

RCS

MODEL ZC4

4 ZONE HVAC CONTROLLER

INSTALLATION AND OPERATION MANUAL

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5/05/03

INTRODUCTION

The 4 Zone HVAC Controller series allows up to 4 standard electronic thermostats to independently control the temperature in up to 4 “zones” or areas of a building using a single heating and cooling mechanical system. Temperature control is achieved by opening or closing motorized dampers in forced air systems or valves in hydronic systems.

The 4 Zone HVAC Controller is compatible with Standard or Heat Pump HVAC systems.

For Standard HVAC systems, the controllers work with any residential style single stage heat, single stage cooling systems. (Note: for split systems with separate power supplies, an external relay is required).

For Heat Pump HVAC systems, the controllers work with any residential style two stage heat, single stage cooling systems. The controllers can work with systems with either changeover with cooling (O) or heating (B) inputs.

The four zones are truly independent and can be in any mix of heating or cooling modes. The controllers feature auto changeover from heating to cooling modes and gives Heat calls priority.

The operation of these controllers is fully automatic and transparent to the user. Each zone thermostat provides the complete control for that zone. You can think of each zone as a separate heating/cooling system.

REMEMBER: YOUR **THERMOSTAT** DETERMINES THE OPERATION OF THE HEATING AND COOLING SYSTEM AND YOU SHOULD REFER TO YOUR **THERMOSTAT MANUAL** FOR INFORMATION ON HOW TO “OPERATE” THE SYSTEM.

SHORT CYCLE PROTECTION DELAY. The controllers provide a 5-minute delay between successive compressor operations for short cycle protection. This delays one zone from calling for compressor operation shortly after another has stopped and prevents potential damage to the compressor due to rapid off-on cycling. Most thermostats also have built-in short cycle protection delays, so remember these compressor cycle delays are normal when trouble shooting the system. For testing purposes, you can reset the controller’s 5 min delay by removing power from the controller.

THERMOSTATS

The controllers work with most thermostats. Use standard thermostats for Gas/Electric HVAC systems and Heat Pump thermostats for Heat Pump HVAC systems. Use only electronic thermostats, either normal or set-back, that are **battery operated** or that use **BOTH sides of the 24VAC** power from the HVAC system.

DO NOT USE POWER STEALING THERMOSTATS. Typically these thermostats “steal” power from the “W” or Heat connection on the HVAC system. THESE WILL NOT WORK.

Also do not use older style mechanical thermostats that use “anticipator” circuits, as these will not function properly.

Thermostats connect to the zone controllers the same as they connect to HVAC systems.

HVAC SYSTEMS

The controllers are designed to work with most residential style heating and cooling systems. These include forced air gas heating systems, electric heating systems, split systems, cooling only systems, and heat pumps. They will also work with circulating hot and/or chilled water systems.

For standard systems, one stage of heating and one stage of cooling are provided. For Heat Pumps, two stages of heat (stage one = compressor output (Y), stage two = heat output (W)) and one stage of cooling (stage one = compressor (Y) + changeover valve (CO)) are provided. Changeover with heat or cooling can be selected.

NOTE FOR HEAT PUMP SYSTEMS: *You cannot use the Emergency Heat (EH) switch on the thermostats for EH mode. To get EH function (no compressor output), you must set the EH mode (dipswitch 1 position 4) on the ZC4 control unit only. This will give you Emergency Heat function.*

The controllers connect to the HVAC systems at their standard thermostat connections and function just like a thermostat to the system.

ZONE DAMPERS/VALVES

The controller provides independent control of temperature by regulating the flow of conditioned air to the zones by dampers or by controlling water flow by valves. The system uses two position, on/off control.

DAMPERS

The controllers are designed to work with normally open, two position, spring return, 24VAC, 2 wire motorized dampers, such as the **ZTECH RD** series of round motorized dampers. These dampers draw .5A each. Normally open dampers are used to provide fail-safe operation, assuring condition air will be available even if a damper fails. When a zone calls, all other dampers for zones not calling are closed. Maximum rating for dampers per zone is 1.0 A.

