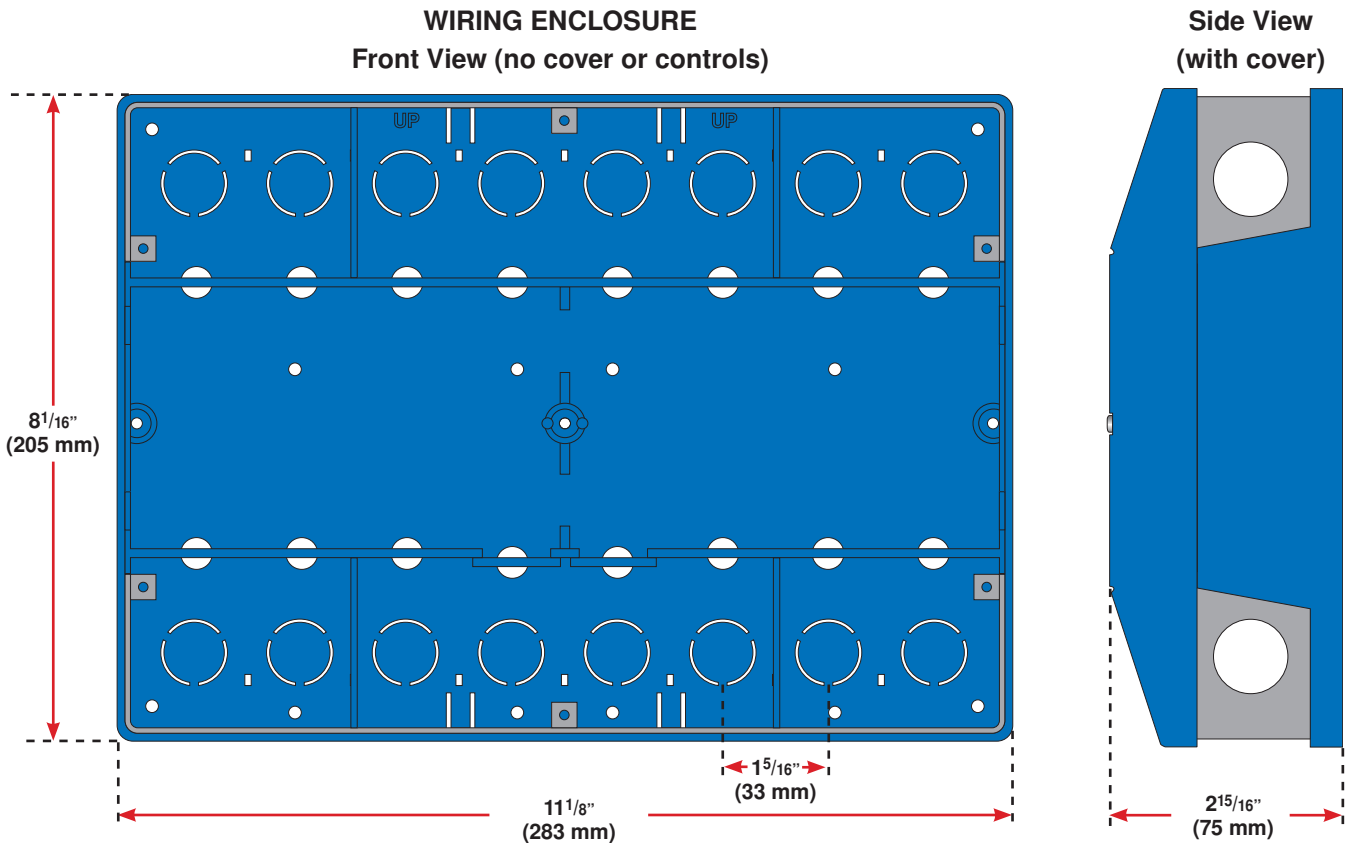


<b>1</b>	<b>Information Brochure</b>	<b>2</b>	<b>Application Brochure</b>	<b>3</b>	<b>Rough-in Wiring</b>	<b>4</b>	<b>Wiring Brochure</b>	<b>5</b>	<b>Data Brochure</b>	<b>6</b>	<b>Job Record</b>
	Choose controls to match application		Design your mechanical applications		Rough-in wiring instructions		Wiring and installation of specific control		Control settings and sequence of operation		Record settings & wiring details for future reference

## Choosing a Location: Wiring Enclosure

Placement of the controls is important. Choosing an appropriate location for the controls needs to be determined early in the construction process to enable proper wiring during rough-in. Consider the following when deciding on the most suitable location for your controls:

- Use an interior wall
- Keep dry. Avoid potential for leakage onto control. < 90% Relative humidity. Non-condensing environment.
- Do not expose to extreme temperatures. For example: beyond 32 - 122°F (0 - 50°C)
- Provide adequate ventilation - especially if inside a panel.
- Keep away from equipment, appliances or other sources of electrical interference.
- Provide easy access for wiring and for viewing and adjustment of the display screen.
- Mount approximately 5 ft. (1.5 m) off the finished floor.
- Mount close to the zones and/or the equipment being controlled.
- Provide a solid backing to mount the enclosure to. For example: plywood, studs, etc.



