

Installation and Calibration Instructions

INTRODUCTION

The Model T287 is a microprocessor based 2-wire transmitter that features high accuracy and high long-term stability. The T287 sets a new standard in ease of setup. These transmitters feature PC programmable configuration technology. The unique communications adapter cable provides a fully isolated serial interface and power source, thus allowing the transmitter to be configured with just a PC – no external power supply, calibrator or meter is required.

Your Model T287 comes from the factory pre-configured as an RTD transmitter, programmed for a type Pt-100, 3-wire RTD, with a temperature range of 0 to 100°C. The unit can be easily re-configured using the C680-0001 Configuration Software. Only one copy of the software is required, and can be used with an unlimited number of T287 transmitters.

QUICK START

Before beginning the process of setting up the transmitter, it is important to understand the difference between *calibration* and *configuration*. The transmitter's precision references are *calibrated* at the factory and may be adjusted later if necessary. *Configuration* is the process of defining the sensor type and range in engineering units. Connecting the transmitter to a PC, and running the configuration software performs a *configuration*. Because the communications adapter provides power to the transmitter's microprocessor, it is not necessary to provide any external power to the transmitter in order to configure it.

1. Install the Configuration and Calibration software.

Run the file "TConf50.exe" on the CD-ROM. It will create a program group labeled XXXX. From the Programs menu of your Start tab, select XXXX and run the program YYYY.

2. Connect the Communications Adapter to the computer and transmitter.

3. Identify the serial port to which the Adapter is connected.

Select "Options" from the menu bar, then click "Communications" and select the correct COMM port from the pull-down menu.


4. Configure the transmitter.

What you will need:

- PC
- Communications Adapter
- Transmitter

CONFIGURATION

The Communications Adapter powers the transmitter from the PC's serial port. It is not necessary to provide external power in order to configure the transmitter.

1. If it did not happen automatically, when you connected the transmitter, you will need to **Upload**  the current configuration from the transmitter.


2. Configure

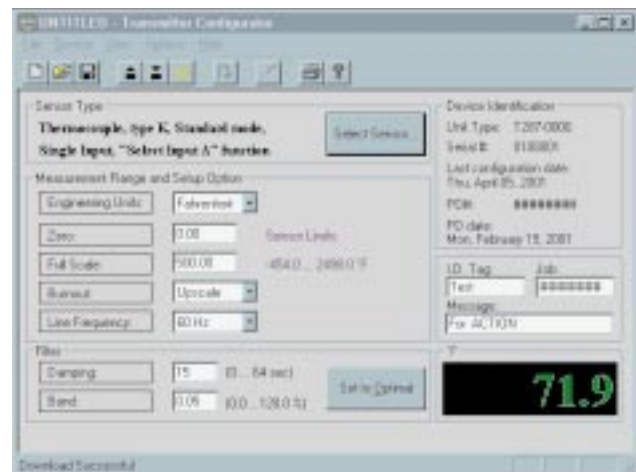
• If the current "Sensor Type" does not match the application, click on the "Select Sensor" box then select the appropriate tab at the top of the "Input Sensor Selection" screen.

• Select whether Single Input or Dual Input is desired. (Refer to the **Configuration Options** section for more explanation on the Dual Input option.) Select the Type of input. Most applications will work with the Mode/Transfer Function set to Standard or Linear depending upon which input type is used. If the application requires the Polynomial or User Defined table, check the Configuration Options section and the User's Guide located on the CD-ROM. Click the "OK" button to return to the Configuration Screen.

• Select the Engineering Units (from the pull-down menu), enter the "Zero Scale" and "Full Scale" values and the "Burnout" mode (transmitter to go above full scale or below zero scale upon input failure). Also, ensure the proper "Line Frequency" is selected.

• Click the "Set to Optimal" button to optimize the transmitter's filtering. (Refer to the **Configuration Options** section and the User's Guide for a more detailed explanation.)

3. Next, Download  the new configuration to the transmitter. the new configuration to the transmitter.



WIRING INSTRUCTIONS

1. Physical dimensions for mounting are shown in Figure 2.

2. Connect the input signal wires according to the interconnection diagram shown in Figure 1.

3. Connect the output signal wires to the controller or digital indicator with a power supply to create an output loop as shown in Figure 1. Observe proper polarity.

