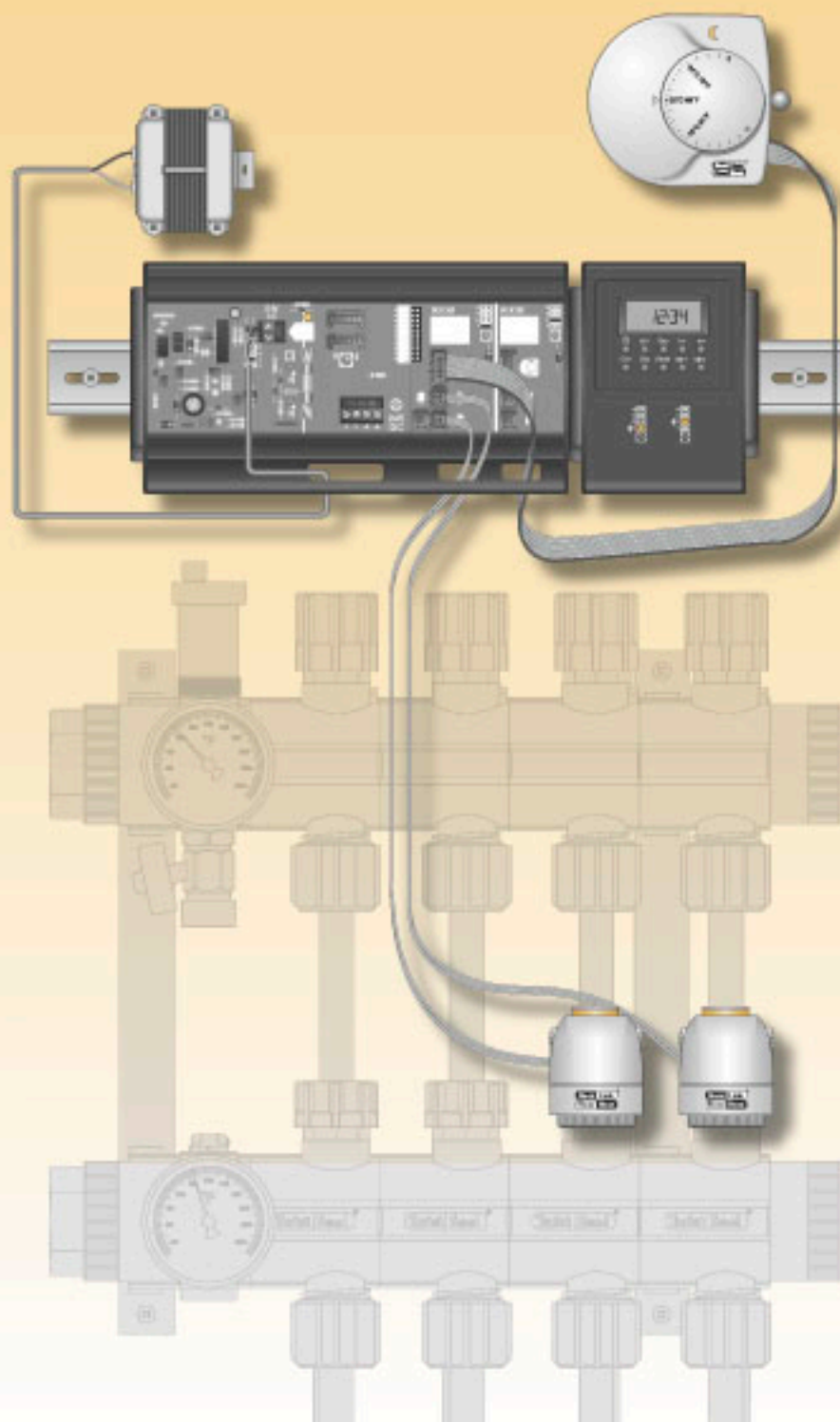
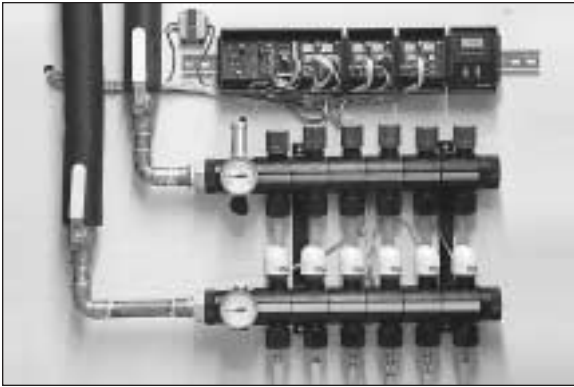


Stat

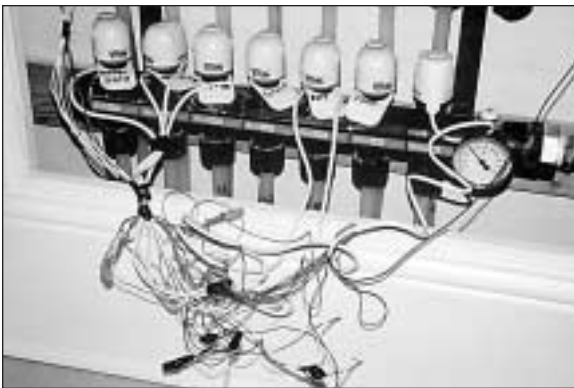
Link[®]

Technical Guide





StatLink[®] System

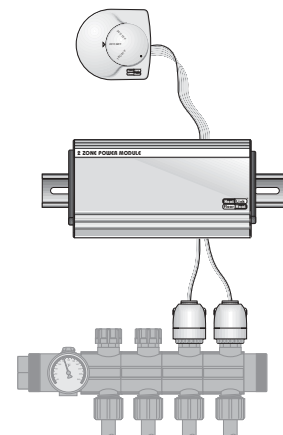
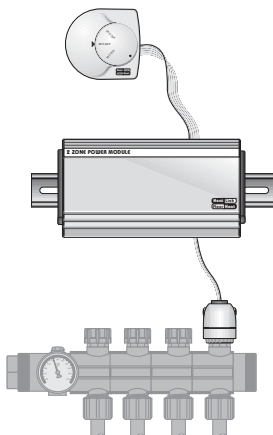
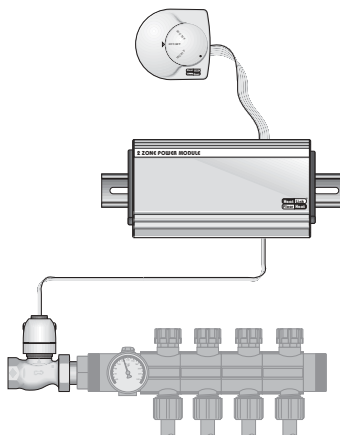


Standard Wire System

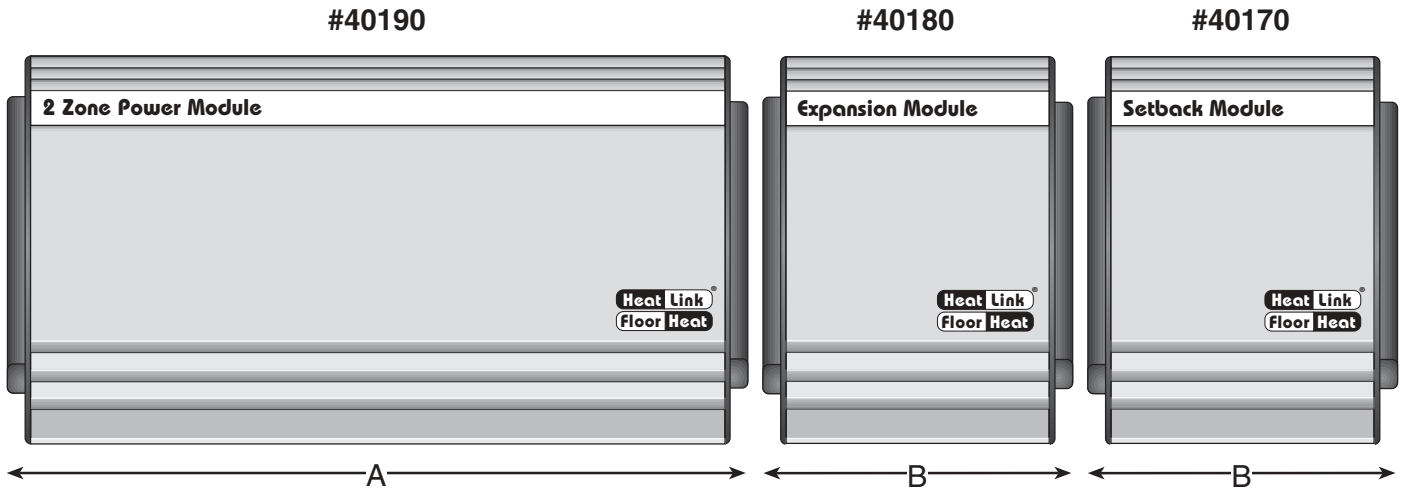
- StatLink[®] is a modular control system
- Forming the basis of this system is a unique “5-wire and plugs” approach
- Simple “Cut, Clip and Plug” system
- Zone motors are pre-wired from factory (for a std. 3-wire connection, plug end will need to be cut off and wire stripped)
- The StatLink[®] system simplifies wiring and troubleshooting compared to pairing standard wires (see photos to the left).
- Temperature setback (both manual & automatic) is available.
- Testing & diagnostic tools are available for easy troubleshooting
- maximum of 2 thermostatic zones per module, and 5 motors per zone; zone motor slots can be expanded by 2 using an expansion adapter
- one 24V/40VA transformer can power as many as 12-16 zone motors

Thermostatic “Zones” Defined

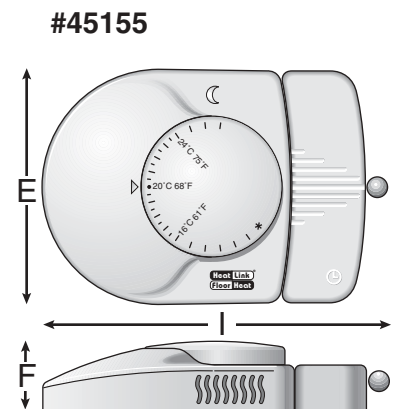
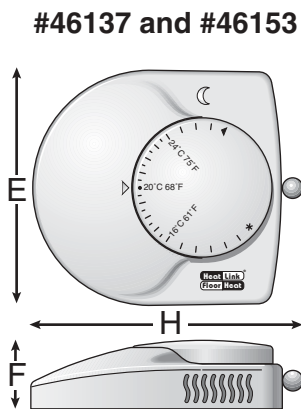
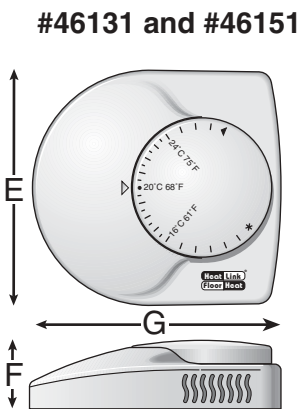
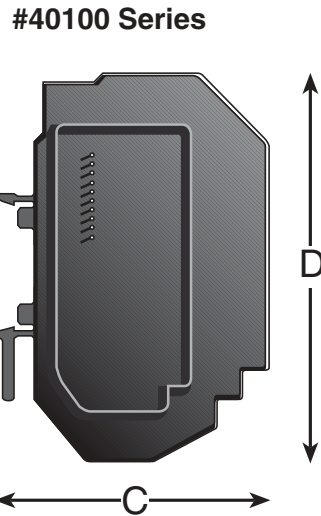
- Zones are areas of **thermostatic control** (which in turn “drive” or “actuate” a motor)
- Zones **do not** apply to the amount of loops in a system
- A zone can be a single valve zone drive motor in front of a manifold being **controlled by one thermostat.***
- A zone can be a single manifold zone drive motor being **controlled by one thermostat.**
- A zone can be multiple manifold zone drive motors being **controlled by one thermostat.**



