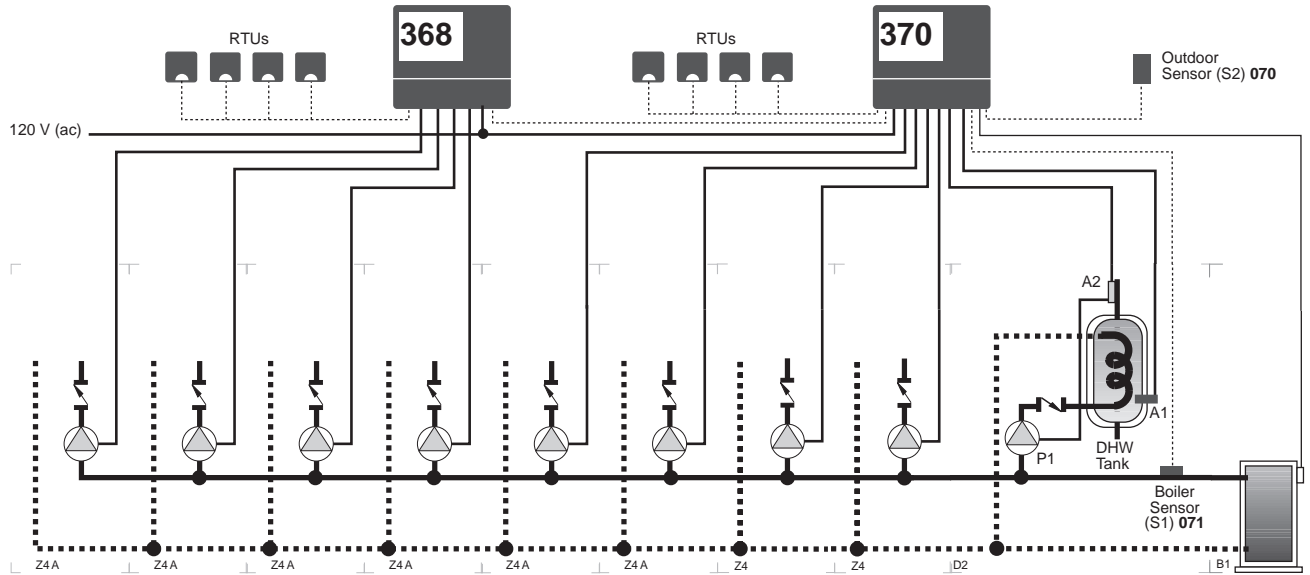
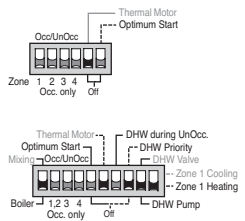


# Mechanical

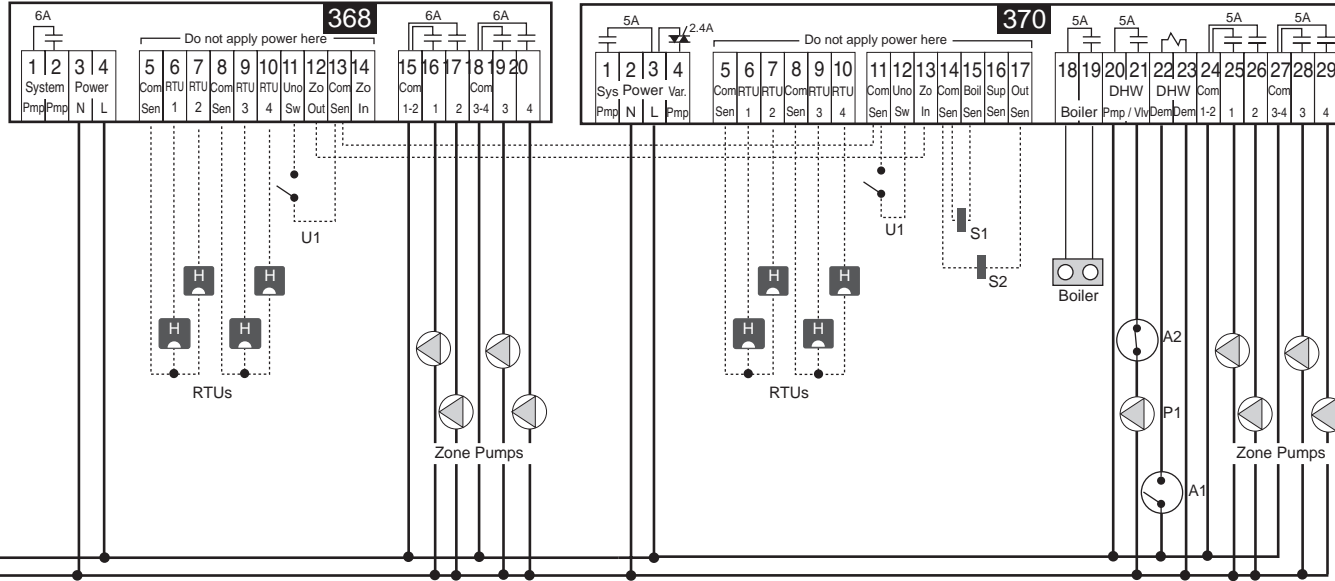


# Electrical

A1 = DHW Aquastat  
 A2 = DHW High Limit Aquastat  
 P1 = DHW Pump  
 S1 = Boiler Sensor 071  
 S2 = Outdoor Sensor 070  
 U1 = tekmar Timer 031 (optional)

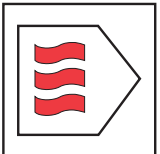


= Required  
 = Optional



**Note:** This is only a concept drawing. The designer must determine whether this application will work in his system and must ensure compliance with code requirements. Necessary auxiliary equipment, isolation relays (for loads greater than the specified tekmar internal relay ratings), and other safety and limit devices must be added.

