



UNISTAT

ELECTRONIC THERMOSTAT: T921

- One analog output
- One contact output



DESCRIPTION

The T921 series thermostats are microcomputer-based, proportional and integral (PI) devices with one analog 0 to 10 Vdc output & one contact output. They can be used with most controlled devices in the HVAC industry that are compatible with those signals. A typical application would be to control an analog actuator on a VAV box with an electric duct heater reheat stage. The thermostats also contain four dip switch to adjust the following parameters :

- Cooling or heating applications
- VAV or valve application
- Dead band value
- Direct or reverse acting mode of contact output

The thermostat also has three internally mounted potentiometers:

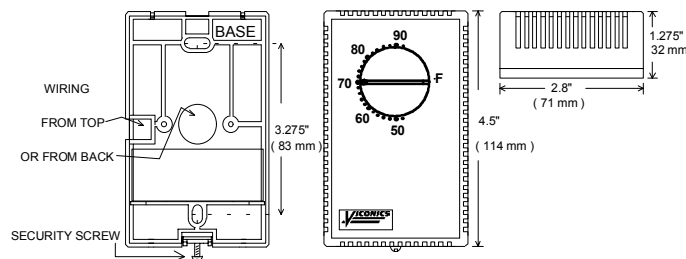
- Minimum voltage (Vmin)
- Maximum voltage (Vmax)
- Heat flow maximum voltage (Vheat) **For VAV applications only.** Re-opens the damper to maximize hot air flow on a call for reheat with cold primary air.

DAY-NIGHT MODE (T921N ONLY)

The T921N has a day / night input and an override button and night mode led mounted on the thermostat cover. The night mode, initiated by a remote timer or computer contact, provides energy savings during unoccupied periods of up to 10 %, without sacrificing comfort in occupied rooms. A flashing LED indicates that the thermostat is in Night mode. The occupant may override this condition locally for 2.5 hours by pressing the button on the thermostat cover.

When output is in	NSB input activates
Cooling mode	5°C (9°F) night setup
Heating mode	5°C (9°F) night setback

DIMENSIONS



SPECIFICATIONS

Operating Conditions: 0 °C to 50 °C (32 °F to 122 °F)
0% to 95% R.H. non-condensing

Sensor: Local 47 K NTC thermistor
Resolution: $\pm 0.1^{\circ}\text{C}$ ($\pm 0.2^{\circ}\text{F}$)
Control accuracy: $\pm 0.2^{\circ}\text{C}$ ($\pm 0.4^{\circ}\text{F}$) (calibrated)

Ranges: 10 °C to 32 °C (50 °F to 90 °F)

Night setup for cooling mode (T921N only): 5°C (9°F) night setup
Night setback for heating mode (T921N only): 5°C (9°F) night setback

Proportional band for room temperature control: Both outputs: 1.8°C (3.2°F)

Analog output: 0 to 10 Vdc into 2K Ω resistance min.

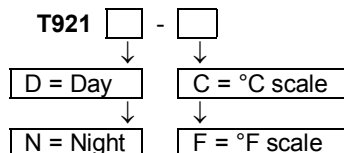
Contact output: Isolated triac: 30 Vac, 1/2 A max.

Power: 24 Vac -15%, +10% 50/60 Hz; 2 VA

Type of output	In cooling	In heating
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Modulating analog 0 to 10 Vdc	Modulating devices Analog damper actuator Analog valve actuator	Modulating devices Analog damper actuator Analog valve actuator SCR's power controls
On/off 24 Vac N.C. devices	DX cooling relay On/off N.C. valve	Duct heater relay Baseboard relay On/off N.C. valve
On/off 24 Vac N.O. devices	On/off N.O. valve	On/off N.O. valve

HOW TO ORDER



Notes: Order changeover sensors such as S60, S70, S80 and S90 separately.
Vertical covers are standard.

Example:

T921D-C Thermostat without night mode
Lexan cover with: °C

ANALOG 0 TO 10 VDC OUTPUT

This output is designed to give true PI modulation out of analog 0 to 10 Vdc actuator for VAV dampers and valves.

The analog 0 to 10 Vdc output feature internal potentiometers for minimum, maximum voltage adjustment: (Vmin. & Vmax).

Heat flow maximum voltage (Vheat) **For VAV applications only.** Re-opens the damper to maximize hot air flow on a call for reheat with cold primary air. See control sequence section.

