

# DE20 / T-DE20 Instruction Manual



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## DE20 Specifications

<b>Standard Input</b>	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
<b>Input Range</b>	-40°F (-40°C) to 1000°F (538°C) °F or °C field selectable
<b>Set Point Range</b>	Selectable throughout the input range
<b>Sensor Break or Short Protection</b>	De-energize control output (No sensor short protection with Thermocouple sensor)
<b>Accuracy</b>	± 0.25% span, ± 1 digit
<b>Enclosure</b>	Type 12, IP54 Face suitable for panel mounting (#20 ga. through 1/4 thick panels)
<b>Display</b>	4 digit, (1/2" nominal), LED display screen
<b>Control Function</b>	ON/OFF Electromechanical Relays
<b>Control Outputs</b>	<b>SP1 Set Point</b> (reverse acting) SPDT 20A resistive@240 VAC max 1HP@240 VAC max, 1/2 HP@120VAC
<b>ON/OFF Differential</b>	Field adjustable 1° (F or C) to 99°
<b>Memory</b>	Nonvolatile
<b>Supply Voltage</b>	100V to 240V +/- 10% VAC, 50-60 Hz, 13VA
<b>Operating Conditions</b>	<ul style="list-style-type: none"> <li>• Indoor Use Only</li> <li>• 20°F (-7°C) to 130°F (54°C)</li> <li>• Max Altitude: 3000m</li> <li>• Max Relative Humidity: 80%</li> <li>• Pollution Degree 2</li> <li>• Installation Category II</li> </ul>
<b>Input Options</b>	RTD 2 & 3-wire 100 ohm 0.00385 ohm/ohm/°C or 0.00392 ohm/ohm/°C  Thermocouples - (types J, K, T, R) NIST Monograph 175, revision ITS-90 (Obsolete)  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)



Equipment protected throughout by Double Insulation or Reinforced Insulation.

## General Description

The DE20 digital temperature control is a microprocessor based device that operates one relay. The relay's contact state is indicated as SET POINT on the front panel.

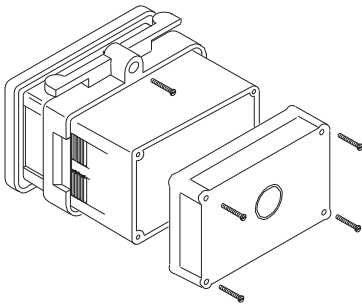
The temperature sensor (i.e. RTD or thermocouple) sends a signal to the DE20 controller. The DE20 compares this signal to a value, determined by the operator and set in the control's memory for the SET POINT. In the heating mode if the sensor signal is lower than the set point value, the DE20 energizes the relay and its isolated contacts close.

The DE20 is also equipped with an "ALARM CONDITION" feature. This feature is activated by using the "F3" parameter (described on page 13). The DE20 enters an "ALARM CONDITION" any time the sensor signal has exceeded the ALARM SET POINT. Under this condition, the DE20 de-energizes the relay and the letters "AAA" flash on the LED display.

## Installation Procedure

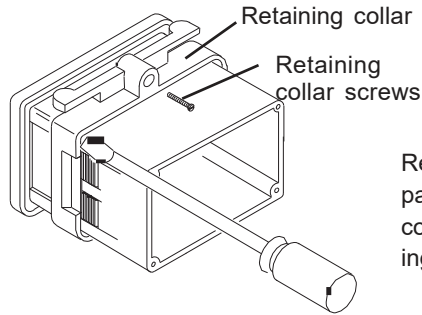
Suitable for indoor use only.

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 rear cover. Select from the four (4) knockouts on the rear cover that which offers the most convenient routing for external wiring.

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



Remove the panel retaining collar by inserting a flat head screwdriver under the collar on alternating

sides while sliding the collar back.

Cut a 1/8 DIN finished opening: 1.750" x 3.625" (44 mm x 92 mm) in the panel where the DE20 is to be mounted.



**CAUTION**

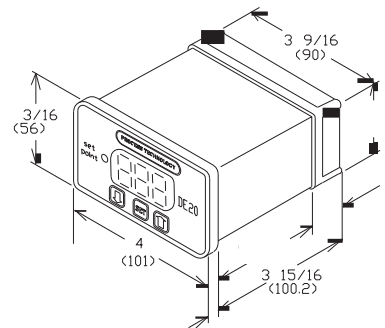
Avoid damaging circuitry. Remove rear cover before removing knockouts with a hammer/punch.



