Johnson Controls

model T701DFN-1

Fan Coil Thermostat

2 or 4 pipe systems

Non-Programmable Thermostat

- Remote sensor ready
- Self-prompting adjustment
- Auto 2-pipe changeover when used with accessory changeover sensor
- Dry contact equipped
- Backlit display
- One For All™ works with most all fan coil systems
- Electric heat ready
- Non-volatile memory
- Dual setpoint with adjustable deadband
- Keypad lockout
- Configurable display
- Display either F or C
- Terminals on backplate

c UL us LISTED

Owner's Manual

Table Of Contents

CAUTION

Follow Installation Instructions carefully. Disconnect Power to the Heater/Air Conditioner before removing the old thermostat and installing the new thermostat.

WARNING

P/N T701DFN-1

North American Emissions Compliance

United States

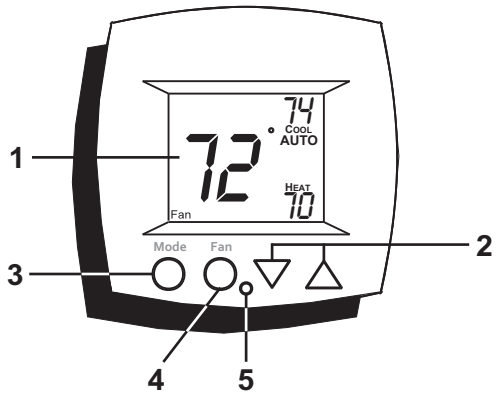
This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

Canada

This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Front Panel



1 Liquid Crystal Display
with Thermoglow

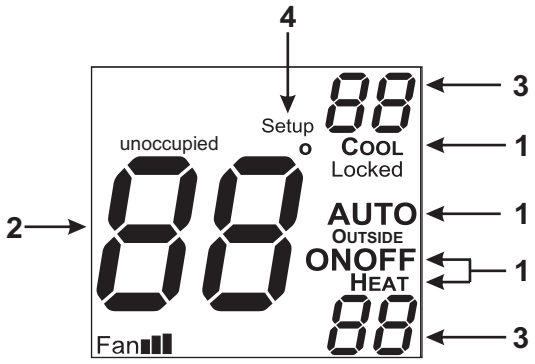
2 Up/Down Buttons

3 Mode Button

4 Fan/Override Button

5 Heat or Cool Indicator
Heat = Red, Cool = Green

Display



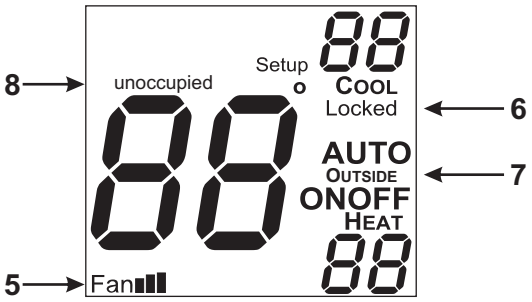
1 Mode Indicators - *Page 5-8*
Selects the operational mode of the equipment.
HEAT - Indicates the heating mode.
COOL - Indicates the cooling mode.
AUTO - Indicates the system will automatically changeover between heat and cool modes as the temperature varies.
OFF - Indicates heating and cooling are turned off.

2 Room Temperature Display
Indicates current room temperature.

3 Desired Set Temperature - *Page 9*
Indicates desired room temperature(s).

4 **Setup** icon - *Pages 10-14*
Indicates the thermostat is in the advanced setup mode.

Display



5 **Fan** icon - *Page 9*
Indicates fan operation.
Fan = low speed
Fan = medium speed
Fan = high speed
When only the **Fan** icon is displayed, the fan is in the Auto mode and will run only when necessary to heat or cool.

6 **Locked** icon - *Page 21*
Indicates keypad has been locked.

7 **Outside** icon - *Pages 13 & 22*
Indicates the temperature displayed is from the optional outside sensor.

