BURNS® ENGINEERING

Model TL Linearized Platinum Resistance Thermometer Temperature Transmitter Instruction Manual

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Introduction
-General

The model TL Temperature Transmitter is designed to accept an input signal from a Platinum Resistance Thermometer (PRT) and provide a linearized 4 - 20 mA output current. The output current is directly proportional to the temperature sensed by the PRT and is independent of the supply voltage and load resistance in the output current circuit. Thus, the transmitter may be remote-mounted near the sensor reducing the effects of EMI/RFI noise and minimizing the signal error due to noise.

The Model TL Transmitter is designed to be direct mounted in the Burns #5 explosion proof connection head,remote mounted in an explosion proof assembly or panel mounted with 'snap track'.

The Model TL Transmitter can be calibrated in the field or laboratory using zero and span 21 turn potentiometers. Major changes in the scaling of the transmitter are achieved by replacing resistors located inside the unit. Besides the recalibration features, the model TL requires no field service. Microcircuit design and burn-in procedures ensure high reliability, high performance operation. All transmitters are 100% inspected and calibrated prior to shipment to ensure a quality product.

Other features include:

- Accepts input from 2-wire, 3-wire, or 4-wire PRTs.
- Inherent upscale burnout indication.
- Reverse polarity protected.
- Input/Output filtering minimizes errors due to transients and/or EMI/RFI interference
- Wide adjustability of ±25 deg C for zero temp, ±25% of span using precision 21 turn potentiometers.
- Field rescaleable - units can be scaled to any zero/span within -200 to 600 deg C range.
- Screw terminal connections accept 12-22 AWG wire - no need for spade lugs.

Introduction
-Repair and Warranty Service

Repair and warranty service is available directly from Burns Engineering. When returning goods, first call toll free 1-800-328-3871 and obtain an RMA number. Always include a letter of transmittal and the RMA number with the shipment. Providing the following information in the letter will expedite service:

- Type of service and length of time the part has been in service.
- Description of the problem, and circumstances of the failure.
- Name and telephone number of the person who can answer questions about the returned part.
- Complete shipping instructions for return delivery.
- Request for warranty service if appropriate.

For more information about repair and warranty service, please contact us at:

Burns Engineering Inc.
10201 Bren Road East.
Minnetonka, Minnesota 55343
1-800-328-3871

Note: Failure analysis is an important part of product improvement. If you have a failure, even if out of warranty, please contact us. We will do our best to help you.

Installation Mechanical
-Mounting

The Model TL temperature transmitter is designed to be process mounted into a Burns Engineering explosion- proof connection head, or remote mounted onto rack mounting or into a remote mount explosion-proof connection head.

Installation Mechanical
-Temperature Environment

The Model TL transmitter will operate within specifications for ambient temperatures in the range of -40 to 85 deg C. The transmitter can be stored without damage at temperatures in the range of -50 to 100 deg C.

Installation Mechanical
-Moist or Corrosive Atmospheres

The Model TL transmitter has been designed to resist moisture and corrosive environments. However, during prolonged exposure, corrosion of the terminal block screws can occur. Significant corrosion to the screws can increase the contact resistance between the PRT/power supply leads and the terminal block, causing erroneous readings and/or complete lack of output. Replacing and/or cleaning the terminal block screws will usually remedy the problem.

Installation Electrical
-Power Supply

The Model TL transmitter is designed to operate with an input voltage of 10 - 40 volts dc (measured at the input terminals of the transmitter). The Unit is factory-calibrated with an input of 24 volts dc. Thus, optimum accuracy will be achieved when the input voltage equals 24 volts dc. Supply voltages of less than 10 volts dc will not provide sufficient energy to power the transmitter output and may result in an erroneous output signal (under-powered output signals are typically lower than their true values). Supply voltages exceeding 40 volts dc may damage the transmitter circuitry beyond repair.

The following formula determines the maximum allowable load resistance in the power supply input circuit. The total load is the sum of the resistance of the signal leads and the load resistance of any controllers, indicators, and related devices. Note that the load resistance of intrinsic safety barriers must be included in the total load.

Load resistances exceeding the calculated amount may cause low voltage conditions at transmitter input terminals, resulting in erroneous output (see above).

$$R_{max} = (V - 10)/C_{max}$$

Where:

R_{max} = Maximum Load Resistance (ohms)

V = Power supply input voltage (volts dc)

C_{max} = .033 amps = Output current under upscale sensor burnout conditions

Installation Electrical
-Sensor Connections

The Model TL transmitter accepts input from several different PRT leadwire configurations. The correct wiring configurations are shown in figure 2.

Leadwire length may play a large part in determining the performance of the transmitter/PRT circuit. In general, long leadwires are sources of errors caused by uncompensated leadwire resistance and pickup of RFI/EMI noise. These sources of errors are particularly evident in 2 wire and 4 wire compensating loop circuits. The 3 wire PRT circuit offers the best immunity to both of these potential errors. However, when long leads are used it is always recommended that the wires are properly shielded (see recommended grounding practices on below).

Installation Electrical
-Grounding Practices

The Model TL transmitter will operate with the current loop either floating or grounded. However, best results will be obtained when the current loop circuit is grounded at the negative (-) terminal of the power supply. Do not ground the transmitter current loop at more than one location (see figure 3). The Model TL transmitter is not isolated, so there can be no grounds in the PRT circuit. Since PRTs are typically well insulated, this is normally not a limitation.

The input/output filtering circuits in the Model TL transmitter are coupled to the case and ground terminal of the transmitter. These circuits must be connected to ground to function properly. When mounting the transmitter in non-grounded enclosures, a grounding wire must be connected between the 'Ground' terminal on the transmitter and earth ground. It is recommended that shielded leadwire be used wherever possible. The shield drain wires should be tied together and then grounded at the negative terminal of the power supply and the 'Ground' terminal of the transmitter (see figure 3).

Installation Electrical
-Multi-channel Installations

A single power supply can be used to power several transmitter circuits. All transmitters must be in parallel and combined transmitter output must not exceed the power supply output limits.

Max output = # of transmitters * .033 amps (Transmitter output will be approximately .033 amps under sensor burnout conditions)

Installation Electrical -Transients

High-energy transients can damage the transmitter. If the transmitter is to be installed in an area where high-energy transients are probable, the input circuitry should be fitted with appropriate transient suppression circuitry. Consult factory for details.

Installation Procedures -Warning!

To avoid personal injury or property damage from electrical shock or contact with live electrical systems, or from combustible material or explosive gases which can be ignited by electrical arcing, install wiring, connection head and conduit in accordance with national and local laws, standards and codes, as well as industry standards.

Also, in hazardous areas, do not apply power to circuit until cover on explosion proof housing is in place and do not remove cover while circuit is alive.

Installation Procedures -Rack Mounting

The Model TL transmitter is designed to fit directly into snap track type rack mounts. No additional hardware is required.

1. Position transmitter mounting plate over snap track and push firmly until unit snaps into place.
2. Connect PRT and current loop leadwires to the appropriate terminals as shown in figure 2.
3. Ground the negative terminal on the power supply as shown in figure 3.
4. Ground current loop and shielded leadwire drains as shown in figure 3.

Installation Procedures -Process Mounting (Explosion Proof Enclosure)

Burns Engineering manufactures an explosion proof connection head designed for process mounting of the transmitter. The connection head installs directly onto a thermowell-1/2" NPT nipple subassembly. The ambient temperature conditions must not exceed those outlined in the Specifications section of this manual.

1. Thread the process mount connection head onto the 1/2" NPT fitting.
2. Insert the spring loaded PRT through the bayonet hole and down into the nipple and thermowell assembly. Turn the bayonet fitting 1/4 turn to lock into place.
3. Insert the 6-32 transmitter mounting screws into the transmitter mounting holes in the connection head. Screw in approximately halfway.
4. Insert the transmitter into the connection head and onto the mounting screws, label side up. Tighten down the transmitter mounting screws.
5. Connect the PRT leads to the A,B,C terminals on the transmitter as shown in figure 2.
6. Connect 3/4" conduit to the connection head. Thread current loop wires through conduit.
7. Connect the current loop leads as shown, figure 1.
8. Ground the 'Ground' terminal of the transmitter (figure 3).
9.Ground current loop leads and leadwire shields as discussed in Grounding section above (figure 3).
10. Make certain conduit seals are in place (where applicable). Tighten explosion proof connection head cover until gasket seats.

Installation Procedures -Remote Mounting

Remote mounting of the transmitter should be used when the ambient temperature conditions in a process mounted application exceed the maximum operating temperature range of the transmitter (see Specifications section of this manual). When remote mounting the transmitter, it is especially important to provide adequate shielding of the PRT leadwires to prevent EMI/RFI signal pickup. This shielding is usually in the form of metal conduit and shielded twisted pair leadwire. Do not run PRT input leads in close proximity to high-current/high-voltage wires.

1. Connect the PRT leadwires to the A,B,C terminals of the transmitter as shown in figure 2.
2. Connect the current loop leadwires to the +,- terminals of

the transmitter as shown in figure 1.
3. Ground the 'Ground' terminal of the transmitter as shown in figure 3.
4. Ground the current loop and shielded wires according to Grounding section above (figure 3).
5. Make certain conduit seals are in place (where applicable). Tighten explosion proof connection head cover until gasket seats.

Theory of Operation
-General

When connected to a DC power supply, the model TL transmitter draws a current that is proportional to sensor temperature, but is independent of supply voltage or load resistance in series with the transmitter. This 4-20 mA signal also powers the transmitter, so no other power source is required.
The Model TL transmitter is designed to be used with platinum resistance thermometers with Ro values of 100 ohms nominal. Other Ro value PRTs can be used (consult factory). The transmitter can be used with 2, 3 and 4-wire PRTs. Best accuracy is achieved when used with a 3-wire PRT.

The Model TL transmitter uses two precision .8 mA current sources to generate a voltage across the PRT sensing element and the compensating leads. The ratio of this differential signal to the transmitters zero resistance value is proportional to the 4-20 mA output and is used in conjunction with a gain-setting span resistor to generate the 4-20 mA output.

The linearizing circuitry provides feedback to the input stage of the transmitter which adjusts the .8 mA sensing currents to provide linearization of the PRT signal.

The power supply voltage is internally regulated to provide a constant input voltage to the transmitters circuitry. The transmitter will work properly as long as the input voltage at the transmitter's terminal block is within the range of 10-40 volts dc. A diode protects the transmitter from damage due to reverse power hookup.

