TT115/TT155/TT165/TT297 Temptran™
2-wire Temperature Transmitter for RTD Thermometers
Installation and Operating Instructions

Tel: 763. 571.3121 Fax: 763. 571.0927 www.minco.com

Description

Designed for use in room air applications, model TT115/TT155/TT165 is a 2-wire temperature transmitter for RTD (Resistance Temperature Detector) thermometers. The Temptran™ converts the RTD's signal into a 4 to 20 mA DC current. The current changes according to the range in which the Temptran is calibrated: 4 mA at the lowest temperature of the range, rising to 20 mA at the top of the range. The leads that supply power also carry the current signal.
Note: *Transmitter circuit board only, Room Air housing and RTD sold separately.*

Specifications

Sensing Element:	100 ohm platinum RTD, 0.00392 ohm/ohm/°C TCR, 100 ohm platinum RTD, 0.00391 ohm/ohm/°C TCR, 100 ohm platinum RTD, 0.00385 ohm/ohm/°C TCR, 1000 ohm platinum RTD, 0.00385 ohm/ohm/°C TCR 1000 ohm platinum RTD, 0.00375 ohm/ohm/°C TCR
Output:	4 to 20 mA DC over specified range, limited to 30mA maximum.
Calibration Accuracy:	± 0.1% of Span
Transmitter Linearity:	± 0.1% of Span.
Physical:	Printed circuit board designed to mount inside the S470 series thermostat housing with RTD
Operating Environment:	32° to 122°F (0° to 50°C), non-condensing.
Storage Environment:	-67° to 212°F (-55° to 100°C), non-condensing.
Ambient Temperature Effects:	± 0.007% Span/°F (± 0.014% Span/°F for Spans < 100°F)
Warm-up Drift:	± 0.1% of Span max., assuming Vsupply = 24 VDC and Rloop = 250 ohms. Stable within 30 minutes.
Supply Voltage:	8.5 to 35 volts DC, non-polarized.
Input Voltage Effect:	± 0.001% of span per volt from 8.5 to 35 VDC.
Maximum Load Resistance:	The maximum allowable resistance of the signal-carrying loop, including extension wires and load resistance, is given by this formula: Rloop max = (Vsupply-8.5)/.02 amps. For example, if the supply voltage is 24 VDC, the loop resistance must be less than 775 Ω.
System Integration:	Output "High" (22-28mA) with sensor open. Output "Low" (3.3-3.7mA) with sensor shorted.
Zero and Span Adjustment:	Non-interacting, Zero and Span ±5%.
Maximum Output Current:	30 mA.
Power Connections:	Screw terminals, non-polar (connect either way).
Sensor Connections:	Screw terminals, non-polar (connect either way).

Installation

Locate the Temptran near the RTD, in an area where the ambient temperature stays between the temperature range of the output.

Connect the Temptran as shown in the wiring diagram below. The transmitter's power and RTD connections are designed for non-polar hook-up, so polarity is not important. The maximum DC supply should not exceed 35 VDC. For the RTD, good connections are a must, a few ohms of resistance in the connection could cause an error of several degrees.

The Temptran has been factory-calibrated to its marked temperature range or to a specific RTD, do not change its Zero or Span adjustments.

Wiring Diagram

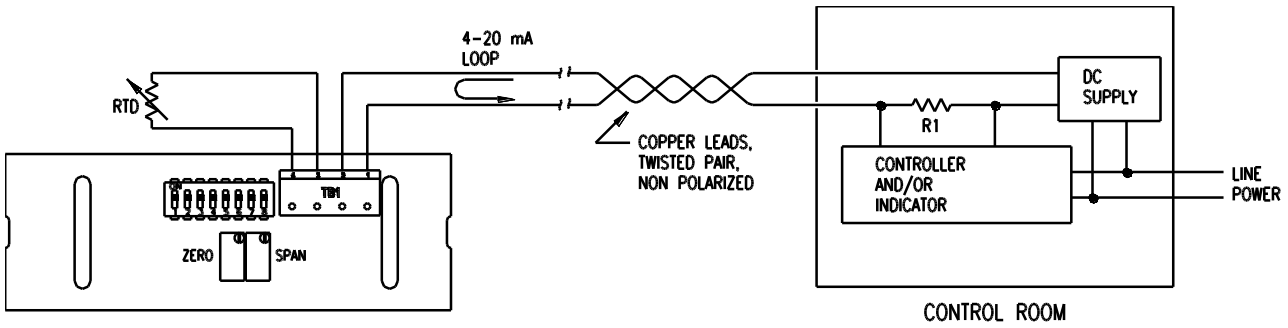

Figure 1

Power Supply

DC power supply requirements are determined by the transmitter's minimum voltage requirement and voltage drop across the load resistor and installation lead wires.

Example: The transmitter requires 8.5 Volts minimum. A typical 250 ohm load resistor drops 5.0 Volts @ 20 mA. Allowing a margin of 0.5 Volts for the supply permits 25 ohms of lead wire resistance for remote installation. Totaling these, we get a minimum power supply requirement of 14 VDC.