VALVES

For water based heating systems, each zone controls a two position, spring return, 24VAC, 2 wire motorized valve. Maximum rating for valves per zone is 1.0 A.

THERMAL EQUALIZER FEATURE

The ZTE version of the controllers includes the exclusive patented *THERMAL EQUALIZER* feature. This is used in two story, forced air applications to reduce the effects of heat stratification. Heat rises naturally and during heating cycles the upstairs zone tends to overheat. This loss of heat to the upstairs keeps the downstairs zone cooler and calling for more heat. This process continues until the upstairs is uncomfortably hot and the downstairs is still calling for more heat.

To balance this natural phenomena, the *THERMAL EQUALIZER* feature will monitor the length of time the heat has been calling downstairs and after a selectable time period, will stop the heat call and recycle the overheated upstairs air back down to the downstairs zone. This “equalizer cycle” will reduce the heat buildup upstairs and put the heat back downstairs where it is still needed. The net effect is a more comfortable temperature in the upstairs zone and an energy saving reuse of the excess heat in the downstairs zone.

The Thermal Equalizer feature monitors Zone 1 for heat run times and this zone must be the “downstairs zone”. When the Thermal Equalizer cycle is on, the Zone 2 damper will be closed and the high speed fan turned on. Zone 2 must be the “upstairs zone”. Zones 3 and 4 are not affected by the equalizer cycle.

INSTALLATION

Install the controller near the HVAC mechanical system or in a convenient indoor service location, such as the garage, basement, closet or utility room.

Mount the controller to the wall or structural bracing. Mounting the controller onto the HVAC unit is possible but generally not desirable due to the potential for excessive vibration and heat.

Wiring

Use standard 18GA thermostat wiring to connect the thermostats to the controller and the controller to the mechanical system.

Power

The controller requires external 24VAC power transformer connected to power input terminal J8. DO NOT USE POWER FROM THE HVAC SYSTEM. With a 4 zone system, the power requirement may exceed the HVAC system's available 24VAC supply rating.

Install a transformer that is sized to provide adequate power for the number of dampers/valves being used in your system. Calculate the maximum damper/valve current load and add .1 amp for the controller itself. For example: 3 dampers at .5A each, plus .1 for the controller equals 1.6A times 24VAC or 38.4VA. This calls for a 40VA transformer. 6 dampers plus .1A equals 3.1A or 74.4VA so a 75VA transformer would be required.

BE CAREFUL TO CALCULATE THIS CORRECTLY AND INSTALL THE PROPER SIZE TRANSFORMER.

The controller is supplied with a 3A fuse. Change this fuse if your damper load calculation shows a larger rating is required.

Thermostat Wiring

Connect the zone thermostats to their respective zone input terminals, J1 to J4. Both the 24VAC Common (C) and 24VAC (R) power is available at these terminals. Only the 24VAC (R) terminal is required for proper input from the thermostats. The 24VAC Common (C) is provided for thermostats that require power from the system.

