DQ15D

Digital Temperature Control

Installation, Operation and Calibration Manual

7010 Lindsay Dr., Mentor, OH 44060 • Phone: 440-974-1300
U.S./Canada: 800-621-1998 • FAX: 440-974-9561
P.O. Box 660, Mentor, OH 44061

www.process-technology.com

Agency Approvals

UL/CUL/CE

Important Note: The DQ15D is designed for indoor installations ONLY.

Electrical Noise / Interference

Process Technology electronic controls are engineered, tested and manufactured to conform to Europe's CE levels of electrical noise and interference found in typical industrial installations.

It is always possible for electrical noise and interference to exceed the level of designed-in protection. This can happen, for example, if arc or spot-welding equipment is close to the control or if they share a common power line. It can occur if flame ignition systems or electrostatic precipitators are in the vicinity of the control.

A more common source of interference occurs when the control is switching inductive loads such as contactor coils, solenoids or motors. The collapse of the magnetic field when loads such as these are switched off can create an electrical "spike" that can cause a malfunction of the microprocessor used in the control.

Even if the control doing the switching is unaffected, a nearby control may be affected. To eliminate or minimize this problem, transient suppressors or "snubbers" can be employed across the inductive load.

Contents

DQ15D Specifications

Standard Input	2 wire- 1000 ohm RTD TCR (alpha), 0.00385 ohm/ohm/°C
	RTD Self Heating Coefficient: 5° C/w in 0.2 m/s water; 200° C/w in 1 m/s air measurement current, 0.1 to 0.2 mA
Input Range	-40 to 1000°F (-40 to 538°C) °F or °C field selectable
Set Point Range	Selectable throughout the input range
Sensor Break or Short Protection	De-energize control output (No sensor short protection with Thermocouple sensor)
Accuracy	± 0.25% span, ± 1 digit
Enclosure	NEMA 12IP55 Face suitable for panel mounting (#20 ga. through 1/4 thick panels)
Display	4 digit, (1/2" nominal), LED display screen
Control Function	ON/OFF Electromechanical Relays
Control Outputs	**SP1 Set Point** (reverse acting) SPDT 20A resistive@240 VAC max 1HP@240 VAC max, 1/2 HP@120VAC
	SP2 Set Point 1/10 HP@240 VAC max, 1/20 HP @ 120 VAC (direct acting) SPDT 2A resistive @240 VAC max
ON/OFF Differential	Field adjustable 1° (F or C) to 99°
Memory	Nonvolatile
Supply Voltage	85 to 240 VDC or VAC, 50 through 400 Hz, 4VA.
Operating Temperature	-20 to 140°F (-33 to 60°C) in a sealed NEMA 12 style case
Input Options	RTD 2 & 3-wire 100 ohm 0.00385 ohm/ohm/ºC or 0.00392 ohm/ohm/ºC
	Thermocouples - (types J, K, T, R) NIST Monograph 175, revision ITS-90
	Current 4-20mA DC
	Voltage (1-10 VDC)
	Frequency (0-200 Hz, counts/second), +/- 6 VDC p to p (up to 30VDC peak with Sw2 ON)
Output Option	4-20 mA DC proportional to the process (display) value. Maximum impedance 450 ohms.

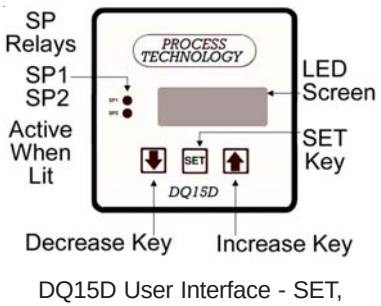
General Description

The DQ15D digital temperature control is a programmable and microprocessor-based controller designed to operate two relays for temperature control.

Features

The temperature sensor (RTD or thermocouple) sends a signal to the DQ15D to compare to a value preset by the user as a Set Point (SP). Set Points LEDs are **SP1** and **SP2** on the front panel.

- In heating mode if the sensor signal is lower than the SP1 Set Point value, DQ15D energizes the SP1 relay and its isolated contacts close.
- In cooling mode if the sensor signal is higher than the SP2 Set Point value, DQ15D energizes SP2 relay and its isolated contacts close.
- DQ15D has an optional Alarm Condition feature. After you activate this feature, when the sensor signal exceeds the Alarm Set Point, DQ15D goes into an alarm condition. In an Alarm Condition, both relays de-energize and the screen displays a flashing AAA.
- The power save, night setback feature permits the use of a second heating Set Point to conserve energy when required.



DQ15D User Interface - SET, Decrease ⇩ and Increase ⇧ Keys

Installation

DQ15D is for indoor use only.

1 Unpack and inspect DQ15D for damage upon receipt. Shipping damage claims must be made through the freight carrier.

2 Remove rear cover and inspect DQ15D for internal damage.

3 Remove the Retaining Collar. Insert a flathead screwdriver under the collar on alternating sides while sliding the collar back.

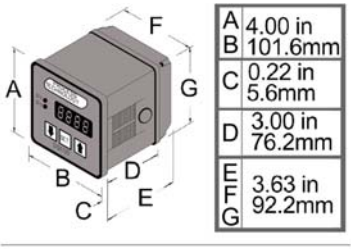
4 Cut a 1/4DIN finished opening: 3.625" x 3.625" (92 mm x 92 mm) in the desired mounting panel location.

