SIEMENS

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Powers™ Controls

Calibration Kit for Room and Duct Thermostats

Product Number 832-177

Caution Notation

CAUTION:	⚠	Equipment damage or loss of data may occur if you do not follow procedures as specified.

Description

This kit contains the equipment required to test pneumatic room and duct thermostats and pneumatic devices such as valve or damper actuators or positioning relays. Table 1 lists the items contained in the calibration kit.

Table 1. Calibration Kit Parts List.

Item	Description	Quantity	Reference
1	Dial thermometer	1	Figure 1
2	Baumanometer	1	Figure 2
3	Dual scale pressure gauge 0 to 30 psi and 0 to 200 kPa	1	Figure 3
4	1/16-inch (1.6 mm) hex Allen wrench	1	Figure 4
5	1/4-inch (6.4 mm) OD plastic tubing, 2-3/4-inch (70 mm) long	2	Figure 5
6	1/4-inch (6.4 mm) OD plastic tubing plug	2	Figure 6
7	1/4-inch (6.4 mm) OD by 1/4-inch (6.4 mm) OD plastic by 1/8-inch (3.2 mm) NPT brass tee	1	Figure 7
8	3/16-inch (4.8 mm) ID rubber tubing, 12 inches (305 mm) long	2	Figure 8
9	Calibration Tool Kit (Part Number 832-178)	1	TB 240

Dial Thermometer

The dial thermometer is used to determine the ambient temperature at the thermostat sensing element.

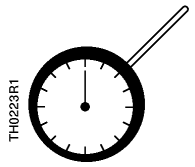

Figure 1. Dial Thermometer.

Baumanometer

The baumanometer is a squeeze bulb with a restrictor type shut-off valve. It is used if a source of air pressure is not available or if a gradual air pressure change is required to operate a pneumatic device such as a valve or damper actuator.

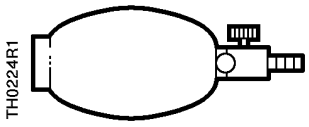

Figure 2. Baumanometer.

Description, Continued

Dual Scale Pressure Gauge

The dual scale pressure gauge has a dual scale of 0 to 30 psi and 0 to 200 kPa, and is bottom-connected. It is used to measure the air pressure being delivered to a pneumatic device or the branch line pressure of a thermostat.

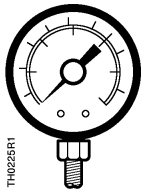

Figure 3. Dual Scale Pressure Gauge.

Hex Allen Wrench

The 1/16 inch hex Allen wrench is used to loosen the cover screws on room thermostats.

Figure 4. Hex Allen Wrench.

1/4-Inch (6.4 mm) OD Plastic Tubing.

The 1/4-inch (6.4 mm) OD plastic tubing is used to make connections between rubber tubing and barbed fittings.

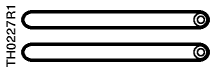

Figure 5. 1/4-Inch (6.4 mm) OD Plastic Tubing.

Tubing Plug

The tubing plug is used to plug pressurized 1/4-inch (6.4 mm) OD plastic tubing air lines that have been disconnected during calibration.

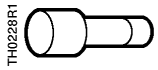

Figure 6. Tubing Plug.

Brass Tee

The brass tee holds the pressure gauge and connects the baumanometer (Figure 2) to the controlled pneumatic device, or connects the gauge to the thermostat's test port.

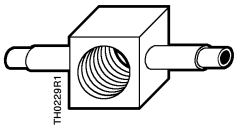

Figure 7. Brass Tee.

3/16-inch (4.8 mm) ID Rubber Tubing

The 3/16-inch (4.8 mm) ID rubber tubing is used to connect the baumanometer (Figure 2) or thermostat test port to the tee holding the gauge.

Figure 8. 3/16-Inch (4.8 mm) ID Rubber Tubing.

Assembly

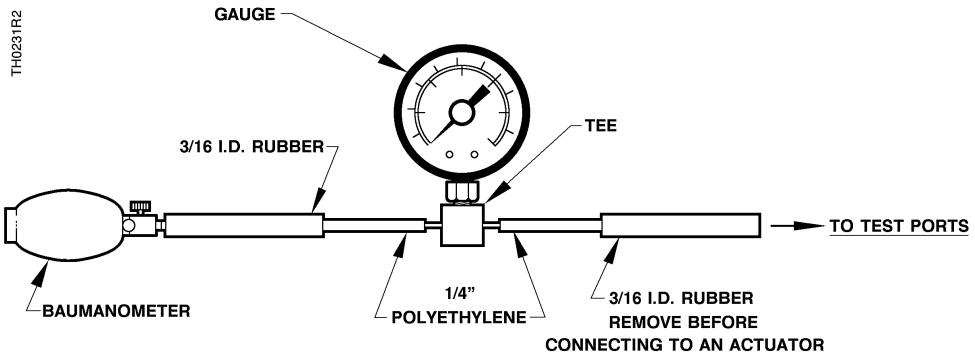

Figure 9. Pressure Gauge Assembly.

CAUTION:

Thermostats must be recalibrated whenever sensitivity is changed.

Calibration Instructions

Table of Contents

TH-180D and TH-180R Single Temperature Room Thermostats

Required Tools

- Small, flat-blade screwdriver (not included)
- Nozzle Wrench
- Cover Screw and Calibration Wrench
- Dial Thermometer
- Pressure Gauge Assembly (see Figure 9)

Thermometer Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove cover using the Cover screw and calibration wrench.
3. Invert the cover to expose the bi-metal coil.
4. Place a small, flat-blade screwdriver in the slot located in the center of the bi-metal coil, and carefully rotate until the pointer tip indicates the correct room temperature.

NOTE: Do not breathe on or touch the bi-metal coil, to avoid influencing the temperature reading.

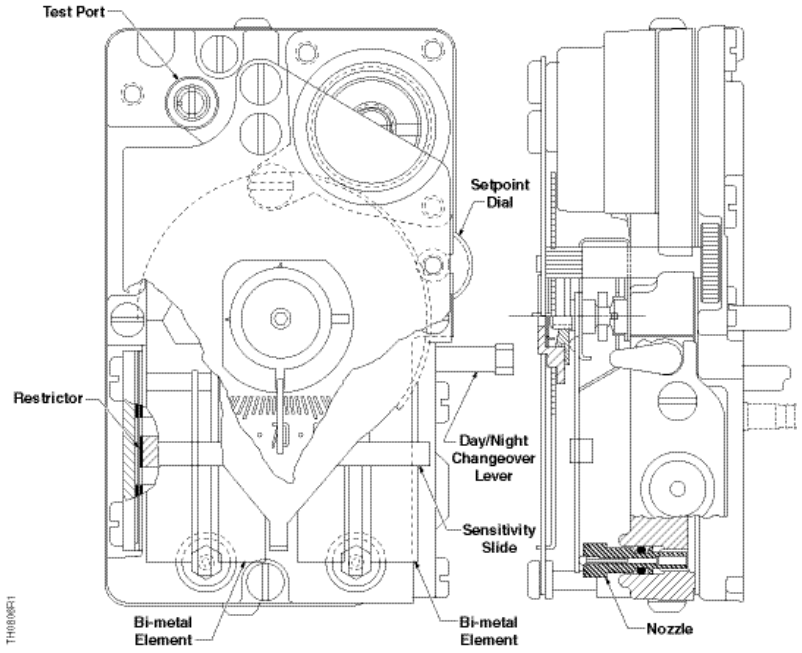

Figure 10. Typical Thermostat Details.

TH-180D and TH-180R Single Temperature Room Thermostats, Continued

Thermostat Calibration

The thermostat is factory-calibrated to pass a control pressure of 7 to 8 psi at 72.5°F (48.2 to 55.1 kPa at 22.5°C). The factory sensitivity setting is approximately 2.5 psi per degree Fahrenheit (31.0 kPa per degree Celsius). The supply air pressure to the thermostat should be 18 to 25 psi, 30 psi maximum (124.0 kPa to 172.2 kPa, 206.7 kPa maximum).