Input and output filtering reduces the effects of electromagnetic and radio frequency interference.

The Model TL transmitter is designed such that the transmitter can be scaled for output over any input range. The transmitter utilizes low drift resistors for scaling the zero, span and linearity correction for the transmitter. These scaling resistors plug into the sockets on the circuit board and are accessible once the mounting plate on the transmitter is removed. The transmitter can be rescaled by pulling the resistors from the sockets and replacing them with resistors of appropriate values (see Calibration section of this manual or call Burns Engineering for assistance). Minor adjustments to the zero and span calibration are made using the 21 turn zero and span potentiometers.

Theory of Operation
-PRT Input

Although the Model TL transmitter is designed to operate using a 3-wire PRT input, it will function properly with 2-wire and 4-wire PRTs. Using the transmitter with a 3-wire PRT will generally produce the highest accuracy.

Figure 2 in the Installations section of this manual shows the correct wiring for the 2, 3, and 4 wire PRTs.

Maintenance
-Calibration

All transmitters are factory calibrated to a customer's specified range prior to shipment. The transmitters can be calibrated against any standard PRT resistance vs. temperature curve. For additional accuracy, the transmitters and PRTs can also be calibrated as matched pairs, thereby eliminating the interchangeability error of the PRT sensor.

The calibration of the transmitter can be field-adjusted utilizing the 21 turns zero and span potentiometers. The potentiometers will allow a minimum of ±25 deg Celsius adjustment to the zero temperature and ± 25% of nominal span adjustment to the span of the transmitter. To perform a bench recalibration of the transmitter, you will need the following equipment:
• Precision decade box or variable resistance device with

resolution of .01 ohm and an accuracy of ±.01%
- 4 1/2 digit multimeter with ±.01% millivolt measurement accuracy (or better) over 0-10 volt dc range.
- Power supply with 24 volts dc output at 20 milliamps dc.
- Precision resistor (±.01% or better) of known value of less than 500 ohms (Burns Engineering uses a 100 ohm resistor). Power rating should be 1/2 watt minimum.

The precision decade box is used to simulate the PRT. The precision readout resistor is wired in series with the negative power supply input lead and is used to measure the current output (output current = voltage measure across resistor / resistor value).

Please note: It is assumed that the transmitter has been properly ranged prior to attempting this calibration.

1. The transmitter, DVM, decade box, precision readout resistor and power supply should be wired as shown in figure 4.
2. Remove the zero and span potentiometer dust cover.
3. Set decade box to PRTs zero value as given in resistance tables (pages 15-18).
4. Adjust the zero potentiometer until 4 ±.004 mA of current is measured across the precision readout resistor.
5. Set decade box to PRTs full scale value as given in resistance tables (pages 15-18).
6. Adjust the span potentiometer until 20 ±.004 mA of current is measure across the precision read out resistor.
7. Repeat steps 4-6 to make sure the values are within tolerance. Repeat as necessary (the zero and span settings are slightly interactive and may require readjustment). Replace the zero and span pot dust cover.

Maintenance
-Rescaling Output

Major changes to the scaling of the transmitter can be made by replacing the plug-in zero, span and linearity scaling resistors. Once the values of the new resistors are known, the existing resistors are removed by simply pulling them out of their sockets. The new resistors are then pushed into the sockets. No soldering is required. If you have any questions concerning this procedure, please call Burns Engineering at 800-328-3871.

The tables on pages 13 & 14 show the values of the zero, span, and linearity resistors, as well as the recommended zero/span potentiometer configurations.

The values of the zero and span potentiometers are set and cannot be changed. The zero and span potentiometer configuration has some effect on the value of the zero and span resistor values you utilize when rescaling the transmitter, so it is important you know the values of the pots in the transmitter before attempting to rescale. The resistance value of the pots are printed in code on the circuit board, visible once the transmitter mounting plate is removed from the transmitter. The resistance values of the pots correspond to the alphanumeric values given below:

Letter code	Resistance value
B	20
C	50
D	100
E	200
F	500

The values are given in the order of ZERO POT VALUE - SPAN POT VALUE. Thus, the code BC means that the zero pot is a 20 ohm pot, and the span pot is a 50 ohm pot

If the zero/span pot configuration called for in the tables on pages 13 & 14 is different than the configuration of your transmitter, you will have to use different values of zero/span resistors than those called out in the tables .

To calculate these values you must

1. Add half of the ohmic value of the pot called for in the tables to the value of the resistor the table specifies.
2. Subtract off half the ohmic value of the pot in the transmitter. A resistor of this value should besubstituted for the existing resistor. (See example on page 11)

Once the resistor values have been determined, the rescaling of the transmitter can proceed. The procedure for rescaling the transmitter is as follows:

1. Remove the transmitter mounting plate by removing the 4 screws on the bottom of the unit. The mounting plate and the inner plate should drop out.
2. The zero, span, and linearity resistors should be visible. Remove the resistors by simply pulling them out of their

sockets. No desoldering is required.
3. Insert the new resistors into their respective sockets by pushing the resistors down until they bottom out. You should not have to use much force. The zero and span resistor sockets are marked on the circuit board by an “Z” and “S”. The linearity resistor sockets are marked on the circuit board by a “L1” and “L2”.
4. Fine tune the calibration using the procedure outline in the calibration section of this manual.
5. Reinstall the inner plate and mounting plate onto the transmitter housing.

If you have trouble using the procedures for rescaling the transmitter, please call Burns Engineering for assistance (800-328-3871).

Maintenance -Troubleshooting

Please refer to the wiring diagrams in figures 1-3 and table 1 when troubleshooting.

Maintenance -PRT Troubleshooting

PRTs generally have 3 failure modes.
1. The temperature sensing element circuit opens.
2. The temperature sensing element leadwires short together or to the sheath.
3. The insulation resistance between the sensing element and the sheath of the PRT becomes low enough to cause changes in the output of the PRT.

To check for these problems with the PRT use the following procedure.

2-Wire PRTs- First measure the resistance between the two leads. The resistance should be approximately equal to

the ambient temperature resistance of the PRT (about 107-110 ohms for a 100 ohm PRT at room ambient). Next, measure the resistance between the leadwires and the sheath of the PRT. This is the insulation resistance and should measure at least several megohms (2,000,000 ohms).

3-Wire PRTs- First measure the resistance between the leadwires of the same color. The resistance you measure should be very small but may be several ohms, depending on the length of the PRT and/or leadwires. Next, measure between each of the same colored wires and the third wire. Both measurements should equal approximately the ambient temperature resistance of the PRT (about 107-110 ohms for a 100 ohm PRT at room ambient). Finally, measure the resistance between the leadwires and the sheath of the PRT. This is the insulation resistance and should measure at least several megohms (2,000,000 ohms).

4-Wire PRTs with compensation loop -First measure the resistance between the same colored leadwires. This resistance should be very small, but may be several ohms, depending on the length of the PRT and/or leadwires. Next, measure the resistance between the other two leads. The resistance should be aproximately equal to the ambient temperature resistance of the PRT (about 107-110 ohms for a 100 ohm PRT at room ambient). Finally, measure the resistance between the leadwires and the sheath of the PRT. This is the insulation resitance and should measure at least several megohms (2,000,000 ohms).

Functional Specifications

Input

100 ohm Platinum Resistance Thermometer (PRT), 2-wire, 3-wire or 4-wire with compensation loop.

Output

4-20 mA dc. Linear with temperature.
Under fault conditions:
3.2 to 3.8 mA minimum output (shorted input)
32 to 35 mA maximum output (open input)

Power Supply

10-40 V dc at input terminals of transmitter. Loop powered.

Maximum Load Resistance

Max Load Resistance (ohms) = (Vpower supply - 10)/.035 amps

Ambient Temperature Limits

-40 to +85 deg C - Transmitter operates within specifications.
-50 to +100 deg C - Transmitter operates without damage.

Burnout Protection

Inherent upscale burnout protection for open circuit PRT elements.

Warm Up Time

Less than 90 seconds to within 0.1°C

Minimum Span Conditions

50 deg C for 100 ohm PRT
25 deg C for 200 ohm PRT

Performance Specifications

Accuracy

+/-.05% of span at reference conditions listed below (Does not include sensor error).

Linearity and Repeatability

Included in accuracy specification

Ambient Temperature Effect

Maximum of +/-.01% of span or.01°C change in output per deg C change in ambient temperature, whichever is greater.

Adjustability

Zero: +/-25°C from nominal zero
Span: +/-25% of nominal span

Power Supply Effect

+/-.005% of span per volt change in supply voltage typical, +/-.01% of span per volt change maximum.

Reference Conditions

24 volts dc power input
25°C ambient conditions
100 ohm series load
50°C,100 ohm PRT input

Table 1: Troubleshooting

No output	1. Current signal loop ◆ Improper wiring 2. Transmitter ◆ Damaged component	◆ Check and repair as neccesary - Wiring connections - Supply polarity - Supply voltage - Loop resistance ◆ Replace transmitter*
Output low (less than 3.5 mA)	1. Current signal loop ◆ Supply voltage low ◆Loop resistance high 2. Input (PRT) ◆ Input improperly wired ◆ Transmitter out of calibration ◆ PRT shorted out ◆ Poor connections at terminals 3. Transmitter ◆ Zero/Span resistors placed improperly ◆ Transmitter damaged	◆ Correct supply voltage ◆ Correct loop resistance ◆ Correct input wiring ◆ Recalibrate transmitter ◆ Check PRT leadwires for shorts ◆ Inspect terminal block screws, clean and/or repair as necessary ◆ Replace Zero/Span resistors ◆ Replace Transmitter*
Output high (more than 22 mA)	1. Input (PRT) ◆ PRT open circuit ◆ Poor connection at terminals 2. Transmitter ◆ Transmitter out of calibration ◆ Transmitter damaged	◆ Check PRT for open circuit in leadwires ◆ Inspect terminal block screws, clean and/or repair as necessary ◆ Recalibrate transmitter ◆ Replace transmitter*
Output stuck at one level	1. Current signal loop ◆ Supply voltage low ◆ Load resistance high 2. Transmitter ◆ Transmitter damaged (typical of lightning strikes, other high voltage high current transients) 3. Input (PRT) ◆ PRT damaged	◆ Correct supply voltage ◆ Correct load resistance ◆ Replace transmitter, provide some type of transient suppression protection* ◆ Replace PRT*
Unit will not calibrate	1. Transmitter ◆ Zero/Span resistors incorrect ◆ Defective potentiometer	◆ Replace Zero/Span resistors ◆ Replace transmitter*
Output noisy	1. Current signal loop ◆ Poor connections in signal loop ◆ Noisy power supply ◆ Inadequate shielding of current loop leadwires ◆ Improper grounding 2. Transmitter ◆ Defective component 3. Input (PRT) ◆ Low insulation resistance ◆ Inadequate shielding of PRT leads	◆ Clean and reassemble connections ◆ Repair/replace power supply ◆ Add shielding to leadwires ◆ Connect ground per recommended procedures ◆ Replace transmitter* ◆ Replace PRT* ◆ Add shielding to leadwires