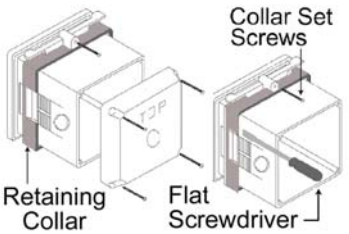
5 Select one or more knock-outs from the three (3) knockouts on the rear cover or enclosure side panels that offers the most convenient routing for external wiring.

Caution

Avoid damaging DQ15D components. Remove rear cover before removing knockouts with a hammer/punch.

(Installation continued on page 6)





DQ15D Dimensions and Installation

6 Remove the knockouts before reattaching the rear cover or inserting the control in the panel.

7 Insert DQ15D through the prepared opening and slide the retaining collar over the case from the rear of the panel.

8 Hand tighten the collar, securely tighten the two (2) collar screws.

9 Install a suitable liquid-tight conduit fitting through the knock-out opening following manufacturer instructions and install field wiring.

10 Using the Power, Heating and Cooling Relay Wiring illustration in this chapter, install the required input and output wires. Use National Electric Code and local codes for determining wire sizing, insulation, terminations, etc.

Warning

Overtemperature protection is required in any system where a fault condition resulting in high temperature could produce a fire or hazardous condition. Operation without thorough safety precautions can result in equipment failure, property damage and personal injury.

Wiring

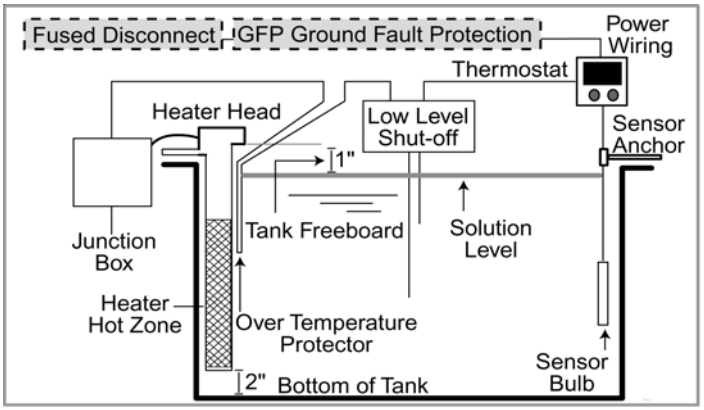
This section provides wiring notes for Power Heating/Cooling relays and Over Temperature Protection.

Over Temperature Protection

Component failure in a temperature controlled process can result in damage to the product, heater over temperature, and the possibility of a fire. To safeguard against these hazards, install over temperature protection to interrupt the heater power supply in case of low solution level.

Process Technology heaters include a thermal fuse standard (Protector I, II, or III) on the heater to monitor heater surface temperature. These devices are designed to cut the power to the heater in case of low solution level. In addition to thermal protection, Process Technology strongly recommends the use of liquid level controls to monitor solution level and shut off heaters prior to over temperature conditions.

Ensure you read and adhere to all Over Temperature Protector Installation instructions and warnings.



Typical Heater Installation only. Follow your system-specific installation instructions.

Power, Heating/Cooling

Relay Equipment Needed

- #2 Phillips head screwdriver.
- 1/8 (x-small) straight blade screwdriver.
- Power supply wire, 18 awg min
- Relay connection wires

Procedure

1 DQ15D is intended for a single power source. Refer to the Power, Heating and Cooling Relay Wiring illustration when wiring DQ15D.

2 Locate and identify terminal locations for the power supply voltage, Set Point relay, and sensor.

3 Connect wires to the designated terminals and tighten retaining screw to secure the wire into place.

See state and local electrical requirements for proper 65°C wire gauge.

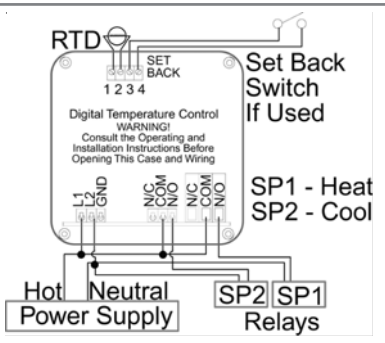
See the Specifications chart in the beginning of this manual for Voltage, Current, Frequency and other DQ15D Specifications.

Extending Wiring

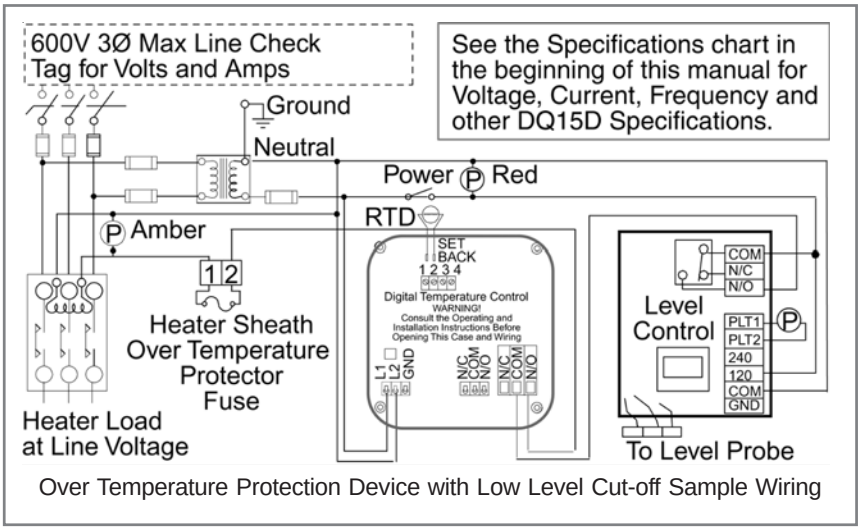
Except when wiring thermocouples, you can extend the factory supplied 1000 ohm RTD sensor with standard 22awg or larger electrical hookup wire. The effect of an additional 22 awg sensor wire length on the value is approximately 1°F for every 65 ft.

