T775 Series 2000 Electronic Stand-Alone Controllers
T775 SERIES 2000 ELECTRONIC STAND-ALONE CONTROLLERS

IMPORTANT
The T775R is an operating control, not a limit or safety control. If used in applications requiring safety or limit controls, a separate safety or limit control device is required.

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T775 APPLICATION TIPS

Q Does the T775 save programmed values if the power is lost?
A Yes. The T775 has an EEPROM that saves all values entered and restores them once power is reapplied. The date and time settings are retained for 24 hours after a power outage. After a power loss of more than 24 hours, the date and time settings may need to be reentered. All other settings are stored permanently.

Q What is the time constant for the T775?
A The T775 standard sensor (50021579-001) has a time constant of approximately 8 seconds. The T775 samples sensor input every 100 milliseconds and updates the control and display every 1 second.

Q Can sensors be shared by several T775s to simplify installation or provide more stages?
A Each T775 must be wired to its own sensor(s). However, a benefit of the T775 controller’s high accuracy is that there is no more than a 2° differential between any two T775 controllers.

Q Can a T775 be powered with dc voltage?
A No. The T775 controllers may be powered with 24 Vac, 120 Vac, or 240 Vac only, and a separate earth ground is required.

Q Is a separate earth ground required?
A Yes. Each T775 controller must have its own earth ground, regardless of the power source (24, 120, or 240 Vac). The earth ground must be connected to the earth ground terminal on the 24 Vac terminal block.

Q Can sensors be series-parallel wired to the T775 to provide an average temperature?
A Yes. Sensors can be series-parallel wired to the T775. In order to maintain control accuracy, the number of sensors wired must be of the n^2 power (i.e. 4, 9, 16, etc.).

Q How do I know that my selection or value has been entered?
A Once you have selected an item from a list or entered a value using the ▲ and ▼ buttons, pressing the ▼ or ▲ button accepts your selection or value and stores it in the controller’s memory.

Q What are the T775 Series 2000 Controller specifications?
A Refer to the T775 Series 2000 Electronic Stand-Alone Controllers - Specification Data (form 63-1318).
### T775 SERIES 2000 ELECTRONIC STAND-ALONE CONTROLLERS

**Accessories**
- 107324A – Bulb Holder, duct insertion
- 107408 – Heat Conductive Compound, 4 ounce
- 50001774-001 – Immersion Well, stainless steel 304, 1/2 in. threading

**FEATURES**

In Table 1 a check mark (✓) indicates that the controller model has this feature. A number indicates the quantity (e.g., the T775M2030 has 4 standard SPDT relay outputs), and "n/a" indicates the feature is not applicable to that controller model.

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<td>Independently selectable for 0-10 Vdc, 2-10 Vdc, 4-20 mA, or Series 90</td>
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4-7147-06
### Sensor Inputs

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T775 OPERATIONS

Integral Action

"Droop" and equipment hunting can be minimized by summing (integrating) the offset errors over time and adding this correction to the output voltage.

A non-zero value for the integral time will allow the controlled temperature to try and reach the setpoint value.

The integral time is factory set for 400 seconds and is similar to the response time of the T775 Series 1000 models. This is a good middle range and should satisfy many applications. The integral time can be increased for applications where sensed response is slow, and can be decreased for applications where sensed response is fast (e.g. discharge air control).

As a starting point, an optimal integral time for discharge air typically ranges from 12 to 200 seconds. An optimal integral time for room control typically ranges from 60 to 2,500 seconds. The purpose of integral action is to reduce or eliminate the offset from setpoint during steady state control.

Keep in mind that the controller is most sensitive to throttling range. Adjust the throttling range first before making any adjustment to integral time. Adjust throttling range to be as wide as possible to start, because this will provide the most stable control. Remember that the integral will eliminate the steady state error so you do not need to have a small throttling range to have accurate control. (Integral action allows for controlling to setpoint even with a wide throttling range.)

Derivative Action

Proportional-integral-derivative (PID) control adds the derivative function to PI control. The derivative function opposes any change and is proportional to the rate of change. The more quickly the control point (actual sensed temperature) changes, the more corrective action the PID system provides.

If the control point moves away from the setpoint, the derivative function outputs a corrective action to bring the control point back more quickly than through integral action alone. If the control point moves toward the setpoint, the derivative function reduces the corrective action to slow down the approach to the setpoint, which reduces the possibility of overshoot. The rate time setting determines the effect of the derivative action. The rate time is the time interval by which the derivative function advances the effect of the proportional action. In T775 controllers, the derivative rate time can range from 0 to 3,600 seconds. The higher the derivative setting, the greater the effect.

For all T775 Series 2000 controllers, the derivative default value is factory set to zero (no derivative control). It is strongly recommended that the derivative remain at zero (0) unless you have a very good reason to adjust it. Derivative control is not needed in the vast majority of HVAC applications.

Differential vs. Throttling Range

Differential is used for relay outputs, and throttling range is used for modulating outputs.

Setpoint and Differential

The following describes the relationship between setpoint and differential for heating and cooling. These settings are programmed for each output relay.

HEATING MODE SETPOINT AND DIFFERENTIAL

In heating mode, the differential is below the setpoint. The relay de-energizes when the temperature rises to the setpoint.

As the temperature drops to the setpoint minus the differential, the relay energizes.

COOLING MODE SETPOINT AND DIFFERENTIAL

In cooling mode, the differential is above the setpoint. The relay de-energizes when the temperature falls to the setpoint.

As the temperature rises to the setpoint plus the differential, the relay energizes.

Throttling Range

The throttling range brackets the setpoint setting, e.g., if the setpoint is 72°F (22°C) and the throttling range is 10°F (-12°C), then the effective throttling temperature range is 67°F to 77°F (19°C to 25°C). This applies to both modulating outputs and floating outputs.

Throttling Range for Modulating High or Low Limit

On models that support this feature, the throttling range for the modulating high or low limit positions the setpoint at the end of the throttling range. For example, with a high (Heat) limit at Sensor B of 200°F (93°C) and a throttling range of 10°F (-12°C), the modulating output controlling Sensor A begins to throttle back at 190°F (88°C), and fully closes at Sensor B 10°F (9°C). Conversely, the throttling range for the low limit begins above the Cooling setpoint in the same manner.

Setpoint High Limit

You can set an irreversible setpoint high limit maximum value for any single setpoint temperature value. This prevents the user from setting any setpoint above the chosen high setpoint limit, which is useful for meeting some local codes.

Adjust the setpoint (at any output) to the desired maximum setpoint. Then, simultaneously press the HOME, , and  buttons, and continue to press all three buttons for five seconds to set the setpoint high limit maximum to this value.

NOTE: You must press all three buttons at exactly the same time for this action to occur.

IMPORTANT

1. This action sets the maximum setpoint value of all outputs to the setpoint high limit maximum.
2. Setting the high limit setpoint maximum is irreversible. If you perform the action inadvertently and this setpoint adversely affects the control of your system, you must replace the controller.
Reset Programming (T775L, T775P, T775R, and T775U models only)

To program an output for reset, refer to the values as shown in the example below and in Fig. 1. Choose your own appropriate values for Sensor A maximum and minimum and Sensor B maximum and minimum.

Reset Example:
- Sensor A is the boiler sensor and Sensor B is the outdoor sensor.
- Maximum boiler temperature desired is 210°F (99°C) when the outdoor temperature is 20°F (-7°C).
- Minimum boiler temperature desired is 160°F (71°C) when the outdoor temperature is 70°F (21°C).

With the above settings example, when the outdoor temperature is 50°F (10°C), the effective setpoint is 180°F (82°C).

Setpoint Offset

NOTE: The Setpoint Offset is used for subsequent outputs only.

This value is the number of degrees plus (+) or minus (-) that you want the temperature to be offset from the first output’s setpoint. See Fig. 1. For example, if you want the second output setpoint to be 10°F (-12°C) less than the first output setpoint, enter -10°F (-23°C).

Setback (Optional) Description

The Setback temperature option is available only if scheduling is enabled or the Digital Input Option is set to Setback.

This value is the number of degrees plus (+) or minus (-) that you want the temperature to be setback (offset) from the setpoint at a predetermined time.

For example, if you want the temperature to be 10°F (-12°C) less than the setpoint during setback mode, enter -10°F (-23°C). See Fig. 2.

In normal operations for heating, the offset will be a negative value; for cooling, the offset will be a positive value.

Setback (optional) Example:

Setback of -10°F (-23°C) is used to drop the temperature at night by 10°F (-12°C).

With the above settings example, when the outdoor temperature is 50°F (10°C), the effective setback setpoint is 170°F (77°C) 180°F (82°C) setpoint minus the 10°F (-12°C) setback).

Choose Reset = NO for any outputs you do not wish to reset, then press the HOME button to record your selection.

NOTES:
1. A single reset curve is programmed for the first output and is used by all outputs setup for Reset.
2. For subsequent outputs, a setpoint offset is used if that output is also being Reset.

When Reset is programmed, the home screen conveniently displays the calculated Heat/Cool setpoint(s) for the outputs based on the reset curve.

Fig. 1. Reset curve with offset for subsequent outputs.

The reset curve established when programming the first output (Fig. 1) is then used for all subsequent outputs that are configured for Reset = YES, and each of those outputs will be offset from this curve.

