



Model C680-0001 Configuration Software User's Guide



**For use with Model T287
Programmable Transmitter**

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TABLE OF CONTENTS

INTRODUCTION	1
SOFTWARE INSTALLATION	1
CONFIGURATION	3
DOCUMENTATION	7
Transmitter User Identification	7
Saving Configuration Information	7
Printing Configuration and Calibration Information	7
INPUT FILTERING – THE SMART WAY	9
Damping Factor	9
Damping Filter Band	9
USER DEFINED TABLES	10
Temperature	12
General Purpose Inputs	12
Creating a Table from a Math Function	12
Applying the “USER DEFINED TABLE” Function	12
Callendar-Van-Dusen Applications	12
OTHER FUNCTIONS	13
Calibration	13
Trimming	13
Command Button Definitions	14
Advanced Trimming	15
Simulation	16
TROUBLESHOOTING	17

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INTRODUCTION

The T287 Series are state-of-the-art, microprocessor and flash memory based, high-performance 2-wire transmitters. The series provides new highs in measurement accuracy and stability. The unique and user friendly configuration software facilitates logical and speedy set-up of the transmitters. The serial port programming adapter cable provides isolated power to the transmitter's circuitry and enables full unit configuration using just a PC. No power supply, calibrator or meter are required.

The T287 transmitters are supplied with input and output reference parameters, fully factory calibrated. For actual operation, all that is required is to perform the simple and easy input configuration procedure.

SOFTWARE INSTALLATION

CAUTION: Before installing the software, it is always advisable to close all other applications including virus scanners and office suites. This is especially important for users running either Windows 3.1 or Windows 3.11. Failure to do so may result in the corruption of certain common files.

Application software may be launched automatically when a computer is started up in three ways; **autoexec.bat** file, the **config.sys** file and by Windows in its startup directory/folder.

The configuration software is provided on a CD-ROM. It may be installed on systems using Windows 3.1, 3.11, 95, 98, Me, 2000 or Windows NT. To install, insert the diskette into the CD-ROM drive on your computer and run "setup.exe". Follow the on screen instructions for complete installation.

For proper operation of your programming adapter, first identify the serial port to which it is connected. From the menu bar, select the "Options" menu, click on "Communication" and enter the correct COM port designation from the pull-down menu. (See Figures 1 & 2)

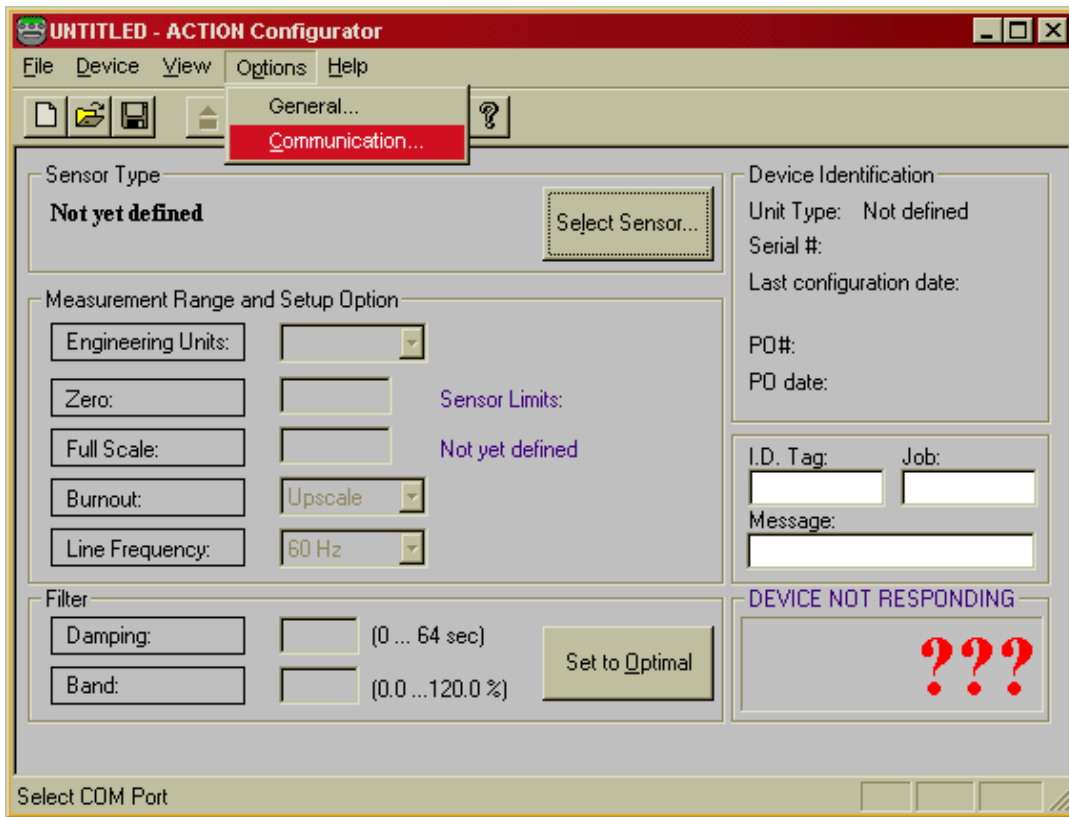


Figure 1.

