

Fluke 177 and 179 Review

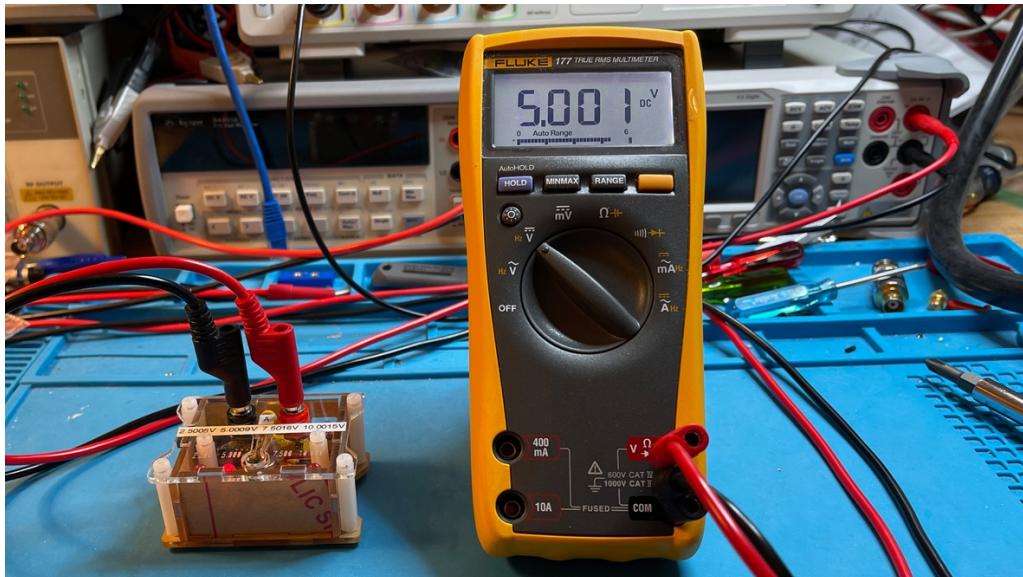
Introduction

Hi, I am Tom, amateur radio call sign N8FDY. This is a review of the Fluke 177 multimeter for use in hobby electronics projects primarily related to amateur radio. I also included comparison with my twenty-year-old Fluke 179.

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 Fluke 177 multimeter that I purchased from Circuit Specialists at a special inventory reduction sale for \$274.49. I wanted to compare a modern Fluke 17x series with my 20-year-old Fluke 179. I bought the Fluke 179 in a tool kit bundle so I don't know what the standalone cost was.

I only used the Fluke 177 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 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 Fluke 177 multimeter will fit your purpose and budget. This is part of a series of multimeters reviews. I am including information on my Fluke 179 to show how a twenty-year-old meter compares with its modern counterpart. The only difference between 177 and 179 is the 179 can measure temperature and comes with K-Type thermocouple, the 177 cannot measure temperature. A good multimeter for hobby electronics projects should be able to measure millivolts, volts, microamps, milliamps, amps, ohms, nanofarads and microfarads. If you want to measure picofarads, nanohenrys, microhenrys or reactance you will need an LCR meter. I cover the two LCR meters I own in another review.

Features

- CSA C US Listed
- CAT III 1000V, CAT IV 600V
- 6,000 Count
- Basic DC Accuracy $\pm(0.09\% + 2)$
- True-RMS
- 33 Segment Analog Bar Graph
- Min/Max/Avg
- Rel/Delta
- Hold
- Auto-Hold
- K-Type Thermocouple (only the 179)
- Auto-off Override
- Backlight Auto-off Override
- Option to turn off beeper
- "Smoothing" mode
- 9V Battery Included
- Limited-Lifetime Warranty