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove the thermostat cover using the Cover screw and calibration wrench.
3. Set the thermostat to the room temperature shown on the thermometer by turning the setpoint adjustment knob (on exposed adjustment thermostats), or using the Hex Allen wrench to turn the adjustment nut on top of the concealed adjustment thermostat.
4. Construct Pressure gauge assembly as shown in Figure 9.
5. Loosen the test screw approximately 1/2 turn. Place the pressure gauge hose over the test port body. Stand away from the thermostat for approximately five minutes to prevent body heat temperature influence.
6. If the control pressure gauge does not read 7psi to 8 psi (48.2 kPa to 55.1 kPa), turn the nozzle with the Nozzle wrench until it does. If less than 7 psi to 8 psi, turn the nozzle counterclockwise. If greater than 7psi to 8 psi, turn the nozzle clockwise.
7. Replace thermostat cover and secure the two screws.

The thermostat is now in calibration and the setpoint adjustment can be changed to the desired room temperature.

Changing Sensitivity

NOTE: To change the sensitivity, carefully move the sensitivity slide to the approximate desired position. It will be 4 psi/°F (49.6 kPa/°C) at the free end of the bi-metal element, decreasing to 1 psi/°F (12.4 kPa/'C) at the rigid end.

The sensitivity slide must always be in contact with the center leg of the element. Recalibrate by rotating the nozzle per *Step 5*.

Table 2. Troubleshooting Guide.

Problem	Check	Cause	Action
Control pressure stays at approximately zero	Air supply	Low supply pressure	Recalibrate or replace thermostat
	Nozzle or flapper	Dirt on nozzle or flapper	Clean nozzle or replace thermostat
	Restrictor	Clogged restrictor	Clean or 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 bi-metal
Excessive air leakage from nozzle	Supply and return line connection	Connections are interchanged or connection to port is incorrect	Reverse tubing connections

TH-180D and TH-180R Single Temperature Room Thermostats, Continued

Troubleshooting

Control pressure remains at 1/2 psi (3.4 kPa)

1. Remove the thermostat cover and connect the pressure gauge assembly. See *Thermostat Calibration,* Steps 1 through 4.
2. Check the throttling pin to see if it is in place under the center leg of the bi-metal element.
3. Use the Hex Allen wrench to gently press the center bi-metal and pin. The control pressure should increase. If not, the restriction plate restriction hole, which is .0045-inch (0.11 mm) diameter, may be clogged.
4. Remove the two screws and holding cover.
5. Remove the gaskets and restriction plate.
6. Clean the restriction hole with compressed air.
7. Replace the gasket, restriction plate, rubber gasket and cover.
8. Tighten screws.
9. Replace thermostat cover and tighten the two screws.

Control pressure remains at maximum, 25 psi to 30 psi (172.2 kPa to 206.7 kPa)

1. Use a flat-blade screwdriver to gently push the center leg of the bi-metal away from the throttling pin.
2. If the control pressure does not drop to approximately 1/2 psi (3.4 kPa), check for a clogged nozzle or a sticking throttling pin.

NOTE: Replacement parts are no longer available for this model. If this problem persists, replace the unit with a TH192 Thermostat.

Excessive air leakage from nozzle—control pressure does not drop

1. If this occurs and the control pressure does not drop to 1/2 psi (3.4 kPa) when the bi-metal is pulled away from the throttling pin, then there is dirt on the throttling pin or brass exhaust valve seat.
2. This dirt particle can usually be removed by moving the pin with a flat-blade screwdriver so that it alternately opens and closes the nozzle. This fluttering action will usually dislodge dirt from the throttling pin or brass exhaust valve seat.

NOTE: Replacement parts are no longer available for this model. If this problem persists, replace the unit with a TH-192 Thermostat.

TH-182 HC Heating-Cooling Thermostat

Required Tools

- Small, flat-blade screwdriver (not included)
- Nozzle Wrench
- Cover Screw and Calibration Wrench
- Dial Thermometer
- Pressure Gauge Assembly (see Figure 9)

Thermometer Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove the thermostat cover using the Cover screw and calibration wrench.
3. Invert cover and place the Cover screw and calibration wrench in the center of the coil of spiral and carefully rotate until the pointer tip indicates the correct room temperature. See Figure 11.

NOTE: Do not breathe on or touch the bi-metal element, to avoid influencing the temperature reading.

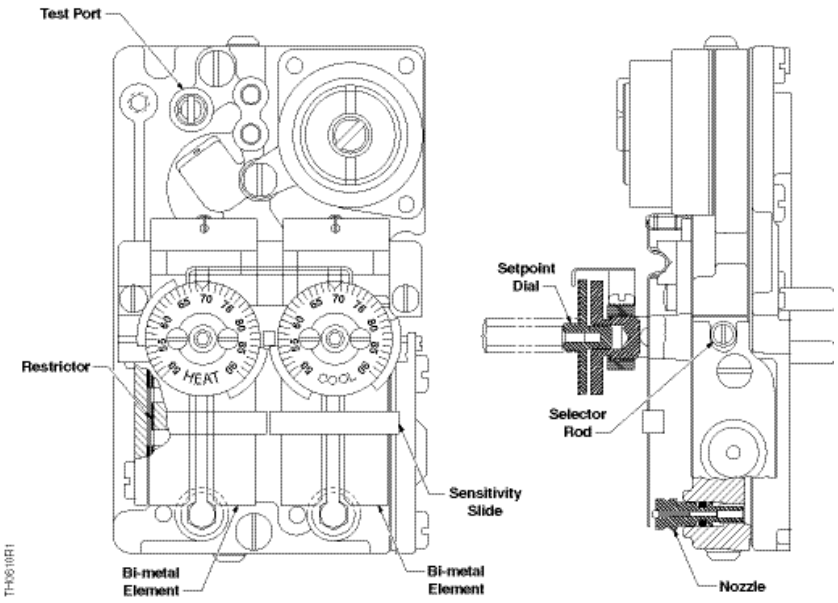

Figure 11. TH 182 HC Thermostat Details.

Thermostat Calibration

The thermostat is factory-calibrated to pass a control pressure of 7 psi to 8 psi at 72°F (48.2 kPa to 55.1 kPa at 22°C). The factory sensitivity setting is approximately 2-1/4 psi per degree Fahrenheit (27.9 kPa per degree Celsius). Any change in temperature setting or sensitivity of the heating side does not affect the cooling setting and vice versa.

TH-182 HC Heating-Cooling Thermostat, Continued

Cooling Calibration

Use 18 psi (124.0 kPa) air supply – Reverse Acting (right bi-metal)

1. Verify that room temperature is between 70°F to 80°F (21.1°C to 26.7°C).
2. Remove the thermostat cover using the Cover screw and calibration wrench.
3. Use the Cover screw and calibration wrench to set the cooling dial to room temperature by inserting it into the center of the setpoint dial and turning to the desired temperature.
4. Construct Pressure gauge assembly as shown in Figure 9.
5. Loosen the test screw approximately 1/2 turn. Place the pressure gauge hose over the test port body. Stand away from the thermostat for approximately five minutes to prevent body heat temperature influence.
6. If the control pressure gauge does not read 7 psi to 8 psi (48.2 kPa to 55.1 kPa), turn the cooling nozzle with the Nozzle wrench until it does. If less than 7 psi to 8 psi, turn the cooling nozzle counterclockwise. If greater than 7 psi to 8 psi, turn the cooling nozzle clockwise.

The cooling element is now in calibration and the setpoint adjustment can be changed to the desired room temperature. Proceed to *Heating Calibration*.

Heating Calibration

Use 25 psi (172.2 kPa) air supply – Direct Acting (left bi-metal)

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove the thermostat cover using the Cover screw and calibration wrench.
3. Use the Cover screw and calibration wrench to set the heating dial to room temperature by inserting it into the center of the setpoint dial and turning to the desired temperature.
4. Construct the Pressure gauge assembly as shown in Figure 9.
5. Loosen the test screw approximately 1/2 turn. Place the pressure gauge hose over the test port body. Stand away from the thermostat for approximately five minutes to prevent body heat temperature influence.
6. If the control pressure gauge does not read 7 psi to 8 psi (48.2 kPa to 55.1 kPa), turn the heating nozzle with the Nozzle wrench until it does. If less than 7 to 8 psi, turn the heating nozzle counterclockwise. If greater than 7 psi to 8 psi (48.2 kPa to 55.1 kPa), turn the heating nozzle clockwise.
7. Replace the thermostat cover and tighten the two screws.

