Zotek ZT-300AB Review

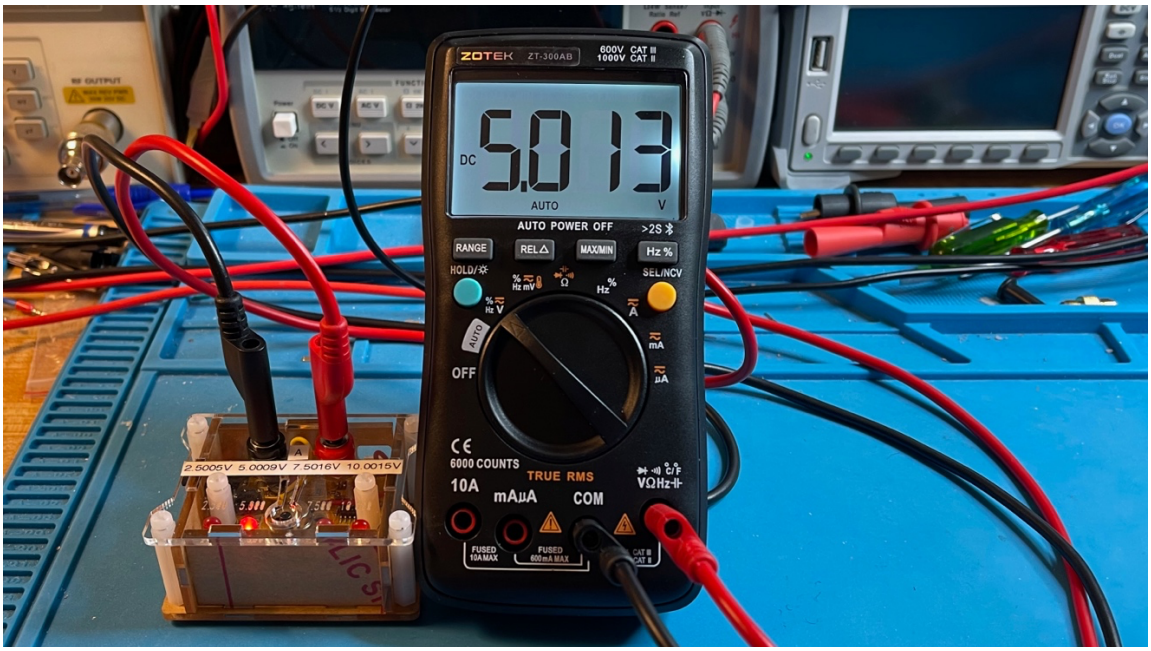
Introduction

Hi, I am Tom, amateur radio call sigh N8FDY. This is a review of the Zotek ZT-300AB multimeter for use in hobby electronic 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 Zotek ZT-300AB multimeter that I purchased from Amazon.com for $39.99. I only used it in a 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.

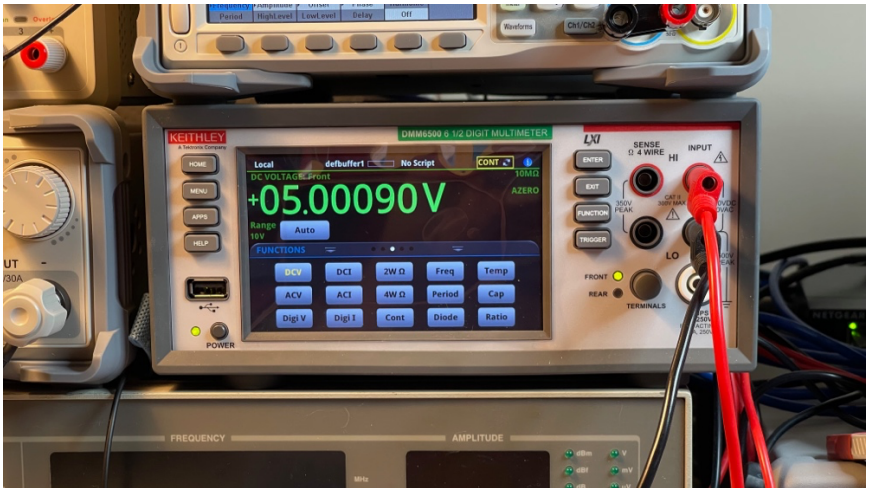
Objectives

This review was produced to help you decide if the Zotek ZT-300AB 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 a LCR meters. I cover the two LCR meters I own in another review.