## Mounting Instructions: Enclosure

The wiring enclosure is designed to allow for easy wiring of all devices that will be connected to the controls. The upper and lower chambers provide ample room for wiring.

There are conduit knockouts provided on both the upper and lower halves and on both the back and sides of the enclosure. The upper half is generally for low voltage connections and the lower half is for line voltage power and loads. Prepare your installation for either of the following two methods.

The rough-in wiring can be prepared to enter the wiring enclosure through the conduit knockouts in the top and bottom (Figure 1) or from the back using a custom panel or electrical box (Figure 2).

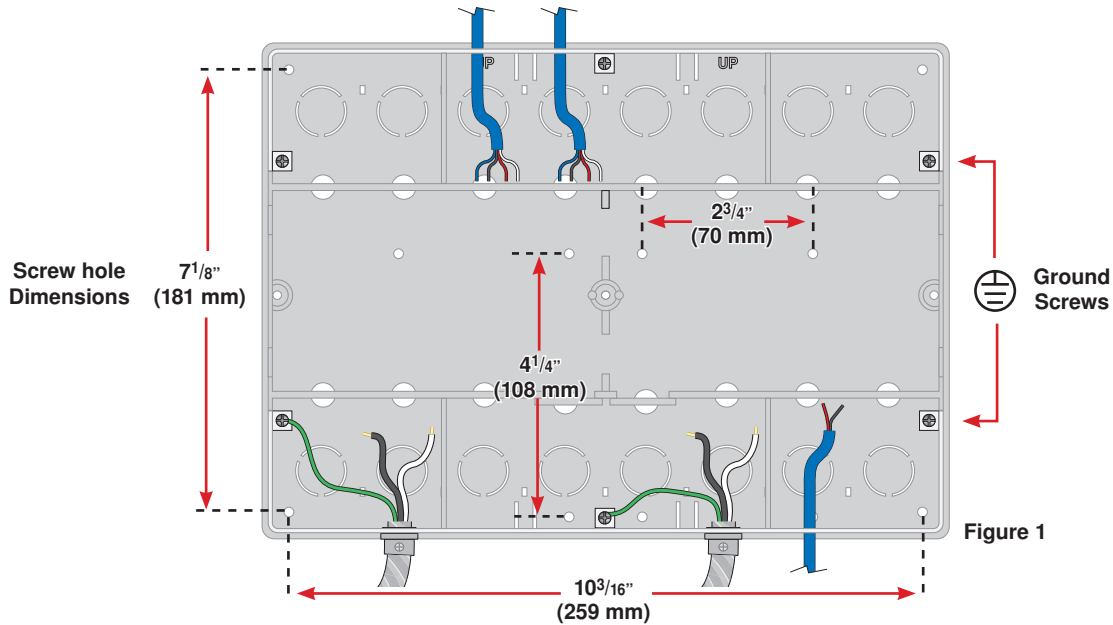


Figure 1

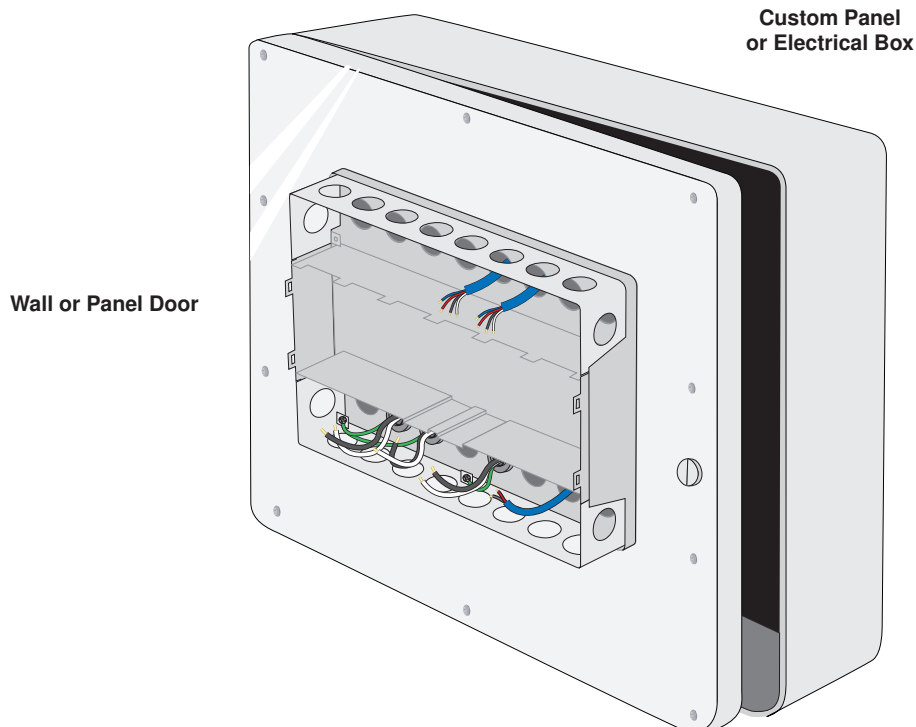


Figure 2

## Typical Applications

**Example #1:** Zone Manager 337 and Universal Reset Module 422. One boiler, one DHW, one setpoint, one injection mixing, six tN4 Thermostats, six zone valves, one zone group pump.

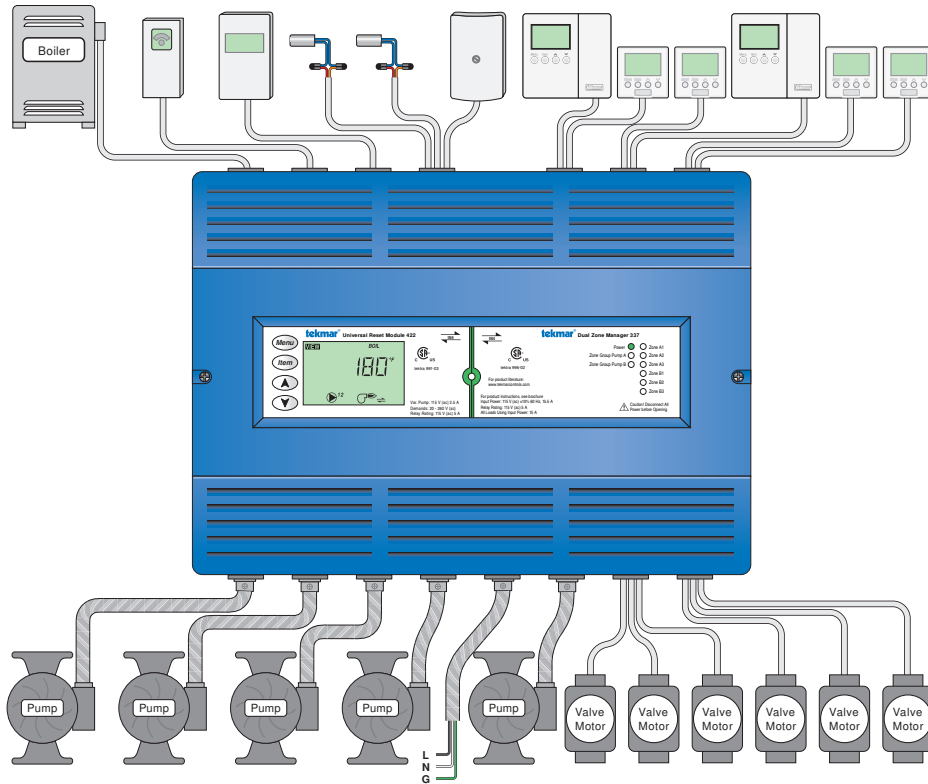


Figure 3

**Example #2:** Zone Manager 335 and Zone Expansion Module 325, twelve tN4 thermostats, twelve zone valves, two zone group pumps.

