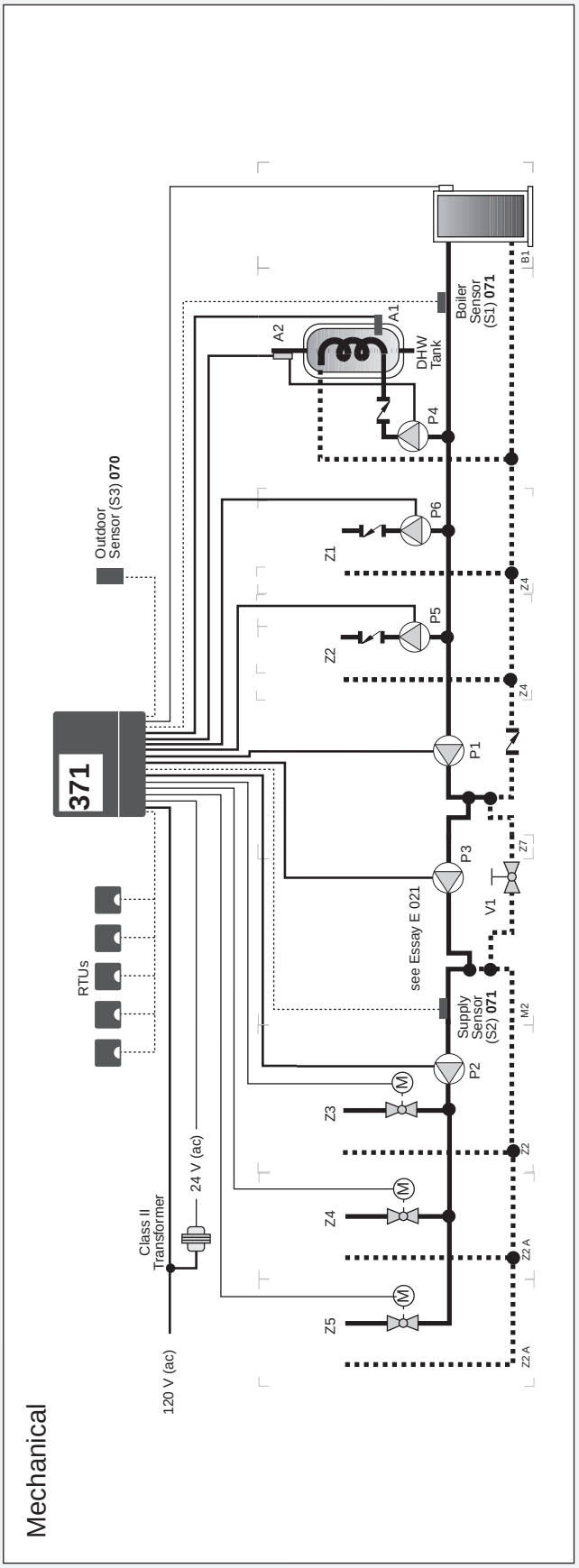
tekmar® - Application

House Control 371

A 371-1

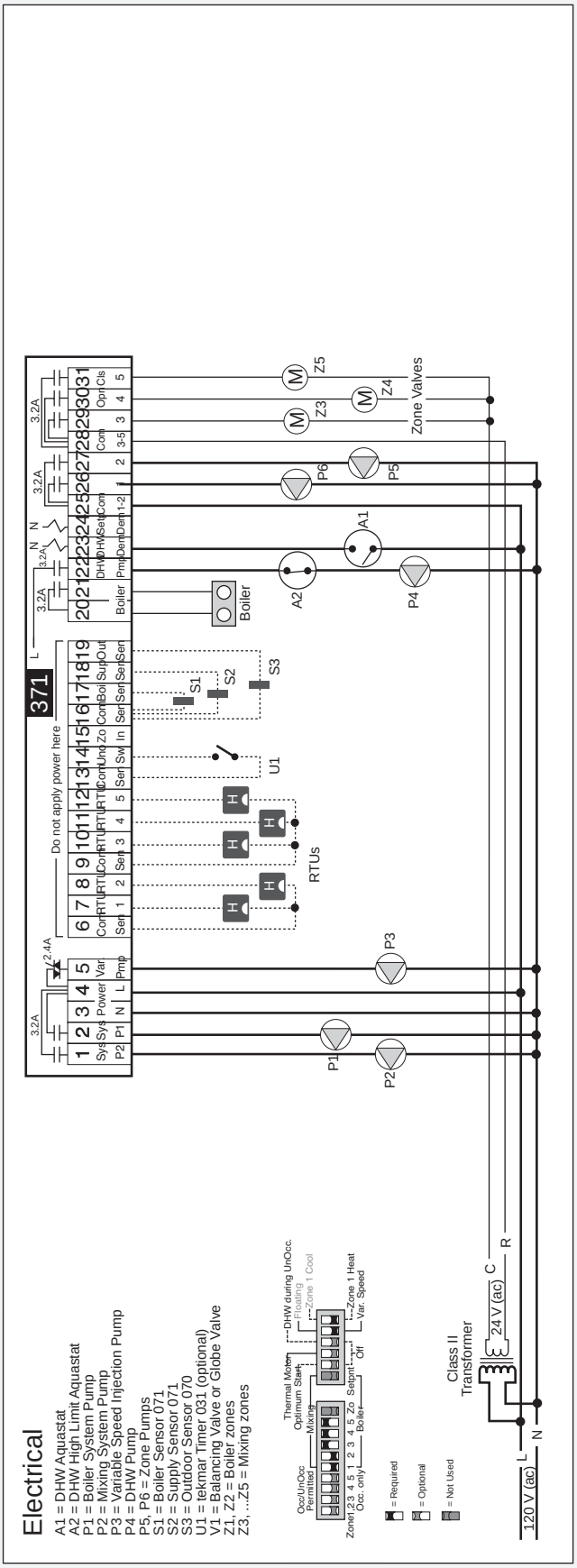
07/96

Mechanical



Electrical

A1 = DHW Aquastat
A2 = DHW High Limit Aquastat
P1 = Boiler System Pump
P2 = Mixing System Pump
P3 = Variable Speed Injection Pump
P4 = DHW Pump
P5, P6 = Zone Pumps
S1 = Boiler Sensor 071
S2 = Supply Sensor 071
S3 = Outdoor Sensor 070
U1 = tekmar Timer 031 (optional)
V1 = Balancing Valve or Globe Valve
Z1, Z2 = Boiler zones
Z3, ...Z5 = Mixing zones