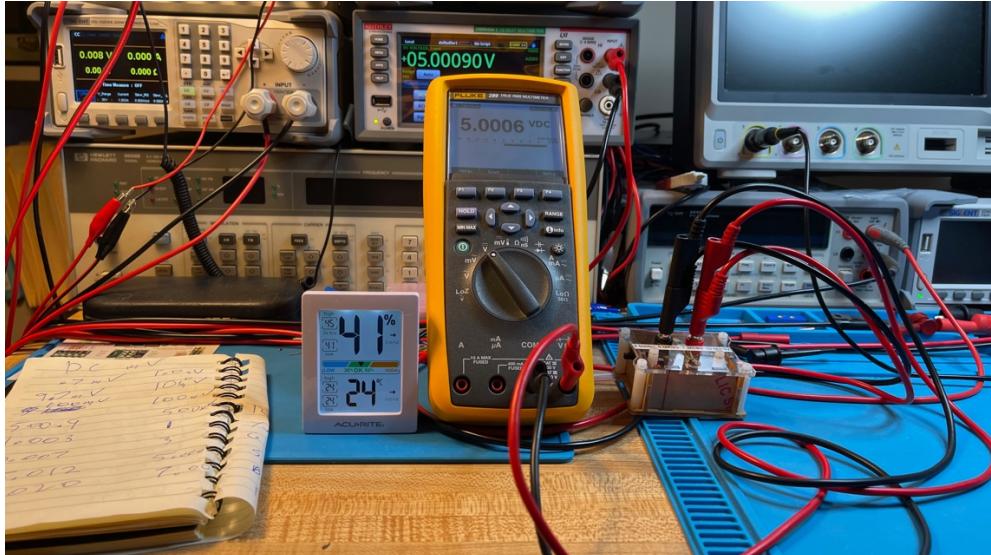
Accuracy



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 use the meter-under-test to 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 $\pm(0.0025\% \text{ of reading} + 0.0005\% \text{ of range})$; 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 $\pm(0.025\% \text{ of reading} + 2 \text{ least significant digits})$ 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 for Fluke 177

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
1 mVDC	1.1	0.09% + 2	0.20099	0.79548	1.20452
10 mVDC	10.1	0.09% + 2	0.20909	9.78711	10.21289
100 mVDC	100.1	0.09% + 2	0.29009	99.70341	100.29659
500 mVDC	499.9	0.09% + 2	0.64991	499.33159	500.66841
1 VDC	1.001	0.09% + 2	0.0029009	0.9970691	1.0029309
3 VDC	3.000	0.09% + 2	0.0047	2.995175	3.004825
5.009 VDC	5.001	0.09% + 2	0.0065009	5.00232388	5.01567613
7 VDC	7.00	0.09% + 2	0.0263	6.973475	7.026525
10.00148 VDC	10.00	0.09% + 2	0.029	9.97218	10.03078
104.3130 VDC	104.3	0.09% + 2	0.29387	104.01436	104.61164
204.977 VDC	205.1	0.09% + 2	0.38459	204.57821	205.37579
302.110 VDC	302.3	0.09% + 2	0.47207	301.61985	302.60015
410.998 VDC	411.2	0.09% + 2	0.57008	410.40548	411.59052
514.604 VDC	515.0	0.09% + 2	0.6635	513.91392	515.29408
646.143 VDC	646.5	0.09% + 2	0.78185	645.32930	646.95670

The Fluke 177 met its accuracy specifications for all the DC voltages I tested. The DC millivolts accuracy specification is the best of this group of 6,000 count meters tested. The DC volts accuracy is above average for this group of 6,000 count meters.

The Fluke 179 also met its accuracy specifications for all the DC voltages I tested. This is good for a 20-year-old meter.

VDC Input	11 MΩ
mVDC input	10 MΩ

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

DC Volts for Fluke 179

The twenty-year-old Fluke 179 also met its accuracy specifications for all the DC voltages I tested.

AC Volts for Fluke 177

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
100Hz Squarewave					
4.999 VAC	4.988	1.0% + 3	0.05299	4.9460	5.0520
60 Hz Sinewave					
1.02 mVAC	1.2	1.0% + 3	0.312	0.677388	1.362612
10 mVAC	10.0	1.0% + 3	0.4	9.564	10.436
100.7 mVAC	100.2	1.0% + 3	1.302	99.30758	102.09242
500 mVAC	500.1	1.0% + 3	5.301	494.099	505.901
1.000 VAC	1.005	1.0% + 3	0.01305	0.98605	1.01395
3.012 VAC	3.014	1.0% + 3	0.03314	2.9740528	3.0499472
5.010 VAC	5.009	1.0% + 3	0.05309	4.950904	5.069096
7.003 VAC	7.04	1.0% + 3	0.1004	6.8953982	7.1106018

The meter met its accuracy specifications for all the AC voltages that I tested. The AC volts accuracy specifications are average for this group of meters.

ACV 1V 3dB cutoff	6.8 kHz
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The low frequency of the cutoff is a little better than the low-cost meters.

AC Volts for Fluke 179

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
60 Hz Sinewave					
1.02 mVAC	2.4	1.0% + 3	0.324	0.665388	1.374612

The twenty-year-old Fluke 179 was out of specification for the 1 mVAC value. All the other readings of AC volts were within its accuracy specifications.

Current for Fluke 177

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
AC 100Hz Squarewave					
0.999 mA	1.01	1.5% + 3	0.044985	0.9540	1.0440

DC					
0.896 μ A	N/A				
9.217 μ A	10	1.0% + 3	30.1	0	39.3216477
99.03 μ A	100	1.0% + 3	31	67.9804365	130.079564
131.86 μ A	130	1.0% + 3	31.3	100.500613	163.219387
1.0088 mA	1.01	1.0% + 3	0.0401	0.96819604	1.04940396
9.9917 mA	10.02	1.0% + 3	0.1302	9.85900166	10.1243983
99.415 mA	99.8	1.0% + 3	1.298	98.092117	100.737883
1.000 A	1.000	1.0% + 3	0.013	0.98655	1.01345
3.000 A	3.001	1.0% + 3	0.03301	2.96537	3.03463

The Fluke 177 met its specifications for all the current values I tested. The meter could not read the 1 μ A value.