**ATTENTION**

Évitez d'endommager les composants du DE20. Enlevez le panneau arrière avant d'enlever le plastique pour faire des trous avec un marteau ou un poinçon.

Insert the DE20 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 diagram

supplied with the controller, 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 control calibration is approximately 1°F for every 65 feet.

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

## Overtemperature 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 device (Protector 1, 2, or 3) 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 requires the use of liquid level controls to monitor the solution level and shut off the heaters prior to an overtemperature condition occurring.

Ensure you read and adhere to all Over-temperature protector installation instructions and warnings.

## WARNING

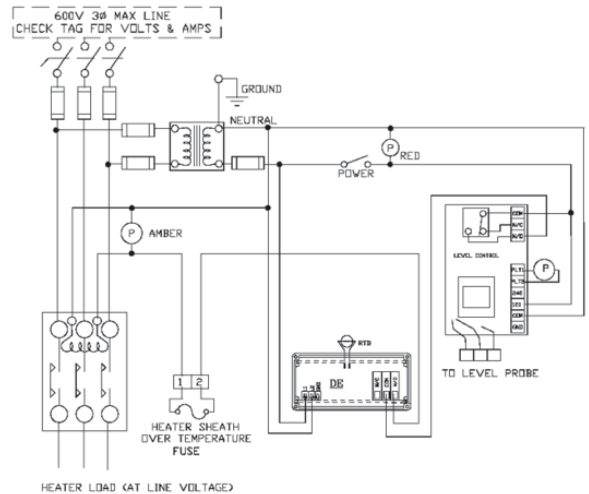
Overtemperature protection is necessary in any system where a fault condition could produce a fire or any other hazardous condition. Operation without thorough safety precautions can result in equipment failure, property damage and personal injury.

## AVERTISSEMENT

La protection de surchauffe est nécessaire dans n'importe quel système où une condition fautive avec résultat d'une température haute pourrait produire un incendie ou autre condition dangereuse. L'opération sans les précautions complètes de sécurité pourrait mener à la défaillance de l'équipement, l'endommagement de la propriété, ou des blessures.

## Overtemperature Protection Device with Low Level Cutoff Sample Wiring Diagram

(your wiring may differ)



## Set Point and Features

### Control Set Point

The set point value will be displayed whenever the “SET” key is pressed. This value can be changed by the following procedure:

**Note: The units displayed, °C, °F, Hz, volts, mA or ohms are established during the setup of the controller. See F2 instructions on page 12 for changing set point relay from reverse to direct acting.**

Press both the “SET” key and the decrease “↓” keys simultaneously and hold for 3 seconds. When released the set point value and a decimal point will appear, release both keys. Wait approximately one second, then using the decrease “↓” key or increase “↑” key, adjust the display to your new value. Depress the “SET” key to enter your new value.

**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.**

The controller will automatically return to the operating mode and display the current temperature.

## Alarm Feature

**Note: This is not a safety device.**

The Alarm feature, which is enabled using the “F3” set-ting during setup (see page 13), 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 set point setting on the control. During the alarm condition the control relay will de-energize the set point relay and flash “AAA” on the display.

After enabling this feature, you may view and adjust the “ALARM SET POINT” on the display. The alarm set point value will be displayed and can be adjusted by pressing the “SET” key and the increase “↑” key simultaneously and holding them for approximately three seconds. The alarm set point value will appear as a flashing display.

**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.**

To change the “ALARM SET POINT”, press the increase “↑” or decrease “↓” keys while the display is flashing. Press the “SET” key to enter your new value. If you wish to accept the current value, press the “SET” key.

The controller will automatically return to the operating mode and display the current temperature.

## Error Conditions

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

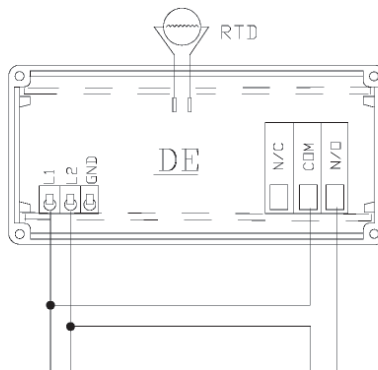
**Note: Shorted thermocouples will not result in an error condition. Instead, incorrect readings will be displayed.**

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 wherein the memory has been erased.

