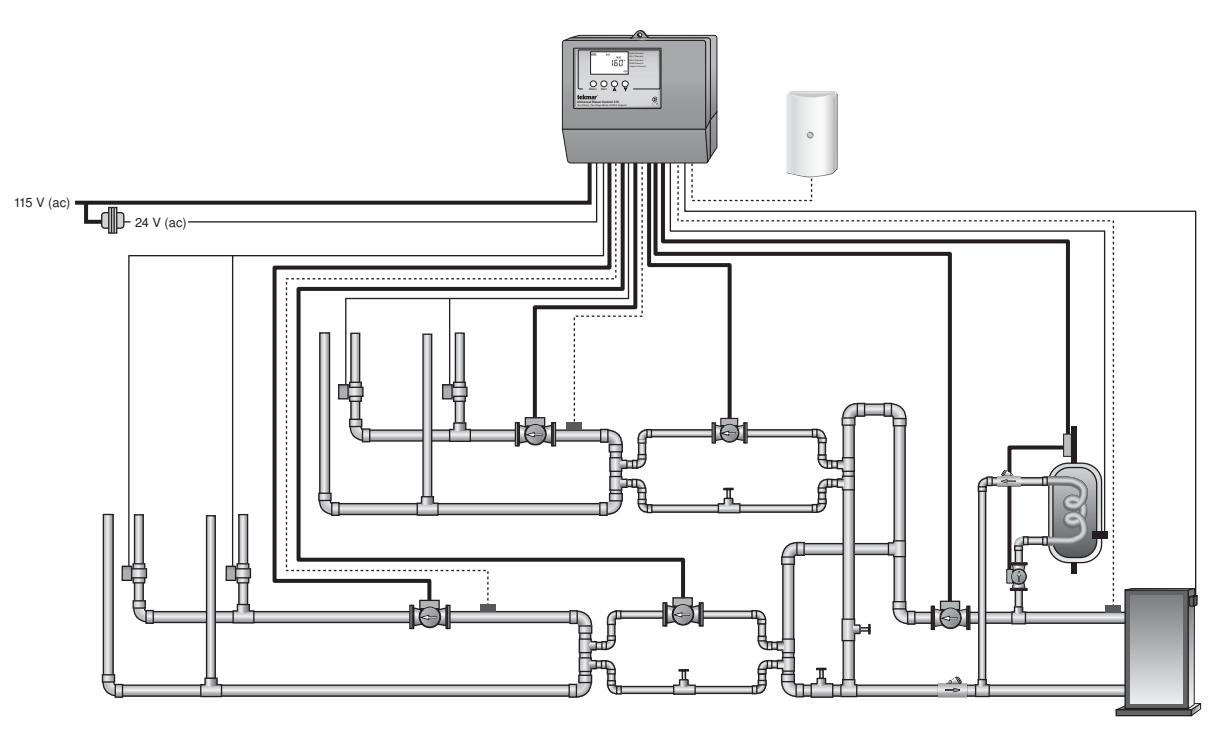
# tekmar® - Application Brochure

Universal Reset Control 374

**A 374**

03/09




### *Features of the Universal Reset Control 374*

Please refer to Essay E 005: Control Functions and Benefits for a detailed description of these features.

- Outdoor Reset
- Characterized Heating Curve
- Warm Weather Shut Down
- Boiler Outdoor Reset
- Boiler Differential (Automatic)
- Boiler Minimum Supply
- Boiler Post Purge
- Fire Delay
- Boiler Mass
- Boiler Enable
- DHW Boiler Reset Override
- DHW Priority
- DHW Priority Override
- DHW Post Purge
- DHW Mixing Purge
- Setpoint Boiler Reset Override
- Setpoint Enable
- Setpoint Priority
- Mixing Outdoor Reset
- Floating Action Output
- Variable Speed Output
- Boiler Protection
- System Protection
- Boiler Load Reset
- Pump / Integrated Exercising
- Internal Setback Timer