Warning

When dealing with THERMO-COUPLES, you MUST use specific thermocouple wire when extending the sensor wire length. Use of incorrect extension wire can cause hazardous operating conditions.



Power, Heating /Cooling Relay Wiring



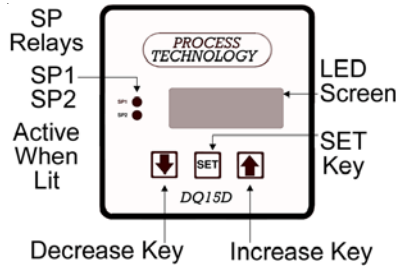
Over Temperature Protection Device with Low Level Cut-off Sample Wiring

Relay Control Set Points

Before operation, you must program Set Points or temperature limits. When DQ15D reaches the Set Point it will energize one or both relays.

- SP1 Heat Set Point for normal Heating Mode operation. Controls SP1 relay.
- SP2 Cool Set Point for normal Cooling Mode operation. Controls SP2 relay.
- P Power Save Set Point for a second heating Set Point lower than SP1 Heat Set Point. Optional; you must enable Power Save feature. Controls SP1 relay.
- A Alarm Set Point to establish an Alarm Condition if temperature reaches the Alarm Set Point (higher than SP1 Set Point). The screen displays a flashing AAA in an Alarm Condition. Optional; you must enable Alarm feature. Controls SP1 and SP2 relays.

Note: The units displayed, °C, °F, Hz, volts, mA or ohms are established during the setup of the control. Values for Set Points can range from -40 to +999 (DQ15D numeric range).



DQ15D User Interface - SET, Decrease ⇩ and Increase ⇧ Keys

View/Change Set Points

The screen normally displays the actual process temperature.

SP1 - Heat Set Point

1 To view the SP1 SET POINT value, press ⇩ once and release. For seven seconds, the letter H and a decimal point followed by the numeric SP1 value display. (After seven seconds the display returns to normal.)
2 To alter the Set Point value, press **SET** while the Set Point value displays (value will flash).
3 Once the value flashes, use ⇧ or ⇩ to change the value.
4 Within 5 seconds after changing the value, press **SET** again to lock the new value into memory.

Note - If you don't press **SET** within 5 seconds of changing the value, the new value will be lost and the Set Point value will revert to its previous setting.

SP2 - Cool Set Point

1 To view the SP2 SET POINT value, press ⇩ twice and release. For seven seconds, the letter C and a decimal point followed by the numeric SP2 value display. (After seven seconds the display returns to normal.)
2 To alter the Set Point value, press **SET** while the Set Point value still displays (value will flash).
3 Once the value flashes, use ⇧ or ⇩ to change the value.
4 Within 5 seconds after changing the value, press **SET** once more to lock the new value into memory.

P-Power Save Set Point

1 To turn on the Power-Save feature, do one of the following tasks, **never do both:**

- either press all three keys (⇧, **SET**, and ⇩) simultaneously, or
- install an external switch to close contacts #3 and #4 on the rear terminal strip.

When the control is operating in Power-Save mode, the display will alternately change between the process value and three dashes ---.

2 Return to normal SP1 operation with one of the following tasks:

- either press all three keys (⇧, **SET**, and ⇩) simultaneously, or
- switch OFF the remote switch wired to terminals #3 and #4.

3 To view the P SET POINT value, press ⇧ once and release. The control will display the letter P and a decimal point followed by the numeric P SET POINT value.

4 To change the Set Point value, press **SET** while the P SET POINT value displays (value will flash).

5 Once the value flashes, press ⇧ or ⇩ to change the value.

6 Press **SET** once to lock the new value into memory.

Alarm Set Point

1 Enable the Alarm feature. See **Configuration (Setup)**, F3 Alarm On/Off Switch for instructions.

2 Press ⇧ twice and release. The letter A, followed by a decimal point and the Alarm Set Point value displays. (After a few seconds the screen returns to normal.)

3 To change the ALARM SET POINT, press **SET** while the alarm Set Point value still displays (value will flash).

4 When it flashes, use ⇧ or ⇩ to change the value, and press **SET** to lock the new value into memory.

Note: Alarm Set Point is not a safety device.

Calibration

This section includes calibration procedures for 2 & 3 wire RTDs, Resistance, Voltage, Current Input, Frequency, and Thermocouples.

Warning!

Calibration procedures require the removal of the rear cover of the control. It also requires that power is ON, exposing the technician to potentially lethal voltages. Always Exercise EXTREME CARE and wear tested electrician's gloves when power is on.

2 Wire RTD

RTD devices are precision resistors whose resistance value varies with temperature. DQ15D measures RTD resistance and compares that value with a standard set of values stored in memory. You can restore, update or verify that this standard set of values is correct.

Equipment needed

- Two precision resistors (tolerance +/- 0.1% or better) with a fixed value equal to the RTD nominal value (i.e. 1000 ohms).
- A suitable jumper cable to facilitate changing input resistance.