* Contact Burns Engineering for failure analysis

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Figure 1. Wiring Schematic

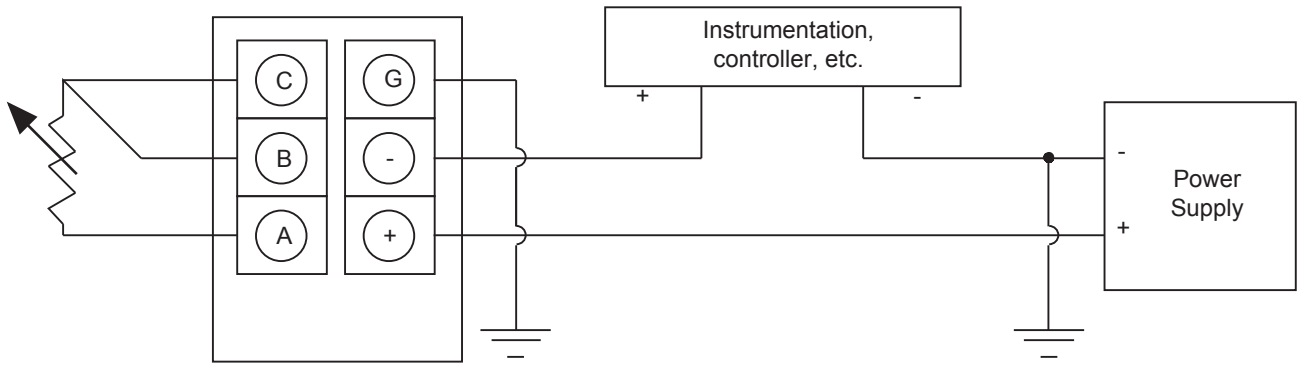


Figure 2. sensor connections

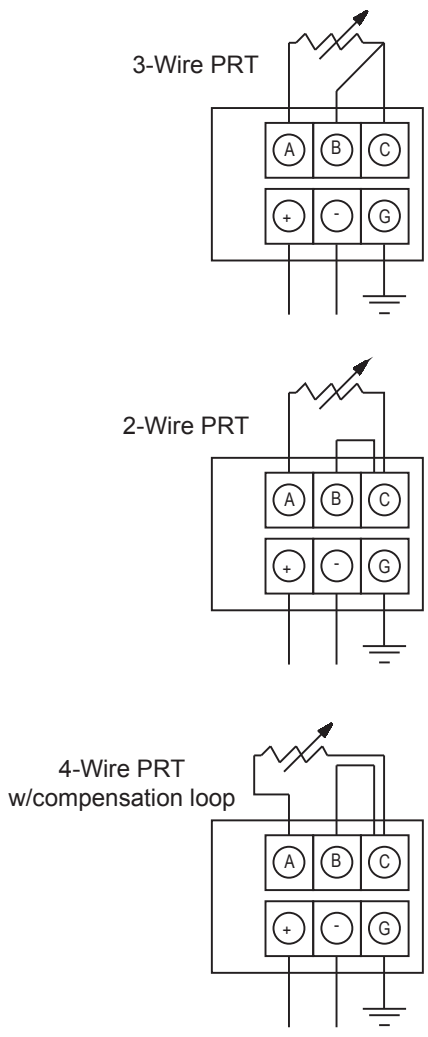


Figure 3. Grounding Schematic

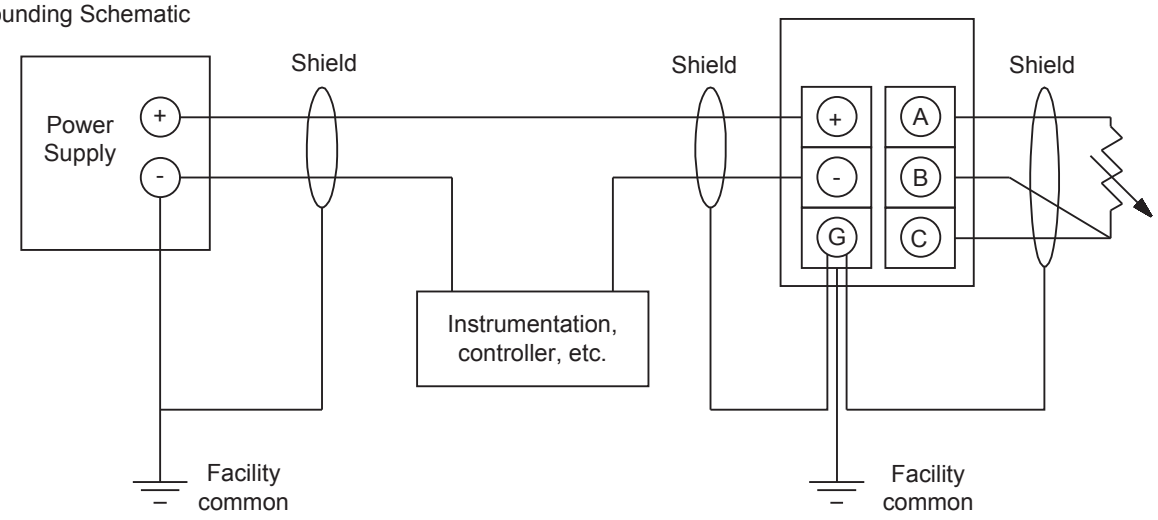
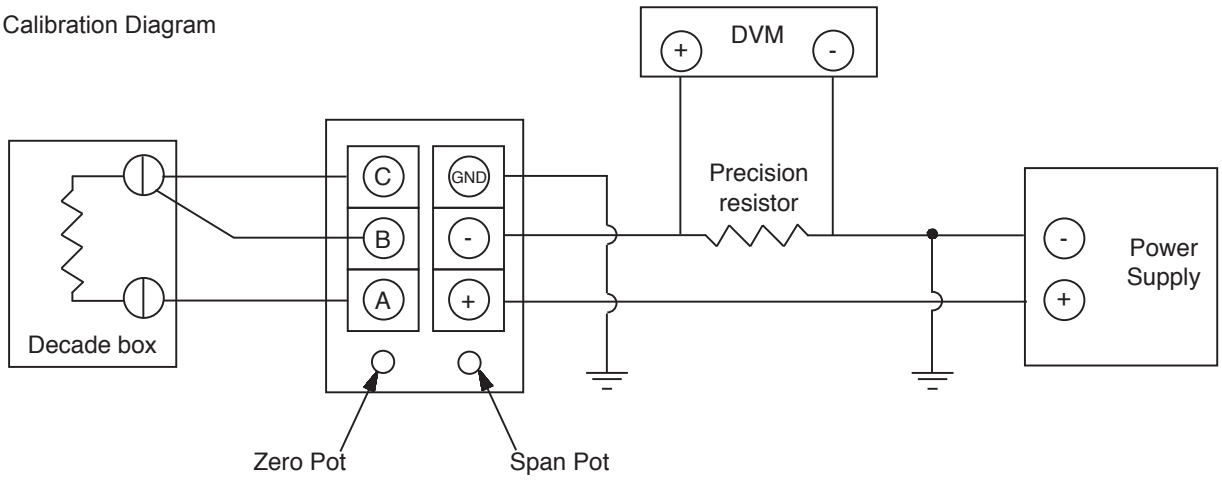


Figure 4. Calibration Diagram



Example: Rescaling Transmitter Output

You have a Model TL transmitter that was configured for a 0 to 200 deg C temperature range when purchased. You now want to use the transmitter in an application where the 4-20 mA temperature range is 100 to 500 deg C. The rescaling tables (pages 13 & 14) give the following information based on the 100 to 500 deg C range: Zero resistor = 110 ohms, Span resistor = 200 ohms, L1 resistor = 7500 ohms, L2 resistor = 9760 ohms, Zero/Span pot configuration = 50 ohm zero pot/200 ohm span pot

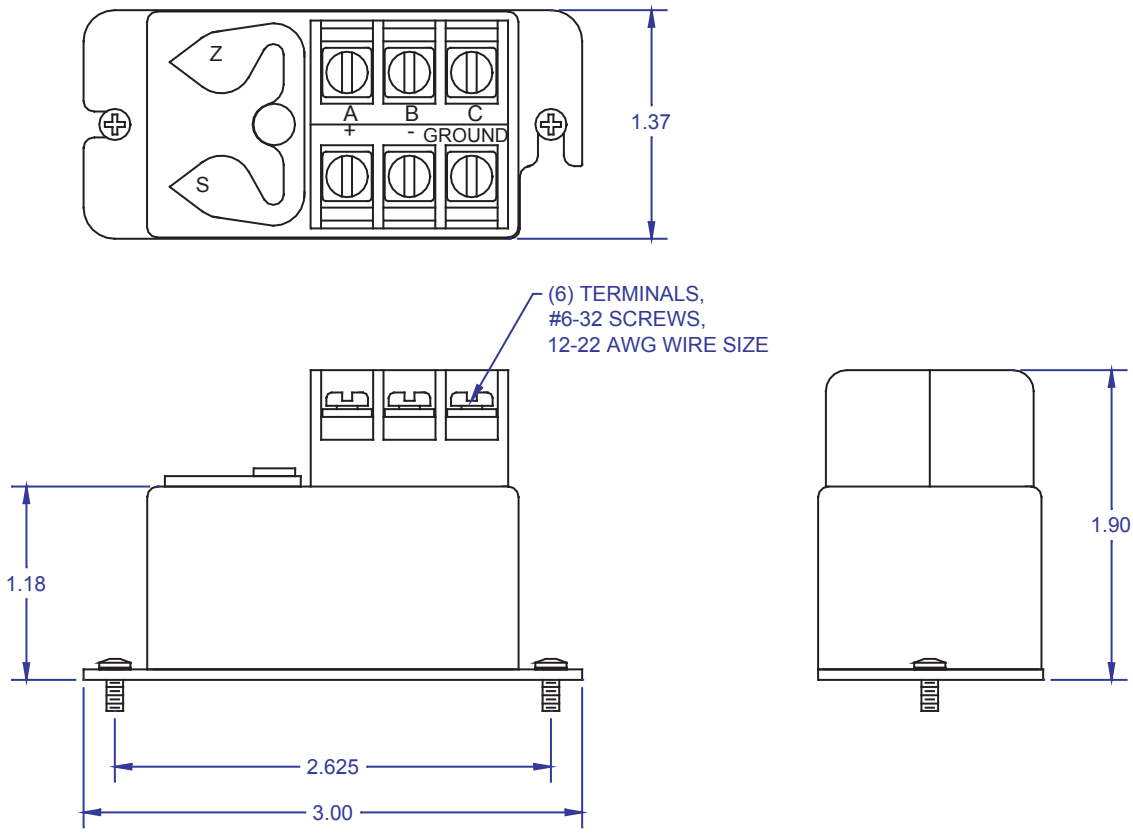
Upon removing the mounting plate from the transmitter you see that your transmitter's zero and span pots configuration is C-D or 50-100 ohms (the configuration information is printed on the middle of the circuit board with the zero pot ohmic value given first followed by the span pot value. Thus the zero pot is a 50 ohm pot and the span pot is a 100 ohm pot).

