Uni-T UT139S Review

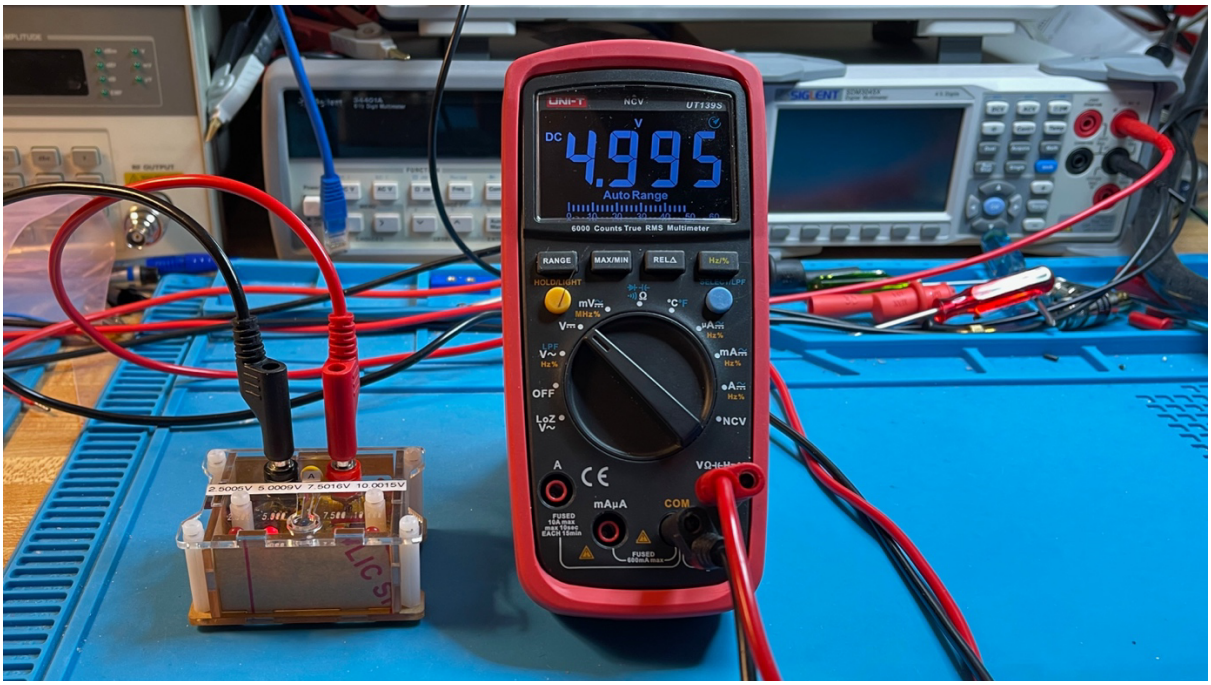
Introduction

Hi, I am Tom, amateur radio call sigh N8FDY. This is a review of the Uni-T UT139S multimeter for use in hobby electronics projects primarily related to amateur radio.

Disclaimer

I am not a professional, I am a hobbyist. This review is not sponsored; I bought this multimeter with my own money. I only used and tested this multimeter in CAT I and CAT II environments. I do not have a way to review or test the safety of this meter. I leave the CAT III and CAT IV environments to trained and licensed professionals. It may seem like I am a Fluke fan boy, but I recognize their flaws along with their advantages. There may be unintended mistakes and/or errors in this review.

Overview



I am testing and demonstrating this Uni-T UT139S multimeter that I purchased from TME.com in Poland for $66.88. I later discovered that a rebranded version of this meter is available from Triplett as the model MM525 and has a 1- year warrantee. The MM525 can be purchased at Lowe's for $93.45 or at TEquipment.com for $68.17; other places like DigiKey carry it. I only used it in CAT I and CAT II environments.

CAT I is for measurements on circuits not directly connected to mains. For example, battery operated electronics, or radio gear connected to a 13V DC power supply.

