

# Keysight U1586B Temperature Adapter

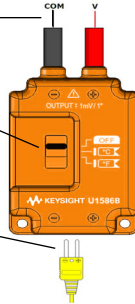
## Operating Instructions

The U1586B temperature adapter is designed for Keysight handheld digital multimeter (DMM), Keysight handheld oscilloscope, and K-Type thermocouple.

OUTPUT: mV output proportional to inside battery. °C and °F as the position of slider switch

Slider switch:  
- OFF: inside battery level  
- °C: 1 mV/°C  
- °F: 1 mV/°F

INPUT: K-type thermocouple with miniature connector



CE Conform to European Union Directives  
IEC/ EN 61010-12001 (2nd Edition)

## Assistance

For technical assistance, contact your nearest Keysight Sales Office or visit the Keysight website at [www.keysight.com/find/assist](http://www.keysight.com/find/assist) for further information.

## Safety Informations

Please use the Keysight U1586B temperature adapter only as specified in this manual. Otherwise, the protection provided may be impaired. Refer to the safety information below.

### ⚠ WARNING

To avoid possible electric shock, personal injury or damage to this instrument and ensure that you use the adapter safely, follow these guidelines:

- Do not use the adapter if it is damaged. Before you use the adapter inspect the case. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors.
- Do not touch thermocouple probe to hazardous voltage.
- Do not operate the adapter around explosive gas, vapor or dust.
- When servicing the adapter, use only specified replacement parts.
- Removed all connections as battery replacement
- Use caution when working above 30 V ac rms, 42 V peak or 60 V dc. Such voltage pose a shock hazard.
- Avoid working alone.
- Do not operate the adapter as the cover removed or loosened.

### CAUTION

To avoid possible damage to the temperature adapter or to the equipment under test, follow below guidelines:

- Do not connect output banana plugs to any power source.
- Use the proper terminals, function, and range for your measurements.

	AC - Alternating Current		Caution, risk of danger (Refer to the user's and service guide for details)
	Double Insulation		DC - Direct Current
	Ground		

## Battery Voltage Test

Set the adapter's slider switch to OFF position, the output will output the proportional mili-volt to represent the battery voltage inside. The proportional scale is DC 9.9 mV per 1 V of battery voltage inside. The operating voltage suggested is up to 7.5 V of battery. So, always make sure the mili-volt output is up to 74.2 mV before temperature measurement.

Battery Voltage	10 V	9 V	8 V	7.5 V
Output of U1586B	99.0 mV	89.1 mV	79.2 mV	74.2 mV

## Introductions

The U1586B temperature adapter accepts any K-Type thermocouple with miniature connector and converts it to 1 milli-volt per degree (Celsius or Fahrenheit).

## Standard Item Purchased Checklist

The following items are included when you make a purchase:

- U1586B temperature adapter
- K-Type bead probe
- Operation Instructions sheet (this sheet)

General Specifications

Specifications	Temperature Adapter
Operating Temperature	0 °C to 55 °C (14 °F to 131 °F)
Storage Temperature	-20 °C to 70 °C (-4 °F to 158 °F)
Relative Humidity	Max 80% RH for temperature up to 35 °C decreasing linearly to 50% RH at 55 °C
Battery life	1600 hours approximately based on alkaline battery
Altitude	2000 meters
EMC Compliance	Susceptibility and Emissions: Commercial Limits per EN61326-1
Dimensions (HxWxD)	31 mm (H) x 59 mm (W) x 113.5 mm (L)
Weight	120 grams

Power Supply:

Single standard 9 V Battery can use Alkaline or Carbon-zinc.

Battery Types	ANSI/NEDA	IEC
Alkaline	1604A	6LR61
Carbon-zinc	1604D	6F22

Electrical Specifications

Range	Resolution	Accuracy	
		± (% of reading + no. of least significant digits) at 23 °C ± 5 °C, with relative humidity less than 80% R.H.	
-50 °C ~ 1000 °C	1 mV/°C	-50 ~ -21 °C	2.5% + 2 °C
		-20 ~ 350 °C	0.5% + 2 °C
		351 ~ 500 °C	1.75% + 2 °C
		501 ~ 1000 °C	2% + 2 °C
-58 °F ~ 1832 °F	1 mV/°F	-58 ~ -5.8 °F	2.5% + 3.6 °F
		-4 ~ 662 °F	0.5% + 3.6 °F
		664 ~ 932 °F	1.75% + 3.5 °F
		933 ~ 1832 °F	2% + 3.6 °F

NOTE

- The accuracy specifications does not include the error of the probe or the digital multimeter, and this adapter should be stabilized for at least one hour on the DUT to be measured. Please refer to the probe accuracy specifications for additional details.
- Accuracy enhancement for 351 °C ~ 500 °C, subtract 3 degrees from the reading. The accuracy is now 0.75% ±2 °C.
- Accuracy enhancement for 663 °F ~ 932 °F, subtract 5.4 degrees from the reading. The accuracy is now 0.75% ±3.6 °F.