The output is normally cooling but can be reversed to heating mode with 3 different methods:

- **An internal dip switch reverses the output to a fixed heating mode**
- **Auto changeover to heating mode with a supply sensor.**
A remote sensor can be used for each thermostat.(S60 or S70 or S90)
Supply temperature > 78°F (26°C) = heating mode
Supply temperature < 75°F (24°C) = cooling mode
Hysteresis is 3°F (2°C)
- **Auto changeover to heating mode with a dry contact.**
A closed contact on the changeover input will change operation of the 0 to 10 Vdc output to heating mode.
Open contact = cooling mode
Closed contact = heating mode

Characteristics of changeover sensor 47 KΩ
(S60, S70 or S90).

Temperature °F	Temperature °C	Sensor resistance
150.0 °F	65.6 °C	9.610 Kohm
140.0 °F	60.0 °C	11.700 Kohm
130.0 °F	54.4 °C	14.342 Kohm
120.0 °F	48.9 °C	17.682 Kohm
110.0 °F	43.3 °C	21.940 Kohm
100.0 °F	37.8 °C	27.412 Kohm
90.0 °F	32.2 °C	34.483 Kohm
80.0 °F	26.7 °C	43.704 Kohm
70.0 °F	21.1 °C	55.834 Kohm
60.0 °F	15.6 °C	71.866 Kohm
50.0 °F	10.0 °C	93.340 Kohm
40.0 °F	4.4 °C	122.298 Kohm

24 VAC CONTACT OUTPUT

This output is designed to give true PI time proportioning modulation out of 2 position 24 Vac on/off relays or valves.

This time proportioning modulation gives a much more precise temperature control than conventional mechanical on / off thermostats with anticipator. When stabilized, the thermostats will cycle the end device (relay or valve) 4 times per hour with a duty cycle that varies with demand.

The output can be used for heating or cooling applications with N.O or N.C. devices depending on dip switch setting.

THERMOSTAT INSTALLATION

Important.

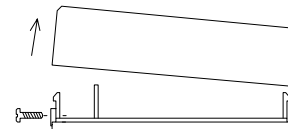
Electronic controllers require special care for wiring and startup. To avoid problems, carefully follow the procedures below.

Be sure to have all the literature on hand for all components installed: controller, actuators, relay, etc...

Look at the wiring diagrams, and study them carefully. Be sure that you understand how the system is supposed to work.

Make the wiring according to the wiring diagrams. Respect polarity for power terminals # 3 & # 4 between multiple controllers if the same transformer is used.

- Remove security screw on left side of thermostat cover.
- Open up by pulling on the bottom side of thermostat.



A) Location:

- 1- Shouldn't be installed on outside wall.
- 2- Must be installed away from any heat source.
- 3- Shouldn't be affected by direct sun radiation.
- 4- Nothing must restrain vertical air circulation to the thermostat.

B) Installation:

- 1- Pull out cables 6" out of the wall.
- 2- Wall surface must be flat and clean.
- 3- Separate the thermostat and the base by pulling the cover by the bottom (same as the security screw.)
- 4- Insert cable in the central hole of the base.
- 5- Align the base and mark the location of the two mounting holes on the wall. Install proper side of base up.
- 6- Install shields in the wall.
- 7- Insert screws in mounting holes on each side of the base. **DO NOT OVERTIGHTEN!**
- 8- Strip each wire 1/4 inch.
- 9- Insert each wire according to wiring diagram.
- 10- Reinstall the cover (top side first) and gently push back extra wire length in the hole in the wall.
- 11- Install security screw.

DIP SWITCH ADJUSTMENTS PER APPLICATIONS

S1	APPLICATION SWITCH CONTACT OUTPUT HEAT / COOL ACTION <u>S2 SWITCH IS NOT USED ON THIS MODEL</u>
0	Generally for VAV room control applications Contact output operates in heating mode
1	Generally for valve room control applications Contact output operates in cooling mode

S4	DEAD BAND
0	2 °F (1.2 °C)
1	4 °F (2.2 °C)