CAT II is for measurements performed on circuits directly connected to the 120V (240V in some countries) power outlets at least 15 feet from the distribution panel. For example, your 120V AC to 13V DC power supply or a vintage piece of ham radio gear we lovingly call "boat anchors" that plug into a 120V AC outlet.

First, we will look at the features of the multimeter, then we will look at the accuracy of the meter. We will then go over the ergonomics. We will wrap up with the pros, cons and conclusion.

I will not be using the test leads that came with the meter. I have not liked any test leads that came with multimeters except the Fluke TL175 TwistGuard® test leads that were bundled with the Fluke 87V MAX. I also use Probe Master Series 8000 Test Leads.

Objectives

This review was produced to help you decide if the Uni-T UT139S multimeter will fit your purpose and budget. This is part of a series of multimeters reviews.
A good multimeter for hobby electronic projects should be able to measure millivolts, volts, microamps, milliamps, amps, ohms, nanofarads and microfarads.
If you want to measure picofarads, nanohenry, microhenry or reactance you will need an LCR meter. I cover the two LCR meters I own in another review.

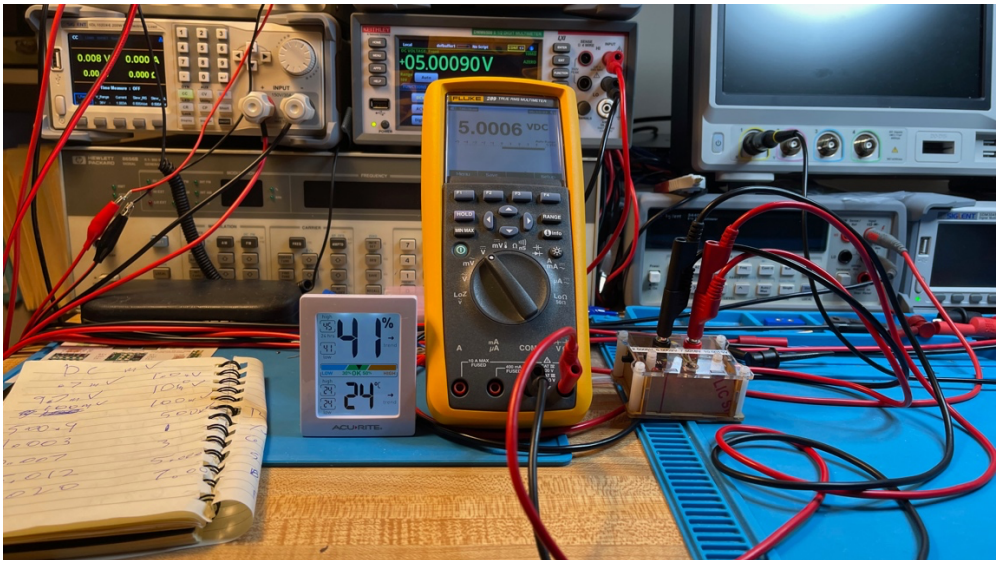
Features

- ETL C US Listed
- CAT III 600V
- 6,000 Count
- Basic DC Accuracy ±(0.7% + 3)
- 31 Segment Bar Graph
- True-RMS
- Min/Max
- Rel/Delta
- K-Type Thermocouple
- LoZ AC Voltage
- Low Pass Filter
- Two AA Batteries Included
- One Year Warranty (for Triplett MM525 rebranded version)