**tekmar® - Application**  
 Zone Control 368 & House Control 370

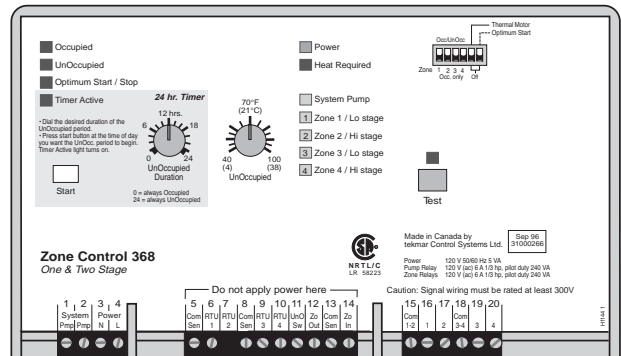


**A 368-1**  
 09/96

**Technical Data**

**Zone Control 368 One & Two Stage**

- Literature — A 000, A 368's, D 368, D 001, D 054, D 070, D 074
- Control — Microprocessor PID control; This is **not a safety (limit) control**.
- Packaged weight — 2.9 lb. (1300 g), Enclosure A, PVC plastic
- Dimensions — 6-5/8" H x 7-9/16" W x 2-13/16" D (170 x 193 x 72 mm)
- Approvals — CSA NRTL / C, meets ICES & FCC regulations for EMI/RFI.
- Ambient conditions — Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing.
- Power supply — 120 V ±10% 50/60 Hz 5 VA
- Pump relay — 120 V (ac) 6 A 1/3 hp, pilot duty 240 VA
- Zone relays — 120 V (ac) 6 A 1/3 hp, pilot duty 240 VA
- Maximum linkage — Up to 6 Zone Controls can be linked to a tekmar reset control.
- Sensors — NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892
  - included: None.
  - required: RTU 054, RTU 055 or 10k Indoor Sensor for each active zone. (Order separately)
- Timer — 24 hour, 1 event / day, 3 minute backup
- UnOcc. Duration — 0 to 24 hours
- Unoccupied — 40 to 100°F (4 to 38°C)



**System Operation & Specifications**

The House Control 370 and Zone Control 368 control the space temperature of eight baseboard heating zones. The supply water temperature of the zones is controlled by cycling the boiler on and off. The 370 also controls the supply of heat to a DHW tank.

**Piping and Heat Source Details** The system is piped in a parallel arrangement with eight zone pumps. A check valve is required after each pump in order to prevent reverse flow through the zone when the pump is turned off. The DHW pump (P1) is also piped in parallel and is used to supply heat to the DHW tank. Either a high mass boiler or a low mass boiler can be used with this application.

**Warm Weather Shut Down (WWSD)** When the outdoor temperature rises above the highest RTU dial setting and the heating zones are satisfied, the 367 shuts down the heating system. The DHW system does, however, continue to operate.

**Boiler Operation** The 370 uses an outdoor reset strategy together with indoor temperature feedback from the RTUs to adjust the boiler supply water temperature. When heat is required in any of the zones, the 370 turns on the appropriate zone pump(s) and operates the boiler at the lowest possible water temperature to satisfy the zone(s). If a non condensing boiler is used, the control minimizes flue gas condensation by raising the boiler supply water temperature above the boiler minimum as fast as possible. The 370 automatically adjusts the boiler differential to prevent the boiler from short cycling.

**Domestic Hot Water (DHW)** When the DHW aquastat (A1) calls for heat, the 370 turns on the DHW pump (P1) and raises the boiler water temperature to at least 180°F (82°C). Once the DHW demand is removed the 370 performs a DHW Post Purge or a DHW Mixing Purge depending on whether or not the zones require heat.

**Zoning Operation** The 370 and 368 vary the on time of each zone pump based on a 15 minute cycle. The controls stagger the operating times of the zones in order to achieve a steady load on the boiler and prevent boiler short cycling.

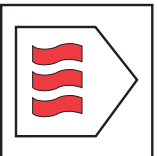
**UnOccupied (Night Setback)** Selected zones can be switched into an UnOccupied (Night Setback) mode through either the built-in 24 hr. Timer or by closing an external UnOccupied switch (U1) using the tekmar Timer 031. When the control is switched into UnOccupied mode, an UnOccupied dial is used to set the desired indoor temperature. An Optimum Start / Stop feature can be used to ensure the zones are returned to their Occupied temperatures as the UnOccupied period ends.

**Other features** Additional control features are listed in the table in the Heating Controls section of the Product Catalog I 000.