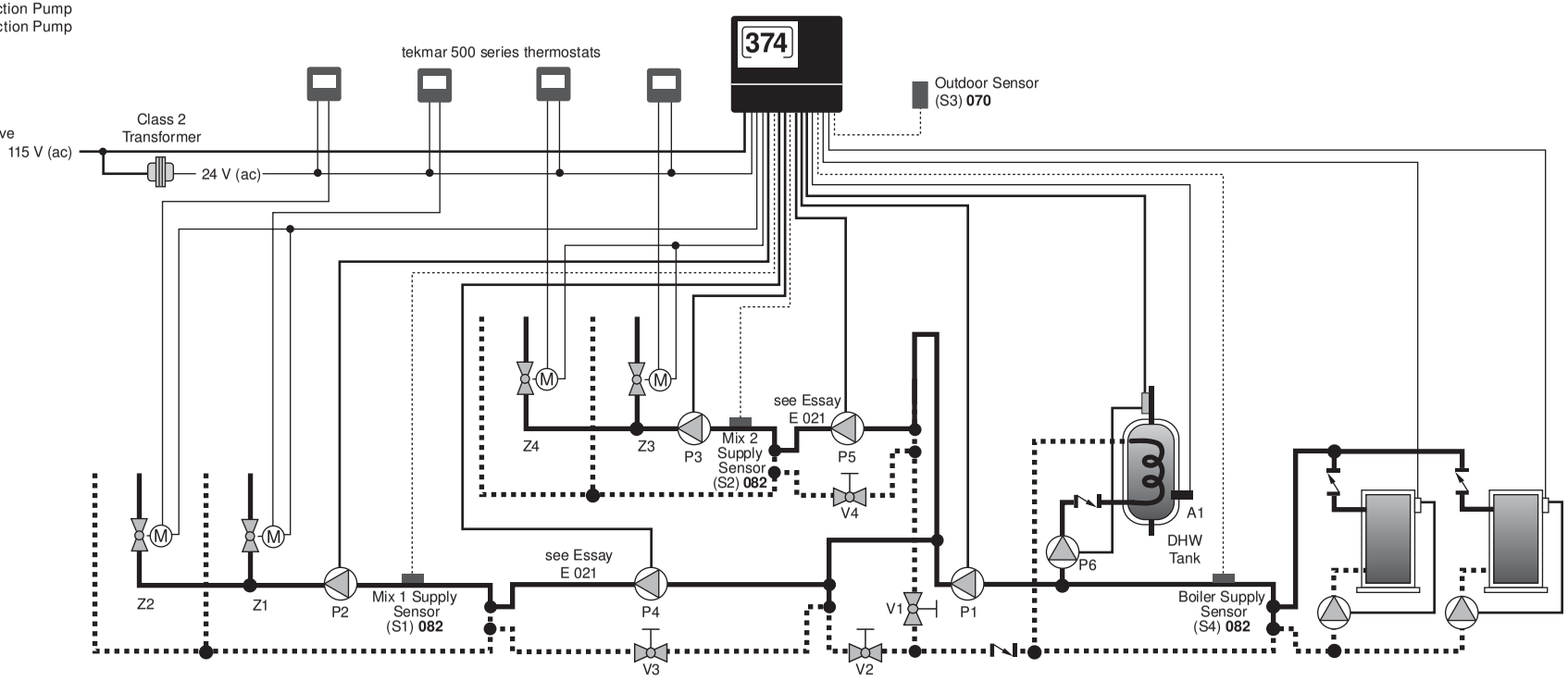
### *Application*

The tekmar Universal Reset Control 374 is designed to maximize the comfort and efficiency provided by a hydronic heating system. The control automatically adjusts the boiler and mix water temperatures that are delivered to the heating system by using outdoor reset. The 374 control can control two separate on / off stages (or one low / high fire) to provide outdoor reset while providing equal run time rotation of the boilers. The 374 can operate two mixing devices, which can be either two variable speed injection pumps or two floating action valves. The mixing devices can be used to supply two different reset water temperatures or one reset and one setpoint water temperature to a space heating system. The 374 is capable of controlling an indirect Domestic Hot Water (DHW) storage tank and setpoint load. The control has an internal timer, which can have 2 events per day on a 24 hour, 5-1-1 day or 7 day schedule.

# tekmar® - Application — Mechanical

**A 374-1**
03/09

A1 = DHW Aquastat
P1 = Primary Pump
P2 = Mix 1 System Pump
P3 = Mix 2 System Pump
P4 = Mix 1 Variable Speed Injection Pump
P5 = Mix 2 Variable Speed Injection Pump
P6 = DHW Pump
S1 = Mix 1 Sensor 082
S2 = Mix 2 Sensor 082
S3 = Outdoor Sensor 070
S4 = Boiler Supply Sensor 082
V1...V4 = Globe or Balancing Valve
Z1, Z2 = Mix 1 Zone Valve
Z3, Z4 = Mix 2 Zone Valve




**Concept Drawing**
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**System Operation**
The Universal Reset Control 374 provides full outdoor reset to two different mix temperature systems, each with two (or more) zones. The output of both variable speed injection pumps are modulated to provide mixed supply water temperatures to each system, and to protect the boiler from flue gas condensation. The 374 also controls the supply of heat to an indirect Domestic Hot Water (DHW) tank. The 374 stages and rotates the boilers in order to satisfy all loads.

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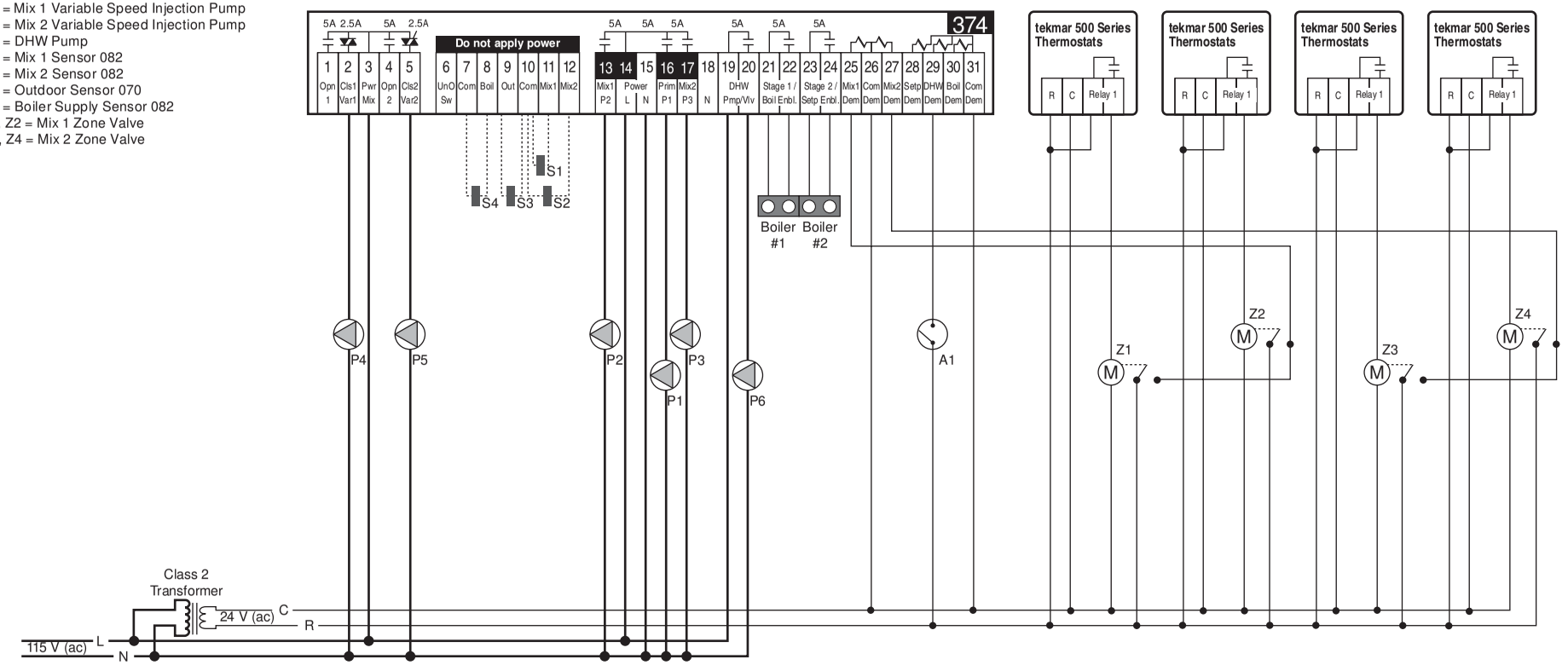
A1 = DHW Aquastat
P1 = Primary Pump
P2 = Mix 1 System Pump
P3 = Mix 2 System Pump
P4 = Mix 1 Variable Speed Injection Pump
P5 = Mix 2 Variable Speed Injection Pump
P6 = DHW Pump
S1 = Mix 1 Sensor 082
S2 = Mix 2 Sensor 082
S3 = Outdoor Sensor 070
S4 = Boiler Supply Sensor 082
Z1, Z2 = Mix 1 Zone Valve
Z3, Z4 = Mix 2 Zone Valve