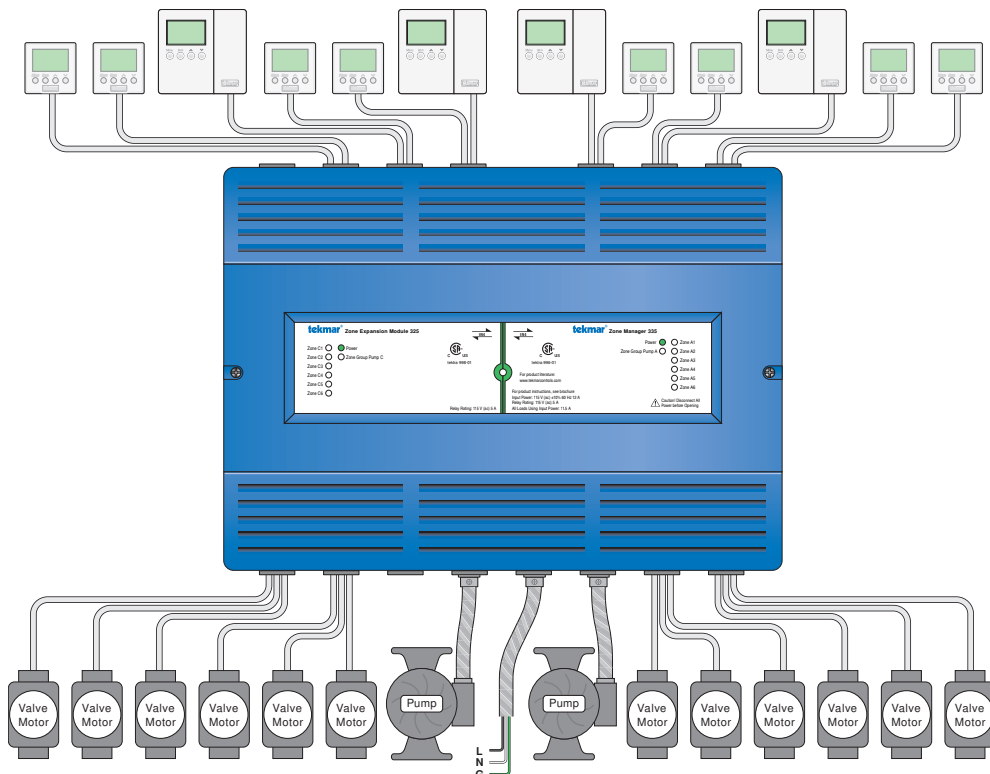


Figure 4

## Wiring Instructions: Wiring Enclosure

Always follow proper wiring practices, building and electrical codes for your jurisdiction. Label all wires during rough-in stage to ensure proper connection during the final installation of controls. Check with the system designer and application drawings to see which of the following items are required for your system.

### Power requirements

**Most tN4 installations require –**

- 115 V (ac) 15 Amp breaker

**except for the Zone Manager 337 which requires –**

- 115 V (ac) 20 Amp breaker.

For ease of service, the breaker or a disconnect switch should be located in reasonably close proximity to the equipment.

Run the 115 V power supply to the lower half of the enclosure, fourth knockout from the right.

Six grounding screws are provided on the metal knockout plates. Three grounding screws in the lower half and three grounding screws in the upper half.

### Thermostats

tekmarNet®4 thermostats are wired to the upper half of the controls. Refer to the thermostat section for specific wire and number of conductors to be used.

### Zone Valves / Zone Pumps

- **24 V (ac) zone valves** – run two conductors (18 AWG) from the lower half of the enclosure to each zone valve location.
- **115 V (ac) zone pumps** – run two conductors (14 AWG) from the lower half of the enclosure to the zone pump location. For on-off pumps with greater than 5 Amps running current, use isolation relays rated to handle the load of the pumps.

### System, Zone Group, DHW, Variable Speed Pumps

- **115 V (ac) pumps** – run two conductors (14 AWG) from the lower half of the enclosure to the pump location. Most jurisdictions require an armored cable for this.

For on-off pumps with greater than 5 Amps running current, use isolation relays rated to handle the load of the pumps.

For the variable speed injection pump the output is fused to a maximum load of 2.5 Amps. An external relay can not be used for the variable speed injection pump.

Cumulative load of all pumps must not exceed ratings on control.

### Mixing Valves (Floating Action)

- **Floating action (power open/power close) mixing valve motors 24 V (ac)** – run three conductors (18 AWG) from the upper half of the enclosure to the mixing valve motor.

### Boiler (On / Off or Modulating)

- **On / off boiler(s)** – run two conductors (18 AWG for 24 V) from the upper half of the enclosure to each boiler location.
- **Two stage on / off boiler(s)** – run four conductors (18 AWG for 24 V) from the upper half of the enclosure to each boiler(s) location.
- **Modulating boiler** – run two or four conductors (18 AWG for 24 V) from the upper half of the enclosure to each boiler location, depending on requirements of the boiler.

### Sensors

For all sensors we recommend using two conductor 18 AWG wire which allow a maximum distance for all sensor runs of 500 ft. (150 m). Sensors may be strapped directly on the pipe or placed in a sensor well. Do not run wire in the same conduit as high voltage wires or near motors.

- **Boiler sensor** – run two conductor wire from the upper half of the enclosure to the sensor location on the boiler supply or return piping as required by the application.
- **Mixing sensor** – run two conductor wire from the upper half of the enclosure to the mixing supply piping.
- **Outdoor sensor** – run two conductor wire from the upper half of the enclosure to the outdoor sensor which should be mounted on an exterior, north-facing wall. For more details, refer to the outdoor sensor section.