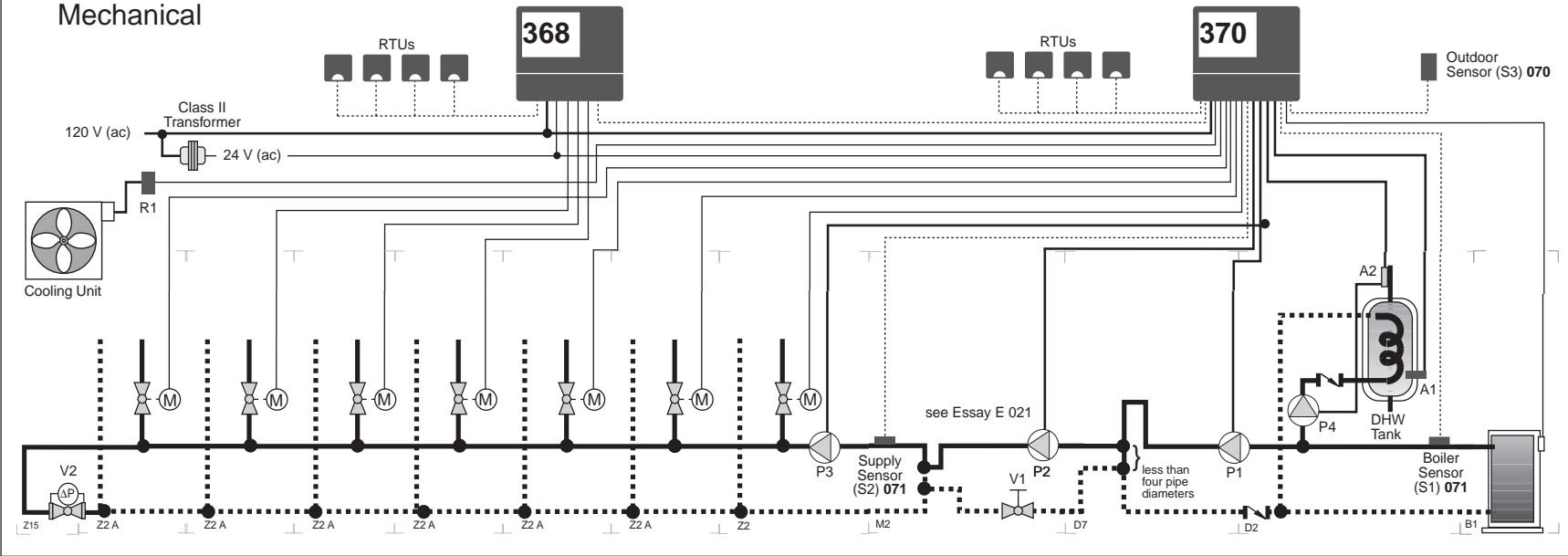
tekmar Control Systems Ltd., Canada  
 tekmar Control Systems, Inc., U.S.A.  
**Head Office: 5100 Silver Star Road**  
**Vernon, B.C. Canada V1B 3K4**  
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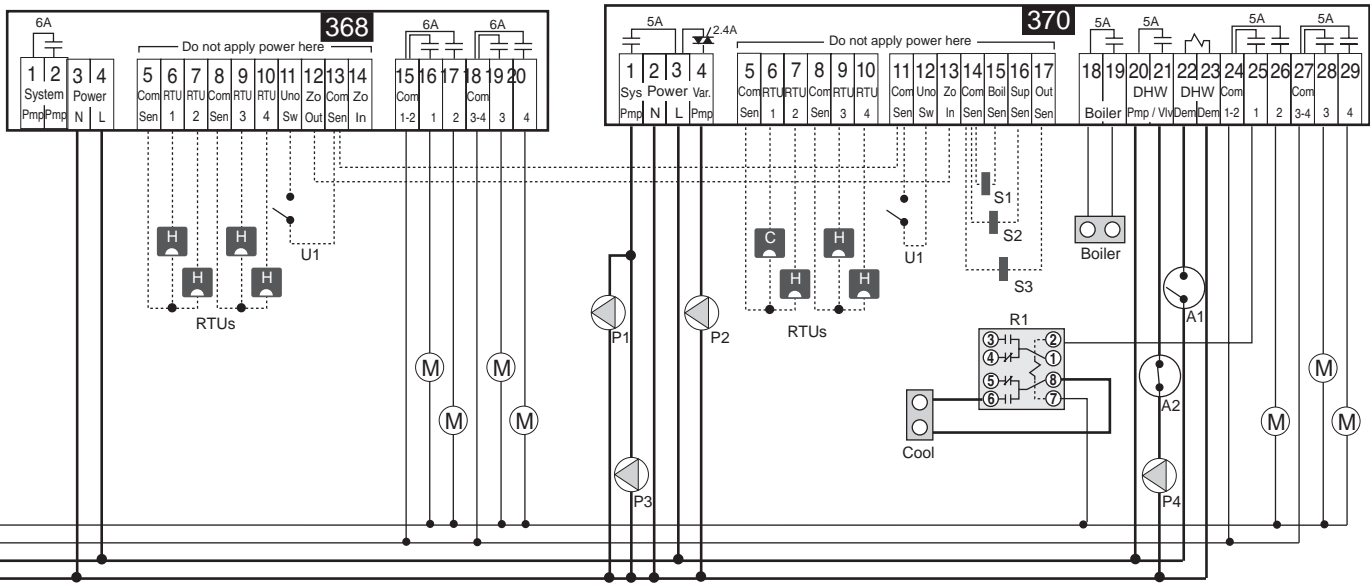
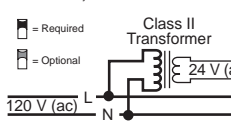
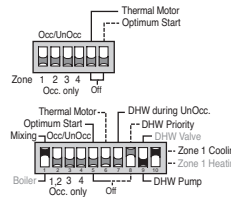
A 368-2  
09/96

## Mechanical



## Electrical

- A1 = DHW Aquastat
- A2 = DHW High Limit Aquastat
- P1 = Primary Pump
- P2 = Variable Speed Injection Pump
- P3 = System Pump
- P4 = DHW Pump
- R1 = Relay 003
- S1 = Boiler Sensor 071
- S2 = Supply Sensor (S2) 071
- S3 = Outdoor Sensor (S3) 070
- U1 = tekmar Timer 031 (optional)
- V1 = Balancing Valve or Globe Valve
- V2 = Pressure Bypass Valve, or Balancing Valve, or Globe Valve

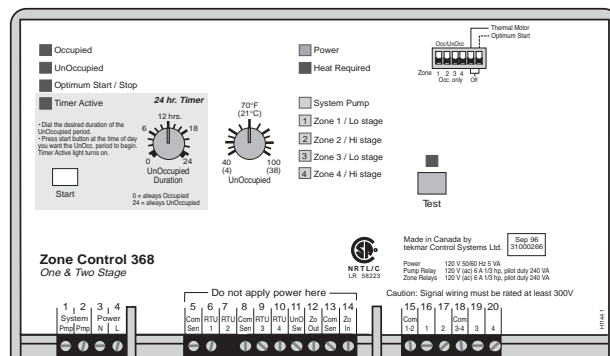


**Note:** This is only a concept drawing. The designer must determine whether this application will work in his system and must ensure compliance with code requirements. Necessary auxiliary equipment, isolation relays (for loads greater than the specified tekmar internal relay ratings), and other safety and limit devices must be added.

**Technical Data**

**Zone Control 368 One & Two Stage**

- Literature — A 000, A 368's, D 368, D 001, D 054, D 070, D 074
- Control — Microprocessor PID control; This is **not a safety (limit) control**.
- Packaged weight — 2.9 lb. (1300 g), Enclosure A, PVC plastic
- Dimensions — 6-5/8" H x 7-9/16" W x 2-13/16" D (170 x 193 x 72 mm)
- Approvals — CSA NRTL / C, meets ICES & FCC regulations for EMI/RFI.
- Ambient conditions — Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing.
- Power supply — 120 V ±10% 50/60 Hz 5 VA
- Pump relay — 120 V (ac) 6 A 1/3 hp, pilot duty 240 VA
- Zone relays — 120 V (ac) 6 A 1/3 hp, pilot duty 240 VA
- Maximum linkage — Up to 6 Zone Controls can be linked to a tekmar reset control.
- Sensors — NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892
  - included: None.
  - required: RTU 054, RTU 055 or 10k Indoor Sensor for each active zone. (Order separately)
- Timer — 24 hour, 1 event / day, 3 minute backup
- UnOcc. Duration — 0 to 24 hours
- Unoccupied — 40 to 100°F (4 to 38°C)



**System Operation & Specifications**

The House Control 370 and Zone Control 368 control the space temperature of eight floor heating zones. A variable speed injection pump and a boiler are controlled by the 370 to maintain the required supply water temperatures. The 370 also controls the supply of heat to a DHW tank. When cooling is required, the 370 turns on and then controls a mechanical cooling unit.

