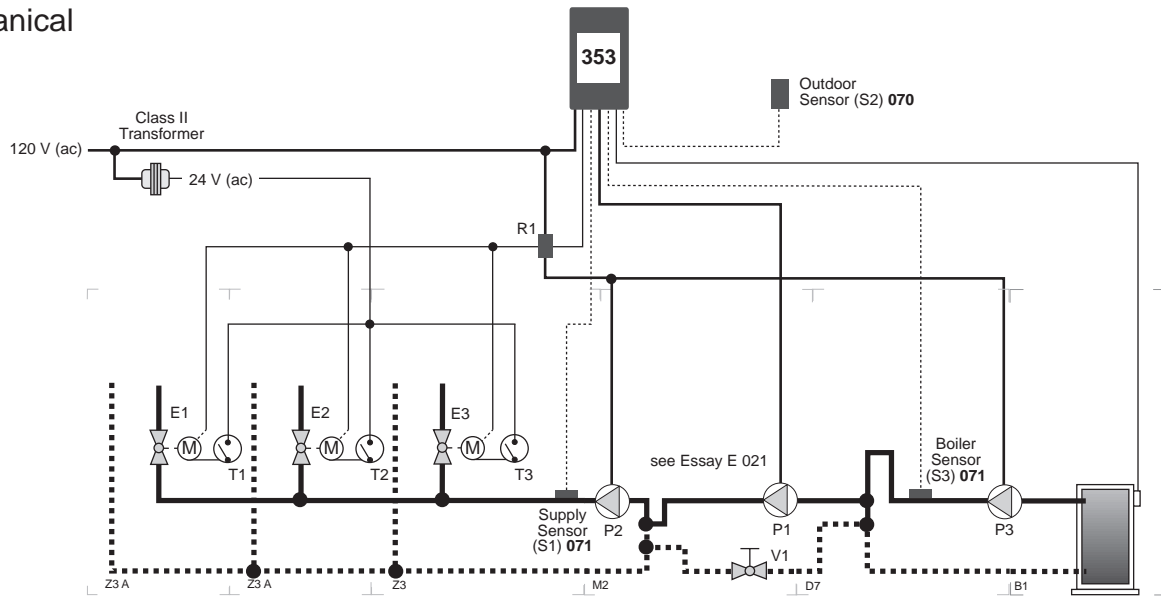
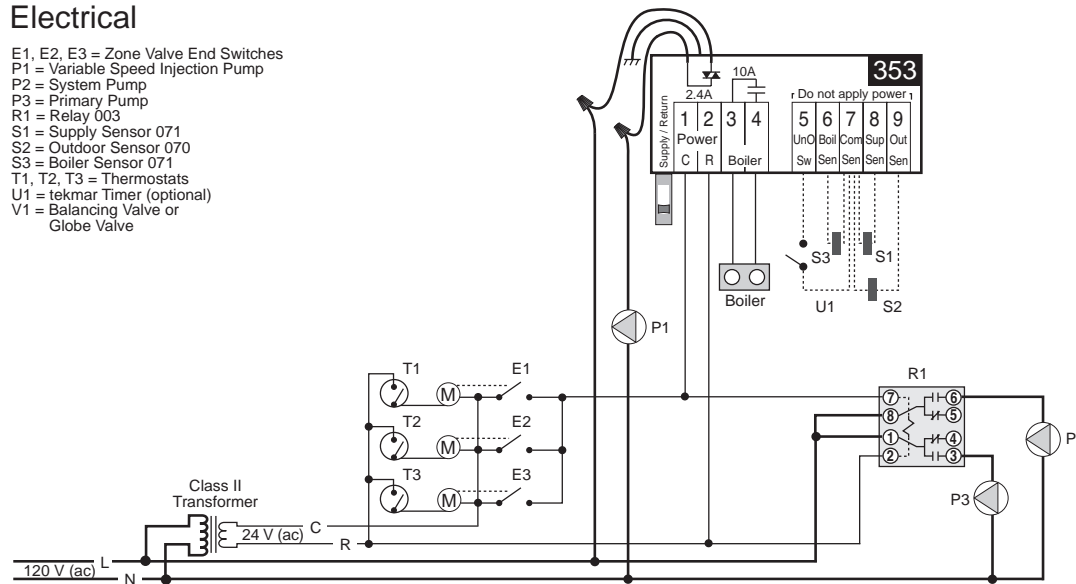