The zero resistor value given in the table for the 100 to 500 deg C range is 110 ohms. To determine the total zero resistance required, you must add the 110 ohms to half the value of the zero pot called for in the table. The table calls out for a 50 ohm zero pot, the same value as the transmitter was originally configured with. Since the zero pot values are the same, the value of the zero resistor does not need to be adjusted. Replace the existing zero resistor with the 110 ohm resistor.

The span resistor value given in the table for the 100 to 500 deg C range is 200 ohms. The span pot value specified is 200 ohms. Add 1/2 the specified pot value (200/2 = 100 ohms) to the specified span resistor value (200 ohms) to get the total resistance value of 300 ohms. Now subtract off half of the value of the span pot (100/2 = 50 ohms) from 300 ohms to get 250 ohms. The value of the span resistor required is 250 ohms.

There is no potentiometer for the linearity resistors and therefore there is no need to use resistor values other than those specified in the rescaling tables. For the 100 to 500 deg C span, the tables specify a 7500 ohm Lin 1 resistor and a 9760 ohm Lin 2 resistor. Remove the existing linearity resistors and put the 7500 ohm resistor in the sockets identified as "L1" and the 9760 ohm resistor in the sockets identified as "L2".

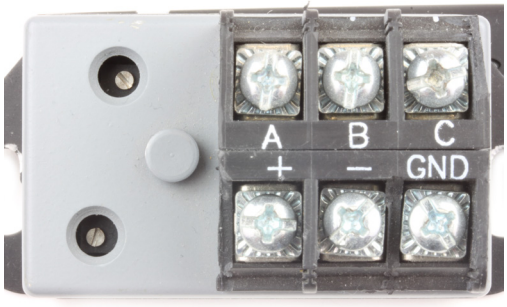
Figure 5. Model TL Transmitter Dimensions (all dimensions in inches)



Model Numbering System for TL Linearized Transmitter					
TL	RTD Transmitter, linearized, 0.05% accuracy				
	RTD Input				
	01	100 Ohm PRT, alpha value = 0.003902 (Burns)			
	21	100 Ohm PRT, alpha value = 0.00385 (Din, IEC)			
		Calibration			
		M	Transmitter and sensor are Matched for improved performance		
		blank	Not Matched		
			Temperature Range		
			{Tmin TO Tmax}	Tmin = Temperature for 4mA output Tmax = Temperature for 20mA output	
				Temperature Scale	
				C	Degrees Celsius
				F	Degrees Fahrenheit

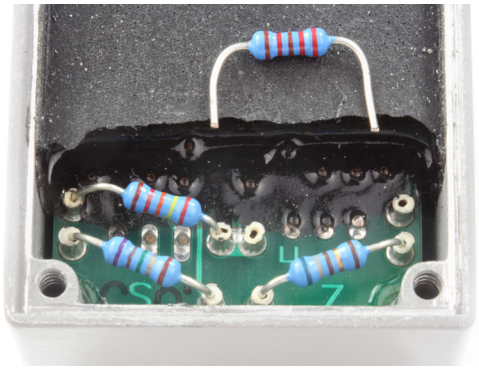
"ZERO" Adjustment Potentiometer

"SPAN" Adjustment Potentiometer



Resister Locations:

L2	L1
"S"	"Z"



TL Transmitter Look-Up Table - Fahrenheit Scale

1. Locate Zero Temperature on bottom of Table
2. Follow Column up to Full-Scale Temperature shown at the left
3. Use Resistances shown in the intersecting box;

Zero & Span Resistors
Lin1 & Lin2 Resistors
Zero & Span Pot Resistance

Full Scale Temp (Deg F)

Full Scale Temp (Deg F)	-100	0	100	200	300	400	500	600	700	800
0	47.5 51100 50	20 53600 50								
100	47.5 28000 50	64.9 30900 50	68.1 60400 50	20 63400 50						
200	47.5 19100 50	82.5 22100 100	68.1 30100 50	64.9 32400 50	90.9 59000 50	20 61900 50				
300	47.5 14700 50	127 16900 100	68.1 19600 50	82.5 22100 100	90.9 29400 50	60.4 31600 50	110 59000 50	20 60400 50		
400	47.5 11500 50	127 14000 200	68.1 14700 50	127 16900 100	90.9 19100 50	82.5 22100 100	110 28700 50	60.4 31600 50	133 57600 50	20 60400 50
500	47.5 9530 50	150 12100 200	68.1 11500 50	127 14000 200	90.9 14300 50	121 16900 100	110 19100 50	82.5 21500 100	133 28700 50	57.6 30900 50	150 56200 50	20 59000 50				
600	47.5 8060 50	221 10500 200	68.1 9530 50	150 11800 200	90.9 11300 50	127 13700 200	110 14000 50	121 16500 100	133 18700 50	82.5 21000 100	150 28000 50	57.6 30100 50	169 54900 50	20 57600 50		
700	47.5 6980 50	261 9530 200	68.1 8060 50	200 10500 200	90.9 9310 50	150 11800 200	110 11000 50	127 13300 200	133 13700 50	121 16200 100	150 18200 50	71.5 20500 100	169 27400 50	54.9 29400 50	187 54900 50	20 56200 50
800	47.5 6190 50	150 8660 500	68.1 6980 50	249 9310 200	90.9 7870 50	200 10200 200	110 9090 50	150 11300 200	133 11000 50	127 13300 200	150 13700 50	110 15800 100	169 17800 50	71.5 20000 100	187 26700 50	52.3 28700 50	200 53600 50	20 54900 50	
900	47.5 5490 50	200 7870 500	68.1 6040 50	150 8450 500	90.9 6810 50	249 9090 200	110 7680 50	200 10000 200	133 8870 50	150 11300 200	150 10700 50	100 13000 200	169 13300 50	110 15400 100	187 17800 50	71.5 19600 100	200 26100 50	52.3 28700 50	232 52300 50	20 54900 50

Zero Temp (Deg F)

TL Transmitter Look-Up Table - Celsius Scale

1. Locate Zero Temperature on bottom of Table
2. Follow Column up to Full-Scale Temperature shown at the left
3. Use Resistances shown in the intersecting box;
   Zero & Span Resistors
   Lin1 & Lin2 Resistors
   Zero & Span Pot Resistance

Full Scale Temp (Deg C)	-100	-50	0	50	100	150	200	250	300	350	400	450
-50	34.8 48700 50	31.6 51100 20										
0	34.8 27400 50	54.9 30100 50	54.9 61900 50	30.1 64900 20								
50	34.8 20000 50	71.5 22600 100	54.9 32400 50	54.9 35700 50	75 66500 50	30.1 69800 20						
100	34.8 15400 50	110 18200 100	54.9 22100 50	71.5 24300 100	75 33200 50	54.9 35700 50	95.3 66500 50	28.7 68100 20				
150	34.8 12700 50	100 15000 200	54.9 16200 50	110 19100 100	75 22100 50	71.5 24300 100	95.3 32400 50	54.9 34800 50	110 64900 50	28.7 68100 20		
200	34.8 10500 50	150 13000 200	54.9 13000 50	100 15400 200	75 16200 50	110 18700 100	95.3 21500 50	71.5 23700 100	110 32400 50	54.9 34800 50	133 63400 50	27.4 66500 20
250	34.8 9090 50	187 11500 200	54.9 10700 50	133 13300 200	75 12700 50	100 15400 200	95.3 15800 50	110 18200 100	110 21000 50	71.5 23700 100	133 31600 50	54.9 34000 50	150 63400 50	25.5 64900 20
300	34.8 7870 50	221 10200 200	54.9 9090 50	169 11500 200	75 10500 50	133 13000 200	95.3 12700 50	100 15000 200	110 15800 50	110 18200 100	133 21000 50	71.5 23200 100	150 30900 50	47.5 33200 50	169 61900 50	25.5 64900 20
350	34.8 6810 50	267 9310 200	54.9 7870 50	221 10200 200	75 8870 50	169 11300 200	95.3 10500 50	133 12700 200	110 12400 50	140 14700 100	133 15400 50	100 17800 100	150 20500 50	71.5 22600 100	169 30900 50	47.5 32400 50	187 60400 50	25.5 63400 20
400	34.8 6190 50	150 8660 500	54.9 6810 50	261 9310 200	75 7680 50	221 10200 200	95.3 8870 50	169 11000 200	110 10200 50	133 12400 200	133 12100 50	140 14300 100	150 15000 50	90.9 17400 100	169 20000 50	71.5 22100 100	187 30100 50	47.5 32400 50	200 60400 50	25.5 61900 20
450	34.8 5490 50	187 8060 500	54.9 6040 50	150 8450 500	75 6810 50	255 9090 200	95.3 7500 50	200 10000 200	110 8660 50	169 11000 200	133 10000 50	127 12400 200	150 12100 50	133 14300 100	169 15000 50	90.9 16900 100	187 20000 50	90.9 22100 100	200 29400 50	47.5 31600 50	221 59000 50	25.5 60400 20
500	34.8 4990 50	232 7500 500	54.9 5490 50	187 7870 500	75 6040 50	150 8450 500	95.3 6650 50	249 8870 200	110 7500 50	200 9760 200	133 8450 50	169 10700 200	150 9760 50	127 12100 200	169 11800 50	133 14000 100	187 14700 50	90.9 16900 100	200 19600 50	47.5 21500 100	221 29400 50	47.5 30900 50	232 57600 50	25.5 60400 20

