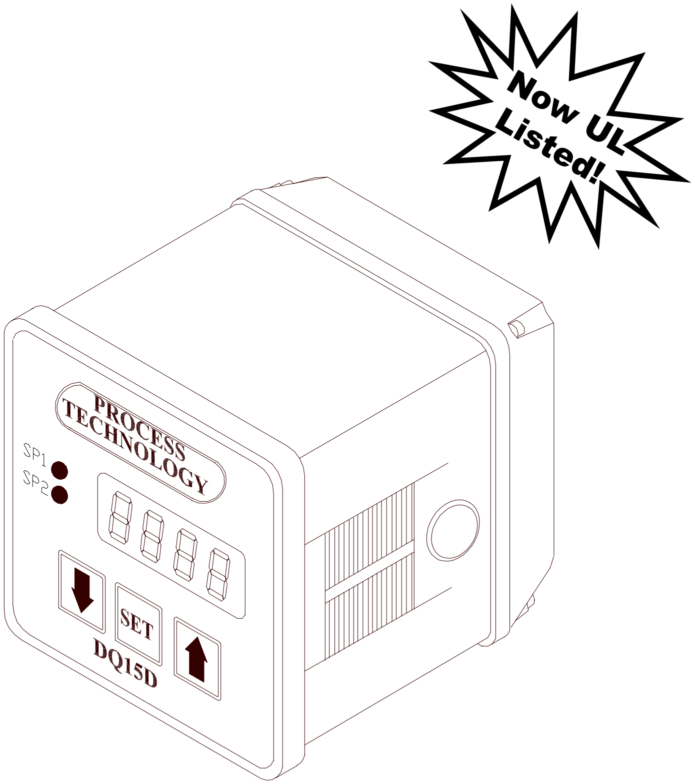
DQ15D INSTRUCTION MANUAL



YOUR DISTRIBUTOR: Chemical Distributors, Inc.
80 Metcalfe Street - Buffalo, NY 14206
1-800-777-CHEM (2436)

Phone: 716-856-2300 Fax: 716-856-7115
sales@cdibuffalo.com

www.cdibuffalo.com

TABLE OF CONTENTS

DQ15D Digital Temperature Control

General Description

The DQ15D digital temperature control is a microprocessor based device that operates two relays. The relays are designated as "**SP1**" and "**SP2**" SET POINTS on the front panel.

The temperature sensor (i.e. RTD or thermocouple) sends a signal to the DQ15D control. The DQ15D compares this signal to a value, determined by the operator and set in the control's memory for the **SP** SET POINT(S). In the heating mode if the sensor signal is lower than the "**SP1**" set point value, the DQ15D energizes the relay and its isolated contacts close. In the cooling mode if the sensor signal is higher than the "**SP2**" set point value, the DQ15D energizes the relay and its isolated contacts close.

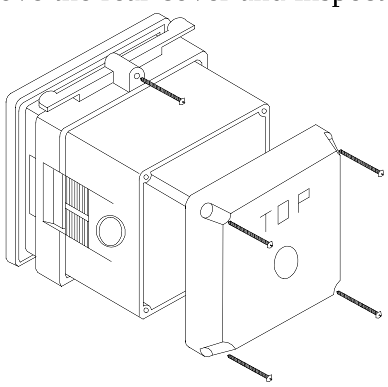
The power save or "night setback" feature permits the use of a second heating set point to conserve energy whenever required.

The DQ15D is equipped with an "ALARM CONDITION" feature. This feature is activated by using the "F3" parameter (described on page 28). The DQ15D enters an "ALARM CONDITION" any time the sensor signal has exceeded the ALARM SET POINT. Under this condition, the DQ15D will de-energize both relays and the letters "AAA" flash on the LED display.

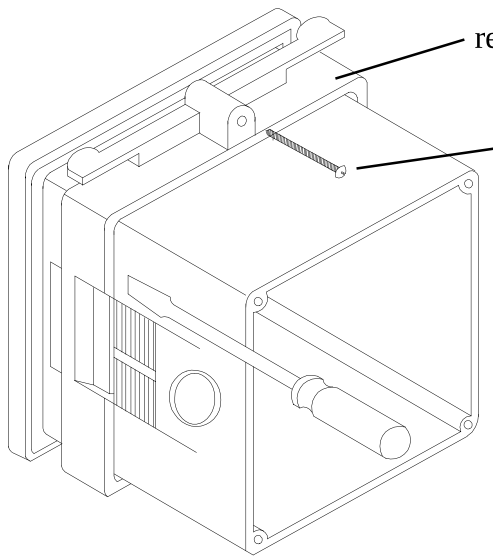
Installation Procedure

Suitable for indoor use only.

Unpack and inspect the controller for damage upon receipt. Any shipping damage claims must be made through the freight carrier that delivered the controller. Remove the rear cover and inspect the controller for internal damage.