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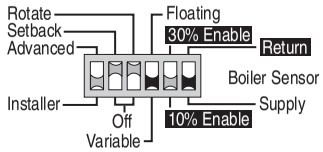
**Essential Control Settings**
DHW MODE = 1 (no priority)
2 (with priority)
MIX 1 MODE = 1
MIX 2 MODE = 1

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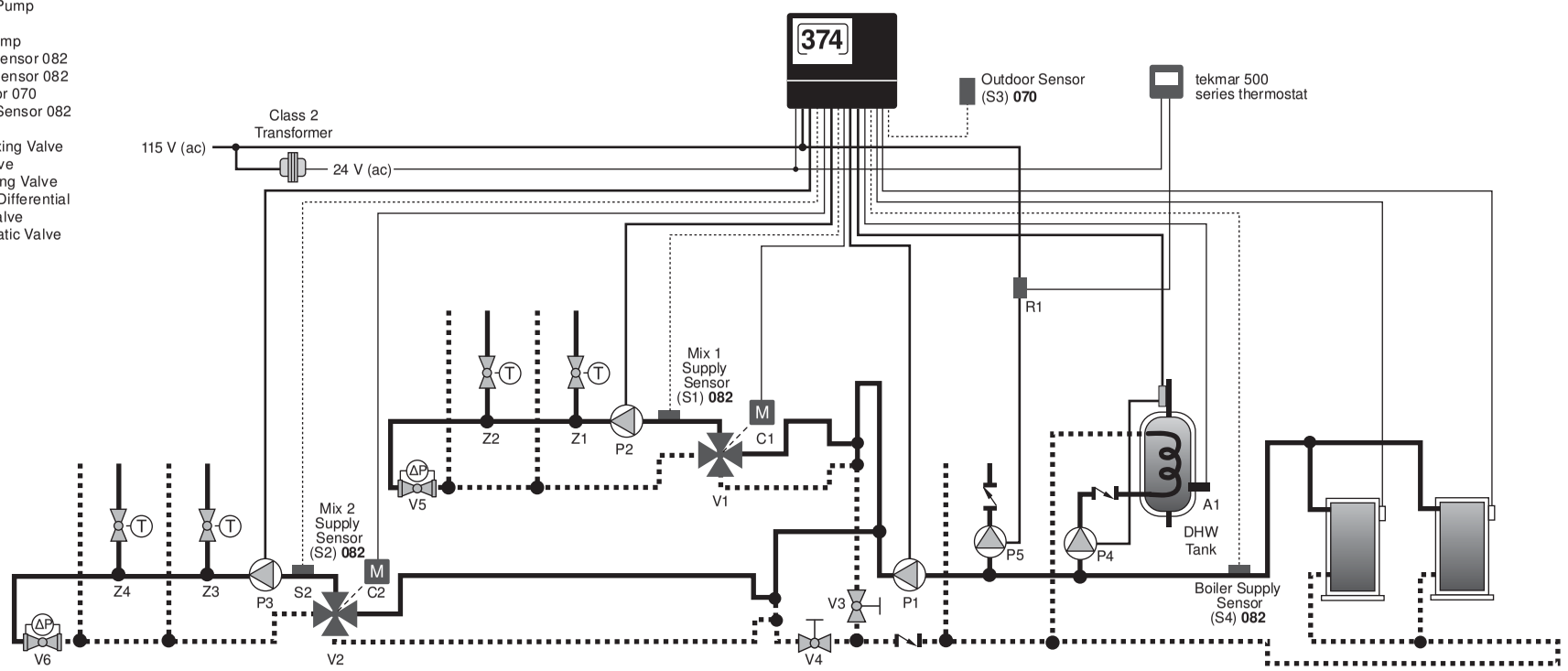
# tekmar® - Application Mechanical

**A 374-2**
03/09

A1 = DHW Aquastat
C1, C2 = Actuating Motor 741
P1 = Primary Pump
P2 = Mix 1 System Pump
P3 = Mix 2 System Pump
P4 = DHW Pump
P5 = Boiler Zone Pump
S1 = Mix 1 Supply Sensor 082
S2 = Mix 2 Supply Sensor 082
S3 = Outdoor Sensor 070
S4 = Boiler Supply Sensor 082
R1 = Relay 003
V1, V2 = 4-Way Mixing Valve
V3, V4 = Globe Valve or Balancing Valve
V5, V6 = Pressure Differential Bypass Valve
Z1... Z4 = Thermostatic Valve

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**System Operation**
The Universal Reset Control 374 provides full outdoor reset to two separate mix temperature systems, each having thermostatic valves. Two floating action 4-way valves are modulated to provide mixed supply water temperatures to each system, and to protect the boiler from flue gas condensation. The 374 provides partial outdoor reset to one (or more) boiler temperature zone. The 374 also controls the supply of heat to an indirect Domestic Hot Water (DHW) tank and provides DHW priority over mix zones. The 374 stages and rotates the boilers in order to satisfy all loads.