Fig. 2. Reset curve for first output with setback offset.
T775 SERIES 2000 ELECTRONIC STAND-ALONE CONTROLLERS

T775 APPLICATIONS

Water Source Heat Pump Loop Water Controller – T775B

Application Description
Water is circulated in a loop to remove waste heat and to provide cooling from a multiple heat pump system. In this example, the T775B controls heating and cooling systems to maintain the loop water temperature between preset upper and lower limits. Alarms are sounded to annunciate abnormally high or low water temperatures.

NOTE: T775R reset models can also be used in this application.

Sensor Designation
This device application only requires one sensor. Sensor A is mounted in a well, located in the main loop water line, before the water source heat pump take-offs.

Operation
In this example, if the loop water temperature drops to 55°F (13°C), heat is added to the system by the boiler (Relay 1) until it reaches the setpoint. If the temperature drops further, Relay 2 sounds the low temperature alarm at 54°F (12°C).

If the loop water temperature rises to 95°F (35°C), Relay 3 brings on cooling. If the temperature rises to 96°F (36°C), Relay 4 powers the high temperature alarm.

NOTE: If no alarms are present, relays 2 and 4 may be used as additional heating and cooling relays.

Programming Example

Relay 1: Enables boiler circuit
Program for:
— Heat
— Setpoint = 65°F (18°C)
— Differential = 10°F (-12°C)

Relay 2: Low temperature alarm circuit
Program for:
— Heat
— Setpoint = 55°F (13°C)
— Differential = 1°F (-17°C)

Relay 3: Enables cooling circuit (heat extraction)
Program for:
— Cool
— Setpoint = 85°F (29°C)
— Differential = 10°F (-12°C)

Relay 4: High temperature alarm circuit
Program for:
— Cool
— Setpoint = 95°F (35°C)
— Differential = 1°F (-17°C)

Setpoints may differ according to equipment manufacturers. See their recommendations.

IMPORTANT
After the desired value is selected, be sure to press the or HOME button in order to save that value in the controller’s memory.

Wiring
All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring. See Fig. 3.

Fig. 3. T775B wiring — loop water controller.
Chiller – T775B

Application Description
As the water temperature in the sump rises, the T775B sequentially cycles on the spray pump valve and two relays of fans. If the water temperature in the sump drops below 40°F (4°C), the T775B energizes a sump dump drain valve to prevent system freeze up.

NOTE: T775R reset models can also be used in this application.

Sensor Designation
This device application only requires one sensor. Sensor A is sensing sump water temperature.

Operation
In this example, the sump water temperature rises above the Cooling Relay 1 setpoint plus differential 65°F (18°C) to bring on the spray pump valve. If the temperature continues to rise, Cooling relays 2, 70°F (21°C) and 3, 75°F (24°C) energize the evaporation fans as needed.

If the sump water temperature drops below 40°F (4°C) (setpoint minus differential), the sump water freeze up protection is provided by energizing Heating Relay 4.

Programming Example
Relay 1: Controlling spray water pump and/or valve
Program for:
— Cool
— Setpoint = 60°F (16°C)
— Differential = 5°F (12°C)

Relay 2: Controlling fan # 1
Program for:
— Cool
— Setpoint = 65°F (18°C)
— Differential = 5°F (12°C)

Relay 3: Controlling fan # 2
Program for:
— Cool
— Setpoint = 70°F (21°C)
— Differential = 5°F (12°C)

Relay 4: Controlling dumping of sump at freeze condition
Program for:
— Heat
— Setpoint = 50°F (10°C)
— Differential = 10°F (-12°C)

IMPORTANT
After the desired value is selected, be sure to press the or or HOME button in order to save that value in the controller’s memory.

Wiring
All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring. See Fig. 4.

Fig. 4. T775B wiring — chiller.
Chiller, Rotary Compressor – T775B

Application Description
The T775B is controlling the discharge water temperature of a rotary compressor. The T775B provides an optional low temperature or low pressure cut-out circuit.

NOTE: T775R reset models can also be used in this application.

Sensor Designation
This device application only requires one sensor. Sensor A is sensing discharge water and controls 1 or 2 compressors.

Operation
In this example, the cooling capacity of a Rotary Compressor is controlled by a slide valve, which when moved towards open or closed allows more or less refrigerant into the compressor. Open and Closed solenoid valves position this slide valve. The T775B is configured such that two relays are used to position a single slide valve in a floating mode by controlling the respective solenoid valves. Capacity of rotary compressors may also be controlled by variable speed drives, not covered here.

Programming Example
Relay 1: Compressor #1 controlling the Close solenoid valve
Program for:
- Cool
  - Setpoint = 52° F (11° C)
  - Differential = 2° F (-1° C)
Relay 2: Compressor #1 controlling the Open solenoid valve
Program for:
- Cool
  - Setpoint = 56° F (13° C)
  - Differential = 2° F (-1° C)
Relay 3: Compressor #2 controlling the Close solenoid valve
Program for:
- Cool
  - Setpoint = 56° F (13° C)
  - Differential = 2° F (-1° C)
Relay 4: Compressor #2 controlling the Open solenoid valve
Program for:
- Cool
  - Setpoint = 60° F (16° C)
  - Differential = 2° F (-1° C)

IMPORTANT
After the desired value is selected, be sure to press the or HOME button in order to save that value in the controller’s memory.

Wiring
All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring. See Fig. 5.

Fig. 5. T775B wiring — chiller, rotary compressor.
Cooling Tower Control – T775B2040

Application Description
The T775B2040 is controlling a cooling tower fan, based on two sensor inputs, to control the low and high fan speeds and provide cold weather shutdown.

NOTE: T775R2001 reset model can also be used in this application.

Sensor Designation
This device application requires two sensors:
• Sensor A is sensing the sump temperature.
• Sensor B is sensing the outside air temperature.

Operation
As the sump temperature increases, the low fan speed is energized by Relay 1. On further increase in temperature, Relay 2 closes, which energizes the high fan speed and shuts off the low fan speed. Relay 3 provides cold weather shutdown of the fan. Relay 3 is wired in series with the common wire of relays 1 and 2, so when Relay 3 breaks at 55° F (13° C), power to the fan is interrupted.

Programming Example
Optional: In Setup, label sensors A and B as desired.

Relay 1: Control to the fan low speed based on the sump temperature.
Program for:
— Setpoint = 65° F (18° C)
— Differential = 5° F (12° C)
— Cool
— Sensor A

Relay 2: Control to the fan high speed based on the sump temperature
Program for:
— Setpoint = 70° F (21° C)
— Differential = 5° F (12° C)
— Cool
— Sensor A

Relay 3: Control to the fan cutoff based on the outside air temperature
Program for:
— Setpoint = 55° F (13° C)
— Differential = 1° F (12° C)
— Cool
— Sensor B

IMPORTANT
After the desired value is selected, be sure to press the or HOME button in order to save that value in the controller’s memory.

IMPORTANT
By programming the Relay 3 setpoint at 55° F (13° C), the T775 is wired to cutoff power to the cooling fan. Once the outside air temperature rises above 55° F (13° C), relays 1 and 2 control the fan speed based on their setpoints for Sensor A Sump.

Device Checkout
The T775B performance can be checked out to determine if proper operation exists.

For example, when the outside air temperature is at 55° F (13° C) or less, the fan should be off. Use the alternate Home screens to verify that the fan is on or off, based on the outside air temperature (Sensor B).

NOTE: The alternate Home screens do not show live updates of the sensor temperature. They show the temperature only at the moment the button is pressed.

1. From the Home screen, use the button to verify the setpoint temperature for Relay 3.
2. Then, press the HOME button to view the actual outside air temperature (Sensor B).

Wiring
All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring. See Fig. 6.
Time-based Control of Fan, Pump, etc. – T775 (all models)

Application Description
In this example, the T775B is able to energize a fan, pump, lights, economizer, or other device based on a daily time schedule rather than based on temperature.

Operation
In this example, one relay will energize at 6:00 a.m. and de-energize at 6:00 p.m. daily to operate a fan, pump, or anything at all.

Configuration Example
Place a 1,000 Ohm resistor at Sensor B (to simulate a constant 32°F (0°C) temperature reading).
Wire the device to the normally open contacts on a relay. Relay 1 is used in this example. See Fig. 7

Programming Example
Program in Setup for:
— Outputs
 — Options
 — Use Scheduler = YES

Program in Schedule for:
— Options
 — Set Date = current date
 — Set Time = current time
 — Set Daylight = YES or NO
 — Mon-Fri
 — E1 Setpoint = Setpoint
 — E1 Time = 06:00 AM
 — E2 Setpoint = Setback
 — E2 Time = 6:00 PM

Relay 1: Control the device (fan, pump, etc.)
Program for:
— Setpoint = 0°F (-17°C)
— Differential = 1°F (-17°C)
— Sensor = Sensor B
— Setback = 100°F (38°C)
— Action = Cool

Now the relay will close at 6:00 a.m. and open at 6:00 p.m., daily.

NOTE: Keep in mind that if the scheduler is energized, all relays will follow the time schedule. If you do not want some outputs to go into a setback mode, choose Scheduler = NO for those outputs, or program the setpoint and setback to the same temperature.

IMPORTANT
After the desired value is selected, be sure to press the or or HOME button in order to save that value in the controller’s memory.

Wiring
All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring.

![Fig. 7. T775B wiring for time-based fan, pump or other device.](image)
Damper or Valve Modulation – T775M or T775R

Application Description
In this example, a T775M is controlling an actuator, based on temperature input, to modulate a damper or valve.