Remove the panel retaining collar by inserting a flat head screwdriver under the collar on alternating sides while sliding the collar back.



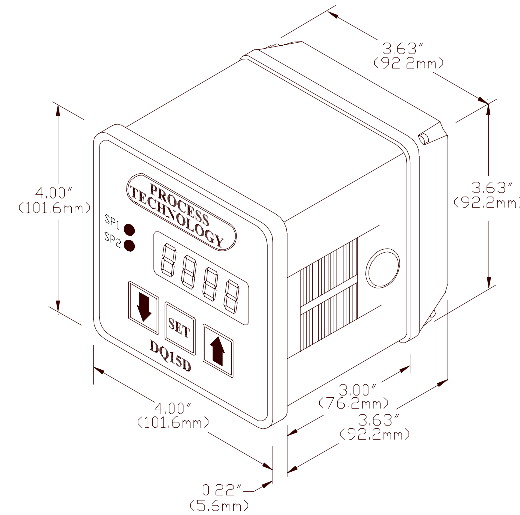
Cut a 1/4 DIN finished opening: 3.625" x 3.625" (92 mm x 92 mm) in the panel where the DQ15D is to be mounted.

Select one or more of the knockouts from the three (3) knockouts on the rear cover or enclosure side panels that offers the most convenient routing for external wiring. Remove the knockouts before reattaching the rear cover or inserting the control in the panel.

Warning: Knockout removal with a hammer and a punch while the rear cover is attached to the control may damage the control components.

Insert the DQ15D through the prepared opening and slide the retaining collar over the case from the rear of the panel. After hand tightening the collar, tighten the two (2) collar screws to ensure a secure fit.

Install a suitable liquid tight conduit fitting through the knockout opening following manufacturer’s instructions and install field wiring. Using the wiring illustration on page 9, install the required input and output wires. Use National Electric Code and local codes for determining wire sizing, insulation, terminations, etc.



The factory supplied 1000 ohm RTD sensor can be extended using standard electrical hookup wire (22 awg or larger). The effect of additional 22 awg sensor wire length on the measured value is approximately 1º F for every 65 feet.

Note: This does not apply to <u>THERMOCOUPLES</u>. You MUST use specific thermocouple wire when extending the sensor wire length. Use of incorrect extension wire can cause hazardous operating conditions.

Over Temperature Protection

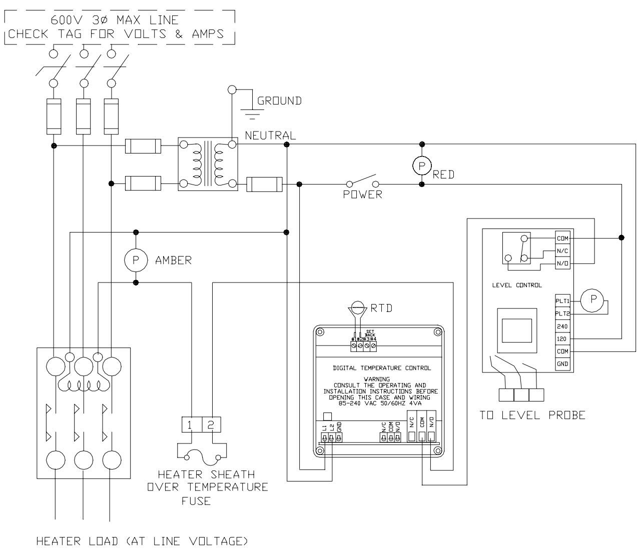
Component failure (sensors, relays, temperature controller, etc.) in a temperature controlled process can result in damage to the product, heater over temperature, and the possibility of a fire.

To safeguard against these events, install over temperature protection. This will interrupt the heater power supply in the event of low solution level. Process Technology heaters include a thermal fuse standard (Protector I, II, or III) on the heater to monitor the heater’s surface temperature. When wired properly, these devices cut the power to the heater in low solution level conditions. In addition to thermal protection, Process Technology strongly recommends the use of liquid level controls to monitor the solution level and shut off the heaters prior to an over temperature condition occurring.

WARNING

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

Over Temperature Protection Device with Low Level Cut-off
Sample Wiring Diagram (your wiring may differ)



SET POINTS AND FEATURES

“SP1” Heat Set Point

The control normally displays the actual process temperature. To view the “**SP1**” SET POINT value, press the decrease “↓” button once and release. The control will display the letter “**H**” and a decimal point followed by a number between -40 and +999 (the numeric range of the controller). After 7 seconds the display will automatically return to normal.

Note: The units displayed, ºC, ºF, Hz, volts, mA or ohms are established during the setup of the control.

To alter the set point value, press the “**SET**” button while the set point value is still displayed. The number on the display will begin flashing.

Once the number begins flashing, use the increase “↑” or decrease “↓” key to change the value. After the new value has been established, press the “**SET**” key once more to lock the new value into memory.