The heating element is now in calibration and the setpoint adjustment can be changed to the desired room temperature.

Use of Selector Rod

(To switch from heating to cooling nozzle)

The supply pressure may be changed at any individual thermostat to facilitate calibration.

1. Apply 25 psi (172.2 kPa) air supply on the system.
2. Use a small, flat-blade screwdriver to push the selector rod until it locks in.

NOTE: You may have to rotate the screw to do this.

The cooling nozzle and bi-metal now control, and may be calibrated. See *Cooling Calibratio*n, Steps 2 through 5. Turn the rod to unlatch it when calibration is complete.

Changing Sensitivity

To change the sensitivity, carefully move the sensitivity slide to the approximate desired position. It will be 4 psi/°F (49.6 kPa/°C) at the free end of the bi-metal element, down to 1 psi/°F (12.4 kPa/°C) at the rigid end.

Adjust one bi-metal slide at a time.

The sensitivity of the slide must always be in contact with the center leg of the element. Recalibrate by rotating the nozzle. See *Heating* or *Cooling Calibration* Step 4.

CAUTION:

The element must be recalibrated whenever sensitivity is changed.

TH-182 HC Heating-Cooling Thermostat, Continued

Troubleshooting

There are three types of malfunction that might occur, and these can be corrected as follows. Before beginning:

- Ensure that there is 18 psi or 25 psi (124.0 kPa and 172.2 kPa) of clean, dry air supply.

  NOTE: Only one bi-metal element with its nozzle and throttling pin will operate at a given time, and the choice of this operating element will be governed by the supply pressure.

- Use the Pressure gauge assembly (Figure 9) to measure control pressure.

If control pressure remains at 1/2 psi (3.4 kPa)

1. Use either 18 psi (cooling) or 25 psi (heating) (124.0 lPa or 172.2 kPa) air supply.
2. Remove the thermostat cover and connect the Pressure gauge assembly. See *Thermostat Calibration, Steps 1* through *4*.
3. Check the throttling pin to see if it is in place under the center leg of the bi-metal element.
4. Use the Cover screw and calibration wrench to gently press the center bi-metal and pin. The control pressure should increase. If not, the restriction plate restriction hole, which is .0045-inch (0.11 mm) diameter, may be clogged.
5. Remove the two screws and restriction cover.
6. Remove the gaskets and restriction plate.
7. Clean the restriction hole with compressed air.
8. Replace the gasket, restriction plate, rubber gasket and cover.
9. Tighten screws.
10. Replace thermostat cover and tighten the two screws.

If control pressure remains at maximum 18 or 25 psi (124.0 or 172.2 kPa)

1. Test both the heating and cooling supply pressures, since either nozzle could be clogged.
2. Use a flat-blade screwdriver to gently push the center leg of the bi-metal away from the throttling pin.
3. If the control pressure does not drop to approximately 1/2 psi, check for a clogged nozzle or a sticking throttling pin.

NOTE: Replacement parts are no longer available for these models. If this problem persists, replace the unit with a TH-192 Thermostat.

If excessive Air Leakage from Nozzle—Control Pressure Does Not Drop

1. Use either the 18 (cooling) or 25 (heating) psi (124.0 or 172.2 kPa) air supply.
2. If the control pressure does not drop to 1/2 psi (3.4 kPa) when the bi-metal is pulled away from the throttling pin, then there is dirt on the throttling pin or brass exhaust valve seat.
3. This dirt particle can usually be removed by moving the pin with a flat-blade screwdriver so that it alternately opens and closes the nozzle. This fluttering action will usually dislodge dirt from the throttling pin or brass exhaust valve seat.

NOTE: Replacement parts are no longer available for these models. If this problem persists, replace the unit with a TH-192 Thermostat.

TH-182DN and TH-182 DNV Day-Night and Day-Night Vent Thermostats

Required Tools

- Small, flat-blade screwdriver (not included)
- Nozzle Wrench
- Cover Screw and Calibration Wrench
- Dial Thermometer
- Pressure Gauge Assembly (see Figure 9)

Thermometer Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove the thermostat cover using the Cover screw and calibration wrench.
3. Invert cover and place the Cover screw and calibration wrench in the center of the coil of spiral and carefully rotate until the pointer tip indicates the correct room temperature.

NOTE: Do not breathe on or touch the bi-metal element, to avoid influencing the temperature reading.

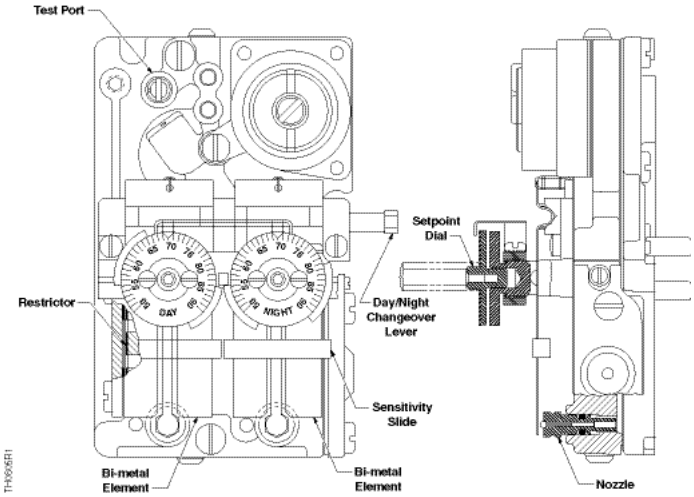

Figure 12. TH182 DN Thermostat Details.

Thermostat Calibration

The thermostat is factory-calibrated to pass a control pressure of 7 psi to 8 psi at 72°F (48.2 kPa to 55.1 kPa at 22°C). The factory sensitivity setting is approximately 2-1/4 psi per degree Fahrenheit (27.9 kPa per degree Celsius). Any change in temperature setting or sensitivity of the heating side does not affect the cooling setting and vice versa.

Day Setting Calibration

Use 18 psi (124.1 kPa) air supply
(right bi-metal)

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove the thermostat cover using the Cover screw and calibration wrench.
3. Use the Hex Allen wrench to set the day room temperature by inserting it into the center of the setpoint dial and turning to the desired temperature.
4. Construct the Pressure gauge assembly as shown in Figure 9..
5. Loosen the test screw approximately 1/2 turn. Place the pressure gauge hose over the test port body. Stand away from the thermostat for approximately five minutes to prevent body heat temperature influence.
8. If the control pressure gauge does not read 7 psi to 8 psi (48.2 kPa to 55.1 kPa), turn the day nozzle with the Nozzle wrench until it does. If less than 7 psi to 8 psi (48.2 kPa to 55.1 kPa), turn the day nozzle counterclockwise. If greater than 7 psi to 8 psi (48.2 kPa to 55.1 kPa), turn the day nozzle clockwise.

The thermostat day setting is now in calibration; proceed to *Night Setting Calibration*.

TH-182DN and TH-182 DNV Day-Night and Day-Night Vent Thermostats, Continued

Night Setting Calibration

Use 25 psi (172.2 kPa) air supply
(left bi-metal)

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Use the Cover screw and calibration wrench to set the night room temperature by inserting it into the center of the setpoint dial and turning to the desired temperature.
3. Construct the Pressure gauge assembly as shown in Figure 9.
4. Loosen the test screw approximately 1/2 turn. Place the pressure gauge hose over the test port body. Stand away from the thermostat for approximately five minutes to prevent body heat temperature influence.
5. If the control pressure gauge does not read 7 psi to 8 psi (48.2 to 55.1 kPa), turn the night nozzle with the Nozzle wrench until it does. If less than 7 psi to 8 psi (48.2 kPa to 55.1 kPa), turn the night nozzle counterclockwise. If greater than 7 psi to 8 psi (48.2 kPa to 55.1 kPa), turn the night nozzle clockwise.
6. Replace the cover and tighten the two screws.

The thermostat night setting is now in calibration and the setpoint adjustment can be changed to the desired room temperature.