Sensor Designation
This device application requires one sensor.
- Sensor A is sensing outside temperature

NOTE: Sensor A or Sensor B can be used in this application.

Programming Example
Program in Setup for:
- Modulating Output (MOD) 1:
  - Type = 2-10V (or whatever output signal is preferred)
  - Minimum Output % = 0% (range is 0-100%)

Modulating Output 1: Enable actuator circuit
Program for:
- Setpoint = 120° F (49° C)
- Throttling Range = 10° F (-12° C)
- Sensor = Sensor A
- Heat or Cool

IMPORTANT
After the desired value is selected, be sure to press the † or ‡ or HOME button in order to save that value in the controller’s memory.

Wiring
See Fig. 8 and 9 for wiring connections for the T775M with examples of an MS75xx actuator and an ML7425 valve actuator.
Hot Water Reset – T775R

Application Description
The T775R is controlling the boiler water temperature with two stages (relays), based on outside temperature using a reset curve and an offset for Relay 2.

Sensor Designation
This device application requires two sensors.
• Sensor A is sensing hot water discharge temperature of the boiler.
• Sensor B is sensing outside air temperature

Operation
In this example, when the outside temperature reaches 70° F (21° C), the desired water temperature of the boiler is 160° F (71° C). Likewise, when the outside temperature drops to 20° F (-7° C), the hot water temperature needs to be 210° F (99° C). See Fig. 10.

Programming Example
Program in Setup:
Press and hold the MENU button for 5 seconds to enter Setup mode. Select the Outputs menu, and then select:
— MOD 1 → Reset = YES-BOILER
— # Relays = 2
— Relay 1 → Reset = YES-BOILER
— Relay 2 → Reset = YES-BOILER

Relay 1: Control to the discharge water temperature Program for: (Refer to the reset curve in Fig. 10.)
— Boiler Max = 210° F (99° C)
— Boiler Min = 160° F (71° C)
— Outside Max = 70° F (21° C)
— Differential = 20° F (-7° C)
— Sensor A
— Heat

Relay 2: Control to the discharge water temperature Program for:
— Setpoint Offset = -10° F (-12° C) (See Fig. 11)
— Sensor A
— Heat

IMPORTANT
After the desired value is selected, be sure to press the ◄ or ► or HOME button in order to save that value in the controller’s memory.

IMPORTANT
By programming the boiler setpoint at 210° F (99° C) the T775 has established 210° F (99° C) as the highest operating point that will be allowed when the outside temperature falls below 20° F (-7° C). As the outside temperature increases above 20° F (-7° C), the boiler will be reset downward per the reset ratio until it reaches the minimum setpoint, 160° F.

Assuming an outside temperature of 20° F (-7° C), Fig. 12 describes the actions of relays 1 and 2 to control the boiler temperature. As the boiler temperature falls below 210° F (99° C), Relay 1 activates (Relay 1 Differential is 20° F (-7° C)), so relay closes at 190° F (88° C). If Relay 1 cannot raise the boiler temperature and the boiler temperature continues to fall to 180° F, Relay 2 activates (Relay 2 differential is 20° F (-12° C) 180° to 200° F (82° to 93° C). When the boiler is able to reach 200° F (93° C), then Relay 2 deactivates and Relay 1 remains active until the temperature reaches 210° F (99° C).

NOTE: The hot water reset application continues on the next page.
Hot Water Reset (continued)

Wiring
All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring. See Fig. 13.

Device Checkout
The T775 performance can be checked out to determine if proper operation exists.

For example, when the outside air temperature is at 50°F (10°C), the boiler setpoint temperature should be 180°F (82°C). See Fig. 14. Use the alternate Home screens to check that the effective setpoint is adjusting correctly based on the outside air temperature (Sensor B).

NOTE: The alternate Home screens do not show live updates of the sensor temperature. They show the temperature only at the moment the button is pressed.

1. From the Home screen, use the ▶ button to verify the setpoint temperature for each output.
2. Then, press the HOME button to view the actual outside air temperature (Sensor B).

Fig. 14. Boiler discharge temperature setpoint vs. outside temperature.
Chilled Water Reset – T775R

Application Description
The T775R is controlling the chiller water temperature, based on outside temperature using a reset curve.

Multiple stages can also be controlled by using an offset from the main setpoint for the subsequent relay outputs. When enabling multiple stages for reset, each stage can have its own programmable offset from Relay 1 (stage 1).

Sensor Designation
This device application requires two sensors.
- Sensor A is sensing the water temperature of the chiller.
- Sensor B is sensing outside air temperature.

Operation
In this example, when the outside temperature reaches 90°F (32°C), the desired water temperature of the chiller is 45°F (7°C). Likewise, when the outside temperature drops to 70°F (21°C), the chilled water temperature needs to be 60°F (16°C).

Programming Example
Program in Setup:
Press and hold the MENU button for 5 seconds to enter Setup mode. Select the Outputs menu, and then select:
- MOD 1 → Setpoint Max A1 (Chiller) = 60°F (16°C)
- MOD 1 → Setpoint Min A2 (Chiller) = 45°F (7°C)
- MOD 1 → Reset B1 (Outside Min) = 70°F (21°C)
- MOD 1 → Reset B2 (Outside Max) = 90°F (32°C)
- MOD 1 → Differential = 10°F (-12°C)
- MOD 1 → Cool

IMPORTANT
After the desired value is selected, be sure to press the or or HOME button in order to save that value in the controller’s memory.

IMPORTANT
By programming the Chiller setpoint at 45°F (7°C) the T775 has established 45°F (7°C) as the lowest operating control point that will be allowed during reset with the above conditions satisfied.

Wiring
All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring.
Chilled Water Reset (continued)

Device Checkout
The T775 performance can be checked out to determine if proper operation exists.

For example, when the outside air temperature is at 80° F (27° C), the chiller water temperature should be 52.5° F (11° C). See Fig. 17. Use the alternate Home screens to check that the effective setpoint is adjusting correctly based on the outside air temperature (Sensor B).

NOTE: The alternate Home screens do not show live updates of the sensor temperature. They show the temperature only at the moment the button is pressed.

1. From the Home screen, use the button to verify the setpoint temperature for each output.
2. Then, press the HOME button to view the actual outside air temperature (Sensor B).

Multi-Stage Boiler Control (No Reset) – T775P

Application Description
The T775P is providing multistage boiler control based on the boiler's discharge water temperature. The T775P uses the fourth output relay to energize the primary pump.

Sensor Designation
This device application requires two sensors.
- Sensor A is sensing discharge water and is used to control 3 boiler stages.
- Sensor C is sensing the return water.

NOTE: Control can be to either Sensor A or C.

Operation
In this example, as the heating load increases, additional stages of heat will cycle ON as the boiler water temperature decreases. The T775P will stage three boilers to provide sufficient heating. (See Fig. 18.) The primary circulating pump energizes whenever any stage is energized.

Programming Example

Program in Setup:
- Press and hold the MENU button for 5 seconds to enter Setup mode. Select the Outputs menu, and then select:
  - # Stages = 3 (T775 assigns pump to Relay 4)
  - Options → On Delay and Off Delay: Seconds = 0 to 3,600 (default is 0)
  - Options → WWSD = YES or NO
  - Temperature = 30 to 100° F (-1 to 38° C)
  - STG4/Pump: (Relay 4 controls the pump output)
  - Enable = YES
  - Exercise = YES or NO
  - Prepurge = -300 to 300 seconds (default is 0)
  - Postpurge = 0 to 300 seconds (default is 0)

NOTES:
1. A positive Prepurge time causes the pump to energize before the first stage energizes. A negative time causes the pump to energize after the first stage energizes.
2. The Postpurge time causes the pump to run for the set number of seconds after the last stage de-energizes.

Return to the Setup menu, and select Alarms:
- High Alarm = YES
- High Limit = 220° F (93° C)

NOTE: This model has Equal Runtime options, which can be configured with the Lead Lag output option in Setup.

Stages 1-3: Control to the discharge water temperature

Program for:
- Setpoint = 200° F (93° C)
- Throttling Range = 16° F (-8° C)
- Sensor A
- Heat

IMPORTANT: After the desired value is selected, be sure to press the or HOME button in order to save that value in the controller’s memory.

Fig. 17. Chiller setpoint vs. outside temperature.

<table>
<thead>
<tr>
<th>CHILLED WATER SETPOINT TEMPERATURE</th>
<th>OUTSIDE AIR TEMPERATURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>60°</td>
<td>70°</td>
</tr>
<tr>
<td>56.25°</td>
<td>75°</td>
</tr>
<tr>
<td>52.5°</td>
<td>80°</td>
</tr>
<tr>
<td>48.75°</td>
<td>85°</td>
</tr>
<tr>
<td>45°</td>
<td>90°</td>
</tr>
</tbody>
</table>

M24876
Refer to the staging diagram in Fig. 18 for individual stage behavior.

**Fig. 18.** Boiler control staging behavior (when the effective setpoint = 200°F).

**Wiring**

All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring. See Fig. 19.

**Multi-Stage Boiler Control (Reset) – T775P**

**Application Description**

The T775P is providing multistage boiler control based on the boiler’s discharge water temperature. The T775P uses the fourth output relay to energize the primary pump. Any number of stages from 1 to 12 can be configured (T775P and T775L models). The throttling range is divided equally among the stages.

**Sensor Designation**

This device application requires three sensors.
- Sensor A is sensing discharge water and is used to control 3 boiler stages.
- Sensor B is sensing outside temperature and is used for reset.
- Sensor C is sensing the return water temperature.