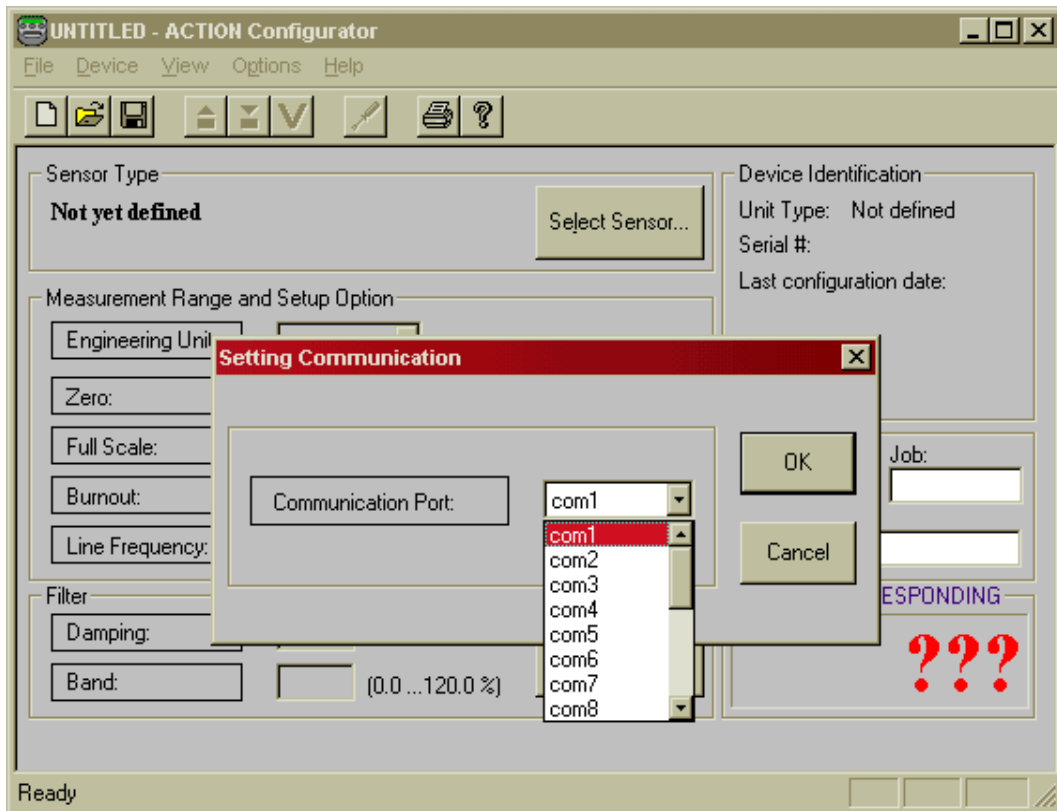




Figure 2.

CONFIGURATION

1. Connect the 9-pin connector of the programming adapter cable into the proper serial port of the PC.
2. Connect the plug on the transmitter side of the cable to the 6-pin jack inside the transmitter. **NOTE:** The connector for T287 is located under the cover on top of the unit, labeled PC Port.
3. Click on the configurator icon to start the program. 
4. When the connection is made and the program recognizes that a transmitter is connected to the serial port, the toolbar icons will become highlighted. If the transmitter was not automatically recognized, click on the “**UPLOAD**”  icon. This will begin the communication process between the transmitter and your PC. Once completed the transmitter's calibration and configuration settings will be loaded into your PC. (See Figure 3)

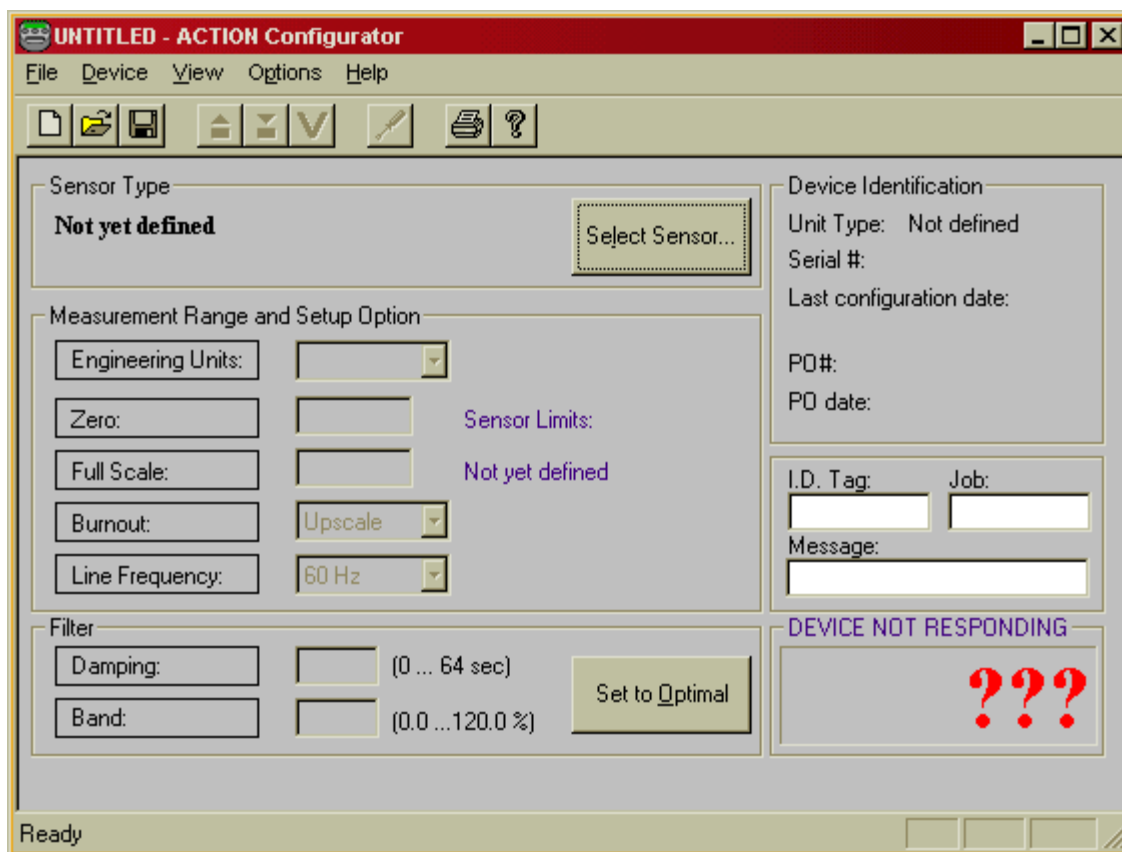


Figure 3.