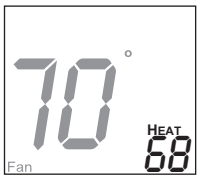
8 **Unoccupied** icons - *Pages 13-14*
Indicates a dry contact forced Unoccupied time period is in effect.

Selecting the Heat or Cool Mode 4-Pipe Operation

Select Mode by Pressing the MODE Button

Heating Only

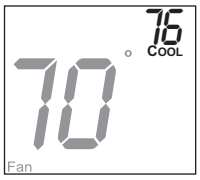
The **HEAT** setting indicates the temperature that the room has to fall to before the heating source will turn on to heat the room.



Press **MODE**

Cooling Only

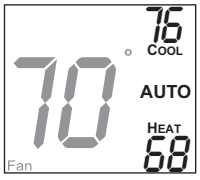
The **COOL** setting indicates the temperature that the room has to rise to before the cooling source will turn on to cool the room.



Press **MODE**

Heating or Cooling

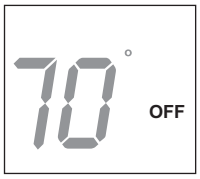
AUTO will automatically select heat or cool based on room temperature demand.



Press **MODE**

Off

OFF indicates both heating and cooling are turned off.



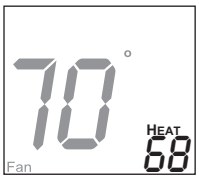
Selecting the Heat or Cool Mode 2-Pipe Operation

Heat Only

Step #4 = 1 in the Advanced Setup section, page 11.

Heating Only

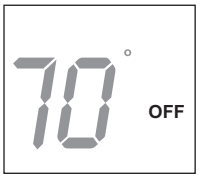
The **HEAT** setting indicates the temperature that the room has to fall to before the heating source will turn on to heat the room.



Press **MODE**

Off

OFF indicates both heating and cooling are turned off.



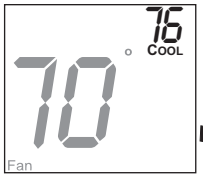
Selecting the Heat or Cool Mode 2-Pipe Operation

Cool Only

Step #4 = 2 in the Advanced Setup section, page 11.

Cooling Only

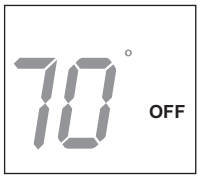
The **COOL** setting indicates the temperature that the room has to rise to before the cooling source will turn on to cool the room.



Press **MODE**

Off

OFF indicates both heating and cooling are turned off.



Selecting the Heat or Cool Mode 2-Pipe Operation

Heating and/or Cooling

Step #4 = 3 in Advanced Setup (page 11), and a changeover sensor is used.
Step #4 = 4 or 5 in Advanced Setup (page 11). Operation is the same as a 4-pipe system (page 5).

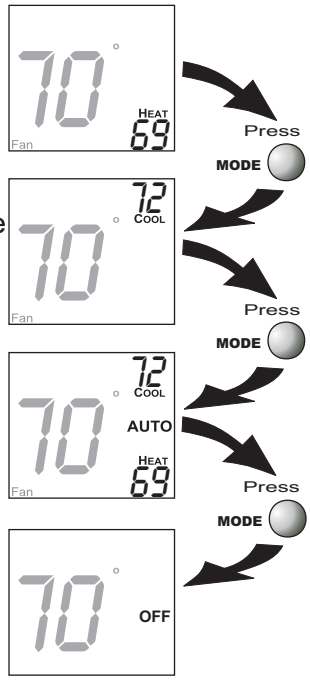
HEAT indicates the temperature that the room has to fall to before the heating source energizes. If the water supply is cold, this screen and heating would be locked out.

COOL indicates the temperature that the room has to rise to before the cooling source energizes. If the water supply is hot, this screen and cooling would be locked out.

If step #4 = 3, this screen will not appear.

AUTO will automatically select heat or cool based on the room temperature demand.