Operation

Follow the procedures provided to select Celsius or Fahrenheit temperature unit in proportion to mili-volt output using slider switch:

1. Ensure the temperature adapter is stabilized in operating environment.
2. Switch the adapter slider's switch to set °C or °F.
3. Plug the banana plugs into V/COM terminals on multimeter.
4. Set the DC voltage measurement and adequate range on multimeter or oscilloscope in use.
5. Plug the miniature K-Type thermocouple probe into adapter.
6. Observe the DC mili-volt on a multimeter which is proportional to the temperature. (1 mV is 1 °C or ° F)
7. Select a better resolution to 0.1 mV on a multimeter if want to see the difference to 0.1 degree.

Calibration Equipment

The pre-calibration guide lines are shown as follows:

- Be sure you are a qualified person to perform the calibration
- The environment should be 23 °C ±2 °C and the relative humidity (RH) shall be < 80%.

The test equipment requirements listed in table below or equivalents are required to perform the calibration and performance verification test procedures. Alternative equipment may be used as long as the accuracy is as good as or better than the specifications listed.

Standard Source	Operating Range	Accuracy Required	Recommended Equipment
K-Type Thermocouple Simulator or Calibrator	-50 ~ 1000 °C -58 ~ 1832 °F	$\leq \pm 0.1\% + 1\text{ }^{\circ}\text{C}$	CL-300-1000C from OMEGA or Fluke-5520A
Multimeter	DC 1000.0 mV	$\leq \pm 0.1\%$	Keysight-U1251A, U1252A or Keysight-34405A
Ice Point Reference Chamber	-5 ~ 38 °C	$\leq \pm 0.1\% + 0.5\text{ }^{\circ}\text{C}$	TRCIII from OMEGA or Fluke -5520A

## Adjustment Procedures

The following procedures are to be performed in sequence after another to ensure a correct calibration sequence.

### Celsius Temperature Offset Adjustment

1. Set the operating range of the digital multimeter to DC 1000.0 mV.
2. Set the reference standard to 0 °C.
3. Switch the adapter's slider to the °C position.
4. Connect the K-type miniature connector from the reference standard into the input of U1586B adapter.
5. Plug in the banana ends of the adapter's output to the V and COM input terminals of the digital multimeter.
6. Wait for at least 30 seconds for the signal conversion from °C to Volts to stabilize at the multimeter display.
7. Observe that the multimeter reading should display a voltage of  $0.0\text{ mV} \pm 0.2\text{ mV}$ .
8. If the multimeter reading display does not meet the required voltage, unscrew 2 Phillips head screws at the back panel of the adapter using a Phillips tip screwdriver and remove the rear cover.
9. Look for VR3 (refer to Figure 1 for the location of VR3 in the adjustment diagram) and carefully adjust the variable resistor using a small Phillips tip screwdriver until the display of the multimeter meets the required reading of  $0.0\text{ mV} \pm 0.2\text{ mV}$ .
10. After performing the adjustment of VR3, remember to replace the rear cover of the adapter or proceed to the next calibration process.

### Celsius Temperature Gain Adjustment

1. Set the operating range of the digital multimeter to DC 1000.0 mV.
2. Set the reference standard to 300 °C.
3. Switch the adapter's slider to the °C position.
4. Connect the K-type miniature connector from the reference standard into the input of U1586B adapter.
5. Plug in the banana ends of the adapter's output to the V and COM input terminals of the digital multimeter.
6. Wait for at least 30 seconds for the signal conversion from °C to Volts to stabilize at the multimeter display.
7. Observe that the multimeter reading should display a voltage of  $300.0\text{ mV} \pm 0.2\text{ mV}$ .
8. If the multimeter reading display does not meet the required voltage, unscrew 2 Phillips head screws at the back panel of the adapter using a Phillips tip screwdriver and remove the rear cover.
9. Look for VR1 (refer to Figure 1 for the location of VR1 in the adjustment diagram) and carefully adjust the variable resistor using a small Phillips tip screwdriver until the display of the multimeter meets the required reading of  $300.0\text{ mV} \pm 0.2\text{ mV}$ .
10. After performing the adjustment of VR1, remember to replace the rear cover of the adapter or proceed to the next calibration process.