Use of Manual Selector

The manual selector permits any individual thermostat to operate at its day setting even though the system is on night supply pressure (25 psi [172.4 kPa]). To latch (lock in) the selector, its handle must point down. This position is stamped DAY on the cover.

To operate, push the selector in, toward the thermostat, until it latches. To return to night setting, rotate the handle until it unlatches and comes out to its normal position. This position is stamped AUTO on the cover.

Changing Sensitivity

To change the sensitivity, carefully move the sensitivity slide to the approximate desired position. It will be 4 psi/°F (49.6 kPa/°C) at the free end of the bi-metal element, down to 1 psi/°F (12.4 kPa/°C) at the rigid end.

Adjust one bi-metal slide at a time.

The sensitivity of the slide must always be in contact with the center leg of the element. Recalibrate by rotating the nozzle. See *Heating* or *Cooling Calibration* Step 4.

CAUTION:

The element must be recalibrated whenever sensitivity is changed.

DNV Maintenance

The night vent connection of the TH-182 DNV thermostat must be connected to a dead end chamber (a damper actuator, for example), or vent port R2 must be plugged. If not connected or plugged, it will exhaust to the atmosphere, and prevent changeover from day to night operation. Any leak in the night vent air line can also prevent changeover.

Troubleshooting

There are three types of malfunction that might occur, and these can be corrected as follows. Before beginning:

- Ensure that there is 18 psi or 25 psi (124.0 kPa and 172.2 kPa) of clean, dry air supply.

  NOTE: Only one bi-metal element with its nozzle and throttling pin will operate at a given time, and the choice of this operating element will be governed by the supply pressure.

- Use the Pressure gauge assembly (Figure 9) to measure control pressure.

TH-182DN and TH-182 DNV Day-Night and Day-Night Vent Thermostats, Continued

If control pressure remains at 1/2 psi (3.4 kPa)

1. Use either 18 psi (day) or 25 psi (night) (124.0 or 172.2 kPa) air supply.
2. Remove the thermostat cover and connect the pressure gauge. See *Thermostat Calibration,* Steps 1 through 4.
3. Check the throttling pin to see if it is in place under the center leg of the bi-metal element.
4. Use the Cover screw and calibration wrench to gently press the center bi-metal and pin. The control pressure should increase. If not, the restriction plate restriction hole, which is .0045-inch (0.11 mm) diameter, may be clogged.
5. Remove the two screws and holding cover.
6. Remove the gaskets and restriction plate.
7. Clean the restriction hole with compressed air.
8. Replace the gasket, restriction plate, rubber gasket and cover.
9. Tighten screws.

If control pressure remains at maximum 18 or 25 psi (124.0 or 172.2 kPa)

1. Test both the day and night supply pressures, since either nozzle could be clogged.
2. Use a flat-blade screwdriver to gently push the center leg of the bi-metal away from the throttling pin.
3. If the control pressure does not drop to approximately 1/2 psi, check for a clogged nozzle or a sticking throttling pin.

NOTE: Replacement parts are no longer available for these models. If this problem persists, replace the unit with a TH-192 Thermostat.

If excessive Air Leakage from Nozzle—Control Pressure Does Not Drop

1. Use either the 18 psi or 25 psi (124.0 kPa or 172.2 kPa) air supply.
4. If the control pressure does not drop to 1/2 psi (3.4 kPa) when the bi-metal is pulled away from the throttling pin, then there is dirt on the throttling pin or brass exhaust valve seat.
5. This dirt particle can usually be removed by moving the pin with a flat-blade screwdriver so that it alternately opens and closes the nozzle. This fluttering action will usually dislodge dirt from the throttling pin or brass exhaust valve seat.

NOTE: Replacement parts are no longer available for this model. If this problem persists, replace the unit with a TH-192 Thermostat.

Direct Acting D Room Thermostat

Required Tools

- D Adjustment Key
- Small, flat-blade screwdriver (not included)
- Dial Thermometer
- Pressure Gauge Assembly (see Figure 9)

Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove thermostat cover using D Adjustment Key.
3. Construct Pressure gauge assembly as shown in Figure 9.
4. Loosen test screw (see Figure 13) using a screwdriver, 1/2 turn counterclockwise.
5. Attach Pressure gauge assembly over the test screw body.

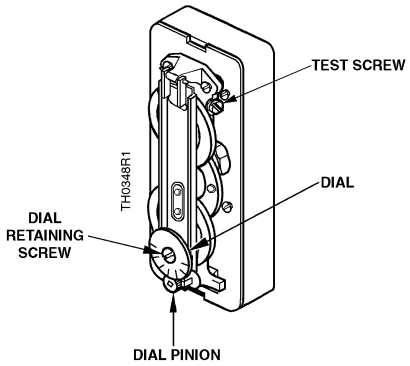

Figure 13. Direct Acting D Thermostat Details.

6. Stand away from thermostat for about five minutes to prevent body heat temperature influence. If control pressure does not read 7 psi to 8 psi (48 kPa to 55 kPa), turn adjustment screw with the D Adjustment Key as follows:
   - If less than 7 psi to 8 psi (48 kPa to 55 kPa), turn the adjustment screw clockwise.
   - If greater than 7 psi to 8 psi (48 kPa to 55 kPa), turn the adjustment screw counterclockwise.

   If there is no change in pressure, the thermostat is not functioning and should be replaced with Part Number 832-040 D Thermostat Replacement unit.
7. If the dial reading and room temperature do not agree, loosen dial retaining screw with a screwdriver. (See Figure 13.)
8. Tilt and rotate until dial reading agrees with room temperature. Do not turn dial pinion.
9. Retighten dial retaining screw.
10. Remove the D Adjustment Key and Pressure gauge assembly, and let pressure stabilize.
11. Verify that the control pressure remains between 7 to 8 psi.
12. Replace the thermostat cover and tighten the two screws.

The thermostat is now in calibration and can be set to the desired room temperature.

D Day-Night Thermostats

Required Tools

- D Adjustment Key
- Small, flat-blade screwdriver (not included)
- Dial Thermometer
- Pressure Gauge Assembly (see Figure 9)

Calibration

Day Setting

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove the thermostat cover using the D Adjustment Key.
3. Verify that the supply pressure is 18 psi (124 kPa) pressure.
4. Construct the Pressure gauge assembly as shown in Figure 9.
5. Loosen test screw one complete turn, using a screwdriver. Place the pressure gauge hose over the test port body. Wait several minutes after installing the test gauge hose before recalibrating. Stand away from the thermostat for approximately five minutes to prevent body heat temperature influence.
6. Adjust the day dial (left) to the actual room temperature. The test gauge should then read 7 psi to 8 psi (48 to 55 kPa). If this is not the case, turn the adjusting post using the D Adjustment Key, as follows:
   - If less than 7 psi to 8 psi (48 kPa to 55 kPa), turn the adjustment screw counterclockwise.
   - If greater than 7 psi to 8 psi (48 kPa to 55 kPa), turn the adjustment screw clockwise.

   If there is no change in pressure, the thermostat is not functioning and should be replace with Part Number 182-041 DN Thermostat Replacement kit.
7. Loosen the day dial retaining screw with a screwdriver and reset the day temperature dial to the correct room temperature.
8. Tilt and rotate until dial reading agrees with room temperature. Do not turn dial pinion.
9. Retighten dial retainer screw being careful not to change the setting of adjustment post. Be careful not to come in contact with thermostatic disc.
10. Remove the D Adjustment Key and Pressure gauge assembly, and let pressure stabilize.
11. Verify that the control pressure remains between 7 to 8 psi.

The Day Setting is now complete; proceed to *Night Setting*.

