scroll through the menu to reach the desired parameter (see below), then press the Fan button.

Exit Menu (Ext):

Equipment Type (E9P): Type of Equipment

- tHP - Default, Trane heat pump, type O reverse valve
- tAC - Trane AC with electric heat
- FHP - Friedrich heat pump, type B reverse valve
- FAC - Friedrich AC with electric heat
- gHP - GE heat pump, type B reverse valve
- gAC - GE AC with electric heat
- AHP - Amana heat pump, type B reverse valve
- AAC - Amana AC with electric heat
- FC - fan coil

Reverse Valve Type (typ): Selects the valve type

- O type - Default, energizes in calls for cooling
- B type - energizes in calls for heating

Heat Pump or AC (Pt):

- HP - Default, 2 stage heat, single stage cool
 - Y = compressor, W = 2nd stage heat
- AC - AC and electric heat
 - Y = cool, W = heat

Fan Speed and Operation (FOp):

- 1U - single speed user selectable fan
- 1C - single speed constant fan
- 1A - single speed auto fan
- 2U - Default, two speed user selectable fan

2C - two speed constant fan

2A - two speed auto fan

Three speed fan only available for fan coil equipment

3U - three speed user selectable fan

3C - three speed constant fan

3A - three speed auto fan

Compressor Protection (FCp): Selects the compressor protection and high or low speed fan in heating

CP - Default heat pump, compressor protection and high fan is allowed in heating

NP - Default fan coil, no compressor protection and high fan is allowed in heating

CP - compressor protection and high fan is allowed in heating

nP - no compressor protection and only low fan is allowed in heating

cP - compressor protection and only low fan is allowed in heating

Continuous Fan Operation (CFL): Selects continuous fan operation

Dis - Default, normal fan operation

Ena - continuous low fan in auto or economy modes

Step 4: Press either up or down to reach desired change.

Step 5: Press fan button to return to program menu.

Step 6: Press Up or Down arrow until End / Prog appear on the display.

Step 7: Press fan button to save changes and exit the program mode. You will need to re-enter programming mode to access a different code.

Access Code 79:

Field Programming Mode

Step 1: Place thermostat into programming mode by pressing and holding the UP and DOWN arrows while sliding the °F/°C switch to the opposite side. 00 will appear on the display. Do not use the °F/°C switch again until done programming.

Step 2: Press either the up or down arrow button to find the access code 79 then press the fan button.

Step 3: Press either the up or down arrow button to scroll through the menu to reach the desired parameter (see below), then press the Fan button.

Step 4: Press either up or down to reach desired change.

Exit Menu (Ext):

Temperature Scale (Unt): Selects scale parameter that will be shown

F - Default, °F

C - °C

Display Temperature (dSP): Selects which temperature is shown on display

SP - Default, display will show setpoint only

rt - display will show room temperature unless either up or down arrow button is pressed. Then the display will show setpoint.

Srt - display will toggle between room temperature and setpoint. Display will revert to setpoint when either the up or down arrow button is pressed.

Temperature Control Mode (HAc):

USr - Default, switch selectable, heat only, auto changeover or cool only

AUt - auto mode only

CL - cool mode only

Ht - heat mode only

Off Function Enabled (OFF): Selects whether or not thermostat can be turned off by pressing the fan button

Ena – Default, enabled, press fan button until OFF appears on display
dis – disabled

Economy Function Enabled (ECo): Selects whether or not thermostat can be manually placed in economy mode by pressing the fan button

Ena – Default, enabled, press fan button until Eco and ECON appears on display
dis – disabled

Comfort Setpoint (CS): Selects setpoint default temperature when thermostat powers up or returns to comfort mode from economy mode

72.0°F (22.0°C) Default
Programmable Range: 60.0°F to 85.0°F (15.5°C to 29.5°C)

Cooling Limit (LC): Selects minimum room temperature in cooling

65.0°F (18.5°C) Default
Programmable Range: 60.0°F to 85.0°F (15.5°C to 29.5°C)

Heating Limit (LH): Selects maximum room temperature in heating

85.0°F (29.5°C) Default
Programmable Range: 60.0°F to 85.0°F (15.5°C to 29.5°C)

Freeze Protection (FP): Selects freeze protection enabled or disabled

Ena – Default, enabled at 40°F
dis – disabled

Fan Purge Timer (FPt): Selects the amount of time the fan will continue to run after a heating or cooling call.