Fig 1. STANDARD THERMOSTAT WIRING

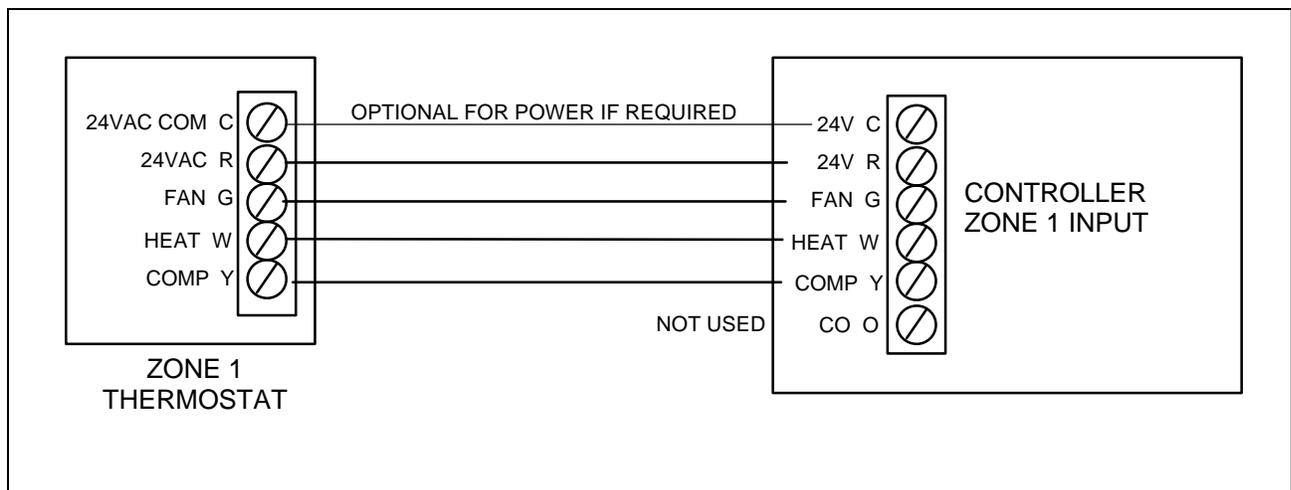
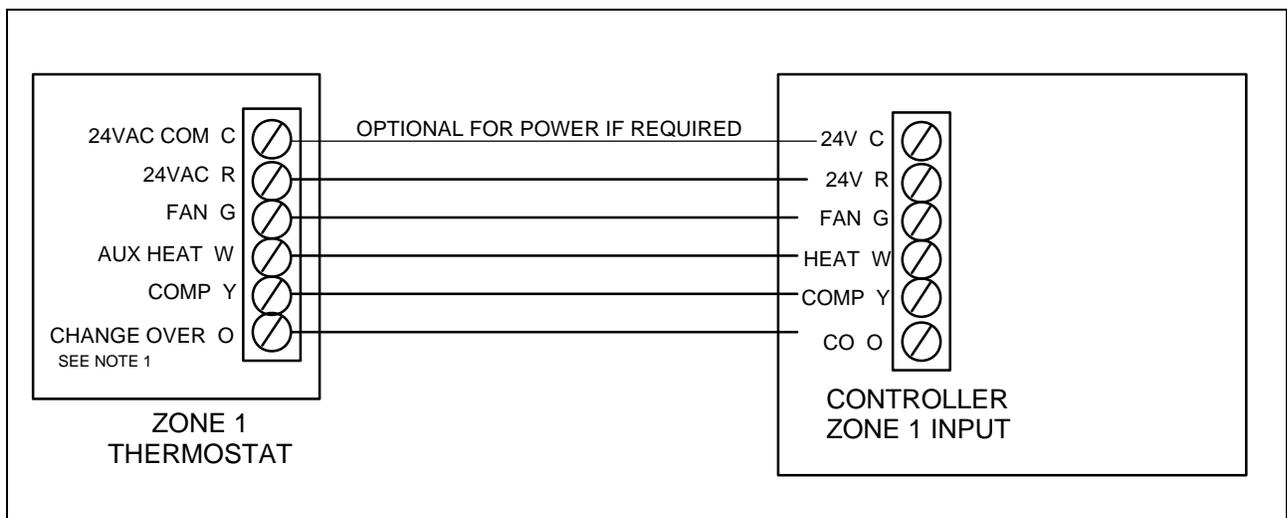


Fig 2. HEAT PUMP THERMOSTAT WIRING



NOTE 1: CHANGE OVER TERMINAL SELECTION: Heat Pump systems have a changeover valve (or reversing valve) that switches the HVAC system mode from heating to cooling. Two types are used: Change over with Cooling (most common) and changeover with Heating. **YOU MUST KNOW WHAT TYPE YOUR SYSTEM IS.** If this is a retrofit application, note carefully the existing wiring to the thermostat O or B terminal. Otherwise refer to your HVAC system manuals.