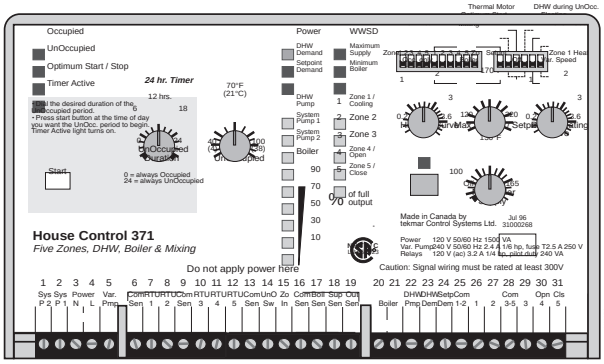


Note: This is only a concept drawing. The designer must determine whether this application will work in his system and must ensure compliance with code requirements. Necessary auxiliary equipment, isolation relays (for loads greater than the specified tekmar internal relay ratings), and other safety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

Technical Data

House Control 371 *Five Zones, DHW, Boiler & Mixing*

Literature	—	A 000, A 371's, I 030, E 021, D 371, D 001, D 054, D 070, D 074
Control	—	Microprocessor PID control; This is **not a safety (limit) control**.
Packaged weight	—	3.5 lb. (1600 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 1500 VA
Variable Pump	—	240 V 50/60 Hz 2.4 A 1/6 hp, fuse T2.5 A 250 V
Relays	—	120 V (ac) 3.2 A 1/4 hp, pilot duty 240 VA
Demand inputs	—	Off @ 0 to 5 V (ac), On @ 15 to 120 V 50/60 Hz 0.6 VA
Sensors	—	NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) ß=3892
included:		Outdoor Sensor 070 and two of Universal Sensor 071.
required:		RTU 054, 055 or 10K 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)
Heating Curve	—	0.2 to 3.6
Max. Supply / Setpoint	—	120 to 220°F (49 to 104°C)
Boiler Heating Curve	—	0.2 to 3.6
Min. Boiler Supply	—	Off, 100 to 165°F (Off, 38 to 74°C)



System Operation & Control Functions

The House Control 371 controls the space temperature of two hot water (boiler) zones and three warm water (mixing) zones. The boiler is operated to supply the required water temperature to the boiler zones and the variable speed injection pump to the mixing zones. The 371 also controls the supply of heat to an indirect Domestic Hot Water (DHW) tank.

Piping and Heat Source Details The system is plumbed in a primary-secondary piping arrangement. Two boiler zones controlled through zone pumps are piped in parallel in the boiler loop. Three mixing zones controlled through zone valves are piped in parallel in the mixing loop. The variable speed injection pump (P3) injects heat from the boiler loop to the mixing loop. A balancing valve or globe valve (V2) may be required for optimum mixing control operation as described in Essay E 021. Either a high mass or a low mass boiler can be used with this application. Heat is supplied to the DHW tank through a DHW pump.

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.

Boiler Operation The 371 uses an outdoor reset strategy, together with indoor temperature feedback from the boiler zones, to adjust the boiler supply water temperature. When heat is required in the boiler loop zones, the 371 turns on the appropriate zone pumps and operates the boiler. The 371 aims to maintain the boiler temperature above the *Min. Boiler Supply* dial setting and automatically adjusts the boiler differential to prevent the boiler from short cycling.

Mixing Operation The 371 uses an outdoor reset strategy, together with indoor temperature feedback from the mixing zones, to adjust the mixed supply water temperature. When heat is required in the mixing zones, the 371 turns on the boiler system pump (P1) and the mixing system pump (P2). The variable speed injection pump (P3) is then controlled to supply the required mixed supply water temperature while protecting the boiler from excessively low water temperatures and protecting the system from excessively high water temperatures.

DHW Operation 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). The control provides a conditional DHW priority by turning off all other pumps until the boiler water temperature is greater than 170°F (77°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.

Zone Operation The 371 varies the on time of each zone valve or pump based on a 15 minute cycle. The control coordinates the operating times of the zones in order to achieve a steady load on the boiler and prevent boiler short cycling.

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, 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.

All control functions are listed in the table in the Heating Controls section of the Product Catalog I 000 and explained in the **Glossary of Functions and Benefits (I 030)** brochure.

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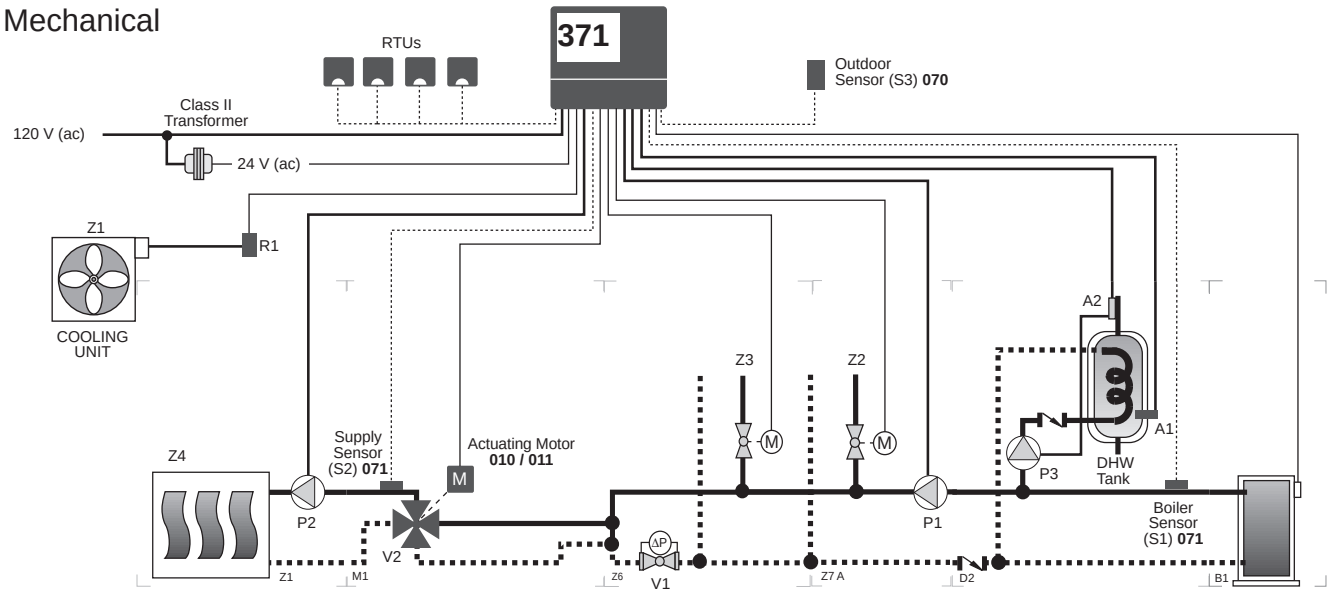
House Control 371