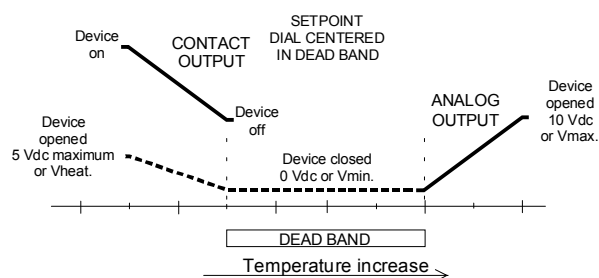
S3	CHANGEOVER OF ANALOG OUTPUT
0	Analog output is cooling (DA) <ul style="list-style-type: none"> Auto changeover of output to heating mode (RA) with a supply sensor or, Auto changeover to heating mode (RA) with a dry contact
1	Reverses the analog output to a fixed heating mode (RA)

S5	APPLICATION SWITCH FOR THE CONTACT OUPUT
0	For 2 position N.C. valve For 2 position electromechanical relay
1	For 2 position N.O. valve

CONTROL CURVES AND SEQUENCE

Application switch S1 = 0

Analog output in cooling mode, changeover not activated
Contact output in heating mode



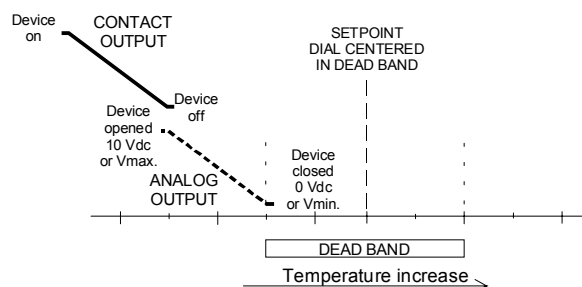
Heat flow maximum voltage (Vheat)

For VAV applications only in this mode only

Re-opens the damper to Vheat position to maximize hot air flow when contact output is energized with cold primary air

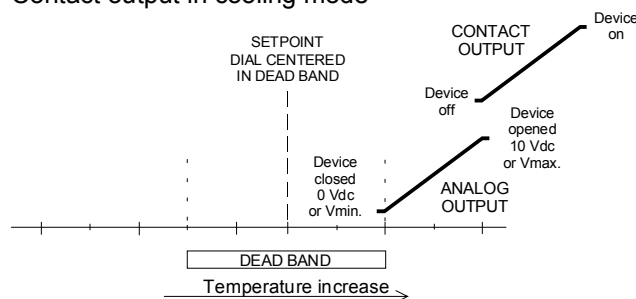
Application switch S1 = 0

Analog output in heating mode, changeover activated
Contact output in heating mode



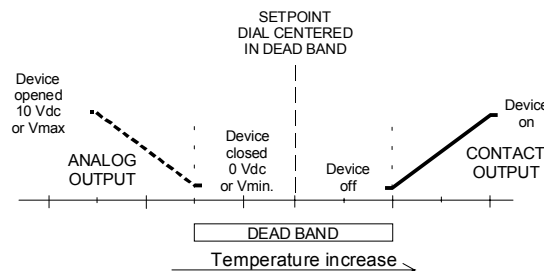
Application switch S1 = 1

Analog output in cooling mode, changeover not activated
Contact output in cooling mode



Application switch S1 = 1

Analog output in heating mode, changeover activated
Contact output in cooling mode

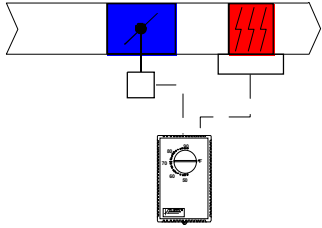


TYPICAL APPLICATIONS

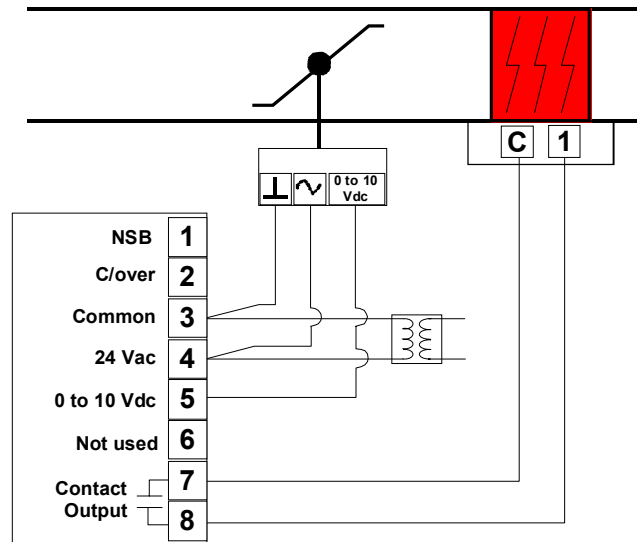
Pressure Dependent VAV With: On/Off Electric Reheat

