1000 OHM NICKEL-IRON RANGEABLE TRANSMITTER

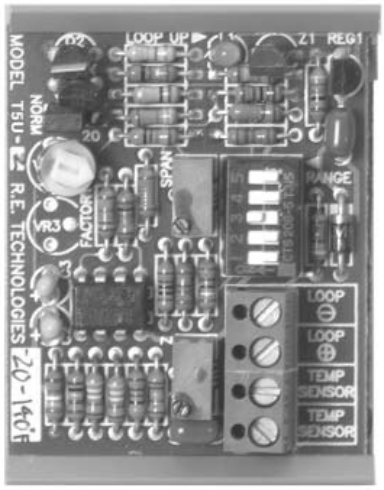
MODEL T5U

DESCRIPTION

The **Model T5U** is a field-rangeable, two-wire 4-20 mA RTD transmitter designed for use with Type 5 nickel-iron Balco sensors.

To adjust the temperature transmitter, set the DIP switches to match the desired range, and use the zero and span pots to fine tune. (A high accuracy digital ohm-meter and decade box are required.)

The **Model T5U** has a special 20 mA loop calibration test signal to provide easy system verification. Simply move the bottle plug jumper from NORM to 20 mA. The loop up LED provides power indication for the 4-20 mA output.



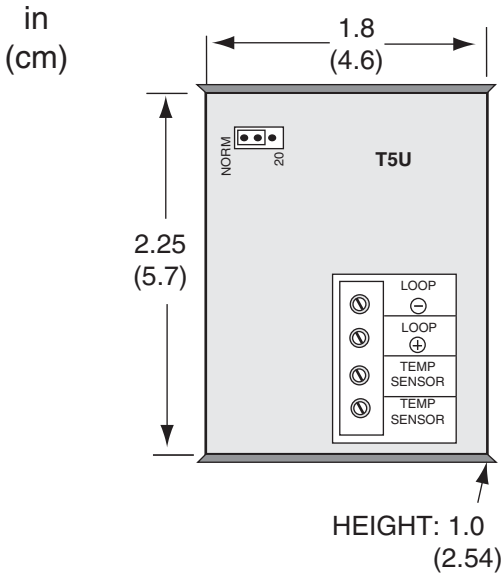
FEATURES

- ***DIP switch rangeable***
- ***Loop calibration test signal***
- ***Low cost***
- ***Snap-track mounting***
- ***Loop power LED indication***