Accuracy

I do not have reference standards. Instead, I use a Keithley DMM6500 6.5 digit bench multimeter that was calibrated recently to measure voltages, currents, resistances and capacitances. I take a reading from the Keithley and based on the Keithley stated tolerance for that range and reading, I compute the lowest and highest value the reading could be, then I take the meter under test and take a reading. I calculate the meter-under-test

reading uncertainty value and subtract it from the lowest value and add it to the highest value. If the reading is within the range of the lower and higher limits, it meets meter-under-test accuracy specification.
For example, I have a voltage source that is 5 Volts. I take a reading with the Keithley and I get a value of 5.00090 and based on the Keithley specifications for that range ±(0.0025% of reading + 0.0005% of range), that value could be anywhere from 5.00072 to 5.00108. I then use the meter under test (for this example my Fluke 289, my most accurate hand-help meter) reading of 5.0006. The Fluke 289's accuracy at this range is ±(0.025% of reading + 2 least significant digits) for an uncertainty value of 0.00145015 Volts. So, subtracting this from the lowest value the Keithley reading gives us 4.99927V for the low value limit and adding to the highest value the Keithley gives us 5.00253V for the high value limit. The meter under test reading (5.0006) is within the limits, so the meter under test meets its accuracy target for 5 volts.



DC Volts

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
1 mVDC	1.02	0.7% + 3	0.03714	0.95933	1.04067
10 mVDC	10.00	0.7% + 3	0.1	9.8962	10.1038
100 mVDC	100.0	0.5% + 2	0.7	99.2935	100.7065
500 mVDC	499.3	0.5% + 2	2.6965	497.285	502.715
1 VDC	0.999	0.7% + 3	0.009993	0.989977	1.010023
3 VDC	2.997	0.7% + 3	0.023979	2.975896	3.024104
5.009 VDC	4.995	0.7% + 3	0.037965	4.97085978	5.04714023
7 VDC	6.98	0.7% + 3	0.07886	6.920915	7.079085
10.00148 VDC	9.98	0.7% + 3	0.09986	9.90132	10.10164
104.0236 VDC	103.8	0.7% + 3	1.0266	102.99224	105.05496
204.953 VDC	204.6	0.7% + 3	1.7322	203.20660	206.69940
302.155 VDC	301.6	0.7% + 3	2.4112	299.72571	304.58429
410.972 VDC	410.3	0.7% + 3	3.1721	407.77746	414.16654
514.261 VDC	513.1	0.7% + 3	3.8917	510.34273	518.17927
652.581 VDC	N/A				

The meter met its accuracy specifications for all the DC voltages I tested. The meter can't read voltages above 600 Volts. The accuracy specification is about average for this group of meters.

VDC Input	11 MΩ

mVDC input	12 MΩ

Both VDC and mVDC input have over 10 MΩ resistance, which is good, so the meter is less likely to load down a high impedance circuit when checking voltage.

AC Volts

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
100Hz Squarewave					
4.999 VAC	4.952 V	0.8% + 3	0.042992	4.9560	5.0420
60 Hz Sinewave					
1.02 mVAC	N/A	1% + 3			
10 mVAC	9	1% + 3	0.12	9.844	10.156
100.7 mVAC	100	1% + 3	1.3	99.30958	102.09042
500 mVAC	501	1% + 3	5.31	494.09	505.91
1.000 VAC	1.003	0.8% + 3	0.011024	0.988076	1.011924
3.012 VAC	3.008	0.8% + 3	0.027064	2.9801288	3.0438712
5.010 VAC	5.001	0.8% + 3	0.043008	4.960986	5.059014
7.003 VAC	6.99	0.8% + 3	0.08592	6.9098782	7.0961218

The meter met its accuracy specifications for all the AC voltages at the 60 Hz sinewave I tested. The 100 Hz squarwave voltage was just outside the specification; this makes me doubt the True RMS claim. The meter could not read a 1 mVAC voltage. The accuracy specification is about average for this group of meters.

ACV 1V 3dB cutoff	2.98 kHz

The low frequency of the cutoff is typical of low-cost meters.