Note: If the “SET” key is not pressed within 5 seconds, the new value will be lost and the set point value will revert to its previous setting.

“SP2” Cool Set Point

The control normally displays the actual process temperature. To view the “**SP2**” SET POINT value, press the decrease “↓” button twice and release. The control will display the letter “**C**” and a decimal point followed by a number between -40 and +999 (the numeric range of the control). After 7 seconds the display will automatically return to normal.

Note: The units displayed, ºC, ºF, Hz, volts, mA or ohms are established during the setup of the control.

To alter the set point value, press the “**SET**” button while the set point value is still displayed. The number on the display will begin flashing. Once the number begins flashing, use the increase “↑” or decrease “↓” key to change the value. After the new value has been established, press the “**SET**” key once more to lock the new value into memory.

Note: If the “SET” key is not pressed within 5 seconds, the new value will be lost and the set point value will revert to its previous setting.

“P” Power-Save Set Point (Stand-by)

The Power-Save feature permits the user to establish a second heating set point. When the established value is set lower than the normal “**SP1**” heat set point, it will reduce heating power through this lower set point whenever the Power-Save feature is turned on.

To turn on the Power-Save feature, press all three keys (“↑”, “**SET**”, and “↓”) simultaneously. As an alternative, you may install an external switch to close contacts #3 and #4 on the rear terminal strip. **NEVER DO BOTH**. When the control is operating in the Power-Save mode, the display will alternately change between the process value and three dashes "---". To return to normal "**SP1**" operation, either press all three keys ("↑", "**SET**", and "↓") simultaneously, or switch OFF the remote switch wired to terminals #3 and #4.

The control normally displays the actual process temperature. To view the "**P**" SET POINT value, press the increase "↑" button once and release. The control will display the letter "**P**" and a decimal point followed by a number between -40 and +999. After 7 seconds the display will return to the process value.

Note: The units displayed, ºC, ºF, Hz, volts, mA or ohms are established during the setup of the control.

To change the set point value, press the "**SET**" button while the "**P**" Power-Save value is displayed. The value will flash, and can be changed by pressing the increase "↑" or decrease "↓" key. After the desired value is entered, press the "SET" key once to lock-in the new value into memory.

Note: If the "SET" key is not pressed within 5 seconds, the new value will be lost and the original value restored in memory.

Alarm Feature

Note: This is not a safety device.

The Alarm feature, which is enabled using the "**F3**" setting during configuration (see page 28), allows the user to establish a set point above which the control will enter into an alarm condition. This set point should be higher than the heat set point. During the alarm condition, both control relays will de-energize and flash "**AAA**" on the display.

After enabling this feature, you may view the "**ALARM SET POINT**" on the display. Press and release the increase "↑" button twice. The display will read "**A**" followed by a decimal point and the alarm set point value. After a few seconds the display will return to normal.

Note: No values can be seen unless "F3" is enabled. The units displayed, ºC, ºF, Hz, volts, mA or ohms, are established during the setup of the control.

To change the "**ALARM SET POINT**", press the "**SET**" button while the alarm set point value is still displayed. The number on the display will flash. After the number begins flashing, use the increase "↑" or decrease "↓" keys to change the value. After the new value has been entered, press the "**SET**" key to lock the new value into memory.

Note: If the "SET" key is not pressed within 5 seconds, the new value will be lost and the set point value will revert to its previous setting.

Error Conditions

Sensor values that are out of range will generate an error display. For Celsius: <-40º C or >+538º C. For Fahrenheit: <-40º F or >+1000º F. In the event of an improperly connected RTD sensor or thermocouple, or if the control reads an "open" circuit, the message "**HHH**" is displayed and the control de-energizes the control relay. In the event the RTD sensor "shorts", the message "**UUU**" is displayed and the control de-energizes the control relay.

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

Error Messages

If the calibration and setup information stored within the memory becomes corrupt or erased, the control will switch to its default calibration/configuration settings. The display will flash the letter "**c**" on the left side when default values are activated. The physical size and position of the letter "**c**" will define the exact nature of the problem.