APPLICATION

- ***Transmitter for Barber Colman 1000Ω nickel-iron Balco RTDs***

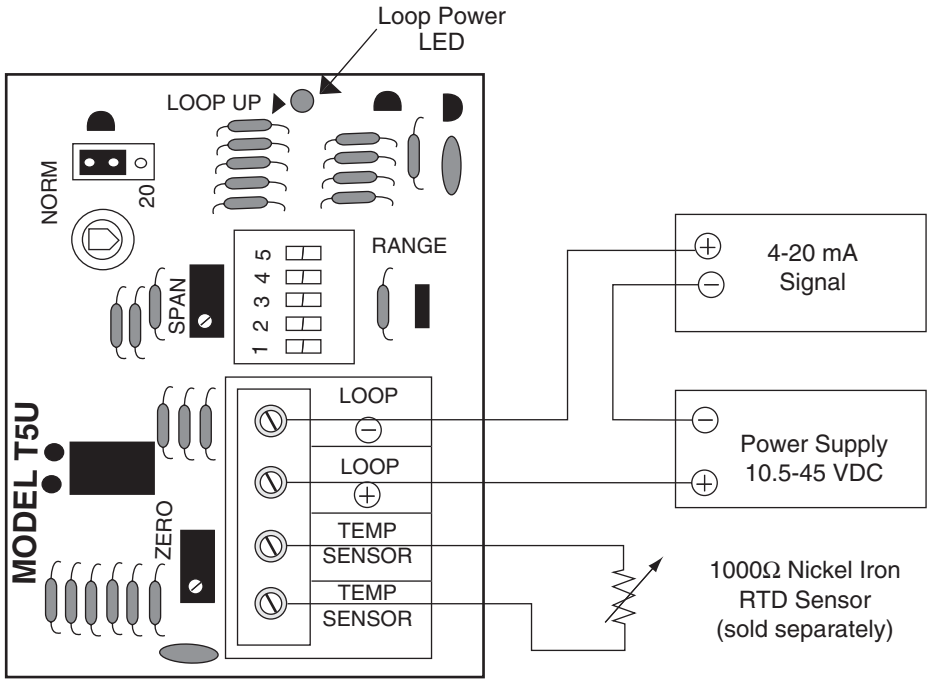
DIMENSIONS



SPECIFICATIONS

Sensor	1000Ω nickel-iron RTD	**Accuracy**	0.2°F or 0.4% of span
Output	4-20 mA, loop-powered	**Ambient operating temp**	0° to 140°F (-18° to 60°C)
Rangeability limits	-30° to 250°F (-34° to 121°C)	**RTD current**	650 µA
Min span	40°F (22°C)	**Dimensions**	1.8"W x 2.25"L x 1"H
Supply voltage	10.5-45 VDC		(4.6 x 5.7 x 2.54 cm)
Max impedance	675Ω @ 24 VDC	**Compatible RTD**	Type 5, nickel-iron Balco

WIRING



ORDERING INFORMATION

MODEL	DESCRIPTION	
T5U	4-20 mA Rangeable RTD Transmitter	
	RANGE	
	2	-20° to 140°F (-29° to 60°C)
	3	0° to 100°F (-18° to 38°C)
	4	30° to 240°F (-1° to 116°C)
	XR†	Special range (see previous page for rangeability limits)
		SENSOR TYPE
		— Transmitter only
		D ST-D5-XW Duct sensor*
		O ST-O5 Outside air sensor*
		W ST-W5-XW Immersion sensor* with well
		XWM Single-gang weather resistant box (mounted without sensor)

T5U — **2** — **D**

Example: **T5U-2-D** Transmitter with range of -20° to 140°F (-29° to 60°C) mounted and wired in duct sensor enclosure

†Indicate at time of order (__ to __° [F/C])
*Includes sensor mounted and wired

RANGE CALIBRATION OF THE T5U RTD TRANSMITTER (All units are factory calibrated before shipping.)

The **T5U** can be field-calibrated by using the ZERO and SPAN potentiometers and DIP switches. Use the step-by-step instructions below to calibrate the **T5U** to the desired temperature range. For information about accuracy, see "Special Notes on Field Calibration" on the reverse side.

Step 1 Assemble required equipment: temperature transmitter, 24 VDC power supply, decade box [Model RSU-280 (Newark) or equal], digital VOM [Fluke Model 87 (Newark) or equal], trim screwdriver, "RTD Resistance vs.Temperature Chart" (see "Temperature" section of Kele catalog).

Step 2 Using the "RTD Resistance vs. Temperature Chart" for 1000Ω nickel-iron Balco curve, select and record the resistance values for the high and low temperatures in your desired range. Designate these values as LOW TEMP OHMS and HIGH TEMP OHMS.

Step 3 Calculate the calibration factor using the ohms recorded in Step 2:

$$\text{CAL FACTOR} = \frac{\text{HIGH TEMP OHMS} - \text{LOW TEMP OHMS}}{16}$$

Step 4 Using the resistance decade box, select a resistance value within one ohm of the low temperature ohms in Step 2. ***Do not use a lower value.*** Measure this resistance with the VOM and record the actual value accurate to hundredths of an ohm. This value will be referred to as MIN REF OHMS.

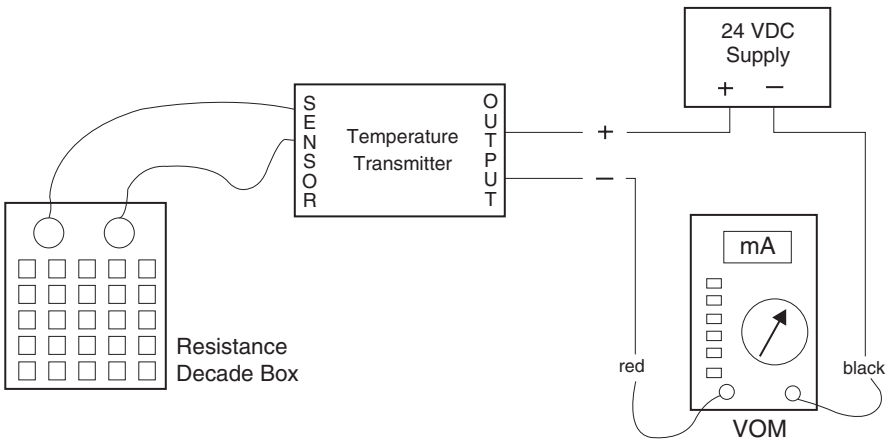
Select a resistance value within one ohm of the high temperature ohms in Step 3. ***Do not use a higher value.*** Measure this resistance with the VOM and record the actual value accurate to hundredths of an ohm. This value will be referred to as MAX REF OHMS.
Calculate the low mA reference:

$$\text{LOW MA REF} = \frac{\text{MIN REF OHMS} - \text{LOW TEMP OHMS}}{\text{CAL FACTOR}} + 4$$