30 seconds Default
Programmable Range: 0 (Off) to 180 seconds (3 minutes), in 10 second increment

Clear Logged Data (CLr): Selects whether or not the logged run time data will be reset to 0's

no – Default, no reset
Yes – reset

Setback Ramping (Sbr): Selects setback function to step back to economy setpoints or to go directly to economy setpoints.

dis - Default, disabled, directly to economy setpoint
Ena – enabled, ramps to economy setpoints
OFF - directly to Off mode

Ramping Setback Timer (rSt): After setback is initiated, selects the amount of time the setpoint will be stepped back by the degrees per setback
Example: if both parameters are defaulted, the thermostat will step back 1° per every 30 minutes until either the economy cooling limit (EC) or the economy heating limit (EH) is reached.

30 minutes Default
Programmable Range: 1 minute to 720 minutes (12 hours), in 15 minute increment

Degrees Per Setback (dPs): Selects the number of degrees per time period that the setpoint will be stepped back

1° Default
Programmable Range: 0°F to 3°F, in 0.5°F increments

Economy Cooling Limit (EC): When in economy or remote setback mode, selects the highest room temperature before cooling turns on. Cooling turns off when temperature falls below EC value.

85.0°F (29.5°C) Default
Programmable Range: 72.0°F to 99.0°F (22.0°C to 37.0°C), in 0.5°F increments

Economy Heating Limit (EH): When in economy or remote setback mode, selects the lowest room temperature before heating turns on. Heating turns off when temperature rises above EH value.

60.0°F (15.5°C) Default
Programmable Range: 41.0°F to 72.0°F (5.0°C to 22.0°C), in 0.5°F increments

Fan Refresh Frequency (FrF): Selects how often the low fan will operate for a fan refresh 0 hours Default, disabled

Programmable Range: 0 hours to 24 hours

Fan Refresh Duration (Frd): Selects the length of time the low fan will operate during a fan refresh

1 minute Default
Programmable Range: 1 minute to 45 minutes

Cycle Rate Timer (crt): Limits the number of heat/cool cycles per hour

6 cycles per hour Default, heat pump
8 cycles per hour Default, fan coil
Programmable Range: 0 (Off) to 12 cycles per hour, heat pump
Programmable Range: 0 (Off) to 24 cycles per hour, fan coil

Differential (Dif): Selects the minimum room temperature above or below setpoint when heating or cooling will turn on or off.

0.4°F (0.2°C) Default
Programmable Range (°F): 0.2, 0.4, 0.6, 0.8, 1.0, 1.2
Programmable Range (°C): 0.1, 0.2, 0.3, 0.4, 0.5, 0.6

Setpoint Hold Timer (SH): Selects a time limit that the occupant's setpoint will be saved, when in economy mode.

0 hours Default, disabled
Programmable Range: 0 to 24 hours

Fan Hold Timer (HFt): Selects a time limit the high and low fans will operate before automatically returning to auto mode.

0 hours Default, disabled
Programmable Range: 0 to 24 hours

Shutdown Delay (Sdd): Selects the amount of time delay between remote shutdown signal and the thermostat going into shutdown mode.

0 seconds Default, immediate
Programmable Range: 0 seconds to 200 minutes

Step 5: Press fan button to return to program menu.

Step 6: Press Up or Down arrow until End / Prog appear on the display.

Step 7: Press fan button to save changes and exit the program mode. You will need to re-enter programming mode to access a different code.

Access Code 92:

Restore Factory Presets

Step 1: Place thermostat into programming mode by pressing and holding the UP and DOWN arrows while sliding the °F/°C switch to the opposite side. 00 will appear on the display. Do not use the °F/°C switch again until done programming.

Step 2: Press either the up or down arrow button to find the access code 92 then press the fan button.

Step 3: All and Erase will appear on the display. Press the fan button again to reset to factory defaults.

Step 4: Press Up or Down arrow until End / Prog appear on the display.

Step 5: Press fan button to save changes and exit the program mode. You will need to re-enter programming mode to access a different code.

NOTE: This procedure does not affect the stored switches in memory. See the "Programming the Radio Receiver" section for methods to clear this memory.

Installation

Junction box mounting is highly recommended. For optimal radio performance do not mount or place the receivers close to the floor or inside a metal housing.