For potentially noisy environments, twisted pair or shielded wiring should be used for the sensors.

### DHW and Setpoint Demands

For DHW and Setpoint demands run two to four conductors (18 AWG) from the upper half of the enclosure to the demand switching device.

- A simple dry contact switch requires two conductors (R and W).
- A powered demand device with jumpered power for switching requires three conductors (C, R and W).
- A powered demand device using separate power for switching requires four conductors (C, R, R1, W).

## tekmarNet®4 (tN4) Network

The tN4 network must be interconnected between all tN4 devices. This network connection allows for two-way communication between devices. With a single wiring enclosure the tN4 network is interconnected with the plugs provided.

If there is more than one wiring enclosure, you must run two conductors (18 AWG) from the upper half of one enclosure to the other. The enclosures may or may not be in the same mechanical room.

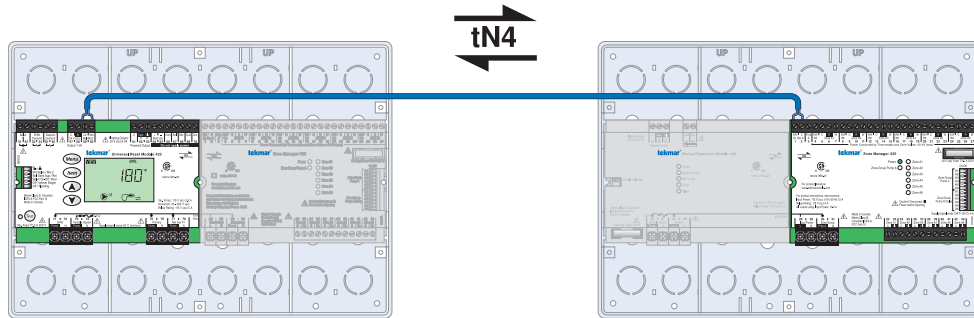


Figure 5

## Choosing a Location: Thermostats

Placement of the thermostats is important and needs to be determined early in the construction process to enable proper wiring during rough-in. Consider the following when deciding on the most suitable location for your thermostats:

- Interior Wall
- Dry, no potential for leakage onto control. < 90% Relative humidity. Non-condensing.
- No exposure to extreme temperatures. Example: 32 - 122°F (0 - 50°C)
- No draft, direct sun, or other cause for inaccurate temperature readings.
- Away from equipment, appliances or other sources of electrical interference.
- Easy access for wiring and for viewing and adjustment of the display screen.
- Approximately 5 ft. (1.5 m) off the finished floor.
- Not behind doors.
- Keep in mind any future considerations such as placement of furniture, pictures, artwork etc.
- An alternate remote location can be chosen with some thermostat models. A room sensor is placed in the area to be controlled and the thermostat is placed in a convenient location elsewhere. Locate the sensor in the zone and use two wires to run back to the thermostat.
- The thermostat may also be used to measure and display temperature of other remote devices such as floor, coil, duct, outdoor, or pool temperature. In this case, the remote tekmar sensor is located at the device being measured and two wires are run back to the thermostat.