**Operation**

In this 3-stage example, as the heating load increases, additional stages of heat will cycle ON as the boiler water temperature decreases. The T775P will stage three boilers to provide sufficient heating. See Fig. 20 for staging behavior.

The primary circulating pump energizes whenever any stage is energized.

**Programming Example**

Program in Setup:
- Press and hold the MENU button for 5 seconds to enter Setup mode. Select the Outputs menu, and then select:
  - # Stages = 3 (T775 assigns pump to Relay 4)
  - Options → Reset = YES-BOILER
  - Options → On Delay and Off Delay: Seconds = 0 to 3,600 (default is 0)
  - Options → WWSD = YES or NO
  - Temperature = 30 to 100°F (-1 to 38° C)
  - STG4/Pump: (Relay 4 controls the pump output) Enable = YES
    - Exercise = YES or NO
    - Prepurge = -300 to 300 seconds (default is 0)
    - Postpurge = 0 to 300 seconds (default is 0)
- Return to the Setup menu, and select Alarms:
  - High Alarm = YES
  - High Limit = 220°F (104° C)
  - Boiler Max = 210°F (99° C)
  - Outside Min = 70°F (-17° C)
  - Outside Max = 70°F (21° C)
  - Throttling Range = 18°F (-8° C)
  - Sensor A
    - Heat
    - Setback = -10°F (-12° C) (Optional)

1See Notes in “Programming Example” on page 18 for an explanation of Prepurge and Postpurge times.
IMPORTANT
After the desired value is selected, be sure to press the or HOME button in order to save that value in the controller's memory.

Wiring
All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring. See Fig. 22.

NOTE: The Multi-Stage Boiler Control (Reset) application continues on the next page.

Multi-Stage Boiler Control (Reset)

Fig. 20. Boiler control staging behavior (when effective setpoint = 200° F).

Fig. 21. Reset curve with optional setback offset.

Fig. 22. T775P wiring — multi-stage boiler control with reset.
Multi-Stage Chiller Control (No Reset) – T775P

Application Description
The T775P is providing multistage cooling control based on the chiller’s discharge water temperature. The T775P uses the fourth output relay to energize the primary pump.

Any number of stages from 1 to 12 can be configured (T775P and T775L models). The throttling range is divided equally among the stages.

Sensor Designation
This device application requires three sensors.
• Sensor A is sensing chiller discharge water and is used to control 3 chiller stages.
• Sensor B is sensing outside temperature and is used to control Relay 4, the pump output.
• Sensor C is sensing the chiller return water temperature.

NOTE: Control can be to either Sensor A or C.

Operation
In this 3-stage example, as the cooling load increases, additional stages of cooling will cycle ON as the chiller water temperature increases. The T775P will stage three chillers to provide sufficient cooling. See Fig. 23 for staging behavior.

The primary circulating pump energizes whenever any stage is energized.

Programming Example
Program in Setup:
Press and hold the MENU button for 5 seconds to enter Setup mode. Select the Outputs menu, and then select:
— # Stages = 3 (T775 assigns pump to Relay 4)
— Options → On Delay and Off Delay:
  Seconds = 0 to 3,600 (default is 0)
— STG4Pump: (Relay 4 controls the pump output)¹
  Enable = YES
  Exercise = YES or NO
  Prepurge = 300 to 300 seconds (default is 0)
  Postpurge = 0 to 300 seconds (default is 0)

Return to the Setup menu, and select Alarms:
— Low Alarm = YES
— Low Limit = 54° F (12° C)

Stages 1-3: Control to the discharge water temperature
Program for:
— Setpoint = 72° F (22° C)
— Throttling Range = 12° F (-11° C)
— Sensor A
— Cool

IMPORTANT
After the desired value is selected, be sure to press the < or > or HOME button in order to save that value in the controller’s memory.

¹ See Notes in See “Programming Example” on page 17, for an explanation of Prepurge and Postpurge times.
4 Stage with Pump Output and Reset – T775P using a T775S Expansion Module

Application Description

The T775P is providing multistage boiler control based on the boiler’s discharge water temperature. Four stages and a dedicated pump output are used in this example. The T775P uses the eighth output relay to energize the primary pump.

NOTE: The pump output is always the last relay output. In this application example, four relays are used for staged boiler control. A T775S expansion module is added to provide the additional relay for the pump. However, the pump must be the last relay, so it is configured as Relay 8 on the T775S module.

Any number of stages from 1 to 12 can be configured (T775P and T775L models). The throttling range is divided equally among the stages.

Sensor Designation

This device application requires three sensors.
- Sensor A is sensing discharge water and controls 4 stages.
- Sensor B is sensing outside temperature and is used for reset.
- Sensor C is sensing the return water temperature.

NOTE: Control can be to either Sensor A or C.

Operation

As the heating load increases additional stages of heat will cycle ON as the boiler water temperature decreases. In this example, the T775P provides four stage control when the effective setpoint is 200° F (93° C). (See Fig. 25.) The primary circulating pump energizes whenever any stage is energized.

NOTE: The pump output must always be the last relay on the controller or expansion module (Relay 4, 8, or 12).

NOTE: For applications with 3 stages or less with a pump output, an additional expansion module is not needed.

Programming Example

Program in Setup:

Press and hold the MENU button for 5 seconds to enter Setup mode. Select the Outputs menu, and then select:
- # Stages = 4 (T775 assigns pump to Relay 8)
- Options → Reset = YES-BOILER
- STG&Pump: (Relay 8 controls the pump output)1
  Enable = YES
  Exercise = YES or NO
  Prepurge = 0 to 300 seconds (default is 0)
  Postpurge = 0 to 300 seconds (default is 0)

Stages 1-4: Control to the discharge water temperature

Program for: (Refer to the reset curve in Fig. 26.)
- Boiler Max = 210° F (99° C)
- Outside Min = 20° F (-7° C)
- Boiler Min = 160° F (71° C)
- Outside Max = 70° F (21° C)
- Throttling Range= 20° F (-7° C)
- Sensor A
- Heat

1 See Notes in “Programming Example” on page 18 for an explanation of Prepurge and Postpurge times.

IMPORTANT

After the desired value is selected, be sure to press the 4 or HOME button in order to save that value in the controller’s memory.

IMPORTANT

By programming the boiler setpoint at 210° F (-99° C) the T775 has established 210° F (-99° C) as the highest operating point that will be allowed when the temperature falls below 20° F (-7° C). As temperature increases above 20° F (-7° C), the boiler will be reset downward per the reset ratio until it reaches the minimum setpoint of 160° F (71° C), at 70° F (21° C) and above outdoor temperature.

Fig. 25. Staging behavior
when the effective setpoint = 200° F (93° C)

Fig. 26. Reset curve.

NOTE: The 4 stage with pump output and reset application continues below.
4 Stage with Pump Output and Reset (continued)

Wiring
All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring.

See Fig. 27.

Device Checkout
The T775 performance can be checked out to determine if proper operation exists.

For example, when the outside air temperature is at 50°F (10°C), the boiler temperature should be 180°F (22°C). See Fig. 28. Use the alternate Home screen to check that the effective setpoint is adjusting correctly based on the outside air temperature (Sensor B).

NOTE: The alternate Home screen does not show live updates of the sensor temperature. It shows the temperature only at the moment the button is pressed.

1. From the Home screen, use the ▶ button to verify the setpoint temperature for each output.
2. Then, press the HOME button to view the actual outside air temperature (Sensor B).

Fig. 27. T775P wiring — 4 stage with pump output and reset.

Fig. 28. Boiler discharge temperature vs. outside temperature.
3 Stage Reciprocating Chiller — T775L

Application Description
The T775L is controlling the return water in a reciprocating chiller with fast-dump freeze protection, low temperature cutoff, and optional low pressure cutoff.

Sensor Designation
This device application requires two sensors.
• Sensor A is sensing return water and controlling three stages of cooling.
• Sensor B is sensing discharge water and is controlling Relay 4 for freeze protection.

Operation
Return water is one indication of the cooling load in the water loop. For example, the higher the return water temperature the higher the apparent load and more stages of refrigeration or cooling would be required. If a large load is quickly dropped from the loop, or for some reason water flow through the chiller is reduced, discharge water temperature may drop rapidly to freezing conditions. In this example, Sensor B in the discharge water will prevent damage to the system by fast-dumping all cooling stages upon close-to-freezing conditions.

Programming Example
Program in Setup:
Press and hold the MENU button for 5 seconds to enter Setup mode. Select the Outputs menu, and then select:
— # Relays = 3
— # Loops = 1
— Options → DI Options = Disable
(acts as low pressure cutoff)
— Loop 1 → # Relays = 3
— Loop 1 → Reset = NO
Loop 1: Chiller cooling
Program for:
— Setpoint = 62° F (17° C)
— Throttling Range = 12° F (-11° C)
— Sensor A
— Cool
Relay 4: Low temperature cutoff for freeze protection
Program for:
— Setpoint = 40° F (4° C)
— Differential = 4° F (-16° C)
— Sensor B
— Heat

IMPORTANT
After the desired value is selected, be sure to press the or HOME button in order to save that value in the controller’s memory.

Wiring
All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring. See Fig. 29.
4 Stage Heat and 6 Stage Cool – T775L

Application Description
The T775L is providing control for four boilers based on the boiler's discharge water temperature and providing multistage cooling control.