INSTALLATION OPTION A:

Heat Pump Configuration

- Step 1: Read all steps for this option before taking any action to install thermostat.
- Step 2: WARNING: To avoid risk of fire, shock, or death, TURN OFF POWER at circuit breaker or fuse and verify that it is OFF before installation begins. Make sure that it remains OFF until installation is complete.
- Step 3: If retrofitting old thermostat, remove old thermostat, carefully noting the wire connections on the old unit. Record wire color and terminal legends (Cable wire color for Control Feed, Load Feed, Common, Auxiliary Heat, Compressor, Low Fan, High Fan, and Reversing Valve). Refer to **Table A**.
- Step 4: Install mounting bracket to the junction box with provided mounting screws.
- Step 5: Wire thermostat according to function as shown in **Figure A**.
- Step 6: Push wires into junction box. Rest bottom of thermostat on mounting tabs in mounting plate. Push top of thermostat towards wall and secure into place with self-tapping screw.
- Step 7: Turn power on.

INSTALLATION OPTION B:

4-Pipe Fan Coil Configuration

- Step 1: Read all steps for this option before taking any action to install thermostat.
- Step 2: WARNING: To avoid risk of fire, shock, or death, TURN OFF POWER at circuit breaker or fuse and verify that it is OFF before installation begins. Make sure that it remains OFF until installation is complete.
- Step 3: If retrofitting old thermostat, remove old thermostat, carefully noting the wire connectinos on the old unit. Record wire color and terminal legeneds (Cable wire color for Control Feed, Load Feed, Common, Auxiliary Heat, Compressor, Low Fan, High Fan, and Reversing Valve). Refer to **Table A**.
- Step 4: Install mounting bracket to the junction box with provided mounting screws.
- Step 5: Wire thermostat according to function as shown in **Figure B**. NOTE: If the mechanical system has only two fan speeds: Green - Low Fan, Violet - High Fan, Orange - Not used.
- Step 6: Push wires into junction box. Rest bottom of thermostat on mounting tabs in mounting plate. Push top of thermostat towards wall and secure into place with self-tapping screw (included).
- Step 7: Turn power On.

INSTALLATION OPTION C:

2-Pipe Fan Coil Configuration

NOTE: Continuous fan is not available on 2-Pipe with aquastat systems. Continuous fan is available on 2-Pipe with electric heat systems.

- Step 1: Follow instructions for a 4-Pipe installation but using **Figure C** for 2-Pipe Fan Coil with Aquastat or **Figure D** for 2-Pipe Fan Coil with Electric Heat.
- Step 2: Push wires into junction box. Rest bottom of thermostat on mounting tabs in mounting plate. Push top of thermostat towards wall and secure into place with self-tapping screw (included).
- Step 3: Turn power On.

Programming the Radio Receiver

The thermostat can be configured to operate with many ILLUMRA transmitters. Depending on the transmitter type and the intended application, the thermostat will need to be programmed to operate in Rocker Mode, Momentary Mode, Toggle Mode, or Scene Mode. Multiple modes can be used with one thermostat. For transmitter installation instructions, see appropriate installation guide. Select the desired Learn Mode below to program the thermostat.

CLEAR MODE:

Clearing the Switch Memory

In order to clear the switch memory within the thermostat, use the following steps:

- Step 1: Press and hold the UP and DOWN buttons until CLR appears on the display (approximately 10 seconds). This will delete all associated transmitters from the memory.

LEARN MODE 0:

Rocker Mode - Wireless Switch Control of Thermostat

Rocker Mode is usually used with ILLUMRA Wireless Light Switches. The thermostat goes into occupied mode when the top of the rocker switch is pressed and unoccupied mode when the bottom of the rocker switch is pressed.

- Step 1: Place the thermostat into Learn Mode by pressing and holding the UP and DOWN buttons until LRN appears on the display (approx. 5 seconds). The display will alternate between LRN and 0 indicating that it is in Learn Mode 0 - Rocker Mode.
- Step 2: Press one of the rockers on the ILLUMRA Wireless Light Switch. The display on the thermostat will briefly display ADD indicating that it has added that transmitter.
- Step 3: The display will resume alternating between LRN and 0 - add more transmitters as desired for this mode (up to 30). The small digit on the display will indicate the number of receivers in memory for each mode.
- Step 4: To delete a transmitter from the thermostat, press the wireless light switch again. The display on the thermostat will briefly display DEL indicating that it has deleted that transmitter.
- Step 5: Exit Learn Mode by pressing and holding the UP and DOWN buttons until LOC appears on the display or wait 30 seconds to normal operating mode. This indicates that all learned transmitters have been locked into memory on the thermostat.