Calculate the high mA reference:

$$\text{HIGH MA REF} = \frac{\text{MAX REF OHMS} - \text{LOW TEMP OHMS}}{\text{CAL FACTOR}} + 4$$

Step 5 Connect the transmitter as shown:

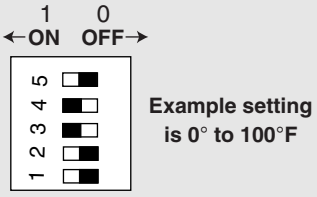


Continued

Step 6 Set DIP switches 1-5 by following these two steps:

(1) Set DIP switches 1 and 2 according to desired ZERO setting (Left position is on and right position is off.):

Desired ZERO	Switch 1	Switch 2
-30° to 15°F (-34° to -9°C)	OFF	OFF
15° to 80°F (-9° to 27°C)	OFF	ON
80° to 145°F (27° to 63°C)	ON	OFF
145° to 210°F (63° to 99°C)	ON	ON



Example setting is 0° to 100°F

Note: If the desired ZERO is very close to a range boundary and after step 7 you cannot adjust the ZERO to the desired setting, change the switch setting to the next range and readjust the potentiometer.

(2) Set DIP switches 3, 4, and 5 according to desired SPAN (HIGH TEMP - LOW TEMP) setting:

Desired SPAN	Switch 3	Switch 4	Switch 5
40° to 90°F (22° to 50°C)	ON	ON	ON
90° to 130°F (50° to 72°C)	ON	ON	OFF
130° to 160°F (72° to 88°C)	ON	OFF	ON
160° to 190°F (88° to 106°C)	ON	OFF	OFF
190° to 220°F (106° to 122°C)	OFF	ON	ON
220° to 250°F (122° to 138°C)	OFF	ON	OFF
250° to 280°F (138° to 156°C)	OFF	OFF	ON
280° to 300°F (156° to 167°C)	OFF	OFF	OFF

Note: If the desired SPAN is very close to a range boundary and you cannot adjust the SPAN to the desired setting, change the switch setting to the next range and readjust the potentiometer.

Examples: **Desired Range:**

0° to 100°F (-18° to 38°C) Set switches 3 and 4 ON; 1, 2, and 5 OFF.
-20° to 140°F (-29° to 60°C) Set switch 3 ON; 1, 2, 4, and 5 OFF.
30° to 240°F (-1° to 116°C) Set switches 2, 4 and 5 ON; 1 and 3 OFF.

Step 7 Set the ZERO and SPAN potentiometers:

A. Set the MIN REF OHMS on the decade box, and adjust the ZERO potentiometer on the transmitter for the LOW MA REF calculated in Step 4.
B. Set the MAX REF OHMS on the decade box, and adjust the SPAN potentiometer on the transmitter for the HIGH MA REF calculated in Step 4.
C. Repeat A and B and Step 6 as necessary.

Special Notes on Field Calibration

The accuracy of a field-calibrated RTD transmitter is highly dependent on the accuracy of the ohmmeter used to measure the sensor substitution resistances (MIN and MAX REF OHMS). ***The percent accuracy of the calibrated RTD transmitter is <u>not</u> the same as the percent accuracy of the ohmmeter.***

OHMMETER ACCURACY	TRANSMITTER ACCURACY	
(% of reading)	LOW TEMP	HIGH TEMP
1%	±4°F	±7°F
0.5%	±2°F	±3.5°F
0.25%	±1°F	±1.8°F
0.1%	±0.4°F	±0.7°F
0.05%	±0.2°F	±0.36°F

A Fluke Model 87 should provide an accuracy of approximately ±1.4°F at low temperatures and ±1.9°F at high temperatures.
A Fluke Model 8060 should provide an accuracy of approximately ±0.4°F at low temperatures and ±0.6°F at high temperatures.