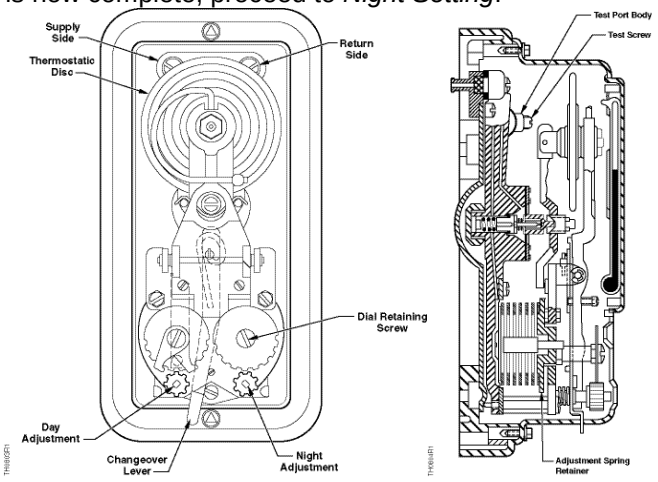

Figure 14. D Day-Night Thermostat Details.

D Day-Night Thermostats, Continued

Night Setting

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Verify that the supply pressure is 25 psi (172 kPa).
3. Repeat *Day Setting* Steps 4 through 11 to calibrate the night (right) scale.
4. Replace the thermostat cover and tighten the two screws.

Manual Reset - System on 25 psi (172 kPa) Night Operation

1. Set changeover lever to the right until a "click" is felt. The thermostat is now controlling at the day dial setting (see Figure 14).
2. Return thermostat supply pressure to day 18 psi (124 kPa). The manual reset lever should automatically return to the left hand side of day cycle.
3. If the manual reset lever does not return to the left hand side when the supply pressure is 18 psi (124 kPa), the tension of spring will have to be increased by turning the adjustment spring retainer clockwise. About one complete turn of the adjustment spring retainer clockwise will increase the pressure change about 1 psi (7 kPa).

   For example: If the manual reset lever is returned to the day setting at 17-1/2 psi (120.6 kPa) system pressure, then the spring tension should be increased so that it would switch over at about 18-1/4 psi (125.7 kPa). This would be approximately three-fourths of a complete turn of the adjustment spring retainer.
4. Apply 25 psi (172 kPa) night supply pressure. Move reset lever to right. Thermostat will now control at day dial setting. Check calibration.
5. Move reset lever back to left. Thermostat will now control at night dial setting. Check calibration.
6. The thermostat is now in calibration. Test hose should be removed and test plug screwed in tightly.
7. Replace the thermostat cover and tighten the two cover screws.

TH-192 S Single Temperature Room Thermostat

Required Tools

- Small, flat-blade screwdriver (not included)
- Needle nose pliers
- Cover Screw and Calibration Wrench
- Dial Thermometer
- Dual Scale Pressure Gauge and Pressure Tap Needle (assembled)

Thermometer Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove thermostat cover using the Cover screw and calibration wrench.
3. Place a screwdriver in the center of the thermometer assembly (see Figure 15). Carefully rotate the thermometer assembly until the pointer tip indicates the correct room temperature.

NOTE: Do not breathe on or touch the bi-metal element, to avoid influencing the temperature reading.

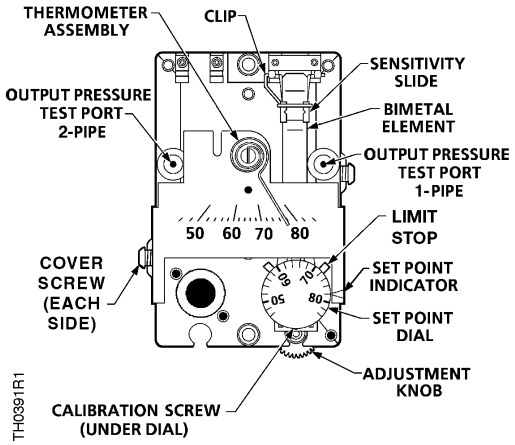

Figure 15. TH-192 S Thermostat Details.

Sensitivity Adjustment

The factory thermostat sensitivity setting is approximately 2.5 psi/°F (31 kPa/°C). To change the sensitivity, use a flat-blade screwdriver to carefully move the sensitivity slide (see Figure 15) to the desired position as follows:

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

Graduation closest to the minimum (MIN) end of the bi-metal element
1 psi/°F (12 kPa/°C)

CAUTION:

Thermostats must be recalibrated whenever sensitivity is changed.

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 the limit stop settings:

1. If not already done, remove the thermostat cover using the Cover screw and calibration wrench.
2. Use a needle nose pliers to pull the limit stop tab (see Figure 15).
3. Rotate the limit stop to its new position.
4. Reposition between the setpoint cam gear teeth. Do not pull the limit stop any more than necessary to clear the gear teeth.

Limit Stop Adjustment, Continued

5. Repeat with second limit stop tab.

NOTE: Changing the limit stop position one gear tooth changes the limit stop setting by 1-1/3°F (0.7°C).

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). No adjustments are required if these settings are appropriate.

If the thermostat has been tampered with, the sensitivity changed, or it is out of adjustment, use the following steps to recalibrate the instrument.

The output pressure test port (see Figure 15) is accessible without removing the thermostat cover through the eighth opening:

- For one-pipe thermostats, the test port is on the *right* side.
- For two-pipe thermostats, the test port is on the *left* side.

CAUTION:
If you use the wrong test port, thermostat damage can occur and result in replacement of the device.

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. If not already done, remove the cover using the Cover screw and calibration wrench.
3. Verify that the supply pressure is 18 psi to 25 psi (124 kPa to 172 kPa), 30 psi (207 kPa) maximum. Set the dial to the room temperature by turning the exposed adjustment knob. Allow the thermostat to stand for about five minutes to adjust to the new setting.
4. Moisten the needle and insert the test gauge and needle adapter in the output pressure test port (see Figure 15). Read the control pressure.
5. If the control pressure gauge does not read 7 to 8 psi (48.2 kPa to 55.1 kPa), turn the calibration screw with the Cover screw and calibration wrench or 1/8-inch wrench until it does.
   - If less than 7 psi to 8 psi (48 kPa to 55 kPa), turn the calibration screw clockwise.
   - If greater than 7 psi to 8 psi (48 kPa to 55 kPa), turn the calibration screw counterclockwise.
6. Remove the Cover screw and calibration wrench, and let the pressure stabilize.
7. Verify that the control pressure remains between 7 and 8 psi (48.2 kPa to 55.1 kPa).
8. Replace the thermostat cover and tighten the two screws.

The sensing element is now in calibration and the setpoint can be changed to the desired room temperature.

Troubleshooting

Before troubleshooting the thermostat per Table 2, ensure there is clean dry supply air at 18 psi to 25 psi (12 kPa4 to 172 kPa) minimum, 30 psi (207 kPa) maximum.

Use the Dual Scale Pressure Gauge and Pressure Tap Needle (assembled) to measure the control pressure at the output test port (see Figure 15). The output pressure test port is accessible without removing the thermostat cover through the eighth opening from the top as follows:

- For one-pipe thermostats, the port is on the *right* side.
- For two-pipe thermostats, the port is on the *left* side.

CAUTION:
If you use the wrong test port, thermostat damage can occur and result in replacement of the device.

TH192 HC Heating/ Cooling Room Thermostat

Required Tools

- Small, flat-blade screwdriver (not included)
- Needle nose pliers
- Dial Thermometer
- Cover Screw and Calibration Wrench
- Dual Scale Pressure Gauge and Pressure Tap Needle, assembled

Thermometer Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove cover using the Cover screw and calibration wrench.
3. Place a screwdriver in the center of the thermometer assembly (See Figure 16).
4. Carefully rotate the thermometer assembly until the pointer tip indicates the correct room temperature.

NOTE: Do not breathe on or touch the bi-metal element, to avoid influencing the temperature reading.

Changeover Point Adjustment

The changeover point is factory set to occur between 19 psi and 22 psi (131 kPa and 152 kPa). The changeover point can be field adjusted to occur between 14 psi and 22 psi (96 kPa and 152 kPa).

1. Connect a pressure gauge or a manometer to measure the supply pressure to the thermostat. Use 30 psi (207 kPa) supply through a positioning switch so pressure can be fully variable.
2. Determine the current changeover point. Turn the cooling dial so that the cooling and heating control pressures are different. Then note the changeover point on the control gauge as the supply pressure changes.
3. Place the Cover screw and calibration wrench in the opening of the thermometer assembly (see Figure 16) to adjust the changeover adjustment screw as follows:
   a. If the changeover is too high, turn off the supply pressure and rotate the changeover adjustment screw clockwise. One turn decreases the changeover point by about 3 psi (20 kPa). Turn on the supply pressure and recheck to verify the new changeover point.
   b. If the changeover is too low, turn off the supply pressure and rotate the changeover adjustment screw counterclockwise. One turn increases the changeover point by about 3 psi (20 kPa). Turn on the supply pressure and recheck to verify the new changeover point.