Using a 24 VDC power supply will take care of nearly all installations, but the transmitter will operate at voltages up to 35 VDC.

Calibration Procedure

1. Connect the equipment as shown below (Figure 2) substituting a resistance decade box, with resolution of at least 0.01 ohm, in place of the RTD.

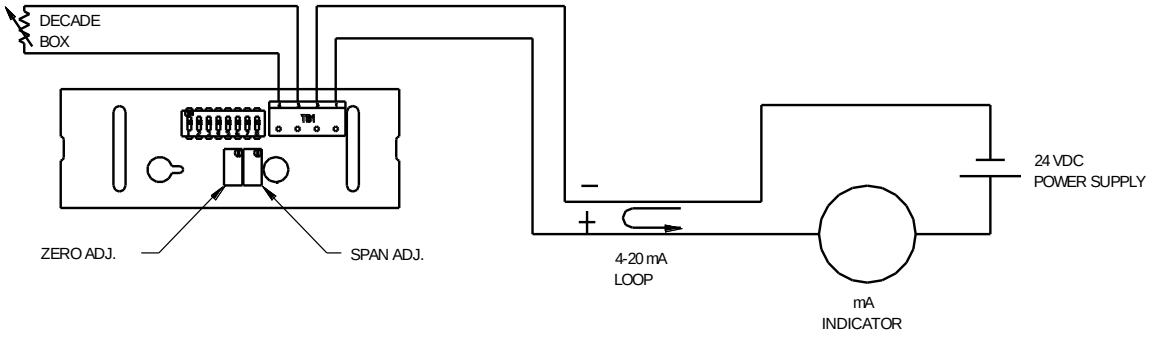

Figure 2

2. Determine sensor resistance corresponding to the lower and upper temperature range of the transmitter from Tables 3 and 4 (page 6). Using "RTD Calc" a more complete resistance vs. temperature chart can be printed; Download it from Minco's web site, www.minco.com.
3. Set the decade box to the resistance value corresponding to the lower temperature. Adjust the Zero pot until the milliammeter reads 4.0 mA +/- 0.016 mA.
4. Set the decade box to the resistance value corresponding to the upper temperature. Adjust the Span pot until the milliammeter reads 20.0 mA +/- 0.016 mA.
5. Set the decade box to the resistance value corresponding to the lower temperature and verify that the milliammeter still reads 4.0 mA +/- 0.016 mA. Correct if necessary, then repeat steps 4 and 5.

Transmitter Ranging

The transmitter is initially calibrated to a specific temperature range, as shown on the label attached to the housing. Unless a different range is desired, ranging is not necessary. If the temperature range is changed, recalibrate the transmitter as described in the section, *Calibration Procedure*.

When a different temperature range is desired, Tables 1, 2, 3, and 4 (Pages 5 and 6) provide range switch settings corresponding to the various temperature ranges. Switches 1 to 4 set the lower temperature limit (Zero) of the transmitter. Switches 5 to 8 set the upper minus lower temperature (Span) of the transmitter.

For example, a temperature range of 30 to 90°F has a Zero of 30°F and a Span of 60°F (90-30). Table 1 shows the closest Zero range is 30°F with switches 1 through 4, respectively, in the OFF, ON, ON, and OFF positions. Likewise, Table 2 shows the closest Span range is 58°F with switches 5 through 8, respectively, in the ON, ON, OFF, and ON positions. Once the switches are set, the Zero and Span trim pots should provide sufficient adjustments to calibrate the transmitter.

In the event that the trim pots do not have sufficient adjustments, the switch settings should then be changed. In the above example, if the Zero trim pot cannot adjust the transmitter current down to 4mA with the 30°F Zero switch settings, then the Zero switch settings should then be changed to 39°F (OFF, ON, OFF and ON) which is the next higher range. Likewise if the Span trim pot does not have sufficient adjustment, then the Span switch settings should be changed.

Zero Switch Settings for 100 Ohm PT Elements

Switch Settings				Center Point	
1	2	3	4	°F	°C
ON	ON	ON	ON	-71	-57
ON	ON	ON	OFF	-62	-52
ON	ON	OFF	ON	-53	-47
ON	ON	OFF	OFF	-44	-42
ON	OFF	ON	ON	-33	-36
ON	OFF	ON	OFF	-24	-31
ON	OFF	OFF	ON	-15	-26
ON	OFF	OFF	OFF	-6	-21
OFF	ON	ON	ON	3	-16
OFF	ON	ON	OFF	14	-10
OFF	ON	OFF	ON	23	-5
OFF	ON	OFF	OFF	32	0
OFF	OFF	ON	ON	41	5
OFF	OFF	ON	OFF	52	11
OFF	OFF	OFF	ON	61	16
OFF	OFF	OFF	OFF	73	23