A 371-2

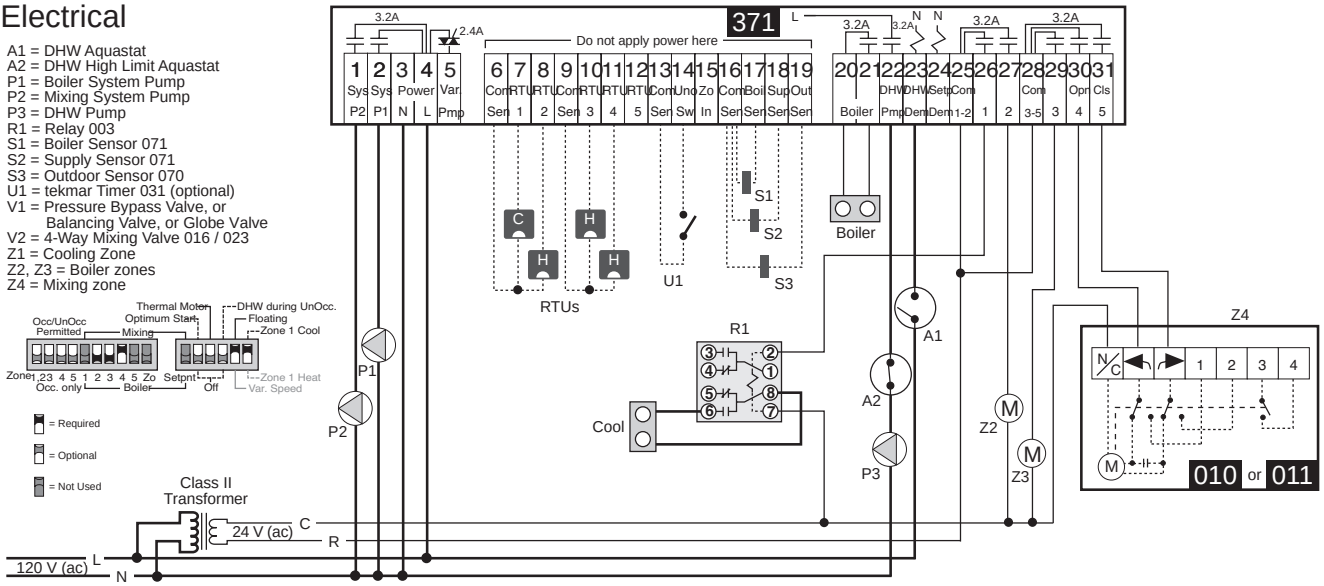
07/96

Mechanical



Electrical

A1 = DHW Aquastat
A2 = DHW High Limit Aquastat
P1 = Boiler System Pump
P2 = Mixing System Pump
P3 = DHW Pump
R1 = Relay 003
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 = 4-Way Mixing Valve 016 / 023
Z1 = Cooling Zone
Z2, Z3 = Boiler zones
Z4 = Mixing zone

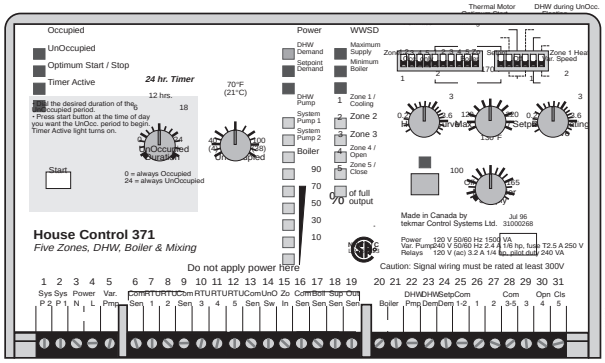


Note: This is only a concept drawing. The designer must determine whether this application will work in his system and must ensure compliance with code requirements. Necessary auxiliary equipment, isolation relays (for loads greater than the specified tekmar internal relay ratings), and other safety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

Technical Data

House Control 371 *Five Zones, DHW, Boiler & Mixing*

Literature	—	A 000, A 371's, I 030, E 021, D 371, D 001, D 054, D 070, D 074
Control	—	Microprocessor PID control; This is **not a safety (limit) control**.
Packaged weight	—	3.5 lb. (1600 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 1500 VA
Variable Pump	—	240 V 50/60 Hz 2.4 A 1/6 hp, fuse T2.5 A 250 V
Relays	—	120 V (ac) 3.2 A 1/4 hp, pilot duty 240 VA
Demand inputs	—	Off @ 0 to 5 V (ac), On @ 15 to 120 V 50/60 Hz 0.6 VA
Sensors	—	NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) ß=3892
included:		Outdoor Sensor 070 and two of Universal Sensor 071.
required:		RTU 054, 055 or 10K 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)
Heating Curve	—	0.2 to 3.6
Max. Supply / Setpoint	—	120 to 220°F (49 to 104°C)
Boiler Heating Curve	—	0.2 to 3.6
Min. Boiler Supply	—	Off, 100 to 165°F (Off, 38 to 74°C)



System Operation & Control Functions

The House Control 371 controls the space temperature of two hot water (boiler) zones and one warm water (mixing) zone. The boiler is operated to supply the required water temperature to the two boiler zones and the 4-way mixing valve to the mixing zone. The 371 also controls the supply of heat to an indirect Domestic Hot Water (DHW) tank. When cooling is required the 371 operates a mechanical cooling unit.

Piping and Heat Source Details The system is plumbed in a primary-secondary piping arrangement. Two boiler zones, controlled through zone valves, are piped in parallel in the boiler loop. The pressure bypass valve or globe valve (V1) is required to create a pressure drop across these boiler zones. The 4-way mixing valve mixes water from the boiler loop with the mixing loop. Either a high mass or a low mass boiler can be used with this application. Heat is supplied to the DHW tank through a DHW pump.

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.

