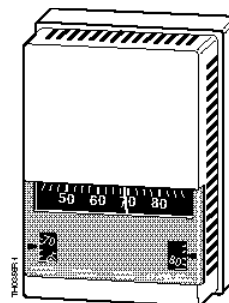


## POWERS™ CONTROLS

### Free Energy Band® TH 193 HC Hesitation Room Thermostat



#### Description

The TH 193 HC Hesitation Thermostats are proportional, single output, dual setpoint, two-pipe (high air capacity) sensor controllers. Each thermostat includes a wall mounting plate for installation in a variety of rough-in terminal boxes. Sensitive bimetals respond to temperature changes to modulate control air through a flapper nozzle. As the heating load decreases due to internal heat gains, a deadband of control minimizes energy consumption while the setpoint changes from 72°F (22°C) heating mode to 78°F (26°C) cooling mode. Two setpoint dials allow adjustment of the deadband (4°F [2°C]), minimum). Air connections are made with 5/32-inch (4 mm) O.D. plastic tubing, directly to the thermostat chassis for retrofit applications, or with plug-in adapters (provided with the TH 192 rough-in terminal box or optional accessories), which slide into the wall mounting plate.

#### Features

- Direct and reverse acting.
- Two separate, adjustable temperature setpoint indicating dials.
- Two highly sensitive bimetal thermostatic elements.
- Fahrenheit or Celsius models.
- Field adjustable deadband output pressure.
- Individual field adjustable sensitivity with graduated scale.
- Integral field adjustable limit stops.
- Control pressure test port accessible without removing cover.
- Easily replaceable thermometer, setpoint dials, filters and restrictor plate.
- Covers available for concealed or exposed thermometers and for concealed, key, or exposed knob adjustment and setpoint indication.
- Standard plastic thermostat covers provide Desert Beige or white finish.

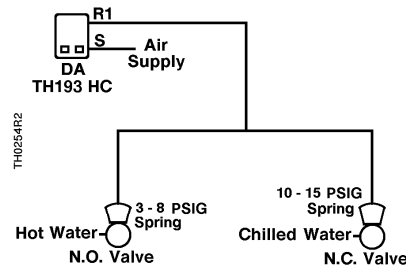
## Optional Design Features

- Fixed temperature limit stops meet government specifications.
- Metal covers available in standard configurations with Desert Beige or white finish.
- Competitor adapter mounting kits available.
- All thermostat chassis available with optional 1/2-inch setpoint adjustment knobs.

## Application

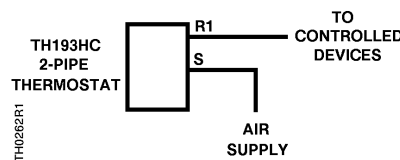
TH 193 HC Hesitation Thermostats control valve and damper actuators in building applications that require early morning heat and afternoon cooling. TH 193 HC Hesitation Thermostats control space temperature and take advantage of the deadband to "float" room temperature between heating and cooling modes while maintaining energy management (maximum economy) and occupancy comfort.

Use TH 193 HC Hesitation two-pipe thermostats where multiple valves and actuators, used with or without high/low limiting controls, require higher air capacities. The thermostats are available with covers that conceal or expose the setpoint adjustment dials.



**Figure 1. Typical TH 193 HC Hesitation Thermostat Application.**

## Piping



**Figure 2. TH 193 HC Hesitation Thermostat Connections.**

## Product Numbers and Ordering Information

### Chassis

See Table 1 for product number and ordering information on TH 193 HC Hesitation Thermostat chassis.

1. Is a Fahrenheit or Celsius scale required?
2. Is the heating and cooling control direct or reverse acting?
3. Where is the setpoint adjustment knob located?
  - a. Adjustment knob located at bottom of chassis.
  - b. Adjustment knob on front with 1/2-inch exposed knob.