Before Beginning RTD Calibration

Calibration

Calibration Procedure

1 Turn OFF all power.
2 Remove rear cover.
3 Ensure the 2 wire, 1000 ohm RTD sensor is connected across terminals #1 AND #2 of the terminal block before beginning.
4 Remove RTD sensor.
5 Install the precision resistors in place of the RTD, as shown.

RTD Calibration - Precision Resistors in Place of the RTD Sensor

6 Install the jumper cable between the loose end of one resistor and the fixed end of the other resistor to establish an input value of a single resistor (i.e. 1000 ohms), as shown.

RTD Calibration - Jumper Cable in Place for First Resistor

7 Carefully restore power to the control, taking precautions not to make contact with any exposed voltage sources.
8 Press and hold ⇧ and ⇩ simultaneously for approximately 6 seconds. The display will indicate AC.0. While the 0 is flashing, use ⇧ to change this to 22. Press **SET.** The control screen displays CAL1.
9 Press and hold **SET** for 1 second. HoLd displays on the screen.
Wait for CAL2 to display.
10 Proceed with caution to avoid SHOCK hazard. Remove and relocate one end of the jumper cable to the loose end of the second precision resistor for the second resistance value (i.e. 2000 ohms), as shown.

RTD Calibration - Jumper Cable in Place for Second Resistor

11 Press and hold **SET** for 1 second. The screen displays HoLd. WAIT for the display to reset. After resetting, the connected precision resistors' approximate temperature value should display (i.e. 511° F or 266° C).
12 Turn OFF power and remove the precision resistors. Reinstall the RTD sensor and the rear cover of the controller. Return the calibrated control to service.

3 Wire RTD

Optional PCN 5447 or 5416 board needed. This board will accept 2 wire RTDs as well. RTD devices are precision resistors whose resistance value varies with temperature. The connection of a third wire eliminates the natural resistance of the lead wires to improve sensor accuracy. The DQ15D control measures the RTD resistance (and the third wire resistance) and compares that measurement with a standard set of values stored in the memory. You can restore, update or verify that the standard set of values is correct.

Note: For a 1000 ohm sensor, the DIP switches should be OFF, OFF, OFF. For 100 ohm, ensure the DIP switches are ON, OFF, OFF. See Dip Switch Settings in **Configuration (Setup).**

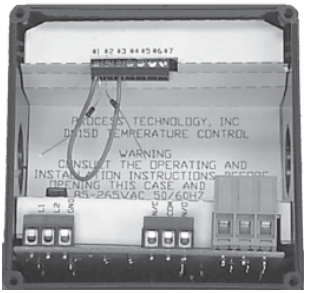
Equipment needed

- Two precision resistors (tolerance +/- 0.1% or better) with a fixed value equal to the RTD nominal value (i.e. 1000 or 100 ohms).
- A suitable jumper cable to facilitate changing input resistance.
- A short piece of jumper wire (simulates third wire).

Warning!
Calibration procedures require the removal of the rear cover of the control. It also requires that power is ON, exposing the technician to potentially lethal voltages. Always Exercise EXTREME CARE and wear tested electrician's gloves when power is on.

Calibration Procedure

1 Turn OFF all power.
2 Remove rear cover.
3 Remove RTD sensor.
4 Install the short piece of jumper wire from terminal #1 to #3.
5 Install the precision resistors in place of the RTD sensor, as shown in terminals #2 and #3.



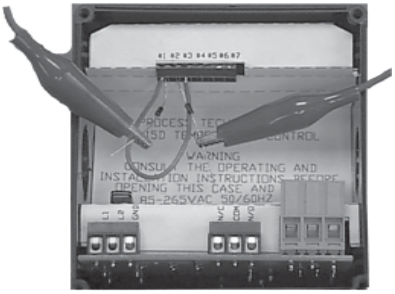
Precision Resistors in Place

6 Install the jumper cable between the loose end of one of the resistors and the fixed end of the other resistor to establish an input value of a single resistor (i.e. 1000 ohms or 100 ohms), as shown.

Establishing Resistor Input Value

7 Carefully restore power to the controller. Do not come in contact with any exposed voltage.
8 Press ⇧ and ⇩ simultaneously and hold for approximately 6 sec. The screen displays AC.0. While the 0 is flashing, use ⇧ to change this to 22. Press **SET.** CAL1displays.
9 Press and hold **SET** for one sec. The screen displays Hold. Wait for the message to change to CAL2.

10 Proceed with CAUTION to avoid SHOCK hazard. Remove and relocate one end of the jumper cable to the loose end of the second precision resistor for the second resistance value (i.e. 2000 ohms or 200 ohms), as shown.



Establishing Second Resistor Value

11 Press and hold **SET** for one second. The screen displays **Hold.** Wait for the display to reset. After it resets, the approximate temperature value for the connected precision resistors should display (i.e. 511° F or 266° C).

12 Turn OFF power to the controller and remove the precision resistors. Retain for future use. Reinstall the RTD sensor and rear cover of controller. Return the calibrated control to service.

Resistance Signal

This section describes how to configure and calibrate DQ15D to measure pure resistance.

Equipment needed

Refer to the calibration procedure for the 2 wire RTD sensor for equipment needed.

Calibration Procedure

1 From the setting configuration mode, set the U1 sensor type parameter to 12. See **Configuration (Setup)**.

2 Follow the Calibration Procedure for a 2 wire RTD sensor. DQ15D will then measure pure resistance from 0-1000 ohms.

Voltage Signal

The DQ15D control measures DC voltage and compares that measurement with a standard set of values in the control memory.

Warning!