**Piping and Heat Source Details** The system is piped in a primary-secondary piping arrangement. The primary pump (P1) is used to circulate water in the boiler loop. The DHW pump (P4) is piped in parallel with the boiler loop and is used to supply heat to the DHW tank. The system pump (P3) supplies heat to the secondary radiant loop. Zone valves control the flowrate to the individual radiant zones. Due to the number of zones used, a pressure bypass valve or globe valve (V2) is required to maintain a relatively constant system head and zone flow rate. Between the primary and secondary loops is a variable speed injection pump (P2). This injection pump injects heat from the boiler loop into the radiant system loop. A balancing valve or globe valve (V2) may be required for optimum control operation as described in Essay E 021. Either a high mass boiler or a low mass boiler can be used with this application.

**Warm Weather Shut Down (WWSD)** When the outdoor temperature rises above the highest RTU dial setting and the heating zones are satisfied, the 370 shuts down the heating system. The DHW system does, however, continue to operate.

**Mixing Operation** The 370 uses an outdoor reset strategy together with indoor temperature feedback from the RTUs to adjust the radiant supply water temperature. When heat is required in any of the radiant zones, the 370 turns on the primary pump (P1) and system pump (P3). The speed of the injection pump (P2) is then varied in order to maintain the required supply water temperature. Injection pump (P2) is also controlled to ensure the boiler is protected from excessively low water temperatures and the radiant zones are protected from excessively high water temperatures.

**Boiler Operation** In order to conserve energy, the 370 operates the boiler at the lowest possible water temperature without causing flue gas condensation. If the mixing system requires additional heat, the 370 raises the boiler water temperature. The 370 automatically adjusts the boiler differential to prevent the boiler from short cycling.

**Domestic Hot Water (DHW)** When the DHW aquastat (A1) calls for heat, the 370 turns on the DHW pump (P4) and raises the boiler water temperature to at least 180°F (82°C). If DHW Priority is selected, the 370 turns off the primary pump (P1). Once the DHW demand is removed, the 370 either performs a DHW Post Purge or a DHW Mixing Purge depending on whether or not the zones require heat.

**Zoning Operation** The 370 and the 368 vary the on time of each zone valve based on a 15 minute cycle. The controls stagger the operating times of the zones in order to achieve a steady load on the boiler and prevent boiler short cycling. The 370 also synchronizes the operation of its own zones with those of the 368.

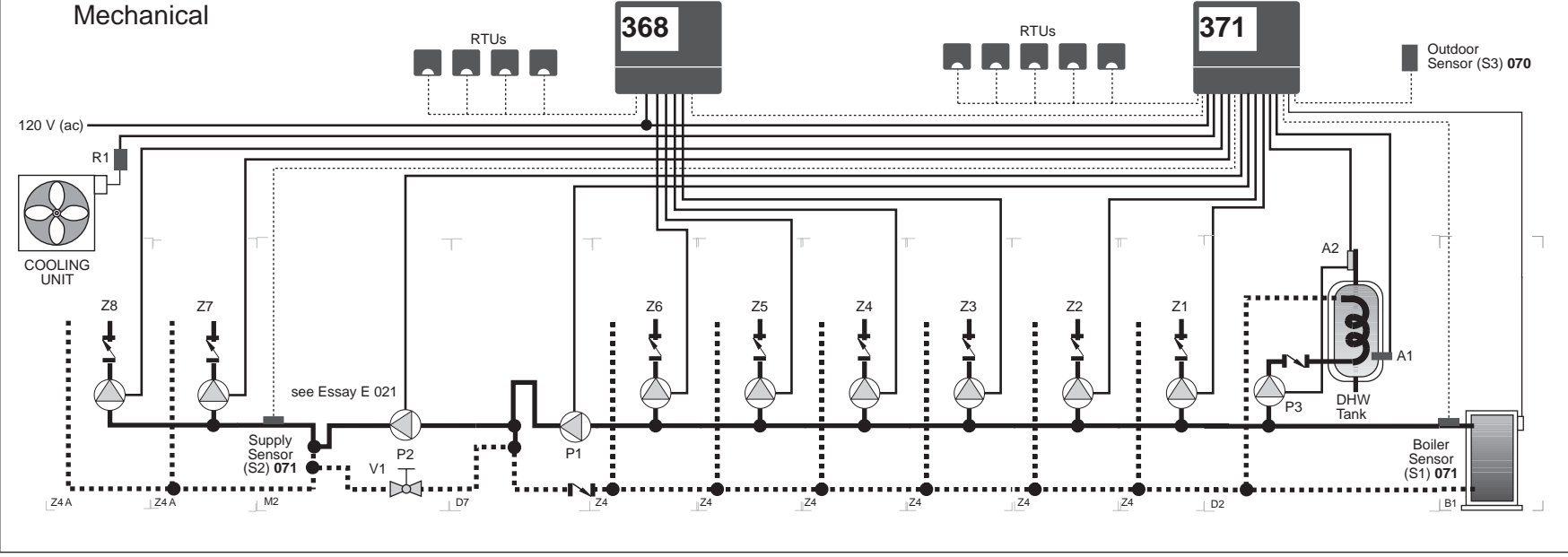
**Cooling Operation** Once the heating system is shut down, the 370 provides a 45 minute interlock before cooling is allowed. During cooling operation, the 370 varies the on time of the mechanical cooling unit over a 30 minute cycle.

**UnOccupied (Night Setback)** Selected zones can be switched into an UnOccupied (Night Setback) mode through either the built-in 24 hr. Timer or by closing an external UnOccupied switch (U1 or U2) using the tekmar Timer 031. When a control is switched into UnOccupied mode, the UnOccupied dial is used to set the desired indoor temperature. An Optimum Start / Stop feature can be used to ensure the zones are returned to their Occupied temperatures as the UnOccupied period ends.