Features

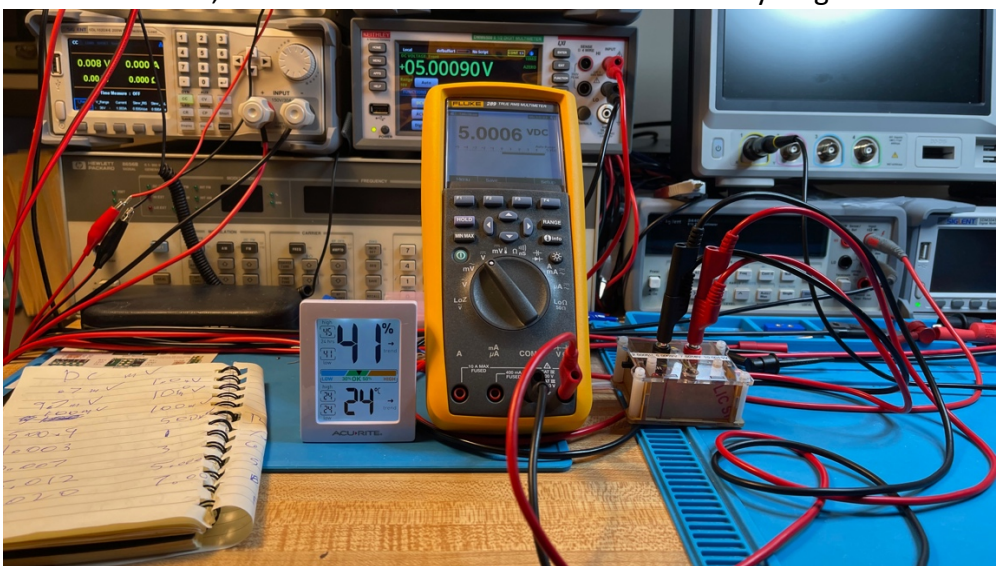
- 6,000 Count
- Basic DC Accuracy ±(0.5% + 3)
- True-RMS
- Min/Max
- Rel/Delta
- Auto Mode
- K-Type Thermocouple
- Bluetooth Smart Phone app
- Carry Pouch
- Two AA Batters Included
- One Year Warranty

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 and 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 it accuracy target for 5 volts.



DC Volts

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
1 mVDC	1.00	0.5% + 3	0.035	0.96147	1.03853
10 mVDC	10.0	0.5% + 3	0.08	9.9162	10.0838
100 mVDC	100.0	0.5% + 3	0.8	99.1935	100.8065
500 mVDC	500.0	0.5% + 3	2.8	497.1815	502.8185
1 VDC	1.002	0.5% + 3	0.00801	0.99196	1.00804
3 VDC	3.008	0.5% + 3	0.01804	2.981835	3.018165
5.009 VDC	5.012	0.5% + 3	0.02806	4.98076478	5.03723523
7 VDC	7.01	0.5% + 3	0.06505	6.934725	7.065275
10.00148 VDC	10.00	0.5% + 3	0.08	9.921	10.082
106.1043 VDC	99.8	0.5% + 3	0.799	98.84691	100.45409
209.039 VDC	194.7	0.5% + 3	1.2735	193.04073	195.61527
307.801 VDC	285.2	0.5% + 3	1.726	283.03061	286.51739
417.995 VDC	289.2	0.5% + 3	1.746	386.87545	390.41055
522.050 VDC	491.2	0.5% + 3	2.756	487.31840	492.88160
652.581 VDC	627	0.5% + 3	6.135	620.08495	632.41705

The meter met its accuracy specifications for all the DC voltages I tested. The uniform 0.5% + 3 specification over the entire voltage range is very good for a $40 meter.

VDC Input	0.9 MΩ
mVDC input	10 MΩ

The VDC range input resistance is very low compared with most meters. This could be a malfunction, but everything else seem to be working fine. The mVDC range is in the normal range as per most meters in this group, which is good, so the meter is less likely to load down a high impedance circuit when checking millivolts.

AC Volts

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
100Hz Squarewave					
4.99899 VAC	4.980	1% + 3	0.05299	4.946	5.052
60 Hz Sinewave					
1.02 mVAC	1.01	1% + 3	0.0401	0.949288	1.090712
10 mVAC	9.95	1% + 3	0.1295	9.8345	10.1655
100.7 mVAC	99.4	1% + 3	1.294	99.31558	102.08442
500 mVAC	496.8	1% + 3	5.268	494.132	505.868
1.000 VAC	0.995	1% + 3	0.01295	0.98615	1.01385
3.012 VAC	3.000	1% + 3	0.033	2.9741928	3.0498072
5.010 VAC	4.990	1% + 3	0.0529	4.951094	5.068906
7.003 VAC	6.97	1% + 3	0.0997	6.8960982	7.1099018

The meter met its accuracy specifications for all the AC voltages I tested. The 1% + 3 specification is about average for this group of meters.