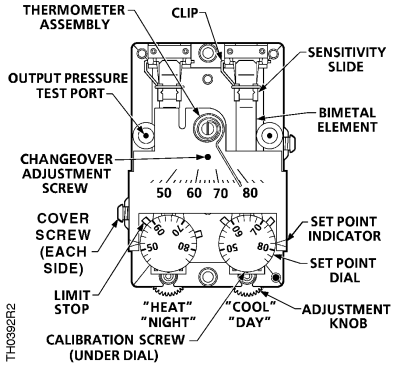

Figure 16. TH192 HC Thermostat Details.

TH192 HC Heating/ Cooling Room Thermostat

Sensitivity Adjustment

The factory thermostat sensitivity setting is approximately 2.5 psi/°F (31 kPa/°C). To change the sensitivity, use a flat-blade screwdriver to carefully move the sensitivity slide (see Figure 16) to the desired position as follows:

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

Graduation closest to the minimum (MIN) end of the bi-metal element
1 psi/°F (12 kPa/°C)

CAUTION:

Thermostats must be recalibrated whenever sensitivity is changed.

Limit Stop Adjustment

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

To change the limit stop settings:

1. If not already done, remove the thermostat cover using the Cover screw and calibration wrench.
2. Use a needle nose pliers to pull the limit stop tab (see Figure 16).
3. Rotate the limit stop to its new position.
4. Reposition between the setpoint cam gear teeth. Do not pull the limit stop any more than necessary to clear the gear teeth.
5. Repeat with second limit stop tab.

NOTE: Changing the limit stop position one gear tooth changes the limit stop setting by 1-1/3°F (0.7°C).

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). No adjustments are required if these settings are appropriate.

If the thermostat has been tampered with, the sensitivity changed, or it is out of adjustment, use the following steps to recalibrate the instrument.

The output pressure test port (see Figure 16) is accessible without removing the thermostat cover through the eighth opening:

NOTE: For TH192 HC thermostats, the test port is on the *left* side.

CAUTION:

If you use the wrong test port, thermostat damage can occur and result in replacement of the device.

TH192 HC Heating/ Cooling Room Thermostat, Continued

Cooling Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. If not already done, remove the cover using the Cover screw and calibration wrench.
3. Verify that the supply pressure is 18 psi (124 kPa). Set the cooling dial to the room temperature by turning the exposed adjustment knob. Allow the thermostat to stand for about five minutes to adjust to the new setting.
4. Moisten the needle and insert the test gauge and needle adapter in the output pressure test port (see Figure 16). Read the control pressure.
5. If the control pressure gauge does not read 7 psi to 8 psi (48.2 kPa to 55.1 kPa), turn the calibration screw with the Cover screw and calibration wrench or 1/8-inch wrench until it does.
   - If less than 7 psi to 8 psi (48.2 kPa to 55.1 kPa), turn the calibration screw clockwise.
   - If greater than 7 psi to 8 psi (48.2 k Pa to 55.1 kPa), turn the calibration screw counterclockwise.
6. Remove the Cover screw and calibration wrench and let the pressure stabilize.
7. Verify that the pressure is between 7 psi to 8 psi (48.2 kPa to 55.1 kPa).

The cooling calibration is complete. Proceed to *Heating Calibration*.

Heating Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Verify that the supply pressure is 25 psi (172 kPa). Set the heating dial to the room temperature by turning the exposed adjustment knob. Allow the thermostat to stand for about five minutes to adjust to the new setting.
3. Moisten the needle and insert the test gauge and needle adapter in the output pressure test port (see Figure 16). Read the control pressure.
4. If the control pressure gauge does not read 7 psi to 8 psi (48.2 to 55.1 kPa), turn the calibration screw with the Cover screw and calibration wrench or 1/8-inch wrench until it does.
   - If less than 7 psi to 8 psi, turn the calibration screw clockwise.
   - If greater than 7 psi to 8 psi, turn the calibration screw counterclockwise.
5. Remove the Cover screw and calibration wrench and let the pressure stabilize.
6. Verify that the pressure is between 7 psi to 8 psi (48.2 kPa to 55.1 kPa).
7. Replace the thermostat cover and tighten the two screws.

The heating calibration is now complete, and the setpoint can be changed to the desired room temperature.

Troubleshooting

Before troubleshooting the thermostat per Table 2, make certain there is clean dry supply air at 18 psi (cooling) or 25 psi (heating) (124 kPa to 172 kPa).

Use the Dual Scale Pressure Gauge and Pressure Tap Needle to measure the control pressure at the output test port (see Figure 16). The output pressure test port is accessible without removing the thermostat cover through the eighth opening from the top as follows:

NOTE: For TH192 HC thermostats, the test port is on the *left* side.

CAUTION:
If you use the wrong test port, thermostat damage can occur and result in replacement of the device.

TH192 DN Day/Night and DNV Room Thermostat

Required Tools

- Small, flat-blade screwdriver (not included)
- Needle nose pliers
- Cover Screw and Calibration Wrench
- Dial Thermometer
- Dual Scale Pressure Gauge and Pressure Tap Needle, assembled

Thermometer Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove cover using the Cover screw and calibration wrench.
3. Place a screwdriver in the center of the thermometer assembly (see Figure 17). Carefully rotate the thermometer assembly until the pointer tip indicates the correct room temperature.

NOTE: Do not breathe on or touch the bi-metal element, to avoid influencing the temperature reading.

Changeover Point Adjustment

The changeover point is factory set to occur between 19 psi and 22 psi (131 kPa and 152 kPa). The changeover point can be field adjustable to occur between 14 psi and 22 psi (96 kPa and 152 kPa).

1. Connect a pressure gauge or a manometer to measure the supply pressure to the thermostat. Use 30 psi (207 kPa) supply through a positioning switch so pressure can be fully variable.
2. Determine the current changeover point. Turn the cooling dial so that the cooling and heating control pressures are different. Then note the changeover point on the control gauge as the supply pressure changes.
3. Place the Cover screw and calibration wrench in the opening of the thermometer assembly (see Figure 17) to adjust the changeover adjustment screw as follows:
   a. If the changeover is too high, turn off the supply pressure and rotate the changeover adjustment screw clockwise. One turn decreases the changeover point by about 3 psi (20 kPa). Turn on the supply pressure and recheck to verify the new changeover point.
   b. If the changeover is too low, turn off the supply pressure and rotate the changeover adjustment screw counterclockwise. One turn increases the changeover point by about 3 psi (20 kPa). Turn on the supply pressure and recheck to verify the new changeover point.

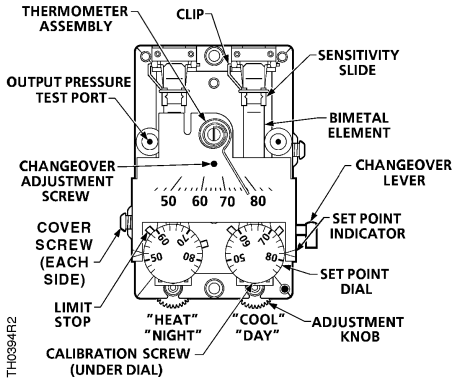

Figure 17. TH192 DN and TH192 DNV Thermostat Details.

TH192 DN Day/Night and DNV Room Thermostat, Continued

Sensitivity Adjustment

The factory thermostat sensitivity setting is approximately 2.5 psi/°F (31 kPa/°C). To change the sensitivity, use a flat-blade screwdriver to carefully move the sensitivity slide (see Figure 16) to the desired position as follows:

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

Graduation closest to the minimum (MIN) end of the bi-metal element
1 psi/°F (12 kPa/°C)

CAUTION:

Thermostats must be recalibrated whenever sensitivity is changed.

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 set point cam gear and the adjustment knob gear.