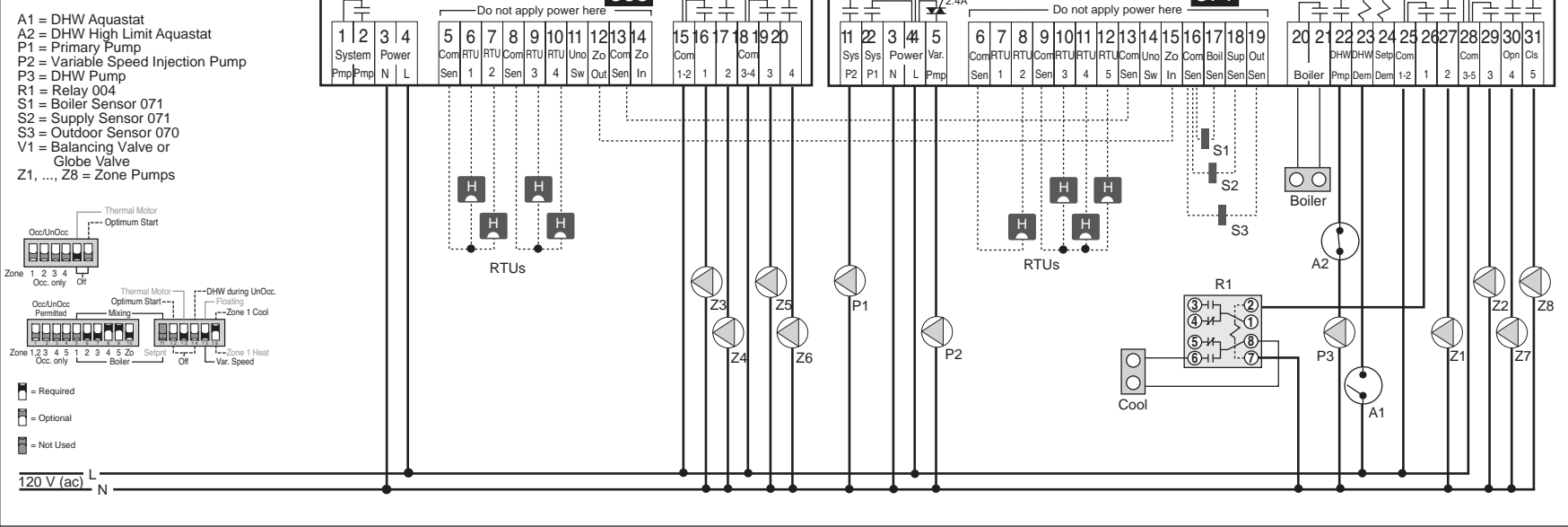
**Other features** Additional control features are listed in the table in the Heating Controls section of the Product Catalog I 000.

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# Mechanical

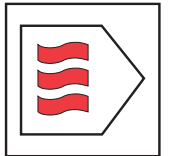


# Electrical



**Note:** This is only a concept drawing. The designer must determine whether this application will work in his system and must ensure compliance with code requirements. Necessary auxiliary equipment, isolation relays (for loads greater than the specified tekmar internal relay ratings), and other safety and limit devices must be added.

**tekmar® - Application**  
 Zone Control 368 & House Control 371

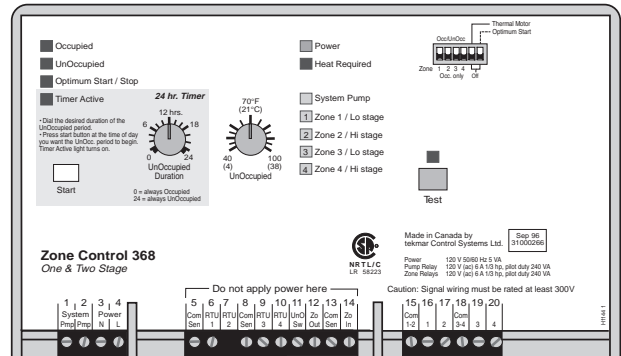


**A 368-4**  
 09/96

**Technical Data**

**Zone Control 368 One & Two Stage**

- Literature — A 000, A 368's, D 368, D 001, D 054, D 070, D 074
- Control — Microprocessor PID control; This is **not a safety (limit) control**.
- Packaged weight — 2.9 lb. (1300 g), Enclosure A, PVC plastic
- Dimensions — 6-5/8" H x 7-9/16" W x 2-13/16" D (170 x 193 x 72 mm)
- Approvals — CSA NRTL / C, meets ICES & FCC regulations for EMI/RFI.
- Ambient conditions — Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing.
- Power supply — 120 V ±10% 50/60 Hz 5 VA
- Pump relay — 120 V (ac) 6 A 1/3 hp, pilot duty 240 VA
- Zone relays — 120 V (ac) 6 A 1/3 hp, pilot duty 240 VA
- Maximum linkage — Up to 6 Zone Controls can be linked to a tekmar reset control.
- Sensors — NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892
  - included: None.
  - required: RTU 054, RTU 055 or 10k Indoor Sensor for each active zone. (Order separately)
- Timer — 24 hour, 1 event / day, 3 minute backup
- UnOcc. Duration — 0 to 24 hours
- Unoccupied — 40 to 100°F (4 to 38°C)



**System Operation & Specifications**

The House Control 371 and Zone Control 368 control the space temperature of six baseboard zones (Z1...Z6) and two radiant zones (Z7 & Z8). A variable speed injection pump and a boiler are controlled by the 371 to maintain the required supply water temperatures. The 371 also controls the supply of heat to a DHW tank. When cooling is required, the 371 interlocks the mechanical cooling.

**Piping and Heat Source Details** The six baseboard zones are piped in parallel using pumps. A check valve is required after each pump to prevent reverse flow. The DHW pump (P3) is also piped in parallel and is used to supply heat to the DHW tank. The primary pump (P1) circulates water in the boiler loop when the radiant zones call for heat. The two radiant zones are piped in parallel using zone pumps. Between the primary loop and the secondary radiant loop is a variable speed injection pump (P2) that transfers heat between the two loops. A balancing valve or globe valve (V1) may be required for optimum control operation as described in Essay E 021. Either a high mass boiler or a low mass boiler can be used with this application.

**Warm Weather Shut Down (WWSD)** When the outdoor temperature rises above the highest RTU dial setting and the heating zones are satisfied, the 371 shuts down the heating system. The DHW system does, however, continue to operate.

**Mixing Operation** The 371 uses an outdoor reset strategy together with indoor temperature feedback from the radiant RTUs to adjust the radiant supply water temperature. When heat is required in any of the radiant zones, the 371 turns on the primary pump (P1) and the appropriate zone pump(s) (Z7 and / or Z8). The speed of the injection pump (P2) is then varied in order to maintain the required supply water temperature. Injection pump (P2) is also controlled to ensure the boiler is protected from excessively low water temperatures and the radiant zones are protected from excessively high water temperatures.

**Boiler Operation** The 371 uses an outdoor reset strategy together with indoor temperature feedback from the baseboard RTUs to adjust the boiler supply water temperature. When heat is required in any of the baseboard zones, the 371 turns on the appropriate zone pump(s) (Z1...Z6) and operates the boiler to maintain the required supply water temperature. The control ensures a minimum water temperature to protect the boiler. The 371 automatically adjusts the boiler differential to prevent the boiler from short cycling.

**Domestic Hot Water (DHW)** When the DHW aquastat (A1) calls for heat, the 371 turns on the DHW pump (P3) and raises the boiler water temperature to at least 180°F (82°C). Once the DHW demand is removed, the 371 either performs a DHW Post Purge or a DHW Mixing Purge depending on whether or not the zones require heat.