* This still allows for individual room by room and loop by loop temperature adjustment using the 12 position flow balancing manifold



| Dimension | inches | mm |
|-----------|---------|-----|
| A | 8-1/4 | 210 |
| B | 3-5/16 | 84 |
| C | 2-7/8 | 74 |
| D | 4-3/16 | 107 |
| E | 3-1/8 | 79 |
| F | 1-1/16 | 27 |
| G | 3-5/16 | 84 |
| H | 3-11/16 | 93 |
| I | 4-11/16 | 118 |

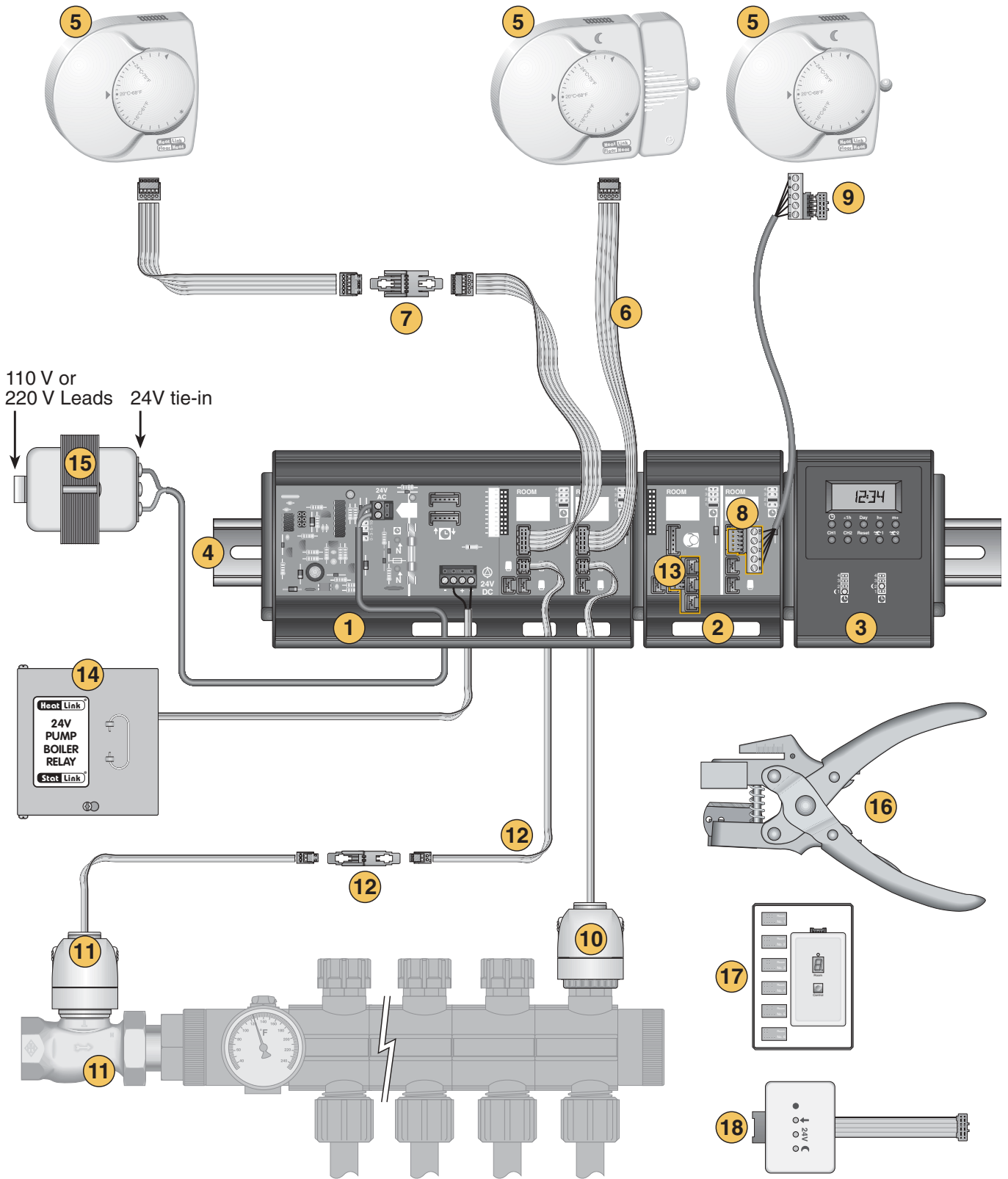


StatLink® System Components (see diagram on opposite page)

- ① **#40190 2 Zone Power Module**; one (1) is needed for each manifold location. Comes with two (2) 5-Wire Plugs (#43205).
- ② **#40180 2 Zone Expansion Module**; necessary if the manifold supplies more than two zones. One (1) for every two (2) additional zones.
- ③ **#40170 Setback Module** optional; for central night time setback. One (1) per house. Allows for 2 setback schedules.
- ④ **#44325 Installation Track for StatLink® Modules** for mounting zone modules. Approx. one (1) per two (2) module locations.
- ⑤ **#46151, and/or #46153, and/or #46155 StatLink® Thermostats**; one (1) per zone. Each thermostat comes with mounting plate and one (1) 5-Wire Plug (#43205).
- ⑥ **#43005** (5-wire flat cable) to connect thermostat to zone module.
- ⑦ To extend the 5-Wire Flat Cable, **#43105 5 -Wire Coupling** and **#43205 5-Wire Plugs** are needed. One (1) coupling and two (2) plugs are required for each extension.
- ⑧ **#43401 StatLink® Module to Standard Wire Adaptor** is required if standard wire is being used to connect to a StatLink® module.
- ⑨ **#43402 StatLink® Thermostat to Standard Wire Adaptor** is required if standard wire is being used to connect to a StatLink® thermostat.
- ⑩ **#56100 Manifold Zone Drive Motor** is used if one or more loops on a manifold are controlled by a thermostat. One (1) per loop per thermostat.
- ⑪ **#56101 Valve Zone Drive Motor, 62000 & 63000** series zone valves. Used if one thermostat controls an entire manifold. One (1) valve and one (1) motor per manifold (thermostat) (if valve cannot be installed see ⑩).
- ⑫ The Zone Drive Motors (#56100 & 56101) come with a 3 foot 2-Wire Flat Cable and Plug. If this needs to be extended, **#43002 StatLink® 2-Wire Flat Cable**, **#43102 2 -Wire Coupling** and **#43202 2-Wire Plugs** are needed. One (1) coupling and two (2) plugs are required for each extension.
- ⑬ **#43300** (StatLink® Expansion Adaptor) is needed if a 2 Zone Power/Expansion Module needs to control more than 3 zone drive motors on one zone (max. 5 zone drive motors) or more than 2 zone drive motors on the other (max. 4 zone drive motors).
- ⑭ **#45102** (Relay box) is needed if the StatLink® system operates the boiler and/or pump system. One (1) per house.
- ⑮ 24Vac Class II Transformer required (not supplied by HeatLink®). 40VA transformer recommended.

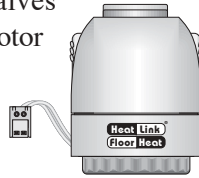
Recommended Tools for Installer

- ⑯ **#44200 StatLink® Crimping Pliers** are necessary for connecting plugs to cable.
- ⑰ **#44100 StatLink® Testing Kit** is optional.
- ⑱ **#44110 StatLink® Diagnostic Indicator** is optional.



The HeatLink® & StatLink® #46000 series thermostats are an integrated component working in conjunction with #56000 series zone drive motors. The thermostats work on a combination of a proportional input processing, providing a pulse with modulation output.

The #56000 series zone valves are a non-motorized zone drive motor actuated with the means of an electric current. This current activates a heating element which in turn “drives” or moves a wax filled piston chamber. As the wax heats up and expands, the motor insert pin moves correspondingly, thereby opening and closing the various distribution manifold and brass zone valves available from HeatLink. The zone drive motor has a full close to full open time range of 5 to 1.5 minutes (depending on the residual temperature of the heating element and wax piston chamber from the previous cycle).



When connecting a standard “bang-bang” (On / Off) thermostat with a predetermined heat anticipation setting to a slow acting zone drive motor, the greatest concern will be the large over and undershoot of the desired room temperature set-point. Due to the large thermal mass being heated in a radiant floor heating system, this “over” and “undershooting” of set-point temperature can be greatly compounded. For this reason a very precise room thermostat is required, and is why a simple “bang-bang” input/output of the thermostat with simple heat anticipation is not sufficient.

In the case of the #46000 series thermostats, the room heating is “stepped up” to achieve the desired room temperature through the means of the pulsed output, **in conjunction with a slow acting zone drive motor.** The cycle on / off time is determined by the variance of the actual room temperature to the desired set-point temperature. The further away from set-point, the longer an open cycle (or signal)



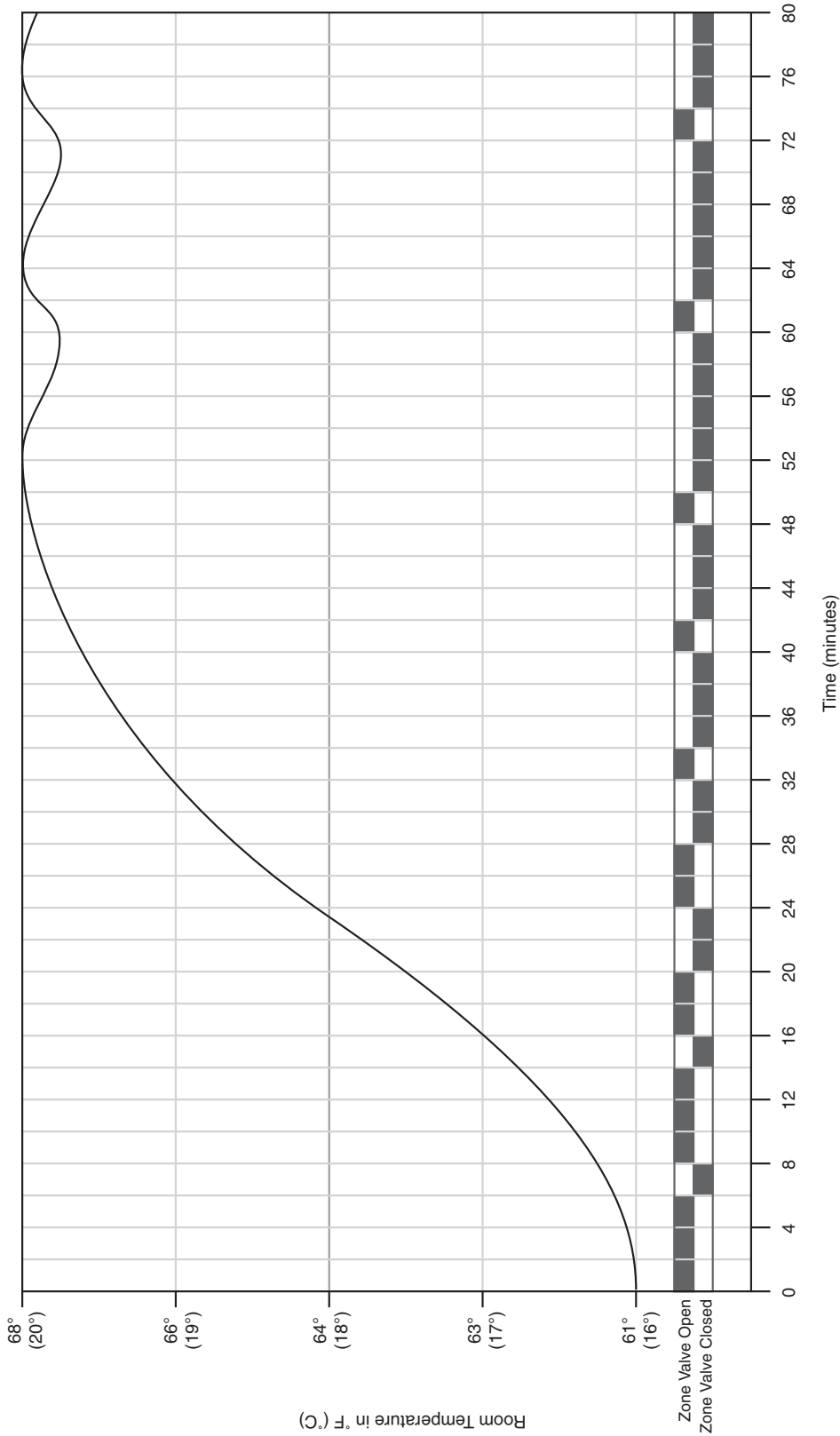
is sent from the thermostat to the zone drive motor. For example, with a room temperature of 16°C (61°F), and a set-point of 20°C (68°F), the thermostat may send a signal of 6 minutes on, and 2 minutes off. This means that the zone drive motor may only close 20% to 30%, before the signal to reopen is received. As the room temperature climbs closer to set-point, the cycle time will adjust itself accordingly (e.g. 4 minutes on / 4 minutes off). In this case the zone drive motor may barely reach a full closed position before receiving its next on cycle. As desired set-point is nearly achieved (e.g. 19°C or 66°F) the on / off cycle will be reversing itself (e.g. 2 minutes on / 6 minutes off) which means the zone drive motor will now be 70% - 80% closed, with just a small 20% - 30% opening per cycle. This is how the room temperature is “stepped up” to achieve the desired set-point, without any room temperature overshoot! The “pulsing” action of the HeatLink thermostats gives the actual room temperature “time to react” by:



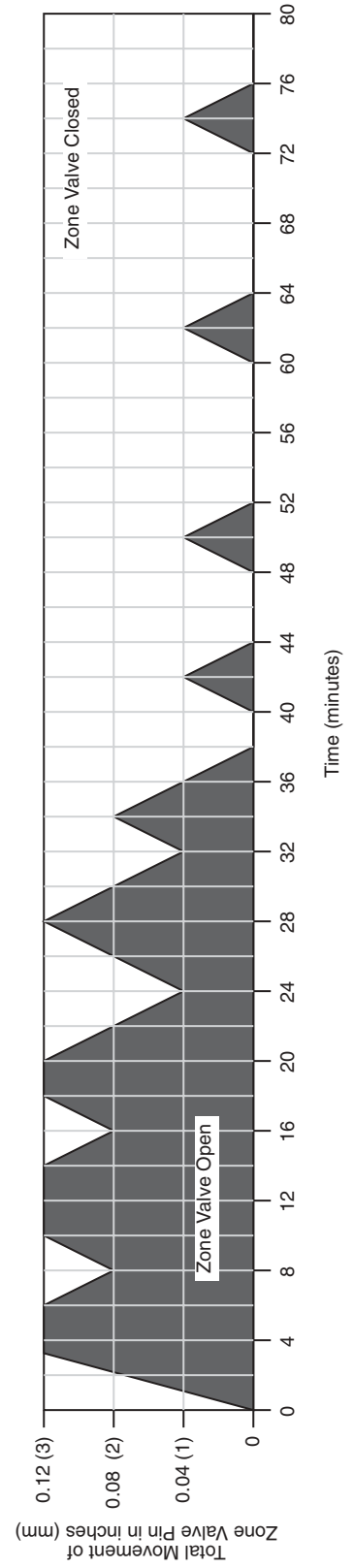
- allowing the energy from the heated floor mass to be absorbed into the room in-between on / off cycles
- monitoring room temperature in between on / off cycles, and then
- initiating a corresponding cycle time based on variance between actual room temperature to desired set-point temperature.

Without a pulsed output capability, a standard thermostat and heat anticipation will not be able to function properly in conjunction with either a slow acting zone drive motor, or a high thermal mass system like radiant floor heating.

Time vs. Room Temperature Response of Thermostats & Zone Drive Motors



Note: Time and temperature is approximate for example purposes only. Actual times and temperature response will vary according to system design, room construction details, etc.

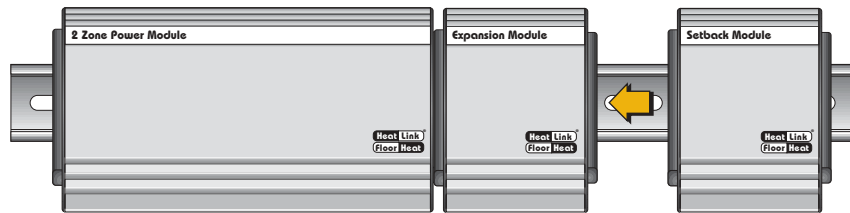
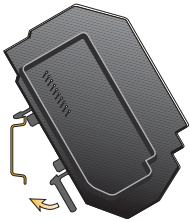


Connection Facilities

The power module and the expansion module each control two (2) zones with connections for two (2) thermostats and five (5) zone motors. A 40 VA transformer will support one (1) power module (#40190), five (5) 2-zone expansion modules (#40180), and one (1) Timer Modules (#40170). This configuration will provide individual control of 12 rooms or heating zones, with a maximum of 16 zone motors per power module. Individual transformers are required for each power module location.

Connecting the Modules

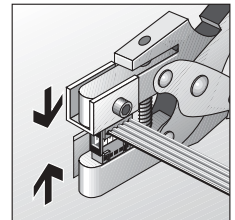
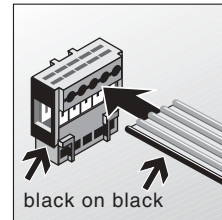
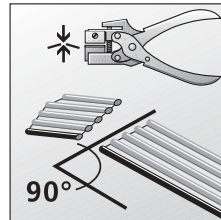
One by one, snap the modules onto StatLink® tracking and push the modules gently together, ensuring that nothing is obstructing the pins.



Plug Assembly

The 2 and 5 wire plugs should be connected to the cable with the crimping pliers (#44200). They ensure even force distribution, and won't destroy the plug ends. **Do not use regular pliers!**

1. Cut the flat cable at a 90° angle with the crimping pliers.
2. Match the **black** side of the wire with the **black** side of the plug and insert.
3. Use the crimping pliers to connect the plug and wire together.



Power Module Technical Information

Pump/Boiler “On” Delay

0 min when setback is off
 4 min when setback is on (using Channel 1)

Pump/Boiler “Off” Delay (user selectable via jumper plug)

0 min jumper position 1
 3 min jumper position 2
 5 min jumper position 3
 10 min jumper position 4

Relay Output

U_{Rel} = 20 to 36 Vdc @ 24 Vac \pm 15%
 I_{Rel} \leq 70 mA
 I_{Short} \leq 110mA for $t < 10$ ms, after this time the relay automatically disconnects (every 2 s it will attempt to reconnect until it does connect)

LED Lights

Green 24 Vac power has been applied
 Red (top) bad connection to thermostat
 Red (bottom) defective fuse
 (Yellow) output overload - lights up only briefly)

Hardware and Software

Microcontroller controlled with internal timer and burn-out-detection
 Tests the jumper connection 10 times every 20 ms
 Test the pump connection 20 times every 10 ms
 Test the setback connection 100 times every 1.25 ms
 Watchdog 15 ms

Effects of Improper Wiring on the Power Module

One Power Module with Setback

| Power Wiring | Pump Wiring | Relay Output |
|----------------|----------------|------------------------|
| same phase | same phase | normal function |
| opposite phase | same phase | one or both fuses blow |
| same phase | opposite phase | relay does not switch |
| opposite phase | opposite phase | one or both fuses blow |

One Power Module without Setback

| Power Wiring | Pump Wiring | Relay Output |
|----------------|----------------|-------------------------------------|
| same phase | same phase | normal function |
| opposite phase | same phase | relay switches on, then quickly off |
| same phase | opposite phase | relay does not switch |
| opposite phase | opposite phase | relay does not switch |

Two Power Modules with Setback

| Power Wiring | Pump Wiring | Relay Output |
|----------------|----------------|------------------------|
| same phase | same phase | normal function |
| opposite phase | same phase | one or both fuses blow |
| same phase | opposite phase | relay does not switch |
| opposite phase | opposite phase | relay does not switch |

Two Power Modules without Setback

| Power Wiring | Pump Wiring | Relay Output |
|----------------|----------------|-----------------------|
| same phase | same phase | normal function |
| opposite phase | same phase | normal function |
| same phase | opposite phase | relay does not switch |
| opposite phase | opposite phase | relay does not switch |

Power Input of the Attached Relay is to High or Short Circuited.

The Power Module tries every 2 seconds to turn on. If the overload or short circuit is eliminated then the Power Module will operate normally.

Power Module (#40190)

Power Requirements

Connect 24 Vac power to the terminal strip ① (see next page). The required transformer size is dependant on the total zone motors connected to the transformer. A 40VA transformer will handle up to 16 zone drive motors. Do not connect anything else to this transformer.

When the module is properly connected and under power the indicator light ④ (see next page) will light up.

Individual transformers are required for each power module location.

Pump/Boiler Switching ② (see next page)

When a thermostat calls for heat, the pump and/or boiler is switched on with no delay if temperature setback is off and after a 4 minute delay if temperature setback is on (using Channel 1). When no thermostat demands heat, the pump and/or boiler is automatically switched off after a user adjustable 0, 3, 5 or 10 minutes as an allowance for the slow acting zone drive motors. To adjust the “off” time delay, move the jumper plug ⑤ to the desired position (0, 3, 5 or 10 minutes). Connect the StatLink[®] pump relay to the DC terminal strip ②. This is a 24 V DC output, do **not** use any other relay then a StatLink[®] DC pump relay. DPDT and TPDT relays are available separately or mounted on a DIN rail in an electrical enclosure.

Interconnecting Multiple Power Modules (#40190)


Setback Switching Extension


Only one setback module (#40170) is necessary for the entire building. Use the StatLink[®] 5-wire flat cable (#43005) with the 5-wire plugs (#43205) for interconnecting multiple power modules (observe coding; i.e. “black to black”). Plug each end into one of the counterplugs ③ (see next page) on each of the modules to be connected.