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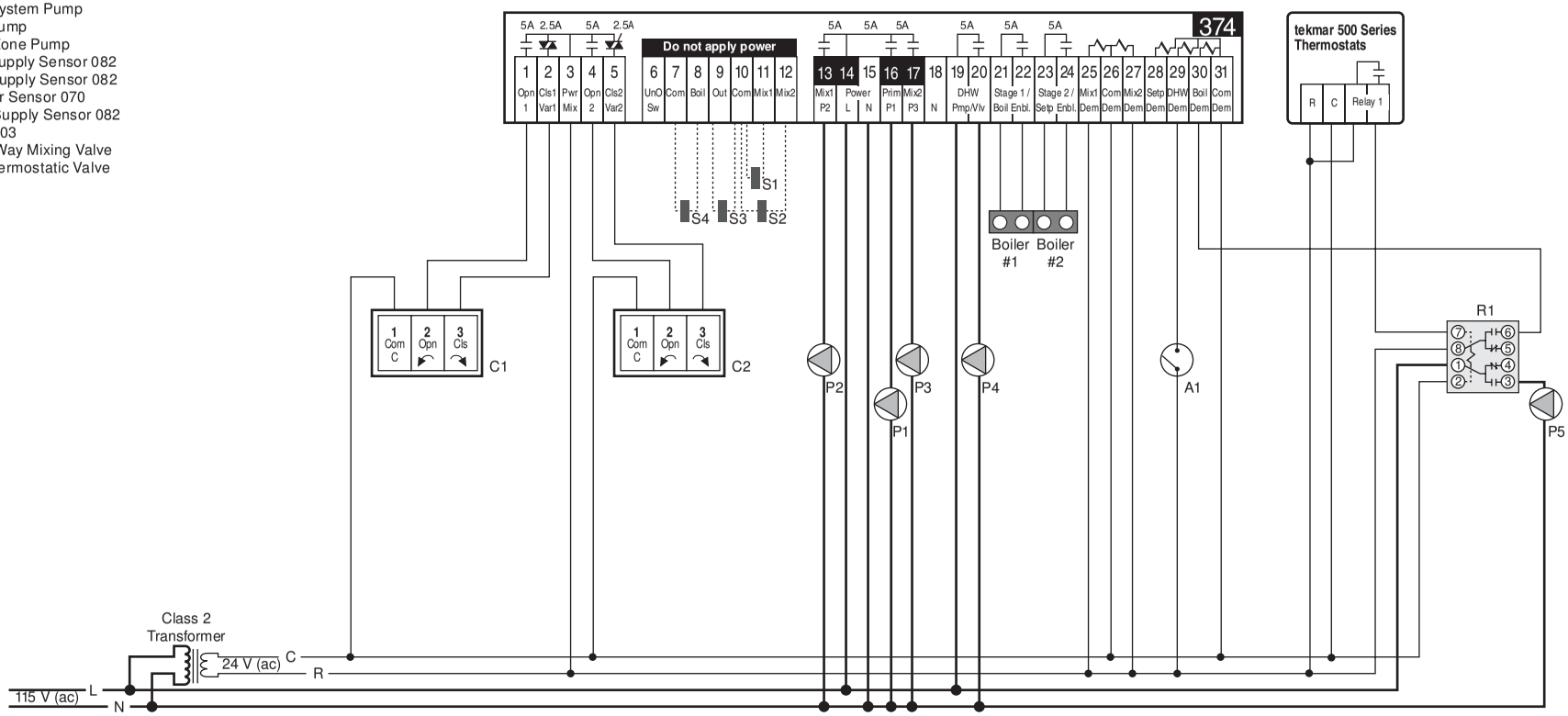
A1 = DHW Aquastat
C1, C2 = Actuating Motor 741
P1 = Primary Pump
P2 = Mix 1 System Pump
P3 = Mix 2 System Pump
P4 = DHW Pump
P5 = Boiler Zone Pump
S1 = Mix 1 Supply Sensor 082
S2 = Mix 2 Supply Sensor 082
S3 = Outdoor Sensor 070
S4 = Boiler Supply Sensor 082
R1 = Relay 003
V1, V2 = 4-Way Mixing Valve
Z1... Z4 = Thermostatic Valve

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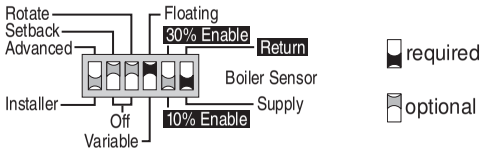
**Essential Control Settings**
DHW MODE = 1 (no priority)
2 (with priority over mix zones)
MIX 1 MODE = 1
MIX 2 MODE = 1





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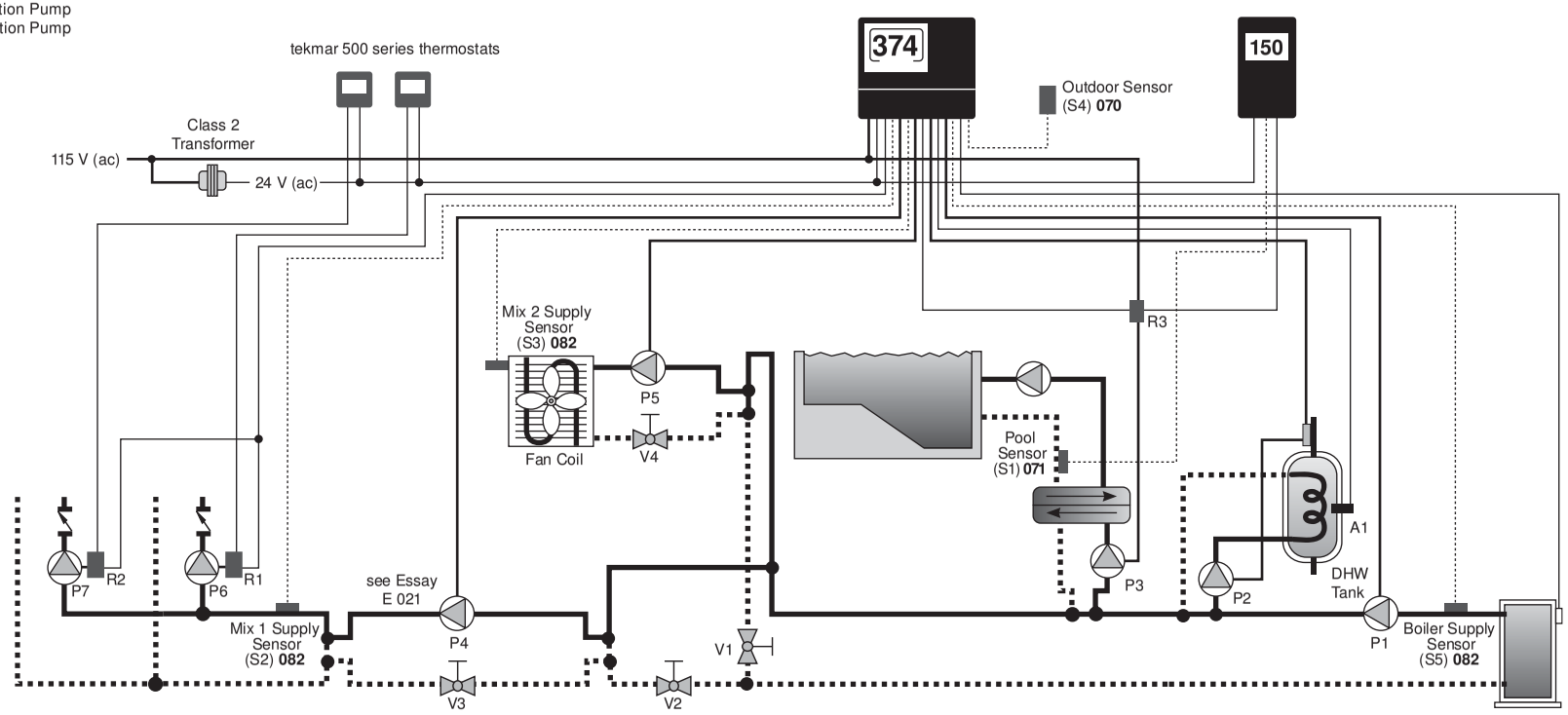
# tekmar® - Application — Mechanical