Mechanical



Electrical

- E1, E2, E3 = Zone Valve End Switches
- P1 = Variable Speed Injection Pump
- P2 = System Pump
- P3 = Primary Pump
- R1 = Relay 003
- S1 = Supply Sensor 071
- S2 = Outdoor Sensor 070
- S3 = Boiler Sensor 071
- T1, T2, T3 = Thermostats
- U1 = tekmar Timer (optional)
- V1 = Balancing Valve or Globe Valve



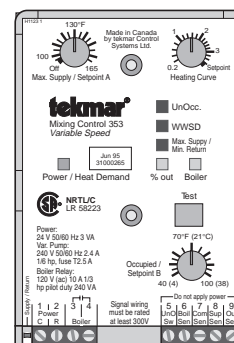
Note: This is only a concept drawing. The designer must determine whether this application will work in his system and must ensure compliance with code requirements. Necessary auxiliary equipment, isolation relays (for loads greater than the specified tekmar internal relay ratings), and other safety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

Technical Data

Mixing Control 353 Variable Speed

- Literature — D 353, A 353, D 001, D 070, Essays
- Control — Microprocessor PID control; This is **not a safety (limit) control**.
- Packaged weight — 1.1 lb. (500 g), Enclosure D, PVC plastic
- Dimensions — 4-3/4" H x 2-7/8" W x 1-7/8" D (120 x 73 x 48 mm)
- Approvals — CSA NRTL / C, meets DOC & FCC regulations for EMI/RFI.
- Ambient conditions — Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing.
- Power supply — Class 2, 24 V ±10% 50/60 Hz 3 VA
- Variable Pump — 240 V 50/60 Hz 2.4 A 1/6 hp, fuse T2.5 A 250 V
- Relay — 120 V (ac) 10 A 1/3 hp, pilot duty 240 VA
- Sensors included: — NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892
Outdoor Sensor 070 and 2 of Universal Sensor 071

- Occupied / Setpoint B — 40 to 100°F (4 to 38°C)
- Heating Curve — 0.2 to 3.4, Setpoint
- Max. Supply / Setpoint A — Off, 100 to 185°F (Off, 38 to 85°C)



System Operation & Specifications

The Mixing Control 353 controls the supply water temperature to three heating zones by varying the speed of an injection pump and operating a boiler. The space temperature in each of the zones is controlled using thermostats.

Piping and Heat Source Details The system is plumbed in a primary-secondary piping arrangement. The variable speed injection pump (P1) injects heat from the boiler loop to the system loop. A balancing valve or globe valve (V1) may be required for optimum control operation as described in Essay E 021. Either a high mass or a low mass boiler can be used with this applicaton.

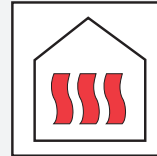
Warm Weather Shut Down (WWSD) When the outdoor temperature rises above the Occupied dial setting, the 353 shuts down the heating system.

Mixing Operation The 353 uses an outdoor reset strategy to adjust the system supply water temperature. When one of the thermostats calls for heat, its zone valve is opened and the zone valve end switch powers up the 353 and turns on the primary pump (P3) and system pump (P2) through relay R1. The 353 then controls the variable speed injection pump (P1) to supply the required system water temperature while protecting the boiler from excessively low water temperatures and protecting the system from excessively high water temperatures. In order to maximize boiler efficiency, the 353 operates the boiler at the lowest possible water temperature without causing flue gas condensation. If the mixing system requires additional heat, the 353 raises the boiler water temperature. The 353 automatically adjusts the boiler differential to prevent the boiler from short cycling.