NOTE: The T775L (with up to two expansion modules) can control any number of heating and cooling stages up to a maximum of 12 stages.

Sensor Designation
This device application requires two sensors.
- Sensor A is sensing boiler discharge water temperature for staged heating control.
- Sensor B is used for cooling control.

Operation
In this example, as the heating load increases, additional stages of heat will cycle ON as the temperature decreases at Sensor A. The T775L will use four stages to provide sufficient heating. The six cooling stages are controlled by Sensor B.

NOTES:
1. The Interstage ON and OFF delay is an option for both the heating and the cooling loops.
2. Because only 10 of the 12 relays are being used, the remaining two relays can be used as independent controls, each with its own setpoint and throttling range.

Programming Example
Program in Setup:
Press and hold the MENU button for 5 seconds to enter Setup mode. Select the Outputs menu, and then select:
- # Relays = 10 (4 heat and 6 cool)
- # Loops = 2
- Loop 1 → # Relays = 4
- Loop 1 → Reset = NO
- Loop 2 → # Relays = 6
- Loop 2 → Reset = NO

NOTES:
1. The Integral setup parameter can be left at the factory default setting or adjusted as needed for each loop.
2. The On Delay and Off Delay setup parameters can be adjusted according to the application.

Loop 1: Control to Sensor A
Program for:
- Setpoint = 200° F (93° C)
- Throttling Range = 20° F (-7° C)
- Sensor A
- Heat
- Relays = 1-4

Loop 2: Control to Sensor B
Program for:
- Setpoint = 72° F (22° C)
- Throttling Range = 12° F (-11° C)
- Sensor B
- Cool
- Relays = 5-10

IMPORTANT
After the desired value is selected, be sure to press the ▼ or ► or HOME button in order to save that value in the controller’s memory.

Wiring
All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring. See Fig. 31.

NOTE: The 4 Stage Heat and 6 Stage Cool application continues on the next page.

Loop 2
All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring. See Fig. 31.

NOTE: The 4 Stage Heat and 6 Stage Cool application continues on the next page.

Loop 2: Control to Sensor B
Program for:
- Setpoint = 72° F (22° C)
- Throttling Range = 12° F (-11° C)
- Sensor B
- Cool
- Relays = 5-10

IMPORTANT
After the desired value is selected, be sure to press the ▼ or ► or HOME button in order to save that value in the controller’s memory.

Wiring
All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring. See Fig. 31.

NOTE: The 4 Stage Heat and 6 Stage Cool application continues on the next page.

Loop 2
All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring. See Fig. 31.

NOTE: The 4 Stage Heat and 6 Stage Cool application continues on the next page.
4 Stage Heat and 6 Stage Cool (continued)

Fig. 31. T775L wiring — 4 stage heat and 6 stage cool using 2 loops.
Pressure with a Variable Frequency Drive (VFD) – T775U

Application Description
In this application the T775U is controlling duct pressure with a fan controlled by an NXS or NXL Variable Frequency Drive. A P7640 pressure sensor, located in the duct, is providing sensor input to the T775U to control the fan speed. The VFD is looking for a 4-20 mA PID control signal from the T775U and will drive the fan with a signal directly proportional to this T775U output.

For additional information about the NXS or NXL variable frequency drives (VFD), refer to the VFD Reference Guide, form 63-9469.

Sensor Designation
This device application requires one sensor:
• Sensor A is sensing pressure at the duct (reference is at the room).

Operation
In this example, as the sensed pressure decreases, the fan speed increases. Assume we have a 0-10 Vdc sensor output for 0-5 inches water column. First, set up a Sensor type of 0-10 Vdc into the T775U Sensor A settings, and a minimum (0) and maximum (5) inches water column for the sensor range.

Also set up a 4-20 mA PID modulating output loop (MOD 1) at the T775U with a setpoint of 2.5 inches and a throttling range of 2 inches, and a reverse acting action. At a sensed pressure of 2.5 inches (in other word, at setpoint), MOD 1 will output close to 50% or about 12 mA. At 1.5 inches water column, the output will be 100% or about 20 mA, and at 3.5 inches water column, the output will be 0% or about 4 mA. Keep in mind these values are valid for proportional control and will differ in a PID loop where integral (usually desired) and derivative (less often required) are set to non-zero values.

Integral and derivative time may need to be adjusted, along with the throttling range.

Programming Example
Program in Setup:
Press and hold the MENU button for 5 seconds to enter Setup mode, and then select:
— Sensors → Sensor A:
  Type = 0-10V
  Units = IN WC
  Minimum Value = 0.0
  Maximum Value = 5.0
— Outputs → MOD 1 (Modulating Output):
  Type = 4-20 mA

Program MOD 1 for:
— Setpoint = 2.5
— Throttling Range = 2 inches w.c.
— Action = REV ACT

IMPORTANT
After the desired value is selected, be sure to press the ← or → or HOME button in order to save that value in the controller’s memory.

IMPORTANT
After programming the VFD, be sure to check the following:
1. Verify that the VFD value P7.1.1.2 (AI2 mode) is set to 2 (4-20 mA).
2. Verify that the jumper block X2 on the Expansion board A is in Current Input Mode (a jumper is across the A terminals, and a jumper is across the B terminals).
3. Verify that the P7640A pressure sensor is set to:
   Output = Voltage
   Range = 0 to 5 inches w,c.
   Mode = Unidirectional (default)
   Volt = 10 Vdc

Wiring
See Fig. 32 for wiring connections for the T775U, the pressure sensor, and the Variable Frequency Drive.

Fig. 32. T775U wiring — pressure with a VFD (loop powered wiring).
Carbon Dioxide (CO2) Sensing – T775U

Application Description
In this application, the T775U is controlling an outside air damper based on CO2 sensing input, to maintain reasonable CO2 levels.

Sensor Designation
This device application requires one sensor:
- Sensor A is sensing CO2 in parts per million

Operation
In this example, as the CO2 level increases a damper is opened to allow fresh air to enter the facility.

Many CO2 sensors are used with a 0-2,000 ppm output range. Parts per million (ppm) units not available on the T775U.
- Set the units for Ppm and enter 0 for a minimum and 2,000 for a maximum. The controller will simply convert the input signal (0-10 Vdc or 4-20 mA) into the correct ppm value and display it on the screen.

Programming Example
Program in Setup:
Press and hold the MENU button for 5 seconds to enter Setup mode, and then select:
- Sensors → Sensor A:
  - Type = 0-10V
  - Units = PPM
  - Minimum Value = 0.0
  - Maximum Value = 2000

NOTE: Sensor A is a 0-10 Vdc CO2 sensor (C7232) with a range of 0 to 2,000 PPM

IMPORTANT
After the desired value is selected, be sure to press the $ or $ or HOME button in order to save that value in the controller’s memory.

Wiring
See Fig. 33 for wiring connections for the T775U and the CO2 sensor.

Fig. 33. T775U wiring — carbon dioxide sensing control.

NOTES:
1. SHIELDED Cable MUST BE CONNECTED TO A SEPARATE EARTH GROUND. HOWEVER, DO NOT GROUND SHIELDED CABLE AT SENSOR END.
2. TO MINIMIZE NOISE PICKUP MAKE SENSOR CONNECTION FROM SHIELDED CABLE AS CLOSE AS POSSIBLE TO SENSOR BODY.

C7232 CO2 SENSOR
(0-10 VDC CONNECTION)

SENSOR A
+ –
SHIELDED CABLE
+ –
–
ANALOGOUT
24 V
L1 (HOT)
L2
RED
BLACK
M24882

USE SEPARATE 24 V TRANSFORMER TO POWER THE C7232 CO2 SENSOR. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

Fig. 33. T775U wiring — carbon dioxide sensing control.
Resetting Zone Air Temp Based on Outside Air Temp (2 stage cooling)

Application Description
In this example, the T775L provides two stage DX cooling based on zone temperature. The T775L calculates the zone air temperature setpoint based on the actual outside air temperature using a reset curve.

Sensor Description
This device application requires two sensors.
• Sensor A is sensing zone air temperature.
• Sensor B is sensing outside air temperature.

Operation
When the outdoor air temperature reaches 90 °F the desired zone air temp is 75 °F. Likewise when the outside air temp drops to 50 °F the zone temp needs to be 68 °F.

Programming Example
Program in Setup:
Press and hold the MENU button for 5 seconds to enter Setup mode. Select the Outputs menu, and then select:

# RELAYS = 2
# LOOPS = 1
LOOP 1 → # RELAYS = 2
LOOP 1 → RESET = YES-OTHER

LOOP 1 Program for: (Refer to the reset curve in Figure 34)
- Setpoint Max A1 (Zone Max) = 75 °F (24° C)
- Reset B1 (Outside Min) = 50 °F (10° C)
- Setpoint Min A2 (Zone Min) = 68 °F (20° C)
- Reset B2 (Outside Max) = 90 °F (32° C)
- Differential = 20 °F (-7° C)
- Cool.

Fig. 34. Zone air reset curve
Fig. 35. T775 wiring — 2 stage cooling
Resetting Discharge Air Temp Based on Return Air Temp
(Modulating cooling valve)

Application Description
The T775R is controlling discharge air temperature based on return air temp using a reset curve.

The T775R calculates the discharge temp setpoint based on the actual return temp in the air handling unit.

Sensor Description
This device application requires two sensors:
- Sensor A is sensing discharge air temperature.
- Sensor B is sensing return air temperature.

Operation
In this example, the T775R controls an actuator, based on the discharge temperature setpoint to modulate the cool water valve.