Once the changeover type is known, you must select the thermostat's output and set the controller to match this type. Thermostats may have an "O" and a "B" terminal. "O" terminals are for changeover with cool, and "B" terminals are for changeover with heat. **SELECT THE ONE THAT MATCHES THE MECHANICAL SYSTEM TYPE AND ALSO SET DIPSWITCH POSITION 3 TO THE CORRECT TYPE.**

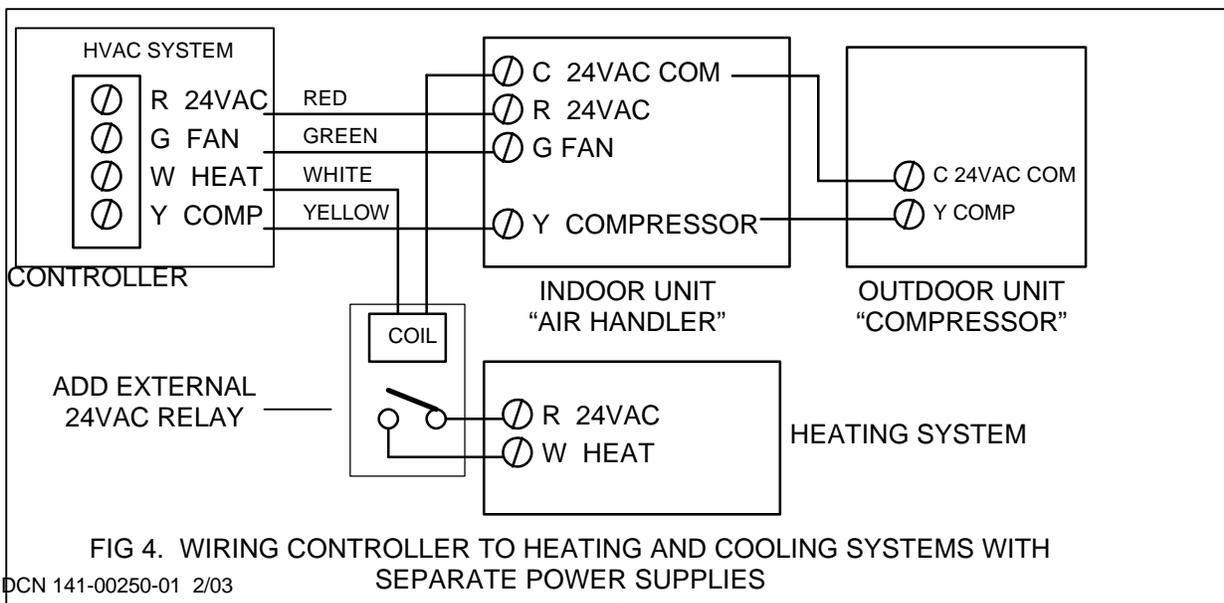
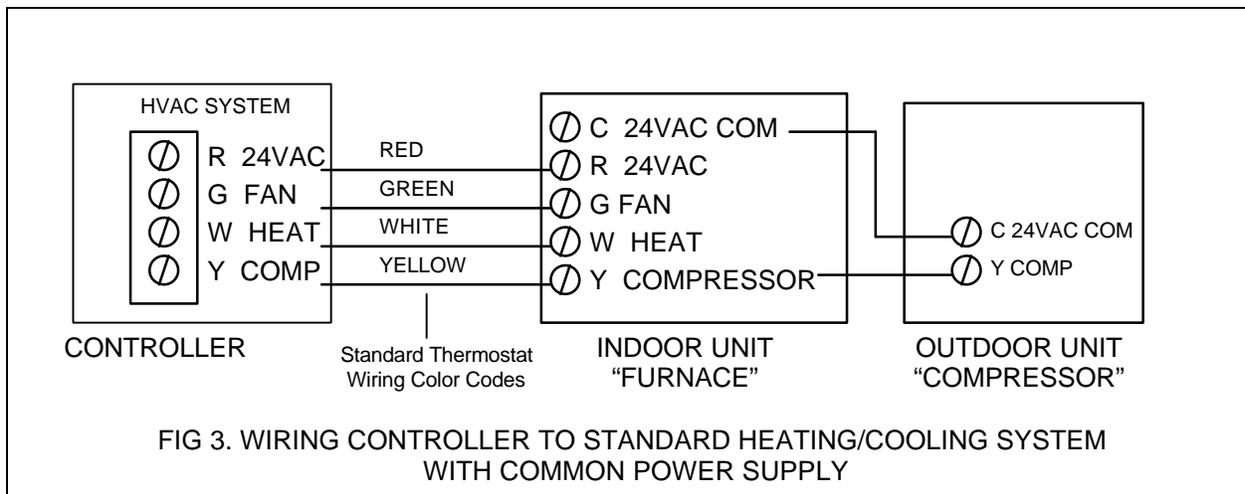
HVAC System Wiring