**Table 1. TH 193 HC Hesitation Thermostat Chassis Part Numbers.**

<b>Chassis with Wall Plate</b>					
<b>Connection Type</b>	<b>Setpoint Adjustment</b>	<b>Fahrenheit</b>		<b>Celsius</b>	
		Heating and Cooling DA	Heating and Cooling RA	Heating and Cooling DA	Heating and Cooling RA
Hesitation	Exposed at Bottom of Cover	193-219	—	193-239	193-240
	Exposed 1/2" Knob on Cover *	193-219K	—	—	—

\* This feature requires a key setpoint adjustment cover (or key type cover).  
See Table 2.

## Covers

See Table 2 for product number and ordering information on TH 193 HC Thermostat covers.

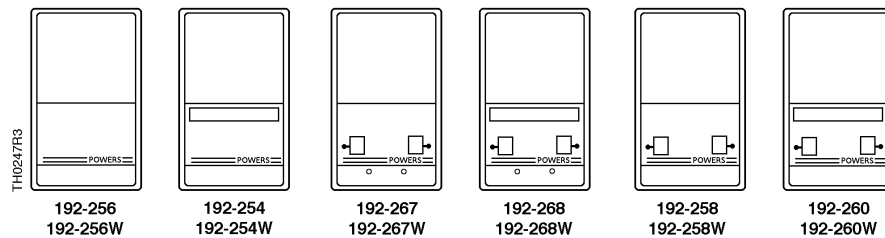
1. Is the setpoint adjustment exposed for customer adjustment or concealed to prevent alteration of setting?
2. Is the thermometer exposed or concealed?
3. Is the setpoint indication exposed or concealed behind the cover?
4. Is a plastic or zinc cast metal cover required?
  - a. Plastic covers order 192-2XX.
  - b. Metal covers order 192-3XX.
5. Is finish of cover standard or optional?
  - a. Standard cover is plastic, desert beige color. For white plastic cover option, add suffix code "W" to the cover part number (for example, 192-256W).
  - b. Optional covers are plastic or metal and available in a variety of colors. See Table 3.

**Table 2. TH 193 HC Hesitation Thermostat Cover Part Numbers.**

Setpoint Adjustment	Cover Configuration		Cover Part Number <sup>2</sup>	
	Thermometer	Setpoint Indicator	Standard Plastic Cover Desert Beige	Optional Metal Cover Desert Beige
Concealed	Concealed	Concealed	192-256	192-356
	Exposed		192-254	192-354
Key <sup>1</sup>	Concealed	Exposed	192-267	192-367
	Exposed		192-268	192-368
Exposed	Concealed		192-258	192-358
	Exposed		192-260	—

1 Key setpoint adjustment cover required for all thermostat chassis with optional 1/2-inch setpoint adjustment knobs.

2 To order a plastic cover with white finish, add suffix code "W". To order a metal cover with a white finish, add suffix code "H".

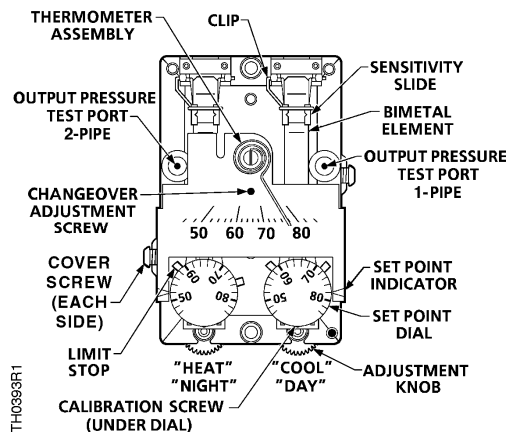


## Specifications

Control action	See Table 1.
Operating ranges	45°F to 85°F (7°C to 30°C)
Supply air pressure, maximum	30 psi (207 kPa)
Normal air supply pressure	18 to 25 psi (124 to 172 kPa)
Sensitivity adjustment	1 to 4 psi/°F (12 to 50 kPa/°C)
Nominal air consumption	40 scim (11 ml/sec)
Deadband	
Output Pressure Adjustment Range	1 to 15 psi (7 to 103 kPa) 0°F to 40°F (0°C to 20°C)
Temperature	
Storage temperature	-10°F to 140°F (-23°C to 60°C)
Ambient operating temperature	40°F to 140°F (4°C to 60°C)
Temperature response	0.1°F (0.06°C)
Dial graduations	2°F (1°C)
Factory settings	
Calibration 72°F (22°C)	7.5 psi (52 kPa)
Sensitivity	2.5 psi/°F (31 kPa/°C)
Limit stop adjustment	45°F and 85°F (7°C and 30°C)
Standard cover	Cyclac, desert beige
Shipping weight	0.7 lbs. (0.3 kg)
Dimensions	See Figure 9.