**A 374-3**
03/09

A1 = DHW Aquastat
P1 = Primary Pump
P2 = DHW Pump
P3 = Pool Mix Pump
P4 = Mix 1 Variable Speed Injection Pump
P5 = Mix 2 Variable Speed Injection Pump
P6 = Zone 1 Pump
P7 = Zone 2 Pump
S1 = Pool Sensor 071
S2 = Mix 1 Supply Sensor 082
S3 = Mix 2 Supply Sensor 082
S4 = Outdoor Sensor 070
S5 = Boiler Supply Sensor 082
R1, R2, R3 = Relay 003
V1...V4 = Globe Valve or Balancing Valve

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**System Operation**
The Universal Reset Control 374 provides full outdoor reset to one mix temperature system and one mixing setpoint temperature for a fan coil unit. The output of both variable speed injection pumps are modulated to provide mixed supply water temperatures, and to protect the boiler from flue gas condensation. The 374 also controls the supply of heat to an indirect Domestic Hot Water (DHW) tank. A 150 Setpoint Control maintains temperature in a pool using the setpoint demand. The 374 stages a single two-stage boiler in order to satisfy the loads.

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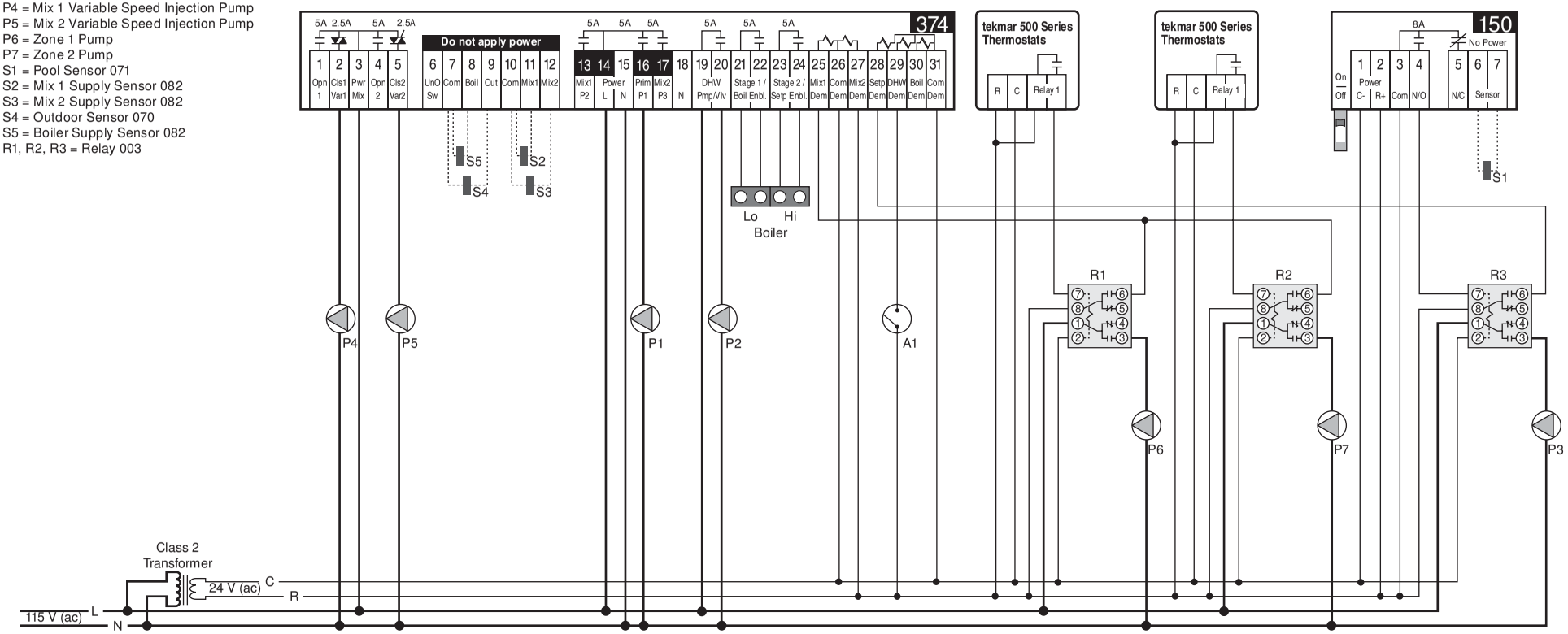
# tekmar® - Application — Electrical

**A 374-3**
03/09

A1 = DHW Aquastat
P1 = Primary Pump
P2 = DHW Pump
P3 = Pool Mix Pump
P4 = Mix 1 Variable Speed Injection Pump
P5 = Mix 2 Variable Speed Injection Pump
P6 = Zone 1 Pump
P7 = Zone 2 Pump
S1 = Pool Sensor 071
S2 = Mix 1 Supply Sensor 082
S3 = Mix 2 Supply Sensor 082
S4 = Outdoor Sensor 070
S5 = Boiler Supply Sensor 082
R1, R2, R3 = Relay 003

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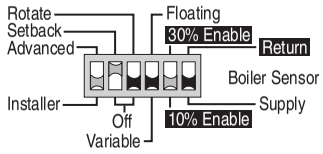
**Essential Control Settings**
DHW MODE = 3
Setpoint MODE = 3
MIX 1 MODE = 1
MIX 2 MODE = 2