**Zoning Operation** The 371 and the 368 vary the on time of each zone pump based on a 15 minute cycle. The controls stagger the operating times of the zones in order to achieve a steady load on the boiler and prevent boiler short cycling. The 371 also synchronizes the operation of its own zones with those of the 368.

**Cooling Operation** Once warm weather shut down occurs, the 371 provides a 45 minute interlock before cooling is allowed.

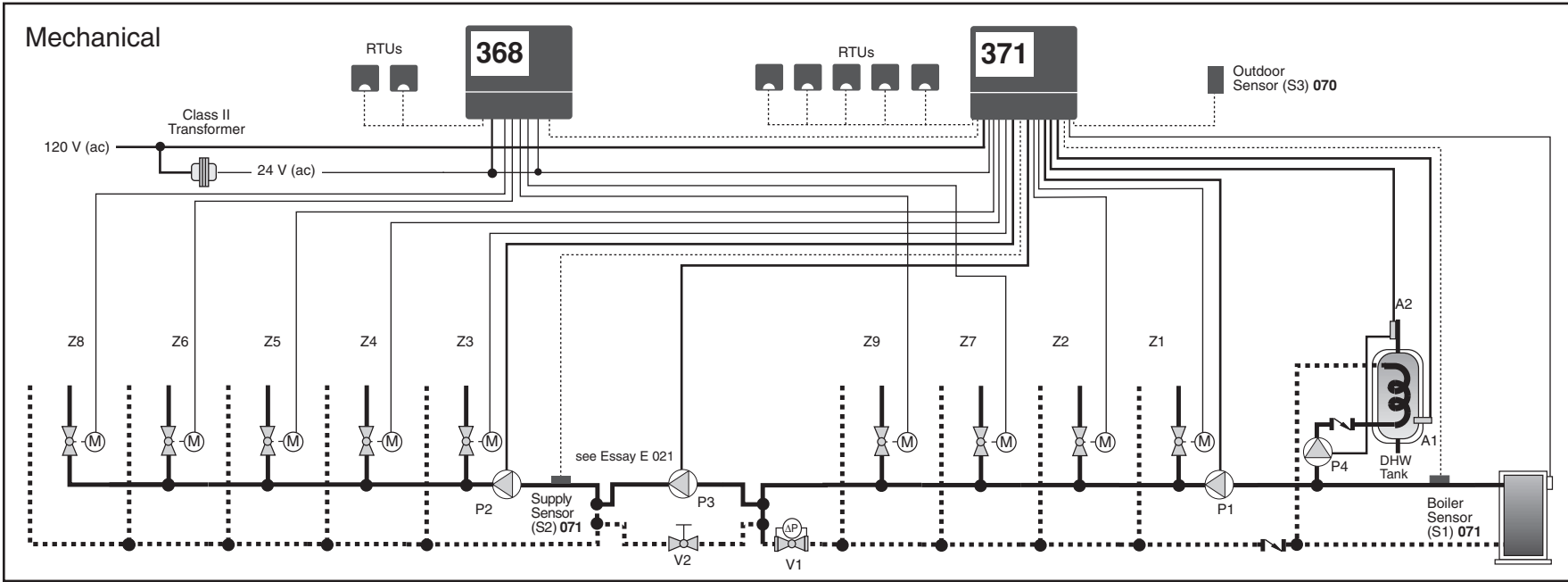
**UnOccupied (Night Setback)** Selected zones can be switched into an UnOccupied (Night Setback) mode through either the built-in 24 hr. Timer or by closing an external UnOccupied switch (U1 or U2) using the tekmar Timer 031. When a control is switched into UnOccupied mode, the UnOccupied dial is used to set the desired indoor temperature. An Optimum Start / Stop feature can be used to ensure the zones are returned to their Occupied temperatures as the UnOccupied period ends.

**Other features** Additional control features are listed in the table in the Heating Controls section of the Product Catalog I 000.

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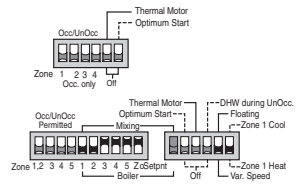


# Mechanical

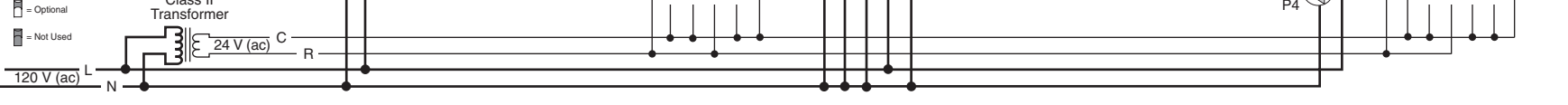


# Electrical

- A1 = DHW Aquastat
- A2 = DHW High Limit Aquastat
- P1 = Primary Pump
- P2 = System Pump
- P3 = Variable Speed Injection Pump
- P4 = DHW Pump
- S1 = Boiler Sensor 071
- S2 = Supply Sensor 071
- S3 = Outdoor Sensor 070
- U1 = tekmar Timer 031 (optional)
- V1 = Pressure Bypass Valve, or Balancing Valve, or Globe Valve
- V2 = Balancing Valve or Globe Valve
- Z1 ... Z9 = Zone Valves

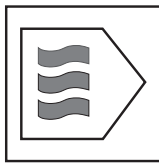


  = Required  
  = Optional  
  = Not Used



**Note:** This is only a concept drawing. The designer must determine whether this application will work in his system and must ensure compliance with code requirements. Necessary auxiliary equipment, isolation relays (for loads greater than the specified tekmar internal relay ratings), and other safety and limit devices must be added.