Table 1

Span Switch Settings for 100 Ohm PT Elements (Upper Minus Lower Temperature Limits)

Switch Settings				Center Point	
5	6	7	8	°F	°C
ON	ON	ON	ON	43	24
ON	ON	ON	OFF	52	29
ON	ON	OFF	ON	63	35
ON	ON	OFF	OFF	74	41
ON	OFF	ON	ON	85	47
ON	OFF	ON	OFF	94	52
ON	OFF	OFF	ON	103	57
ON	OFF	OFF	OFF	113	63
OFF	ON	ON	ON	124	69
OFF	ON	ON	OFF	135	75
OFF	ON	OFF	ON	144	80
OFF	ON	OFF	OFF	153	85
OFF	OFF	ON	ON	164	91
OFF	OFF	ON	OFF	175	97
OFF	OFF	OFF	ON	184	102
OFF	OFF	OFF	OFF	193	107

Table 2

* Span = Upper - Lower Temperature. Zero ranges overlap next adjacent range.

Zero Switch Settings for 1000 Ohm PT Elements

Switch Settings				Center Point	
1	2	3	4	°F	°C
ON	ON	ON	ON	-71	-57
ON	ON	ON	OFF	-62	-52
ON	ON	OFF	ON	-53	-47
ON	ON	OFF	OFF	-44	-42
ON	OFF	ON	ON	-33	-36
ON	OFF	ON	OFF	-24	-31
ON	OFF	OFF	ON	-15	-26
ON	OFF	OFF	OFF	-6	-21
OFF	ON	ON	ON	3	-16
OFF	ON	ON	OFF	14	-10
OFF	ON	OFF	ON	23	-5
OFF	ON	OFF	OFF	32	0
OFF	OFF	ON	ON	41	5
OFF	OFF	ON	OFF	52	11
OFF	OFF	OFF	ON	61	16
OFF	OFF	OFF	OFF	73	23

Table 3

Span Switch Settings for 1000 Ohm PT Elements (Upper Minus Lower Temperature Limits)

Switch Settings				Center Point	
5	6	7	8	°F	°C
ON	ON	ON	ON	43	24
ON	ON	ON	OFF	52	29
ON	ON	OFF	ON	63	35
ON	ON	OFF	OFF	74	41
ON	OFF	ON	ON	85	47
ON	OFF	ON	OFF	94	52
ON	OFF	OFF	ON	103	57
ON	OFF	OFF	OFF	113	63
OFF	ON	ON	ON	124	69
OFF	ON	ON	OFF	135	75
OFF	ON	OFF	ON	144	80
OFF	ON	OFF	OFF	153	85
OFF	OFF	ON	ON	164	91
OFF	OFF	ON	OFF	175	97
OFF	OFF	OFF	ON	184	102
OFF	OFF	OFF	OFF	193	107

Table 4

* Span = Upper - Lower Temperature. Zero ranges overlap next adjacent range.

How to Order

TT115	Model Number: TT115 = Nominally calibrated transmitter TT155 = Calibrated with thermometers so output tracks temperature within ±0.75% of temperature Span TT165 = Calibrated with thermometers so output tracks temperature within ±0.50% of temperature Span TT297 = Calibrated with thermometers so output tracks temperature within ±0.20% of temperature Span
PD	Resistance thermometer type: RTD Temptran PA = 100 Ω Platinum (.00392) PB = 100 Ω Platinum (.00391) PD = 100 Ω Platinum (.00385) PE = 100 Ω Platinum (.00385) PF = 1000 Ω Platinum (.00385) PW = 1000 Ω Platinum (.00375)
1	4-20 mA DC Output
H	Temperature Range (4 mA Temp/20 mA Temp): H = 40 to90°F (4 to32°C) Consult factory for current list of available ranges.
TT115PD1H ← Sample part number	

Warranty

Items returned within three years from the date of sale, transportation prepaid, which Minco Products, Inc. (the "seller") reasonably determines to be faulty by reason of defective materials or faulty workmanship will be replaced or repaired at the seller's discretion, free of charge.

This remedy is to be the sole and exclusive remedy available to the buyer in the event of a breach by the seller. Items that show evidence of mishandling or misapplication may be returned by the seller at the customer's expense.

Furthermore, the seller is not to be held responsible for consequential damages caused by this product except as required under Minnesota Statutes, Section 336.1-719 (3).

This warranty is in lieu of any other expressed warranty or implied warranty of merchantability or fitness for a particular purpose, and of any other obligations or liability of the seller or its employees or agent.

Minco (Main Office)
7300 Commerce Lane
Minneapolis, MN
55432
USA
Tel: 1.763.571.3121
Fax: 1.763.571.0927

Customer Service/ Order Desk:
Tel: 1.763.571.3123
Fax: 1.763.571.0942
custserv@minco.com
www.minco.com

Minco S.A.
Usine et Service
Commercial, Z.I.
09310 Aston, France
Tel: (33) 5 61 03 24 01
Fax: (33) 5 61 03 24 09