Pump/Boiler Switching Extension

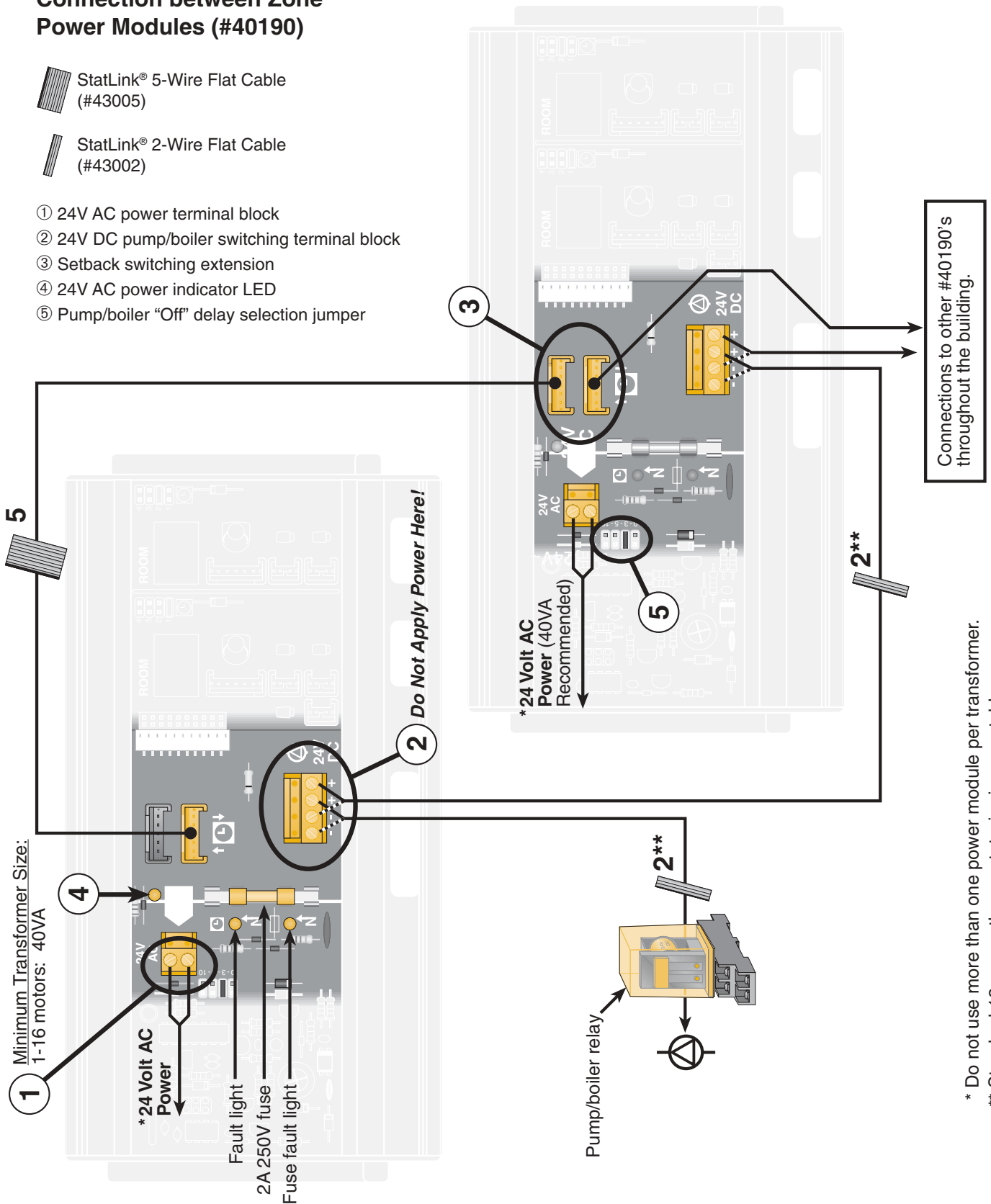
Only one pump/boiler relay is necessary for the entire building. Use StatLink[®] 2-wire flat cable (#43002) or standard thermostat wire for interconnecting multiple power modules. Connect each end to the DC terminal strip ② (see next page). One positive (+) and one negative (-) connection must be made. **Ensure that “+” to “+” and “-” to “-” wiring is maintained.** Mixing a “+” and “-” will damage the unit (see “Effects of Improper Wiring on the Power Module” on page 9).

Connection between Zone Power Modules (#40190)

 StatLink[®] 5-Wire Flat Cable (#43005)

 StatLink[®] 2-Wire Flat Cable (#43002)

- ① 24V AC power terminal block
- ② 24V DC pump/boiler switching terminal block
- ③ Setback switching extension
- ④ 24V AC power indicator LED
- ⑤ Pump/boiler "Off" delay selection jumper



* Do not use more than one power module per transformer.
** Standard 18 gauge thermostat wire is acceptable.

Connecting the Thermostats and Zone Motors

Use the StatLink® 5-wire flat cable (#43005) with the 5-wire plugs (#43205) to connect the thermostats to the StatLink® modules. (observe coding; i.e. “black to black”). Simply connect a 5-wire plug to the end of the wire coming from the thermostat and plug it into the connection ① (below). Use the room identification test kit (#44100) to identify which wire belongs to which thermostat. Plug the appropriate zone motors into the connection ② (below). If the 2-wire cable on the zone motor is not long enough use the StatLink® 2-wire flat cable (#43002) with the 2-wire plugs (#43202) and the 2-wire couplings (#43102) to connect the zone motors to the StatLink® modules.

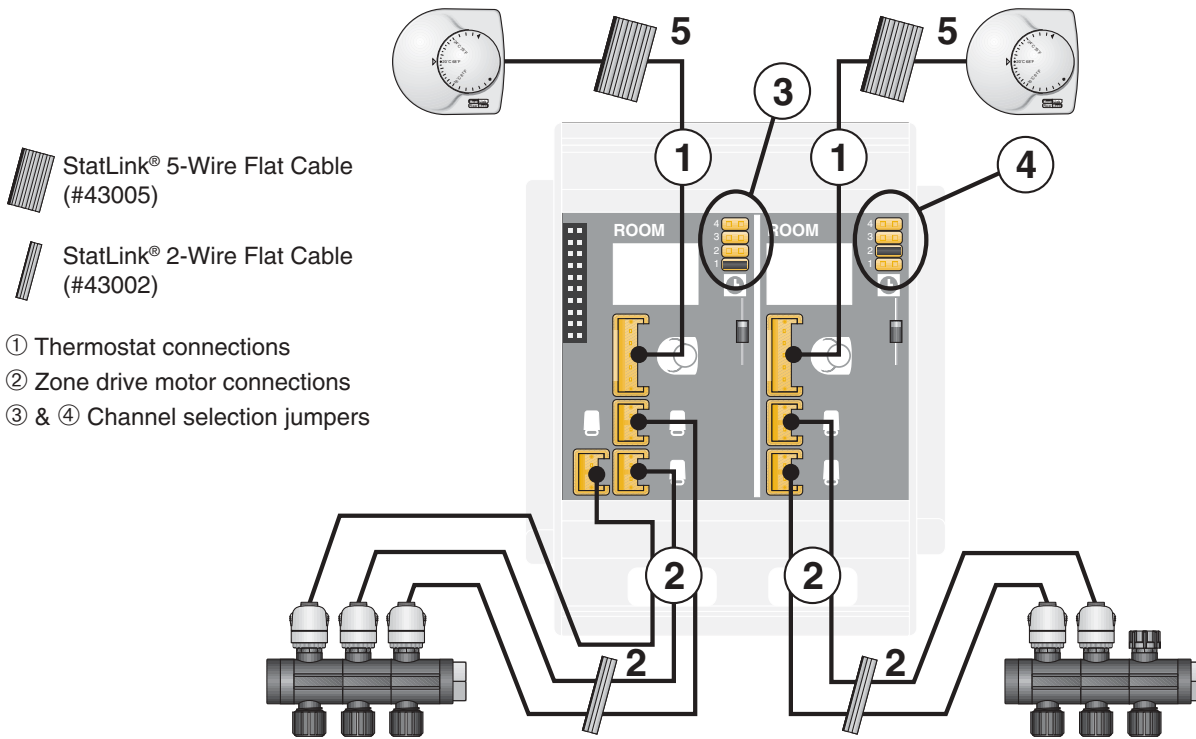
Channel Selection

Only applicable if using the setback module (#40170) or the clock thermostat (#46155). The setback programs of these timers are automatically available for each room via the StatLink® power and expansion modules.

The setback programs are divided into channels 1 to 4. By means of the jumpers ③ and ④, each zone can access the desired setback program. When used with the clock thermostat each zone that is on the same channel as the clock thermostat will access that setback program.

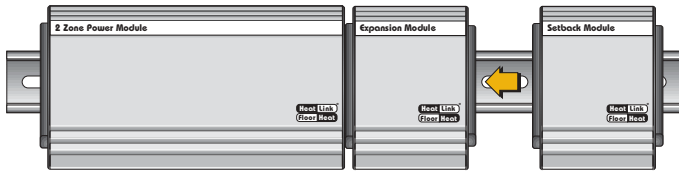
Note: The setback module (#40170) accesses channels 1 and 2 only. Channels 3 and 4 are accessible only by the StatLink® Timer Thermostat (#46155) in addition to channels 1 and 2.

Connection of Thermostats and Zone Drive Motors to Power/Expansion Modules



Wiring

The maximum length of wire cable per room for a combination of ① + ② is 100 feet (30 m).

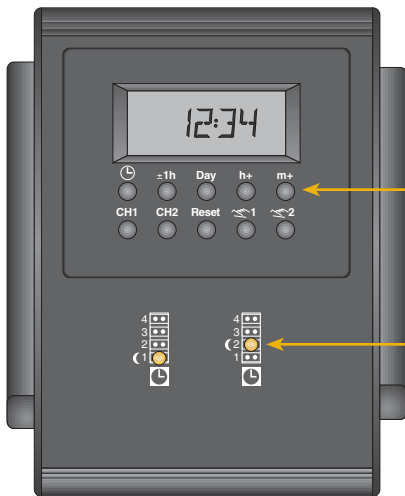
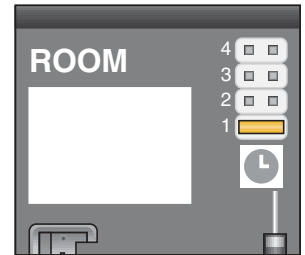


Setback Module Installation

The setback (clock) module is always inserted onto the end of the row of modules and is immediately ready for operation.

Channel Selection on Zone Modules

LED's indicate the setback operation of the respective channel. By respective jumper settings of the power/extension modules, the required setback/heating period is arranged for each room; ie., setback periods of channel 1 would have jumper position bus to be set at number 1.



The control panel of the setback module, #40170

Amber LED's to indicate the channels, CH1 or CH2

Note: With the setback modes switched on, the room temperature is reduced according to the setting of the room thermostat. For the #46151 Standard thermostat it would setback 7.2°F (4°C). For the #46153 Setback 3 Position and #46155 Timer thermostats it would setback 3.6-10.8°F (2-6°C) since these thermostats are adjustable.

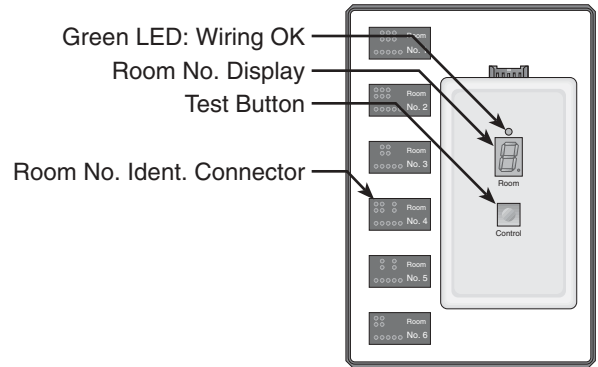
Example

The Setback Module (#40170) has 2 setback channels available. This allows different heating zones to have different setback schedules. In a house, the living area may only need to be heated during the daytime when they are occupied. The bedrooms may only need to be heated during the evening and night when they are occupied. The Setback Module can be programmed so that the temperature is reduced during the night in the living area and the temperature is reduced during the daytime in the bedrooms.