<b>Accessories</b>	See the following Technical Bulletins for information on accessories	
	<b>Technical Bulletin</b>	<b>Document Number</b>
	TB 237 Terminal Kits	155-244P25
	TB 214 Adapter Kits	155-231P25
	TB 193 Guard Kit	155-222P25
	TB 241 Test Head Kit	155-255P25
	TB 167 Restrictors	155-213

**TH 193 HC FEB  
Hesitation  
Thermostat Details**



**Figure 3. TH 193 HC Hesitation Thermostat Details.**

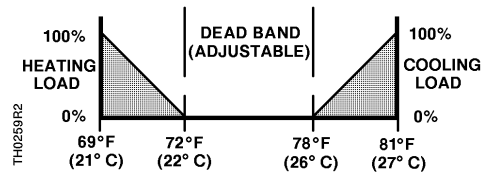
**Operation**

The TH 193 HC Hesitation Thermostat is a two-temperature thermostat with a single output. In direct acting control, an increase in temperature increases the control air pressure, and a decrease in temperature decreases the control pressure. In reverse acting control, an increase in temperature decreases the control air pressure, and a decrease in temperature increases the control pressure.

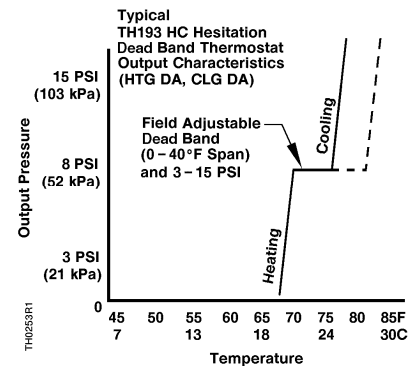
The TH 193 HC Hesitation Thermostat provides two separate bimetal elements; one for heating mode and the other for cooling mode. The setpoint of the two elements determines the window of the deadband. A 4°F (2°C) minimum deadband is standard, where the heating mode setpoint is 72°F (22°C) and the cooling mode setpoint is 78°F (26°C). Figure 4 shows a typical application with setpoints adjusted for a 6°F (4°C) deadband.

Figure 5 shows direct acting TH193 HC hesitation output characteristics. As heating increases, the output pressure increases from 0 to 8 psi (0 to 52 kPa). A field adjustable deadband occurs. The deadband spans from 0°F to 40°F (-17°C to 4°C) with a 3 to 15 psi (21 to 103 kPa) output pressure. When the deadband elapses, cooling increases from 8 to 15 psi (52 to 103 kPa).

## Operation, Continued



**Figure 4. TH 193 HC Hesitation Operating Characteristics.**



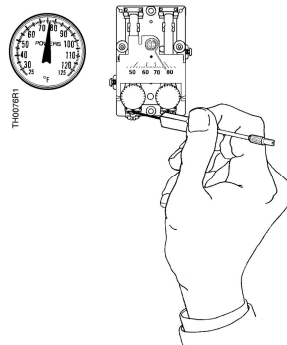
**Figure 5. TH 193 HC Hesitation Input/Output Characteristics.**

## Thermometer Calibration

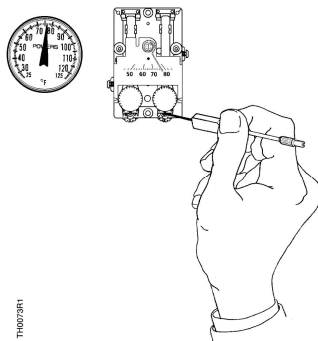
1. Use a test thermometer to read the current room temperature.
2. Place a screwdriver in the center of the thermometer assembly (Figure 3). Carefully rotate the thermometer assembly until the pointer tip indicates the correct room temperature.