Figure 3 is an example of the screen that will be displayed when the user opens the program. From this point you must plug-in the transmitter to the computer for the next screen (See Figure 4) to appear.

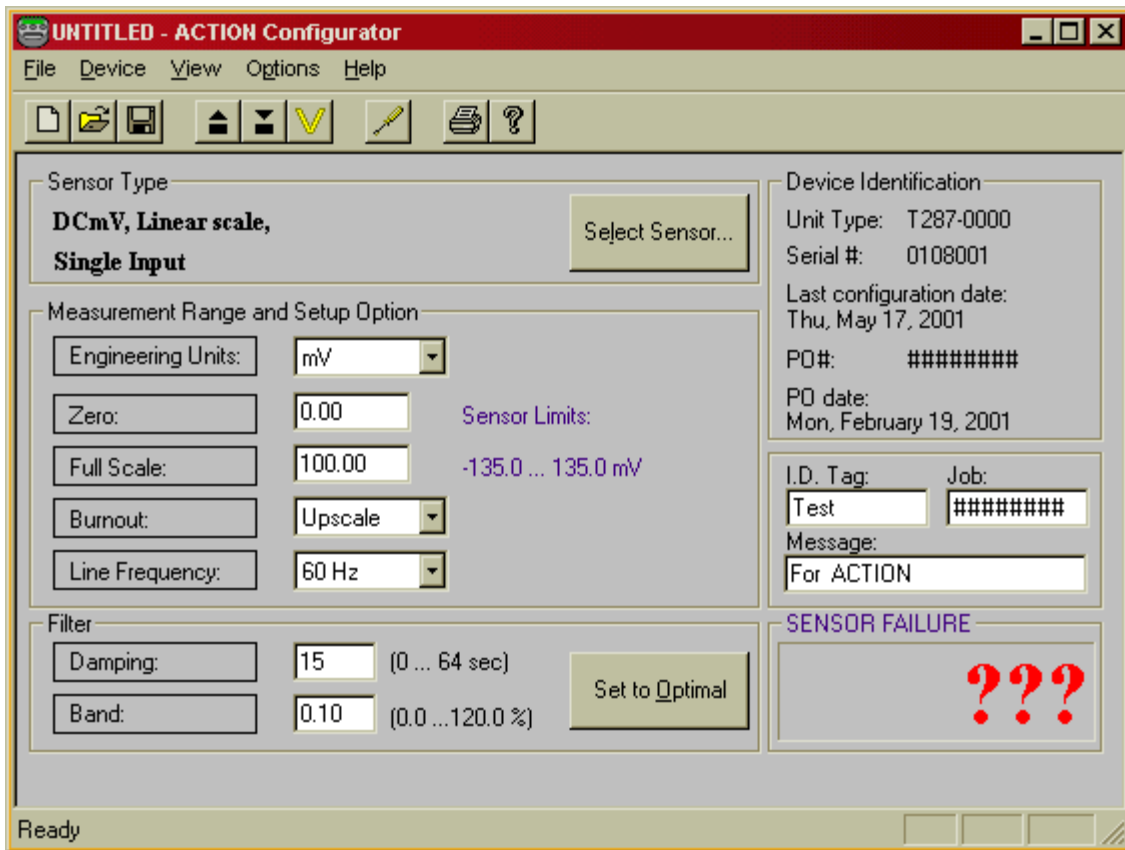


Figure 4.

- Select the input sensor type by clicking on the “**Select Sensor**” box.



From the sensor selection screen choose the proper “**TAB**” at the top of the screen for the sensor of your choice the specific sensor screen will now be presented (see Figure 5). You will also notice the T287 supports Single or Dual Inputs. Dual input can be used with 2-wire RTD, resistance, thermocouple, or mV inputs. Refer to the Installation Guide for the terminal connections for this mode.

In Dual Input mode, math functions are available to the user. The math functions available are:

(A+B)	Sum
(A-B)	Differential
(A+B)/2	Average
Min(A,B)	Minumum
Max(A,B)	Maximum

- Click on the various selection boxes which best define your sensor's parameters. Click the **OK** button to return to the main screen. On the main screen next to the **"Select Sensor"** box you will see the **Sensor Type** that has been selected. (See Figure 6) This is to confirm the selection made on the previous screen.



Figure 6.

- Next select the **"Engineering Units"** when appropriate from a pull-down menu. The choices will be °F, °C or °K. (See Figure 7)

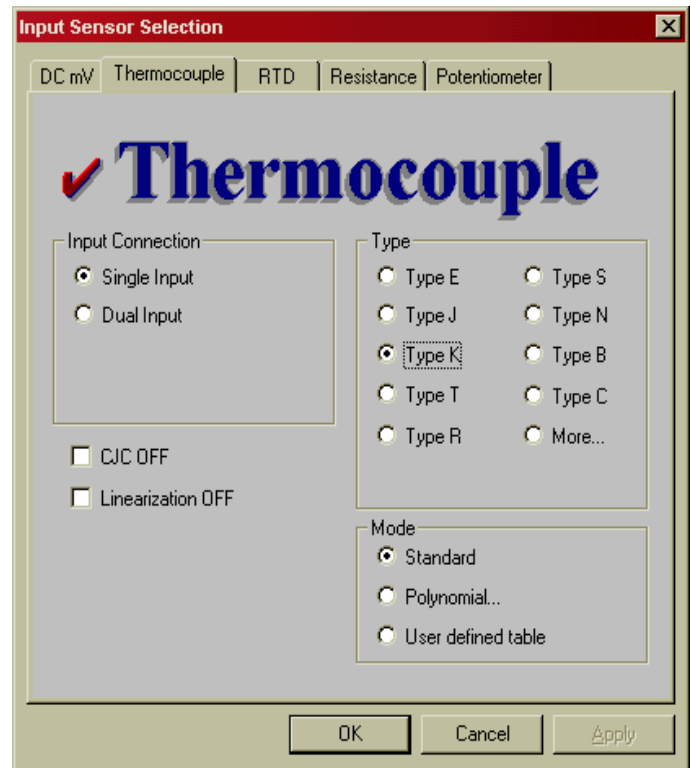


Figure 5.