Room Identification

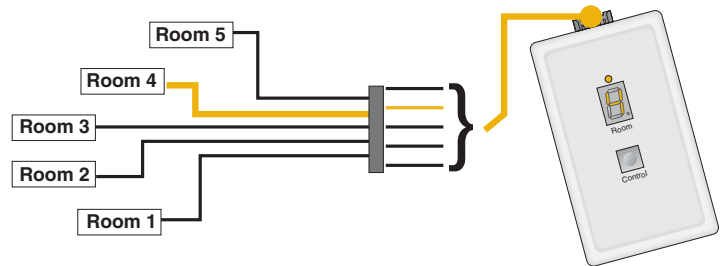
The “Room-ID” tester matches the module 5-wire connector with the respective room thermostats.

Room number ID connectors are attached to the plugs that are installed in the individual rooms or thermostats. Up to 6 rooms and their thermostats can be identified with a single set-up. The incoming wires at the module are then connected to the tester with the installed plug, one at a time. Pressing the test button displays the number of the room which is served by the individual wire and the green LED should light up.



Example

Room number 4 identification connector is plugged in at Room Number 4. Pressing the test button displays Room Number 4.



Important: The green LED should light up together with the room number display. This indicates that the wiring and connector are O.K. (See Troubleshooting).

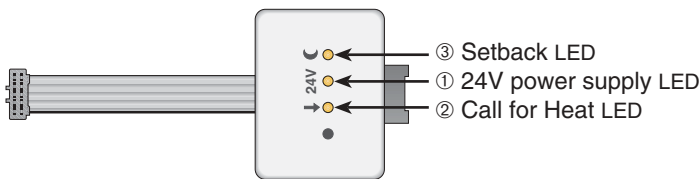
Power Supply:

The Room-ID operates with a 9V battery which is to be installed in the battery compartment. Pressing the test button should illuminate a clear and bright “Zero” in the room number display.

Troubleshooting:

- *If the green LED does **not** light up when the test button is pressed, but a room number is displayed:*
Check wiring connections; one or several conductors may not be connected properly. The displayed room number in this case will be incorrect.
- *Display does not light up when the test button is pressed:*
Check that a battery is installed and make sure the battery charge is OK.

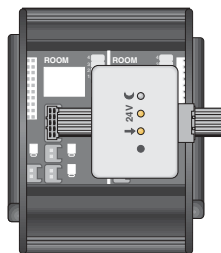
StatLink® Diagnostic Indicator (#44110)



Function Test – 2-Zone (Power) Module #40190 & 40180

Insert the Control-Check adapter into one of the two 5-wire sockets in the 2-zone module, connect the 5-wire from the thermostat into the adapter.

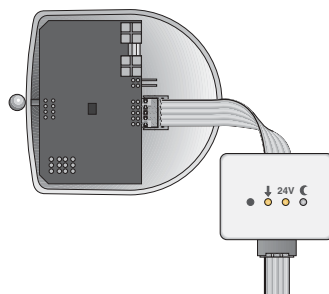
- ① If the power supply is adequate, the 24V LED will light up.
- ② Adjusting the temperature at the thermostat tests the signal to the zone motor. The ↓ LED will light up when the thermostat calls for heat.
- ③ The ☾ LED will be lit only when in automatic setback mode e.g. through the Timer Module (#40170) or the timer thermostat (#46155)



Function Test – Room Thermostat #46151/46153/46155

Insert the Control-Check adapter into the socket in the thermostat, connect the 5-wire from 2-zone module into the adapter.

- ① The 24V LED will light up if the power supply is adequate.
- ② Adjusting the temperature at the thermostat tests the signal to the zone motor. The ↓ LEDs will light up when the thermostat calls for heat.
- ③ The ☾ LED will be lit only when in automatic setback mode e.g. through the Setback Module (#40170) or the Timer Thermostat (#46155). It will also be lit when the Setback Thermostat (#46153) is in manual setback mode.



Troubleshooting:

• *Ref. (1) - 24V LED display does not come on:* Make sure the power module is wired and 24V power supply (transformer) is functioning.

• *Ref.(2) - ↓ LED. The 24V LED comes on but not the ↓ LED.* The fuse is blown on the thermostat or powermodule. It is also possible that the thermostat is defective and must be replaced.

Caution: In setback mode or during sun exposure, the set point of the thermostat may not be within an adjusting range. In these specific circumstances it will not be possible to change the indicator LED by turning the thermostat dial.

Setback mode LED

#46155

• *Ref.(3) - Power Supply LED is lit, and the #46155 selector switch was turned to “moon” but the “moon” LED does not light:* The thermostat is defective and must be replaced.

#46153

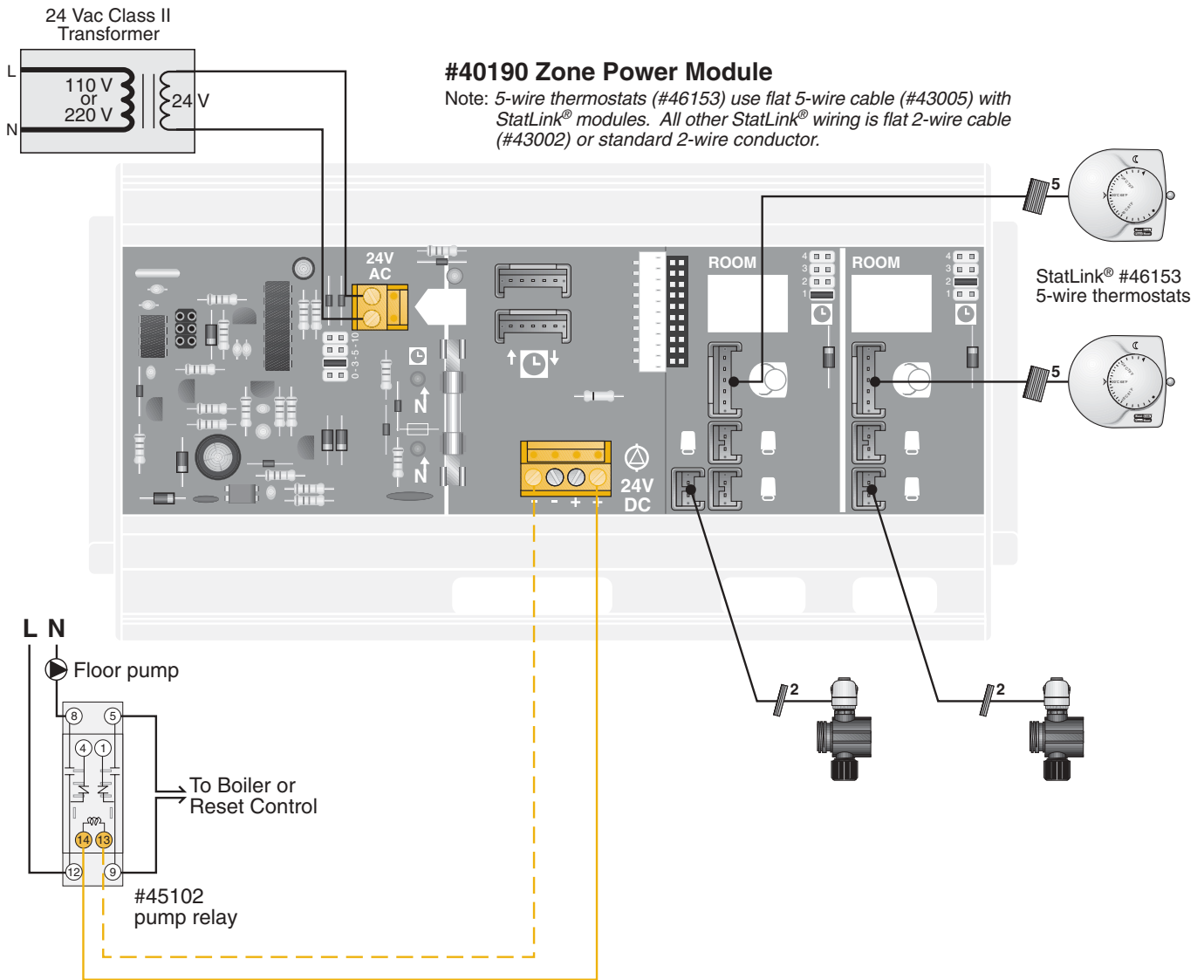
• *Ref.(3) - Switching the #46153 thermostat to “moon” should not light up the “moon” LED:* If the LED lights up then there is a setback signal from the setback timer module or the clock room thermostat.

#40180

• *Ref.(1,2,3) None of the LEDs light up if the Diagnostic Indicator is inserted into a 5-wire receptacle of a #40180 or #40190 module:* Check the power supply.

• *Ref.(2) Power supply LED is lit but the ↓ LEDs are not:* Check that the incoming thermostat plug is pushed properly into the Diagnostic Indicator and that the indicator’s plug is inserted into the thermostat. The fuse could be blown on the thermostat or power module. If there are still no signals, check out the wiring between the adaptors and the room check plug.

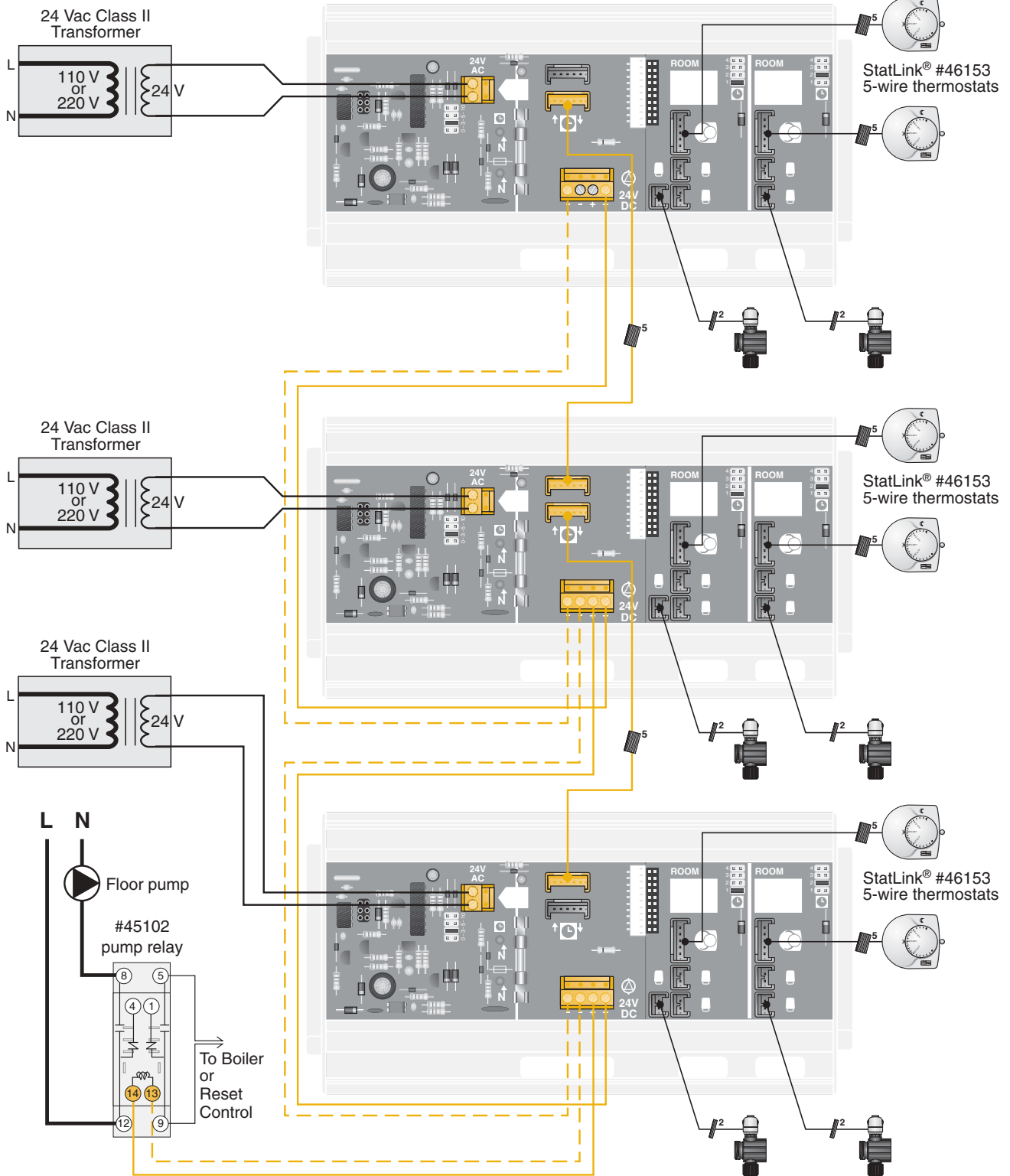
Application: Connecting a single #40190 Power Module to a 24V_{dc} Relay.