**NOTE:** Avoid breathing on or touching the bimetal spiral, since this influences the temperature reading.

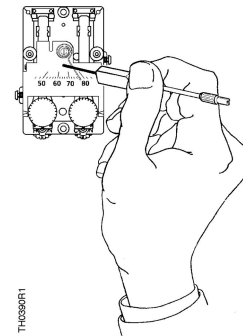
## Deadband Output Pressure Adjustment



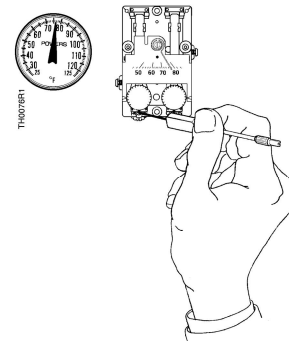
**Step 1 —**  
Set the heating dial to minimum temperature and the cooling dial to maximum temperature.



**Step 3 —**  
Set heating and cooling dials to desired setpoints. The deadband is between these two setpoints.



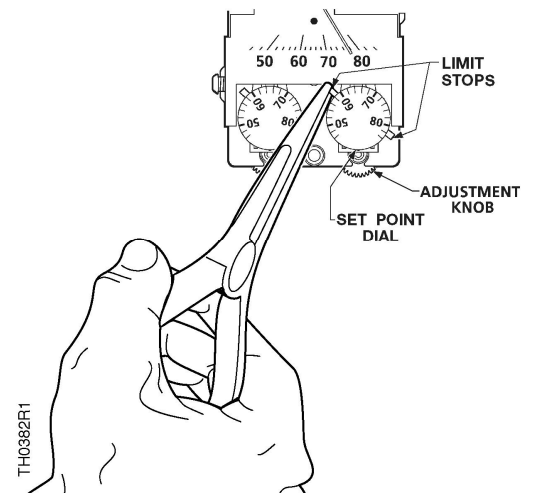
**Step 2 —**  
Adjust the relief valve until the control pressure is at the deadband output pressure.



## Limit Stop Adjustment

Thermostat limit stops define the minimum and maximum thermostat setpoints. The limit stops engage in the setpoint cam gear teeth and cause interference between the setpoint cam gear and the adjustment knob gear.

To change limit stop settings, use needle nose pliers to pull the limit stop between the setpoint cam gear teeth. Rotate the limit stop to its new position. Do not pull the limit stop any more than necessary to clear the gear teeth. Changing the limit stop position one gear tooth changes the limit stop setting by 1-1/3°F (0.7°C).



**Figure 6. Thermostat Limit Stop Adjustments.**

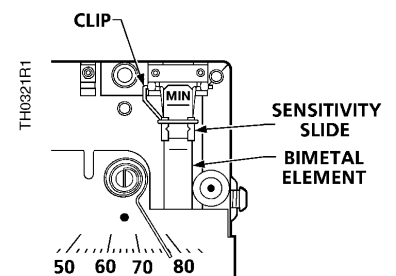
## Sensitivity Adjustment

To change thermostat sensitivity, use a flat-blade screwdriver to carefully move the sensitivity slide to the desired position as follows:

Graduation closest to the rigid end of the bimetal element  
4 psi/°F  
(50 kPa/°C)



Graduation closest to the minimum end of the bimetal element  
1 psi/°F  
(12 kPa/°C)



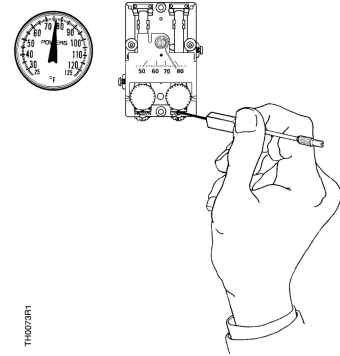
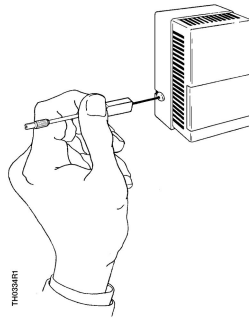
**Figure 7. TH 193 HC Hesitation Sensitivity Adjustment.**