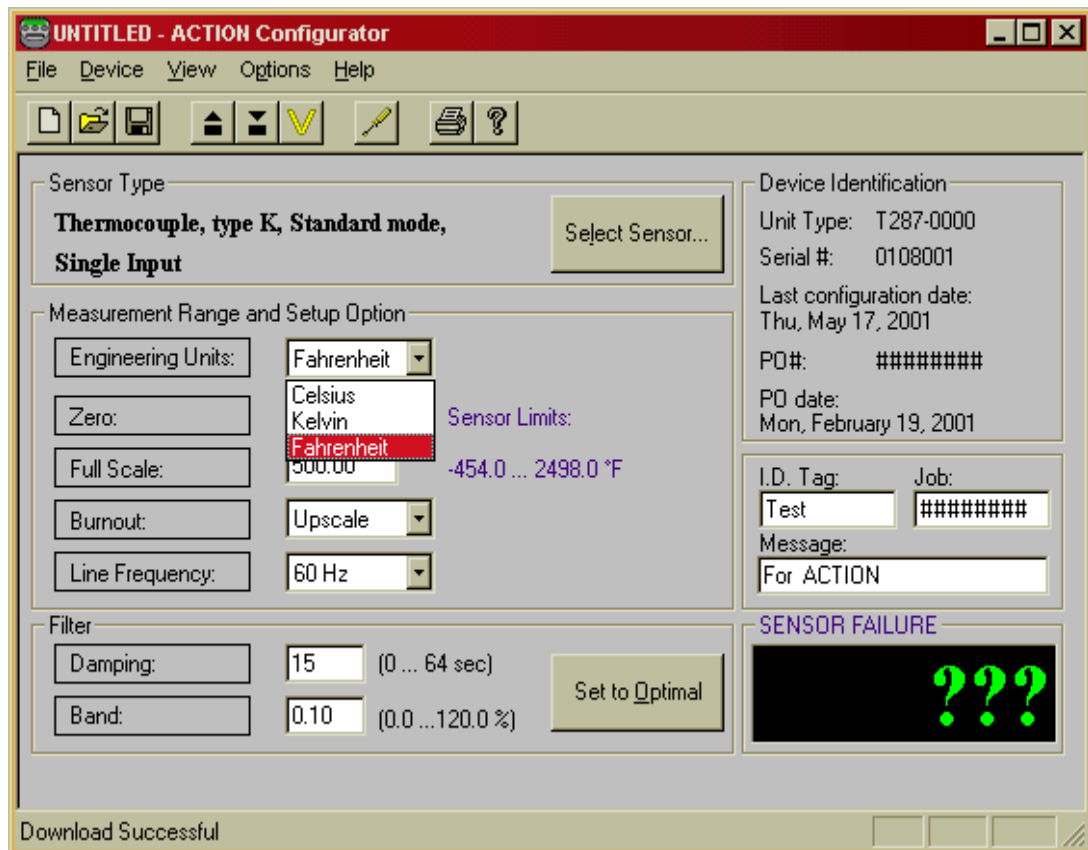


Figure 7.

8. TAB down to the next box which is **“Zero”**. Just to the right of the **“Zero”** box in blue type is the maximum allowable measurement range for the selected sensor. Enter the **“Zero”** value to define the specific low input range. Next TAB down to the **“Full Scale”**. Enter the **“Full Scale”** value that defines the transmitters high input range. (See Figure 8)

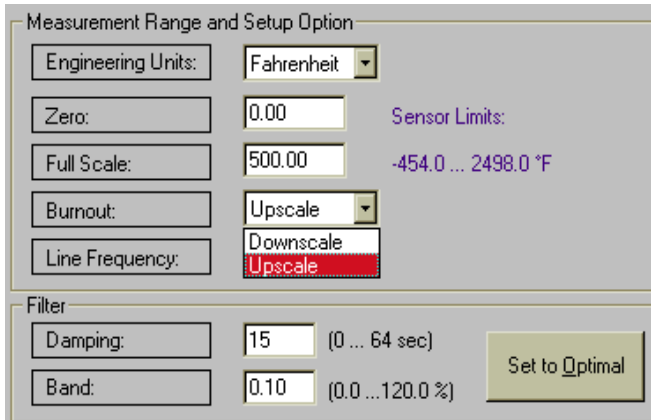


Figure 9.

11. Next Click on the **“Set to Optimal”** button to enable the computer to calculate and select the optimal values for the damping factor and the damping filter band. (See page 9 for more information on this function)

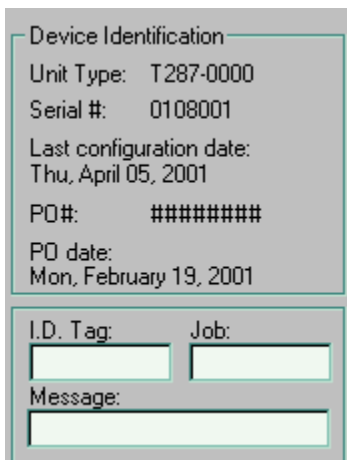
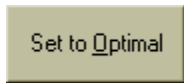


Figure 11.

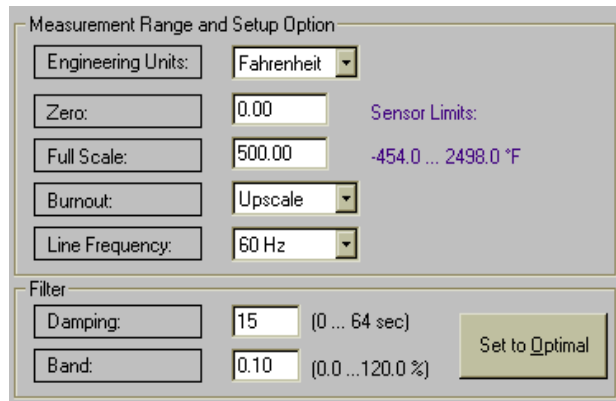


Figure 8.