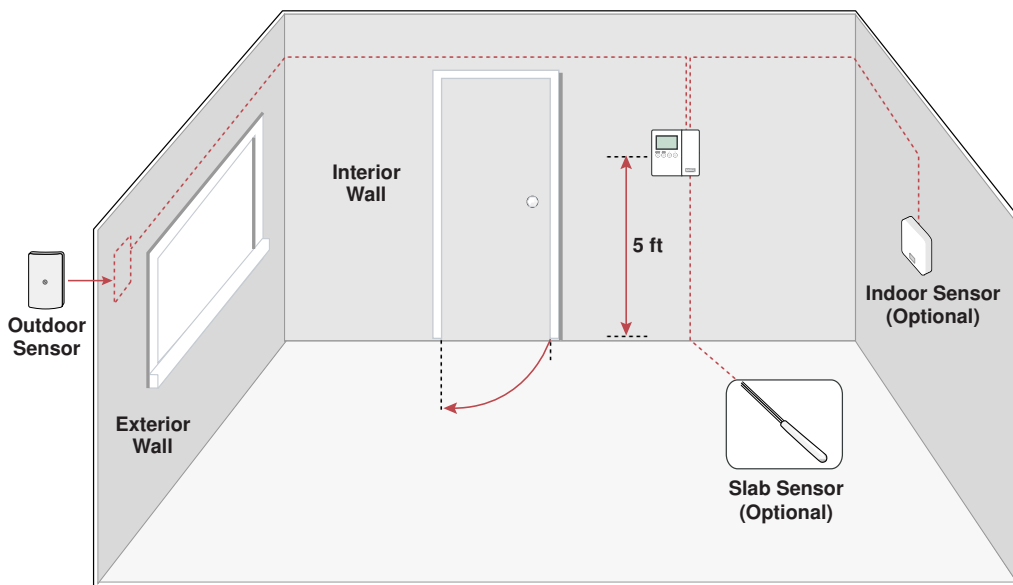


Figure 6

## Mounting Instructions: Thermostats

The use of switch boxes for the thermostats and/or remote sensor locations is recommended in order to prevent the wiring being buried during dry wall installation. Ensure that the switch box or hole for wire does not allow cold drafts into the thermostat. Check the building plans to ensure no thermostats or

sensors are missed. There are two types of thermostat enclosures. The smaller "J" enclosure requires a tekmar 007 adaptor plate in order to be mounted on a single gang switch box. The larger "K" enclosure can be fastened directly to a single or double gang switch box as per the following figures.