OFF indicates both heating and cooling are turned off.



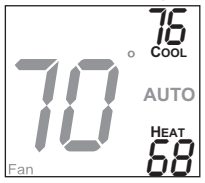
Note: *If the water temperature is changed during the year, the thermostat will then automatically lock out the incorrect mode.*

Basic Operation

Selecting Your Desired Temperature (adjusting the setpoints)

AUTO OR PROGRAM MODE

Pressing the UP or DOWN button in Auto **or** Program mode will adjust **both** the heat and cool set temperatures simultaneously.



Adjust the desired set temperature with the

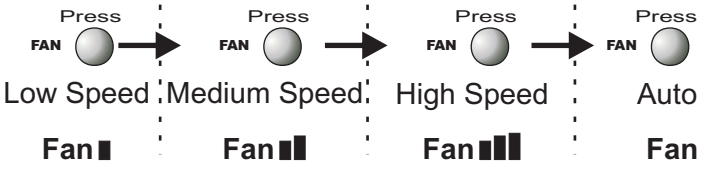
buttons.

Fan Operation

Press FAN

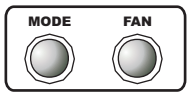
Pressing the FAN button will run the fan in low, medium, or high speed continuously *(see below and page 20)*.

When only the **Fan** icon is displayed, the fan is in the Auto mode and will run only when necessary to heat or cool *(see below and page 20)*.



Note: *If the thermostat is placed in the Off mode, the fan will de-energize (see page 5).*

Advanced Setup



Press the MODE and FAN buttons at the same time for 10 seconds to enter Advanced Setup screens.

NOTE: *Each step # is located at the top right corner of the display for easy reference.*

Display On

Select Display operation:
On = Full Display
Off = Minimal display

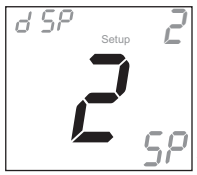
See Page 20

Display Off

Press MODE

Select Display operation:
1 = Single Setpoint
2 = Dual Setpoint

See Page 24



Note: *When Single Setpoint is selected, the heating or cooling setpoint will always be displayed. To display the room temperature, press and hold the MODE button for two seconds. The degree icon will blink when the large number is displaying room temperature and will remain solid when displaying the heating or cooling setpoint.*

Press MODE

Continued

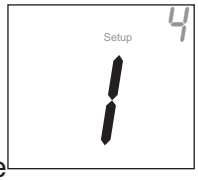
Advanced Setup

Select fan coil system type:
2 = 2-pipe fan coil
4 = 4-pipe fan coil

Press MODE

Step #4 only appears if step #3 = 2.

2-PIPE SYSTEM OPERATION



1= Heat only system
2= Cool only system
3= Heat/Cool Auto changeover
4= Heat/Cool Aux Electric heat, Lockout Electric Heat when Hot Water is available
5= Heat/Cool total electric heat, **no** Hot Water, **only** Electric Heat.

Press MODE

Note: #3 & #4 require accessory changeover sensor

On

Select operation when fan is in the Auto mode:
On = continuous low speed fan
Off = only energize during a heating or cooling cycle.