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



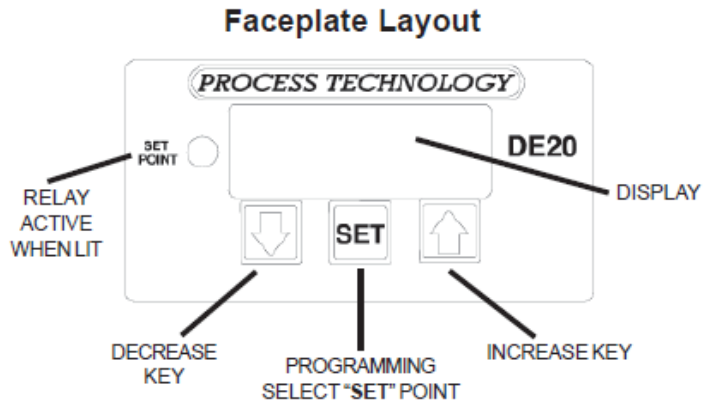
HOT	NEUTRAL	HEATER, CONTACTOR or
POWER SUPPLY		SOLENOID
85-265 VAC		20 AMPS @ 240 VAC
50-60 hZ, 13VA		1 HP @ 240 VAC

## Power and 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 65°C wire gauge).

Referring to the "Power, Heating and Cooling Relay Wiring (rear view of controller)" illustration above, 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.



## Calibration

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

### 2 Wire RTD Sensor Calibration

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

#### Calibration Procedure for the 2 Wire RTD:

RTD devices are precision resistors whose resistance value varies with temperature. The DE20 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  $\pm 0.1\%$  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 potentially lethal voltages. Exercise **EXTREME CARE** and wear tested electrician’s gloves whenever power is on.

### AVERTISSEMENT

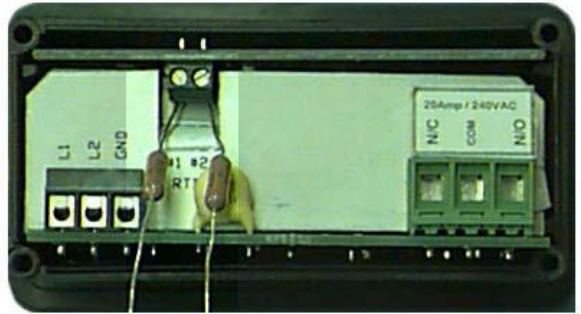
Les procédures de calibration nécessitent l'enlèvement du panneau arrière du contrôle. Ça exige aussi que le courant électrique est allumé ce qui expose le technicien à des tensions potentiellement létales. Utilisez toujours un soin extrême et portez des gants certifiés d'électricien quand le courant est allumé.

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

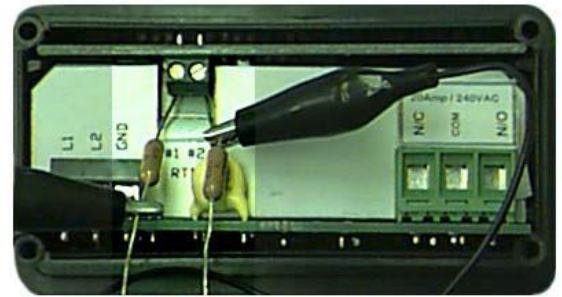
**Step 2:** Remove rear cover.

**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.

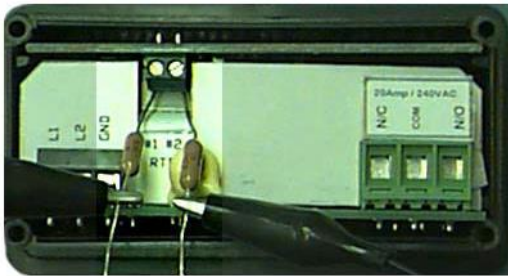
**Step 7:** Press the decrease “↓” key and increase “↑” buttons simultaneously and hold for approximately 6 seconds. The display will indicate “AC.0”. While the “0” is flashing, use the increase key to change this to “22”. Press the “SET” key. The control display will read “CAL1”.