Calibration procedures require the removal of the rear cover of the control. It also requires that power is ON, exposing the technician to potentially lethal voltages. Always Exercise EXTREME CARE and wear tested electrician's gloves when power is on.

Verify Standard Values

To restore, update or merely verify that this standard set of values is correct, do the following:

- Make sure that the DIP switch settings are OFF, ON, OFF. See Dip Switch Settings in **Configuration (Setup)**.
- The voltage signal must be connected across terminals #1 and #2 of the Adder Board (PCN 5416 or 5447). Terminal #2 is common (negative), and terminal #1 is the signal connection (positive).
- Always observe polarity.

Verify Standard Set of Values for Voltage Signal

Calibration Procedure

1 Turn OFF all power.
2 Remove rear cover.
3 Remove voltage input wiring.
4 Install a voltage calibrator or power supply to terminals 1 and 2.

Voltage Calibration

5 CAREFULLY restore power to the controller, ensuring that you do not come in contact with any exposed voltage.
6 Press ⇧ and ⇩ simultaneously and hold for approximately 6 seconds. The screen displays AC.0. While the 0 is flashing, use ⇧ to change this to 22. Press **SET.** The control screen displays CAL1.
7 Adjust power supply to 1.0V.
8 Press and hold **SET** for one second. The screen displays Hold. Wait for display to change to CAL2.
9 Adjust calibrator to 10.0V.
10 Press and hold **SET** for one second. The screen displays Hold. Wait for display to reset and display 10.0.
11 Turn OFF power to the control and remove the calibrator. Reinstall the voltage input and the rear cover of the control. Return the calibrated control to service.

Current Input

Optional PCN 5447 or 5416 board needed. The DQ15D control measures the DC current and compares that measurement with a standard set of values in the control memory. To restore, update or merely verify that this standard set of values is correct, do the following:

- Check that the DIP switches are set to OFF, OFF, ON. See Dip Switch Settings in **Configuration (Setup)**.
- Terminal 1 is positive, terminal 2 is negative.

Equipment needed

- A precision, NIST traceable, 0-20 mA DC current calibrator OR a precision, NIST traceable, digital ammeter or DMM
- a regulated linear DC power supply with an adjustable 0-10 volt or better output and,
- a 400 ohm, 0.1% or better tolerance, precision resistor.


Warning!

Calibration procedures require the removal of the rear cover of the control. It also requires that power is ON, exposing the technician to potentially lethal voltages. Exercise EXTREME CARE and wear tested electrician's gloves when power is on.

Calibration Procedure

1 Turn OFF all power.
2 Remove rear cover.
3 Remove input leads.
4 Install the 0-20 mA DC calibrator or the power supply, resistor and ammeter in series with terminal #1 and #2.
5 CAREFULLY restore power to the controller, ensuring that you do not come in contact with any exposed voltage.
6 Press ⇧ and ⇩ simultaneously and hold for approximately 6 seconds. The screen displays AC.0. While the 0 is flashing, use ⇧ to change this to 22. Press **SET.** The screen then displays CAL1.
7 Adjust the calibrator or power supply to 5.0 mA.
8 Press and hold **SET** for one second. The screen displays Hold. Wait for it to change to CAL2.
9 Adjust power supply to 20.0 mA.
10 Press and hold **SET** for one second. The screen displays Hold. Wait for display to reset and display 20.0.
11 Turn OFF power to the control and remove the power supply.
12 Reinstall the voltage input and the DQ15D rear cover and return the calibrated DQ15D to service.

Frequency Signal (Pulse Train)

The DQ15D measures frequency and compares it with a standard set of values derived from the microprocessor oscillator.

Equipment needed

Optional PCN 5447 or 5416 board needed.

Calibration Procedure

Since this is a dedicated frequency, no field calibration is possible. Check that the DIP switches are set to OFF, OFF, OFF. See Dip Switch Settings in **Configuration (Setup)**.

Thermocouple

Installation requires configuration for the specific thermocouple used.

- The two wire thermocouple is polarized, therefore it is necessary to connect the negative lead wire of the thermocouple to the #1 terminal and the positive lead wire to the #2 terminal to maintain proper polarity for the PCN 5418 sensor board.
- Connect the negative lead wire to terminal #2 and the positive to terminal #3 for the PCN 5419 Sensor board.

Thermocouple Calibration

Equipment needed

Optional thermocouple sensor board needed (PCN 5418 or 5419). A precise, NIST traceable, thermocouple calibrator with suitable extension leads to match the thermocouple type used.

Warning!

Calibration procedures require the removal of the rear cover of the control. It also requires that power is ON, exposing the technician to potentially lethal voltages. Exercise EXTREME CARE and wear tested electrician's gloves whenever power is on.

Calibration Procedure

1 Turn OFF all power.
2 Remove rear cover.
3 Remove T/C sensor.
4 Install the thermocouple calibrator to terminal #1 and #2 on PCN 5418 board, or terminal #2 and #3 on 5419 sensor board.
5 CAREFULLY restore power to the controller, ensuring you do not come in contact with any exposed voltage.
6 Press ⇧ and ⇩ keys simultaneously and hold for approximately 6 seconds. The display will indicate AC.0. While the 0 is flashing, use ⇧ to change this to 22. Press **SET.** The control screen displays CAL1.
7 Adjust the thermocouple calibrator to 0.0° C (32.0° F).
8 Press and hold **SET** for one second. The screen displays Hold. Wait for display to change to CAL2.
9 Adjust the thermocouple calibrator to 250.0° C (482.0° F).
10 Press and hold **SET** for one second. The screen displays Hold. Wait for the display to reset and display 250.0° C (482.0° F).
11 Turn OFF power to the control and remove the thermocouple calibrator. Reinstall the thermocouple sensor and the rear cover of the control. Return the control to service.