Dip switch position	S1	S2	S3	S4	S5
VAV is cooling only (2°F deadband)	0	0	0	0	0

Analog VAV Actuator
& On/Off Duct Heater



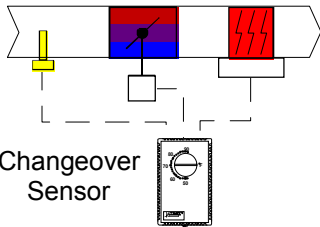
Room Temperature Control
Thermostat With Internal
Minimum & Maximum
Position Adjustments



Pressure Dependent VAV With: Cool / Heat Auto Changeover Input & On/Off Electric Reheat

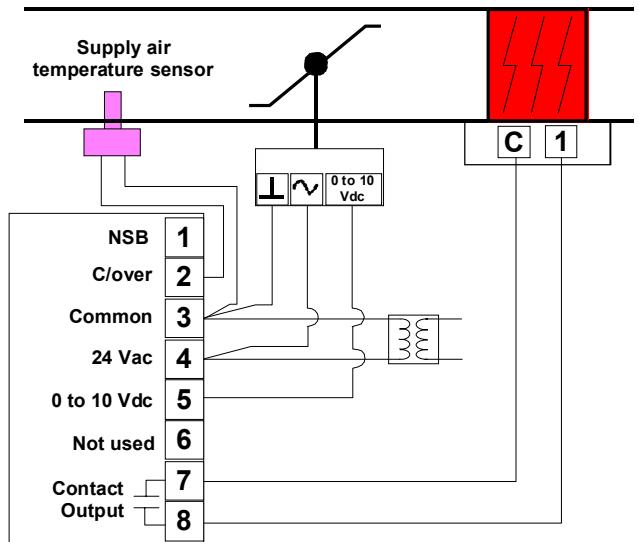
Dip switch position	S1	S2	S3	S4	S5
Cool/heat auto changeover input (2°F deadband)	0	0	0	0	0

Analog VAV Actuator
Heating and/or Cooling
& On/Off Duct Heater



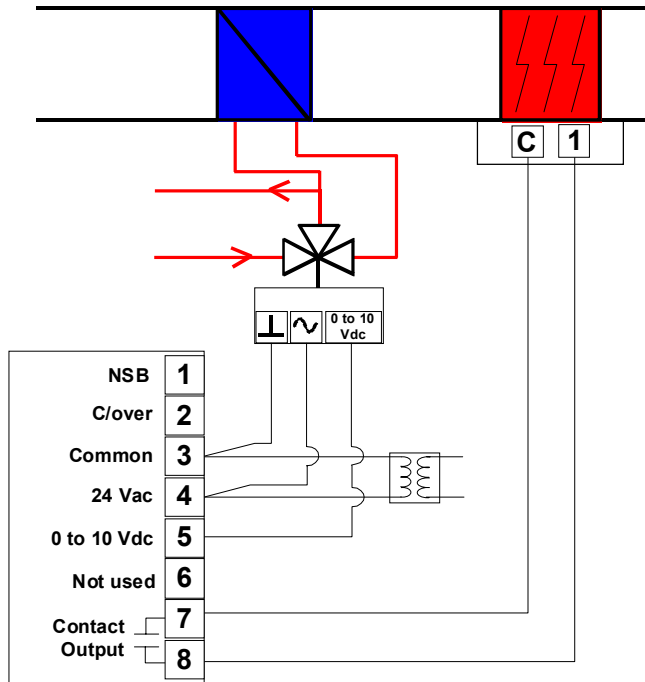
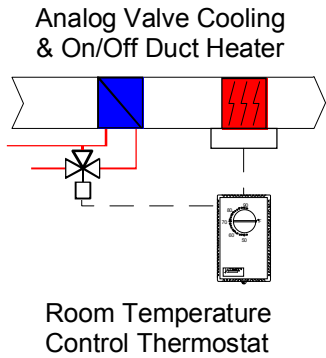
Changeover
Sensor