9. TAB to the **“Burnout”** mode and select from the pull down menu either Upscale or Downscale. (See Figure 9)
10. Next TAB to the **“Line Frequency”** and select from the pull-down menu and select 50Hz or 60Hz as appropriate. (See Figure 10)

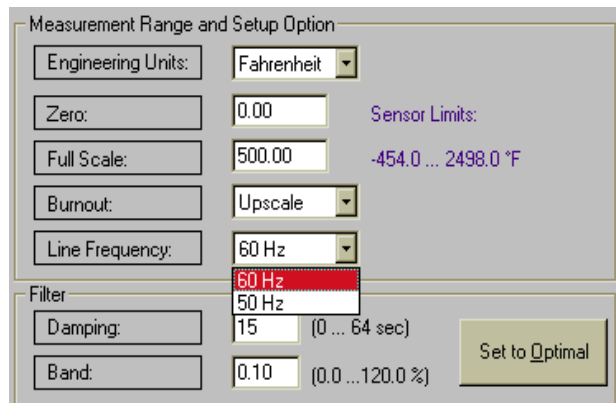


Figure 10.

12. You may now TAB over to the **I.D. Tag:** and type in up to eight alpha -numeric characters for a description to be saved in the transmitter's memory. You may do the same for the **Job:** and **Message:** boxes and type in information in these boxes. Message will store up to sixteen characters, please refer to Figure 11.
13. Now, click on the **“DOWNLOAD”** icon. This will instruct the PC to calculate the new reference parameters and download the new configuration values into the T287 transmitter.

DOCUMENTATION


Transmitter User Identification

The T287 transmitters contain several fields, which may be used to specifically identify that individual unit. These include:

- I.D. Tag:** Up to 8 alphanumeric characters
Job: Up to 8 alphanumeric characters
Message: Up to 16 alphanumeric characters

These fields can be changed or modified at any time. Just click on the appropriate field and enter the text. To conclude and save this information click on the **“DOWNLOAD”** icon. The information will be downloaded and stored in the transmitter's memory. Any transmitter configuration information can be retrieved at any time just by clicking on the **“UPLOAD”** icon.

Saving Configuration Information

Each T287 specific configuration may be saved into a standard file. This information may be used for future references, re-loading, archiving, statistical comparative analysis and records. To **SAVE**, click on the **“DISKETTE”**  icon in the tool bar and specify a file name and directory location to which the file is to be saved. Should the user have many transmitters that will be configured with the exact same parameters you may use the file to configure the other transmitters.

Printing Configuration and Calibration Information.


Click on the **“PRINTER”**  icon on the tool bar to initiate the printing of the transmitter's configuration and calibration information. The report will include the values of the unit's own input and output calibration reference codes, configuration reference codes, current time and date, the date of last configuration and the date of the last calibration. The printed information can provide invaluable data in the systems' performance research, error corrections, and “before” and “after” analysis. (See Table 1.)

Table 1.**Configuration and Calibration Information****Device Status**

Unit Type:	T287
Serial Number:	0108001
Tag:	030101
Message:	
Job:	
PO Number:	
PO Date:	
Last Configuration Date:	Fri, February 16, 2001

Sensor Type

**Thermocouple, type K, Standard Mode,
Single Input**

Input Range and Setup Option

Engineering Units:	Fahrenheit
Zero:	0.00
Full Scale:	500.00
Burnout:	Upscale
Line Frequency:	60 Hz

Filter

Damping:	15 sec.
Band:	0.44%

Calibration References

Output 4mA:	1782
Output 20mA:	8948
Input mV:	91.289
Input Ohms:	301.023
CJ Temperature:	296.768

Last Calibration Date:	Fri, February 16, 2001
Device Program I.D. :	31977.2

Printed on: Friday, February 16, 2001, 12:06:17

INPUT FILTERING - THE SMART WAY

Input filtering is of great importance in measurement application with a low level signal. The effect of low pass filtering is to average out small transients of the input parameter resulting from process and sensor noise, as well as externally generated electrical noises. To overcome the sluggish response, associated with long filter settings, the T287 uses a **Selective Filtering** technique. This method allows the transmitter to achieve a fast response for significant variation, yet to provide a stable, smooth and noise free output.

Damping Factor

The **Damping Factor** provides a measure of the time (in seconds) over which the input signal will be averaged. The greater the **Damping Factor**, the smoother the output (and the slower the measurement). **Selective Filtering** implies that **Damping** is only applied over a limited input **Band** around the input levels where noise is most likely to be found. This is the **Filter Band**.

Damping Filter Band

The **Filter Band** is defined as the band (in % of the input span) over which **Damping** is applied. A 1% **Band** for a transmitter with a measurement input span of 500° C means that **Damping** will apply to input variations of 5° C or less. However, changes in the input of greater than 5° C will be directly reflected in the transmitter's output without a delay.

Since noise levels do not vary largely between most applications it is sensible to assume that wide input spans would require low band settings and narrow spans would require large band settings. The configurator software provides for a calculated optimal filter setting suitable for the majority of applications, accounting for the specific transmitter input span.

To enable the automatic application of this function simply click on the "**Set to Optimal**" button. The settings may be changed at any time for applications where a high level of noise is known to exist, or in a slow responding system where a very smooth output signal is imperative.