Zero Temp (Deg C)

Resistance vs. Temperature table for DIN PRTs (alpha = .00385)

in Deg Celsius

Ro = 100.000 ohms

°C	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-200	18.52									
-190	22.83	22.40	21.97	21.54	21.11	20.68	20.25	19.82	19.38	18.95
-180	27.10	26.67	26.24	25.82	25.39	24.97	24.54	24.11	23.68	23.25
-170	31.34	30.91	30.49	30.07	29.64	29.22	28.80	28.37	27.95	27.52
-160	35.54	35.12	34.70	34.28	33.86	33.44	33.02	32.60	32.18	31.76
-150	39.72	39.31	38.89	38.47	38.05	37.64	37.22	36.80	36.38	35.96
-140	43.88	43.46	43.05	42.63	42.22	41.80	41.39	40.97	40.56	40.14
-130	48.00	47.59	47.18	46.77	46.36	45.94	45.53	45.12	44.70	44.29
-120	52.11	51.70	51.29	50.88	50.47	50.06	49.65	49.24	48.83	48.42
-110	56.19	55.79	55.38	54.97	54.56	54.15	53.75	53.34	52.93	52.52
-100	60.26	59.85	59.44	59.04	58.63	58.23	57.82	57.41	57.01	56.60
-90	64.30	63.90	63.49	63.09	62.68	62.28	61.88	61.47	61.07	60.66
-80	68.33	67.92	67.52	67.12	66.72	66.31	65.91	65.51	65.11	64.70
-70	72.33	71.93	71.53	71.13	70.73	70.33	69.93	69.53	69.13	68.73
-60	76.33	75.93	75.53	75.13	74.73	74.33	73.93	73.53	73.13	72.73
-50	80.31	79.91	79.51	79.11	78.72	78.32	77.92	77.52	77.12	76.73
-40	84.27	83.87	83.48	83.08	82.69	82.29	81.89	81.50	81.10	80.70
-30	88.22	87.83	87.43	87.04	86.64	86.25	85.85	85.46	85.06	84.67
-20	92.16	91.77	91.37	90.98	90.59	90.19	89.80	89.40	89.01	88.62
-10	96.09	95.69	95.30	94.91	94.52	94.12	93.73	93.34	92.95	92.55
0	100.00	99.61	99.22	98.83	98.44	98.04	97.65	97.26	96.87	96.48

°C	0	1	2	3	4	5	6	7	8	9
0	100.00	100.39	100.78	101.17	101.56	101.95	102.34	102.73	103.12	103.51
10	103.90	104.29	104.68	105.07	105.46	105.85	106.24	106.63	107.02	107.40
20	107.79	108.18	108.57	108.96	109.35	109.73	110.12	110.51	110.90	111.29
30	111.67	112.06	112.45	112.83	113.22	113.61	114.00	114.38	114.77	115.15
40	115.54	115.93	116.31	116.70	117.08	117.47	117.86	118.24	118.63	119.01
50	119.40	119.78	120.17	120.55	120.94	121.32	121.71	122.09	122.47	122.86
60	123.24	123.63	124.01	124.39	124.78	125.16	125.54	125.93	126.31	126.69
70	127.08	127.46	127.84	128.22	128.61	128.99	129.37	129.75	130.13	130.52
80	130.90	131.28	131.66	132.04	132.42	132.80	133.18	133.57	133.95	134.33
90	134.71	135.09	135.47	135.85	136.23	136.61	136.99	137.37	137.75	138.13
100	138.51	138.88	139.26	139.64	140.02	140.40	140.78	141.16	141.54	141.91
110	142.29	142.67	143.05	143.43	143.80	144.18	144.56	144.94	145.31	145.69
120	146.07	146.44	146.82	147.20	147.57	147.95	148.33	148.70	149.08	149.46
130	149.83	150.21	150.58	150.96	151.33	151.71	152.08	152.46	152.83	153.21
140	153.58	153.96	154.33	154.71	155.08	155.46	155.83	156.20	156.58	156.95
150	157.33	157.70	158.07	158.45	158.82	159.19	159.56	159.94	160.31	160.68
160	161.05	161.43	161.80	162.17	162.54	162.91	163.29	163.66	164.03	164.40
170	164.77	165.14	165.51	165.89	166.26	166.63	167.00	167.37	167.74	168.11
180	168.48	168.85	169.22	169.59	169.96	170.33	170.70	171.07	171.43	171.80
190	172.17	172.54	172.91	173.28	173.65	174.02	174.38	174.75	175.12	175.49
200	175.86	176.22	176.59	176.96	177.33	177.69	178.06	178.43	178.79	179.16
210	179.53	179.89	180.26	180.63	180.99	181.36	181.72	182.09	182.46	182.82
220	183.19	183.55	183.92	184.28	184.65	185.01	185.38	185.74	186.11	186.47
230	186.84	187.20	187.56	187.93	188.29	188.66	189.02	189.38	189.75	190.11
240	190.47	190.84	191.20	191.56	191.92	192.29	192.65	193.01	193.37	193.74
250	194.10	194.46	194.82	195.18	195.55	195.91	196.27	196.63	196.99	197.35
260	197.71	198.07	198.43	198.79	199.15	199.51	199.87	200.23	200.59	200.95
270	201.31	201.67	202.03	202.39	202.75	203.11	203.47	203.83	204.19	204.55
280	204.90	205.26	205.62	205.98	206.34	206.70	207.05	207.41	207.77	208.13
290	208.48	208.84	209.20	209.56	209.91	210.27	210.63	210.98	211.34	211.70
300	212.05	212.41	212.76	213.12	213.48	213.83	214.19	214.54	214.90	215.25
310	215.61	215.96	216.32	216.67	217.03	217.38	217.74	218.09	218.44	218.80
320	219.15	219.51	219.86	220.21	220.57	220.92	221.27	221.63	221.98	222.33
330	222.68	223.04	223.39	223.74	224.09	224.45	224.80	225.15	225.50	225.85
340	226.21	226.56	226.91	227.26	227.61	227.96	228.31	228.66	229.02	229.37
350	229.72	230.07	230.42	230.77	231.12	231.47	231.82	232.17	232.52	232.87
360	233.21	233.56	233.91	234.26	234.61	234.96	235.31	235.66	236.00	236.35
370	236.70	237.05	237.40	237.74	238.09	238.44	238.79	239.13	239.48	239.83
380	240.18	240.52	240.87	241.22	241.56	241.91	242.26	242.60	242.95	243.29
390	243.64	243.99	244.33	244.68	245.02	245.37	245.71	246.06	246.40	246.75
400	247.09	247.44	247.78	248.13	248.47	248.81	249.16	249.50	249.85	250.19
410	250.53	250.88	251.22	251.56	251.91	252.25	252.59	252.93	253.28	253.62
420	253.96	254.30	254.65	254.99	255.33	255.67	256.01	256.35	256.70	257.04
430	257.38	257.72	258.06	258.40	258.74	259.08	259.42	259.76	260.10	260.44
440	260.78	261.12	261.46	261.80	262.14	262.48	262.82	263.16	263.50	263.84
450	264.18	264.52	264.86	265.20	265.53	265.87	266.21	266.55	266.89	267.22
460	267.56	267.90	268.24	268.57	268.91	269.25	269.59	269.92	270.26	270.60
470	270.93	271.27	271.61	271.94	272.28	272.61	272.95	273.29	273.62	273.96
480	274.29	274.63	274.96	275.30	275.63	275.97	276.30	276.64	276.97	277.31
490	277.64	277.98	278.31	278.64	278.98	279.31	279.64	279.98	280.31	280.64
500	280.98	281.31	281.64	281.98	282.31	282.64	282.97	283.31	283.64	283.97

Resistance vs. Temperature table for DIN PRTs (alpha = .00385)

in Deg Farhenheit

Ro = 100.000 ohms

°F	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-330	18.04									
-320	20.44	20.20	19.96	19.72	19.48	19.24	19.00	18.76	18.52	18.28
-310	22.83	22.59	22.35	22.11	21.87	21.63	21.39	21.16	20.92	20.68
-300	25.20	24.97	24.73	24.49	24.25	24.02	23.78	23.54	23.30	23.06
-290	27.57	27.33	27.10	26.86	26.62	26.39	26.15	25.91	25.68	25.44
-280	29.93	29.69	29.46	29.22	28.98	28.75	28.51	28.28	28.04	27.81
-270	32.27	32.04	31.80	31.57	31.34	31.10	30.87	30.63	30.40	30.16
-260	34.61	34.38	34.14	33.91	33.68	33.44	33.21	32.98	32.74	32.51
-250	36.94	36.71	36.47	36.24	36.01	35.78	35.54	35.31	35.08	34.84
-240	39.26	39.03	38.80	38.56	38.33	38.10	37.87	37.64	37.40	37.17
-230	41.57	41.34	41.11	40.88	40.65	40.42	40.19	39.95	39.72	39.49
-220	43.88	43.65	43.42	43.19	42.96	42.73	42.49	42.26	42.03	41.80
-210	46.17	45.94	45.71	45.48	45.26	45.03	44.80	44.57	44.34	44.11
-200	48.46	48.23	48.00	47.78	47.55	47.32	47.09	46.86	46.63	46.40
-190	50.74	50.52	50.29	50.06	49.83	49.60	49.38	49.15	48.92	48.69
-180	53.02	52.79	52.56	52.34	52.11	51.88	51.65	51.43	51.20	50.97
-170	55.29	55.06	54.83	54.61	54.38	54.15	53.93	53.70	53.47	53.25
-160	57.55	57.32	57.10	56.87	56.65	56.42	56.19	55.97	55.74	55.51
-150	59.81	59.58	59.35	59.13	58.90	58.68	58.45	58.23	58.00	57.78
-140	62.06	61.83	61.61	61.38	61.16	60.93	60.71	60.48	60.26	60.03
-130	64.30	64.08	63.85	63.63	63.40	63.18	62.95	62.73	62.50	62.28
-120	66.54	66.31	66.09	65.87	65.64	65.42	65.20	64.97	64.75	64.52
-110	68.77	68.55	68.33	68.10	67.88	67.66	67.43	67.21	66.99	66.76
-100	71.00	70.78	70.55	70.33	70.11	69.89	69.66	69.44	69.22	68.99
-90	73.22	73.00	72.78	72.56	72.33	72.11	71.89	71.67	71.45	71.22
-80	75.44	75.22	75.00	74.78	74.55	74.33	74.11	73.89	73.67	73.45
-70	77.66	77.43	77.21	76.99	76.77	76.55	76.33	76.11	75.88	75.66
-60	79.86	79.64	79.42	79.20	78.98	78.76	78.54	78.32	78.10	77.88
-50	82.07	81.85	81.63	81.41	81.19	80.97	80.75	80.53	80.31	80.09
-40	84.27	84.05	83.83	83.61	83.39	83.17	82.95	82.73	82.51	82.29
-30	86.47	86.25	86.03	85.81	85.59	85.37	85.15	84.93	84.71	84.49
-20	88.66	88.44	88.22	88.00	87.78	87.56	87.34	87.13	86.91	86.69
-10	90.85	90.63	90.41	90.19	89.97	89.75	89.54	89.32	89.10	88.88
0	93.03	92.82	92.60	92.38	92.16	91.94	91.72	91.50	91.29	91.07