NOTE: These steps are also used for Manual On/Auto Off - when learning a wireless occupancy sensor.

LEARN MODE 1:

Momentary Mode - Keypad Switch Control of Thermostat

Momentary Mode is used with ILLUMRA Wireless Key Card Switches. The thermostat will be in occupied mode when the key card is inserted and unoccupied when the key card is removed.

- Step 1: Place the thermostat into Learn Mode by pressing and holding the UP and DOWN buttons until LRN appears on the display. The display will alternate between LRN and 0 indicating that it is in Learn Mode 0.
- Step 2: Press and release the UP button. The display will alternate between LRN and 1, indicating that it is in Learn Mode 1 - Momentary Mode.
- Step 3: Insert a key card into an ILLUMRA Key Card Access Switch. The display on the thermostat will briefly display ADD indicating that it has added that transmitter.
- Step 4: The display will resume alternating between LRN and 1 - add more transmitters as desired for this mode.
- Step 5: To delete a transmitter from the thermostat, remove the key card (if inserted) of a learned switch and insert it again. The display on the thermostat will briefly display DEL indicating that it has deleted that transmitter from memory.
- Step 6: Exit Learn Mode by pressing and holding the UP and DOWN buttons until LOC appears on the display or wait 30 seconds to normal operating mode. This indicates that all learned transmitters have been locked into memory on the thermostat.

NOTE: These steps are also used for Auto On/Auto Off - Occupancy Sensor Control.

LEARN MODE 2:

Toggle Mode

Toggle Mode is available for future product releases.

- Step 1: Place the thermostat into Learn Mode by pressing and holding the UP and DOWN buttons until LRN appears on the display. The display will alternate between LRN and 0 indicating that it is in Learn Mode 0.
- Step 2: Press and release the UP button. The display will alternate between LRN and 1, indicating that it is in Learn Mode 1 - Momentary Mode.
- Step 3: Press and release the UP button. The display will alternate between LRN and 2, indicating that it is in Learn Mode 2 - Toggle Mode.
- Step 4: Press the transmit button on the desired transmitter. The display on the thermostat will briefly display ADD indicating that it has added that transmitter.
- Step 5: The display will resume alternating between LRN and 2 - add more transmitters as desired for this mode.
- Step 6: To delete a transmitter from the thermostat, press the learned transmit button again. The display on the thermostat will briefly display DEL indicating that it has deleted that transmitter.
- Step 7: Exit Learn Mode by pressing and holding the UP and DOWN buttons until LOC appears on the display or wait 30 seconds to normal operating mode. This indicates that all learned transmitters have been locked into memory on the thermostat.

LEARN MODE 3:

Scene Mode - For Future Product Releases

Specifications

	E3X-T02-U2W
Range	50 to 150 feet (typical)
Frequency	315 MHz
Input Voltage	24 VAC
Max Loads	1.5 amp/circuit
Temperature Monitor Range	32.0°F to 99.9°F (0.0°C to 37.7°C)
Temperature Set Point Range	60°F to 85°F (15.5°C to 29.5°C)
Operating Temperature	14°F to 131°F (-10°C to 55°C)
Storage Temperature	-4°F to 131°F (-20°C to 55°C)
Sampling Rate	Every 5 seconds
Display Format	Liquid Crystal Display (LCD)
Fan Control	Selectable: Auto Cycle, Low, Medium, High, Economy, Off
Memory	Stores up to 30 switch IDs
Accuracy	+/- 1°F (0.5°C)
Heat/Cool Control	1 Heat and 1 Cool circuit, Heat pump reversing valve circuit
Dimensions	3.5 x 5.0 x 1.5 inches
Radio Certifications	FCC (U.S. SZV-TCM2XXC), IC (Canada 5713A-TCM2XXC)

Warranty

Please refer to www.ILLUMRA.com for updated warranty information

Tables / Wiring Diagrams

Table A:

NOTE: This table is provided for reference and is not intended to match every situation. Multiple installation options are available. Wiring connections should be made by a qualified HVAC Contractor. If unsure about wire colors or terminal functions, contact a qualified HVAC contractor. If connections are not made properly, damage to equipment or property could result.