**tekmar® - Application**  
 Zone Control 368 & House Control 371

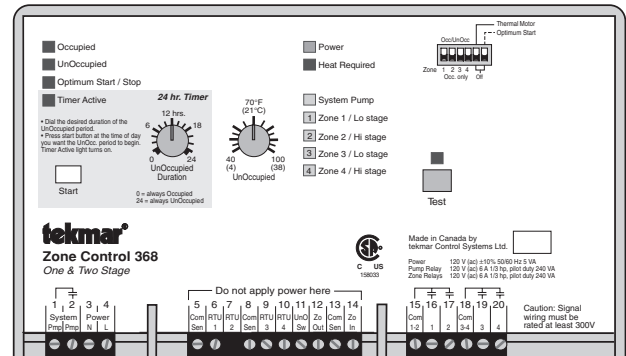


**A 368-5**  
 03/00

**Technical Data**

**Zone Control 368 One & Two Stage**

- Literature — D 368, A 368's, D 001.
- Control — Microprocessor PID control; This is **not a safety (limit) control**.
- Packaged weight — 2.9 lb. (1300 g), Enclosure A, blue PVC plastic
- Dimensions — 6-5/8" H x 7-9/16" W x 2-13/16" D (170 x 193 x 72 mm)
- Approvals — CSA C US, meets ICES & FCC regulations for EMI/RFI.
- Ambient conditions — Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing.
- Power — 120 V (ac) ±10% 50/60 Hz 5 VA
- Pump Relay — 120 V (ac) 10 A 1/3 hp, pilot duty 240 VA
- Zone Relays — 120 V (ac) 6 A 1/3 hp, pilot duty 240 VA
- Maximum linkage — Up to 6 Zone Controls can be linked to a tekmar reset control.
- Sensors required — NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892 RTU 054 or 055. (ordered separately)
- Optional devices — tekmar type #: 031, 367, 368.
- Timer — 24 hour, 1 event / day, 3 minute backup
- UnOcc. Duration — 0 to 24 hours
- Unoccupied — 40 to 100°F (4 to 38°C)



**System Operation & Specifications**

The House Control 371 and Zone Control 368 control the space temperature of two baseboard zones (Z1,Z2), three single stage radiant zones (Z3...Z5) and two - two stage radiant / baseboard zones (Z6/Z7 & Z8/Z9). A variable speed injection pump and a boiler are controlled by the 371 to maintain the required supply water temperatures. The 371 also controls the supply of heat to a DHW tank.

**Piping and Heat Source Details** The system is piped in a primary-secondary piping arrangement. The primary boiler loop pump (P1) supplies heat to the two baseboard zones as well as the second stage of baseboard for the two stage radiant zones. A balancing valve or globe valve (V1) is required to create a pressure drop across the baseboard zones. The DHW pump (P4) is used to supply heat to the DHW tank. The secondary system pump (P2) supplies heat to the five radiant zones. Between the primary and secondary loops is a variable speed injection pump (P3). This injection pump injects heat from the boiler loop into the radiant system loop. A balancing valve or globe valve (V2) may be required for optimum control operation as described in Essay E 021. Either a high mass boiler or a low mass boiler can be used with this application.

**Warm Weather Shut Down (WWSD)** When the outdoor temperature rises above the highest RTU dial setting and the heating zones are satisfied, the 371 shuts down the heating system. The DHW system does, however, continue to operate.

**Mixing Operation** The 371 uses an outdoor reset strategy together with indoor temperature feedback from the radiant RTUs to adjust the radiant supply water temperature. When heat is required in any of the radiant zones, the 371 turns on the primary pump (P1) and system pump (P2). The speed of the injection pump (P3) is then varied in order to maintain the required supply water temperature. Injection pump (P3) is also controlled to ensure the boiler is protected from excessively low water temperatures and the radiant zones are protected from excessively high water temperatures.


**Boiler Operation** The 371 uses an outdoor reset strategy together with indoor temperature feedback from the baseboard RTUs to adjust the boiler supply water temperature. When heat is required in any of the baseboard zones, the 371 turns on the primary pump (P1) and operates the boiler to maintain the required supply water temperature. The 371 automatically adjusts the boiler differential to prevent the boiler from short cycling.

**Domestic Hot Water (DHW)** When the DHW aquastat (A1) calls for heat, the 371 turns on the DHW pump (P4) and raises the boiler water temperature to at least 180°F (82°C). If DHW Priority is selected, the 371 turns off the boiler pump (P1). Once the DHW demand is removed, the 371 either performs a DHW Post Purge or a DHW Mixing Purge depending on whether or not the zones require heat.