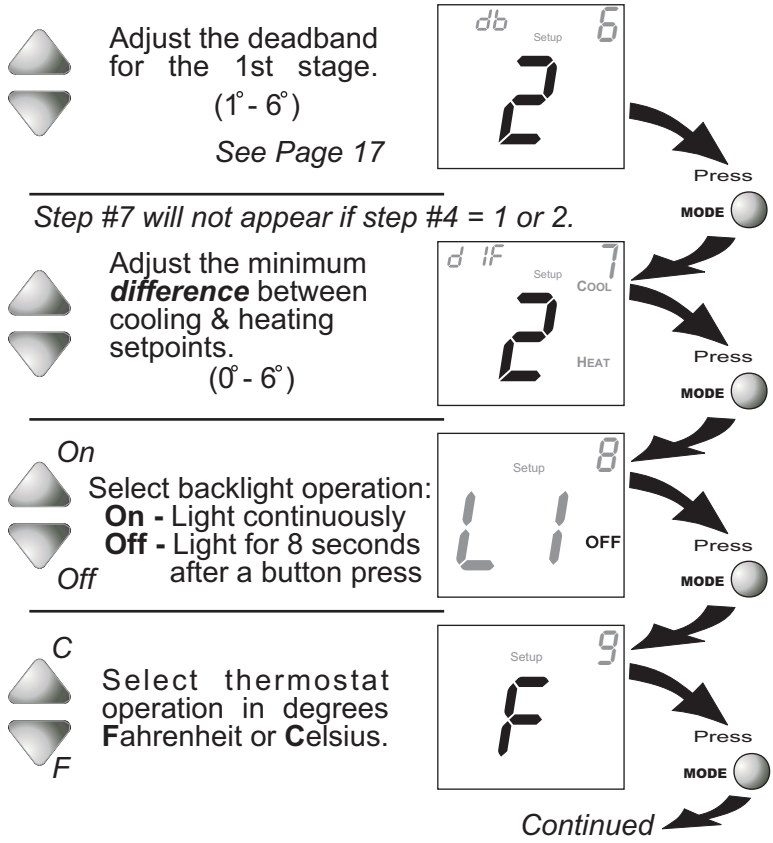
Off

Press MODE

See Page 20, Note #2

Continued

Advanced Setup



Advanced Setup

On

Off

Select sensor operation:
On = read only duct sensor
Off = control to duct sensor

NO

NC

Dry Contact
NO = Normally Open
NC = Normally Closed

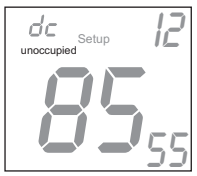
See Page 18

Press MODE

Unoccupied Setpoints

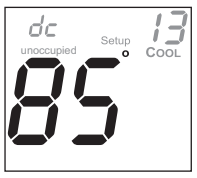
Off

Select Dry Contact Unoccupied operation:
Unoccupied = when the Dry Contact is closed, the thermostat will control to the Unoccupied setpoints.
Off = when the Dry Contact is closed, the thermostat will turn off.



Press MODE

Adjust the cooling setpoint for unoccupied periods.
(35°- 99°, OF)



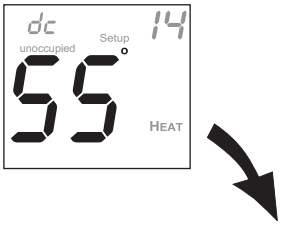
Press MODE

Continued

Advanced Setup

Adjust the heating set-point for Unoccupied periods.

(OF, 35° - 99°)



After programming is complete, press the MODE and FAN buttons at the same time for two seconds to leave the Setup screens. If no buttons are pressed, the display will leave the setup screens after 30 seconds.

Advanced Setup

Advanced Setup Table

Step #	Description	Range	Factory Default
1	Display Blanking	On / Off	On
2	Single or Dual Setpoint	1 / 2	2
3	2-or 4-Pipe System	2 / 4	4
4	2-Pipe System Operation	1 - 5	1
5	Fan Auto Operation	On / Off	Off
6	Deadband/Temp. Swing 1st Stage	1˚ - 6˚	2˚
7	Minimum Heat/Cool Differential	0˚ - 6˚	2˚
8	Thermoglow Backlight	On / Off	Off
9	Fahrenheit or Celsius	F / C	F
10	Read Only Duct Sensor?	On / Off	Off
11	Dry Contact Polarity	NO / NC	NO
12	Dry Contact Operation	Unoccupied / Off	Unoccupied
13	Unocc. Cool Setpoint	35˚ - 99˚, OF	85˚
14	Unocc. Heat Setpoint	OF, 35˚ - 99˚	55˚

About Advanced Features & Operation

- CALIBRATION - Under normal circumstances it will not be necessary to adjust the calibration of the temperature sensor. If calibration is required, please contact a trained HVAC technician to correctly perform the following procedure.