To change the limit stop settings:

1. If not already done, remove the thermostat cover using the Cover Screw and Calibration Wrench.
2. Use a needle nose pliers to pull the limit stop tab (see Figure 17).
3. Rotate the limit stop to its new position.
4. Reposition between the setpoint cam gear teeth. Do not pull the limit stop any more than necessary to clear the gear teeth.
5. Repeat with second limit stop tab.

NOTE: Changing the limit stop position one gear tooth changes the limit stop setting by 1-1/3°F (0.7°C).

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). No adjustments are required if these settings are appropriate.

If the thermostat has been tampered with, the sensitivity changed, or it is out of adjustment, use the following steps to recalibrate the instrument.

The output pressure test port (see Figure 17) is accessible without removing the thermostat cover through the eighth opening:

NOTE: For TH192 DN and DNV thermostats, the test port is on the *left* side.

CAUTION:

If you use the wrong test port, thermostat damage can occur and result in replacement of the device.

TH192 DN Day/Night and DNV Room Thermostat, Continued

Day Setting Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove the cover using the Cover screw and calibration wrench.
3. Verify that the supply pressure is 18 psi to 25 psi (124 kPa to 72 kPa). Set the day (right) dial to the room temperature by turning the exposed adjustment knob. Allow the thermostat to stand for about five minutes to adjust to the new setting.
4. Moisten the needle and insert the test gauge and needle adapter in the output pressure test port (see Figure 17). Read the control pressure.
5. If the control pressure does not read 7 psi to 8 psi (48 kPa to 55 kPa), turn the calibration screw (see
6. Figure 16) using the Cover screw and calibration wrench or a 1/8-inch wrench as follows:
   - If less than 7 psi to 8 psi (48 kPa to 55 kPa), turn the calibration screw clockwise.
   - If greater 7 psi to 8 psi (48 kPa to 55 kPa), turn the calibration screw counterclockwise.
7. Remove the wrench and let the pressure stabilize.
8. Verify that the pressure is between 7 psi to 8 psi (48 kPa to 55 kPa).

The Day calibration is now complete. Proceed to *Night Calibration.*

Night Setting Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Verify that the supply pressure is 18 psi to 25 psi (124 kPa to 172 kPa). Set the night (left) dial to the room temperature by turning the exposed adjustment knob. Allow the thermostat to stand for about five minutes to adjust to the new setting.
3. Repeat *Day Setting Cooling Calibration* steps 4 through 8.
4. Replace the thermostat cover and tighten the two screws.

The Night calibration is now complete, and the setpoint can be changed to the desired room temperature.

Troubleshooting

Before troubleshooting the thermostat per Table 2, make certain there is clean dry supply air at 18 psi (day) or 25 (night) psi (124 or 172 kPa).

Use the Dual Scale Pressure Gauge and Pressure Tap Needle to measure the control pressure at the output test port (see Figure 17). The output pressure test port is accessible without removing the thermostat cover through the eighth opening from the top as follows:

NOTE: For TH192 DN and DNV thermostats, the test port is on the *left* side.

CAUTION:
If you use the wrong test port, thermostat damage can occur and result in replacement of the device.

Free Energy Band™ TH193 HC Heating/Cooling Room Thermostat

Required Tools

- Small, flat-blade screwdriver (not included)
- Needle nose pliers
- Cover Screw and Calibration Wrench
- Dial Thermometer
- Dual Scale Pressure Gauge and Pressure Tap Needle, assembled

Thermometer Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove the thermostat cover using the Cover screw and calibration wrench.
3. Place a screwdriver in the center of the thermometer assembly (see Figure 18). Carefully rotate the thermometer assembly until the pointer tip indicates the correct room temperature.

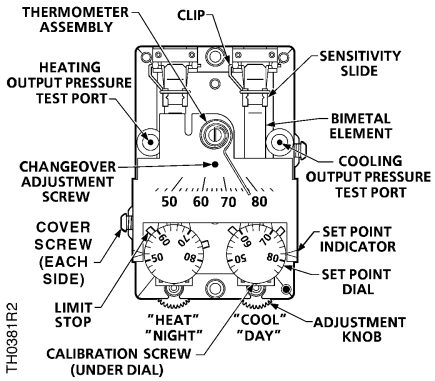

Figure 18. Free Energy Band TH193 HC Thermostat Details.

NOTE: Do not breathe on or touch the bi-metal element, to avoid influencing the temperature reading.

Sensitivity Adjustment

The factory thermostat sensitivity setting is approximately 2.5 psi/°F (31 kPa/°C). To change the sensitivity, use a flat-blade screwdriver to carefully move the sensitivity slide (see Figure 18) to the desired position as follows:

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

Graduation closest to the minimum (MIN) end of the bi-metal element
1 psi/°F (12 kPa/°C)

CAUTION:

Thermostats must be recalibrated whenever sensitivity is changed.

Free Energy Band™ TH193 HC Heating/Cooling Room Thermostat, Continued

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 set point cam gear and the adjustment knob gear.

To change the limit stop settings:

1. If not already done, remove the thermostat cover using the Cover screw and calibration wrench.
2. Use a needle nose pliers to pull the limit stop tab (see Figure 18).
3. Rotate the limit stop to its new position.
4. Reposition between the setpoint cam gear teeth. Do not pull the limit stop any more than necessary to clear the gear teeth.
5. Repeat with second limit stop tab.

NOTE: Changing the limit stop position one gear tooth changes the limit stop setting by 1-1/3°F (0.7°C).

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). No adjustments are required if these settings are appropriate.

If the thermostat has been tampered with, the sensitivity changed, or it is out of adjustment, recalibrate the instrument.

The output pressure test port (see Figure 18) is accessible without removing the thermostat cover through the eighth opening:

NOTE: For one-pipe thermostats, the test port is on the *right* side.

For two-pipe thermostats, the test port is on the *left* side.

CAUTION:

If you use the wrong test port, thermostat damage can occur and result in replacement of the device.

Before calibrating the thermostat, determine what dead band output pressure is desired by using the midpoint between the heating and cooling valve spring ranges. For example, if the heating valve spring range is 2 to 6 psi (15 to 40 kPa) and the cooling valve spring range is 10 to 14 psi (70 to 95 kPa), the midpoint is 8 psi (55 kPa). The determined output pressure is the control pressure required for the calibration of the heating and cooling elements.

To calibrate the TH193 HC Hesitation Thermostat, perform the following tasks in the order shown:

1. Calibrate the cooling element per *Cooling Calibration*.
2. Calibrate the heating element per *Heating Calibration*.
3. Adjust the dead band output pressure per *Dead Band Output Pressure Adjustment*.

Free Energy Band™ TH193 HC Heating/Cooling Room Thermostat, Continued

Cooling Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove the cover using the Cover screw and calibration wrench.
3. Verify that the supply pressure is 18 psi to 25 psi (124 kPa to 172 kPa). Set the cooling dial (right) to the room temperature by turning the exposed adjustment knob. Allow the thermostat to stand for about five minutes to adjust to the new setting.
4. Moisten the needle and insert the test gauge and needle adapter in the cooling test port (see Figure 18). Read the control pressure.
5. If the control pressure does not read 7 psi to 8 psi (48 kPa to 55 kPa), turn the calibration screw (see Figure 18) using the Cover screw and calibration wrench or a 1/8-inch wrench as follows:
   - If less than 7 psi to 8 psi (48 kPa to 55 kPa), turn the calibration screw clockwise.
   - If greater than 7 psi to 8 psi (48 kPa to 55 kPa), turn the calibration screw counterclockwise.
6. Remove the wrench and let the pressure stabilize.
7. Verify that the pressure is between 7 psi to 8 psi (48 kPa to 55 kPa).

The cooling calibration is now complete. Proceed to *Heating Calibration*.

Heating Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Verify that the supply pressure is 18 psi to 25 psi (124 kPa to 172 kPa). Set the heating dial (left) to the room temperature by turning the exposed adjustment knob. Allow the thermostat to stand for about five minutes to adjust to the new setting.
3. Repeat *Cooling Calibration* steps 4 through 7.

