

T100A,F,M Controllers

THERMOSTATIC VALVE ACTUATORS

INSTALLATION INSTRUCTIONS

APPLICATION

The T100 Controllers are used with V100 Valves to control radiators, convectors, baseboard heating units, or other heating units with standard capacity requirements. The control is self-powered and requires no electrical connection. The T100A,M Controllers include an integral sensor, setpoint dial and valve actuator. They are not for use inside enclosures or where airflow around the sensor is restricted. The T100F includes a setpoint dial and valve actuator connected by a capillary tube to a sensor. The T100F can be used inside enclosures. The T100M is designed to lock onto the valve body with no visible evidence of a locking device. Authorized personnel can remove the control from the valve body with a special tool.

SPECIFICATIONS

Dimensions:

See Fig. 1.

Materials:

Body: Industrial grade plastic with low thermal conductivity.

Fastening Ring: Plated brass.

Internal Parts: Brass thermostat capsule, other metals.

Thermal Element:

T100A,M: Wax.

T100F: Liquid.

Capillary Length (T100F only):

6-1/2 ft (2m).

Sensor Temperature Ratings:

Range: 43°F to 79°F (6°C to 26°C).

Maximum: 125°F (52°C).

Available Valves:

See Fig. 2.

Available T100 Controls:

See Fig. 3.

Accessories:

272844 Locking Cap and Limit Pins for T100M.

203225 Replacement Bulb Guard for T100F.

A100D1001 Valve Adapter to use T100 on RA2000

Valve Bodies (manufactured by Danfoss Inc.).

A100M1001 Valve Adapter to use T100 on TM Valve Bodies (manufactured by MACON® Control Corporation).

A104F1007 Limit Pins for T100A,F.

G111B1053 Bulb Guard to protect sensor when wall-mounted (for T100F).

MT100L1023 Removal Tool for T100M.

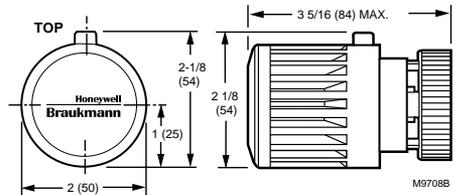


Fig. 1. T100A,F,M dimensions in in. (mm).



VALVE BODIES

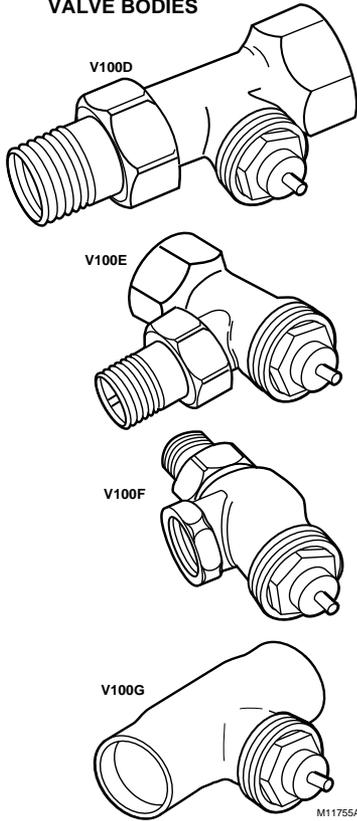


Fig. 2. Available valves.

THERMOSTATIC CONTROLS

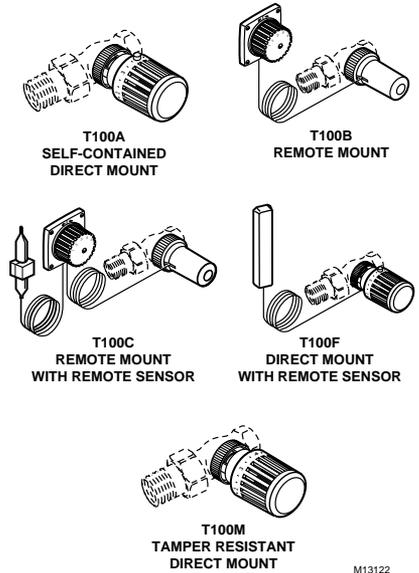


Fig. 3. Available T100 Controls.