1

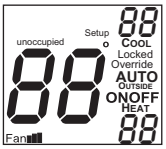
MODE

Place the thermostat in the OFF mode.

2

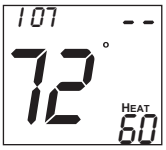
MODE

Press and hold the MODE button. While holding the MODE button, press and hold the DOWN button for 5 seconds. All icons will appear on the display.



3

Press the MODE button once. The thermostat temperature will be displayed and may be calibrated using the UP or DOWN button.



4

MODE

After calibration is complete, press the MODE button **once** to save your changes and return to normal operation.

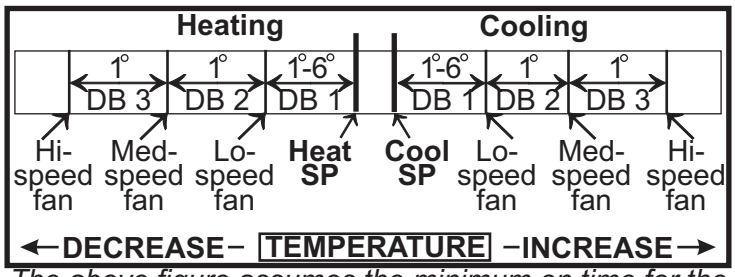
About Advanced Features & Operation

✻ DEADBAND OPERATION - Controls one Heat and one Cool stage with a three speed fan (see below).

The **low speed fan** for heat or cool is turned on when: The temperature spread from the setpoint is equal to or greater than: *the setpoint plus the 1st stage deadband (step #6, page 12).* This 1st stage deadband is adjustable from 1-6 degrees and the default is two degrees.

The **medium speed fan** for heat or cool is turned on when: The temperature spread from the setpoint is equal to or greater than: *the setpoint plus the 1st stage deadband (step #6, page 12), plus the 2nd stage deadband.* This 2nd stage deadband is fixed at one degree and is not adjustable.

The **high speed fan** for heat or cool is turned on when: The temperature spread from the setpoint is equal to or greater than: *the setpoint plus the 1st stage deadband (step #6, page 12), plus the 2nd stage deadband, plus the 3rd stage deadband.* This 3rd stage deadband is fixed at one degree and is not adjustable.



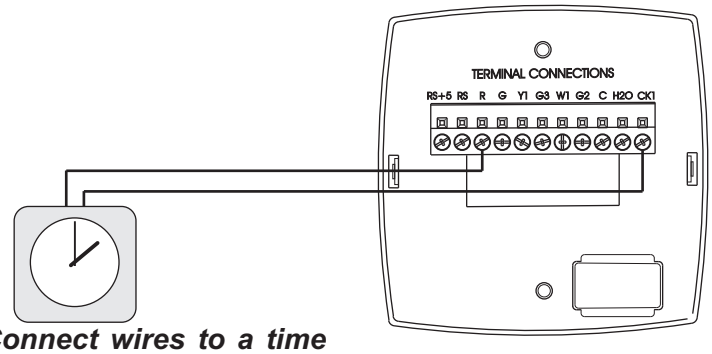
The above figure assumes the minimum on time for the prior stage has been met to allow the next stage to turn on, once the deadbands have been exceeded.

About Advanced Features & Operation

- DRY CONTACT SWITCH - This feature allows an external device such as a Central Time Clock, Occupancy Sensor, or a Telephone activated device to force one or more thermostats into an Unoccupied mode *(steps #11 and 12, page 13)*.

  When the CK1 and R terminals are shorted together, and the thermostat is programmed for Unoccupied operation *(step #12, page 13),* the thermostat will be forced into Unoccupied setpoints and the Unoccupied icon will appear on the display.