4-20mA Output Option

The DQ15D is available with an optional 4-20 mA output signal proportional to the measured (displayed) temperature. This option is useful for source transmitting the measured temperature to a current loop-sensing device such as a PLC, remote intelligent display or chart recorder. Use Terminals #2 and #3 for 2 wire 1000 ohm RTD.

Factory calibration is verified using an intelligent NIST traceable 4 digit DMM, a NIST traceable sensor calibrator, and an intelligent display. The factory range setting is 0-500° F vs. 4-20 mA. Custom ranges can be accommodated if specified at time of order. Field calibration can use a similar arrangement or a 4-20 mA calibrator for verification.

Since calibration is an involved operation, it is suggested that it be performed only after determining that the measured values differ from factory settings, or if the output range is to be altered. Use Terminals #2 and #3 for 2 wire 1000ohm RTD.

4-20 mA Output Option

Warning!
Calibration procedures require the removal of the rear cover of the control. It also requires that power is ON, exposing the technician to potentially lethal voltages. Exercise EXTREME CARE and wear tested electrician's gloves whenever power is on.

Equipment needed

- PCN 5416 or 5419 board.
- An NIST traceable sensor simulator (calibrator), a precision 20 mA or higher calibrator/tester, or a precision DMM for verification.

Calibration Procedure

1 Turn OFF all power.
2 Remove rear cover.
3 Remove sensor leads.
4 Install appropriate sensor calibrator, i.e. resistors or thermo-couple simulator.
5 Remove ONE lead of the 4-20 mA output wire and install the DMM or tester in series with the external loop and this terminal. OBSERVE POLARITY.
6 Restore power to control.
7 Verify basic instrument sensor input accuracy by simulating various sensor inputs and observing the display values. If out of tolerance, perform appropriate sensor calibration before proceeding.
8 Simultaneously press and hold ⇩ and ⇧ for approximately 6 sec. The screen displays AC.0. While the 0 is flashing, use ⇧ to enter 33. The screen changes to display L followed by the current lower process limit, i.e. 0°, -20°, 0V, etc.
9 Use ⇧ or ⇩ to alter the lower display value. Press **SET** to store the new value. The display will then read hexadecimal 2AAA or 4.0mA, verify that this is the value displayed on your 4-20 mA calibrator/tester or DMM.

10 Press ⇧ or ⇩ to adjust the lower current value. Press **SET** to retain the value. The screen displays U followed by the current upper display value limit,(i.e. 500°, 10 volt)
11 Use ⇧ or ⇩ to alter the upper display value. Press **SET** to retain the value. The display will then read hexadecimal D555 or 20.0 mA.
12 Verify the value by observing the value on your 4-20 mA calibrator/tester or DMM.
13 Adjust the upper current output value by pressing ⇧ or ⇩. Press **SET** to retain the value. The current sensor input value then displays and the 4-20 mA output will reflect your new or confirmed settings.
14 Turn OFF all power.
15 Disconnect calibration equipment.
16 Reconnect 4-20 mA lead and sensor leads.
17 Reinstall rear cover.

Error Conditions

Sensor values that are out of range will generate an error display. The temperature range is as follows:
Celsius: <-40° C or >+538° C
Fahrenheit: <-40° F or >+1000° F

Calibration Error Messages

If calibration or setup information stored in the memory becomes corrupt or erased, DQ15D switches to its default calibration and setup settings. A flashing letter c displays on the left side when DQ15D switches to default settings. The size and position of the letter c will define the exact nature of the problem.

c A small c in the upper left-hand corner indicates the control is relying on default (factory set) calibration values. This happens when the control is new and has not yet been calibrated (setup).

c A small c in the lower left hand corner indicates the control is relying on default configuration values. This is a rare condition, but may occur if the control has been calibrated for use with a two-wire RTD sensor but the configuration parameters have not been changed from their default values. Changing any of the configuration or Set Point variables will turn off this indication.

C A large C on the left side of the display indicates default values are being used for the configuration and the calibration. This can occur in a new control that has never been calibrated or configured, or if the memory has been erased.

RTD Error Messages

If the screen displays one of the following messages, the control relay de-energized due to an RTD condition.

HHH A thermocouple or RTD sensor is improperly connected, or the control read an open circuit.

UUU The RTD sensor shorted.

Note: Thermocouple shorts cause a new junction/measurement point to be created. This will lead to false readings and dangerous operating conditions.

Shorted thermocouples will not result in an error condition. Instead, incorrect readings will be displayed.

Configuration (Set-up)

1 To configure the DQ15D, press ⇧ and ⇩ simultaneously and hold for approximately 6 seconds. The screen displays AC.0.

2 While the 0 is flashing, use ⇧ to change this to 11. Press **SET**. The control will be in the configuration mode. While in this mode, the screen displays the values of various configuration settings. The first setting to display is the U1 setting. See setting summary. By using ⇧ and ⇩ keys, it is possible to scroll through the list of settings to those needing modification.

Adjust Configuration Setting

1 To adjust a setting while in the Configuration Mode, use ⇧ and ⇩ to bring the particular setting into the view on the screen.