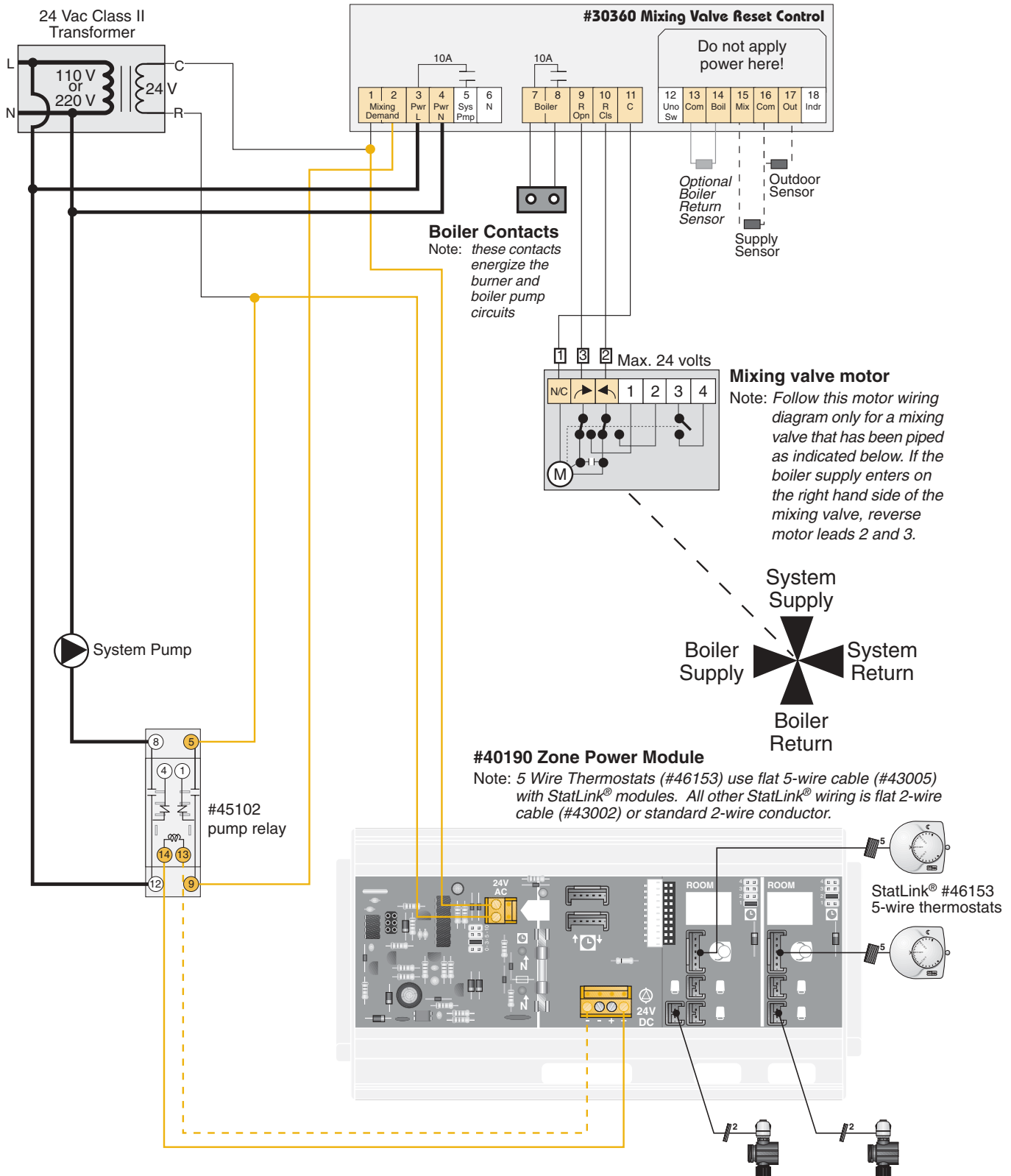
Application: Connecting Multiple #40190 Power Modules to a 24V_{dc} Relay.

#40190 Zone Power Module

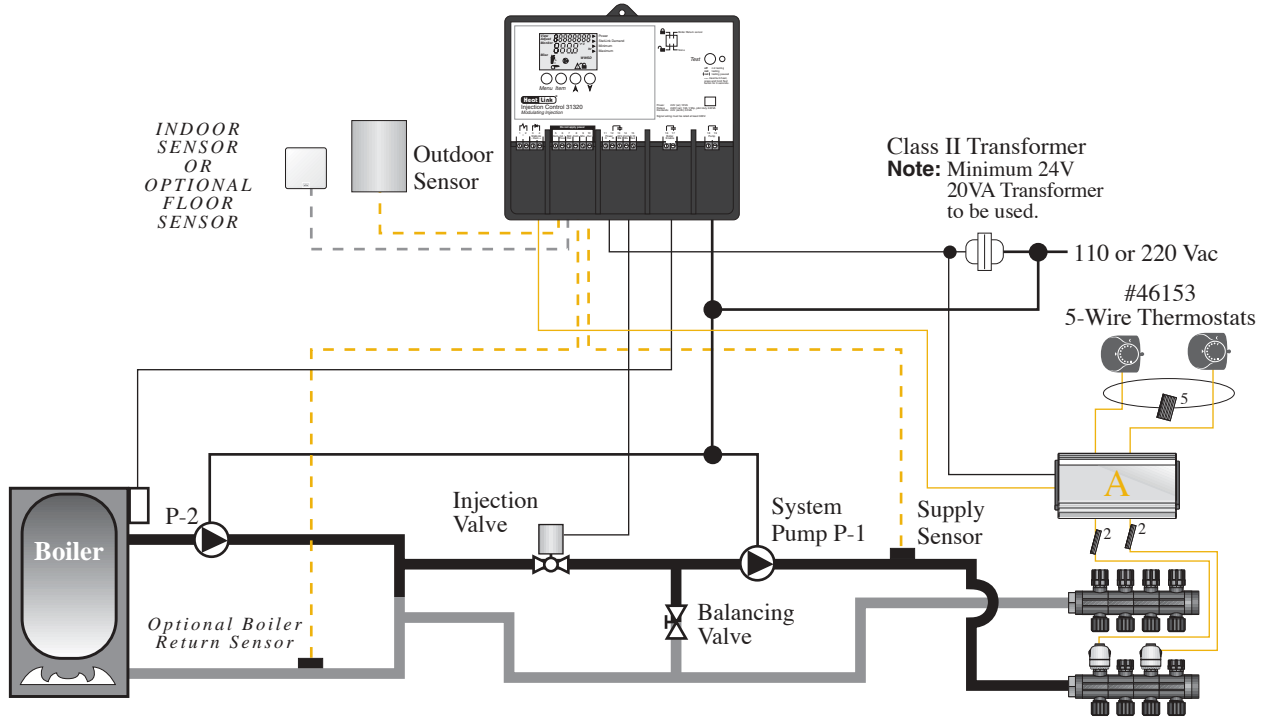
Note: 5-wire thermostats (#46153) use flat 5-wire cable (#43005) with StatLink[®] modules. All other StatLink[®] wiring is flat 2-wire cable (#43002) or standard 2-wire conductor.



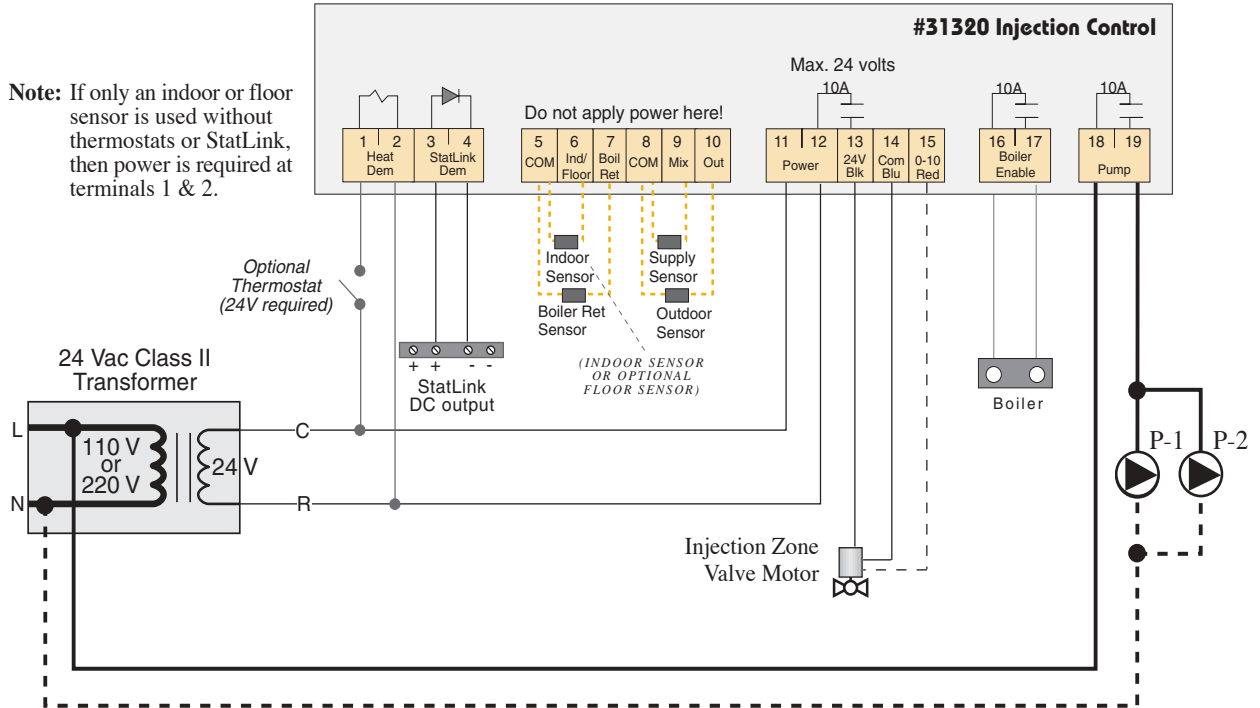
Application: Connecting #40190 Power Module with #30360 Indoor-Outdoor Control.



Application: Injection mixing control activating secondary pump for the low temperature manifold circuit. Boiler c/w system pump (P-1) and primary pump (P-2).