Important Note: ***For control of <u>multiple thermostats by one source,</u> refer to 'Potential Phasing Problems' on page 24.***



Connect wires to a time clock or other device to force the thermostat into Occupied 1 or Unoccupied.

About Advanced Features & Operation

- FACTORY DEFAULTS - If, for any reason, you desire to return all the stored settings back to the factory default settings, follow the instructions below.

  WARNING: This will reset all Advanced Programming to the default settings. Any information entered prior to this reset will be permanently lost.

1

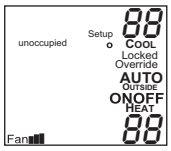
MODE

Place the thermostat in the OFF mode.

2

MODE

Press and hold the MODE button. While holding the MODE button, press and hold the DOWN button for 5 seconds. All icons will appear on the display.



3

FAN

After all of the icons appear, release the MODE and DOWN buttons. Then press and hold the FAN button for 5 seconds.

4

MODE

After the letters **Fd** appear on the display (Factory Default), release the FAN button. Press the MODE button **twice** to return to normal operation.

About Advanced Features & Operation

- FAN OPERATION - Fan operation is available in four different modes:

  Fan: When only the fan icon is displayed, this indicates that the fan is in the Auto mode, will only energize during a heating or cooling cycle, and will modulate fan speeds based on temperature demand *(see page 17)*.

  Fan▮, **Fan**▮▮, or **Fan**▮▮▮ : Pressing the FAN button will cause the low, medium, or high speed fan icon to appear *(see page 9)*, indicating that the fan will run continuously. The fan will de-energize if the thermostat is placed in the Off mode or a dry contact forced unoccupied time period *(see page 18)*.

  Notes:
  1) If a Duct sensor is connected to this thermostat, then the fan should be programmed for continuous operation (step #5, page 11). This will provide airflow over the Duct sensor and provide more accurate temperature readings.

  2) If the fan is programmed for continuous operation (step #5, page 11), the low speed fan will run continuously when the fan is in the Auto mode, but will de-energize if the thermostat is placed in the Off mode.

- MINIMAL DISPLAY - When the thermostat is programmed for a minimal display *(step #1, page 10)*, a blank screen will appear. When a button is pressed the full, normal display will appear for 10 seconds.

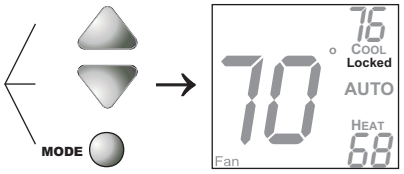
About Advanced Features & Operation

- HEAT/COOL DIFFERENTIAL - The Heat and Cool setpoints will not be allowed to come any closer to each other than the value set in Advanced Setup *step #7, on page 12*. This minimum difference is enforced during Auto-changeover operation.

  Note: *To increase the spread between the heating and cooling setpoints in the Auto-changeover mode press the MODE button until only the heat setpoint is displayed; adjust to the desired setpoint. Press the MODE button until only the cool setpoint is displayed; adjust to the desired setpoint. Press the MODE button again to enter the Auto-changeover mode where both the heat and cool setpoints are displayed.*

- KEYPAD LOCKOUT - To prevent unauthorized use of the thermostat, the front panel buttons may be disabled. To disable, or 'lock' the keypad, press and hold the MODE button. While holding the MODE button, press the UP and DOWN buttons together. The LOCKED icon will appear on the display, then release the buttons.

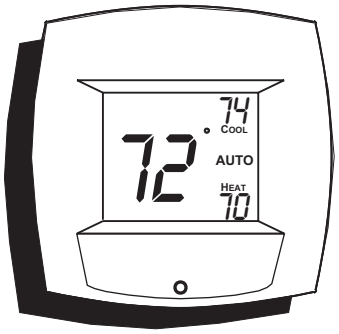
Press all three buttons in the order outlined above for keypad lockout



To ***unlock*** the keypad, press and hold the MODE button. While holding the MODE button, press the UP and DOWN buttons together. The LOCKED icon will disappear from the display, then release the buttons.