°F	0	1	2	3	4	5	6	7	8	9
0	93.03	93.25	93.47	93.69	93.91	94.12	94.34	94.56	94.78	95.00
10	95.21	95.43	95.65	95.87	96.09	96.30	96.52	96.74	96.96	97.17
20	97.39	97.61	97.83	98.04	98.26	98.48	98.70	98.91	99.13	99.35
30	99.57	99.78	100.00	100.22	100.43	100.65	100.87	101.09	101.30	101.52
40	101.74	101.95	102.17	102.39	102.60	102.82	103.04	103.25	103.47	103.69
50	103.90	104.12	104.34	104.55	104.77	104.98	105.20	105.42	105.63	105.85
60	106.07	106.28	106.50	106.71	106.93	107.15	107.36	107.58	107.79	108.01
70	108.23	108.44	108.66	108.87	109.09	109.30	109.52	109.73	109.95	110.17
80	110.38	110.60	110.81	111.03	111.24	111.46	111.67	111.89	112.10	112.32
90	112.53	112.75	112.96	113.18	113.39	113.61	113.82	114.04	114.25	114.47
100	114.68	114.90	115.11	115.33	115.54	115.76	115.97	116.18	116.40	116.61
110	116.83	117.04	117.26	117.47	117.68	117.90	118.11	118.33	118.54	118.76
120	118.97	119.18	119.40	119.61	119.82	120.04	120.25	120.47	120.68	120.89
130	121.11	121.32	121.53	121.75	121.96	122.18	122.39	122.60	122.82	123.03
140	123.24	123.46	123.67	123.88	124.09	124.31	124.52	124.73	124.95	125.16
150	125.37	125.59	125.80	126.01	126.22	126.44	126.65	126.86	127.08	127.29
160	127.50	127.71	127.93	128.14	128.35	128.56	128.78	128.99	129.20	129.41
170	129.62	129.84	130.05	130.26	130.47	130.68	130.90	131.11	131.32	131.53
180	131.74	131.96	132.17	132.38	132.59	132.80	133.01	133.23	133.44	133.65
190	133.86	134.07	134.28	134.50	134.71	134.92	135.13	135.34	135.55	135.76
200	135.97	136.19	136.40	136.61	136.82	137.03	137.24	137.45	137.66	137.87
210	138.08	138.29	138.51	138.72	138.93	139.14	139.35	139.56	139.77	139.98
220	140.19	140.40	140.61	140.82	141.03	141.24	141.45	141.66	141.87	142.08
230	142.29	142.50	142.71	142.92	143.13	143.34	143.55	143.76	143.97	144.18
240	144.39	144.60	144.81	145.02	145.23	145.44	145.65	145.86	146.07	146.28
250	146.49	146.70	146.91	147.11	147.32	147.53	147.74	147.95	148.16	148.37
260	148.58	148.79	149.00	149.21	149.41	149.62	149.83	150.04	150.25	150.46
270	150.67	150.88	151.08	151.29	151.50	151.71	151.92	152.13	152.33	152.54
280	152.75	152.96	153.17	153.38	153.58	153.79	154.00	154.21	154.42	154.62
290	154.83	155.04	155.25	155.46	155.66	155.87	156.08	156.29	156.49	156.70
300	156.91	157.12	157.33	157.53	157.74	157.95	158.15	158.36	158.57	158.78
310	158.98	159.19	159.40	159.61	159.81	160.02	160.23	160.43	160.64	160.85
320	161.05	161.26	161.47	161.67	161.88	162.09	162.29	162.50	162.71	162.91
330	163.12	163.33	163.53	163.74	163.95	164.15	164.36	164.57	164.77	164.98
340	165.18	165.39	165.60	165.80	166.01	166.21	166.42	166.63	166.83	167.04
350	167.24	167.45	167.66	167.86	168.07	168.27	168.48	168.68	168.89	169.09
360	169.30	169.51	169.71	169.92	170.12	170.33	170.53	170.74	170.94	171.15
370	171.35	171.56	171.76	171.97	172.17	172.38	172.58	172.79	172.99	173.20
380	173.40	173.61	173.81	174.02	174.22	174.43	174.63	174.83	175.04	175.24
390	175.45	175.65	175.86	176.06	176.26	176.47	176.67	176.88	177.08	177.29
400	177.49	177.69	177.90	178.10	178.30	178.51	178.71	178.92	179.12	179.32
410	179.53	179.73	179.93	180.14	180.34	180.55	180.75	180.95	181.16	181.36
420	181.56	181.77	181.97	182.17	182.38	182.58	182.78	182.98	183.19	183.39
430	183.59	183.80	184.00	184.20	184.40	184.61	184.81	185.01	185.22	185.42
440	185.62	185.82	186.03	186.23	186.43	186.63	186.84	187.04	187.24	187.44
450	187.65	187.85	188.05	188.25	188.45	188.66	188.86	189.06	189.26	189.46
460	189.67	189.87	190.07	190.27	190.47	190.67	190.88	191.08	191.28	191.48
470	191.68	191.88	192.09	192.29	192.49	192.69	192.89	193.09	193.29	193.49
480	193.70	193.90	194.10	194.30	194.50	194.70	194.90	195.10	195.30	195.50
490	195.71	195.91	196.11	196.31	196.51	196.71	196.91	197.11	197.31	197.51
500	197.71	197.91	198.11	198.31	198.51	198.71	198.91	199.11	199.31	199.51
510	199.71	199.91	200.11	200.31	200.51	200.71	200.91	201.11	201.31	201.51
520	201.71	201.91	202.11	202.31	202.51	202.71	202.91	203.11	203.31	203.51
530	203.71	203.91	204.11	204.31	204.51	204.71	204.90	205.10	205.30	205.50
540	205.70	205.90	206.10	206.30	206.50	206.70	206.89	207.09	207.29	207.49
550	207.69	207.89	208.09	208.29	208.48	208.68	208.88	209.08	209.28	209.48
560	209.67	209.87	210.07	210.27	210.47	210.67	210.86	211.06	211.26	211.46
570	211.66	211.85	212.05	212.25	212.45	212.64	212.84	213.04	213.24	213.44
580	213.63	213.83	214.03	214.23	214.42	214.62	214.82	215.02	215.21	215.41
590	215.61	215.80	216.00	216.20	216.40	216.59	216.79	216.99	217.18	217.38
600	217.58	217.77	217.97	218.17	218.37	218.56	218.76	218.96	219.15	219.35
610	219.55	219.74	219.94	220.13	220.33	220.53	220.72	220.92	221.12	221.31
620	221.51	221.70	221.90	222.10	222.29	222.49	222.68	222.88	223.08	223.27
630	223.47	223.66	223.86	224.06	224.25	224.45	224.64	224.84	225.03	225.23
640	225.42	225.62	225.82	226.01	226.21	226.40	226.60	226.79	226.99	227.18
650	227.38	227.57	227.77	227.96	228.16	228.35	228.55	228.74	228.94	229.13
660	229.33	229.52	229.72	229.91	230.11	230.30	230.49	230.69	230.88	231.08
670	231.27	231.47	231.66	231.86	232.05	232.24	232.44	232.63	232.83	233.02
680	233.21	233.41	233.60	233.80	233.99	234.18	234.38	234.57	234.77	234.96
690	235.15	235.35	235.54	235.73	235.93	236.12	236.31	236.51	236.70	236.89
700	237.09	237.28	237.47	237.67	237.86	238.05	238.25	238.44	238.63	238.83
710	239.02	239.21	239.41	239.60	239.79	239.98	240.18	240.37	240.56	240.75
720	240.95	241.14	241.33	241.52	241.72	241.91	242.10	242.29	242.49	242.68
730	242.87	243.06	243.26	243.45	243.64	243.83	244.02	244.22	244.41	244.60
740	244.79	244.98	245.18	245.37	245.56	245.75	245.94	246.13	246.33	246.52
750	246.71	246.90	247.09	247.28	247.47	247.67	247.86	248.05	248.24	248.43
760	248.62	248.81	249.00	249.20	249.39	249.58	249.77	249.96	250.15	250.34
770	250.53	250.72	250.91	251.10	251.30	251.49	251.68	251.87	252.06	252.25
780	252.44	252.63	252.82	253.01	253.20	253.39	253.58	253.77	253.96	254.15
790	254.34	254.53	254.72	254.91	255.10	255.29	255.48	255.67	255.86	256.05
800	256.24	256.43	256.62	256.81	257.00	257.19	257.38	257.57	257.76	257.95
810	258.14	258.33	258.52	258.70	258.89	259.08	259.27	259.46	259.65	259.84
820	260.03	260.22	260.41	260.60	260.78	260.97	261.16	261.35	261.54	261.73
830	261.92	262.11	262.29	262.48	262.67	262.86	263.05	263.24	263.43	263.61
840	263.80	263.99	264.18	264.37	264.56	264.74	264.93	265.12	265.31	265.50
850	265.68	265.87	266.06	266.25	266.44	266.62	266.81	267.00	267.19	267.37
860	267.56	267.75	267.94	268.12	268.31	268.50	268.69	268.87	269.06	269.25
870	269.44	269.62	269.81	270.00	270.18	270.37	270.56	270.75	270.93	271.12
880	271.31	271.49	271.68	271.87	272.05	272.24	272.43	272.61	272.80	272.99
890	273.17	273.36	273.55	273.73	273.92	274.11	274.29	274.48	274.67	274.85
900	275.04	275.22	275.41	275.60	275.78	275.97	276.15	276.34	276.53	276.71