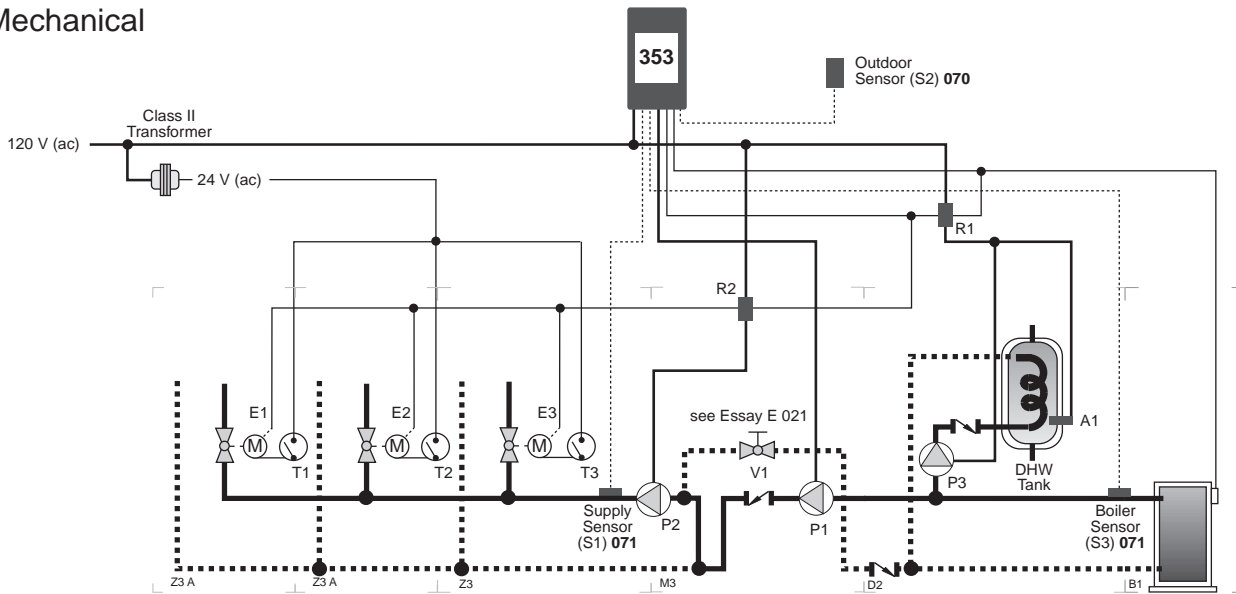
UnOccupied (Night Setback) The 353 can be switched into an UnOccupied (Night Setback) mode by closing an external UnOccupied switch (U1). When the control is switched into UnOccupied mode, the target indoor temperature is reduced to 9°F below the Occupied dial setting.

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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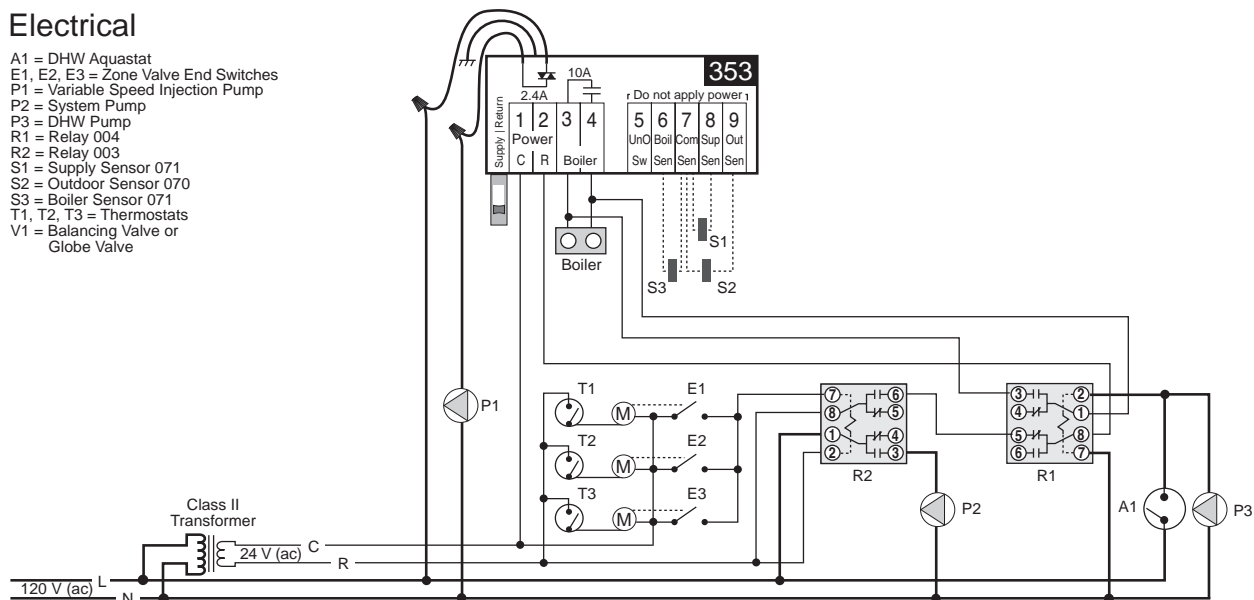