**NOTE:** If the thermostat sensitivity is adjusted, the thermostat must be recalibrated.

## Thermostat Calibration

The thermostat is factory calibrated to a control pressure of 7.5 psi (52 kPa) when the setpoint and the ambient temperature are both at 72°F (22°C). The factory sensitivity setting is approximately 2.5 psi/°F (31 kPa/°C). No adjustments are required if these settings are appropriate for the application. If the thermostat has been tampered with, the sensitivity has changed, or it is out of adjustment, use the following steps to recalibrate the instrument.

### Cooling Calibration

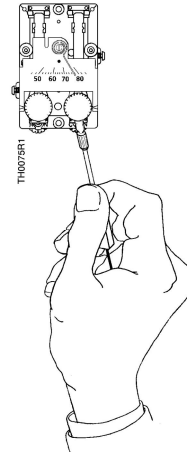
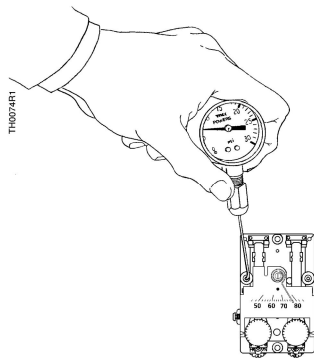
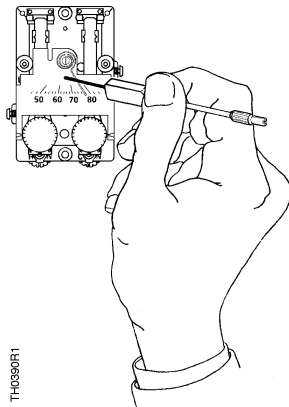


#### Step 1 —

Remove the cover using the 192-632 Calibration Tool. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).

#### Step 2 —

Verify that the supply pressure is 18 to 25 psi (124 to 172 kPa). Set the cooling dial to room temperature by turning the exposed adjustment knob, or using a hex key as shown. Allow the thermostat to stand for about five minutes to adjust to the new setting.



#### Step 3 —

Rotate the adjustment screw clockwise to open the relief valve to maximum. Allow the thermostat to stand for about five minutes to adjust to the new setting.

#### Step 4 —

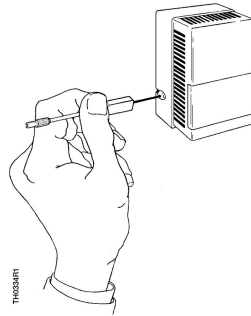
Moisten the needle and insert the 192-633 Test Gauge and needle adapter in the test port. Read the control pressure.

#### Step 5 —

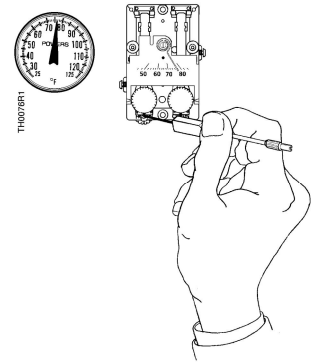
If the control pressure does not read 7 to 8 psi (48 to 55 kPa), turn the calibration screw using the 192-632 Calibration Tool or 1/8-inch (3.2 mm) wrench until the pressure is 7 to 8 psi (48 to 55 kPa). The sensing element is now in calibration and the setpoint can be changed to the desired room temperature.



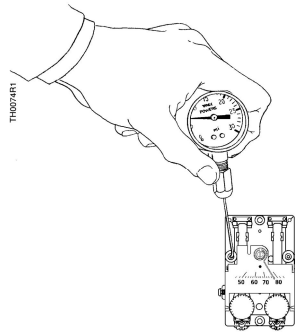
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**Heating Calibration****Step 1 —**

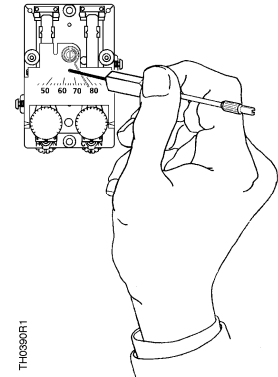
If not already done, remove the cover using the 192-632 Calibration Tool. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).