Room Temperature Control
Thermostat With Internal
Minimum & Maximum
Position Adjustments



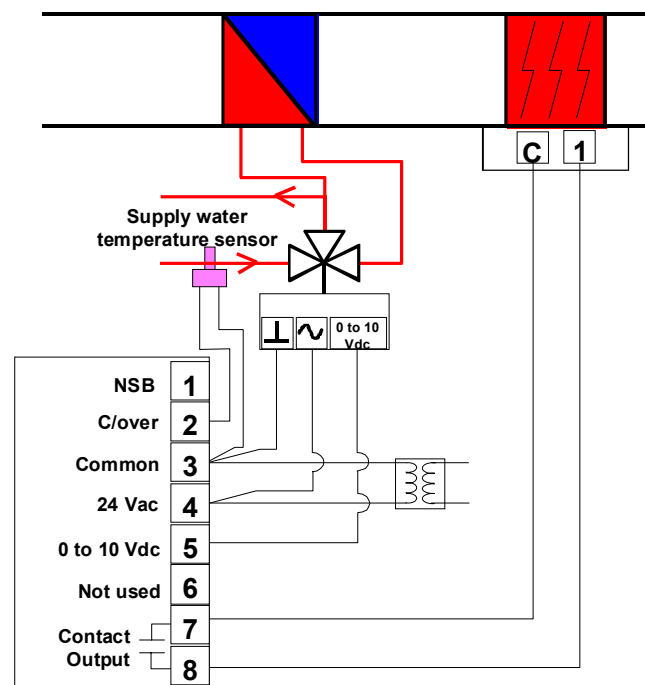
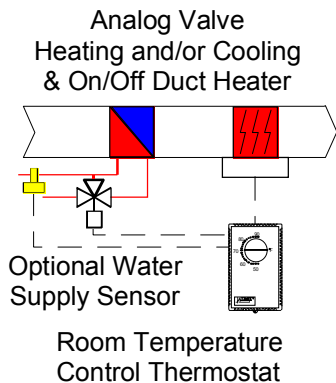
Valve Control Room Thermostat With: On/Off Electric Reheat

Dip switch position	S1	S2	S3	S4	S5
Valve is cooling only (2°F deadband)	0	0	0	0	0



Valve Control Room Thermostat VAV With: Cool / Heat Auto Changeover Input & On/Off Electric Reheat

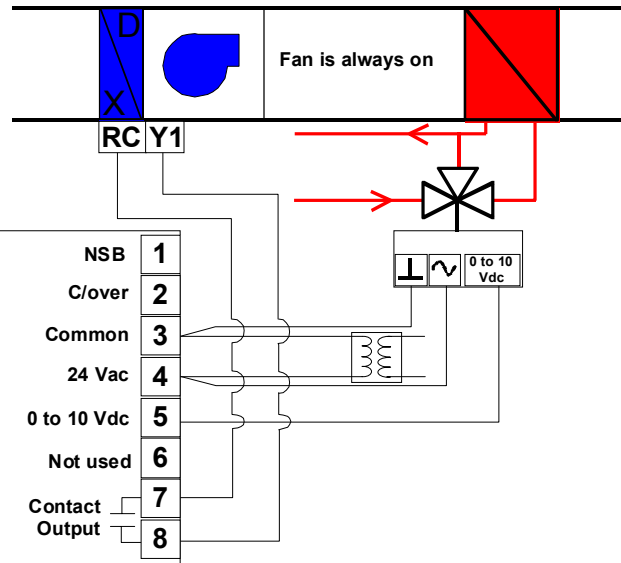
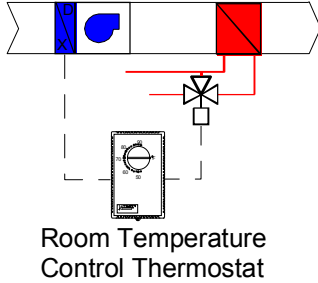
Dip switch position	S1	S2	S3	S4	S5
Cool/heat auto changeover input (2°F deadband)	0	0	0	0	0