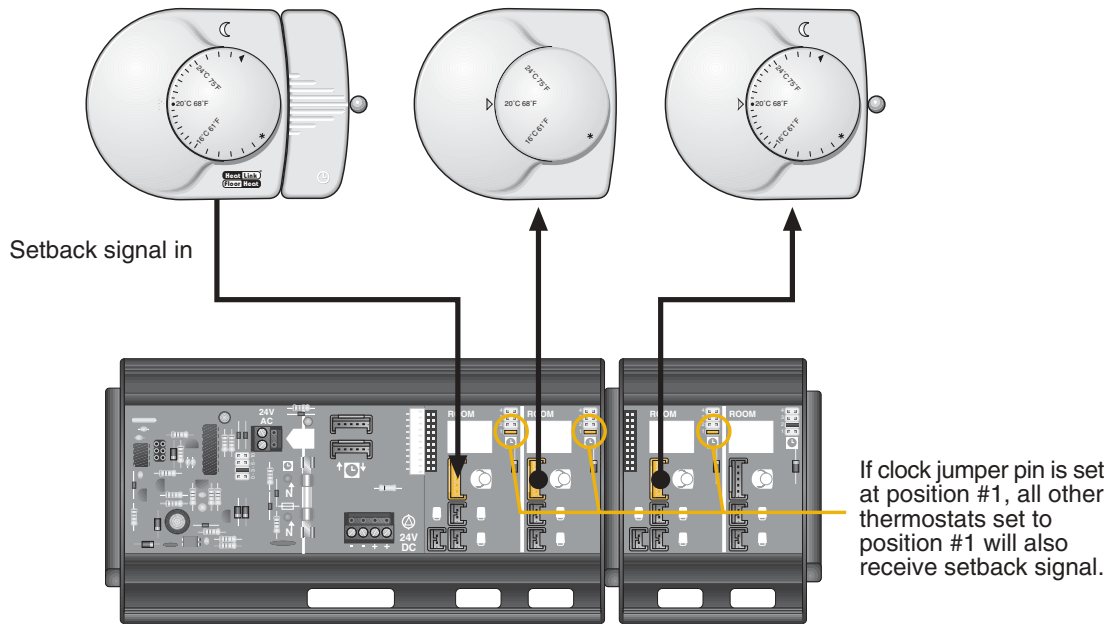
A (#40190) 2 Zone Power Module (Manifold #1)
 Note: 5 Wire Thermostats (#46153) use flat 5-wire (#43005) cable with StatLink modules. All other StatLink wiring is flat 2-wire (#43002 or standard 2-wire conductor).



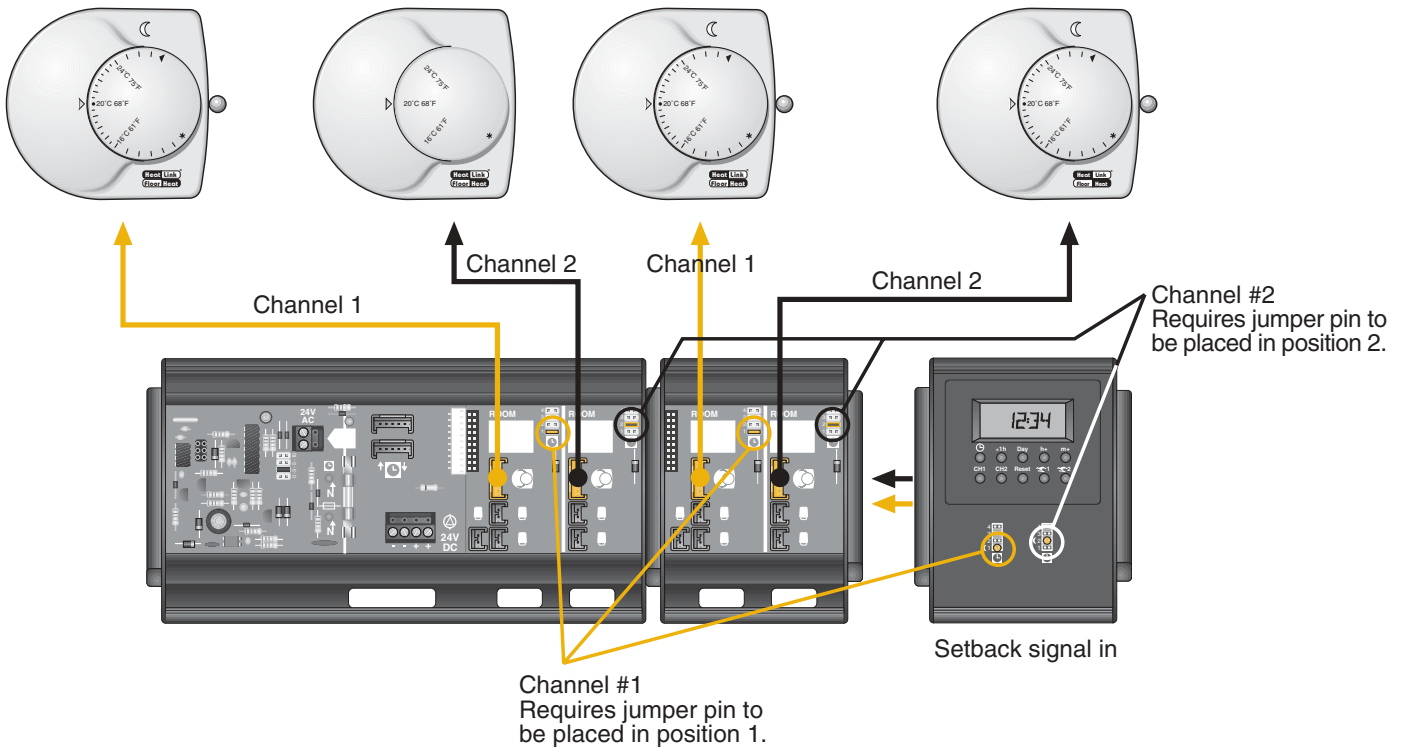
Note: If only an indoor or floor sensor is used without thermostats or StatLink, then power is required at terminals 1 & 2.

Note: This is only a concept drawing. The designer must determine whether this application applies to the system. Design must comply with local code requirements. Necessary equipment and other safety and limit devices must be added.

Circuit for Temperature Setback via the StatLink[®] Digital Timer Thermostat (#46155)



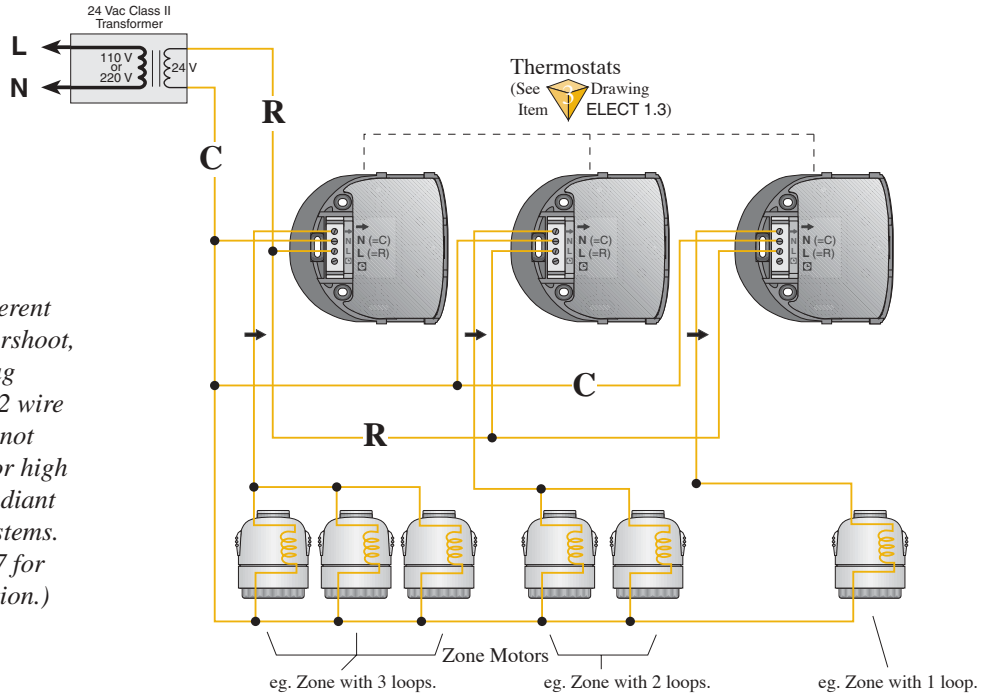
Circuit for Temperature Setback via the StatLink[®] Setback Module (#40170)



Standard HeatLink[®] Thermostat (#46131) Wiring (3 Wire)

Application: Zone motors & 3 wire thermostats with internal resistor for heat anticipation

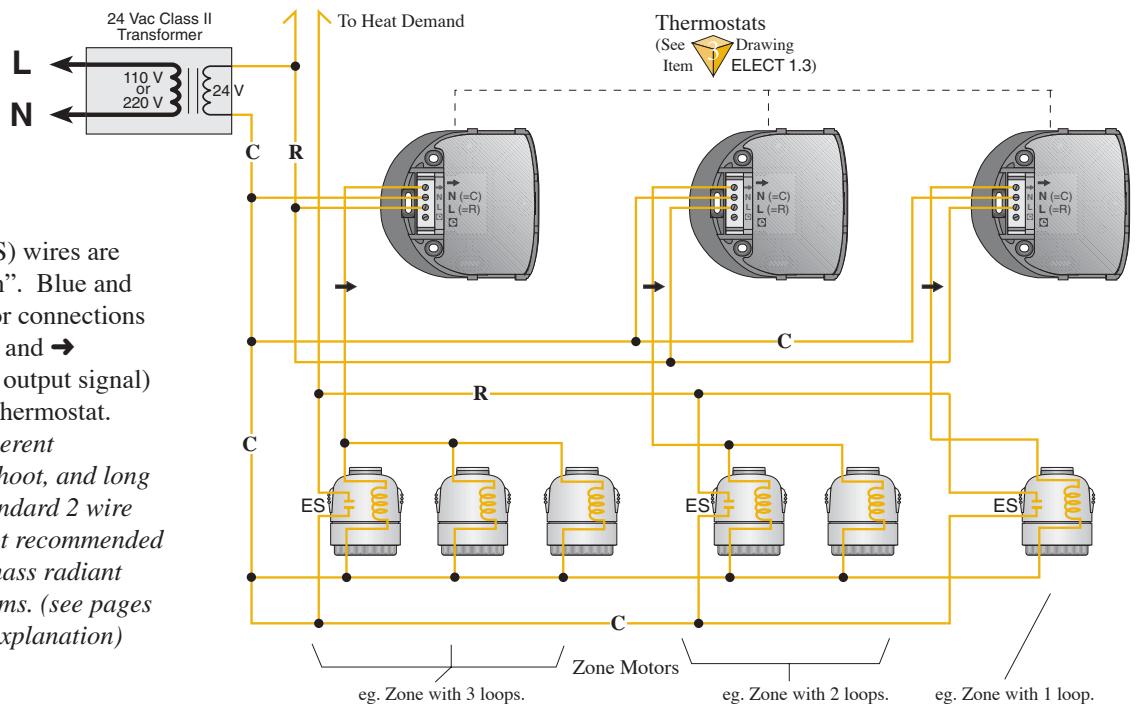
Note: Due to their inherent temperature overshoot, and long lead/lag times, standard 2 wire thermostats are not recommended for high thermal mass radiant floor heating systems. (see pages 6 & 7 for further explanation.)