**Step 2 —**

Verify that the supply pressure is 18 to 25 psi (124 to 172 kPa). Set the heating dial to minimum, and the cooling dial to maximum temperature by turning the exposed adjustment knob, or using a hex key as shown.

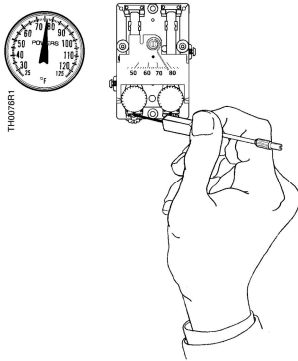
**Step 3 —**

Moisten the needle and insert the 192-633 Test Gauge and needle adapter in the test port. Read the control pressure.

**Step 4 —**

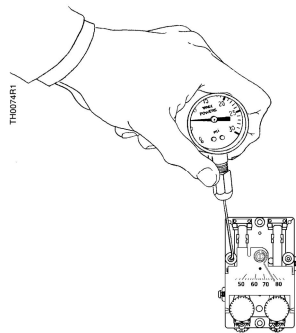
Rotate the adjustment screw counterclockwise to close the relief valve until the pressure is at least 5 psi (35 kPa). Allow the thermostat to stand for about five minutes to adjust to the new setting.

## Heating Calibration, Continued



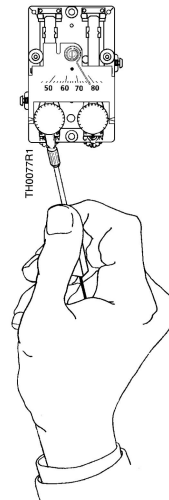
### Step 5 —

Set the heating dial to room temperature by turning the exposed adjustment knob, or by using a hex key as shown. Allow the thermostat to stand for about five minutes to adjust to the new setting.



### Step 6 —

Moisten needle and insert P/N 192-633 test gauge and needle adapter in the test port. Read control pressure.



### Step 7 —

If control pressure does not show required deadband output pressure, turn calibration screw to obtain this pressure. Sensing element is now in calibration.

## Troubleshooting

Before troubleshooting thermostat per Table 4, ensure that there is clean, dry supply air at 18 psi (124 kPa) minimum. Use the test probe gauge and needle adapter to measure the control pressure at the thermostat test port.

The output pressure test port is accessible without removing the thermostat cover through the 8th opening from the top left side for two-pipe thermostats.

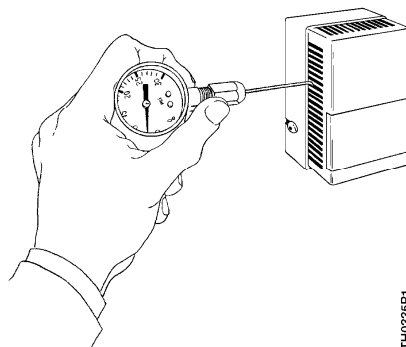


Figure 8. Accessing Output Pressure Test Port.

**Table 4. Troubleshooting Guide.**

<b>Problem</b>	<b>Check</b>	<b>Cause</b>	<b>Action</b>
Control pressure stays at approximately zero	Air supply	Low supply pressure	As required
	Nozzle or flapper	Dirt on nozzle or flapper	Clean nozzle or replace thermostat
	Restrictor	Clogged restrictor	Replace restrictor
	Calibration	Out of calibration	Recalibrate
Control pressure stays at approximately supply pressure	Nozzle	Clogged nozzle	Clean nozzle or replace thermostat
	Calibration	Dirt on either supply or exhaust valve seat	Alternately close and open nozzle by gently pushing down the bimetal
Excessive air leakage from exhaust port on left side of thermostat	Supply and return line connection	Connections are interchanged or connection to port is incorrect	As required