Boiler Operation The 371 uses an outdoor reset strategy, together with indoor temperature feedback from the boiler zones, to adjust the boiler supply water temperature. When heat is required in the boiler zones, the 371 turns on the boiler system pump (P1) and opens the zone valves. The 371 aims to maintain the boiler temperature above the *Min. Boiler Supply* dial setting and automatically adjusts the boiler differential to prevent the boiler from short cycling.

Mixing Operation The 371 uses an outdoor reset strategy, together with indoor temperature feedback from an RTU, to adjust the mixed supply water temperature. When heat is required in the mixing zone, the 371 turns on the boiler system pump (P1) and the mixing system pump (P2). The 4-way mixing valve is controlled to supply the required mixed water temperature while protecting the boiler from excessively low water temperatures and protecting the system from excessively high water temperatures.

DHW Operation 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). The control provides a conditional DHW priority by closing the boiler zones and the mixing valve and turning the boiler system pump off until the boiler water temperature is greater than 170°F (77°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.

Zone Operation The 371 varies the on time of each zone valve based on a 15 minute cycle. The control coordinates the operating times of the zones in order to achieve a steady load on the boiler and prevent boiler short cycling.

Cooling Operation Once the heating system is shut down, the 371 provides a 45 minute interlock before cooling is allowed. During cooling operation, the 371 varies the on time of the mechanical cooling unit (Z1) over a 30 minute cycle.

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, 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.

All control functions are listed in the table in the Heating Controls section of the Product Catalog I 000 and are explained in the **Glossary of Functions and Benefits (I 030)** brochure.

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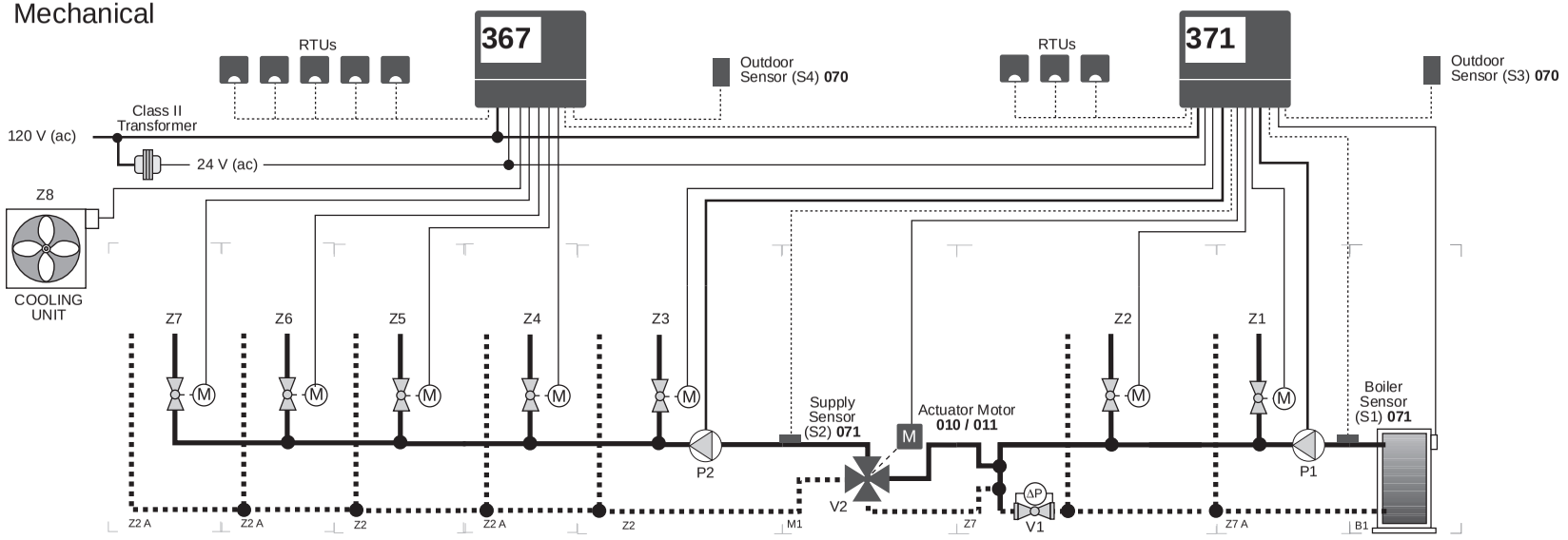
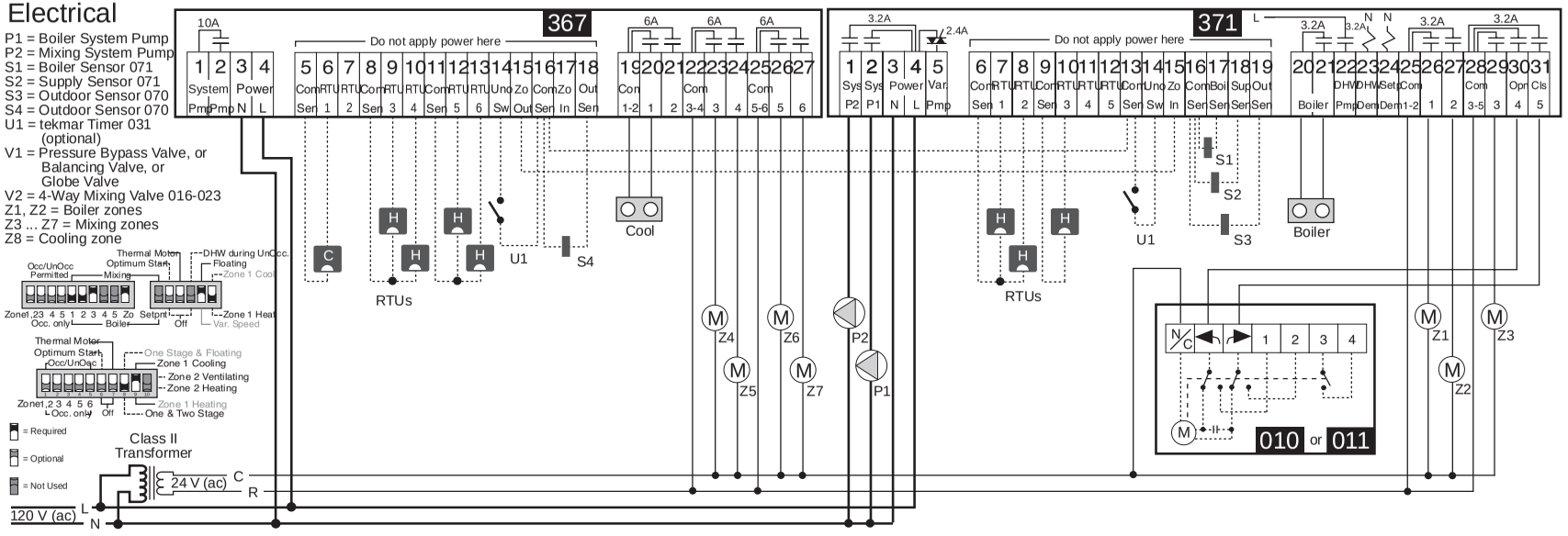
House Control 371 & Zone Control 367