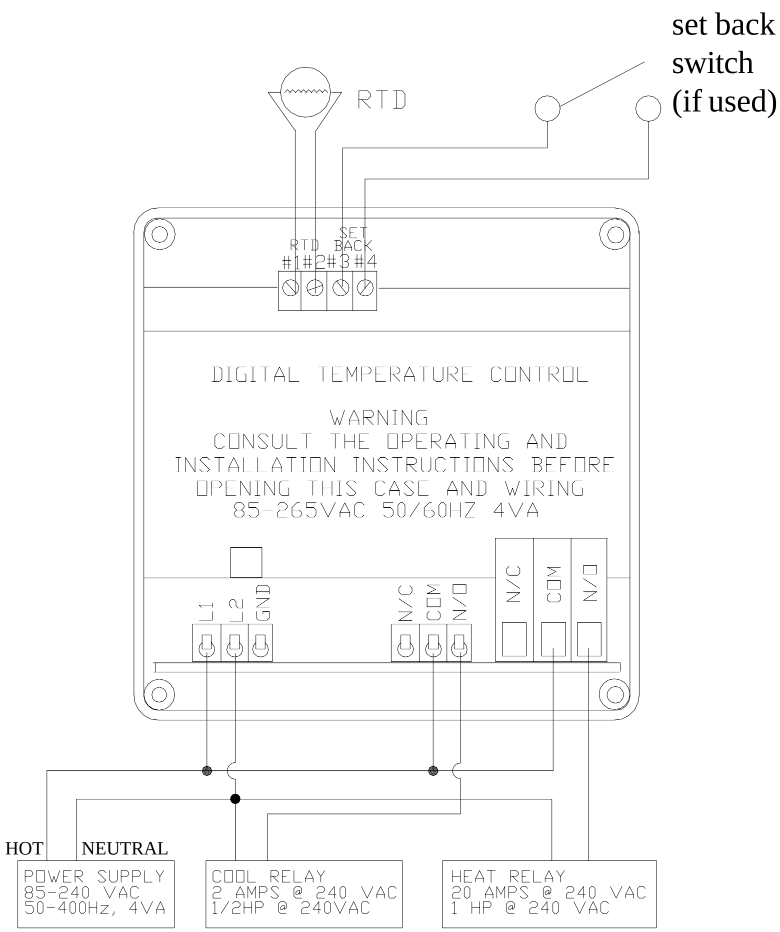
Note: Shorted thermocouples will not result in an error condition. Instead, incorrect readings will be displayed.

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).

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.

A large “**C**” on the left side of the display indicates the control is using the default values for the configuration and the calibration. This can occur in a new control that has never been calibrated or configured, or in a control where the memory has been erased.

Power, Heating and Cooling Relay Wiring
(rear view of controller)



Power, Heating & Cooling Relay: Wiring Procedure

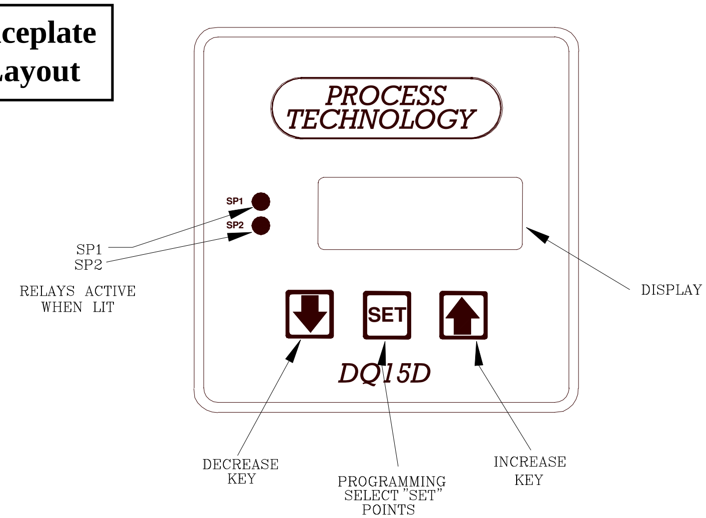
Unit is intended for a single power source.

To complete the wiring procedure, you will need these tools and materials:

1. #2 Phillips head screwdriver.
2. 1/8” (x-small) straight blade screwdriver.
3. Power supply wire, 18 awg minimum.
4. Relay connection wires (see state and local electrical requirements for proper 65º C wire gauge).

Referring to the illustration on page 9, locate and identify terminal locations for the power supply voltage, the set point relay, and the appropriate sensor. Connect wires into their designated terminals and tighten the retaining screw which will secure the wire into place.

Faceplate Layout



2 Wire RTD Sensor Calibration

The 2 wire, 1000 ohm RTD sensor must be connected across terminals #1 AND #2 of the terminal block. Standard PCN 5414 board needed.

Calibration Procedure for the 2 Wire RTD:

RTD devices are precision resistors whose resistance value varies with temperature. The DQ15D control measures the RTD resistance and compares that measurement with a “standard” set of values stored in the control memory. To restore, update or verify that this “standard” set of values is correct, do the following:

Equipment needed:

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

WARNING!

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

Step 1: Turn **<u>OFF</u>** all power.

Step 2: Remove rear cover.

Step 3: Remove RTD sensor.

Step 4: Install the precision resistors in place of the RTD sensor, as shown.

Step 5: 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), as shown.

Step 6: Carefully restore power to the control, taking precautions not to make contact with any exposed voltage sources.

Step 7: Press the increase “↑” and decrease “↓” keys simultaneously and hold for approximately 6 seconds. The display will indicate “AC.0”. while the “0” is flashing, use the increase key to change this to “22”. Press the “SET” key. The control display will read “**CAL1**”.