Current

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
AC 100Hz Squarewave					
0.999 mA	00.98	1% + 3	0.042992	4.9560	5.0420
DC					
0.896 µA	1.0	0.7% + 2	0.207	0.6880968	1.1039032
9.217 µA	9.1	0.7% + 2	0.2637	8.94865235	9.48534765
99.03 µA	99.1	0.7% + 2	0.8937	98.0867365	99.9732635
131.86 µA	131.9	0.7% + 2	1.1233	130.677313	133.042687
1.0088 mA	1.00	0.7% + 2	0.207	0.80129604	1.21630396
9.9917 mA	10.02	0.7% + 2	0.27014	9.71906166	10.2643383
99.415 mA	99.3	0.7% + 2	0.8951	98.495017	100.334983
1.000 A	1.001	1% + 3	0.01301	0.98654	1.01346
3.000 A	3.001	1% + 3	0.03301	2.96537	3.03463

The meter met its accuracy specifications for all the current values I tested. The DC current's accuracy is about average for this group of 6,000 count meters. The AC microamps and milliamps accuracy is above average for this group of 6,000 count meters. The AC amps is average for this group of 6,000 count meters.

A Shunt Resistance	0.020 Ω
mA Shunt Resistance	2.08 Ω
µA Shunt Resistance	100.99 Ω

It is always good to know how much resistance you are adding to your circuit when you make current measurements.

Resistance

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
1.0054 Ω	1.1	1% + 2	0.211	0.79411454	1.21668546
10.007 Ω	10.1	1% + 2	0.301	9.70494941	10.3090506
100.07 Ω	100.0	1% + 2	1.2	98.8594941	101.280506
1.0011 kΩ	0.999	0.8% + 2	0.009992	0.99102692	1.01117308
10.001 kΩ	9.98	0.8% + 2	0.09984	9.90034993	10.1016501
100.01 kΩ	99.8	0.8% + 2	0.9984	99.0030993	101.016901
0.9936 MΩ	0.995	1.2% + 3	0.01494	0.97855464	1.00864536
9.97 MΩ	9.95	1.5% + 5	0.19925	9.766662	10.173338

The meter met its accuracy specifications for all the resistance values I tested. The accuracy values are average for this group of 6,000 count meters. Many meters have less accuracy in the high ohm ranges.

Resistance Test Voltage	
Low Range	1.0 V
Medium Range	0.92 V
High Range	0.51 V

Capacitance

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
0.0093 nF	N/A				
0.1024 nF	N/A				
1.008 nF	0.667	4% + 10	0.03668	0.958256	1.057744
9.941 nF	9.659	4% + 10	0.39636	9.494876	10.387124
99.45 nF	99.23	4% + 5	4.0192	94.933	103.967
1.00081 µF	0.999	4% + 5	0.04496	0.9581076	1.0580924
10.916 µF	11.00	4% + 5	0.49	10.372336	11.459664
113.83 µF	112.8	4% + 5	5.012	108.26268	119.39732
986.5 µF	991.5	4% + 5	40.16	936.4075	1036.5925

The meter met its accuracy specifications for all but one of the capacitance values I tested and could not read the 10 pF and 100 pF capacitor. The accuracy for capacitance is below average for this group of 6,000 count meters. 1 nF and above are OK for troubleshooting use, but not for tuned circuit use.

Diode

Max Diode Voltage	3.227 V
Max Diode Current	1.345 mA

This will light some LEDs, for those who test LEDs with multimeters.

Continuity

Not very fast but it does latch.

LowZ

The meter has a LowZ position on the rotary switch. It measures AC voltage with 3.3 kΩ resistance. It is used by electricians to eliminate ghost voltages when checking a circuit. I did not test this feature.

Low Pass Filter

The low pass filter reduces the AC volts frequency response to 1V 3dB cutoff around 2 kHz.

Test Leads

If you are in the market for an under-$100 meter, you probably will not buy $40 Probe Master test leads to use with it, so I looked at the included test leads. The test leads were a rigid plastic type, and the tips felt oily and caused intermittent contact, so remember to clean new test lead tips. The meter also came with a thermocouple for measuring temperature. I did not test temperature measurements.