Mechanical



Electrical

- A1 = DHW Aquastat
- E1, E2, E3 = Zone Valve End Switches
- P1 = Variable Speed Injection Pump
- P2 = System Pump
- P3 = DHW Pump
- R1 = Relay 004
- R2 = Relay 003
- S1 = Supply Sensor 071
- S2 = Outdoor Sensor 070
- S3 = Boiler Sensor 071
- T1, T2, T3 = Thermostats
- V1 = Balancing Valve or Globe Valve

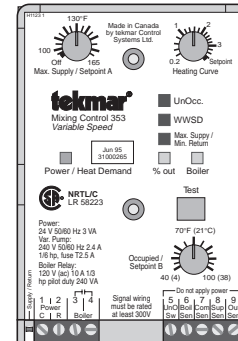


Note: This is only a concept drawing. The designer must determine whether this application will work in his system and must ensure compliance with code requirements. Necessary auxiliary equipment, isolation relays (for loads greater than the specified tekmar internal relay ratings), and other safety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

Technical Data

Mixing Control 353 Variable Speed

- Literature — D 353, A 353, D 001, D 070, Essays
- Control — Microprocessor PID control; This is **not a safety (limit) control**.
- Packaged weight — 1.1 lb. (500 g), Enclosure D, PVC plastic
- Dimensions — 4-3/4" H x 2-7/8" W x 1-7/8" D (120 x 73 x 48 mm)
- Approvals — CSA NRTL / C, meets DOC & FCC regulations for EMI/RFI.
- Ambient conditions — Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing.
- Power supply — Class 2, 24 V ±10% 50/60 Hz 3 VA
- Variable Pump — 240 V 50/60 Hz 2.4 A 1/6 hp, fuse T2.5 A 250 V
- Relay — 120 V (ac) 10 A 1/3 hp, pilot duty 240 VA
- Sensors — NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892
- included: Outdoor Sensor 070 and 2 of Universal Sensor 071
- Occupied / Setpoint B — 40 to 100°F (4 to 38°C)
- Heating Curve — 0.2 to 3.4, Setpoint
- Max. Supply / Setpoint A — Off, 100 to 185°F (Off, 38 to 85°C)



System Operation & Specifications

The Mixing Control 353 controls the supply water temperature to three heating zones by varying the speed of an injection pump and operating a boiler. The space temperature in each of the zones is controlled using thermostats. The supply of heat to a DHW tank is controlled through external relay logic.

Piping and Heat Source Details The variable speed injection pump (P1) injects heat from the boiler into the system loop. A balancing valve or globe valve (V1) may be required for optimum 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.

Warm Weather Shut Down (WWSD) When the outdoor temperature rises above the Occupied dial setting, the 353 shuts down the heating system.

Mixing Operation The 353 uses an outdoor reset strategy to adjust the system supply water temperature. When one of the thermostats calls for heat, its zone valve is opened and the zone valve end switch powers up the 353 and turns on the system pump (P2) through relay R2. The 353 then controls the variable speed injection pump (P1) to supply the required system water temperature while protecting the boiler from excessively low water temperatures and protecting the system from excessively high water temperatures. In order to maximize boiler efficiency, the 353 operates the boiler at the lowest possible water temperature without causing flue gas condensation. If the mixing system requires additional heat, the 353 raises the boiler water temperature. The 353 automatically adjusts the boiler differential to prevent the boiler from short cycling.