When the return air temperature reaches 75, the desired discharge air temp is 50. Likewise when the return air temp drops to 70, the discharge temp needs to be 60.

Programming Example
Program in Setup:
Press and hold the MENU button for 5 seconds to enter Setup mode. Select the Outputs menu, and then select:
MOD 1 —RESET = YES-OTHER

MOD1 Program for: (Refer to the reset curve in Figure 36)
- Setpoint Max A1 (Discharge Max) = 60° F (16° C)
- Reset B1 (Return Min) = 70° F (21° C)
- Setpoint Min A2 (Discharge Min) = 50° F (10° C)
- Reset B2 (Return Max) = 75° F (24° C)
- Throttling Range = 10° F (-12° C)
- Cool.

![Fig. 36. Discharge air reset curve](image)

**Fig. 37. T775 wiring — valve modulation**
Using the T775R as a Differential Temperature Controller for Solar Water Heating

Application Description
The T775 can be used as a differential temperature controller for solar water heating applications. The controller regulates the circulation of water between the solar energy collector and the water storage tank. The circulation pump turns on/off based on the desired (predetermined) temperature differential between the collector and the tank.

Sensor Description
This device application requires two sensors:
• Sensor A is sensing collector water temperature.
• Sensor B is sensing storage water temperature.

Operation
Programming example: Settings may be changed according to geographical location, equipment, and other preferences.
Pump turns on when there is a 25°F differential between the solar collector water temperature and the storage tank temperature and turns off when the differential is 5°F.

High limit shut off or alarm at 190°F.
Optional low temperature purge or alarm at 40°F.

Programming Example
Program in Setup:
Press and hold the MENU button for 5 seconds to enter Setup mode. Select the Outputs menu, and then select:

Setting up the Sensor label names (Optional).
SETUP → SENSORS → SENSOR A
Select Label then highlight DISCHRG A. Press the once to get back to the SENSORS menu. Select SENSOR B. Select Label then highlight RETURN B. Choose other names if desired.

Setting up RELAY 1 and RELAY 2 for reset.
SETUP → OUTPUTS
RELAY 1 → RESET = YES-OTHER (used only to set the differential curve, do not wire Relay 1)
RELAY 2 → RESET = YES
RELAY 3 → RESET = YES
Press Home to exit Setup, and press Menu to enter programming.

RELAY 1: The below settings for RELAY 1 are to establish the offset curve only. There will not be any electrical connections to RELAY 1. (Refer to reset curve in Fig. 38).
- SP MAX A1 = 248°F
- RESET B1 = 248°F
- SP MIN A2 = -40°F
- RESET B2 = -40°F
- DIFFRENTL = N/A
- HEAT/COOL = HEAT

RELAY 2: Enter the temperature differential at which you want the pump to turn on. In our example this value is 25°F.
- OFFSET = 25°F

Next you must determine the value at which you want the pump to shut off. The differential will determine the number of degrees below the setpoint (25°F differential) at which the pump will turn off. In our example this value is 20°F (i.e., 5°F above the storage tank temperature).
- DIFFRNTL = 20°F
- HEAT

RELAY 3: Enter the high limit temperature. The pump will shut off if the return water temperature from the storage tank reaches this temperature. In our example this value is 190°F.
- SETPOINT = 190°F
- DIFFRNL = 5°F
- SENSOR: SENSOR B
- HEAT

RELAY 4: Enter the low limit temperature. An alarm will turn on or valve will close when the return water from the storage tank reaches this temperature. In our example this value is 40°F.
- SETPOINT = 40°F
- DIFFRNL = 2°F
- SENSOR: SENSOR B
- HEAT

Fig. 38. Reset curve.
Fig. 39. T775R wiring diagram for solar water heating.
Maintaining Differential Temperature for both Heating and Cooling

Application Description
This T775 program can be used to maintain a differential temperature between Sensor A and Sensor B. This is done by using the T775R2001, which can be used to maintain a delta temperature between the sensors.

Sensor Description
This device application requires two sensors.

- Sensor A is sensing room temperature.
- Sensor B is sensing outside air temperature.

Operation
In this example, the T775 program energizes dampers to open for free cooling or free heating. One relay energizes for cooling whenever the outside temperature (Sensor B) is at least 3°F above the room temperature (Sensor A), and de-energizes when the temperature drops to 1°F above the room temperature. A second relay energizes for heating when temperature is at least 3°F below the room temperature and turns off when temp rises to 1°F below the room temperature.

Programming Example

Program in Setup:
Press and hold the MENU button for 5 seconds to enter Setup mode. Select the Outputs menu, and then select:

- Setting up the Sensor label names (Optional).

Select Label, then highlight ROOM A. Press once to get back to the SENSORS menu. Select SENSOR B. Select Label then highlight OUTDOOR B. Choose other names if desired.

Setting up RELAY 1 and RELAY 2 for reset.

- SETUP → OUTPUTS
- RELAY 1 → RESET = YES-OTHER (used only to set the differential curve, do not wire Relay 1)
- RELAY 2 → RESET = YES (used for cooling)

Press Home to exit Setup, and press Menu to enter programming.

- RELAY 1: The below settings for RELAY 1 are to establish the reset curve only. There will not be any electrical connections to RELAY 1. (Refer to reset curve in Fig. 40).
  - SP MAX A1 = 248°F
  - RESET B1 = 248°F
  - SP MIN A2 = -40°F
  - RESET B2 = -40°F
  - DIFFRENTL = N/A
  - HEAT/COOL = HEAT

- RELAY 2: Enter the temperature delta (difference) at which you want the cooling to turn on. In our example this value is 3°F above the room temperature.
  - OFFSET = 3°F

  Next, the differential will determine the number of degrees below the setpoint (3°F differential) at which the cooling will turn off. In our example this value is 2°F (i.e., 1°F above the room temperature).
  - DIFFRNTL = 2°F

Fig. 40. Reset curve.

Fig. 41. T775R wiring diagram for maintaining differential temperature for both heating and cooling.
This section describes how a T775 Series 2000 Electronic Stand-Alone Controller is wired and programmed to replace various older generation Honeywell devices.

**T775M2030 Replacement for W973A Logic Panel**

This replacement example illustrates how a T775M2030 is configured to replace a two-stage Heat and two-stage Cool W973A Logic Panel.

- Fig. 42 illustrates the wiring connections for the W973A Logic Panel.
- Fig. 43 and Table 2 on page 35 illustrate the wiring and configuration of the T775M2030 controller.

---

Fig. 42. W973A wiring connections (pre-existing control).

NOTE: The T775M2030 Replacement for W973A Logic Panel continues on the next page.
NOTE: Fig. 43 is for wiring purposes only. A thorough review of the existing W973A application is required in order to determine the capability of the T775 controller replacement.

Fig. 43. T775M2030 wiring connections for replacing a W973A Logic Panel.

NOTE: The T775M2030 Replacement for W973A Logic Panel continues on the next page.
Table 2. T775M2030 replacement for W973A

<table>
<thead>
<tr>
<th>Component/Function</th>
<th>W973A Logic Panel</th>
<th>T775M2030 Replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermostat</td>
<td>T7067</td>
<td>Sensor A (Room) - C7132B1008.</td>
</tr>
<tr>
<td>Discharge Sensor</td>
<td>C7346</td>
<td>Sensor B (Discharge) - C7046B1008.</td>
</tr>
<tr>
<td>Heating/Cooling Motor</td>
<td>M954</td>
<td>Series 90, 4-20 mA, 0-10 Vdc, or 2-12 Vdc motor may be used.</td>
</tr>
<tr>
<td>Fan Start</td>
<td>Fan Start Relay</td>
<td>If a relay is available, it can be used for fan control (e.g., 1 stage Heat and 2 stage Cool using the T775M2030).</td>
</tr>
<tr>
<td>Economizer</td>
<td>M955</td>
<td>With the T775M2030 there are two modulating outputs. Therefore, two of the three functions (Heat, Cool, or Economizer) are available to be used. The example in Fig. 35 uses the Heat and Cool functions; no Economizer.</td>
</tr>
<tr>
<td>Outside Air Changeover</td>
<td>H205</td>
<td>Optional – SPDT Changeover (H705).</td>
</tr>
</tbody>
</table>

T775M2030 Replacement for W973A Logic Panel (continued)

In this replacement application, the T775M2030 provides the following, as described in Table 2.

T775R Replacement for W964F Aquatrol Panel with Floating Actuator

This replacement example illustrates how a T77R is configured to replace a W964F Aquatrol Panel.

- Fig. 45 illustrates the wiring connections for the W964F Aquatrol Panel.
- Fig. 46 and Table 4 on page 34 illustrate the wiring and configuration of the T775R controller.

**Diagram**: Fig. 44. W964F wiring connections (pre-existing Control).

NOTE: The T775R Replacement for W964F Aquatrol Panel with Floating Actuator continues on the next page.
T775 SERIES 2000 ELECTRONIC STAND-ALONE CONTROLLERS

T775R Replacement for W964F Aquatrol Panel with Floating Actuator (continued)

NOTE: Table 45 is for wiring purposes only. A thorough review of the existing W964F application is required in order to determine the capability of the T775 controller replacement.

Fig. 45. T775R wiring connections for replacing a W964F Aquatrol Panel.

NOTE: The T775R Replacement for W964F Aquatrol Panel with Floating Actuator continues on the next page.
In this replacement application, the T775R provides the following, as described in Table 3.