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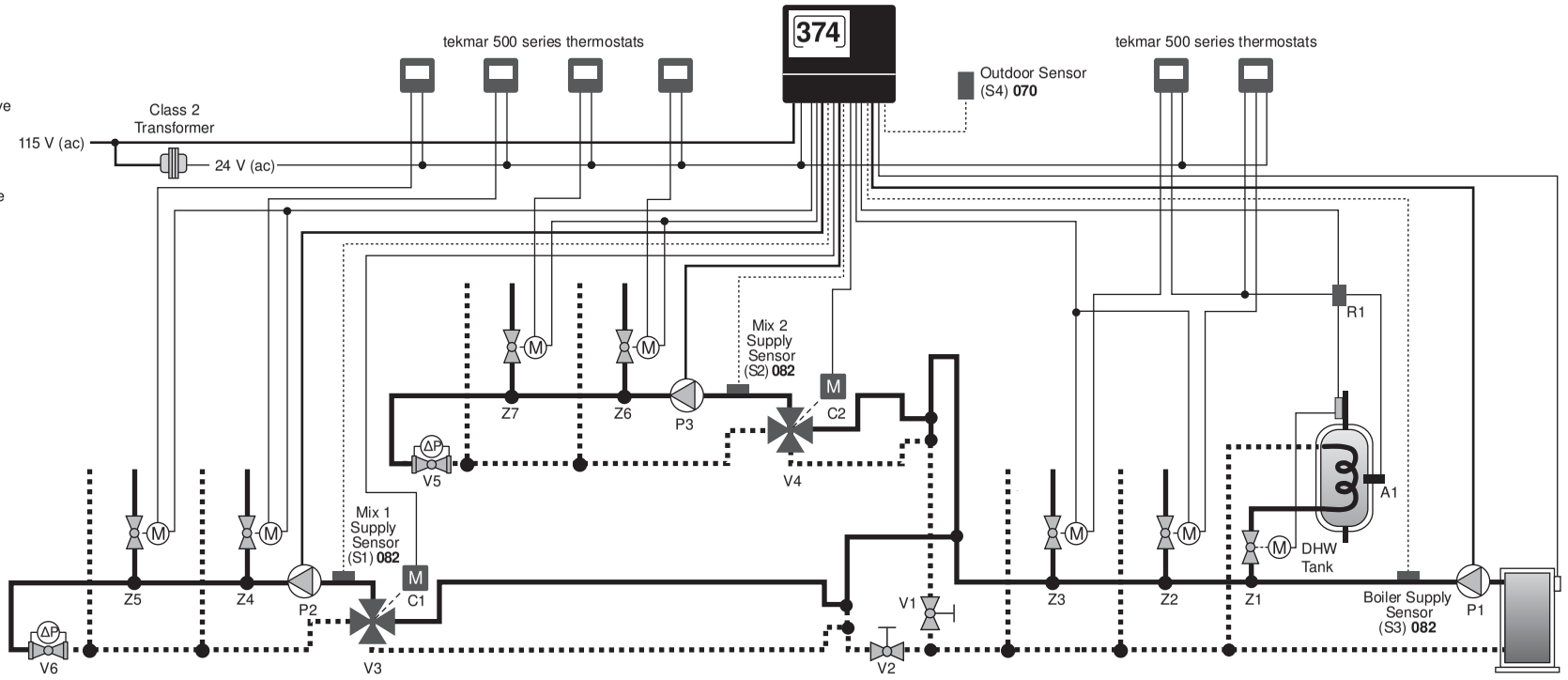
# tekmar® - Application Mechanical

**A 374-4**
03/09

A1 = DHW Aquastat
C1, C2 = Actuating Motor 741
P1 = Primary Pump
P2 = Mix 1 System Pump
P3 = Mix 2 System Pump
R1 = Relay 003
S1 = Mix 1 Supply Sensor 082
S2 = Mix 2 Supply Sensor 082
S3 = Boiler Supply Sensor 082
S4 = Outdoor Sensor 070
V1, V2 = Balancing or Globe Valve
V3, V4 = 4-Way Mixing Valve
V5, V6 = Pressure Differential Bypass Valve
Z1 = DHW Zone Valve
Z2, Z3 = Boiler Temp. Zone Valve
Z4, Z5 = Mix 1 Zone Valve
Z6, Z7 = Mix 2 Zone Valve

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**System Operation**
The Universal Reset Control 374 provides full outdoor reset to two separate mix temperature systems, each with two zones. The 374 modulates each 4-way mixing valve to provide mixed supply water temperatures to each system, and to protect the boiler from flue gas condensation. There are two boiler temperature zones. The 374 also controls the supply of heat to an indirect Domestic Hot Water (DHW) tank. The DHW tank has priority over the heating system. The 374 operates a single boiler on outdoor reset for heating loads and at setpoint for the DHW load.

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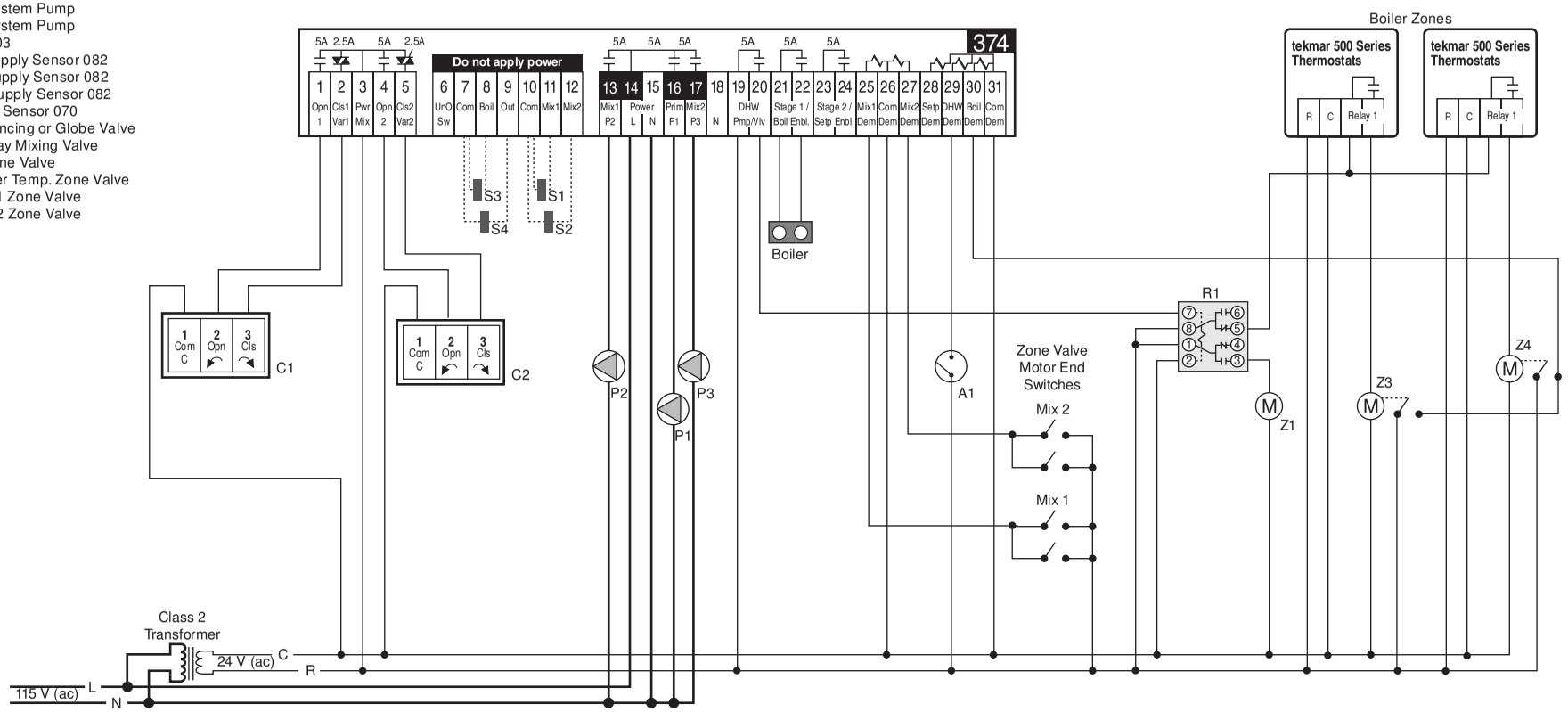
A1 = DHW Aquastat
C1, C2 = Actuating Motor 741
P1 = Primary Pump
P2 = Mix 1 System Pump
P3 = Mix 2 System Pump
R1 = Relay 003
S1 = Mix 1 Supply Sensor 082
S2 = Mix 2 Supply Sensor 082
S3 = Boiler Supply Sensor 082
S4 = Outdoor Sensor 070
V1, V2 = Balancing or Globe Valve
V3, V4 = 4-Way Mixing Valve
Z1 = DHW Zone Valve
Z2, Z3 = Boiler Temp. Zone Valve
Z4, Z5 = Mix 1 Zone Valve
Z6, Z7 = Mix 2 Zone Valve