Setpoint Reference

The T100 Controllers have a low limit of 43°F (6°C) with the dial turned fully cw (as viewed from the top) to the frost protection mark (*).

Table 1 shows setpoint temperatures under ideal conditions. Because factors affecting temperature at the sensor vary for each installation, it may be necessary to adjust the setpoint higher or lower to achieve the desired space temperature.

T100A,F

The setpoint dial has reference marks (0 to 6). The red button indicates the 68°F (20°C) setpoint limit. Set higher by holding in the button while turning the knob.

T100M

The setpoint dial has reference marks (*, 1 to 4). The controller has a hidden ratchet device that locks the controller to the valve. This ratchet can be overridden only through the use of a Removal Tool (see Accessories in the Specifications section).

Table 1. T100A,F Setpoint Temperatures Under Ideal Conditions.

Setpoint	0	*	1	2	3	4	5	6
°F	32	43	46	54	61	68	73	79
°C	0	6	8	12	16	20	23	26

Table 2. T100M Setpoint Temperatures Under Ideal Conditions.

Setpoint	*	a	1	2	3	4	a	a
°F	43	46	61	64	68	72	75	79
°C	6	8	16	18	20	22	24	26

^a Unmarked on dial.

INSTALLATION

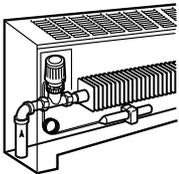
IMPORTANT

Mount the T100A,M horizontally for accurate temperature regulation. Improper mounting can result in false sensing of heated air from the supply pipe by the built-in sensor (see Fig. 4). Use a T100F, which has a remote sensor, when space limitations prohibit horizontal mounting.

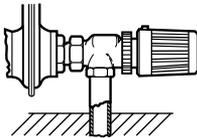
IMPORTANT

Do not install the T100A,M inside an enclosure. The heat buildup inside an enclosure can cause false sensing and, therefore, overheating. The T100F can be mounted inside an enclosure if the sensor is located a minimum of 3 in. (76 mm) beneath the heating coils in the cold air return.

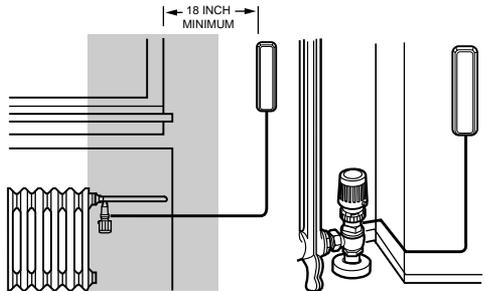
CORRECT
USE T100F WITH REMOTE SENSOR IF T100A CANNOT BE MOUNTED HORIZONTALLY.



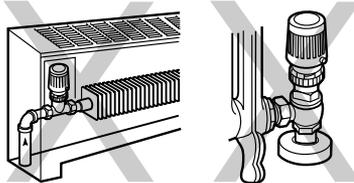
CORRECT
(T100A,M MOUNTING)



CORRECT
(T100F MOUNTINGS)



INCORRECT



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Fig. 4. Typical T100 installation.

Controller

Mounting

Mounting the T100 on the valve requires no special tools. To make the process easier, first set the controller to the highest setting. To do this, turn the adjusting knob ccw (as viewed from the top) until it stops. This moves the actuator plunger up into the actuator, reducing the force of the valve spring

1. Check for grooves in the neck of the valve body (see Fig. 5). If the neck does not have grooves, go to step 3.
2. If the neck has grooves, make sure the bosses on the actuator base fit securely into the valve body grooves.
3. Screw the actuator to the valve body using the threaded ring.
4. Firmly tighten the threaded ring to the valve body.