**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.



## 2 Wire RTD Sensor Calibration (Continued)



**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. 511°F or 266°C).

**Step 11:** 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.

### Resistance Signal

Optional Item Number 5415 board needed. 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 11. The unit will then measure pure resistance from 0-1000 ohms.

### 3 Wire RTD Sensor

**Note:** For a 1000 ohm sensor, the DIP switches should be OFF, OFF, OFF. For 100 ohm, the DIP switches should be ON, OFF, OFF (see page 13).

RTD devices are precise resistors whose resistance value varies with temperature. The DE20 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 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 potentially lethal voltages. Exercise **EXTREME CARE** and wear tested electrician’s gloves whenever power is on.

## ⚠ AVERTISSEMENT

Les procédures de calibration nécessitent l'enlèvement du panneau arrière du contrôle. Ça exige aussi que le courant électrique est allumé ce qui expose le technicien à des tensions potentiellement létales. Utilisez toujours un soin extrême et portez des gants certifiés d'électricien quand le courant est allumé.

### Calibration procedure for the 3 Wire RTD:

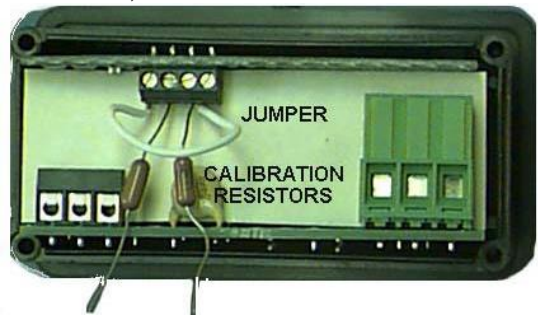
**Step 1:** Turn OFF all power.

**Step 2:** Remove rear cover.

**Step 3:** Remove RTD sensor

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

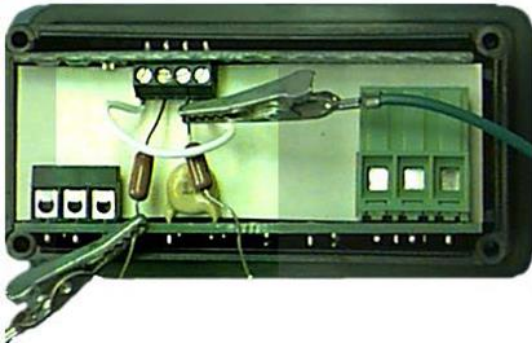
**Step 5:** Install the precision resistors in place of the RTD sensor, as shown in terminals #2 and #3.



**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.



### 3 Wire RTD Sensor Calibration (Continued)



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

**Step 8:** Press the decrease “↓” key and increase “↑” buttons 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 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. 511°F or 266°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.

### Thermocouple

The DE20 can be equipped with an optional thermocouple sensor board (Item Number 5417\*). 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 to the #2 terminal to maintain proper polarity.

#### Equipment needed:

A precise, NIST traceable, thermocouple calibrator with suitable extension leads to match the thermocouple type used.

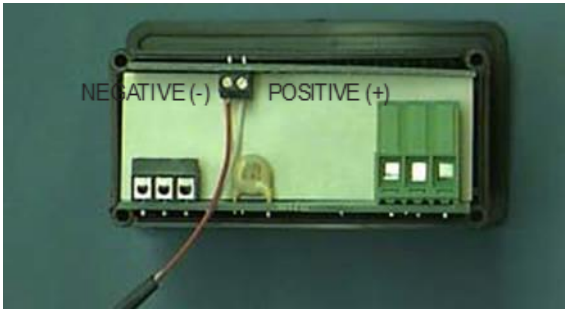
### ⚠ WARNING

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

### ⚠ AVERTISSEMENT

Les procédures de calibration nécessitent l'enlèvement du panneau arrière du contrôle. Ça exige aussi que le courant électrique est allumé ce qui expose le technicien à des tensions potentiellement létales. Utilisez toujours un soin extrême et portez des gants certifiés d'électricien quand le courant est allumé.

*\*Input board 5417 is no longer available*



### Calibration procedure for a thermocouple:

- Step 1:** Turn **OFF** all power.
- Step 2:** Remove rear cover.
- Step 3:** Remove T/C sensor.
- Step 4:** Install the thermocouple calibrator to terminal #1 and #2.
- 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 decrease “↓” key and increase “↑” buttons 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 0.0°C (32.0°F).
- 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 thermocouple calibrator to 250.0°C (482.0°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 250.0°C (482.0°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.