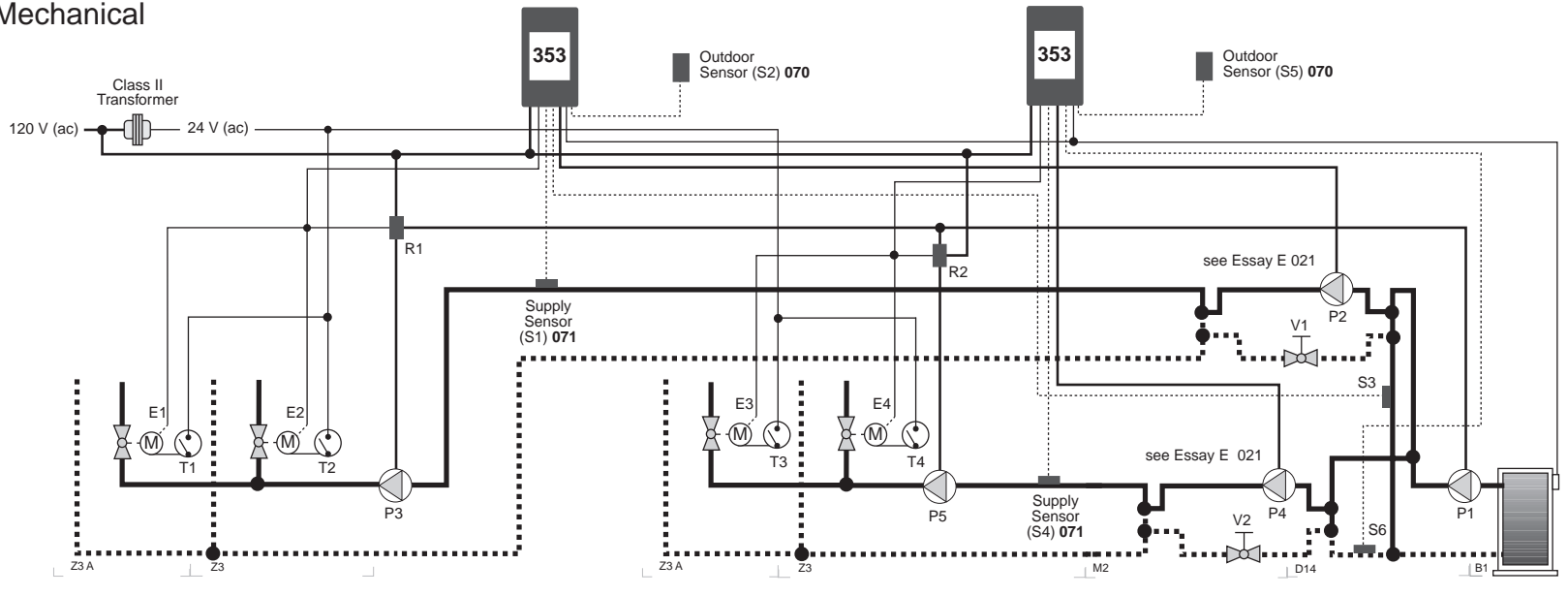
Domestic Hot Water (DHW) When the DHW tank requires heat, the DHW aquastat (A1) turns on DHW pump (P3) and relay R1. Relay R1 turns on the boiler and breaks power to the 353 in order to provide DHW Priority.

UnOccupied (Night Setback) The 353 can be switched into an UnOccupied (Night Setback) mode by closing an external UnOccupied switch (U1). When the control is switched into UnOccupied mode, the target indoor temperature is reduced to 9°F below the Occupied dial setting.