USER DEFINED TABLES

Two methods are being used for creating “User Defined Tables”. One is for temperature sensors such as thermocouples and RTDs. The other is for inputs such as mV, Volts, mA, resistance and potentiometers. (See Figure 12)

The tables must be made in simple text (ASCII) files. These text files may be written in, or transferred to, any standard text editor. Lines containing notes, memos, comments and descriptions must be preceded with an asterisk (*). The * signifies to the software that this line is not a part of the conversion table. The conversion table must contain numerical values only! No letters, symbols or other characters are allowed. (See Table 2)

The table can consist of a maximum of 200 data pairs. The software will then reduce that set of data pairs to 170 points equally spaced. (If you only input 25 pairs, the software will still create 170 points.) Of those 170 points, 140 of them will represent the normal range from zero to span, 15 will represent overrange values and 15 will represent underrange values.

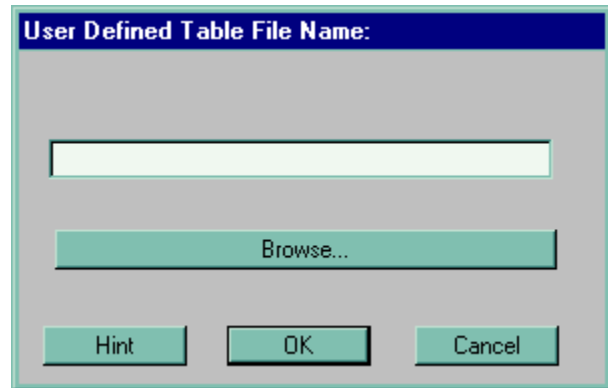


Figure 12.

This feature could come in handy where you have a curve that is fairly linear at the end-points, but is very non-linear in the middle. You would only have to use a few points on the ends and you have the majority of the points for the middle area.

Note: The Over and Under values each represent 10% of full scale span. Remember though, the 4 to 20mA output does not extend $\pm 10\%$.

It may also be useful to open up a special directory for storing such tables in order to facilitate easy access in future use. We also recommend using a .tbl file extension in order to distinguish these special files from others.

The table's first (leftmost) column must be monotonously increasing and increment values must be identical. Thus, each number must be smaller than the next one by the same amount. The second (right) column must also be monotonous, but in either increasing or decreasing order.

Table 2. was imported into the configurator software and will be used for the specific application. Every time the transmitter that has been configured for this table, it will look for the specific location for this table.

Table 2.

*User defined table for
 *IRt/c.xxx-K-80F/27C
 *Minimum range -70 degrees Celsius
 *Maximum range 200 degrees Celsius
 *First column degrees Celsius
 *Second Column mV
 *Delta 10 degrees
 *Use with Thermocouple Sensor Type, User defined table
 *Created November 7, 2000

-70.00	-2.59
-60.00	-2.26
-50.00	-1.92
-40.00	-1.57
-30.00	-1.20
-20.00	-0.82
-10.00	-0.42
0.00	0.00
10.00	0.44
20.00	0.90
30.00	1.38
40.00	1.90
50.00	2.44
60.00	3.01
70.00	3.62
80.00	4.26
90.00	4.95
100.00	5.67
110.00	6.45
120.00	7.28
130.00	8.16
140.00	9.09
150.00	10.07
160.00	11.09
170.00	12.16
180.00	13.27
190.00	14.40
200.00	15.55

The table's Input (left) and output (right) values should be separated by at least a single space or (TAB).

It is a good practice to include a description, references, dates, and other notes relating the specific application of the conversion table as a heading to the table.

Temperature

A user defined table consists of two columns of numbers. The first column is a list of numbers representing the input temperatures for which the table is defined. The temperature values should always be defined in degrees Centigrade. The second column represents the sensor's output at these temperatures.

General Purpose Inputs

The first column should display the values of the actual sensor output in mV, mA, Volts, Ohms, or % (for potentiometers). The second column should display the corresponding values in engineering units.

Creating a Table From a Math Function

If your sensor's transfer function can be described in a mathematical (trigonometric, log, etc.) equation it is an easy task to convert it into a table. Use any commercial spreadsheet software program, under Windows, such as Excel or Lotus, in order to generate a table as above. Use **"COPY"** and **"PASTE"** commands to transfer the table section to any text editor such as "Notepad" and edit the table and text according to the above instructions.

Applying the "USER DEFINED TABLE" Function

1. Select the input sensor for the application.
2. From the "transfer function" or "mode" selection box, select the "user defined table" button.
3. Enter the minimum and maximum table input range.
4. Enter the table's complete file name.
5. Select the "OK" button.

The T287 device is now ready to apply the function.

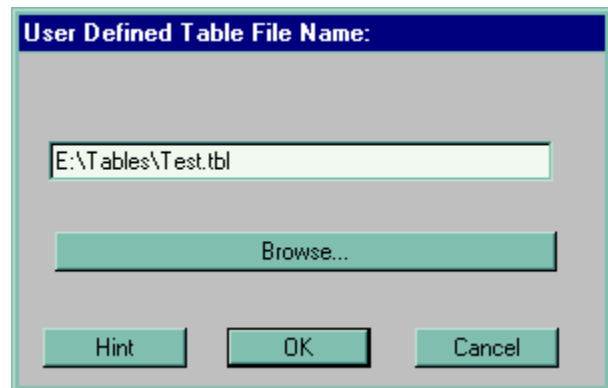


Figure 13.

Callendar-Van Dusen Application

The Callendar-Van Dusen formula provides constants for a third order polynomial equation, which then approximates the actual Pt-100 RTD's resistance to a high degree of precision. Of course, the specific RTD needs to be precisely characterized by exact temperature testing, and the coefficients should then be calculated.

- a Alpha is the nominal coefficient for the RTD, which, for most standard elements will be in the vicinity of 0.00385 (DIN curve).
- b Beta is zero (0) for temperatures >0 degrees C. It is the significant constant for <0 ranges.
- d Delta is the significant coefficient for the higher temperature ranges. (See Figure 14)

The minimum and maximum values are the temperatures within the values for which the sensor was supposed to be defined and tested for. The units are always in Degrees C. If the sensor was tested and defined between -50° C and +450° C you may enter any values up to and including -50° C for the minimum value and +450° C for the maximum value.