The ZC4 controller connects to the HVAC mechanical systems at the normal thermostat terminals on the HVAC unit.

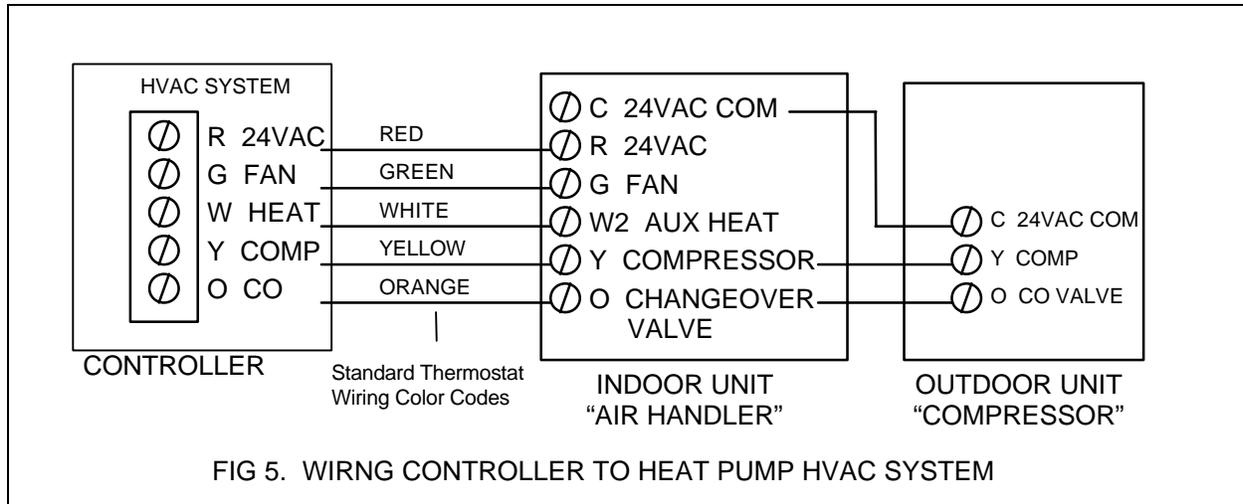
WIRING STANDARD HEATING COOLING SYSTEMS

Connect the controller to the HVAC system by wiring from the HVAC System terminal, J5, to the normal thermostat connection on the HVAC system. Most HVAC systems have a common heating/cooling power supply and are wired as shown in Fig 3.

For those systems that have separate heating and cooling power supplies, an additional external relay is required. Wire as shown in Fig 4.



WIRING HEAT PUMP HVAC SYSTEMS



DIPSWITCH SETTING

The controller has a configuration dipswitch, SW1. Set the dipswitch as follows.

SW1 Position 1: Standard or Heat Pump System Select

Select OFF for Standard systems, ON for Heat Pump Systems

SW1 Position 2: Fan Mode Select

Select OFF for Standard Fan (No fan with Heat, Fan with Cool)
Select On for Fan with Heat (Fan with Heat or Cool)

SW1 Position 3: Changeover Valve Mode Select (For Heat Pump Systems only)

Select OFF for changeover with Cool (CO/CL)
Select ON for changeover with Heat (CO/HT)

SW1 Position 4: Normal/Emergency Heat Mode Select (For Heat Pump Systems only)

Select OFF for Normal operation.

Select ON for Emergency Heat Mode. Heat calls will bypass Stage 1 Heat compressor call and go directly to Stage 2 Aux Heat. For use by service technician in case of compressor failure to provide backup heating.