About Advanced Features & Operation

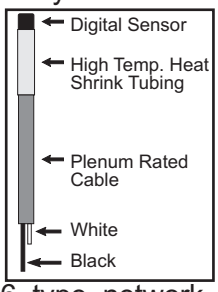
- LOCKING COVER w/Tamper Proof Screws



- OUTSIDE SENSOR - To view an Outside Sensor *(step #10, page 13)*, press and hold the FAN button for two seconds until the Outside icon appears. If an optional outside sensor is connected, the outside temperature will appear on the display. To exit the outside temperature display, press any button.

About Advanced Features & Operation

- DUCT SENSOR **(P/N SEN-700-1)** - The thermostat is programmed from the factory to automatically recognize when a Duct Sensor is connected (*step #10, page 13).*



The Duct Sensor measures indoor air temperature and sends this information to the thermostat; it measures temperature with a range of 32° to 99° F.

The Duct Sensor should be connected to the thermostat using solid conductor CAT 5, CAT 5e, or CAT 6 type network communication cable. This is an unshielded cable with four twisted pairs of 24 gauge solid wire; *DO NOT use stranded cable*. The cable length should not exceed 250 feet. If less than 75 feet of cable is required to connect the thermostat to the Duct Sensor, a two conductor thermostat cable (16-24 gauge) may be used; this cable is NOT suitable for any length greater than 75 feet.

IMPORTANT: Do no use shielded wire. Do not run sensor wiring in the same conduit as the 24VAC thermostat wiring. Electrical interference may cause the sensor to give incorrect temperature readings.

See the Duct Sensor instructions for further details.

***Note:** If a Duct sensor is connected to this thermostat, then the fan should be programmed for continuous operation (step #5, page 11). This will provide airflow over the Duct sensor and provide more accurate temperature readings.*

About Advanced Features & Operation

- SINGLE SETPOINT BEHAVIOR - When configured for *Single Setpoint* operation *(step #2, page 10)*, the degree icon will blink when the large number is displaying room temperature and will remain solid when displaying the heating or cooling setpoint. In the Auto mode the deadband is enforced both above and below the setpoint. To avoid short cycling, a deadband of at least two degrees is recommended *(step #6, page 12)*. To display the room temperature press and hold the MODE button for two seconds. Release the MODE button to return to the normal display.

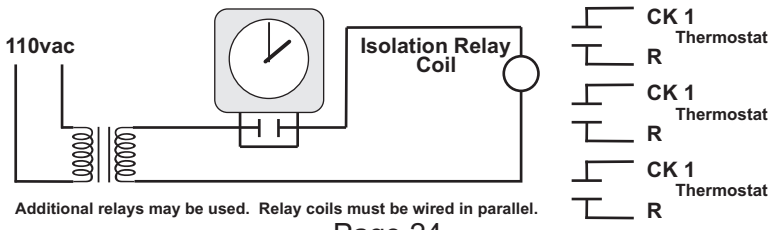
Auxiliary Input Control and Multiple HVAC Control Potential Phasing Problems

CAUTION WARNING

When using the auxiliary input (CK1 & R) or controlling multiple HVAC units with a single thermostat, it is possible to encounter transformer phasing problems that will interfere with thermostat operation. Connecting transformers that are not phased correctly may result in a direct short, which could damage transformers and/or the thermostat. Phasing problems are likely if the units share a common ground with secondary grounded transformers.

SOLUTION: If possible, phase all HVAC units together. If phasing is impractical, isolation relays may be used to isolate the transformers. To isolate the auxiliary input, use a separate transformer for the auxiliary control device, usually a time clock. Connect the device to an isolation relay coil. Connect one set of isolated contacts to each thermostat at **CK1** and **R**. See diagram A.

Diagram A- Auxiliary Control



Additional relays may be used. Relay coils must be wired in parallel.

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