Mechanical



Electrical

P1 = Boiler System Pump
P2 = Mixing System Pump
S1 = Boiler Sensor 071
S2 = Supply Sensor 071
S3 = Outdoor Sensor 070
S4 = Outdoor Sensor 070
U1 = tekmar Timer 031 (optional)
V1 = Pressure Bypass Valve, or Balancing Valve, or Globe Valve
V2 = 4-Way Mixing Valve 016-023
Z1, Z2 = Boiler zones
Z3 ... Z7 = Mixing zones
Z8 = Cooling zone



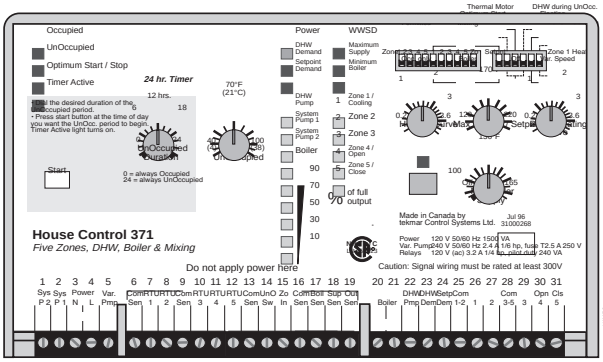
Note: This is only a concept drawing. The designer must determine whether this application will work in his system and must ensure compliance with code requirements. Necessary auxiliary equipment, isolation relays (for loads greater than the specified tekmar internal relay ratings), and other safety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

A 371-3
07/96

Technical Data

House Control 371 *Five Zones, DHW, Boiler & Mixing*

Literature	—	A 000, A 371's, I 030, E 021, D 371, D 001, D 054, D 070, D 074
Control	—	Microprocessor PID control; This is **not a safety (limit) control**.
Packaged weight	—	3.5 lb. (1600 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 1500 VA
Variable Pump	—	240 V 50/60 Hz 2.4 A 1/6 hp, fuse T2.5 A 250 V
Relays	—	120 V (ac) 3.2 A 1/4 hp, pilot duty 240 VA
Demand inputs	—	Off @ 0 to 5 V (ac), On @ 15 to 120 V 50/60 Hz 0.6 VA
Sensors	—	NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) ß=3892
included:		Outdoor Sensor 070 and two of Universal Sensor 071.
required:		RTU 054, 055 or 10K 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)
Heating Curve	—	0.2 to 3.6
Max. Supply / Setpoint	—	120 to 220°F (49 to 104°C)
Boiler Heating Curve	—	0.2 to 3.6
Min. Boiler Supply	—	Off, 100 to 165°F (Off, 38 to 74°C)



System Operation & Control Functions

The House Control 371 and a Zone Control 367 control the space temperature of two hot water (boiler) zones and five warm water (mixing) zones. The boiler is operated to supply the required water temperature to the two boiler zones and the 4-way mixing valve to the mixing zones. When cooling is required the 371 operates a mechanical cooling unit.

Piping and Heat Source Details The system is plumbed in a primary-secondary piping arrangement. Two boiler zones, controlled through zone valves, are piped in parallel in the boiler loop. The pressure bypass valve or globe valve (V1) is required to create a pressure drop across the boiler loop zones. Five mixing zones controlled through zone valves are piped in parallel in the mixing loop. The 4-way mixing valve mixes water from the boiler loop with the mixing loop. Either a high mass 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.

Boiler Operation The 371 uses an outdoor reset strategy, together with indoor temperature feedback from the boiler zones, to adjust the boiler supply water temperature. When heat is required in the boiler zones, the 371 turns on the boiler system pump (P1) and opens the zone valves. The 371 aims to maintain the boiler water temperature above the *Min. Boiler Supply* dial setting and automatically adjusts the boiler differential to prevent the boiler from short cycling.

Mixing Operation The 371 uses an outdoor reset strategy, together with indoor temperature feedback from the mixing zones, to adjust the mixed supply water temperature. When heat is required in the mixing zones, the 371 turns on the boiler system pump (P1) and the mixing system pump (P2). The 4-way mixing valve is controlled to supply the required mixed water temperature while protecting the boiler from excessively low water temperatures and protecting the system from excessively high water temperatures.

Zone Operation The 371 and the 367 vary the on time of each zone valve based on a 15 minute cycle. The controls coordinate 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 367.

Cooling Operation Once the heating system is shut down, the 367 provides a 45 minute interlock before cooling is allowed. During cooling operation, the 367 varies the on time of the mechanical cooling unit over a 30 minute cycle.

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 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.

All control functions are listed in the table in the Heating Controls section of the Product Catalog I 000 and explained in the **Glossary of Functions and Benefits (I 030)** brochure.