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

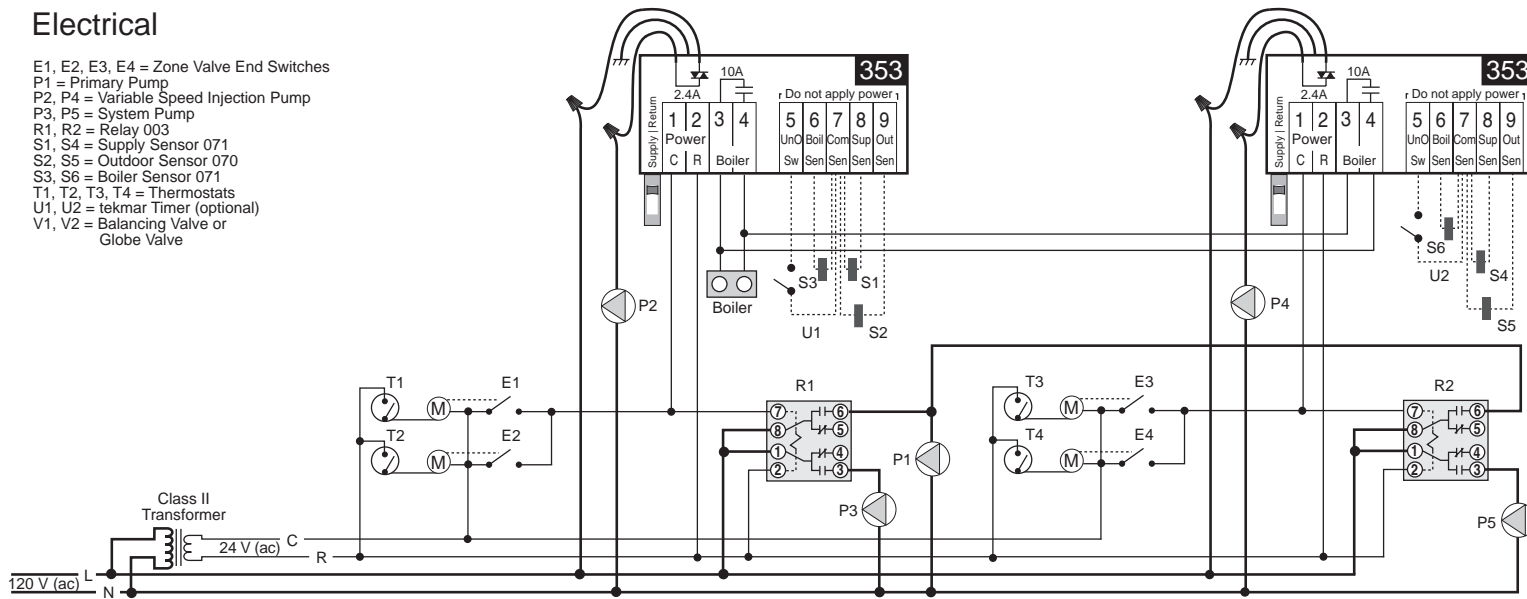
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Mechanical

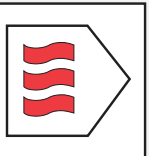


Electrical

- E1, E2, E3, E4 = Zone Valve End Switches
- P1 = Primary Pump
- P2, P4 = Variable Speed Injection Pump
- P3, P5 = System Pump
- R1, R2 = Relay 003
- S1, S4 = Supply Sensor 071
- S2, S5 = Outdoor Sensor 070
- S3, S6 = Boiler Sensor 071
- T1, T2, T3, T4 = Thermostats
- U1, U2 = tekmar Timer (optional)
- V1, V2 = Balancing Valve or Globe Valve



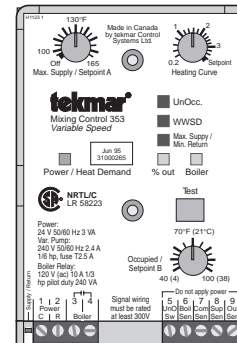
Note: This is only a concept drawing. The designer must determine whether this application will work in his system and must ensure compliance with code requirements. Necessary auxiliary equipment, isolation relays (for loads greater than the specified tekmar internal relay ratings), and other safety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



Technical Data

Mixing Control 353 Variable Speed

- Literature — D 353, A 353, D 001, D 070, Essays
- Control — Microprocessor PID control; This is **not a safety (limit) control**.
- Packaged weight — 1.1 lb. (500 g), Enclosure D, PVC plastic
- Dimensions — 4-3/4" H x 2-7/8" W x 1-7/8" D (120 x 73 x 48 mm)
- Approvals — CSA NRTL / C, meets DOC & FCC regulations for EMI/RFI.
- Ambient conditions — Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing.
- Power supply — Class 2, 24 V ±10% 50/60 Hz 3 VA
- Variable Pump — 240 V 50/60 Hz 2.4 A 1/6 hp, fuse T2.5 A 250 V
- Relay — 120 V (ac) 10 A 1/3 hp, pilot duty 240 VA
- Sensors — NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892
- included: Outdoor Sensor 070 and 2 of Universal Sensor 071
- Occupied / Setpoint B — 40 to 100°F (4 to 38°C)
- Heating Curve — 0.2 to 3.4, Setpoint
- Max. Supply / Setpoint A — Off, 100 to 185°F (Off, 38 to 85°C)



System Operation & Specifications

Two Mixing Controls 353 control the supply water temperature to four heating zones by varying the speed of injection pumps. Through the appropriate settings this application can provide different supply water temperatures in each of the mixing systems. The space temperature in each of the zones is controlled using thermostats.