### Voltage Signal Calibration

The DE20 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 is correct, do the following:

Make sure that the DIP switch settings are OFF, ON, OFF (see page 13). The voltage signal must be connected across terminals #1 and #2 of the Adder Board

(Item Number 5415). Terminal #1 is common (negative), and terminal #2 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.

## ⚠ AVERTISSEMENT

Les procédures de calibration nécessitent l'enlèvement du panneau arrière du contrôle. Ça exige aussi que le courant électrique est allumé ce qui expose le technicien à des tensions potentiellement létales. Utilisez toujours un soin extrême et portez des gants certifiés d'électricien quand le courant est allumé.

### Calibration procedure for voltage signal:

- Step 1:** Turn **OFF** all power.
- Step 2:** Remove rear cover.
- Step 3:** Remove sensor.
- Step 4:** Install the voltage calibrator 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 decrease “↓” key and increase “↑” buttons 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 the display to change to “CAL2”.
- Step 9:** Adjust the power supply to 10.0 volts.
- Step 10:** Press and hold the “SET” key for one second. The display will read “HoLd”. Wait for the display to reset and display 10.0.
- 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.

## Current Input Calibration

The DE20 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 13).

### 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 potentially lethal voltages. Exercise **EXTREME CARE** and wear tested electrician’s gloves whenever power is on.

## AVERTISSEMENT

Les procédures de calibration nécessitent l'enlèvement du panneau arrière du contrôle. Ça exige aussi que le courant électrique est allumé ce qui expose le technicien à des tensions potentiellement létales. Utilisez toujours un soin extrême et portez des gants certifiés d'électricien quand le courant est allumé.

### Calibration procedure for a current input:

**Step 1:** Turn OFF 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 decrease “↓” key and increase

“↑” buttons 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 the 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)

The T-DE20 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 13).

## Configuration

To enter the configuration mode, press the increase “↓” and decrease “↑” keys simultaneously for approximately 6 seconds (display will first show internal junction value followed by “AC.0”). While the “0” is flashing, adjust this value to “11” using the increase “↑” key. Then press the “SET” key.

The first setting to be displayed is the “U1” setting. See setting summary below. 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

<u>Label</u>	<u>Settings</u>	<u>Description</u>
U1	Sensor Type	Used to select the type of sensor
U2	Signal Offset	Offset value from -9 to +9 applied to reading
U3	N/A	
U4	Signal Filter	Adjustable running average filter on input signals
U5	Set Point Dead Band (SP1)	Value from 1 to 99 applied to SP1
U6	N/A	
U7	N/A	
U8	Display Stabilizer	Reduces display instability when used in conjunction with U4
L	Set Point Limit	High set point limit for heat, cool, standby and alarm
F1	N/A	
F2	Heat/Cool Switch	Toggle flag selects relay for direct vs. reverse acting
F3	Alarm Enable	Toggle flag to enable the “alarm set point” feature
F4	Unit Display Enable	Toggle flag enabling temperature units to be displayed
F5	Temperature Unit	Toggle flag to select °F or °C
F6	N/A	

## U1, Sensor Type

This setting tells the DE20 control what type of sensor it is using.

<u>Value</u>	<u>Board</u>	<u>Sensor Type</u>	<u>Sensor Description</u>
1	5413	2-wire RTD	Platinum RTD, TCR 0.00385 ohm/ohm/°C
2	5413	2-wire RTD	Platinum RTD, TCR 0.00392 ohm/ohm/°C
3	5415	3-wireV RTD	Platinum RTD, TCR 0.00385 ohm/ohm/°C
4	5415	3-wire RTD	Platinum RTD, TCR 0.00392 ohm/ohm/°C
5	5417*	Thermocouple	J-Type Iron-Constantan NIST Monograph 175 REV ITS-90
6	5417*	Thermocouple	K-Type Chromel-Alumel NIST Monograph 175 REV ITS-90
7	5417*	Thermocouple	T-Type Copper-Constantan NIST Monograph 175 REV ITS-90
8	5417*	Thermocouple	R-Type Platinum, 13% Rhodium-Platinum NIST Monograph 175 REV ITS-90
9	5415	Voltage	Potential signal (1.0 to 10.0 V)
10	5415	Current	Current signal (4.00 to 20.00 mA)
11	5415	Frequency	Pulse train frequency (0 to 200 Hz, counts per second)
12	5415	Resistance	Pure resistance signal (0 to 1000 ohms)

**Note:** The 5415 sensor board will also accept 2 wire RTDs. The default sensor type setting is “1” (1000 ohm 2 wire RTD). When using the 5415 sensor board, an “on-board” DIP switch must also be configured, see page 13.