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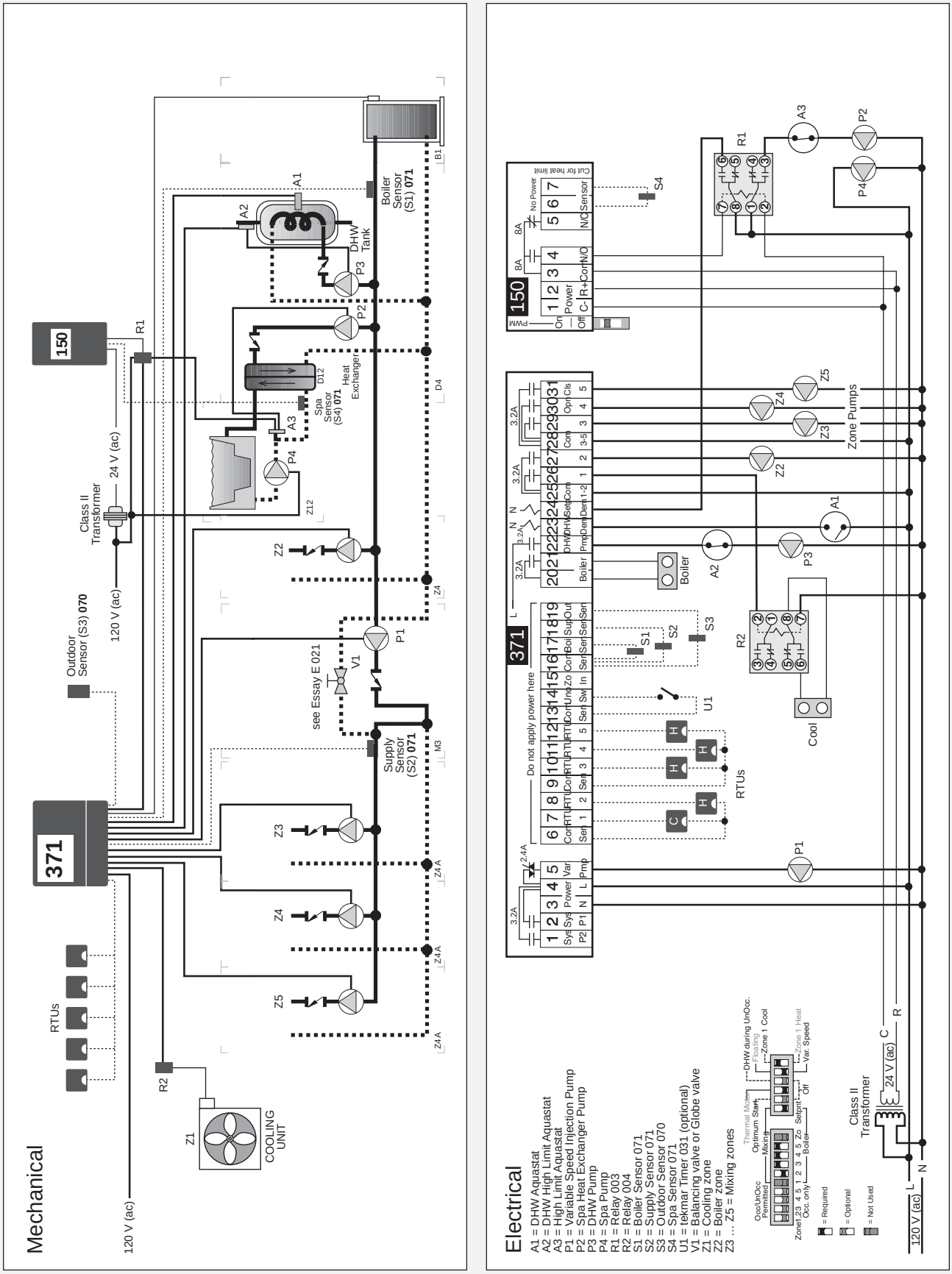
House Control 371 & One Stage Setpoint Control 150

A 371-4

07/96

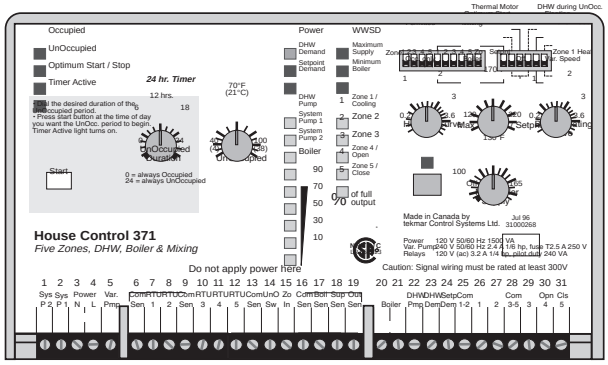


Note: This is only a concept drawing. The designer must determine whether this application will work in his system and must ensure compliance with code requirements. Necessary auxiliary equipment, isolation relays (for loads greater than the specified tekmar internal relay ratings), and other safety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

Technical Data

House Control 371 *Five Zones, DHW, Boiler & Mixing*

Literature	—	A 000, A 371's, I 030, E 021, D 371, D 001, D 054, D 070, D 074
Control	—	Microprocessor PID control; This is **not a safety (limit) control**.
Packaged weight	—	3.5 lb. (1600 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 1500 VA
Variable Pump	—	240 V 50/60 Hz 2.4 A 1/6 hp, fuse T2.5 A 250 V
Relays	—	120 V (ac) 3.2 A 1/4 hp, pilot duty 240 VA
Demand inputs	—	Off @ 0 to 5 V (ac), On @ 15 to 120 V 50/60 Hz 0.6 VA
Sensors	—	NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) ß=3892
included:		Outdoor Sensor 070 and two of Universal Sensor 071.
required:		RTU 054, 055 or 10K 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)
Heating Curve	—	0.2 to 3.6
Max. Supply / Setpoint	—	120 to 220°F (49 to 104°C)
Boiler Heating Curve	—	0.2 to 3.6
Min. Boiler Supply	—	Off, 100 to 165°F (Off, 38 to 74°C)



System Operation & Control Functions

The House Control 371 controls the space temperature of one hot water (boiler) zone and three warm water (mixing) zones. The Setpoint Control 150 controls the temperature of a spa. The boiler is operated to supply the required water temperature to the boiler zone and the variable speed injection pump to the mixing zones. The 371 also controls the supply of heat to an indirect Domestic Hot Water (DHW) tank and the spa. When cooling is required the 371 operates a mechanical cooling unit.

Piping and Heat Source Details One boiler zone, controlled through a zone pump, is piped in parallel in the boiler loop. Three mixing zones, controlled through zone pumps, are piped in parallel in the mixing loop. The variable speed injection pump (P1) injects heat directly from the boiler to the mixing loop. A balancing valve or globe valve (V1) may be required for optimum mixing control operation as described in Essay E 021. Since the flow of water through the boiler changes with the speed of the injection pump (P1), a high mass boiler must be used to prevent the boiler from short cycling. Heat is supplied to the DHW tank through a DHW pump.

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 and Spa systems do, however, continue to operate.

Boiler Operation The 371 uses an outdoor reset strategy, together with indoor temperature feedback from the boiler zone, to adjust the boiler supply water temperature. When heat is required in the boiler zone, the 371 turns on the zone pump. The 371 aims to maintain the boiler water temperature above the *Min. Boiler Supply* dial setting and automatically adjusts the boiler differential to prevent the boiler from short cycling. When the spa requires heat, the 150 turns on the spa heat exchanger pump (P2) and the 371 turns on the boiler to provide at least 180°F (82°C).