Figure 14.

You MUST enter a value for Delta or else the program will request it. Typical values will run in the order of 1.40 to 1.60 for 100 ω (@ 0 Degrees C) elements. For units with the 0.000385 curve the typical values are in the order of 1.45 to 1.47.

Once you enter all of the numbers, the software will generate the linearization table for the particular range of the unit. Upon downloading, this table will be entered into the T287's memory.

Please Note: the values may be verified by using the device simulation function (Alt + S) and seeing that the device indeed provides the proper temperatures (and/or output values in mA) for the resistance's found by the element's tests, or visa versa.

OTHER FUNCTIONS

Calibration

Under the Device menu item is the selection labeled Calibration. This selection is password protected and should never need to be accessed by the user. Fine tuning or "Trimming" of the zero and span values can be adjusted with the Trimming function described below. If it is felt that the unit is out of calibration, please contact our Technical Services Group at 1-800-767-5726.

Trimming

Realizing that sensors are not always perfectly matched to their ideal curves, the Trimming function allows the user to fine-tune the transmitter's calibration to match a specific sensor to its ideally defined parameters. The Trimming function is a "smart" substitute for the "zero" and "span" adjustment potentiometers. Trimming may be applied to a low (zero) or a high measurement point (span), much like the conventional "zero" and "span" adjustments.

Trimming is not password protected and is selected from the Device menu. Once selected, the screen shown in Figure 15 will appear. To activate the screen, click in the Trim On box. Your window should now look like Figure 16.

Note: The Trimming function is only available in Single Input mode.

Command Button Definitions

OK	Transfers the specified trimming parameters to the transmitter.
Clear	Clears the trimming parameters from the configuration screen
Trim On	Enables On-Line “Zero” and “Span” trimming controls. Applies the trimming parameters to the transmitter. Disabling “Trim On” restores the original calibration to the trimming screen.
Cancel	Closes the “Trimming” configuration screen with no changes being applied.
Restore	Restores the last transferred trimming parameters from the transmitter to the trimming configuration screen.
Lock/Unlock	Enables/Disables slide control action of the Zero and Span trimming controls.
Advance	Opens the Advanced Trimming configuration screen.

The basic “Trimming” screen allows for a zero and span potentiometer-like trimming of the transmitter. To perform the trimming operation, first select Trim On, as shown in Figure 16. Then, apply a known signal at the low end of the measurement range to the transmitter. Click the “Unlock” button of the “Zero” trimming control (refer to Figure 17). This will enable the slide control for “Zero”.

The button will have changed to a “Lock” button. Adjust the slide control bar of the “Zero” trimming control until the Disp. (display) and Output windows show the desired trimmed results. Once you have reached the proper results, click the “Lock” button of the “Zero” trimming control to fix the Zero trim at the selected values.

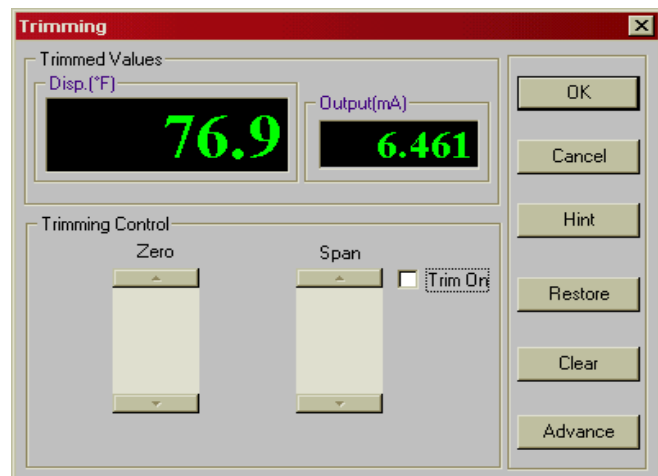


Figure 15.

Next, apply a known signal at the high end of the measurement range to the transmitter and click the “Unlock” button of the “Span” trimming control. As with the Zero section, the button will change to a “Lock” button. Adjust the slide control bar of the “Span” trimming control until the Disp. and the Output windows indicate the desired trimmed results. At this point, click the “Lock” button to fix the Span trim at the selected values.

If all the values are correct, press the OK button. The trimming parameters will now be downloaded to the memory of the transmitter.

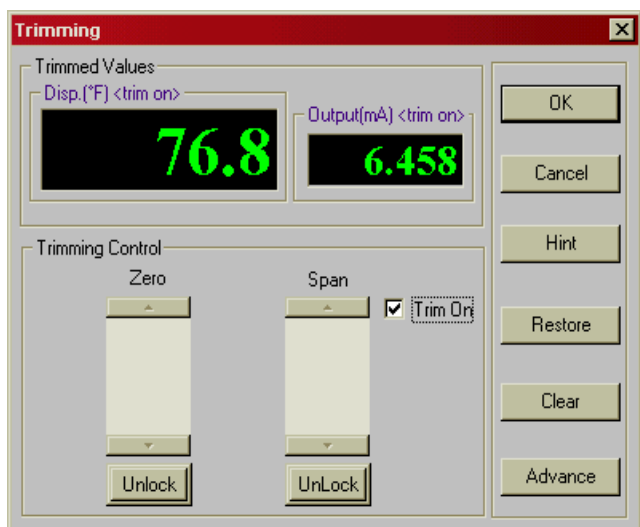


Figure 16.

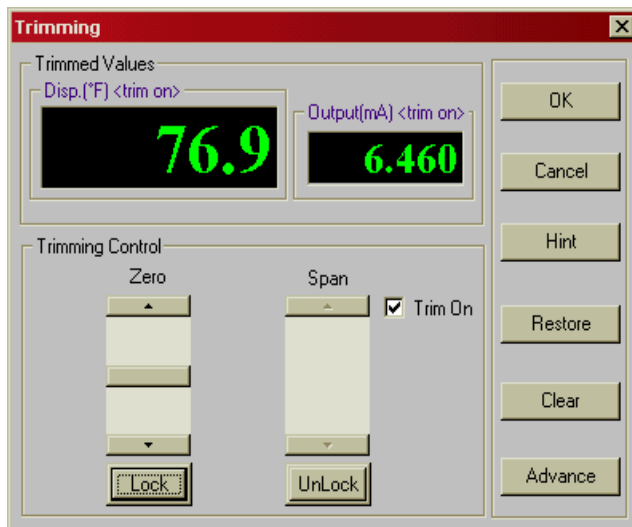


Figure 17.