NOTE: To ease tightening of the ring to the valve body, gently squeeze the controller tighter against the valve body while tightening the threaded ring.

IMPORTANT

Improper mounting of the actuator can cause overheating.

Sensor

Several things must be considered when choosing the mounting location for the sensor. Avoid the following:

- Direct sunlight on the sensor.
- Mounting the sensor on a cold surface (such as an outside wall).
- Cold air drafts across the sensor.
- Locations consisting of dead air space (such as behind doors or curtains, or inside cabinets).

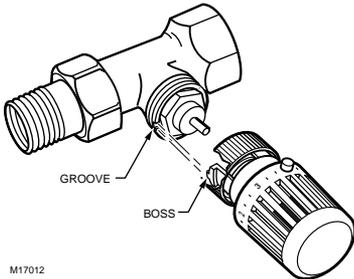


Fig. 5. Valve with groove in valve body neck.

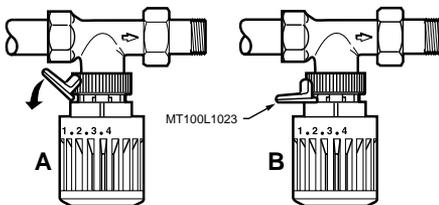


Fig. 6. Removal of T100M from V100 Valve.

Removal of T100M

A special tool is required to remove the T100M Controller from the valve. To unlock and remove the controller:

1. Insert the metal tab of the tool between the threaded ring and the controller (see Fig. 6A).
2. Position the concave body of the tool flush against the threaded ring (see Fig. 6B).
3. Rotate the tool ccw around the ring (see Fig. 6C) until a stop is felt.
4. Push the tool an additional two or three mm to unlock the ratchet mechanism (see Fig. 6D).
5. Keep the tool in place and unscrew the threaded ring.

Removing Adjustment Knob

NOTE: This task is easier when the T100 is mounted.

1. Remove the end cap from the adjustment knob. See Fig. 7. For the T100A,F Controllers, go to step 3.

NOTE: Use a screwdriver to snap off the white cover.

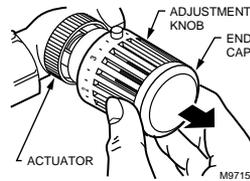
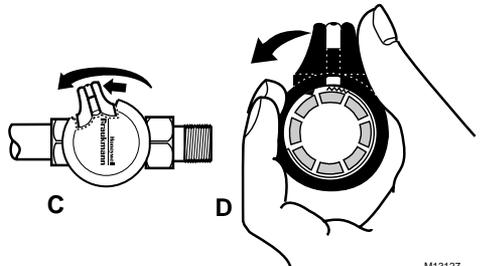


Fig. 7. Lift end cap off adjustment knob.

2. Remove the gray locking cover by wedging a small screwdriver under the gray cover where it contacts the main cover.
3. Pull the knob off the head. See Fig. 8.



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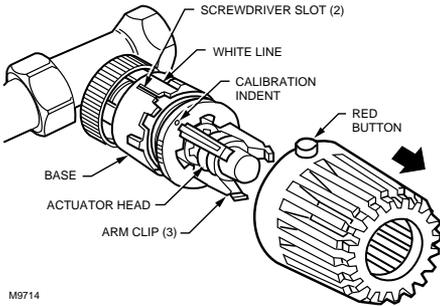


Fig. 8. Remove knob from actuator.

Sensor (T100F Only)



CAUTION

Equipment Damage Hazard.
Careless handling of the capillary tubing can damage the device beyond repair.
 Take care not to break, kink or sharply bend the capillary tubing.

1. Mount the sensor unit a minimum of three inches beneath the heating coils in the cold air return.
2. Coil excess capillary tubing beneath and away from the heating coils.