Step 8: Press and hold the “**SET**” key for 1 second. The display will read “**HoLd**”. Wait for the display to change to “**CAL2**”.

Step 9: 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.

Step 10: Press and hold the “**SET**” key for 1 second. The display will read “**HoLd**”. WAIT for the display to reset. After resetting, the display should indicate the approximate

temperature value for the connected precision resistors (i.e. 511º F or 266º C).

Step 11: Turn OFF power and remove the precision resistors. Re-install the RTD sensor and the rear cover of the controller. Return the calibrated control to service.

2 and 3 Wire RTD, Voltage, Current, Frequency and Resistance

Optional PCN 5447 or 5416 board needed.

3 Wire RTD Sensor Calibration

Note: For a 1000 ohm sensor, the DIP switches should be OFF, OFF, OFF. For 100 ohm, check that the DIP switches are ON, OFF, OFF (see page 29).

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 control memory. To restore, update or verify that this “standard” set of values is correct, do the following:

Equipment needed:

1. Two precision resistors (tolerance +/- 0.1% or better) with a fixed value equal to the nominal value of the RTD (i.e. 1000 ohms or 100 ohms).
2. A suitable jumper cable to facilitate changing input resistance.
3. 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 <u>potentially lethal voltages</u>. Exercise EXTREME CARE and wear tested electrician’s gloves whenever power is on.

Calibration procedure for the 3 Wire RTD:

Step 1: Turn **<u>OFF</u>** all power.

Step 2: Remove rear cover.

Step 3: Remove RTD sensor.

Step 4: Install the short piece of jumper wire from terminal #1 to #3.

Step 5: Install the precision resistors in place of the RTD sensor, as shown in terminals #2 and #3.

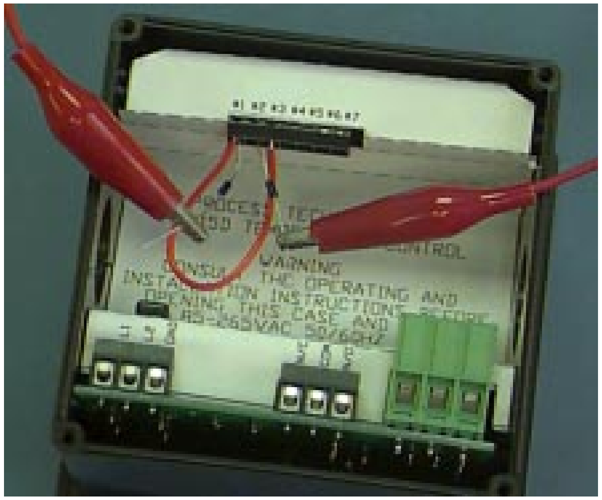
Step 6: Install the jumper cable between the loose end of one of the resistors and the fixed end of the other resistor to establish an input value of a single resistor (i.e. 1000 ohms or 100 ohms), as shown.

Step 7: Carefully restore power to the controller, ensuring that you do not come in contact with any exposed voltage.

Step 8: Press the increase “↑” and decrease “↓” keys simultaneously and hold for approximately 6 seconds. The display will indicate “AC.0”. while the “0” is flashing, use the increase key to change this to “22”. Press the “SET” key. The control display will read “**CAL1**”.

Step 9: Press and hold the “**SET**” key for one second. The display will read “**HoLd**”. Wait for the display to change to “**CAL2**”.

Step 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.



Step 11: Press and hold the “**SET**” key for one second. The display will read “**HoLd**”. Wait for the display to reset. After it resets, the display should indicate the approximate temperature value for the connected precision resistors (i.e. 511º F or 266º C).

Step 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

The configuration and calibration procedures used for measuring pure resistance are the same as are used to configure and calibrate a two wire RTD sensor. However, in the setting configuration mode, the “**U1**” sensor type parameter must be set to “**12**”. See the “**U1**” instructions on page 24. The unit will then measure pure resistance from 0-1000 ohms.

Voltage Signal Calibration

Optional PCN 5447 or 5416 board needed. The DQ15D control measures DC voltage 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 are correct, do the following:

Make sure that the DIP switch settings are OFF, ON, OFF (see page 29). 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).

Note: Polarity must be observed.

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 for voltage signal:

Step 1: Turn **OFF** all power.

Step 2: Remove rear cover.

Step 3: Remove voltage input wiring.

Step 4: Install a voltage calibrator or power supply to terminal #1 and #2.

Step 5: CAREFULLY restore power to the controller, ensuring that you do not come in contact with any exposed voltage.

Step 6: Press the increase "↑" and decrease "↓" keys simultaneously and hold for approximately 6 seconds. The display will indicate "AC.0". while the "0" is flashing, use the increase key to change this to "22". Press the "SET" key. The control display will read "**CAL1**".

Step 7: Adjust the power supply to 1.0 volts.