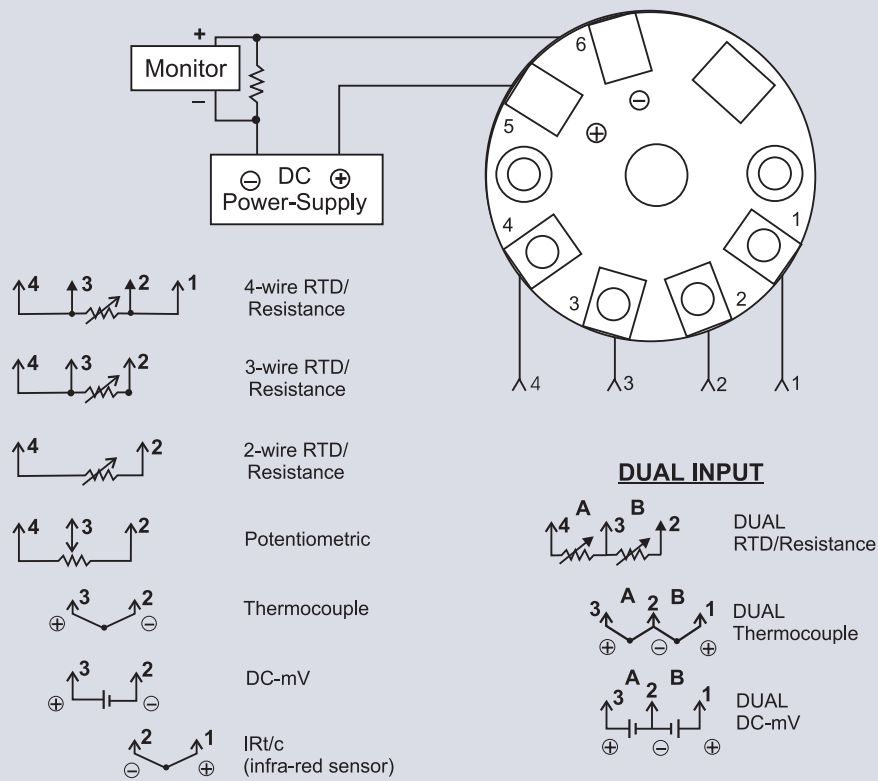


Figure 1: Terminal Assignment

CONFIGURATION OPTIONS

The Model T287 is capable of performing many functions in addition to the simple example outlined in the Quick Start exercise.

SINGLE VS. DUAL INPUT MODE

The T287 is capable of supporting either single or dual inputs. In the dual input mode, either input can be selected to control the output or math functions can be applied where both inputs have an effect on the output. The functions available are Sum, Difference, Average, Higher of the two or Lower of the two inputs.

OTHER TRANSFER FUNCTIONS

The transfer function is the “formula” the transmitter uses to determine the appropriate output signal for a given input signal.

- A “Linear” function means the output is changed in a straight line fashion as the input changes within the configured input zero and full scale range. Zero percent of range input yields 4mA output and 25% of range input yields 8mA, etc.
- A “Standard” function means the transmitter will apply a standard linearization curve for temperature inputs.
- RTD sensor matching, square root, custom Polynomial and custom User Defined Tables are described below.

RTD SENSOR MATCHING

The accuracy of RTD temperature sensing can be increased significantly when the temperature transmitter is “matched” to the individual sensor using a method called Callender-van Dusen linearization. Doing so requires entering the sensor’s Alpha, Beta (measured for temperatures above zero and for temperatures below zero), Sigma, and Ro values into the transmitter’s configu-

ration. These values can be requested from the manufacturer when the sensor is purchased or may be measured by a testing lab.

SQUARE ROOT

Select this function if the transmitter’s output is to vary with the square root of the input.

CUSTOM POLYNOMIAL

The transmitter can use up to a 10th order polynomial equation ($y = A_0 + A_1x + A_2x^2 + \dots + A_{10}x^{10}$) as the transfer function by inputting the coefficients into the transmitter’s configuration.

CUSTOM USER DEFINED TABLE

The transmitter can use a User Defined Table by specifying a .tbl file. The data in the file should be two columns, separated by either a single space or a tab. Up to xx data pairs may be listed. The input values in column one must be equally spaced in value.

DYNAMIC INPUT FILTERING

Filtering is provided to optimize the stability and response of the transmitter output signal. The filter is set by specifying a filter band and a damping time constant. To simplify the definition of the filter values, click on the “Set to Optimal” button on the configuration screen.