SETTINGS AND CALIBRATION

The T100A,F,M Controllers include an adjustable range limiting pin (order additional pins separately). The pin is factory-set to limit the low range of the control to the frost protection (*) setting (see Table 3). Setting both low and high limits requires an additional pin.

NOTE: The T100M Controller includes two limit pins.

Setting Limits or Locking Temperature

To change a limit from the factory setting or lock the controller at a single temperature:

1. Determine the desired temperature range or locking temperature (see Table 3).
2. Remove the adjustment knob from the actuator.
3. Set the limits or lock the control at a single temperature.

Setting Limits

Move the pins to the desired configuration:

1. Push up the limit pin to remove it from the current slot.

NOTE: If necessary, loosen the threaded insert slightly to allow pin removal; do not remove the insert.

2. Slide the pin into the slot that corresponds with the desired temperature limit; see Table 3 and Fig. 9 and 10.

3. Replace the adjustment knob.

Example 1 for T100A,F: If the desired temperature range is 43°F to 73°F (6°C to 23°C), leave the pin in the slot marked * and add one pin in slot 5.

Example 2 for T100A,F: If the desired temperature range is 32°F to 68°F (0°C to 20°C), move the pin to slot 5. This does not require an additional pin.

Locking the Control at a Single Temperature

To lock the control at one temperature setting, use one of the following procedures:

T100A,F

1. Insert the pin into slot 4a for 68°F (20°C) or slot 4b for 72°F (22°C). See Fig. 9.
2. Replace the adjustment knob.

T100M

1. Insert pins at locations just above and just below the desired setting, see Table 3.
2. Replace the adjustment knob.

Replacing Adjustment Knob

To maintain proper calibration of the T100, use the following procedure when replacing the adjustment knob:

1. Align the red button (for the T100A,F) or the 3 (for the T100M) with the calibration indent.
2. Push the knob toward the base.
3. Ensure the three clips snap into place at the top of the adjustment knob. For the T100A,F Controllers, go to step 5.
4. Replace the gray locking cover.
5. Replace the end cap.

NOTE: With the T100M Controllers, be sure to replace the plastic ring around the underside of the adjustment knob.

Table 3. T100 Limit Pin Positions.

Temperature Range in °F (°C)		Pin Position(s)	
Low	High	T100A,F	T100M
32 (0)	68 (20)	4b	3
32 (0)	73 (23)	5	4
32 (0)	79 (26)	NONE	6
43 (6)	68 (20)	4b and *	* and 3
43 (6)	73 (23)	5 and *	* and 4 ^a
43 (6)	79 (26)	* ^a	* and 6
47 (8)	75 (24)	N/A	*+ and 5
61 (16)	79 (26)	3	0 and 6
64 (18)	79 (26)	N/A	1 and 6
68 (20)	68 (20)	4a	2 and 3
72 (22)	72 (22)	4b	3 and 4

^a Factory default setting.

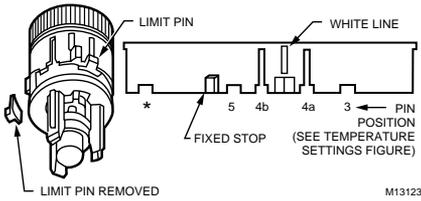


Fig. 9. Insert the pin in the slot to set the limit range (T100A,F).

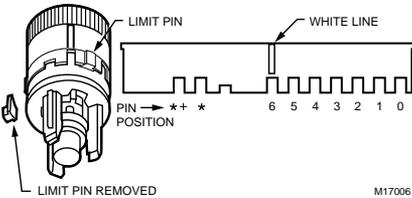


Fig. 10. Insert the pin in the slot to set the limit range (T100M).

Controller Recalibration

Maintaining calibration requires proper alignment of the T100 knob on the actuator body. To check or correct the calibration, use the following procedure:

1. Remove the adjustment knob.
2. Turn the actuator head clockwise (when viewed from above) until the head stops.
3. If the calibration indent is less than 90 degrees from the white mark, go to step 6.