Standard HeatLink[®] Thermostat Wiring (3 Wire) c/w End Switch Tie-In to Relay

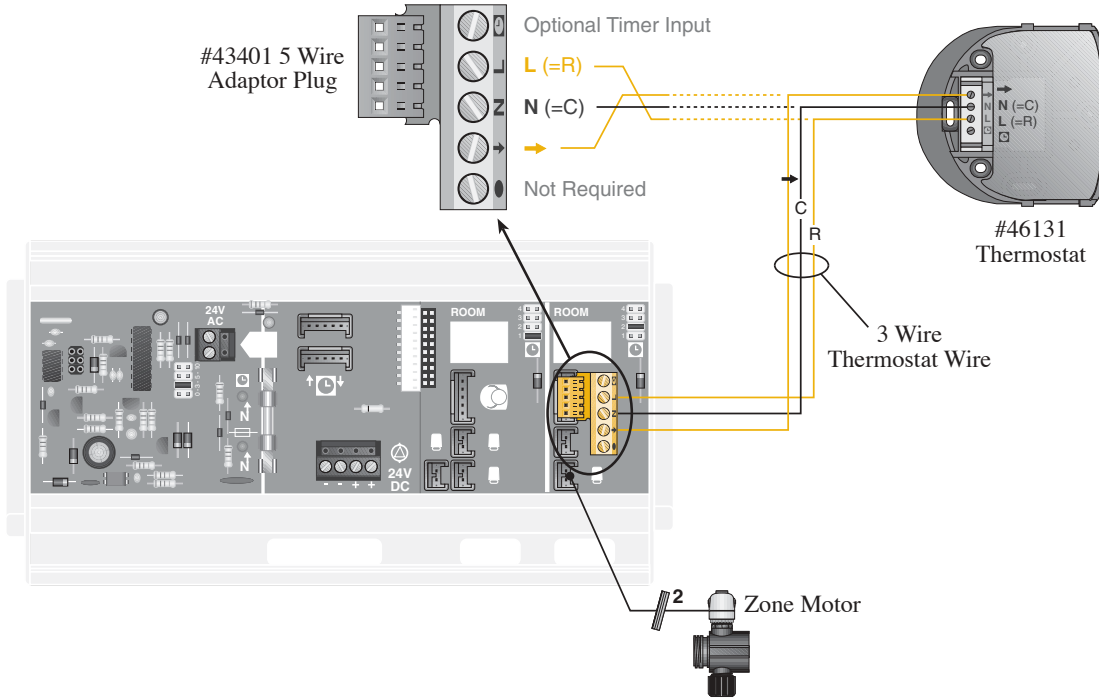
Application: Zone motors c/w end switch contacts & 3 wire thermostats with connection to a 24Vac Relay.

Note: ① End Switch (ES) wires are color coded "green". Blue and brown wires are for connections to the transformer, and → (thermostat power output signal) connection to the thermostat.
 ② Due to their inherent temperature overshoot, and long lead/lag times, standard 2 wire thermostats are not recommended for high thermal mass radiant floor heating systems. (see pages 6 & 7 for further explanation)



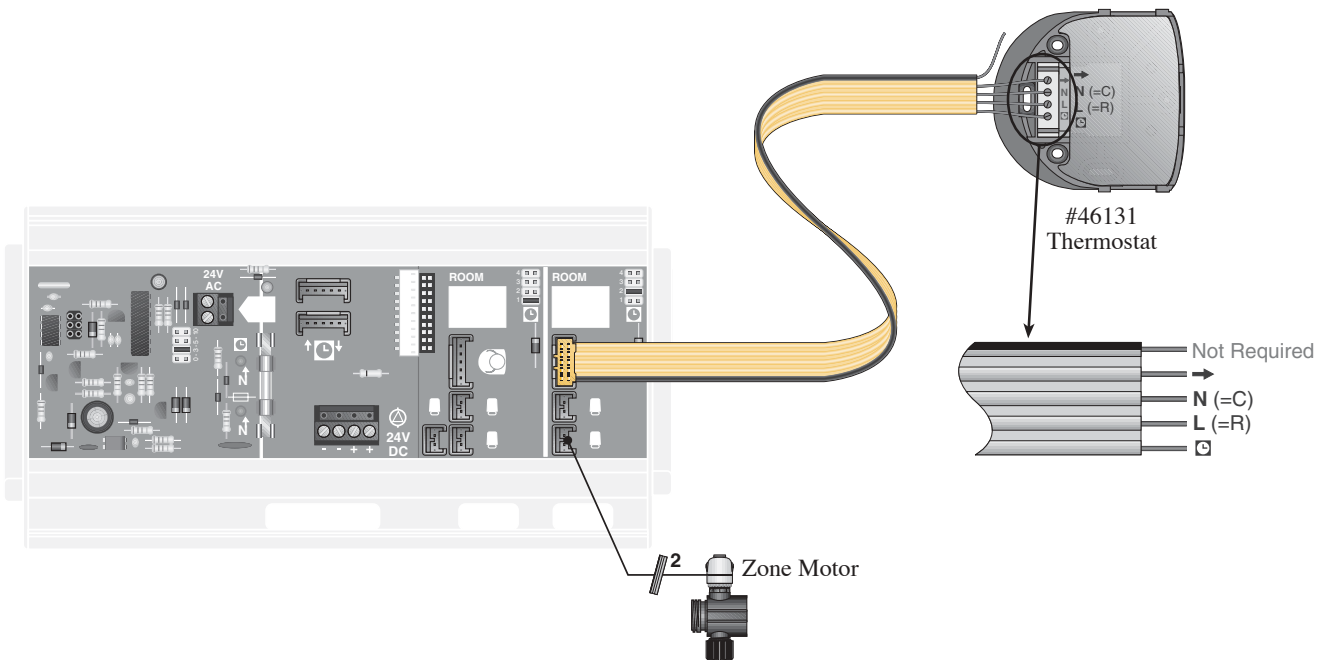
Standard Thermostat Wiring (3 Wire) to Power Module using Adaptor Plug

Application: Connecting #46131 3-Wire Thermostat to #40190 Power Module using #43401 adaptor plug.



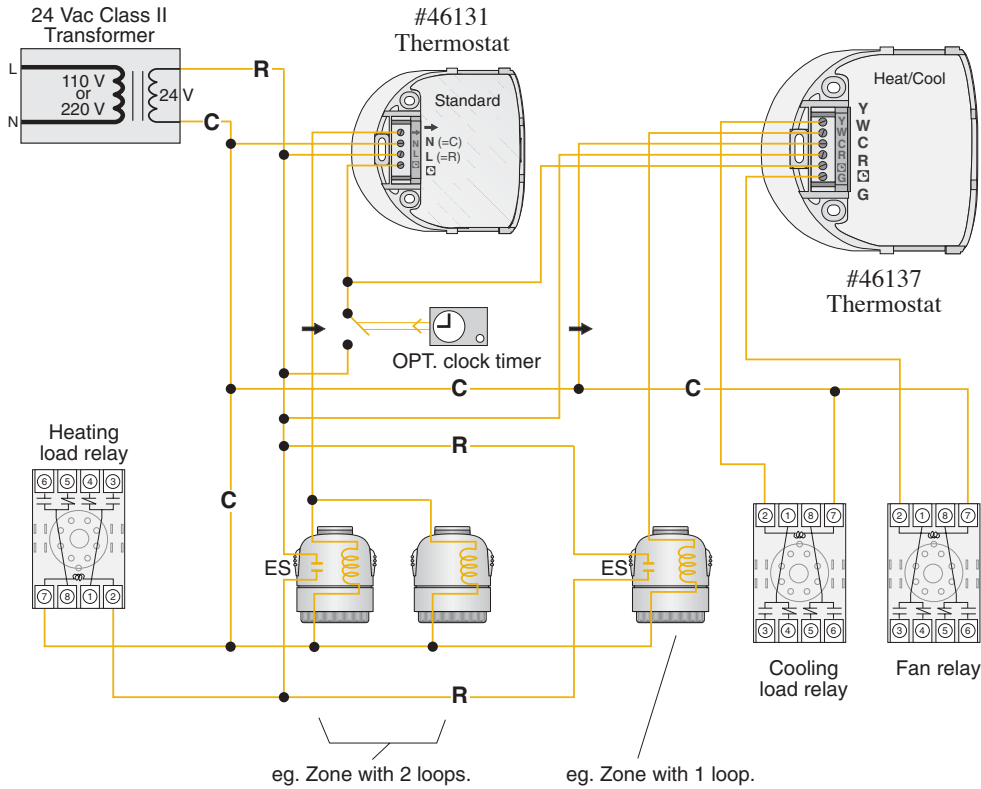
StatLink[®] Power Module Wiring (5 Wire) to Standard Thermostat

Application: Connecting #46131 3-Wire Thermostat to #40190 Power Module using #43005 5-wire flat cable.



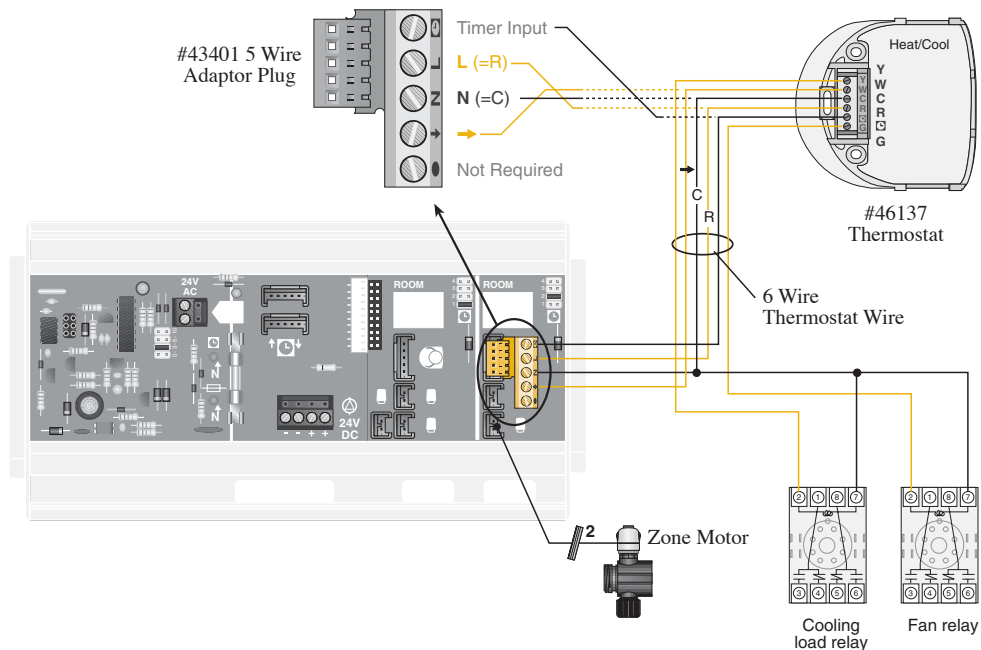
HeatLink[®] Heat/Cool (#46137) Thermostat Wiring (6 Wire)

Application: Zone motors c/w end switch contacts & #46130 series thermostats connecting to heating, cooling, and fan relays.



HeatLink[®] Heat/Cool (#46137) Thermostat Wiring (6 Wire)

Application: Connecting #46137 Heat/Cool Thermostat to #40190 Power Module using #43401 adaptor plug.





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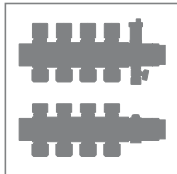
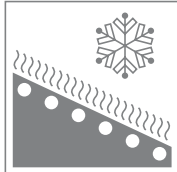
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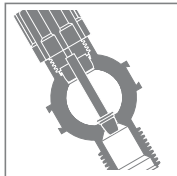


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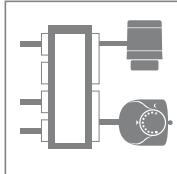
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