2 Press **SET** to change the value of the setting. Once **SET** has been released, the display will flash.

3 Use ⇧ and ⇩ to scroll through the options for the selected setting.

4 After the option has been determined, press **SET** once more to lock the new value into memory.

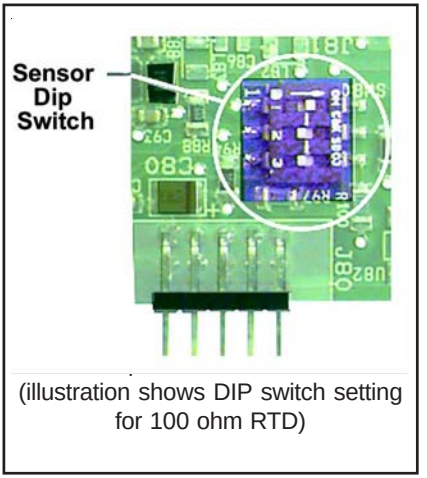
5 After completing all changes to the configuration of the control, the new configuration must be saved. To save the new value, press ⇧ and ⇩ simultaneously. This will cause the control to store the new values internally and then reset the unit.

Sensor DIP Switch

When using the sensor 5416 or 5447 boards, an on-board DIP switch must also be configured.

Sw1	Sw2	Sw3	Type
OFF	OFF	OFF	1000 ohm RTD
ON	OFF	OFF	100 ohm RTD
OFF	ON	OFF	voltage
OFF	OFF	ON	current
OFF	OFF	OFF	frequency

Note: Switching off power to the unit before saving the new configuration will cause all changes to be lost.



(illustration shows DIP switch setting for 100 ohm RTD)

Main Menu Summary

Label	Settings	Description
U1	Sensor Type	Used to select the type of sensor
U2	Signal Offset	Offset -9 to +9 applied to reading
U3*,**	Output Signal Offset	Adjusts 4-20 mA output from -9 to +9
U4	Signal Filter	Filter on input signals
U5	Set Point Dead Band (SP1)	Value from 1 to 99, SP1
U6	Set Point Dead Band (SP2)	Value from 1 to 99, SP2
U7	Power Save Set Point	Value from 1 to 99, power save mode
U8	Display Stabilizer	Stability when used with U4
L	Set Point Limit	High Set Point limit
F1	SP2 and U7 Disable	Modifies control to single Set Point
F2	Heat/Cool Switch	N/A
F3	Alarm Enable	Enable the alarm Set Point
F4	Unit Display Enable	Enable temperature units
F5	Temperature Unit	Select °F or °C
F6*	Current Output Enable	Enable mA current

U1, Sensor Type

This setting tells the DQ15D control what type of sensor it is using.

Value/ Board #	Sensor Type	Sensor Description
1/5414	2-wire RTD	Platinum RTD, TCR 0.00385 ohm/ohm/°C
2/5414	2-wire RTD	Platinum RTD, TCR 0.00392 ohm/ohm/°C
3/5447*	3-wire RTD	Platinum RTD, TCR 0.00385 ohm/ohm/°C
4/5447*	3-wire RTD	Platinum RTD, TCR 0.00392 ohm/ohm/°C
5/5418**	Thermocouple	J-Type Iron-Constantan NIST Monograph 175 REV ITS-90
6/5418**	Thermocouple	K-Type Chromel-Alumel NIST Monograph 175 REV ITS-90
7/5418**	Thermocouple	T-Type Copper-Constantan NIST Monograph 175 REV ITS-90
8/5418**	Thermocouple	R-Type Platinum, 13% Rhodium-Platinum NIST Monograph 175 REV ITS-90
9/5447*	Voltage	Potential signal (1.0 to 10.0 V)
10/5447*	Current	Current signal (4.00 to 20.00 mA)
11/5447*	Frequency	Pulse train frequency (0-200 Hz, counts/sec)
12/5447*	Resistance	Pure resistance signal (0 to 1000 ohms)

The 5447 sensor board will also accept 2 wire RTDs. The default sensor type setting is 1 (1000 ohm 2 wire RTD). When using the 5447 sensor board, an on-board DIP switch must also be configured, see Dip Switch Settings.

*Optional 5416 sensor board permits 4-20 mA signal process value transmission.

U2, Signal Offset

This setting can be any number from -9 to +9. It represents an offset value applied to the signal received from the sensor. Units (°C, °F, ohms) are dictated by sensor type selected in U1 settings.

Temperature Sensor - Number represents degrees C or F as determined by F5 setting

Voltage Sensor - Number represents tenths of a Volt (0.1 VDC)

Current Sensor - Number represents hundredths of milliamps (0.01 mA)

Resistance Signal Devices - Number represents ohms.

Frequency Signal Devices - This setting will have no effect.

U3, Output Signal Offset

U3 adjusts the optional 4-20 mA process value output. It can be any number from -9 to +9 and is added to the signal level to cause the value to be rounded in an intelligent receiving device. This does not affect display value.

This function requires either the optional 5416 or 5419 sensor boards.

The default and minimum for the parameter is one (1).

Temperature Sensor - Number represents degrees C or F, determined by the F5 setting

Voltage Sensor -Number represents tenths of a volt (0.1 VDC)

Current Sensor -Number represents hundredths of milliamps (0.01 mA)

Resistance Signal Device -Number represents ohms

Frequency Signal Device -Setting represents hertz (counts/second)

U4, Signal Filter

This setting can be any number from 1 to 64. It represents the number of samples taken from the sensor and maintained in memory which are then averaged to provide an active filter of the signal. Using a small value for this setting will cause the DQ15D to respond more quickly to sudden changes in the sensor signal level, but will cause the unit to be more susceptible to EMI/RFI noise. As the value increases, the susceptibility to inference reduces.