Ergonomics

The rotary switch is easy to turn. The rotary switch beeps every time you change it and the meter beeps when you press any of the buttons.
The meter is a little wobbly and slippery when using the bail on a smooth surface.
The display is big with big easy-to-read numbers. The screen has a black background and the number and other symbols are bluish. The backlight button makes the numbers and symbols brighter and the background stays black. The backlight is on by default.

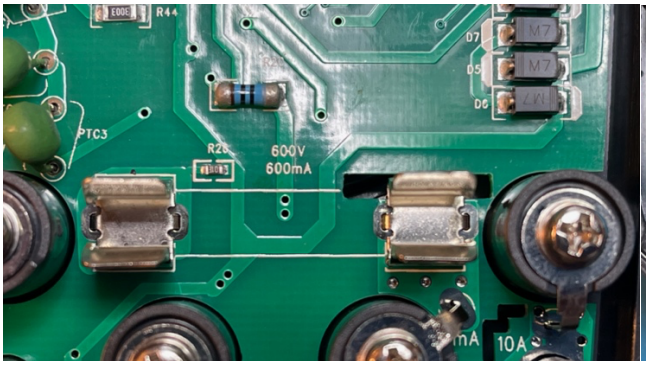
Battery

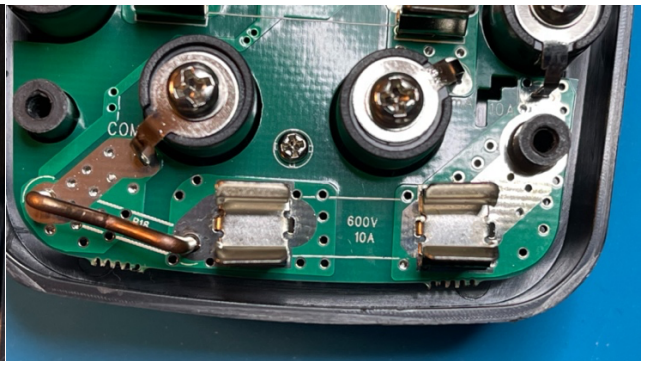
The low battery symbol started to show near the end of the testing, sooner than any other meter, so I replaced the batteries and kept on testing. The meter uses two AA batteries accessible from the back by removing the battery cover. The battery cover has one captured Philips screw that mates with a brass insert.

Fuses

The 600mA fuse is accessible from the battery compartment. The 10A fuse is only accessible by taking the meter apart. You need to remove the battery door and remove 2 self-tapping screws that mate with plastic. Be careful reinserting the screws. Rotate them counterclockwise a bit so they catch in the previously cut threads. Only use light pressure and do not overtighten.

The manual states the fuses are F1 Fuse 6×32mm FF600mA H 600V; F2 Fuse 6×25mm FF 10A H 600V.





Pros

- Passed third-party safety testing by ETL to meet US and Canada standards
- Above average AC current accuracy for this group
- 600mA fuse accessible from the battery door
- Met specifications for all DC Voltage, currents, and resistances tested
- Available in the US as Triplett model MM525 with 1 year warranty

Cons

- 600 Volt maximum
- Short battery life
- Below average capacitance specifications
- Must disassemble the meter to change 10A fuse.

Conclusion

I have had the Uni-T UT139S since November 2022. I had great hopes that this could be the economical multimeter that I could recommend to everyone. Sadly, it's not. The picture of the screens looks better than the screen in person. The capacitance range is disaponting. I think my expectations were just too high for an under-$100 meter.
Resetting my expectations, this meter does OK with voltage, current and resistance, and it is third-party tested for safety. If you buy it in the US under the Triplett name, you will get a 1-year warranty. With a different Triplett meter, I had a very positive experience with Triplett's customer support.
If you are a beginner and must stay under $70 (plus tax & shipping) then this meter will do fine. You may have to shop around the internet to get it for under $70, but I would not pay much more for it.