Piping and Heat Source Details The system is plumbed in a primary-secondary piping arrangement. Each variable speed injection pump (P2 and P4) injects heat from the boiler loop to its system loop. A balancing valve or globe valve (V1 and V2) may be required for optimum control operation as described in Essay E 021. Either a high mass or a low mass boiler can be used in this application.

Warm Weather Shut Down (WWSD) When the outdoor temperature rises above the Occupied dial setting, the 353 stops providing heat to its heating zones.

Mixing Operation Each 353 uses an outdoor reset strategy to adjust its system supply water temperature. Operation of the upper system is as follows. When one of the thermostats (T1 or T2) calls for heat, the appropriate zone valve is opened and the zone valve end switch (E1 or E2) powers up the 353 and turns on the system pump (P3) and primary pump (P1) through relay R1. The 353 then controls the variable speed injection pump (P2) to supply the required system water temperature while protecting the boiler from excessively return low water temperatures and protecting the system from excessively high water temperatures. If either of the 353's require additional heat, the boiler is turned on and allowed to run on its aquastat. A separate tekmar boiler control could be added to regulate the boiler's operation.

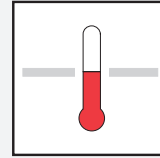
UnOccupied (Night Setback) Either 353 can be switched into an UnOccupied (Night Setback) mode by closing an external UnOccupied switch (U1 or U2). When a control is switched into UnOccupied mode, the target indoor temperature is reduced to 9°F below the Occupied dial setting.

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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tekmar® - Application