### Table 3. T775R replacement for W964F

<table>
<thead>
<tr>
<th>Component/Function</th>
<th>W964F Aquatrol</th>
<th>T775R Replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensors</td>
<td>T7044A or T7043A</td>
<td>Sensor A - Standard 1097 Ohm temperature sensor.</td>
</tr>
<tr>
<td></td>
<td>T7043B</td>
<td>Sensor B - Standard 1097 Ohm temperature sensor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>See &quot;Temperature Sensors&quot; on page 3.</em></td>
</tr>
<tr>
<td>Reset ratio and parallel shift</td>
<td>n/a</td>
<td>Reset programming in the T775R provides the reset curve.</td>
</tr>
<tr>
<td>On/Off motor control</td>
<td>Jumper terminals 1 and 2 on the W964F</td>
<td>If the W964F provided On/Off motor control, then wire motor to a relay output on the T775R to provide On/Off control.</td>
</tr>
<tr>
<td>Actuator motor speed</td>
<td>n/a</td>
<td>Use the Integral Time and Throttling Range to tune the T775R control.</td>
</tr>
<tr>
<td>Differential</td>
<td>n/a</td>
<td>Use the Throttling Range to tune the T775R control.</td>
</tr>
<tr>
<td>Program setback</td>
<td>n/a</td>
<td>The T775R provides Setback and alternate setpoint programming parameters.</td>
</tr>
<tr>
<td>Motor</td>
<td>M944B Series 90, 4-20 mA, 0-10 Vdc, or 2-12 Vdc motor may be used.</td>
<td></td>
</tr>
</tbody>
</table>

Motor M944B Series 90, 4-20 mA, 0-10 Vdc, or 2-12 Vdc motor may be used.
T775L Replacement for S984 Step Controller

This replacement example illustrates how a T775L using a T775S Expansion module is configured to replace a S984 Step Controller.

**NOTE:** This replacement section also applies to the S684 Step Controller.

Fig. 46 illustrates the wiring connections for the S984 Step Controller.

Fig. 47 and Table 4 on page 40 illustrate the wiring and configuration of the T775L controller.

**Fig. 46. S984 wiring connections (pre-existing control).**

**NOTE:** The T775L replacement for S984 step controller continues on the next page.
T775L Replacement for S984 Step Controller (continued)

NOTE: Fig. 47 is for wiring purposes only. A thorough review of the existing S984 application is required in order to determine the capability of the T775 controller replacement.

In this replacement application, the T775L provides the following, as described in Table 4:

Fig. 47. T775L wiring connections for replacing a S984 Step Controller.
## Table 4. T775L replacement for S684 or S984.

<table>
<thead>
<tr>
<th>Component/Function</th>
<th>S684 or S984</th>
<th>T775L Replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor</td>
<td>Series 60, Series 90, T915, T991, T921, W902, etc. controller</td>
<td>Sensor A - Standard 1097 Ohm temperature sensor. Sensor B - Standard 1097 Ohm temperature sensor; (required only if reset control is used; i.e. a T991B or W902A controller was used.) See “Temperature Sensors” on page 3. NOTE: If you are implementing two-sensor reset control, Sensor A must always be the controlled temperature and Sensor B must always be the controlling temperature. For example, in a reset control based on outside temperature, Sensor A must be the inside sensor and Sensor B must be the outside sensor.</td>
</tr>
<tr>
<td>Delay Timer</td>
<td>S400A</td>
<td>Use the On Delay and Off Delay programmable parameters of the T775L.</td>
</tr>
<tr>
<td>Throttling Range</td>
<td>n/a</td>
<td>Set the programmable Throttling Range parameter to match the application.</td>
</tr>
<tr>
<td>Reset</td>
<td>T991B or W902A (if used)</td>
<td>Reset programming in the T775L provides the reset curve.</td>
</tr>
<tr>
<td>Loads 1 - 5</td>
<td>n/a</td>
<td>Program the 5 relays into a single loop.</td>
</tr>
<tr>
<td>Auxiliary Pot.</td>
<td>S964J only</td>
<td>The T775L Controller with two T775S Expansion modules allows for up to 12 relay outputs.</td>
</tr>
</tbody>
</table>
T775L Replacement for W7100C Discharge Air Controller

This replacement example illustrates how a T775L using a T775S Expansion module is configured to replace a two-stage Heat and four-stage Cool W7100C Discharge Air Controller.

Fig. 48 illustrates the wiring connections for the W7100C Discharge Air Controller.

Fig. 49 and Table 5 on page 43 illustrate the wiring and configuration of the T775L controller.

NOTE: The T775L Replacement for W7100C Discharge Air Controller continues on the next page.
T775L Replacement for W7100C
Discharge Air Controller (continued)

NOTE: Fig. 49 is for wiring purposes only. A thorough review of the existing W7100C application is required in order to determine the capability of the T775 controller replacement.

Fig. 49. T775L wiring connections for replacing a W7100C Discharge Air Controller.

NOTE: The T775L Replacement for W7100C Discharge Air Controller continues on the next page.
### T775L Replacement for W7100C

Discharge Air Controller (continued)

In this replacement application, the T775L provides the following, as described in Table 5.

<table>
<thead>
<tr>
<th>Component/Function</th>
<th>W7100C Discharge Air Controller</th>
<th>T775L Replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor</td>
<td>C7100</td>
<td>Sensor A - C710001001</td>
</tr>
<tr>
<td></td>
<td>T7047C1025 and S963B1037</td>
<td>Sensor B - Standard 109°F Ohm temperature sensor; space or outdoor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See “Temperature Sensors” on page 3.</td>
</tr>
<tr>
<td>Economizer</td>
<td>M955, Q209A, and H705</td>
<td>The T775L can not provide a direct economizer function. However, an output relay can be used to enable a separate economizer module (e.g., W7212) to provide economization.</td>
</tr>
<tr>
<td>Heat/Cool switch changeover</td>
<td>T675A</td>
<td>Connect the Digital Input terminal to an outdoor temperature control, e.g. T6031 or T675A. Program the Digital Input for Setback using -40°F (-40° C) for the T675A cooling setpoint to lock out the cooling system during cold weather.</td>
</tr>
<tr>
<td>Setpoint and Reset</td>
<td></td>
<td>Reset programming in the T775L provides the reset curve.</td>
</tr>
<tr>
<td></td>
<td>• Setpoint and Reset dial</td>
<td>Remote setpoint adjustment is not possible.</td>
</tr>
<tr>
<td></td>
<td>• S963B1078 or S963B1086</td>
<td>Remote adjustment of the reset curve is not possible.</td>
</tr>
<tr>
<td></td>
<td>• S963B1037 and T7047C1025</td>
<td>NOTES: 1. Reset can be used for Heating or Cooling, but not both. 2. Remote adjustment of the reset curve is not possible.</td>
</tr>
<tr>
<td>Control Band</td>
<td>Control Band dial</td>
<td>Set the programmable Throttling Range parameter to match the application.</td>
</tr>
<tr>
<td>Satellite (if used)</td>
<td>W7101A (if used)</td>
<td>By adding up to two T775S Expansion modules, you have up to 12 relays available.</td>
</tr>
</tbody>
</table>
**T775 CROSS REFERENCE**

Table 6 lists the manufacturers in the following order:
- Johnson (System 350) — beginning on page page 44.
- Honeywell — beginning on page 45.
- Johnson (Mechanical) — beginning on page 49.
- White Rogers — beginning on page 51.
- Barber Colman — beginning on page 52.
- Ranco — beginning on page 53.
- Tekmar — beginning on page 54.

### Table 6. Cross Reference.

<table>
<thead>
<tr>
<th>Old Control</th>
<th>Temperature ° F/Humidity Range (RH)</th>
<th>Switch Action</th>
<th>Cap Length</th>
<th>Recommended Honeywell Electromechanical Replacement</th>
<th>Recommended Honeywell Electronic Replacement</th>
<th>Honeywell Well # (Order Sep.)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A350A/B</td>
<td>Johnson</td>
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**NOTE:** For all T775 Series 2000 Controllers, the Setpoint Temperature Range is -40° to 248° F (-40° to 120° C).
Table 6. Cross Reference. (Continued)

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<th>Old Control</th>
<th>Manufacturer</th>
<th>Temperature °F/Humidity Range (RH)</th>
<th>Switch Action</th>
<th>Cap Length</th>
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<th>Honeywell Well # (Order Sep.)</th>
<th>Recommended Honeywell Electronic Replacement</th>
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Honeywell

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The T775R is a Reset controller

T775A1006 | Honeywell | 70 to 140 °F | SPST | 10 ft. | T775A2009 | 5001774-001 | Johnson model: 1 SPDT with no display | | |
| T775A1016 | Honeywell | 70 to 140 °F | SPST | 10 ft. | T775A2009 | 5001774-001 | Johnson model: 1 SPDT with small display | | |
| T775A1022 | Honeywell | 70 to 140 °F | SPST | 10 ft. | T775A2009 | 5001774-001 | Johnson model: 1 SPDT with no display | | |
| T775A1022 | Honeywell | 70 to 140 °F | SPST | 10 ft. | T775A2009 | 5001774-001 | Johnson model: 1 SPDT with small display | | |
### Table 6. Cross Reference. (Continued)