Step 8: Press and hold the "**SET**" key for one second. The display will read "**HoLd**". Wait for display to change to "**CAL2**".

Step 9: Adjust the calibrator to 10.0 volts.

Step 10: Press and hold the "**SET**" key for one second. The display will read "**HoLd**". Wait for display to reset and display 10.0.

Step 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 Calibration

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 page 29). Terminal 1 is positive, terminal 2 is negative.

Equipment needed:

1. A precision, NIST traceable, 0-20 mA DC current calibrator OR

2. A precision, NIST traceable, digital ammeter or DMM and:
   a. a regulated linear DC power supply with an adjustable 0-10 volt or better output and,
   b. 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 <u>potentially lethal voltages</u>. Exercise EXTREME CARE and wear tested electrician's gloves whenever power is on.

Calibration procedure for a current input:

Step 1: Turn **<u>OFF</u>** all power.

Step 2: Remove rear cover.

Step 3: Remove input leads.

Step 4: Install the 0-20 mA DC calibrator or the power supply, resistor and ammeter in series with terminal #1 and #2.

Step 5: CAREFULLY restore power to the controller, ensuring that you do not come in contact with any exposed voltage.

Step 6: Press the increase "↑" and decrease "↓" keys simultaneously and hold for approximately 6 seconds. The display will indicate "AC.0". while the "0" is flashing, use the increase key to change this to "22". Press the "SET" key. The control display will read "**CAL1**".

Step 7: Adjust the calibrator or power supply to 5.0 mA.

Step 8: Press and hold the "**SET**" key for one second. The display will read "**HoLd**". Wait for the display to change to "**CAL2**".

Step 9: Adjust the power supply to 20.0 mA.

Step 10: Press and hold the "**SET**" key for one second. The display will read "**HoLd**". Wait for display to reset and display 20.0.

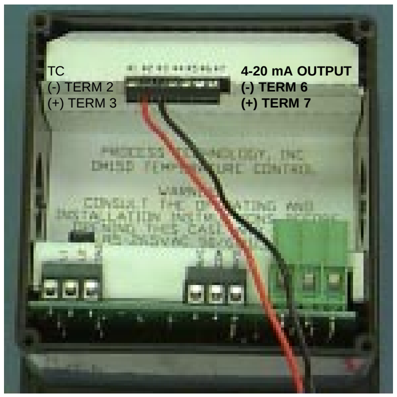
Step 11: Turn OFF power to the control and remove the power supply. Reinstall the voltage input and the rear cover of the control. Return the calibrated control to service.

Frequency Signal (Pulse Train)

Optional PCN 5447 or 5416 board needed. The DQ15D control measures frequency and compares that measurement with a "standard" set of values derived from the microprocessor oscillator. Since this is a dedicated frequency, no field calibration is possible. Check that the DIP switches are set to OFF, OFF, OFF (see page 29).

Thermocouple Calibration

Optional thermocouple sensor board needed (PCN 5418 or 5419). 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.



Equipment needed:
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 <u>potentially lethal voltages</u>. Exercise EXTREME CARE and wear tested electrician's gloves whenever power is on.

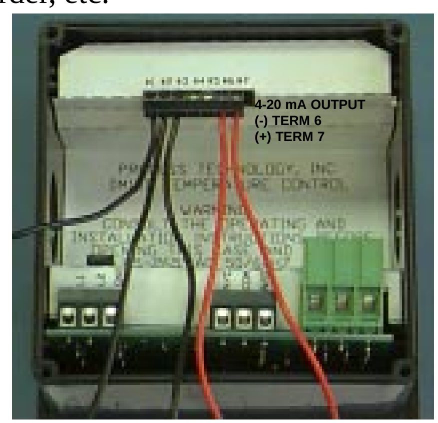
Calibration procedure for a thermocouple:

Step 1: Turn **<u>OFF</u>** all power.
Step 2: Remove rear cover.
Step 3: Remove T/C sensor.
Step 4: Install the thermocouple calibrator to terminal #1 and #2 on PCN 5418 board, or terminal #2 and #3 on 5419 sensor board.
Step 5: CAREFULLY restore power to the controller, making sure that you do not come in contact with any exposed voltage.
Step 6: Press the increase "↑" and decrease "↓" keys simultaneously and hold for approximately 6 seconds. The display will indicate "AC.0". while the "0" is flashing, use the increase key to change this to "22". Press the "SET" key. The control display will read "**CAL1**".
Step 7: Adjust the thermocouple calibrator to 0.0º C (32.0º F).
Step 8: Press and hold the "**SET**" key for one second. The display will read "**HoLd**". Wait for display to change to **"CAL2**".
Step 9: Adjust the thermocouple calibrator to 250.0º C (482.0º F).
Step 10: Press and hold the "**SET**" key for one second. The display will read "**HoLd**". Wait for the display to reset and display 250.0º C (482.0º F).
Step 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.