Conventional HVAC Systems			
Commonly Used Wiring Terminal Designators	Possible Wire Color	Possible Signal Names/Functions	Comments
C	Black	24VAC Common	From one side of the 24VAC transformer, usually called the common side.
R or V	Red	24VAC Hot	From other side of the 24Vac transformer, usually called the hot side. The thermostat may connect this terminal with W (call for heat) or Y (call for cool), if RH and RC are not used/available. Some thermostats also use this to supply power to themselves.
RH or 4	Red	24VAC hot usually used for call for heat	Functions as the source of power for the W terminal. The thermostat usually connects this terminal with W when it calls for heat.
RC	Red	24VAC hot usually used for call for cool	Functions as the source of power for the Y terminal. The thermostat usually connects this terminal with Y when it calls for heat.
G	Green	Activate blower fan	The fan switch on the thermostat usually connects this terminal with R when it is in the ON position.
W or W1 or W2	White	Call for heat	The thermostat usually connects this terminal with R or RH when it calls for heat. The thermostat usually connects this terminal with G when the fan switch is set to AUTO. Some thermostats require a jumper from W to Y if a heat pump is used. Other thermostats might use this as second-stage heating. Sometimes W2 designates auxiliary heating in systems that use heat pumps.
Y	Yellow	Call for cool	The thermostat usually connects this terminal with R or RC when it calls for heat. The thermostat usually connects this terminal with G when the fan switch is set to AUTO. Could also be for cooling of first-stage heating on a heat pump.
S1 and S2	Varies	Outside air temperature display	Used to display the outside air temperature on some digital thermostats

Systems with heat pumps or staged heating/cooling sub-systems			
Commonly Used Wiring Terminal Designators	Possible Wire Color	Possible Signal Names/Functions	Comments
C	Black	24VAC Common	From one side of the 24Vac transformer, usually called the common side.
R	Red	24VAC Hot	From other side of the 24Vac transformer, usually called the hot side. The thermostat may connect this terminal with W (call for heat) or Y (call for cool), if RH and RC are not used/available. Some thermostats also use this to supply power to themselves.

RH	Red	24VAC hot usually used for call for heat	Functions as the source of power for the W terminal. The thermostat usually connects this terminal with W when it calls for heat.
RC	Red	24VAC hot usually used for call for cool	Functions as the source of power for the Y terminal. The thermostat usually connects this terminal with Y when it calls for heat.
Y	Yellow	Call for cool	The thermostat usually connects this terminal with R or RC when it calls for heat. The thermostat usually connects this terminal with G when the fan switch is set to AUTO. Could also be for cooling of first-stage heating on a heat pump.
Y2	Blue, Orange, Pink	Second-stage cooling	Activates the second stage cooling.
W2 or W	White	Second-stage heating	Activates first stage auxiliary heating on a heat pump.
G	Green	Activate blower fan	The fan switch on the thermostat usually connects this terminal with R when it is in the ON position.
E	Varies, blue, pink, gray, tan	Emergency heat relay on a heat pump. Active all the time when selected, usually not used.	Disables the heat pump and turns on first stage auxiliary heating.
O	Varies, Orange	Reversing valve	Energize to cool. Switches from heat to cool on heat pumps.
B	Varies, blue, black, brown, orange	For GE, York, Trane, and possibly others: 24VAC common	From one side of the 24Vac transformer, usually called the common side.
		For Rheem, Ruud and Weatherking and possibly others: Activate reversing valve	May be needed on some electronic thermostats or may be needed if you have indicator lamps.
X	Varies	24VAC common or emergency heat relay	Check with the manufacturer to be certain.
X2	Varies	Second stage heating or indicator lights on some thermostats	Might be emergency heat relay or miscellaneous contacts.
T	Varies, Tan or Gray	Outdoor anticipator reset	Used on GE/Trane/American Standard and some Carrier Products.
L	Varies	Service light	
S1 and S2	Varies	Outdoor unit shut-off	Can save energy by disabling the outdoor unit when the outdoor air temperature is such that it would cause the unit to operate inefficiently.