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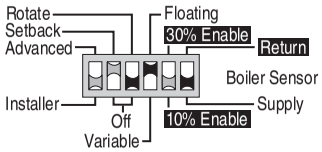
**Essential Control Settings**
DHW MODE = 4
MIX 1 MODE = 1
MIX 2 MODE = 1
Boil 2 = OFF

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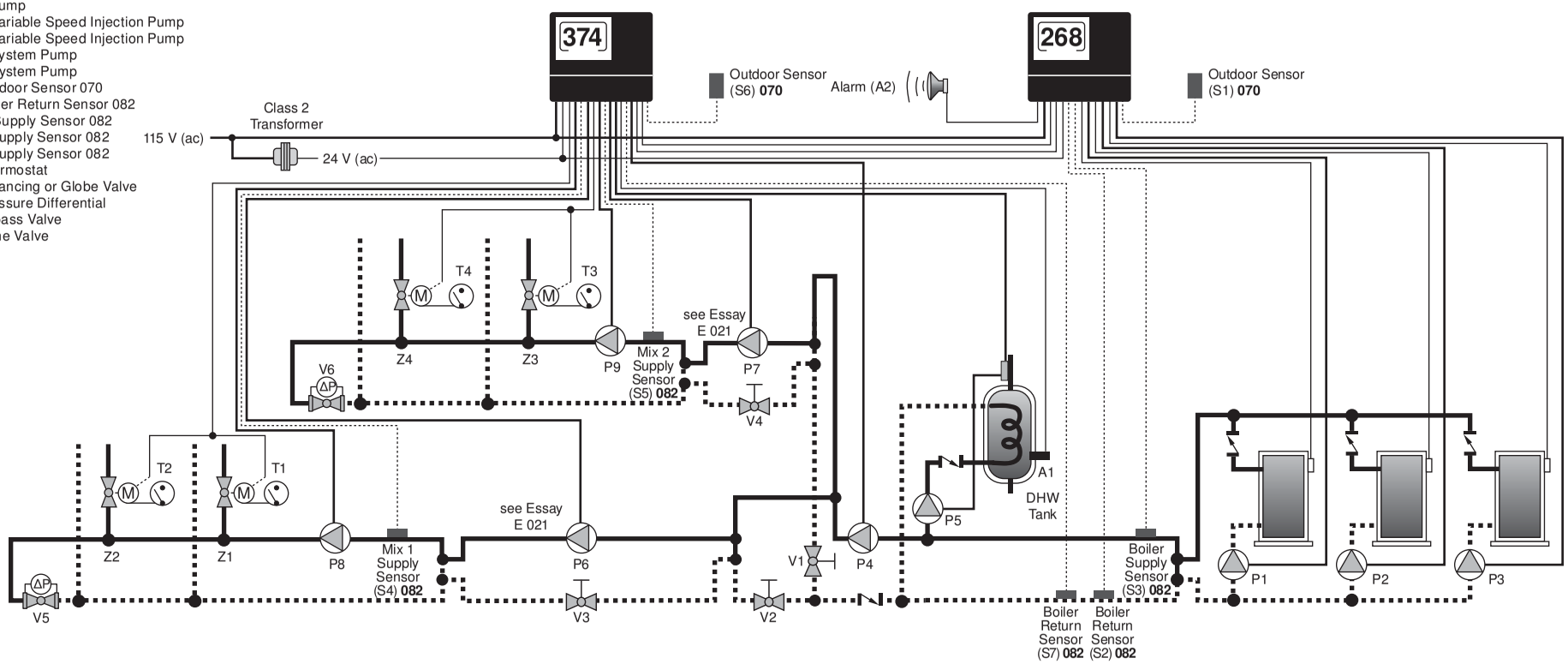
# tekmar® - Application — Mechanical

**A 374-5**
03/09

A1 = DHW Aquastat
A2 = Alarm
P1, P2, P3 = Boiler Pump
P4 = Primary Pump
P5 = DHW Pump
P6 = Mix 1 Variable Speed Injection Pump
P7 = Mix 2 Variable Speed Injection Pump
P8 = Mix 1 System Pump
P9 = Mix 2 System Pump
S1, S6 = Outdoor Sensor 070
S2, S7 = Boiler Return Sensor 082
S3 = Boiler Supply Sensor 082
S4 = Mix 1 Supply Sensor 082
S5 = Mix 2 Supply Sensor 082
T1...T4 = Thermostat
V1...V4 = Balancing or Globe Valve
V5, V6 = Pressure Differential Bypass Valve
Z1...Z4 = Zone Valve

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**System Operation**
The Universal Reset Control 374 and Boiler Control 268 are combined to provide full outdoor reset to two separate mix temperature systems. The output of the variable speed pumps can be modulated to provide a mixed supply water temperature to the mix zones, and protect the boilers from flue gas condensation. The 374 also controls the supply of heat to the Domestic Hot Water (DHW) tank. The 268 stages and rotates three two-stage boilers and operates the boiler pumps to provide pre-purge and post-purge on each boiler.