4-20 mA Output Option

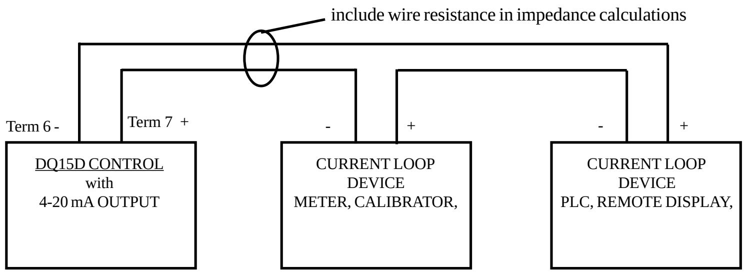
The DQ15D is available with an optional 4-20 mA output signal proportional to the measured (displayed) temperature. PCN 5416 or 5419 board needed. This option is useful for source transmitting the measured temperature to a current loop-sensing device, i.e. PLC, remote intelligent display, chart recorder, etc.

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 0-500º 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.

Typical 4-20 mA CURRENT LOOP
maximum impedance = 450 ohms



Calibration procedure for 4-20 mA output:

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.

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:
An NIST traceable sensor simulator (calibrator), a precision 20 mA (or higher) calibrator/tester, or a precision DMM for verification.

Step 1: Turn **OFF** all power.
Step 2: Remove rear cover.
Step 3: Remove sensor leads.
Step 4: Install appropriate sensor calibrator, i.e. resistors or thermocouple simulator.
Step 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.**
Step 6: Restore power to control.
Step 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.
Step 8: Press decrease "↓" and increase "↑" keys simultaneously and hold for approximately 6 seconds. The display will indicate "**AC.0**". While the "**0**" is flashing, use increase key to enter "**33**". The display will change to indicate "**L**" followed by the current lower process limit, i.e. "**0°**", "**-20°**", "**0** volts", etc.
Step 9: Use the increase "↑" key or decrease "↓" key to alter the lower display value. Press the "**SET**" key to store the new value. The display will then read hexadecimal "**2AAA**" or **4.0** mA, verify that this is the value displayed on your 4-20 mA calibrator/tester or DMM.
Step 10: Adjust the lower current value by pressing the increase "↑" or decrease "↓" key. Press the "**SET**" key to retain the value. The display will read "**U**" followed by the current upper display value limit, i.e. "**500°**", **10** volts, etc.
Step 11: Use the increase "↑" key or decrease "↓" key to alter the upper display value. Press the "**SET**" key to retain the value. The display will then read hexadecimal "**D555**" or **20.0** mA. Verify the value by observing the value on your 4-20 mA calibrator/tester or DMM.
Step 12: Adjust the upper current output value by pressing the increase "↑" or decrease "↓" key. Press the "**SET**" key to retain the value. The display will then return to the current sensor input value and the 4-20 mA output will reflect your new or confirmed settings.
Step 13: Turn **OFF** all power.
Step 14: Disconnect calibration equipment.
Step 15: Reconnect 4-20 mA lead and sensor leads.
Step 16: Reinstall rear cover.

CONFIGURATION (Set-up)

To configure the DQ15D temperature control, press the increase "↑" and decrease "↓" keys simultaneously and hold for approximately 6 seconds. The display will indicate "AC.0". while the "0" is flashing, use the increase key to change this to "11". Press the "SET" key. The control will be in the "configuration mode". While in this mode, the control display will show the values of various configuration settings. The first setting to be displayed is the "U1" setting. See setting summary. By using the increase "↑", decrease "↓" buttons, it is possible to scroll through the list of settings to those needing modification.

To adjust a setting while in the "Configuration Mode", use the increase "↑", decrease "↓" buttons to bring the particular setting into the view on the display. Press the "**SET**" button to change the value of the setting. Once the "**SET**" button has been released, the display will flash. Use the increase "↑", decrease "↓" buttons to scroll through the options for the selected setting. After the option has been determined, press the "**SET**" button once more to lock the new value into memory.

After completing all changes to the configuration of the control, the new configuration must be saved. To save the new value, press the increase "↑" and decrease "↓" buttons simultaneously. This will cause the control to store the new values internally and then reset the unit.

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

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 ºF or ºC**
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/ºC**
2	**5414**	**2-wire RTD**	**Platinum RTD, TCR 0.00392 ohm/ohm/ºC**
3	**5447***	**3-wire RTD**	**Platinum RTD, TCR 0.00385 ohm/ohm/ºC**
4	**5447***	**3-wire RTD**	**Platinum RTD, TCR 0.00392 ohm/ohm/ºC**
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 to 200 Hz, counts per second)**
12	**5447***	**Resistance**	**Pure resistance signal (0 to 1000 ohms)**

Note: 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 page 30.