### Fahrenheit Temperature Offset Adjustment

1. Set the operating range of the digital multimeter to DC 1000.0 mV.
2. Set the reference standard to 32 °F.
3. Switch the adapter's slider to the °F position.
4. Connect the K-type miniature connector from the reference standard into the input of U1586B adapter.
5. Plug in the banana ends of the adapter's output to the V and COM input terminals of the digital multimeter.
6. Wait for at least 30 seconds for the signal conversion from °C to Volts to stabilize at the multimeter display.
7. Observe that the multimeter reading should display a voltage of  $32.0\text{ mV} \pm 0.2\text{ mV}$ .
8. If the multimeter reading display does not meet the required voltage, unscrew 2 Phillips head screws at the back panel of the adapter using a Phillips tip screwdriver and remove the rear cover.
9. Look for VR4 (refer to Figure 1 for the location of VR4 in the adjustment diagram) and carefully adjust the variable resistor using a small Phillips tip screwdriver until the display of the multimeter meets the required reading of  $32.0\text{ mV} \pm 0.2\text{ mV}$ .
10. After performing the adjustment of VR4, remember to replace the rear cover of the adapter or proceed to the next calibration process.

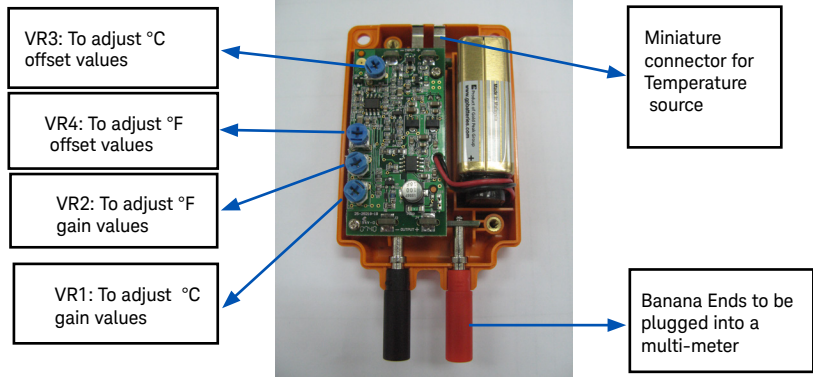


Figure 1: U1586B Adjustment Diagram

#### NOTE

Always remember to adjust the gain of the temperature in Celsius before Fahrenheit.

#### Fahrenheit Temperature Gain Adjustment

1. Set the operating range of the digital multimeter to DC 1000.0 mV.
2. Set the reference standard to 572 °F (300 °C).
3. Switch the adapter's slider to the °F position.
4. Connect the K-type miniature connector from the reference standard into the input of U1586B adapter.
5. Plug in the banana ends of the adapter's output to the V and COM input terminals of the multimeter.
6. Wait for at least 30 seconds for the signal conversion from °F to Volts to stabilize at the multimeter display.
7. Observe that the multimeter reading should display a voltage of 572.0 mV  $\pm$  0.2 mV.
8. If the multimeter reading display does not meet the required voltage, unscrew 2 Phillips head screws at the back panel of the adapter using a Phillips tip screwdriver and remove the rear cover.
9. Look for VR2 (refer to Figure 1 for the location of VR2 in the circuit diagram) and carefully adjust the variable resistor using a small Phillips tip screwdriver until the display of the multimeter meets the required reading of 572.0 mV  $\pm$  0.2 mV.
10. After performing the adjustment of VR2, remember to replace the rear cover of the adapter.

#### Maintenance

Repair or service not cover this manual should be performed only by qualified personnel.

#### WARNING

To avoid electrical shock or damage to the adapter, do not get water inside the case .

#### Cleaning

- Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasive or solvents.

#### Troubleshooting

If the temperature adapter does not perform properly, follow the steps below to identify the problem:

1. Before inspecting the battery voltage, switch the adapter's slider to OFF position. Replace the battery if the voltage output ends less than 74.2 mV.
2. Check the K-type thermocouple probe whether has been plugged into adapter or any crack on bead end. Replace with new one as necessary.
3. Verify that the DC voltage and range on the multimeter is correct.

#### WARNING

Never discharge the battery by short battery or reverse polarity in any subjects.

#### Battery Replacement

The adapter is powered by 9 V battery. Ensure to use specified battery only.

Following is the procedures for battery replacement:

1. Removed all the connections for thermocouple probe and banana plugs.
2. Loose two screw on the bottom case and remove the bottom case.
3. Replace the specified batteries and ensure the polarity of the batteries.
4. The red and black surrounding plastic cases are for "+" and "-" banana plug ends. Please ensure the polarity and color.
5. Once done place back the bottom case to its original place and tighten the screw.

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