Figure A: Installation - Heat Pump Configuration

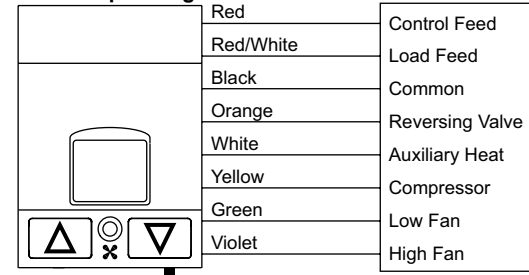


Figure B: Installation - 4-Pipe Fan Coil Configuration

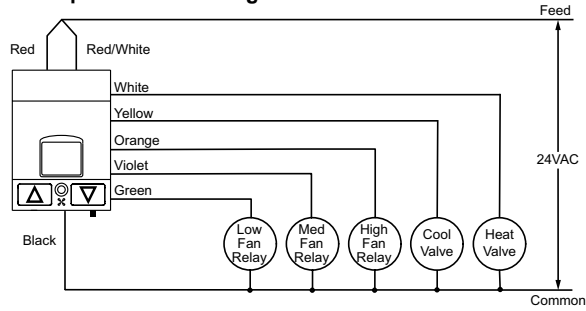


Figure C: Installation - 2-Pipe Fan Coil with Aquastat Configuration

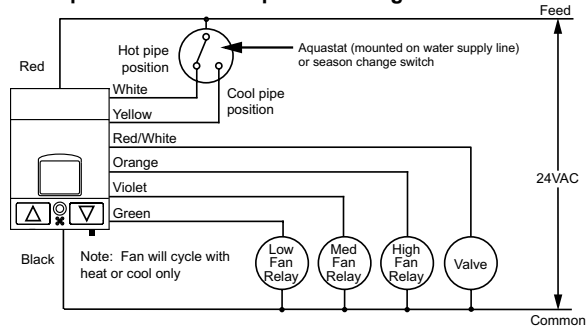


Figure D: Installation - 2-Pipe Fan Coil with Electric Heat Configuration

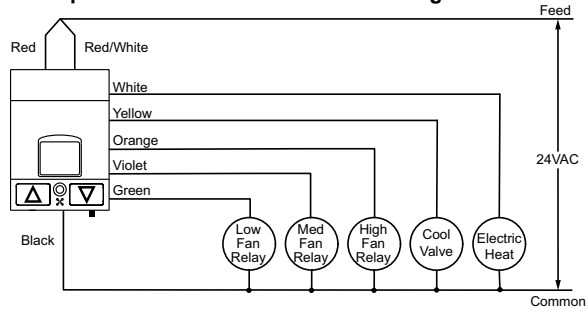


Figure E: Disable HVAC Unit When Existing Light Circuit is Turned Off

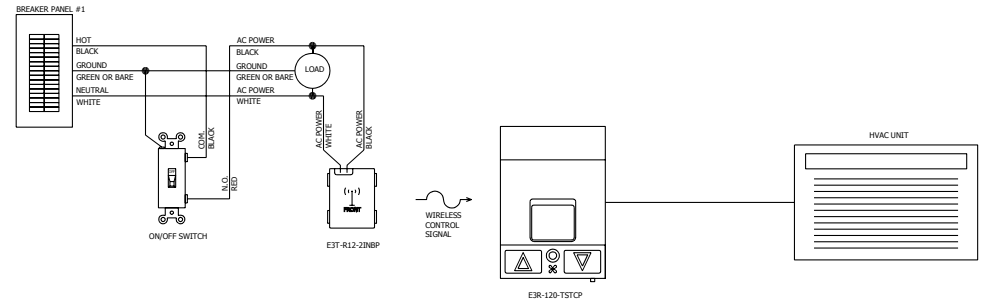
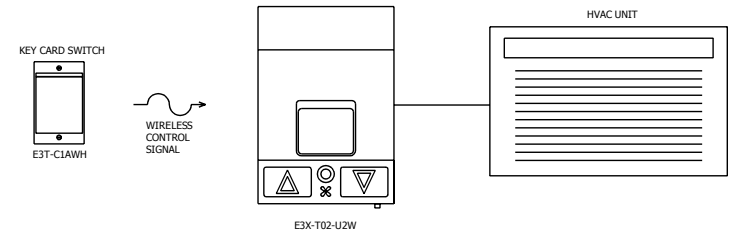


Figure F: Key Card Switch Control of Thermostat



Complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (i.) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

This device or certain aspects thereof is protected by at least one U.S. or international patent or has at least one such patent application pending.



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