Advanced Trimming

The Advanced Trimming screen extends the trimming features. It provides “Trim Data” and “Input” zones. (Refer to Figure 18)

Trim data – Displays both low and high trimming points (Inp), the corresponding trimmed input (Disp) and output (Output) values at these points. Optionally, values may be entered man-uually into the edit boxes.

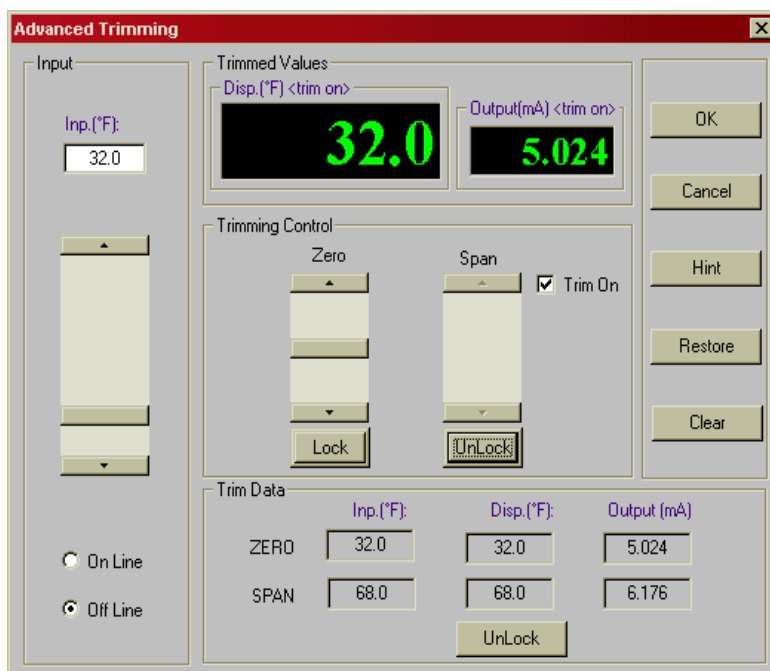


Figure 18.

Input – Enables to select either “On Line” trimming, using a physical input to the transmitter, or “Off Line” trimming using the scroll bar (or edit box) for input simulation.

Simulation

The Simulation function is also found under the Device menu. The Simulation function allows the user to check the relationship between the transmitter’s configured input, in basic electrical units (e.g. mV) to the scales or engineering units, such as °F or °C, and to its output, in mA and %. It is quite useful for evaluating and/or testing a control sequence in a PLC, PC, DCS or loop controller. (Refer to Figure 19.)

Simulation is also useful for testing a “Sensor v.s. Output” transfer function when using non-standard sensor transformations, such as Calendar-Van Dusen, Polynomial or User Defined Table.

Simulation may be either off-line or on-line. If no transmitter is connected to the PC, the simulation is off-line. Enter any one of the four values in the dialog box and the other three will automatically be calculated.

If communication between the transmitter and the PC is enabled, On-Line Simulation will be performed. As with Off-Line Simulation, enter any of the four values and the other three will be calculated. Click the “Apply” button and the transmitter’s output will be driven to the indicated value. For a continuous, dynamic update of the output, the “Dynamic Link” box must be checked.

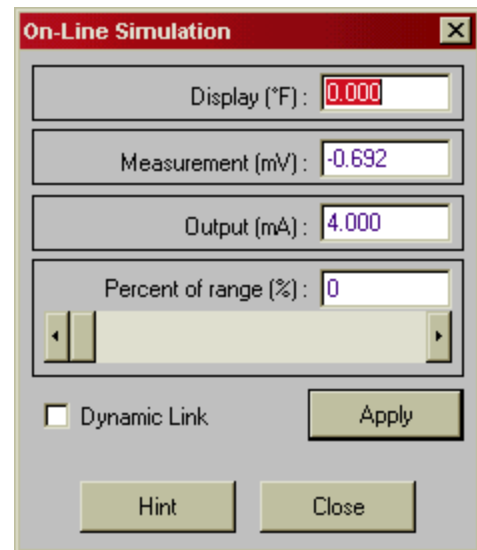


Figure 19.

Note: Allow for a two to three second delay for a change of a value to be effected at the output.

The scroll bar may be used to increase or decrease the transmitter’s output by fixed amounts. Clicking on the arrows at the ends of the scroll bar changes the output by 1%. Clicking inside the scroll bar changes the output by 10%.

Note: For temperature sensors, the entire range of Thermocouple and RTD tables for most standard sensor types is contained in the Simulation function.

TROUBLESHOOTING

The software will not load on my computer?

- There have been no problems reported under Windows 95, or later versions.
- Under Windows 3.1 and 3.11 empty the start-up directory, reboot, install the configuration software reboot, and then move things back into the startup directory and reboot again.

I am unable to communicate to my transmitter from my PC?

- From the menu bar, select the "Options" menu, click on "Communication" and enter the correct COM port designation from the pull-down menu.
- Exit and re-enter the program to implement the changes.

I am unable get the Trimming function to activate.

- First make sure you are in the Single Input mode.
- If you are, and still cannot open the Trimming function, check to see if you have a Dual Input Function listed after the "Single Input" statement.
- If there is a Dual Input Function listed, go to the "Select Sensor" screen, select Dual Input, then re-select Single Input.
- Next, Download to the T287 to re-initialize as Single Input. The Trimming icon should now be available.

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