The default setting value is four (4). When sensing temperature with a 100ohm RTD (2 or 3 wire), set the value to twenty (20) to reduce control error.

When sensing frequency signal, this setting establishes the time period for the controller to wait for a pulse signal. Use two (2) for this value, when measuring frequency. This causes the control to measure frequencies as low as 1 hertz while updating the display once every two seconds.

U5, SP1 Set Point Dead Band

This setting, which may be any number from 1 to +99 represents a dead band that only applies to the SP1 SET POINT. This is the heat Set Point.

The default and minimum for the setting is one (1).

Temperature Sensor - Number represents degrees C or F determined by F5 setting

Voltage Sensor -Number represents tenths of a volt (0.1 VDC)

Current Sensor -Number represents hundredths of milliamps (0.01 mA)

Resistance Signal Devices - Number represents ohms

Frequency Signal Devices -Setting represents hertz (counts/second)

This bandwidth applies to the low side of the SP1 SET POINT. If the U5 setting is set at 5° F and the SP1 SET POINT is set at 115° F, then the Set Point relay is de-energized when the (displayed) temperature reaches 115° F and it is reenergized when the temperature falls to 110° F.

U6, SP2 Set Point Dead Band

This setting, which may be any number from +1 to +99, represents a dead band that only applies to the SP2 SET POINT. This is the cool Set Point.

Temperature Sensor - Number represents degrees Celsius or Fahrenheit determined by F5 setting

Voltage Sensor -Number represents tenths of a volt (0.1 VDC)

Current Sensor -Number represents hundredths of milliamps (0.01 mA)

Resistance Signal Devices -Number represents ohms

Frequency Signal Devices -Setting represents hertz (counts/second)

This bandwidth applies to the high side of the SP2 SET POINT. If the U6 setting is set at 5° F and the SP2 SET POINT is set at 115° F, then the Set Point relay is de-energized when the (displayed) temperature reaches 115° F and will remain de-energized until the temperature increases to 120° F.

Note: The default and minimum for the setting is one (1).

U7, Power-Save Set Point Dead Band

This setting, which may be any number from 1 to +99, represents a dead band that only applies to the Power Save SET POINT.

Temperature Sensor - Number represents degrees Celsius or Fahrenheit as determined by the F5 setting

Voltage Sensor -Number represents tenths of a volt (0.1 VDC)

Current Sensor -Number represents hundredths of milliamps (0.01 mA)

Resistance Signal Devices -Number represents ohms

Frequency Signal Devices -Setting represents hertz (counts/second)

If the Power Save SET POINT dead band setting is set at 10° F and the Power Save SET POINT is 75°F, the SP1 relay de-energizes when the temperature reaches 75° F and reenergizes when the temperature falls to 65°F.

U8, Display Stabilizer

If the display value changes by a digit or two in a steady state condition, this setting can be altered in conjunction with the U4 setting to reduce the display instability. Lower values cause maximum suppression. Larger values provide greater accuracy. The default value for the U8, Display Stabilizer setting is ten (10).

L, Set Point Limit

This setting, which may be any number between -99 and +999, is the maximum limit for all SET POINTS except the ALARM SET POINT. This will prevent accidental setting of a Set Point, which could be too high or low (depending upon the application).

Temperature Sensor - Number represents degrees Celsius or Fahrenheit as determined by the F5 setting

Voltage Sensor -Number represents tenths of a volt (0.1 VDC)

Current Sensor -Number represents hundredths of milliamps (0.01 mA)

Resistance Signal Devices -Number represents ohms

Frequency Signal Devices -Setting represents hertz (counts/second)

The default value for this setting is +999.

F1, SP2 and U7 Disable

This setting may be either a one (1) or a zero (0), and controls the behavior of the DQ15D by making it perform like the single Set Point PROCESS TECHNOLOGY model DE control. When this setting is set to one (1), it is ON. The SP2 Set Point and the U7 Power Save Set Point are both disabled and will not work.

F2, Heating or Cooling Switch

This setting is not applicable for the DQ15D control.

F3, Alarm On/Off Switch

This setting may be a zero (0) or a one (1). When set to zero, the alarm Set Point is turned off. When set to one, alarm Set Point is turned on.

The default value for this setting is zero (0).

F4, Unit Display Enable

This setting may be set to a zero (0) or a one (1). When set to one (1), the DQ15D will display either a C or an F, separated by a decimal point. This indicates that either Celsius or Fahrenheit is being displayed. If the temperature being measured is greater than +999 degrees, the units are not shown because the display is limited to four positions.

F5, Temperature Units Conversion

This setting may be set to a zero (0) or a one (1). When set to a zero (0), the temperature is displayed in degrees Fahrenheit. When set to a one (1), the temperature is displayed in degrees Celsius.

Conversion from F to C does NOT change Set Point or alarm upper limit values. These must be changed manually.

The default setting is zero (0).

F6, Current Output Enable

This setting can be either zero (0), which is OFF, or one (1), which is ON. When ON, it enables the optional current adder board on the DQ15D. See **4-20 mA Output Option** for details on the current output signal.

If the DQ15D is equipped with the optional 4-10 mA output feature, then setting F6 to one (1) turns ON this feature. F6 must be ON before any calibration can be performed.

The default setting is zero (0). Only active when using either of the optional 5416 or 5419 boards.