Resistance vs. Temperature table for 3902 PRTs (alpha = .003902)

in Deg Celsius

Ro = 100.000 ohms

°C	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-200	17.00									
-190	21.43	20.99	20.55	20.10	19.66	19.22	18.77	18.33	17.89	17.44
-180	25.82	25.38	24.94	24.51	24.07	23.63	23.19	22.75	22.31	21.87
-170	30.17	29.73	29.30	28.87	28.43	28.00	27.56	27.13	26.69	26.25
-160	34.48	34.05	33.62	33.19	32.76	32.33	31.89	31.46	31.03	30.60
-150	38.75	38.32	37.90	37.47	37.04	36.62	36.19	35.76	35.33	34.90
-140	42.99	42.57	42.15	41.72	41.30	40.88	40.45	40.03	39.60	39.18
-130	47.20	46.78	46.36	45.94	45.52	45.10	44.68	44.26	43.84	43.41
-120	51.39	50.97	50.55	50.13	49.72	49.30	48.88	48.46	48.04	47.62
-110	55.54	55.13	54.71	54.30	53.88	53.47	53.05	52.64	52.22	51.80
-100	59.67	59.26	58.85	58.44	58.02	57.61	57.20	56.78	56.37	55.96
-90	63.78	63.37	62.96	62.55	62.14	61.73	61.32	60.91	60.50	60.09
-80	67.87	67.47	67.06	66.65	66.24	65.83	65.42	65.01	64.60	64.19
-70	71.94	71.54	71.13	70.72	70.32	69.91	69.50	69.10	68.69	68.28
-60	76.00	75.59	75.19	74.78	74.38	73.97	73.57	73.16	72.76	72.35
-50	80.03	79.63	79.23	78.82	78.42	78.02	77.61	77.21	76.80	76.40
-40	84.05	83.65	83.25	82.85	82.45	82.04	81.64	81.24	80.84	80.43
-30	88.06	87.66	87.26	86.86	86.46	86.06	85.66	85.26	84.86	84.45
-20	92.05	91.65	91.25	90.86	90.46	90.06	89.66	89.26	88.86	88.46
-10	96.03	95.63	95.24	94.84	94.44	94.04	93.65	93.25	92.85	92.45
0	100.00	99.60	99.21	98.81	98.41	98.02	97.62	97.22	96.83	96.43

°C	0	1	2	3	4	5	6	7	8	9
0	100.00	100.40	100.79	101.19	101.58	101.98	102.38	102.77	103.17	103.56
10	103.96	104.35	104.75	105.14	105.54	105.93	106.32	106.72	107.11	107.51
20	107.90	108.29	108.69	109.08	109.47	109.87	110.26	110.65	111.05	111.44
30	111.83	112.23	112.62	113.01	113.40	113.79	114.19	114.58	114.97	115.36
40	115.75	116.14	116.54	116.93	117.32	117.71	118.10	118.49	118.88	119.27
50	119.66	120.05	120.44	120.83	121.22	121.61	122.00	122.39	122.78	123.17
60	123.56	123.95	124.34	124.73	125.11	125.50	125.89	126.28	126.67	127.06
70	127.44	127.83	128.22	128.61	129.00	129.38	129.77	130.16	130.54	130.93
80	131.32	131.70	132.09	132.48	132.86	133.25	133.64	134.02	134.41	134.79
90	135.18	135.57	135.95	136.34	136.72	137.11	137.49	137.88	138.26	138.65
100	139.03	139.41	139.80	140.18	140.57	140.95	141.33	141.72	142.10	142.48
110	142.87	143.25	143.63	144.02	144.40	144.78	145.17	145.55	145.93	146.31
120	146.69	147.08	147.46	147.84	148.22	148.60	148.98	149.37	149.75	150.13
130	150.51	150.89	151.27	151.65	152.03	152.41	152.79	153.17	153.55	153.93
140	154.31	154.69	155.07	155.45	155.83	156.21	156.59	156.97	157.35	157.72
150	158.10	158.48	158.86	159.24	159.62	159.99	160.37	160.75	161.13	161.51
160	161.88	162.26	162.64	163.01	163.39	163.77	164.14	164.52	164.90	165.27
170	165.65	166.03	166.40	166.78	167.15	167.53	167.90	168.28	168.66	169.03
180	169.41	169.78	170.16	170.53	170.90	171.28	171.65	172.03	172.40	172.78
190	173.15	173.52	173.90	174.27	174.64	175.02	175.39	175.76	176.14	176.51
200	176.88	177.25	177.63	178.00	178.37	178.74	179.12	179.49	179.86	180.23
210	180.60	180.97	181.34	181.72	182.09	182.46	182.83	183.20	183.57	183.94
220	184.31	184.68	185.05	185.42	185.79	186.16	186.53	186.90	187.27	187.64
230	188.01	188.38	188.75	189.11	189.48	189.85	190.22	190.59	190.96	191.32
240	191.69	192.06	192.43	192.80	193.16	193.53	193.90	194.27	194.63	195.00
250	195.37	195.73	196.10	196.47	196.83	197.20	197.56	197.93	198.30	198.66
260	199.03	199.39	199.76	200.12	200.49	200.85	201.22	201.58	201.95	202.31
270	202.68	203.04	203.41	203.77	204.13	204.50	204.86	205.22	205.59	205.95
280	206.31	206.68	207.04	207.40	207.77	208.13	208.49	208.85	209.22	209.58
290	209.94	210.30	210.66	211.03	211.39	211.75	212.11	212.47	212.83	213.19
300	213.56	213.92	214.28	214.64	215.00	215.36	215.72	216.08	216.44	216.80
310	217.16	217.52	217.88	218.24	218.60	218.95	219.31	219.67	220.03	220.39
320	220.75	221.11	221.47	221.82	222.18	222.54	222.90	223.25	223.61	223.97
330	224.33	224.68	225.04	225.40	225.76	226.11	226.47	226.83	227.18	227.54
340	227.89	228.25	228.61	228.96	229.32	229.67	230.03	230.38	230.74	231.10
350	231.45	231.80	232.16	232.51	232.87	233.22	233.58	233.93	234.29	234.64
360	234.99	235.35	235.70	236.05	236.41	236.76	237.11	237.47	237.82	238.17
370	238.53	238.88	239.23	239.58	239.93	240.29	240.64	240.99	241.34	241.69
380	242.05	242.40	242.75	243.10	243.45	243.80	244.15	244.50	244.85	245.20
390	245.55	245.90	246.25	246.60	246.95	247.30	247.65	248.00	248.35	248.70
400	249.05	249.40	249.75	250.10	250.45	250.79	251.14	251.49	251.84	252.19
410	252.54	252.88	253.23	253.58	253.93	254.27	254.62	254.97	255.31	255.66
420	256.01	256.35	256.70	257.05	257.39	257.74	258.09	258.43	258.78	259.12
430	259.47	259.81	260.16	260.51	260.85	261.20	261.54	261.88	262.23	262.57
440	262.92	263.26	263.61	263.95	264.29	264.64	264.98	265.33	265.67	266.01
450	266.36	266.70	267.04	267.39	267.73	268.07	268.41	268.76	269.10	269.44
460	269.78	270.12	270.47	270.81	271.15	271.49	271.83	272.17	272.51	272.86
470	273.20	273.54	273.88	274.22	274.56	274.90	275.24	275.58	275.92	276.26
480	276.60	276.94	277.28	277.62	277.96	278.29	278.63	278.97	279.31	279.65
490	279.99	280.33	280.67	281.00	281.34	281.68	282.02	282.35	282.69	283.03
500	283.37	283.70	284.04	284.38	284.72	285.05	285.39	285.73	286.06	286.40

Resistance vs. Temperature table for 3902 PRTs (alpha = .003902)

in Deg Farhenheit

Ro = 100.000 ohms

°F	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-330	16.50									
-320	18.97	18.73	18.48	18.23	17.99	17.74	17.49	17.24	17.00	16.75
-310	21.43	21.18	20.94	20.69	20.45	20.20	19.96	19.71	19.46	19.22
-300	23.87	23.63	23.38	23.14	22.90	22.65	22.41	22.16	21.92	21.67
-290	26.30	26.06	25.82	25.58	25.33	25.09	24.85	24.60	24.36	24.12
-280	28.72	28.48	28.24	28.00	27.76	27.51	27.27	27.03	26.79	26.55
-270	31.13	30.89	30.65	30.41	30.17	29.93	29.68	29.44	29.20	28.96
-260	33.52	33.28	33.04	32.80	32.56	32.33	32.09	31.85	31.61	31.37
-250	35.90	35.67	35.43	35.19	34.95	34.71	34.48	34.24	34.00	33.76
-240	38.28	38.04	37.80	37.57	37.33	37.09	36.85	36.62	36.38	36.14
-230	40.64	40.40	40.17	39.93	39.70	39.46	39.22	38.99	38.75	38.51
-220	42.99	42.76	42.52	42.29	42.05	41.82	41.58	41.35	41.11	40.88
-210	45.33	45.10	44.87	44.63	44.40	44.16	43.93	43.70	43.46	43.23
-200	47.67	47.44	47.20	46.97	46.74	46.50	46.27	46.04	45.80	45.57
-190	49.99	49.76	49.53	49.30	49.07	48.83	48.60	48.37	48.13	47.90
-180	52.31	52.08	51.85	51.62	51.39	51.15	50.92	50.69	50.46	50.23
-170	54.62	54.39	54.16	53.93	53.70	53.47	53.24	53.00	52.77	52.54
-160	56.92	56.69	56.46	56.23	56.00	55.77	55.54	55.31	55.08	54.85
-150	59.22	58.99	58.76	58.53	58.30	58.07	57.84	57.61	57.38	57.15
-140	61.50	61.28	61.05	60.82	60.59	60.36	60.13	59.90	59.67	59.45
-130	63.78	63.56	63.33	63.10	62.87	62.64	62.42	62.19	61.96	61.73
-120	66.06	65.83	65.60	65.38	65.15	64.92	64.69	64.47	64.24	64.01
-110	68.33	68.10	67.87	67.65	67.42	67.19	66.97	66.74	66.51	66.29
-100	70.59	70.36	70.14	69.91	69.68	69.46	69.23	69.01	68.78	68.55
-90	72.85	72.62	72.39	72.17	71.94	71.72	71.49	71.27	71.04	70.81
-80	75.10	74.87	74.65	74.42	74.20	73.97	73.75	73.52	73.30	73.07
-70	77.34	77.12	76.89	76.67	76.45	76.22	76.00	75.77	75.55	75.32
-60	79.58	79.36	79.14	78.91	78.69	78.46	78.24	78.02	77.79	77.57
-50	81.82	81.60	81.37	81.15	80.93	80.70	80.48	80.26	80.03	79.81
-40	84.05	83.83	83.61	83.38	83.16	82.94	82.71	82.49	82.27	82.04
-30	86.28	86.06	85.84	85.61	85.39	85.17	84.94	84.72	84.50	84.28
-20	88.50	88.28	88.06	87.84	87.61	87.39	87.17	86.95	86.73	86.50
-10	90.72	90.50	90.28	90.06	89.84	89.61	89.39	89.17	88.95	88.73
0	92.94	92.72	92.49	92.27	92.05	91.83	91.61	91.39	91.17	90.94