Valve Control Heating Only With: 1 Stage On/Off DX Cooling

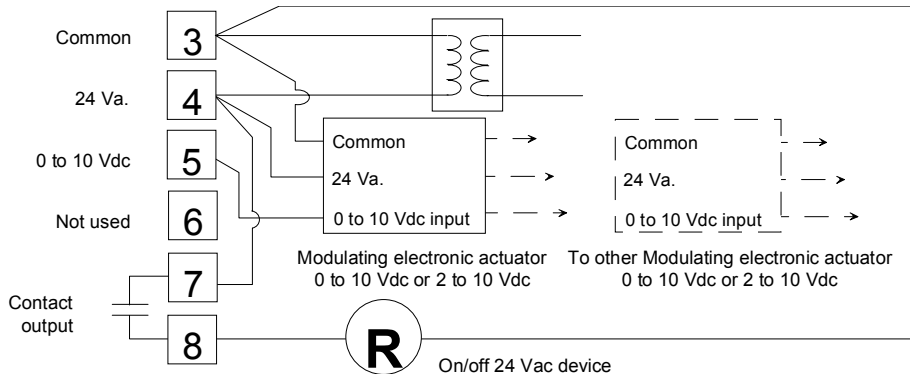
Dip switch position	S1	S2	S3	S4	S5
DX Cooling (2°F deadband)	1	0	1	0	0

Analog Valve Heating
& On/Off DX Cooling

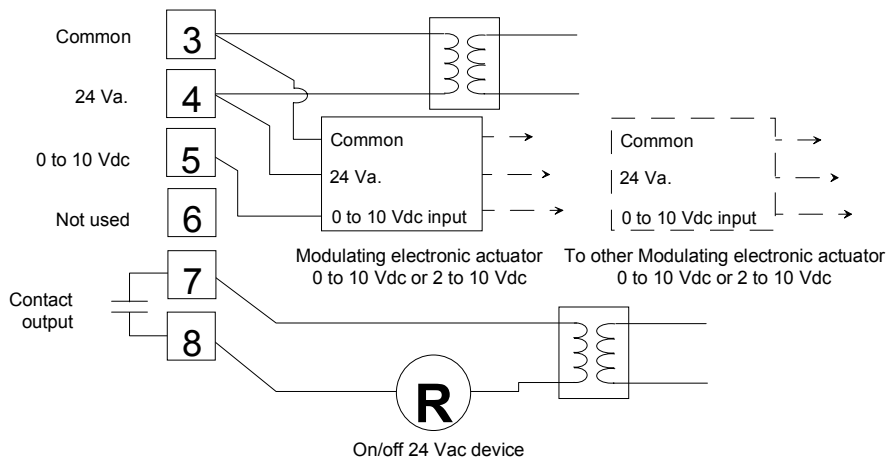


24 VAC POWER, CONTACT OUTPUT AND ANALOG ACTUATOR TYPICAL WIRING

SAME TRANSFORMER TO POWER THE END DEVICE CONNECTED TO THE CONTACT OUTPUT



SEPARATE TRANSFORMER TO POWER THE END DEVICE CONNECTED TO THE CONTACT OUTPUT

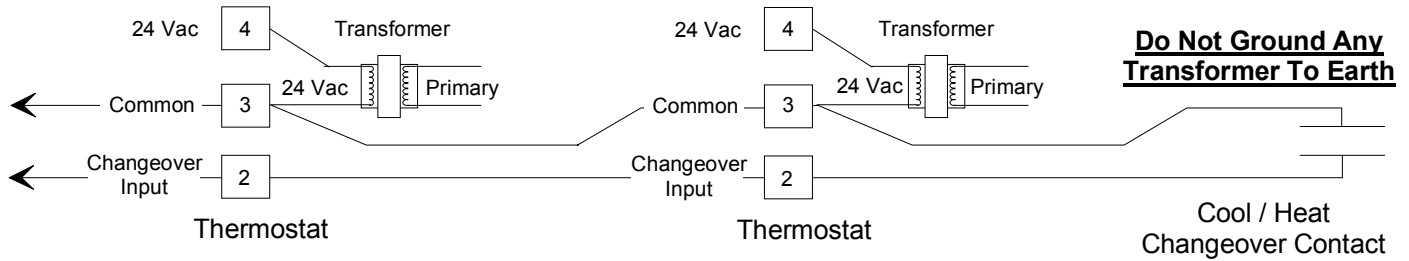


- Power Supply 24 Vac -15% +10% 50/60 HZ 2 VA
- Note: terminals 1, 2, and 3 can be wired together between each thermostat if polarity is respected
- Important: if using a common transformer, respect polarity (Common and 24 Vac between thermostats and actuator)