Mixing Operation The 371 uses an outdoor reset strategy, together with indoor temperature feedback from the mixing zones, to adjust the mixed supply water temperature. When heat is required in the mixing zones, the 371 operates the variable speed injection pump. The speed of the pump is varied in order to maintain the required mixed water temperature while protecting the boiler from excessively low water temperatures and protecting the system from excessively high water temperatures.

DHW Operation When the DHW aquastat calls for heat, the 371 turns on the DHW pump (P3) and raises the boiler water temperature to at least 180°F (82°C).The control provides a conditional DHW priority by turning off the injection pump (P1) and the boiler zone pump until the boiler water temperature is greater than 170°F (77°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.

Zone Operation The 371 varies the on time of each zone pump based on a 15 minute cycle. The control coordinates the operating times of the zones in order to achieve a steady load on the boiler and prevent boiler short cycling.

Cooling Operation Once the heating system is shut down, the 371 provides a 45 minute interlock before cooling is allowed. During cooling operation, the 371 varies the on time of the mechanical cooling unit over a 30 minute cycle.

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 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.

All control functions are listed in the table in the Heating Controls section of the Product Catalog I 000 and are explained on the **Glossary of Functions and Benefits (I 030)** brochure.

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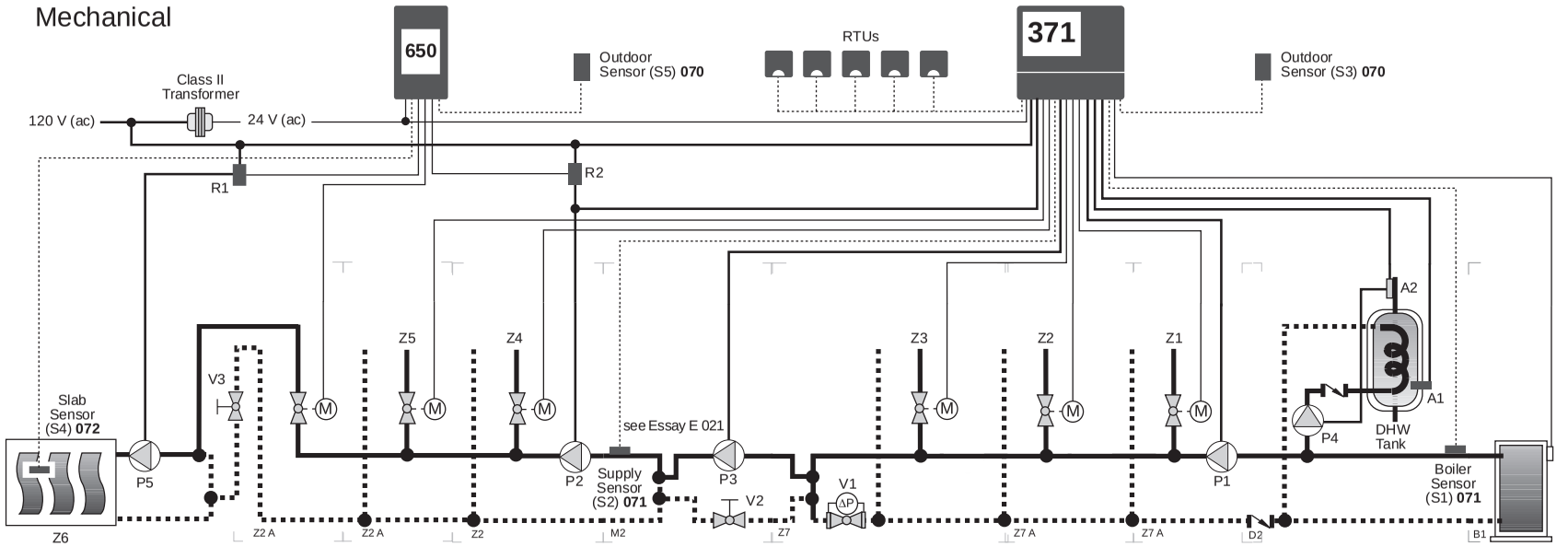
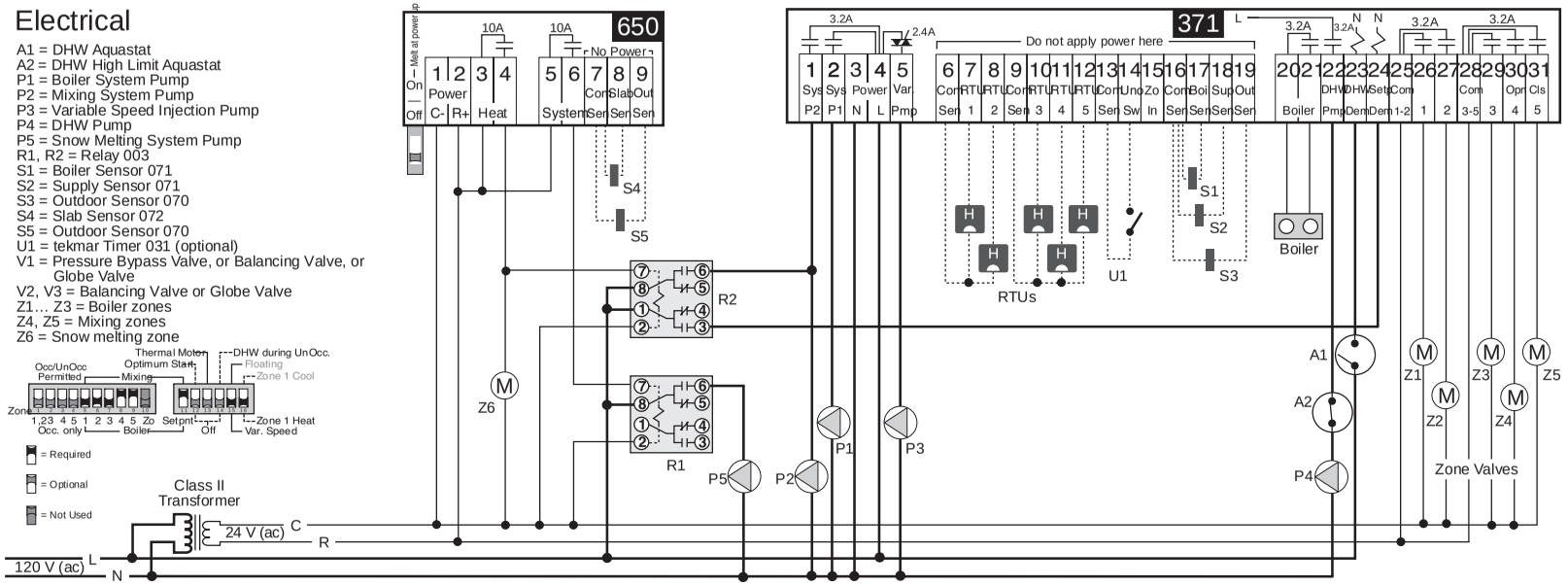
Mechanical