### "J" Enclosure

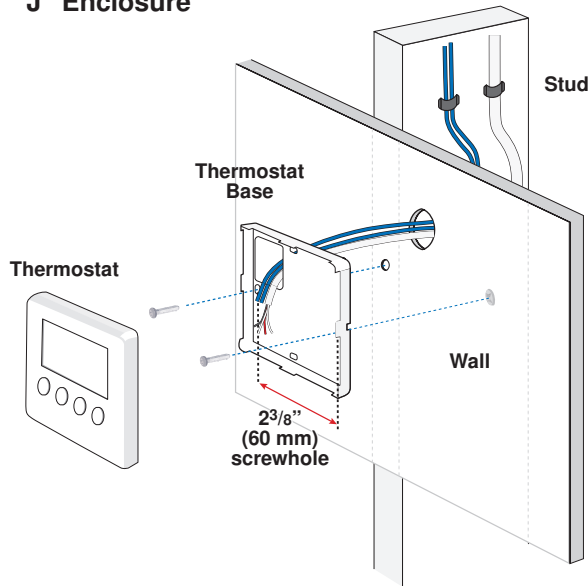


Figure 7

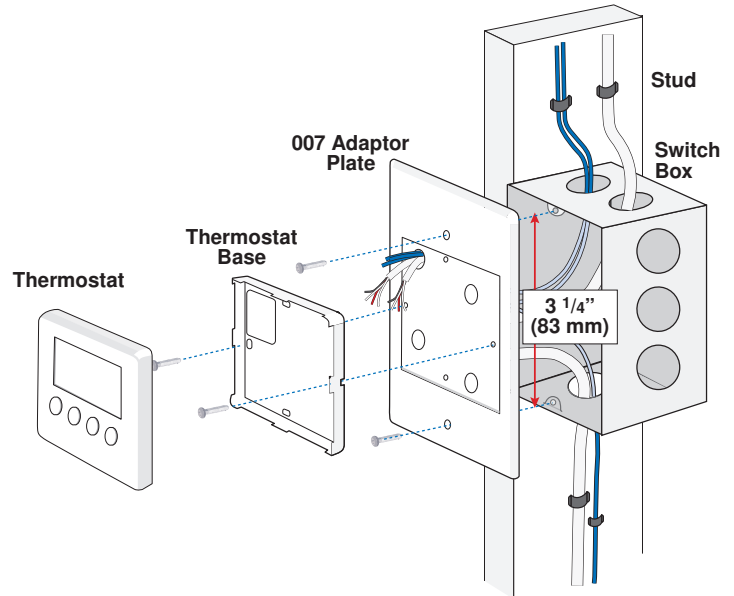


Figure 8

Mounted on wallboard

Mounted on switch box

### "K" Enclosure

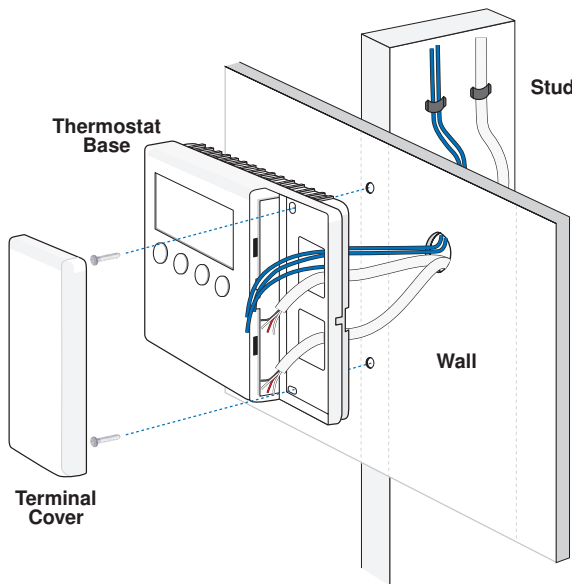


Figure 9

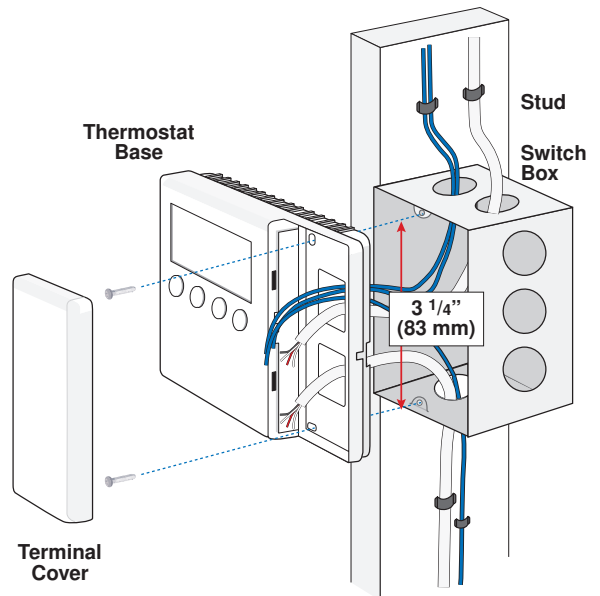


Figure 10

## Wiring Instructions: Thermostats

Always follow proper wiring practices, building and electrical codes for your jurisdiction. Label all wires during rough-in stage to ensure proper connection during the final installation of the thermostats.

Each thermostat will require a number of conductors to be run from the thermostat location to the inputs and outputs. These may include any auxiliary remote sensor

inputs, heating equipment, cooling equipment, fans, and ventilation equipment. Rough in the wires for each thermostat depending on which inputs and outputs are required. Use standard 18 AWG wire for the thermostat power, stages, tN4 and sensor connections. Twisted pair or shielded wire for sensors is allowed, but not mandatory. To calculate the number of conductors required, refer to the following figure or the wiring chart on the last page.