ACV 1V 3dB cutoff	4 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	0.98	1.5% + 3	0.044985	0.954	1.044
DC					
0.896 µA	0.8	1.2% + 3	0.3096	0.5854968	1.2065032
9.217 µA	9.1	1.2% + 3	0.4092	8.80315235	9.63084765
99.03 µA	98.6	1.2% + 3	1.4832	97.4972365	100.562764
131.86 µA	131.4	1.2% + 3	1.8768	129.923813	133.796187
1.0088 mA	1.00	1.2% + 3	0.042	0.96629604	1.05130396
9.9917 mA	9.97	1.2% + 3	0.14964	9.83956166	10.1438383
99.415 mA	99.3	1.2% + 3	1.4916	97.898517	100.931483
1.000 A	0.998	1.2% + 3	0.014976	0.984574	1.015426
3.000 A	2.994	1.2% + 3	0.038928	2.959452	3.040548

The meter met its accuracy specifications for all the current values I tested. 1.2% + 3 is below average for this group of 6,000 count meters.

A Shunt Resistance	0.057 Ω
mA Shunt Resistance	1.36 Ω
µA Shunt Resistance	100.05 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	0.8	0.5% + 3	0.304	0.70111454	1.30968546
10.007 Ω	10.1	0.5% + 3	0.3505	9.65544941	10.3585506
100.07 Ω	99.7	0.5% + 3	0.7985	99.2609941	100.879006
1.0011 kΩ	0.995	0.5% + 3	0.007975	0.99304392	1.00915608
10.001 kΩ	9.97	0.5% + 3	0.07985	9.92033993	10.0816601
100.01 kΩ	99.8	0.5% + 3	0.799	99.2024993	100.817501
0.9936 MΩ	0.995	0.5% + 3	0.007975	0.98551964	1.00168036
9.97 MΩ	9.95	1.5% + 3	0.17925	9.786662	10.153338

The meter met its accuracy specifications for all the resistance values I tested. 0.5% + 3 is average for groups of 6,000 count meters. Many meters have less accuracy in the high ohm ranges.

Resistance Test Voltage	
Low Range	0.677 V
Medium Range	
High Range	0.60 V

Capacitance

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
0.0093 nF	N/A				
0.1024 nF	0.068	5% + 20	0.0234	0.0731808	0.1316192
1.008 nF	1.020	5% + 20	0.071	0.923936	1.092064
9.941 nF	10.03	2% + 5	0.2506	9.640636	10.241364
99.45 nF	99.38	2% + 5	2.4876	96.4646	102.4354
1.00081 µF	1.006	2% + 5	0.02512	0.9779476	1.0382524
10.916 µF	11.13	2% + 5	0.2726	10.589736	11.242264
113.83 µF	114.5	2% + 5	2.79	110.48468	117.17532
986.5 µF	1007	2% + 5	20.64	955.9275	1017.0725

The meter met its accuracy specifications for all but one of the capacitance values I tested and could not read the 10 nF capacitor. 1 nF and above are fine for troubleshooting use.

Diode

Max Diode Voltage	3.979 V
Max Diode Current	1.6 mA

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

Continuity

Not very fast but it does latch.

Auto

The meter has an auto position on the rotary switch. When a voltage greater then 0.8 V is applied the meter it will show the voltage, AC or DC. If you have a signal with both AC & DC it will show the high voltage value. You can also measure resistance, and continuity in auto mode.