DAMPING FILTER BAND

The Damping Filter Band allows the transmitter to be configured to react quickly to significant changes in input while smoothing out small changes. This band defines the range above and below the current input reading within which the damping time constant will be applied. It is defined as a percent of the configured span of the transmitter. For example, a 0.5% Damping Filter Band on a transmitter configured for an input range of 200 to 700 degrees F,

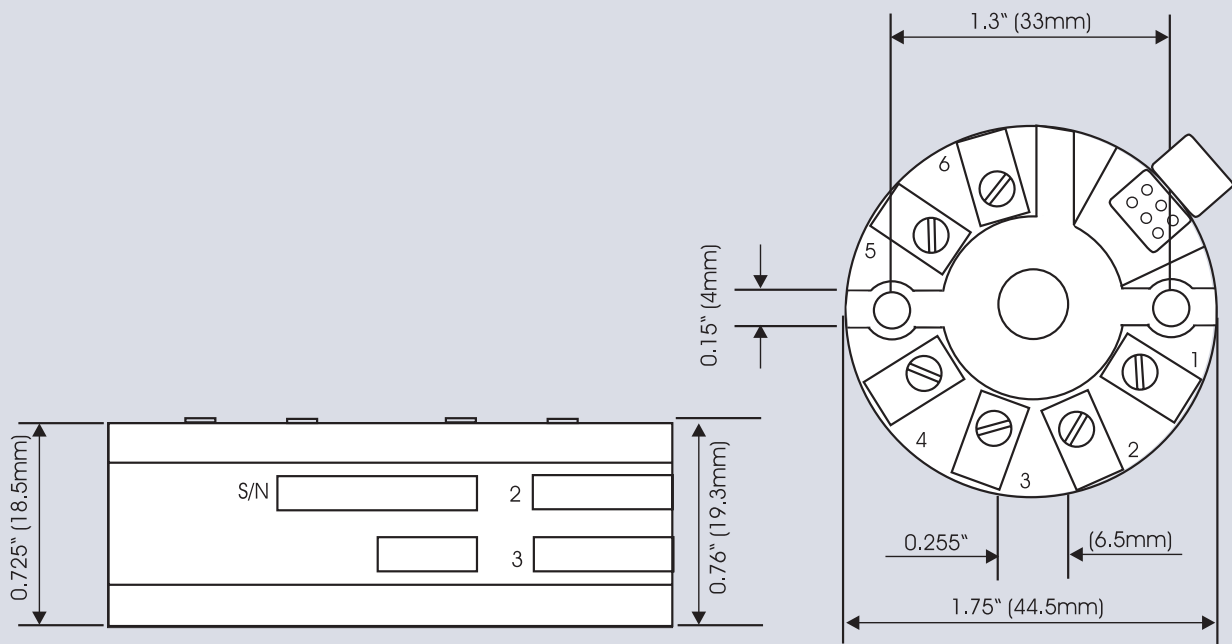


Figure 2: Dimensions

would mean the damping time constant will be applied to input changes of less than 2.5 degrees, but changes of more than 2.5 degrees would be immediately reflected in the output. In general, the larger the full scale range, the smaller the Damping Filter Band should be. Conversely, a larger filter band is generally appropriate for smaller input ranges. Clicking the “Set to Optimal” button triggers the calculation of an appropriate setting based on the currently defined input range.

DAMPING FACTOR

Damping defined as the length of time, in seconds, the input will be averaged over to determine the output value when the input change is less than the Filter Band. Changes in the input that are greater than the Filter Band bypass the Damping Filter and are reflected in the output. The default value of 15 seconds, when used with the optimal Damping Filter Band yields a very stable output while maintaining a fast response to significant changes in the input.

DEFINING THE TRANSMITTERS USER FIELDS

Each unit may be assigned an I.D. Tag name of up to eight characters, Job Number up to eight characters, and a “Message” of up to sixteen characters stored in the transmitter’s memory. Click on the desired field, enter the text, and click the download icon.

SAVING THE CONFIGURATION INFORMATION TO A FILE

The transmitter’s configuration information may be saved to a file by clicking the diskette icon on the toolbar and specifying a file name and location.

PRINTING THE CONFIGURATION INFORMATION

Clicking the printer icon on the toolbar will initiate the printing of a preconfigured summary of the transmitter’s configuration and calibration information. The report includes the current time and date, the date of the last calibration, and date of the last configu-

ration. Printing this report before and after calibrating a unit provides “as found” and “as left” documentation.

CALIBRATION AND ADJUSTMENT

The Model T287 is supplied factory-calibrated, with calibration reference parameters stored in the unit’s non-volatile memory. Calibration requires high precision input sources for parameters such as mV, mA, resistance and temperature. Regardless of when and how changes of calibration settings were performed, the original factory-calibration parameters may be restored at any time during the life of the unit.