The heating calibration is now complete. Proceed to *Dead Band Output Pressure Adjustment.*

Dead Band Output Pressure Adjustment

1. Set the heating dial (left) to the minimum temperature and the cooling dial (right) to the maximum temperature.
2. Adjust the relief valve using a screwdriver until the control pressure is at the dead band output pressure (see Figure 18):
   - Adjust counterclockwise to increase pressure.
   - Adjust clockwise to decrease pressure.
3. Set the heating and cooling dials to the desired set points. The dead band is between these two set points.
4. Replace the thermostat cover and tighten the two screws.

The thermostat is now in calibration, and the setpoint can be changed to the desired room temperature.

Free Energy Band™ TH193 HC Heating/Cooling Room Thermostat, Continued

Troubleshooting

Before troubleshooting the thermostat per Table 2, make certain there is clean dry supply air at 18 psi (cooling) or 25 psi (heating) (124 or 172 kPa).

Use the Dual Scale Pressure Gauge and Pressure Tap Needle to measure the control pressure at the output test port (see Figure 18). The output pressure test port is accessible without removing the thermostat cover through the eighth opening from the top as follows:

NOTE: For one-pipe thermostats, the test port is on the *right* side.

For two-pipe thermostats, the test port is on the *left* side.

CAUTION:
If you use the wrong test port, thermostat damage can occur and result in replacement of the device.

Free Energy Band™ TH193 HC Hesitation Room Thermostat,

Required Tools

- Small, flat-blade screwdriver (not included)
- Needle nose pliers
- Cover Screw and Calibration Wrench
- Dial Thermometer
- Dual Scale Pressure Gauge and Pressure Tap Needle, assembled

Thermometer Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Remove the thermostat cover using the Cover screw and calibration wrench.
3. Place a screwdriver in the center of the thermometer assembly (see Figure 19). Carefully rotate the thermometer assembly until the pointer tip indicates the correct room temperature.

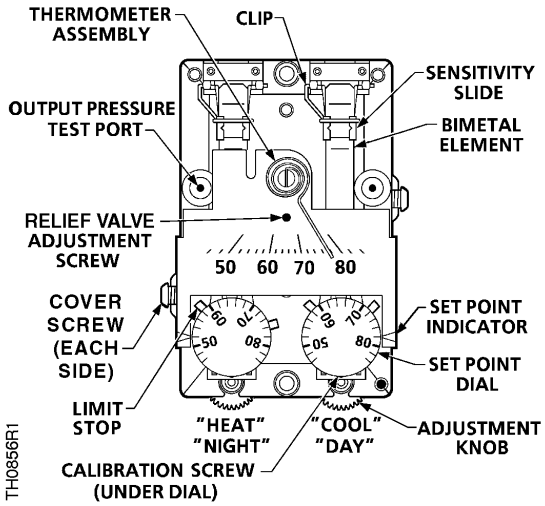

Figure 19. Free Energy Band TH193 HC Hesitation Thermostat Details.

NOTE: Do not breathe on or touch the bi-metal element, to avoid influencing the temperature reading.

Sensitivity Adjustment

The factory thermostat sensitivity setting is approximately 2.5 psi/°F (31 kPa/°C). To change the sensitivity, use a flat-blade screwdriver to carefully move the sensitivity slide (see Figure 19) to the desired position as follows:

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

Graduation closest to the minimum (MIN) end of the bi-metal element
1 psi/°F (12 kPa/°C)

CAUTION:

Thermostats must be recalibrated whenever sensitivity is changed.

Free Energy Band™ TH193 HC Hesitation Room Thermostat, Continued

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 set point cam gear and the adjustment knob gear.

To change the limit stop settings:

1. If not already done, remove the thermostat cover using the Cover screw and calibration wrench.
2. Use a needle nose pliers to pull the limit stop tab (see Figure 19).
3. Rotate the limit stop to its new position.
4. Reposition between the setpoint cam gear teeth. Do not pull the limit stop any more than necessary to clear the gear teeth.
5. Repeat with second limit stop tab.

NOTE: Changing the limit stop position one gear tooth changes the limit stop setting by 1-1/3°F (0.7°C).

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). No adjustments are required if these settings are appropriate.

If the thermostat has been tampered with, the sensitivity changed, or it is out of adjustment, use the following steps to recalibrate the instrument.

The output pressure test port (see Figure 19) is accessible without removing the thermostat cover through the eighth opening:

NOTE: For Free Energy Band TH193 HC Hesitation Thermostats, the port is on the *left* side.

CAUTION:

If you use the wrong test port, thermostat damage can occur and result in replacement of the device.

Before calibrating the thermostat, determine what dead band output pressure is desired by using the midpoint between the heating and cooling valve spring ranges. For example, if the heating valve spring range is 2 psi to 6 psi (15 kPa to 40 kPa) and the cooling valve spring range is 10 psi to 14 psi (70 kPa to 95 kPa), the midpoint is 8 psi (55 kPa). The determined output pressure is the control pressure required for the calibration of the heating and cooling elements.

To calibrate the TH193 HC Hesitation Thermostat, perform the following tasks in the order shown:

1. Calibrate the cooling element per *Cooling Calibration*.
2. Calibrate the heating element per *Heating Calibration*.
3. Adjust the dead band output pressure per *Dead Band Output Pressure Adjustment*.

Cooling Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. If not already done, remove the cover using the Cover screw and calibration wrench.
3. Verify that the supply pressure is 18 psi to 25 psi (124 kPa to 172 kPa). Set the cooling dial (right) to the room temperature by turning the exposed adjustment knob. Allow the thermostat to stand for about five minutes to adjust to the new setting.
4. 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.
5. Moisten the needle and insert the test gauge and needle adapter in the test port (see Figure 19). Read the control pressure.
6. If the control pressure does not read the required dead band output pressure, turn the calibration screw (see Figure 19) using the Cover screw and calibration wrench or a 1/8-inch wrench as follows:
   - If less than the required pressure, turn the calibration screw clockwise.
   - If greater than the required pressure, turn the calibration screw counterclockwise.
7. Remove the wrench and let the pressure stabilize.
8. Verify that the pressure is correct.

The cooling calibration is now complete. Proceed to *Heating Calibration*.

Heating Calibration

1. Verify that the room temperature is between 70°F and 80°F (21°C and 27°C).
2. Verify that the supply pressure is 25 psi (172 kPa). Set the heating dial (left) to the room temperature by turning the exposed adjustment knob. Allow the thermostat to stand for about five minutes to adjust to the new setting.
3. Moisten the needle and insert the test gauge and needle adapter in the output pressure test port (see Figure 19). Read the control pressure.
4. Rotate the adjustment screw counterclockwise to close the relief valve until the pressure is at least 5 psi (35 kPa) higher than the desired dead band output pressure. Allow the thermostat to stand for about five minutes to adjust to the new setting.
5. Set the heating dial to room temperature by turning the exposed adjustment knob. Allow the thermostat to stand for about five minutes to adjust to the new setting.
6. Repeat *Cooling Calibration* steps 6 through 8.

The heating calibration is now complete. Proceed to *Dead Band Output Pressure Adjustment.*

Free Energy Band™ TH193 HC Hesitation Room Thermostat, Continued

Dead Band Output Pressure Adjustment

1. Set the heating dial (left) to the minimum temperature and the cooling dial (right) to the maximum temperature.
2. Adjust the relief valve using the Cover screw and calibration wrench until the control pressure is at the dead band output pressure (see Figure 19):
   - Adjust counterclockwise to increase pressure.
   - Adjust clockwise to decrease pressure
3. Set the heating and cooling dials to the desired setpoints. The dead band is between these two setpoints.
4. Replace the thermostat cover and tighten the two screws.

The thermostat is now in calibration, and the setpoint can be changed to the desired room temperature.

Troubleshooting

Before troubleshooting the thermostat per Table 2, make certain there is clean dry supply air at 18 psi to 25 psi (124 kPa to 172 kPa).

Use the Dual Scale Pressure Gauge and Pressure Tap Needle to measure the control pressure at the output test port (see Figure 19). The output pressure test port is accessible without removing the thermostat cover through the eighth opening from the top.

NOTE: For Free Energy Band TH193 HC Hesitation Thermostats, the test port is on the *left* side.

CAUTION:
If you use the wrong test port, thermostat damage can occur and result in replacement of the device.