Test Leads

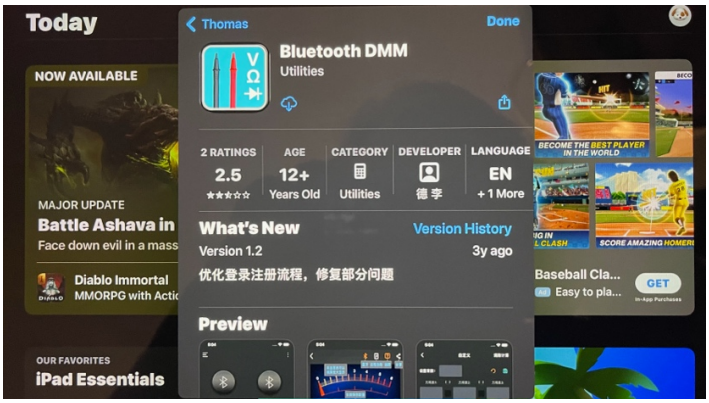
If you are in the market for this $40 meter, you probably will not buy $40 Probe Master test leads to use with it, so I looked at the included test leads. The test leads were rigid plastic type, and the tips felt oily and caused intermittent contact, so remember to clean new test lead tips.

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 wobbly and slippery when using the bail on a smooth surface.
The display is big with big easy-to-read numbers. The backlight is bright and even, except for the right edge hot spot. The manual claims the backlight turns off after 2 minuets, but it stayed on for me until the meter auto-shutoff activated after 10 minuets and 30 seconds.

Communications

This meter has Bluetooth connectivity. The IOS app has not been updated in 3 years.



The app asks for a login, but you can pick visitor on the lower right on the IOS app to bypass the login. It is a very simple monitor screen. I don't have any Android devices to try that version of the app.

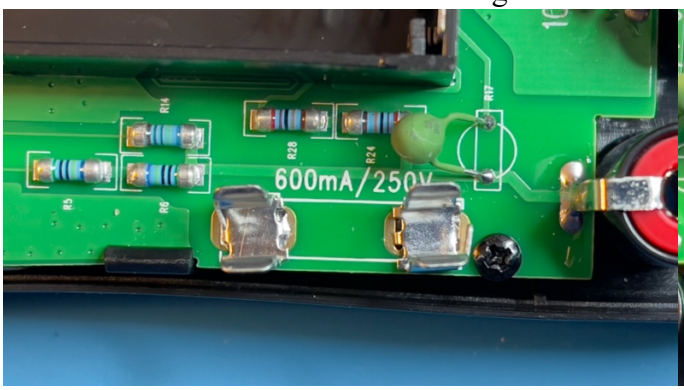
Battery

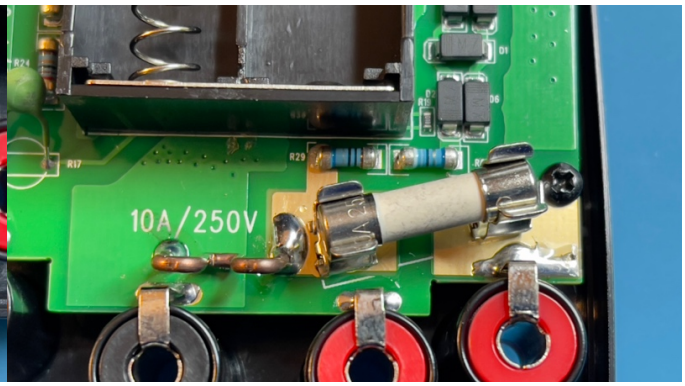
The meter uses two AA batteries accessible from the back by removing the battery cover. The battery cover has one Philips screw that mates with a brass insert.

Fuses

The fuses are only accessible by taking the meter apart. You need to remove 4 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 does not state what fuses to use. The PCB shows 600mA at 250V and a 10A at 250V. These fuses don't seem correct for a meter claiming to be CAT III at 600 Volts.





Pros

- Under $50
- All but one of my tests show that it meets the manual's stated accuracy specifications
- DCV accuracy good for a low-cost meter
- Large easy-to-read numbers
- Detailed manual that seems mostly correct
- Bright backlight
- Bluetooth connectivity

Cons

- No indication of any third-party safety testing
- Low DCV input impedance
- DC current ranges are below average accuracy in the 6,000 count group
- Capacitance ranges have low accuracy
- Beeps every time you change the function knob or push a button
- No protective boot

- Must disassemble meter to change fuses

Conclusion

The biggest drawback to the Zotek ZT-300AB is that there is no third-party safety testing. If you are on a tight budget or want to experience using a multimeter at a low cost and want to monitor the meter from your phone give this a try.
It is good for voltages, OK for resistance, not so good for current and bad for capacitance measurements.
If you are new to using multimeters, the manual can help. It has simple step by step instructions for each function.
In general, if you only plan to use the Zotek ZT-300AB in a low voltage and low energy environment I would say as a low-cost entry-level meter that you could give it a try. As you get more involved with electronic projects you could soon outgrow this meter.