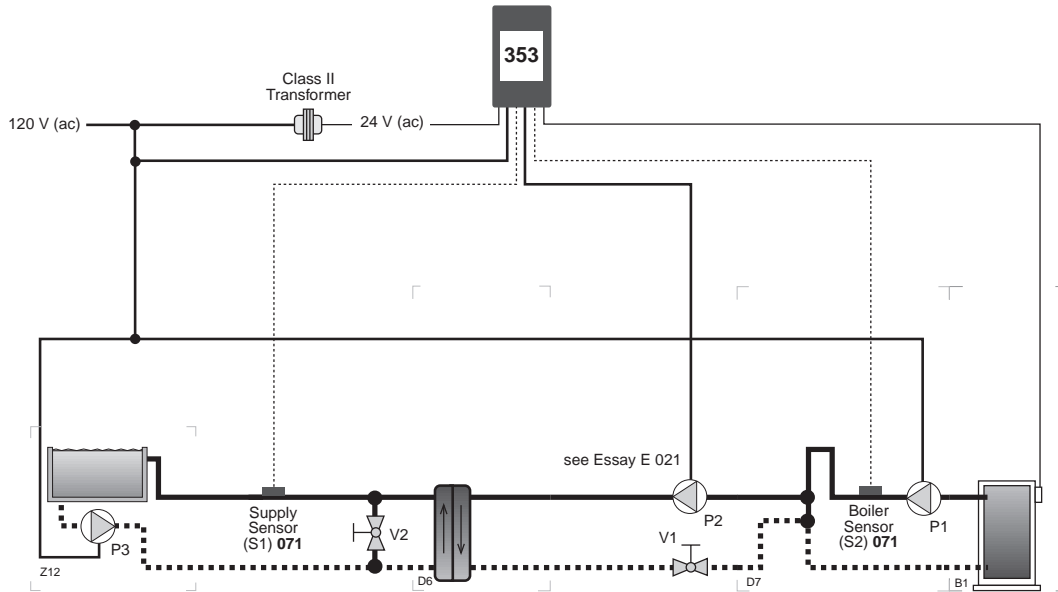
Mixing Control 353



A 353-4

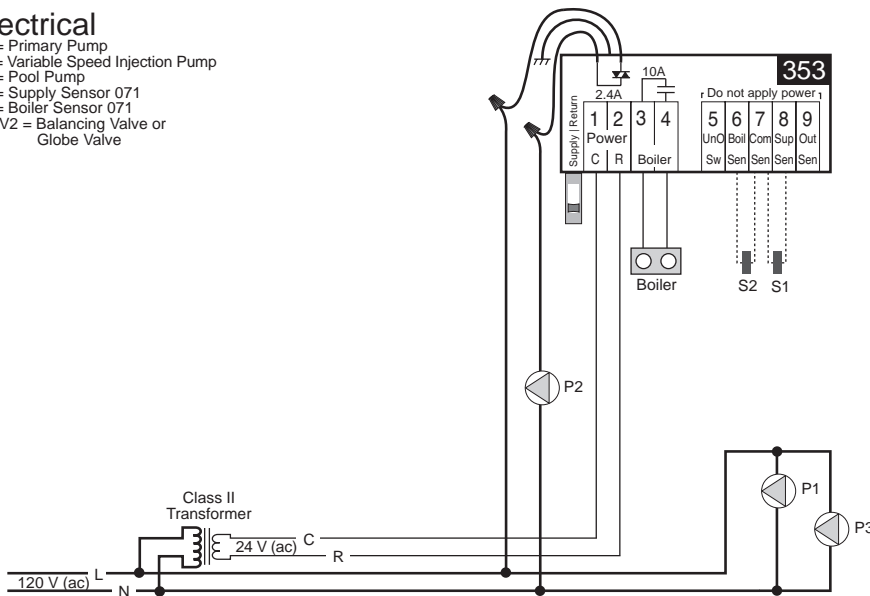
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Mechanical



Electrical

- P1 = Primary Pump
- P2 = Variable Speed Injection Pump
- P3 = Pool Pump
- S1 = Supply Sensor 071
- S2 = Boiler Sensor 071
- V1, V2 = Balancing Valve or Globe Valve

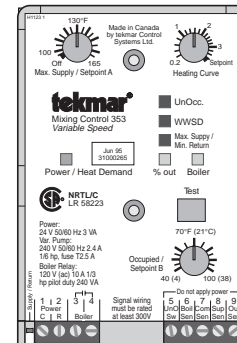


Note: This is only a concept drawing. The designer must determine whether this application will work in his system and must ensure compliance with code requirements. Necessary auxiliary equipment, isolation relays (for loads greater than the specified tekmar internal relay ratings), and other safety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

Technical Data

Mixing Control 353 Variable Speed

- Literature — D 353, A 353, D 001, D 070, Essays
- Control — Microprocessor PID control; This is **not a safety (limit) control**.
- Packaged weight — 1.1 lb. (500 g), Enclosure D, PVC plastic
- Dimensions — 4-3/4" H x 2-7/8" W x 1-7/8" D (120 x 73 x 48 mm)
- Approvals — CSA NRTL / C, meets DOC & FCC regulations for EMI/RFI.
- Ambient conditions — Indoor use only, 32 to 122°F (0 to 50°C), < 90% RH non-condensing.
- Power supply — Class 2, 24 V ±10% 50/60 Hz 3 VA
- Variable Pump — 240 V 50/60 Hz 2.4 A 1/6 hp, fuse T2.5 A 250 V
- Relay — 120 V (ac) 10 A 1/3 hp, pilot duty 240 VA
- Sensors included: — NTC thermistor, 10 kΩ @ 77°F (25°C ±0.2°C) β=3892
Outdoor Sensor 070 and 2 of Universal Sensor 071
- Occupied / Setpoint B — 40 to 100°F (4 to 38°C)
- Heating Curve — 0.2 to 3.4, Setpoint
- Max. Supply / Setpoint A — Off, 100 to 185°F (Off, 38 to 85°C)



System Operation & Specifications

The Mixing Control 353 controls the supply water temperature to a pool or spa.

Piping and Heat Source Details The system is plumbed with a variable speed injection pump (P1) injecting heat from the boiler loop into a heat exchanger. A balancing valve or globe valve (V1) may be required for optimum control operation as described in Essay E 021. Either a high mass or a low mass boiler can be used with this application.

Mixing Operation The 353 controls the variable speed injection pump (P1) and a boiler in order to maintain a set supply water temperature to the pool or spa. The 353 also protects the boiler from excessively low water temperatures that would cause flue gas condensation. The pool pump (P2) runs continuously.

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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