CHANGEOVER INPUT TYPICAL WIRING

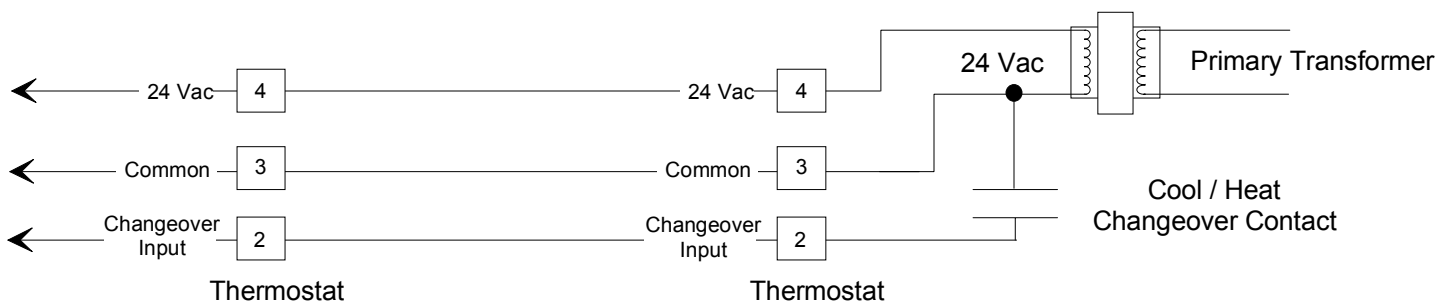
MULTIPLE TRANSFORMERS (1 DRY CONTACT FOR ALL THERMOSTATS)

Open contact = Cooling mode. Closed contact = Heating mode



SINGLE TRANSFORMER (1 DRY CONTACT FOR ALL THERMOSTATS)

Open contact = Cooling mode. Closed contact = Heating mode



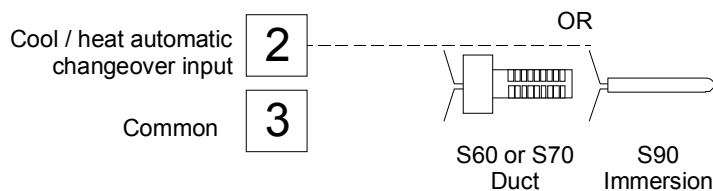
1 SUPPLY CHANGEOVER SENSOR PER THERMOSTAT (1 SUPPLY SENSOR PER THERMOSTAT)

Auto changeover input using an S60, S70 duct supply sensor or S90 immersion supply sensor

Supply temperature > 78°F (26°C) = Heating mode

Supply temperature < 75°F (24°C) = Cooling mode

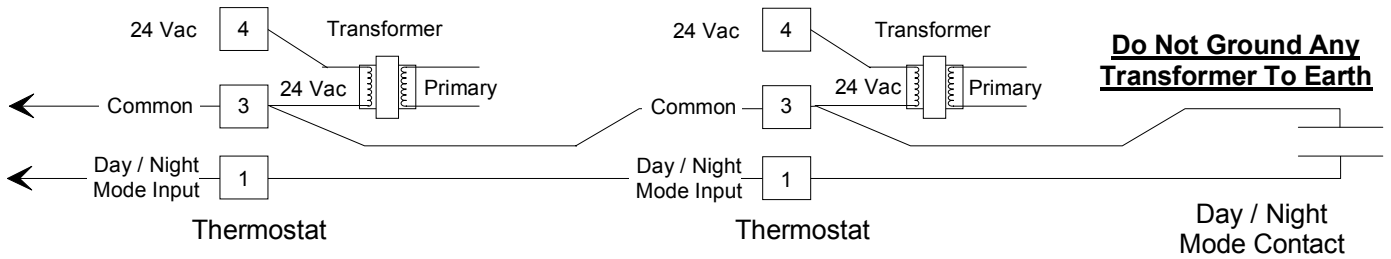
Hysterisys is 3°F (2°C) between heating and cooling



NSB INPUT TYPICAL WIRING (T950N ONLY)

• MULTIPLE TRANSFORMERS

Closed = night mode. 1 contact can be used for all thermostats on the same transformer.



• SINGLE TRANSFORMER

Closed = night mode. 1 contact can be used for all thermostats on the same transformer.