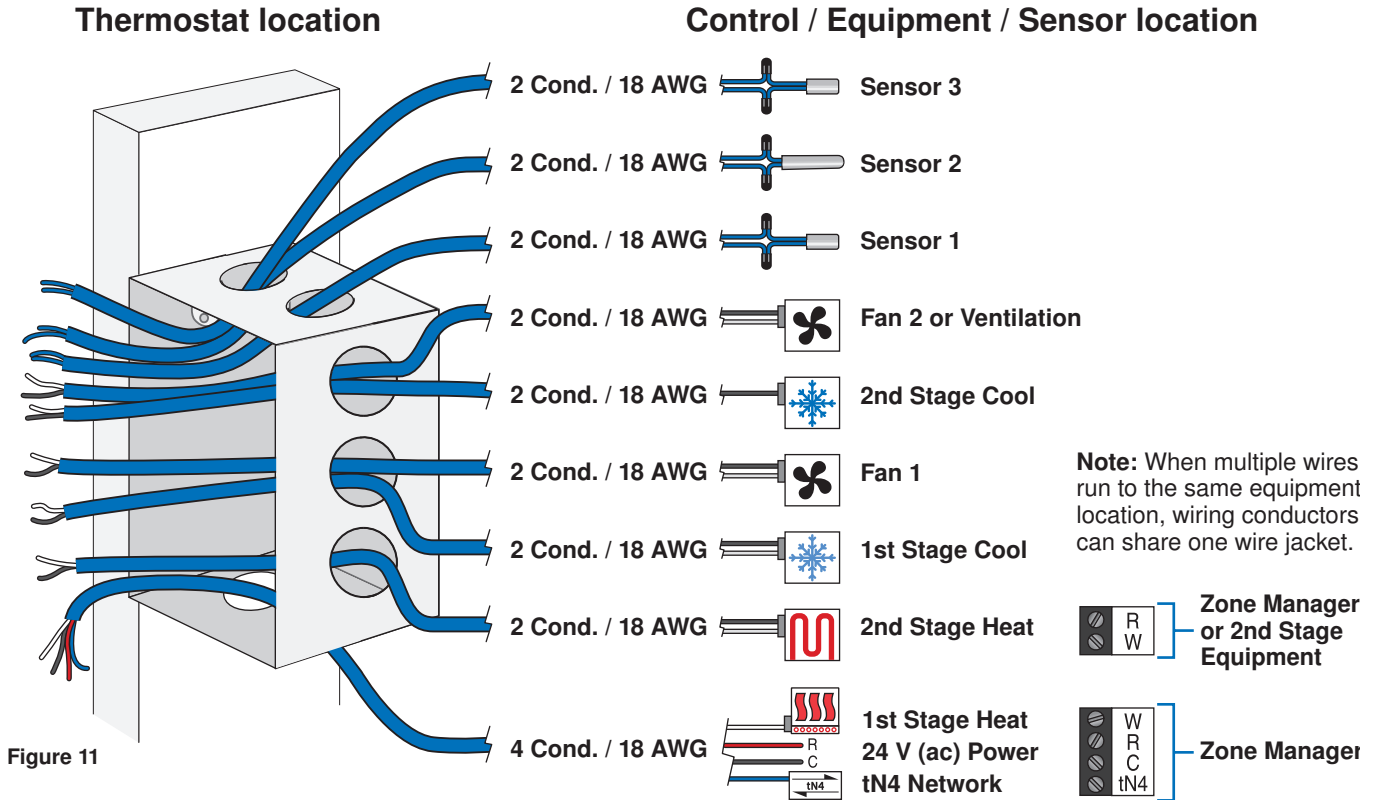


Figure 11

**Note** – conductors may be combined in the same jacket if they are running to the same HVAC equipment location.

## Choosing a Location: Outdoor Sensor

Placement of the Outdoor Sensor (070) is critical to proper operation of the system. It must read an accurate ambient outdoor air temperature, therefore proper location and installation must be followed. See Data Brochure D070. Consider the following when deciding on the location for your outdoor sensor:

- North-facing exterior wall
- Away from any heat sources, wall openings, vents, open doors or windows and sun.
- Dry location, away from direct exposure to rain or snow. Example: Under an overhang.
- Away from possible damage or tampering
- Accessible for replacement, in the event of failure

## Wiring Instructions: Outdoor Sensor

Virtually all the tN4 systems will require an outdoor sensor. Because information is shared on the two-way communication network, only one outdoor sensor is required for a tN4 system even though several tN4 controls may be present.

Once the outdoor sensor location has been determined as above, run the two conductor wire from the sensor location to the nearest tN4 device, usually a thermostat, or back to the reset control in the mechanical room. The outdoor temperature reading can be accessed on all tN4 displays.

# Thermostat Conductor Calculator

Thermostat Conductor Calculator																											
Thermostats & Features				Terminals / Conductors (dots • indicate a conductor, see note** below)																							
tN4 Model	Heat	Cool	Fan	Sensors	Network / Power			Stages							Sensors												
					tN4	C	R	W1 (Rh1)	W2 (Rh2)	Rc	Y1	Y2	G1	G2 (G1)	G2 (G2)	S1	S2	Cs	S3	Cs							
541	1	-	-	1	•	•	•	•	•							•											
542	1	-	-	2	•	•	•	•	•								•										
543	2	-	-	2	•	•	•	•	•	•						•											
544	1	1	1	2	•	•	•	•	•	•	•					•	•										
545	2	1	1	2	•	•	•	•	•	•	•					•	•										
546	2	2	2	3	•	•	•	•	•	•	•	•				•	•	•						•			
Typical Wiring Color					Blue	Black	Red	White	(J)	Brown	(J)	Red	Yellow	Orange	Green	(J)	Gray / Pink	(J)	Black	White	Black	White	Black	White			
Conductor Total					4 to 5			1 to 2			3 to 5			1 to 2			2	2	2	Run sensor wires from tstat to sensor location if used							
Wiring Routing					Run network, power and 1st stage heat wires back to Zone Manager			Run to 2nd stage heat or 2nd Zone Manager			Run to 1st and 2nd stage cooling and fan equipment			Run to 2nd stage fan or ventilation			Run sensor wires from tstat to sensor location if used										
Wiring Type					For the network, power, staging and sensor terminals, only standard type thermostat wire is required. Example: type LVT 18 AWG Length to 500 ft. For sensors in areas of high electromagnetic interference (EMI), shielded or twisted pair wire is recommended																						
tN4 Thermostat Ratings Power: 24 V (ac) 1.6 - 3.5 VA Relay Ratings: 24 V (ac) 2 A					** Note: Dots • on chart denote conductor is required. Bracketed dots (•) and terminals denote conductor may be required. A separate conductor may not be required if power can be shared from another terminal using a jumper (J). Example: R-(W1). If in doubt run the extra conductor.																						



tekmar Control Systems Ltd., Canada  
 tekmar Control Systems, Inc., U.S.A.  
**Head Office: 5100 Silver Star Road**  
**Vernon, B.C. Canada V1B 3K4**  
**(250) 545-7749 Fax. (250) 545-0650**  
**Web Site: www.tekmarcontrols.com**