SW1 Position 5&6: Thermal Equalizer Mode Select

These two dipswitch positions determine the length of time the equalizer cycle will run after it has been tripped on by the Heat Run Time timeout.

SW1 Positions 7&8: Thermal Equalizer Heat Run Time Mode Select

These two dipswitch positions determine the length of time that a Zone 1 Heat Call can be on before it times out and is interrupted by an equalizer cycle.

FIG 5. DIPSWITCH SW1
EQUALIZER RUN TIME
SETTINGS

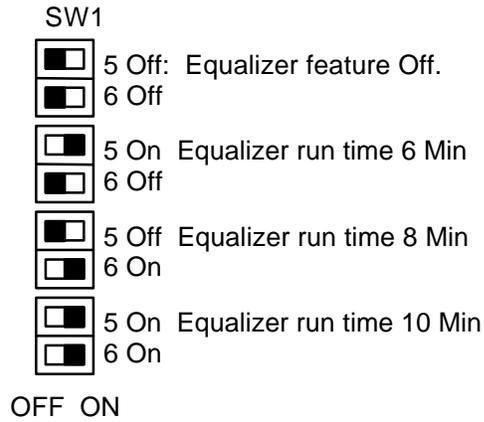
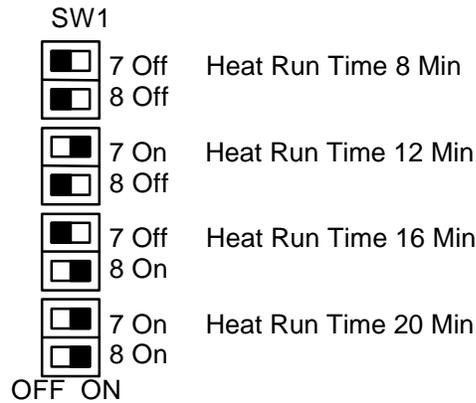


FIG 6. DIPSWITCH SW1
EQUALIZER HEAT RUN TIME
SETTINGS



STATUS LED

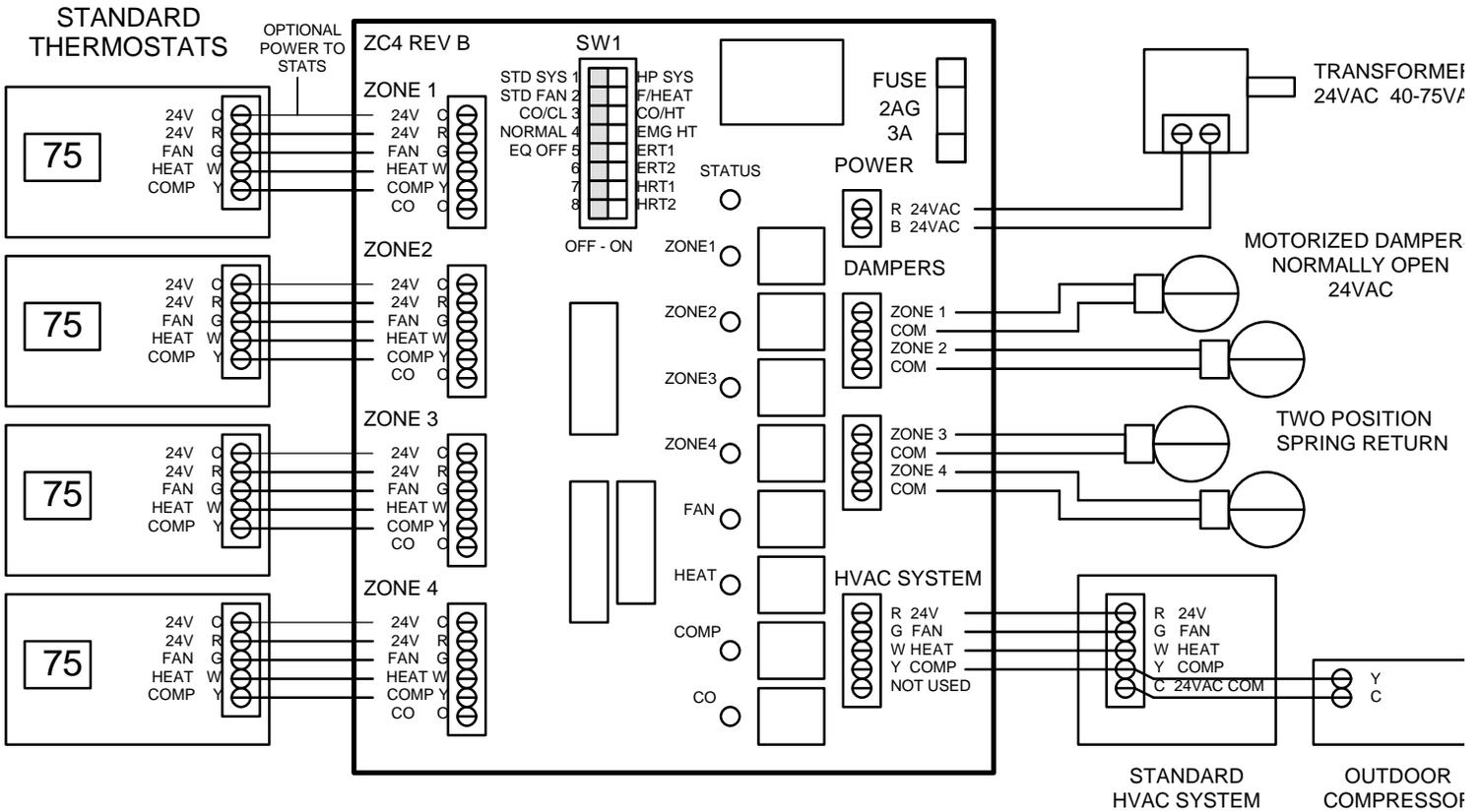
The status LED will flash one time every second for normal operation. During certain other modes of operation the LED will flash differently to indicate these modes. See table below.