### Chassis Tube Connector and Restrictor Plate Replacement

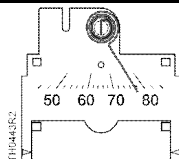
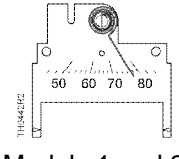


1. Remove the thermostat chassis from wall. The terminal does not have a ball check valve.  
**NOTE:** You must close off the supply air. For example, use a connector with the supply air terminal plugged.
2. Remove the two Phillips head screws from the connector on the back of the thermostat chassis. Pull the connector out of the recess. If necessary, pry the connector loose with a screwdriver, but be careful not to damage restrictor plate and gasket.
3. Remove the gasket from under the connector. Remove the restrictor. Remove the second gasket from under restrictor.
4. Use the Restrictor Replacement Kit 192-321 to replace the gasket, restrictor, and second gasket.  
**NOTE:** The restrictor plate is keyed to ensure proper orientation during installation.
5. Remove the filters from the existing connector and insert in new connector. Or, if filters are dirty, use restrictor replacement kit P/N 192-321 to replace filters.
6. Use the Chassis Tube Connector Replacement Kit 192-525 to replace the connector and mounting screws.

## Service Parts

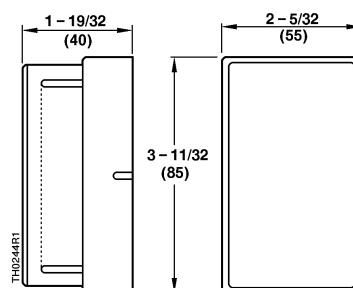
The following chart lists accessory parts and tools available for thermostat service.

Description	Part Number
Dial thermometer (-40°F to 140°F, -40°C to 60°C) with pocket case	141-0573
Basic pneumatic calibration kit with thermometer, gauge, squeeze bulb, fittings, and case	832-177
Test head kit	832-179
Calibration tools	832-178
Test probe to check pressure with cover on	
Needle probe with 1-1/2 inch diameter gauge 0-30 psig (0-200 kPa) and calibration/cover wrench	192-633
Needle probe, no gauge (package of five)	192-759
1-1/2 inch diameter gauge, 0-200 kPa, back connected 1/8-inch NPT male	142-0344
1-1/2 inch diameter compound gauge, 0-30 psig/0-200 kPa, back connected 1/8-inch NPT male	142-0373
1-1/2" diameter compound gauge, 0-30 psig/0-200 kPa, bottom connected 1/8-inch NPT male.	142-0426
Replacement for use with 192-633	
Chassis tube connector replacement kit with mounting screws (material for 10 thermostats included)	192-525
Restrictor plate replacement kit with filters and gasket (material for 10 thermostats included)	192-321
Plug-in adapters for quick thermostat removal	
Straight, blue (package of 20)	192-485
Straight, white (package of 20)	192-486
Air link connects adapters for pressure tests (package of 20)	192-501
Compression ring (package of 100)	141-388
Elbow (provides quick return for wall surface mounting), blue (package of 20)	192-487
Elbow (provides quick return for wall surface mounting), white (package of 20)	192-488
20 scim (5.4 ml/sec) restrictors for one-pipe systems (package of 5). (1/4-inch, 6.4 mm, O.D. plastic barb unless noted.)	
Brass coupling, 1/8-inch NPT (1 only).	184-040
Coupling	184-116
Tee	184-113
Pre-piped dual tee for dual one-pipe systems	184-130

## Service Parts, Continued

Description		Part Number	
Replacement thermometer kits, brown (packages of 5)		192-775	
Scale Range	Thermostat Model		
45°F to 85°F	 Model 3 and Up		
10°C to 30°C			
45°F to 85°F	 Models 1 and 2		
10°C to 30°C			
Replacement setpoint dials (packages of 10)		192-779	
°F, Direct Acting	Right Side		
°F, Reverse Acting			
°C, Direct Acting			
°C, Reverse Acting			
°F, Direct Acting	Left Side		
°F, Reverse Acting			
°C, Direct Acting			
°C, Reverse Acting			

## Dimensions



**Figure 9. TH 193 HC Hesitation Room Thermostat Dimensions in Inches (Millimeters).**

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