\*Input board 5417 is no longer available.

## 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 (°C, °F, 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

Not available.

## 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 DE20 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 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 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:** 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 Dead Band

Not Available

### U7, Power Save Set Point Dead Band

Not Available

### 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 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:** Setting represents hertz (counts/second)

**The default value for this setting is +999.**

### F1, Emulation Flag

Not available

### F2, Heating or Cooling Switch

When the setting is turned OFF (0), then the relay is reverse acting. That is, when a sensor reports a temperature less than the SET POINT, the relay is energized. At temperatures greater than the SET POINT, the relay is de-energized. This setting is common for heating applications.



### 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 Flag

This setting may be set to a zero (0) or a one (1). When set to one (1), the DE20 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 Flag

Not available.

### Sensor DIP Switch Settings

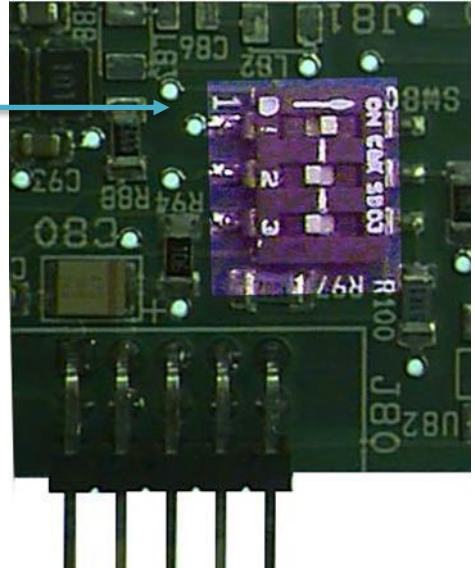
When using the sensor 5415 board, an “on-board” DIP switch must also be configured. The DIP switch settings are as follows:

#### Sensor DIP Switch:

##### *Selections*

<u>Sw1</u>	<u>Sw2</u>	<u>Sw3</u>	<u>Type</u>
OFF	OFF	OFF	1000 ohm RTD
ON	OFF	OFF	100 ohm RTD
OFF	ON	OFF	voltage
OFF	OFF	ON	current
OFF	OFF	OFF	frequency

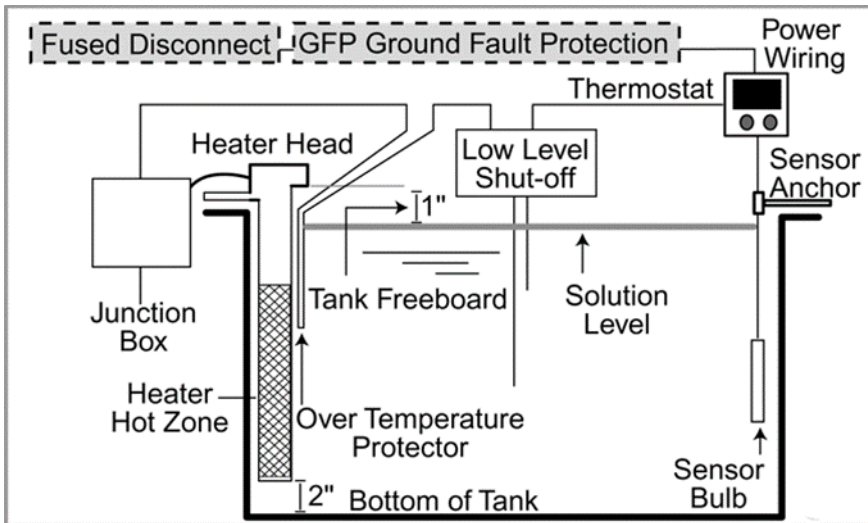
(Illustration shows DIP switch setting for 100 ohm RTD.)



## 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.

## Illustration of a Typical Heater Installation in a Process Tank



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