LED Flash Modes

One Flash	Normal Operation
Two Flashes	Equalizer Cycle On
Three Flashes	Short Cycle Protection Delay On. (Compressor output inhibited)

WIRING DIAGRAM

- For Standard HVAC Systems
- One Stage Heat, One Stage Cool
- Standard Thermostats
- Thermal Equalizer Feature



SW1 DIP SWITCH SETTINGS

SW1-1 STD OR HP SYSTEM SELECT 1 <input type="checkbox"/> OFF - Standard HVAC System 1 <input checked="" type="checkbox"/> ON- Heat Pump HVAC System	SW1-2 FAN MODE SELECT 2 <input checked="" type="checkbox"/> Standard Fan 2 <input type="checkbox"/> Fan w/Heat	SW1-3 CHANGEOVER MODE SELECT 3 <input checked="" type="checkbox"/> Not used with Std Systems 3 <input type="checkbox"/>	SW1-4 EMERGENCY HEAT MODE 4 <input checked="" type="checkbox"/> Not used with Std Systems 4 <input type="checkbox"/>
SW1-5,6 EQUALIZER MODE SELECTION 5 <input checked="" type="checkbox"/> 6 <input type="checkbox"/> Equalizer OFF 5 <input checked="" type="checkbox"/> 6 <input type="checkbox"/> Equalizer Run Time = 6 Min 5 <input checked="" type="checkbox"/> 6 <input type="checkbox"/> Equalizer Run Time = 8 Min 5 <input checked="" type="checkbox"/> 6 <input type="checkbox"/> Equalizer Run Time = 10 Min		SW1-7,8 HEAT RUN TIME SELECTION 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> Heat Run Time = 8 Min 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> Heat Run Time = 12 Min 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> Heat Run Time = 16 Min 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> Heat Run Time = 20 Min	

Note: There is a 2 Min Minimum Heat Run Time (MHRT). If the Heat Call is terminated during this period, no Equalizer cycle will be started at the end of the call. If the Heat Call last longer than the MHRT, but less than 8 Min, then an Equalizer cycle will be started at the end of the call.