

How to add the temperature measurement mode in the ZT101 multimeter.

Option 1 (flashing EEPROM).

That in the multimeter ZT101 there was a mode of measurement of temperature it is necessary only change the values of some EEPROM cells 24C02.

In cell AFH, change the value to 13H (Celsius temperature), and in cell BFH change at 15H (Fahrenheit temperature).

The temperature measurement mode will be available in the "mV" selector position by pressing yellow button (mVDC → mVAC → °C → °F → mVDC). Alternating modes can be change by rearranging the values in cells 8FH - BFH.

An example of flashing 24C02 with PICKIT2.

1. First, you need to set jumpers between the VPP checkpoint and the contacts JP2 (see the picture). This is necessary to enable writing to 24C02 and transferring the processor to reset state so as not to interfere with the operation of 24C02.
2. Connect 24C02 to PICKIT2. For this, only 3 wires are needed. Can use the clip. If there are no clips, then 3 wires are not difficult and solder.

3. Turn on the power of the multimeter by turning the selector to any position other than OFF.
4. Connect PICKIT2 to the computer, run PICKIT2 Programmer, select 24C02 and read the contents of the EEPROM by pressing the READ pedal. The content should look like this like on a picture. Some values may vary.

It does not hurt to save the read dump to a file so that you can restore the factory data settings, in which case.

5. In cells 0AF and 0BF (circled in red), change the values to 13 and 15. These modes temperature measurements in degrees Celsius and Fahrenheit, respectively. They can be swap.
6. Record the corrected dump in EEPROM 24C02 by pressing the WRITE pedal. Green field in the event window confirms the successful record.
7. Turn off the power of the multimeter, disconnect 24C02 from PICKIT2, remove the jumpers RESET-GND-WP.

All. Now in the position of the selector "mV" two more modes will be available. Mode Selection yellow button.

The thermocouple is connected to the COM jacks (black banana, "-") and VΩHz (red banana, "+").

Option 2 (without EEPROM flashing).

As already noticed, the Chinese do not make a bunch of options for printed circuit boards, and they make one

universal and, as necessary, establish a certain set of parts. That's with multimeters ZT101 / ZT102 the same situation, but ... On boards v0.5 this option does not work.

ZT101

ZT102

In the 101st there is no R45 and R46, but it is installed jumper R47.

At 102 the jumpers R45, R46 and is not R47.

That's all the difference.

In fact, the options for reworking 101st in 102nd are absolutely identical, i.e. measuring mode temperature works the same, that in the first, that in the second variant. The difference is only in The method of choosing this mode and aesthetic appearance.

How to evaluate the accuracy of temperature measurement.

To assess the accuracy of measuring the temperature with a multimeter, however it seemed strange, it is not even necessary to have a reference temperature meter. The bottom line is that thermocouple there is EMF, the voltage of which is proportional to the measured temperature, more precisely the temperature difference between a cold and hot junction. And the voltage of this multimeter

can measure fairly accurately. Knowing the voltage of the emf can easily be determined the corresponding temperature value according to the calibration table [1], or use the online calculator [2]. The thermocouple type K (TXA) is the de-facto for multimeters.

But first, we'll deal with the temperature of the cold junction.

In the temperature measurement mode, if the thermocouple is not connected or the input is shorted, the multimeter indicates (or should show) the ambient temperature (temperature inside the device). This temperature is measured by the internal sensor of the chip. This temperature and

will be considered the temperature of the cold junction. Temperature equalization processes inside device and contact temperature (bananas) is omitted. Now if you heat up the working end (hot junction) of the thermocouple, we get the voltage in the mV mode and the temperature in corresponding mode, but with the cold junction temperature taken into account. Having compared The obtained values with tabular data are not difficult to estimate the accuracy of the measurement temperature.

1. Calibration chart for thermocouple type K (TXA) - <http://sensorsse.com/page11.html>

2. Online calculator - <http://rcl-radio.ru/?p=20577>

Example. Key points.

The thermocouple is fixed on the soldering iron tip (screwed with a thin wire).

The heating regulator can be set to a different temperature. Moreover, the numerical values of temperature are not important to us at this stage.

The main thing is that the temperature is maintained at the set level was stable and there were no sharp jumps.

Results of measurement at some control points of the interesting temperature range are listed in the table

The voltage of the EMF,
mV (multimeter)

Temperature by
multimeter, ° C

Online calculator, ° C
(T of around 25 ° C)

0	25	25
3.28	105	104.43
7.09	199	198.78
11.26	302	301.78
15.41	401	400.32
19.79	504	503.63

Estimation of the accuracy of temperature measurement from the data obtained.

The multimeter measures the temperature accurately enough and in any adjustments needs.

What to do, if...

If the cold junction temperature is not correctly determined, the measured values the temperatures will be shifted relative to the calculated values by a constant value.

Adjust this value by changing the value in the memory cell 0BH

EEPROM 24C02. By default, the value FA (250 in decimal form is written there, that corresponds to a temperature of 25.0 ° C). To be precise, in the two cells 0CH and 0BH recorded number 00FA.

If the multimeter overestimates the measured temperature, then the value in the indicated cell needs Reduce, if understates, then increase. For example, if you want to lower the measured temperature of 3 degrees, then in the indicated cell, the initial value of FA must be changed to DC (in decimal form $250 - 30 = 220$).