4. Unscrew the head completely from the base.

IMPORTANT

Complete removal of the head from the base is required only if the actuator was previously dismantled.

5. Rotate the head 180 degrees and rethread it to the base. Then return to step 2.
6. Align the indent with the white mark.
7. Turn the actuator head ccw approximately one full turn until the calibration indent on the head aligns with the white line on the base.
8. To verify calibration, measure the distance between the actuator head and the base. When correctly calibrated, this distance is 11/32 in. (9 mm).
9. Replace the adjustment knob:
 - a. For the T100A,F, align the red button with the calibration indent.
 - b. For the T100M, align the 3 with the calibration indent.
 - c. Push the knob toward the base.

NOTE: For the 72°F (22°C) single temperature setting, rotate the knob ccw to align the calibration indent with the center of the adjustable limiting pin before reattaching the knob.

IMPORTANT

Make sure the three clips snap into place at the top of the adjustment knob.

10. Replace the end cap.

TROUBLESHOOTING

Symptom	Possible Cause	Solution
Not all sections of the radiator are heating.	Many radiators are oversized and not all sections heat to maintain the desired room temperature.	System is operating properly.
Underheating.	Sensor in the wrong location.	Change sensor location, or change control type.
	T100A,M Controller mounted in a vertical position.	Mount the T100A,M horizontally.
	Excess T00F capillary tubing coiled above or too close to the heat source.	Coil excess capillary tube below or away from heat source.
	Flow through the valve is in the wrong direction.	Check the arrow on the valve body. It should be in the direction of the flow. Change the valve direction or flow direction.
	Inadequate system temperature or pressure.	Check the operating and limiting controls on the boiler. Check the circulating pump and isolating valves.
	Defective steam traps.	Repair or replace the traps.
	Airlock in the hot water system.	Fully open the valve to allow air to pass. Install vents.
	Scale or debris blocks flow.	Flush the system. Do not use oilbase additives. Clean strainer insert in steam applications.
Overheating.	Heating cabinet dampers are closed.	Open or remove the dampers.
	Sensor in the wrong location.	Change sensor location or change control type.
	Control not properly installed.	Check for bosses and grooves, reset actuator on valve and tighten knurled ring to valve body.
	T100F Capillary tube broken, kinked, or bent sharply.	Replace control.
	Dirt or scale under the seat prevents tight shutoff.	Remove the control from the valve body, allowing the valve to open fully and flush away scale and debris. Reinstall the control and turn fully clockwise. If the valve does not close fully, remove the control and cartridge using a valve cartridge replacement tool or service socket (isolate valve from system if not using replacement tool). Inspect and clean valve seat area and disk. Always use a strainer insert in steam applications.
	Flow through the valve is in the wrong direction, damaging the valve seat.	Check the arrow on the valve body. It should correspond to the direction of the flow. Change the valve direction or flow direction. Remove the valve cartridge and inspect for damage to the seat disk.
	Defective steam traps.	Repair or replace traps.
	Excessive differential pressure forces the valve open (hot water systems).	Install differential pressure regulator (D146A) to maintain less than 15 psi (103 kPa) differential between the supply and return pipes.
Chattering or knocking.	Flow through the valve is in the wrong direction.	Check the arrow on the valve body. It should correspond to the direction of the flow. Change the valve direction or flow direction.
	Vacuum in the system.	Steam—check traps and vents. Hot water—check expansion tank operation and location.
	Excessive differential pressure.	Install differential pressure regulator (D146A) to maintain less than 15 psi (103 kPa) differential between the supply and return pipes.
	Bent piping.	Ensure adequate space for piping.

Honeywell

Braukmann

Home and Building Control
Honeywell Inc.
Honeywell Plaza
P.O. Box 524
Minneapolis, MN 55408-0524

Home and Building Control
Honeywell Limited-Honeywell Limitée
155 Gordon Baker Road
North York, Ontario
M2H 3N7