°F	0	1	2	3	4	5	6	7	8	9
0	92.94	93.16	93.38	93.60	93.82	94.04	94.26	94.49	94.71	94.93
10	95.15	95.37	95.59	95.81	96.03	96.25	96.47	96.69	96.91	97.14
20	97.36	97.58	97.80	98.02	98.24	98.46	98.68	98.90	99.12	99.34
30	99.56	99.78	100.00	100.22	100.44	100.66	100.88	101.10	101.32	101.54
40	101.76	101.98	102.20	102.42	102.64	102.86	103.08	103.30	103.52	103.74
50	103.96	104.18	104.39	104.61	104.83	105.05	105.27	105.49	105.71	105.93
60	106.15	106.37	106.59	106.81	107.02	107.24	107.46	107.68	107.90	108.12
70	108.34	108.56	108.78	108.99	109.21	109.43	109.65	109.87	110.09	110.30
80	110.52	110.74	110.96	111.18	111.40	111.61	111.83	112.05	112.27	112.49
90	112.70	112.92	113.14	113.36	113.58	113.79	114.01	114.23	114.45	114.67
100	114.88	115.10	115.32	115.54	115.75	115.97	116.19	116.41	116.62	116.84
110	117.06	117.27	117.49	117.71	117.93	118.14	118.36	118.58	118.79	119.01
120	119.23	119.45	119.66	119.88	120.10	120.31	120.53	120.75	120.96	121.18
130	121.40	121.61	121.83	122.05	122.26	122.48	122.69	122.91	123.13	123.34
140	123.56	123.78	123.99	124.21	124.42	124.64	124.86	125.07	125.29	125.50
150	125.72	125.94	126.15	126.37	126.58	126.80	127.01	127.23	127.44	127.66
160	127.88	128.09	128.31	128.52	128.74	128.95	129.17	129.38	129.60	129.81
170	130.03	130.24	130.46	130.67	130.89	131.10	131.32	131.53	131.75	131.96
180	132.18	132.39	132.61	132.82	133.04	133.25	133.47	133.68	133.89	134.11
190	134.32	134.54	134.75	134.97	135.18	135.39	135.61	135.82	136.04	136.25
200	136.46	136.68	136.89	137.11	137.32	137.53	137.75	137.96	138.18	138.39
210	138.60	138.82	139.03	139.24	139.46	139.67	139.88	140.10	140.31	140.52
220	140.74	140.95	141.16	141.38	141.59	141.80	142.02	142.23	142.44	142.66
230	142.87	143.08	143.29	143.51	143.72	143.93	144.14	144.36	144.57	144.78
240	145.00	145.21	145.42	145.63	145.85	146.06	146.27	146.48	146.69	146.91
250	147.12	147.33	147.54	147.76	147.97	148.18	148.39	148.60	148.82	149.03
260	149.24	149.45	149.66	149.87	150.09	150.30	150.51	150.72	150.93	151.14
270	151.36	151.57	151.78	151.99	152.20	152.41	152.62	152.83	153.05	153.26
280	153.47	153.68	153.89	154.10	154.31	154.52	154.73	154.94	155.16	155.37
290	155.58	155.79	156.00	156.21	156.42	156.63	156.84	157.05	157.26	157.47
300	157.68	157.89	158.10	158.31	158.52	158.73	158.94	159.15	159.36	159.57
310	159.78	159.99	160.20	160.41	160.62	160.83	161.04	161.25	161.46	161.67
320	161.88	162.09	162.30	162.51	162.72	162.93	163.14	163.35	163.56	163.77
330	163.98	164.19	164.40	164.60	164.81	165.02	165.23	165.44	165.65	165.86
340	166.07	166.28	166.49	166.69	166.90	167.11	167.32	167.53	167.74	167.95
350	168.16	168.36	168.57	168.78	168.99	169.20	169.41	169.61	169.82	170.03
360	170.24	170.45	170.65	170.86	171.07	171.28	171.49	171.70	171.90	172.11
370	172.32	172.53	172.73	172.94	173.15	173.36	173.56	173.77	173.98	174.19
380	174.39	174.60	174.81	175.02	175.22	175.43	175.64	175.85	176.05	176.26
390	176.47	176.67	176.88	177.09	177.30	177.50	177.71	177.92	178.12	178.33
400	178.54	178.74	178.95	179.16	179.36	179.57	179.78	179.98	180.19	180.40
410	180.60	180.81	181.01	181.22	181.43	181.63	181.84	182.05	182.25	182.46
420	182.66	182.87	183.08	183.28	183.49	183.69	183.90	184.10	184.31	184.52
430	184.72	184.93	185.13	185.34	185.54	185.75	185.96	186.16	186.37	186.57
440	186.78	186.98	187.19	187.39	187.60	187.80	188.01	188.21	188.42	188.62
450	188.83	189.03	189.24	189.44	189.65	189.85	190.06	190.26	190.47	190.67
460	190.87	191.08	191.28	191.49	191.69	191.90	192.10	192.31	192.51	192.71
470	192.92	193.12	193.33	193.53	193.73	193.94	194.14	194.35	194.55	194.75
480	194.96	195.16	195.37	195.57	195.77	195.98	196.18	196.38	196.59	196.79
490	196.99	197.20	197.40	197.60	197.81	198.01	198.21	198.42	198.62	198.82
500	199.03	199.23	199.43	199.64	199.84	200.04	200.25	200.45	200.65	200.85
510	201.06	201.26	201.46	201.66	201.87	202.07	202.27	202.47	202.68	202.88
520	203.08	203.28	203.49	203.69	203.89	204.09	204.30	204.50	204.70	204.90
530	205.10	205.31	205.51	205.71	205.91	206.11	206.31	206.52	206.72	206.92
540	207.12	207.32	207.52	207.73	207.93	208.13	208.33	208.53	208.73	208.93
550	209.14	209.34	209.54	209.74	209.94	210.14	210.34	210.54	210.75	210.95
560	211.15	211.35	211.55	211.75	211.95	212.15	212.35	212.55	212.75	212.95
570	213.15	213.35	213.56	213.76	213.96	214.16	214.36	214.56	214.76	214.96
580	215.16	215.36	215.56	215.76	215.96	216.16	216.36	216.56	216.76	216.96
590	217.16	217.36	217.56	217.76	217.96	218.16	218.36	218.56	218.76	218.95
600	219.15	219.35	219.55	219.75	219.95	220.15	220.35	220.55	220.75	220.95
610	221.15	221.35	221.54	221.74	221.94	222.14	222.34	222.54	222.74	222.94
620	223.14	223.33	223.53	223.73	223.93	224.13	224.33	224.53	224.72	224.92
630	225.12	225.32	225.52	225.72	225.91	226.11	226.31	226.51	226.71	226.90
640	227.10	227.30	227.50	227.70	227.89	228.09	228.29	228.49	228.69	228.88
650	229.08	229.28	229.48	229.67	229.87	230.07	230.27	230.46	230.66	230.86
660	231.06	231.25	231.45	231.65	231.84	232.04	232.24	232.44	232.63	232.83
670	233.03	233.22	233.42	233.62	233.81	234.01	234.21	234.40	234.60	234.80
680	234.99	235.19	235.39	235.58	235.78	235.98	236.17	236.37	236.56	236.76
690	236.96	237.15	237.35	237.55	237.74	237.94	238.13	238.33	238.53	238.72
700	238.92	239.11	239.31	239.50	239.70	239.90	240.09	240.29	240.48	240.68
710	240.87	241.07	241.26	241.46	241.66	241.85	242.05	242.24	242.44	242.63
720	242.83	243.02	243.22	243.41	243.61	243.80	244.00	244.19	244.39	244.58
730	244.78	244.97	245.16	245.36	245.55	245.75	245.94	246.14	246.33	246.53
740	246.72	246.92	247.11	247.30	247.50	247.69	247.89	248.08	248.27	248.47
750	248.66	248.86	249.05	249.24	249.44	249.63	249.83	250.02	250.21	250.41
760	250.60	250.79	250.99	251.18	251.37	251.57	251.76	251.96	252.15	252.34
770	252.54	252.73	252.92	253.11	253.31	253.50	253.69	253.89	254.08	254.27
780	254.47	254.66	254.85	255.04	255.24	255.43	255.62	255.82	256.01	256.20
790	256.39	256.59	256.78	256.97	257.16	257.36	257.55	257.74	257.93	258.12
800	258.32	258.51	258.70	258.89	259.09	259.28	259.47	259.66	259.85	260.04
810	260.24	260.43	260.62	260.81	261.00	261.20	261.39	261.58	261.77	261.96
820	262.15	262.34	262.54	262.73	262.92	263.11	263.30	263.49	263.68	263.87
830	264.07	264.26	264.45	264.64	264.83	265.02	265.21	265.40	265.59	265.78
840	265.97	266.17	266.36	266.55	266.74	266.93	267.12	267.31	267.50	267.69
850	267.88	268.07	268.26	268.45	268.64	268.83	269.02	269.21	269.40	269.59
860	269.78	269.97	270.16	270.35	270.54	270.73	270.92	271.11	271.30	271.49
870	271.68	271.87	272.06	272.25	272.44	272.63	272.82	273.01	273.20	273.39
880	273.57	273.76	273.95	274.14	274.33	274.52	274.71	274.90	275.09	275.28
890	275.47	275.65	275.84	276.03	276.22	276.41	276.60	276.79	276.98	277.16
900	277.35	277.54	277.73	277.92	278.11	278.29	278.48	278.67	278.86	279.05

Notes:

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