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<thead>
<tr>
<th>Old Control</th>
<th>Manufacturer</th>
<th>Temperature °F / Humidity Range (RH)</th>
<th>Switch Action</th>
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<th>Recommended Honeywell Electromechanical Replacement</th>
<th>Honeywell Well № (Order Sep.)</th>
<th>Recommended Honeywell Electronic Replacement</th>
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<td>(20 to 60°F)</td>
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<td>6 ft.</td>
<td>L4088B1106</td>
<td>(110 to 290°F)</td>
<td>121371L (3 in. insulation)</td>
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<td>L678A1127</td>
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<td>30 to 110</td>
<td>2-SPDT</td>
<td>6 ft.</td>
<td>T678A1527 (0 to 100°F)</td>
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<td>Johnson</td>
<td>40 to 90</td>
<td>2-SPDT</td>
<td>6 ft.</td>
<td>T678A1437 (0 to 100°F)</td>
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<td>1/2&quot; - 112630AA</td>
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<td>Johnson</td>
<td>60 to 140</td>
<td>2-SPDT</td>
<td>6 ft.</td>
<td>T678A1445 (0 to 175°F)</td>
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<td>80 to 80</td>
<td>2-SPDT</td>
<td>6 ft.</td>
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<td>A2BA-1</td>
<td>Johnson</td>
<td>80 to 150</td>
<td>2-SPDT</td>
<td>10 ft.</td>
<td>T678A143 (0 to 100°F) or T678A1445 (0 to 175°F)</td>
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<td>5001774-001 T775 has no weatherproof enclosure</td>
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<td>A2BMA-1</td>
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<td>40 to 120</td>
<td>2-SPDT</td>
<td>6 ft.</td>
<td>T678A1437 (0 to 100°F) or T678A1445 (0 to 175°F)</td>
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<td>A2BMA-2</td>
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<td>6 ft.</td>
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<td></td>
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<td>3/8 in.</td>
<td>6 ft.</td>
<td>T991A2044</td>
<td>1/2&quot; - 112622AA</td>
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<td>3/8 in.</td>
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<td>1/2&quot; - 112630AA</td>
<td>5001774-001 T775 has 5 ft. cap; other models available</td>
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### Table 6. Cross Reference. (Continued)

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<tr>
<th>Old Control</th>
<th>Manufacturer</th>
<th>Temperature °F</th>
<th>Humidity Range (RH)</th>
<th>Switch Action</th>
<th>Cap Length</th>
<th>Recommended Honeywell Electromechanical Replacement</th>
<th>Honeywell Well # (Order Sep.)</th>
<th>Recommended Honeywell Electronic Replacement</th>
<th>Honeywell Well # (Order Sep.)</th>
<th>Comments</th>
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<td>A80ABA-3</td>
<td>Johnson</td>
<td>60 to 140</td>
<td>135 Ohm</td>
<td>6 ft.</td>
<td>1991A1244</td>
<td>121371Q</td>
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<td>6 ft.</td>
<td>1915C1928</td>
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<td>A80ABA-5</td>
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<td>6 ft.</td>
<td>1991A1061</td>
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<td>A80ABA-22</td>
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<td>White Rodgers</td>
<td>20 to 50</td>
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<td>123870A</td>
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<td>White Rodgers</td>
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<td>SPST</td>
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<td>White Rodgers</td>
<td>1609-102</td>
<td>White Rodgers</td>
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<td>SPST</td>
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<td>10 ft.</td>
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<td>1609-104</td>
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<td>SPST</td>
<td>20 ft.</td>
<td>16031A1080</td>
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<td>1609-106</td>
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<td>SPST</td>
<td>5 ft.</td>
<td>1675A1700 (0 to 100° F)</td>
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<td>1681-9</td>
<td>White Rodgers</td>
<td>30 to 90</td>
<td>SPST</td>
<td>8 ft.</td>
<td>16031A1136</td>
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<td>2A38-14</td>
<td>White Rodgers</td>
<td>20 to 120</td>
<td>20 ft.</td>
<td>SPDT</td>
<td>1075A1085 (0 to 100° F)</td>
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<td>123870A</td>
<td>T775A2009</td>
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<td>230-22</td>
<td>White Rodgers</td>
<td>20 to 120</td>
<td>8 ft.</td>
<td>SPST</td>
<td>14031A1004 (40 to 180° F)</td>
<td>1/2&quot; - 123890A</td>
<td>123870A</td>
<td>T775A2009</td>
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### Table 6. Cross Reference. (Continued)

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<th>Old Control</th>
<th>Manufacturer</th>
<th>Temperature °F Humidity Range (RH)</th>
<th>Switch Action</th>
<th>Cap Length</th>
<th>Recommended Honeywell Electromechanical Replacement</th>
<th>Honeywell Well # (Order Sep.)</th>
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<tbody>
<tr>
<td>230-22</td>
<td>White Rodgers</td>
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<td>241-2</td>
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<td>445-6</td>
<td>White Rodgers</td>
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<td>1/2&quot; - 123869A (20 to 90° F)</td>
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<td>12&quot; - 123869A</td>
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<td>Barber Colman</td>
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<td>1/2&quot; - 123869A (40 to 180° F)</td>
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<td>TC4251</td>
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<td>1/2&quot; - 123869A (40 to 180° F)</td>
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<th>Cap Length</th>
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**Ranco**

| ETC-11100   | Ranco        |                                    |               |            |                                    | T775A2009                    |                              |          |
| ETC-11110   | Ranco        |                                    |               |            |                                    | T775M2048                    |                              |          |
| ETC-11200   | Ranco        |                                    |               |            |                                    | T775M2049                    |                              |          |
| ETC-12110   | Ranco        |                                    |               |            |                                    | T775M2049                    |                              |          |
| ETC-14100   | Ranco        |                                    |               |            |                                    | T775B2016                    |                              |          |
| ETC-21100   | Ranco        |                                    |               |            |                                    | T775B2932                    |                              |          |
| ETC-21110   | Ranco        |                                    |               |            |                                    | T775M2049                    |                              |          |
| ETC-21200   | Ranco        |                                    |               |            |                                    | T775B2032                    |                              |          |
| ETC-21210   | Ranco        |                                    |               |            |                                    | T775M2049                    |                              |          |
| ETC-24100   | Ranco        |                                    |               |            |                                    | T775B2016                    |                              |          |
### Table 7. Cross Reference. (Continued)

<table>
<thead>
<tr>
<th>Features</th>
<th>Tekmar Model &amp; T775 Cross</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustable Minimum Off Time</td>
<td>✓</td>
</tr>
<tr>
<td>Auto Differential</td>
<td>✓</td>
</tr>
<tr>
<td>Boiler Demand</td>
<td>✓</td>
</tr>
<tr>
<td>Built-in Display</td>
<td>✓</td>
</tr>
<tr>
<td>Combustion Air or Alarm Contact</td>
<td>✓</td>
</tr>
<tr>
<td>DHW Control</td>
<td>✓</td>
</tr>
<tr>
<td>Digital Input for Setback or Disable</td>
<td>✓</td>
</tr>
<tr>
<td>Equal Run Time</td>
<td>✓</td>
</tr>
<tr>
<td>External Input 0-10Vdc or 2-10Vdc</td>
<td>✓</td>
</tr>
<tr>
<td>First On/ First Off Rotation</td>
<td>✓</td>
</tr>
<tr>
<td>First On/ Last Off Rotation</td>
<td>✓</td>
</tr>
<tr>
<td>Fixed Last Rotation</td>
<td>✓</td>
</tr>
<tr>
<td>Fixed Lead Rotation</td>
<td>✓</td>
</tr>
<tr>
<td>Floating Output</td>
<td>✓</td>
</tr>
<tr>
<td>Integral Voltage Options</td>
<td>✓</td>
</tr>
<tr>
<td>Irreversible High Set Point Limit</td>
<td>✓</td>
</tr>
<tr>
<td>L2/I Hi or H/Lo staging</td>
<td>✓</td>
</tr>
<tr>
<td>Modulating Outputs</td>
<td>(T775M2048)</td>
</tr>
<tr>
<td>Nema 4x Models</td>
<td>(T775B2016)</td>
</tr>
<tr>
<td>Optional Input Sensor</td>
<td>✓</td>
</tr>
<tr>
<td>Outdoor Reset</td>
<td>✓</td>
</tr>
<tr>
<td>Power Supply Voltage</td>
<td>20 to 28 Vac</td>
</tr>
<tr>
<td>Pump Exercising</td>
<td>✓</td>
</tr>
<tr>
<td>Pump Purging</td>
<td>✓</td>
</tr>
<tr>
<td>PWM Mode</td>
<td>✓</td>
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<tr>
<td>Relay Rating</td>
<td>24 Vac</td>
</tr>
<tr>
<td>Relay Outputs</td>
<td>1 SPDT</td>
</tr>
<tr>
<td>Sensor Calibration</td>
<td>✓</td>
</tr>
<tr>
<td>Sensor Inputs</td>
<td>1</td>
</tr>
<tr>
<td>Sensor Type</td>
<td>10kΩ at 77°F</td>
</tr>
<tr>
<td>Time Clock with Setback</td>
<td>✓</td>
</tr>
<tr>
<td>Adjustable Interstage Delay</td>
<td>✓</td>
</tr>
<tr>
<td>Warm Weather Shut Down</td>
<td>✓</td>
</tr>
</tbody>
</table>

1. can be configured with up to two T775S expansion modules for a maximum of 12 stages
2. if staging 4 relays and a pump output add one T775S2008 expansion module
3. if staging 9 relays and a pump output add two T775S2008 expansion modules