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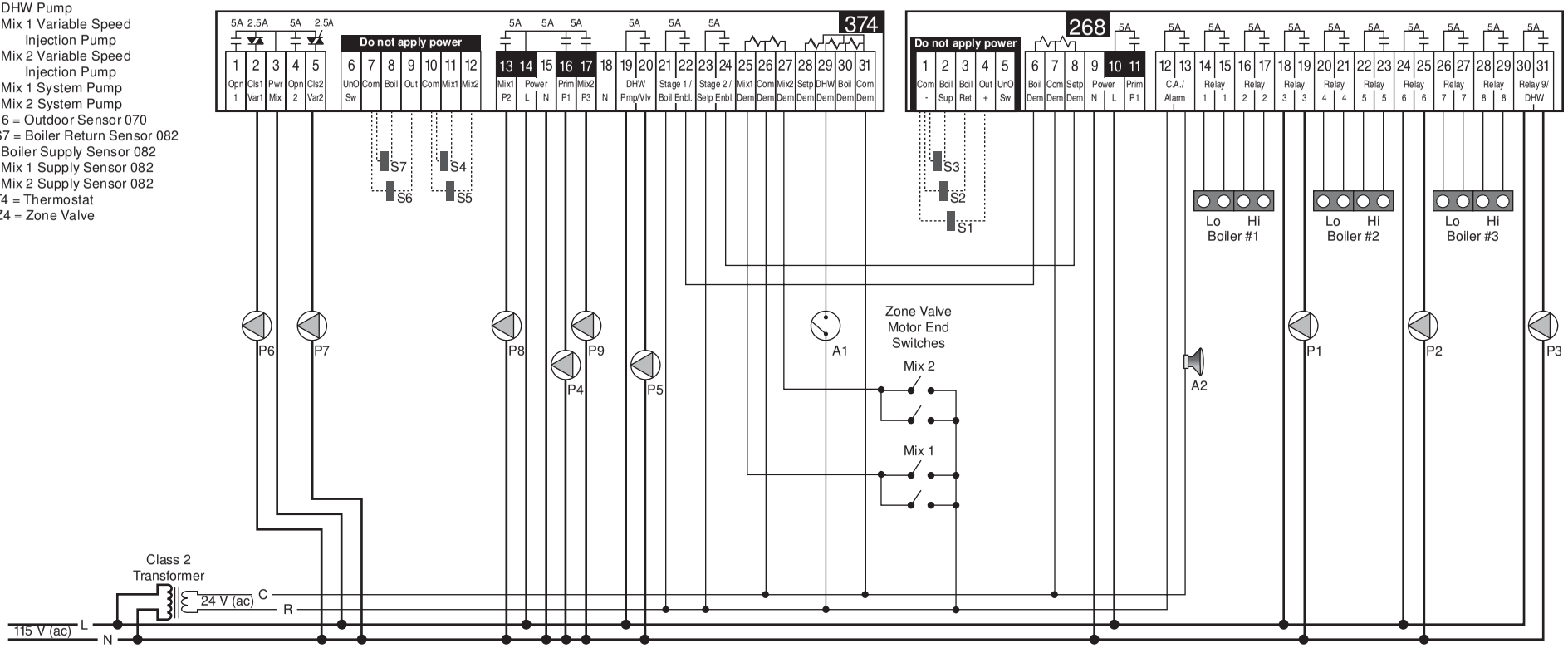
A1 = DHW Aquastat
A2 = Alarm
P1, P2, P3 = Boiler Pump
P4 = Primary Pump
P5 = DHW Pump
P6 = Mix 1 Variable Speed Injection Pump
P7 = Mix 2 Variable Speed Injection Pump
P8 = Mix 1 System Pump
P9 = Mix 2 System Pump
S1, S6 = Outdoor Sensor 070
S2, S7 = Boiler Return Sensor 082
S3 = Boiler Supply Sensor 082
S4 = Mix 1 Supply Sensor 082
S5 = Mix 2 Supply Sensor 082
T1...T4 = Thermostat
Z1...Z4 = Zone Valve

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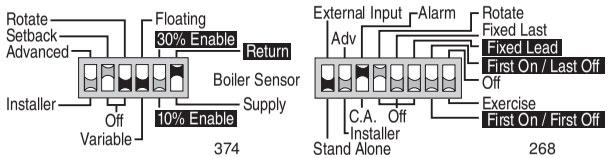
**Essential Control Settings**
374: DHW MODE = 1 (no priority)
2 (priority)
374: MIX 1 MODE = 1
374: MIX 2 MODE = 1
374: 374 Boiler Min = 268 Boiler Min - 20° F
268 = MODE 4





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## Specifications

**The following are the recommended specifications for the Universal Reset Control 374.**

- The control shall be able to control the supply fluid temperature of two mixing devices.
- The control shall have the option to directly operate two variable speed injection pumps or two mixing valves with floating action actuating motors.
- The control shall have the ability to provide outdoor reset to each mixing system.
- The control shall have the ability to provide a setpoint temperature to one mixing system.
- The control shall have the ability to limit the amount of cool water being returned to the boiler through the mixing device in order to prevent low boiler operating temperatures and flue gas condensation.
- The control shall have a mix system pump contact for each mixing device.
- The control shall be able to operate boilers that have one or two stages.
- The control shall have a primary pump contact that operates during a call for space heating.
- The control shall have the ability to calculate the boilers' target temperature based on outdoor reset.
- The control shall have the ability to have the boilers' target temperature set using an adjustable setpoint.
- The control shall provide heat to the space heating system as needed unless the outdoor air temperature is warmer than the control's warm weather shut down temperature setting.
- The control shall have an adjustable warm weather shut down.
- The control shall have an option to rotate the firing sequence of the boilers and the option for rotating the boiler firing sequence shall be based on the boilers' accumulated running hours.
- The control shall use proportional, integral and derivative (PID) logic when staging boiler stages.
- The control shall have an adjustable Minimum Supply water temperature setting to help prevent condensation of flue gases and subsequent corrosion and blockage of the boilers' heat exchanger and chimney.
- The control shall have the option of an automatic differential calculation in order to prevent short cycling of the stages.
- The control shall have an adjustable minimum inter-stage delay that can be set manually or calculated automatically by the control.
- The control shall have the ability to operate a domestic hot water contact that operates during a domestic hot water call.
- The control shall have the ability to provide domestic hot water priority and to limit the maximum allowed domestic hot water priority period based on the outdoor air temperature.
- The control shall have two separate lockable access levels to limit the number of adjustments available to various users.
- The control shall have a test button that activates a pre-programmed test sequence testing all the control's outputs.
- The control shall have the ability to show the current outdoor, boiler supply, mixing device number one and mixing device number two temperatures.
- The control shall continuously monitor its temperature sensors and provide an error message upon a control or sensor failure.
- During extended periods of inactivity, the pumps or valves that are operated by the control shall be periodically exercised to prevent seizure during long idle periods.
- The control shall have an internal timer that shall have two events per day on a 24 hour, 5-1-1 day or 7 day schedule.

tekmar® Control Systems

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