Electrical

A1 = DHW Aquastat
A2 = DHW High Limit Aquastat
P1 = Boiler System Pump
P2 = Mixing System Pump
P3 = Variable Speed Injection Pump
P4 = DHW Pump
P5 = Snow Melting System Pump
R1, R2 = Relay 003
S1 = Boiler Sensor 071
S2 = Supply Sensor 071
S3 = Outdoor Sensor 070
S4 = Slab Sensor 072
S5 = Outdoor Sensor 070
U1 = tekmar Timer 031 (optional)
V1 = Pressure Bypass Valve, or Balancing Valve, or Globe Valve
V2, V3 = Balancing Valve or Globe Valve
Z1... Z3 = Boiler zones
Z4, Z5 = Mixing zones
Z6 = Snow melting zone



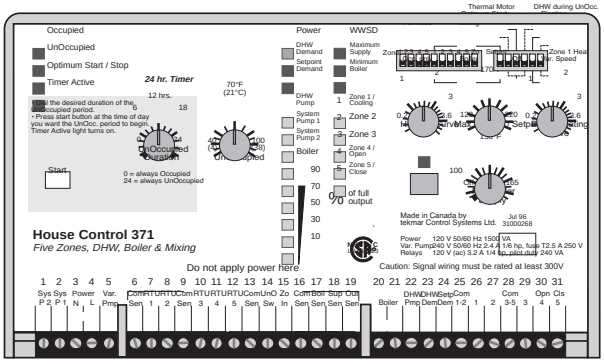
Note: This is only a concept drawing. The designer must determine whether this application will work in his system and must ensure compliance with code requirements. Necessary auxiliary equipment, isolation relays (for loads greater than the specified tekmar internal relay ratings), and other safety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

A 371-5
07/96

Technical Data

House Control 371 *Five Zones, DHW, Boiler & Mixing*

Literature	—	A 000, A 371's, I 030, E 021, D 371, D 001, D 054, D 070, D 074
Control	—	Microprocessor PID control; This is **not a safety (limit) control**.
Packaged weight	—	3.5 lb. (1600 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 1500 VA
Variable Pump	—	240 V 50/60 Hz 2.4 A 1/6 hp, fuse T2.5 A 250 V
Relays	—	120 V (ac) 3.2 A 1/4 hp, pilot duty 240 VA
Demand inputs	—	Off @ 0 to 5 V (ac), On @ 15 to 120 V 50/60 Hz 0.6 VA
Sensors	—	NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) ß=3892
included:		Outdoor Sensor 070 and two of Universal Sensor 071.
required:		RTU 054, 055 or 10K 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)
Heating Curve	—	0.2 to 3.6
Max. Supply / Setpoint	—	120 to 220°F (49 to 104°C)
Boiler Heating Curve	—	0.2 to 3.6
Min. Boiler Supply	—	Off, 100 to 165°F (Off, 38 to 74°C)



System Operation & Control Functions

The House Control 371 controls the space temperature of three hot water (boiler) zones and two warm water (mixing) zones. The Snow Melting Control 650 controls the temperature of a snow melt slab. The boiler is operated to supply the required water temperature to the boiler zones and the variable speed injection pump to the mixing zones. The 371 also controls the supply of heat to an indirect Domestic Hot Water (DHW) tank and the snow melting system.

Piping and Heat Source Details The system is plumbed in a primary-secondary piping arrangement. Three boiler zones controlled through zone valves are piped in parallel in the boiler loop. The pressure bypass valve or globe valve (V1) is required to create a pressure drop across these boiler loop zones. Two mixing zones controlled through zone valves are piped in parallel in the mixing loop. The variable speed injection pump (P1) injects heat from the boiler loop to the mixing loop. A balancing valve or globe valve (V2) may be required for optimum mixing control operation as described in Essay E 021. Either a high mass or a low mass boiler can be used with this application. Heat is supplied to the DHW tank through a DHW pump. An antifreeze (glycol) solution is assumed to flow through the entire heating system.

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.

Boiler Operation The 371 uses an outdoor reset strategy, together with indoor temperature feedback from the boiler zones, to adjust the boiler supply water temperature. When heat is required in the boiler zones, the 371 turns on the boiler system pump (P1) and opens the zone valves. The 371 aims to maintain the boiler water temperature above the *Min. Boiler Supply* dial setting and automatically adjusts the boiler differential to prevent the boiler from short cycling.

Mixing Operation The 371 uses an outdoor reset strategy, together with indoor temperature feedback from the mixing zones, to adjust the mixed supply water temperature. When heat is required in the mixing zones, the 371 turns on the boiler system pump (P1) and the mixing system pump (P2). The variable speed injection pump (P3) is controlled to supply the required mixed water temperature while protecting the boiler from excessively low water temperatures and protecting the system from excessively high water temperatures. When snow melting is required, the 650 turns on the snow melting pump (P5). The 650 then injects heat into the slab by opening the zone valve, and provides a setpoint demand to the 371. The 371 operates the variable speed injection pump (P3) to increase the mixed supply water temperature to the *Max. Supply / Setpnt* dial setting.

DHW Operation When the DHW aquastat calls for heat, the 371 turns on the DHW pump (P4) and raises the boiler water temperature to at least 180°F (82°C). The control provides a conditional DHW priority by closing the boiler zones and turning off the boiler system pump (P1) until the boiler temperature is greater than 170°F (77°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.

Zone Operation The 371 varies the on time of each zone pump based on a 15 minute cycle. The control coordinates the operating times of the zones in order to achieve a steady load on the boiler and prevent boiler short cycling.

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 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.

All control functions are listed in the table in the Heating Controls section of the Product Catalog I 000 and are explained in the **Glossary of Functions and Benefits (I 030)** brochure.

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