****   An optional 5416 sensor board will permit transmission of the process value as a 4-20 mA signal.***

***** An optional 5419 sensor board will permit transmission of the process value as 4-20 mA signal.***

U2, Signal Offset

This setting, which may be any number from -9 to +9, represents an offset value which is applied to the signal received from the sensor. The units (ºC, ºF, ohms, etc.) will be dictated by the type of sensor selected in "**U1**" settings.

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 -	This setting will have no effect.

U3, Output Signal Offset

This setting, which may be any number from -9 to +9, adjusts the optional 4-20 mA process value output. This does not affect the display value. The value is added to the signal level and causes the value to be "rounded" in an "intelligent" receiving device.

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

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)

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

U4, Signal Filter

This setting, which may be any number from 1 to 64, represents the number of samples taken from the sensor and maintained in memory. These samples are then averaged to provide an active filter of the signal.

Using a small value for this setting will cause the DQ15D control to respond more quickly to sudden changes in the sensor signal level, but this also causes the unit to be more susceptible to EMI/RFI noise. As this

value is increased, the susceptibility to inference is reduced.

The default value for this setting is four (4).

Note: When sensing temperature with a 100 ohm RTD (2 or 3 wire), set this 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.

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)

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

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

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 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)

This bandwidth applies to the low side of the "**SP2**" SET POINT. If the "**U5**" setting is set at 5º F and the "**SP2**" SET POINT is set at 115º F, then the set point relay is de-energized when the (displayed) temperature reaches 115º F and will remain energized until the temperature falls to 110º 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 10º F and the POWER SAVE SET POINT is 75º F, the "**SP1**" relay de-energizes when the display temperature reaches 75º F and is reenergized when the temperature falls to 65º 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)

Note: 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.

Note: 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.

Note: 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 page 21 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.

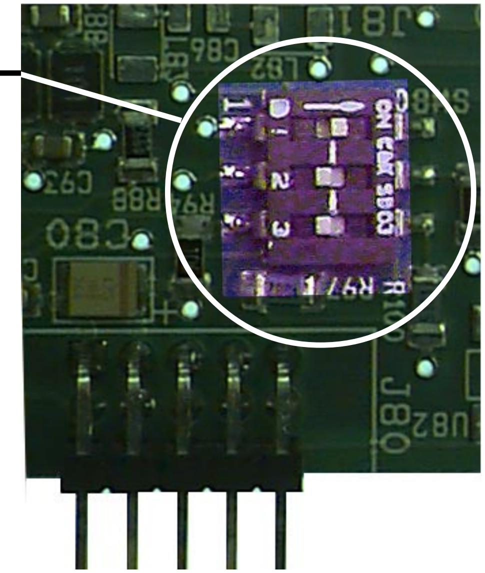
Note: The default setting is zero (0). Only active when using either of the optional 5416 or 5419 boards.

Sensor DIP Switch Settings
5447 or 5416

When using the sensor 5416 or 5447 boards, an “on-board” DIP switch must also be configured. The DIP switch settings are as follows:

Sensor DIP Switch:
Selections

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**



(illustration shows DIP switch setting for 100 ohm RTD)

Electrical Noise and 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.

Specifications

Standard Input:
2 wire- 1000 ohm RTD: TCR (alpha), 0.00385 ohm/ohm/ºC
RTD Self Heating Coefficient: 5º C/w in 0.2 m/s water;
200º C/w in 1 m/s air measurement current, 0.1 to 0.2 mA;

Input Range:
-40 to 1000º F (-40 to 538º C), ºF or ºC field selectable.

Set Point Range:
Selectable throughout the input range.

Sensor Break or Short Protection:
(No sensor short protection with Thermocouple sensor.)
De-energize control output.

Accuracy:
± 0.25% span, ± 1 digit.

Enclosure:
NEMA 12 face suitable for panel mounting (#20 ga. through 1/4" thick panels).

Display:
4 digit, ½" (nominal) LED display.

Control Function:
ON/OFF Electromechanical Relays.

Control Outputs:
SP1 Set Point (reverse acting). SPDT.
20A resistive @ 240 VAC maximum, 1 H.P. @ 240 VAC maximum.
SP2 Set Point (direct acting). SPDT.
2A resistive @ 240 VAC maximum, 1/20 H.P. @ 240 VAC maximum.

ON/OFF Differential:
Field adjustable 1º (F or C) to 99º.

Memory:
Nonvolatile.

Supply Voltage:
85 to 240 VDC or VAC, 50 through 400 Hz, 4VA.

Operating Temperature:
-20 to 140º F (-33 to 60º C), in a sealed NEMA 12 style case.

Input Options:

a. RTD 2 & 3-wire 100 ohm 0.00385 ohm/ohm/ºC or 0.00392 ohm/ohm/ºC
b. Thermocouples (types J, K, T and R) NIST Monograph 175, revision ITS-90
c. Current (4-20 mA DC)
d. Voltage (1-10 VDC)
e. 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.

Agency Approvals:
UL/CUL

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