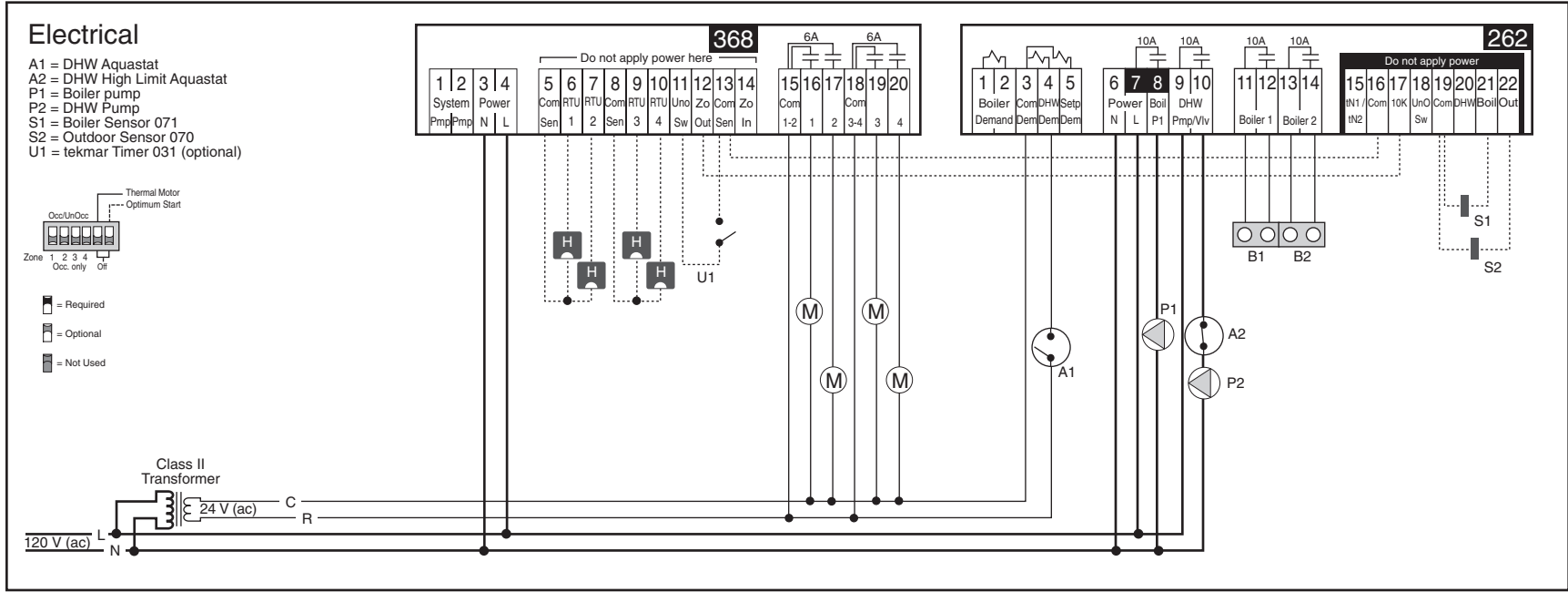
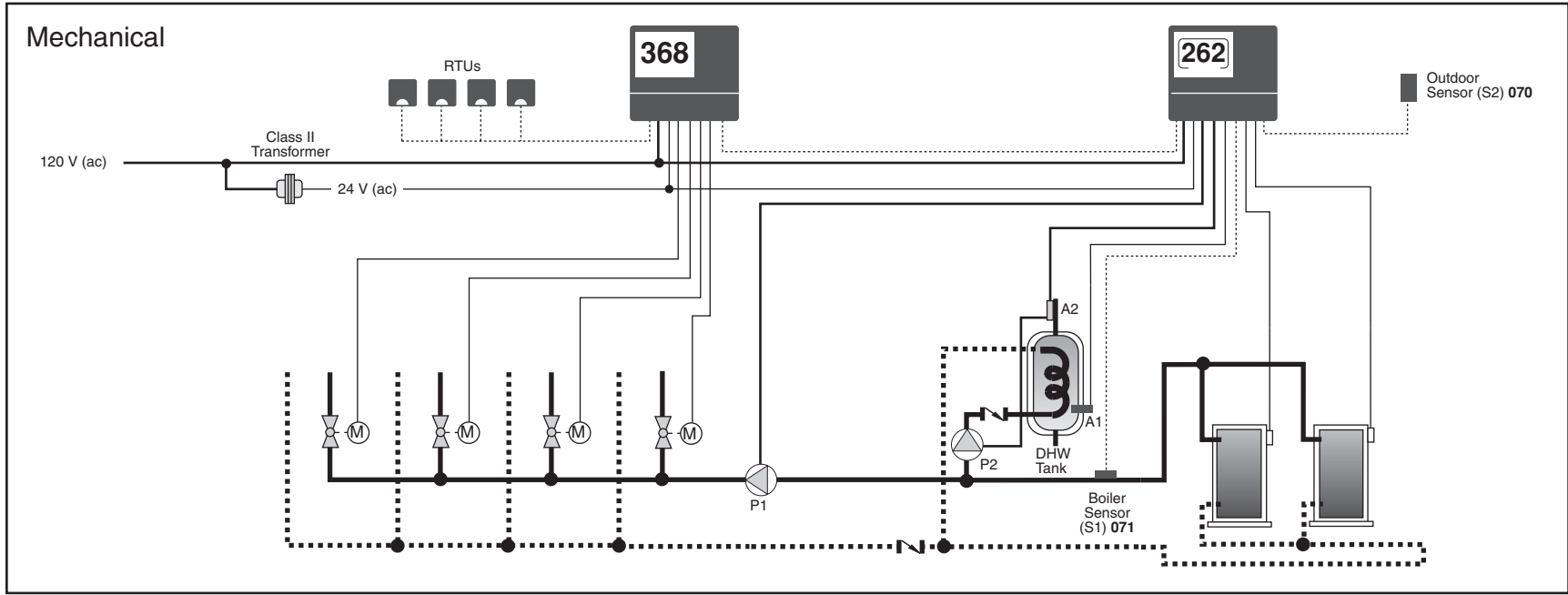
**Zoning Operation** The 371 and the 368 vary the on time of each zone valve based on a 15 minute cycle. The zone valves Z6 and Z8 are controlled as the first stage of heat until their required on times exceed the 15 minute cycle. The 371 then turns on the zone valves Z7 and / or Z9 and increases the on time of these valves in order to satisfy the heating load. The controls stagger the operating times of the zones in order to achieve a steady load on the boiler and prevent boiler short cycling. The 371 also synchronizes the operation of its own zones with those of the 368.

**UnOccupied (Night Setback)** Selected zones can be switched into an UnOccupied (Night Setback) mode through either the built-in 24 hr. Timer or by closing an external UnOccupied switch (U1 or U2) using the tekmar Timer 031. When a control is switched into UnOccupied mode, the UnOccupied dial is used to set the desired indoor temperature. An Optimum Start / Stop feature can be used to ensure the zones are returned to their Occupied temperatures as the UnOccupied period ends.

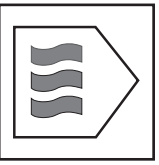
**Other features** Additional control features are listed in the table in the Heating Controls section of the Product Catalog I 000.

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**Note:** This is only a concept drawing. The designer must determine whether this application will work in his system and must ensure compliance with code requirements. Necessary auxiliary equipment, isolation relays (for loads greater than the specified tekmar internal relay ratings), and other safety and limit devices must be added.



**A 368-6**  
04/00

## System Operation

The Boiler Control 262 and the Zone Control 368 combine to provide either full or partial outdoor reset to four zones of heating using Room Temperature Units (RTU's) as well as Domestic Hot Water (DHW) operation and staging and rotation of two boilers.

**Heat Source Details** The heat source can be either high mass or low mass non-condensing or low temperature boilers. If using low temperature boilers, refer to sections C3 and D1 of the Data Brochure D 262 for additional information.

**Piping Details** RTU controlled zone valves are piped into the boiler loop. The boiler pump (P1) provides circulation through these zones when heat is required. Heat is supplied to the DHW tank through a DHW pump (P2).

**Heating Zones** The air temperatures in the boiler zones are controlled using RTU's. The Zone Control 368 uses PID (proportional, integral, derivative) air temperature control and synchronizes the operation of the zones to provide more even loading of the boiler system. The 368 uses its Zo Out terminal to send an internal Boiler Demand to the 262 when the boiler zones require heat. The same Zo Out terminal provides an indoor temperature feedback signal from the 368 to the 262. This signal allows the 262 to provide more accurate control of the boiler supply temperature.

**DHW Demand** When the DHW aquastat (A1) calls for heat, the 262 turns on the DHW pump (P2) and raises the boiler water temperature to at least the DHW XCHG setting. The control can provide DHW priority (refer to section C2 and C3 of the Data Brochure D 262) by turning off the boiler pump (P1). Once the DHW demand is removed, the 262 performs a DHW Post Purge and possibly a Mixing Purge.

**Boiler Demand** When heat is required in the boiler zones, the Zone Control 368 provides an internal Boiler Demand (through the Zo Out / 10K connection) to the 262. The 262 turns on the boiler pump (P1). The boiler supply temperature is based on the *Characterized Heating Curve* settings and indoor temperature feedback from the Zone Control 368.

All control functions and specifications are listed in the Product Catalog I 000 and the Data Brochures D 262 and D 368.



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