INSTRUCTIONS

Instrumentation requirements:

1. High-Precision 100mV source, 1 μ V resolution.
2. Precision 20.000mA current monitor.
3. Precision 300.000W resistor.
4. Precision ambient temperature thermometer.
5. Precision thermocouple simulator/calibrator.

Connect the device to the power source and current output monitor according to the wiring diagram. Connect the device to the programming adapter and start the configuration software. Allow for a minimum warm up time of 15 minutes.

From the “Device” drop down menu, select “Calibration”. A prompt for the password will be displayed. After entering the password (the default password is the device serial number) the “Device Calibration” screen will appear.

OUTPUT CALIBRATION

From the “calibration references” list, select: Output 4 mA. Use the output scroll bar to adjust the reading of the current monitor to 4.00mA. Press the “send to device” button. The new reference will be downloaded to the unit.

From the “calibration references” list, select: Output 20 mA. Use the output scroll bar to adjust the reading of the current monitor to 20.00mA. Press the “send to device” button. The new reference will be downloaded to the unit.

V CALIBRATION

From the “calibration references” list, select: “Input mV”. Connect the precision 100.000mV source to the device mV input terminals. Wait for the mV display to settle to within the required accuracy. Once the display turns green you may press the “send to device” button. The new reference will be downloaded to the unit.

Ohms Calibration

From the “calibration references” list, select: “Input Ohms”. Connect the precision 300.000W resistor to the device Ohms input terminals in the 4-wire configuration. Wait for the Ohms display to settle to within the required accuracy. Once the display turns green you may press the “send to device” button. The new reference will be downloaded to the unit.

CC CALIBRATION

From the “calibration references” list, select: “CJ temperature”.

Cold junction temperature may be calibrated in one of two ways:

1. Direct setting mode: Select “Direct setting” from the CJ temperature drop down menu. Use the precision ambient temperature

thermometer to measure the temperature of the thermocouple input terminals. Then enter the value of the measurement in the input terminal temperature window. Wait for the display to settle then press the “send to device” button.

2. Simulation mode (recommended): From the CJ temperature drop down menu select one of the available thermocouple type simulation possibilities (whichever is more convenient). Using the precision thermocouple calibrator and the same type thermocouple wires, simulate an ambient temperature of 20°C to the thermocouple input terminals and enter this number into the input terminal temperature window. Wait for the display to settle then press the “send to device” button.

RETURN TO FACTORY CALIBRATION SETTINGS

Restore a single parameter – when a specific parameter is selected inside the calibration menu, it is possible to return to the original factory settings by pressing the “default” button.

Restore all parameters – to restore all of the calibration parameters to the original factory calibration settings, the calibration menu must be started anew and NONE of the parameters should be selected. Pressing the “default” button will restore the factory settings for all of the calibration references.

SPECIFICATIONS

Input Types

Thermocouples: Most standard types and all special types using customer defined tables and polynomials.

RTD: 2-, 3- and 4-wire, Pt-100, Ni-110, Ni-120 and other RTDs. Includes Callandar-Van-Dusen adaptation and custom sensors linearization with user defined tables and polynomials.

DC mV: -10 to 100mV

Potentiometers: 0 to 20kΩ

Resistance: 0 to 400Ω

General Specifications

Minimum Range	2mV
Output	4-20mA
Supply Voltage	9-40VDC (@ no load), reverse polarity protected
Maximum Load	$R_{max} = (V_{supply} - 9V) / 20mA$
Operating Temperature	-40 to 85°C
Storage Temperature	-55 to +125°C
Humidity:	0 to 95% RHNC
Response Time	0.3 seconds, to 90% of input (>3 updates per second)

Damping Factors	Programmable 0 to 64 seconds, to 0 to 120% of input range, using configuration software
Stability	Better than ±0.1% of span for 12 months
Isolation	2000VDC, input to output
RFI Protection	<1% effect of span at 20-1000MHz and at field strength of 20V/m

Performance Specifications

Output Resolution	0.015% of span (2.5μA)
Output Linearity (D/A)	Better than 0.02% of output span
Sensor Linearization	Better than 0.1°C for RTDs Better than 0.2°C for Thermocouple
Cold Junction Compensation	Automatic to within ±0.7°C for all thermocouples
Temperature Stability	0.015%/°C combined Zero and Span
Supply Voltage Effect	<±0.003% per volt
Calibration	Automatic, unit includes all the calibration parameters. The unit performs periodic zero & span self-test, and auto calibration.
Input Linearity	Better than 0.01% of span (mV input)

FACTORY ASSISTANCE:

For additional information on calibration, operation and installation please contact Action's Technical Services Group. Call toll free:

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