The uncertainty value was too large for the other μ A values to be useful. The current accuracy specifications are average for this group of meters.

A Shunt Resistance	0.022 Ω
mA Shunt Resistance	1.456 Ω
μ A Shunt Resistance	N/A

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

Current for Fluke 179

The twenty-year-old Fluke 179 met its specifications for all the current values I tested. But the 179 could not read the 1 μ A value or the 10 μ A value. The uncertainty value was too large for the other μ A values to be useful.

Resistance for Fluke 177

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
1.0054 Ω	1.1	0.9% + 2	0.2099	0.79521454	1.21558546
10.007 Ω	10.1	0.9% + 2	0.2909	9.71504941	10.2989506
100.07 Ω	100.2	0.9% + 2	1.1018	98.9576941	101.182306
1.0011 k Ω	1.000	0.9% + 1	0.010	0.99101892	1.01118108
10.001 k Ω	10.00	0.9% + 1	0.100	9.90018993	10.1018101
100.01 k Ω	100.0	0.9% + 1	1.000	99.0014993	101.018501
0.9936 M Ω	1.001	0.9% + 1	0.010	0.98348564	1.00371436
9.97 M Ω	9.96	1.5% + 3	0.179	9.786512	10.153488

The Fluke 177 met its accuracy specifications for all the resistance values I tested. The accuracy specifications for the resistance ranges are average for this group of 6,000 count meters.

Resistance Test Voltage	
Low Range	7.3 V
Medium Range	3.4 V
High Range	2.6 V

Resistance for Fluke 179

The Fluke 179 met its accuracy specifications for all the resistance values I tested. Not bad for a twenty-year-old meter.

Resistance Test Voltage	
Low Range	1.2 V
Medium Range	1.2 V
High Range	0.6 V

It looks like Fluke change the way resistance is done in the newer incarnation of the 17x meters.

Capacitance for Fluke 177

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
0.0093 nF	N/A				
0.1024 nF	N/A				
1.008 nF	1	1.2% + 2	2.012	0	3.033064
9.941 nF	10	1.2% + 2	2.12	7.771236	12.110764
99.45 nF	100	1.2% + 2	3.2	95.7522	103.1478
1.00081 µF	1.008	1.2% + 2	0.032096	0.9709716	1.0452284
10.916 µF	11.1	1.2% + 2	0.3332	10.529136	11.302864
113.83 µF	113	10%	11.3	101.97468	125.68532
986.5 µF	1000	10%	100	876.5675	1096.4325

The Fluke 177 met its accuracy specifications for all the capacitance values I tested. The meter could not read the 10pF and 100pF values. [The 1nF uncertainty value is so large that the reading is not meaningful](#). The accuracy specification for capacitance ranges up to 100µF are average for this group of 6,000 count meters. The accuracy specification for capacitance ranges above 100µF are the lowest in the group.

Capacitance for Fluke 179

The twenty-year-old Fluke 179 had the same performance with capacitance measurements as the Fluke 177.

Diode for Fluke 177

Max Diode Voltage	7.30 V
Max Diode Current	1.00 mA

This lit the LEDs I tested and the Schottky, Small Signal and Power diodes measured correctly.

Diode for Fluke 179

Max Diode Voltage	2.689 V
Max Diode Current	0.977 mA

Obviously, Fluke has changed the diode test in the newer incarnations of the 17x meters. The twenty-year-old Fluke 179 could not light the green LED. The voltage drops were shown for all the diodes tested.

Continuity for Fluke 177

Fast and latches. The beeper is louder then most of the meters in this group.

Test Leads

The test leads were a plastic stiff type. The Fluke 179 came with a thermocouple for measuring temperature. I did not test temperature measurements.

Ergonomics for Fluke 177

The rotary switch is easy to turn and firmly clicks into place.

The display is medium-sized with medium-sized numbers. The backlight is bright and even, except for a hotspot on the right side. The auto-backlight-off can be disabled by holding the backlight key down while turning the meter on. The beeper is louder than most meters in this group. The following functions are enabled when you hold down a button when you turn on the meter:

Button	Power On Action
Yellow	Disables automatic power-off
Min Max	Disables the beeper for all functions
Range	Enables the Meter's smoothing feature
HOLD	Turns on all LCD segments
Backlight	Disables automatic 2-minute backlight timeout.

Ergonomics for Fluke 179

The 17x series was upgraded with functions my twenty-year-old 179 is missing. My 179 has a much dimmer backlight and no way to disable the auto-shutoff. Also, there is no smoothing function or auto-power-off disable.

Accuracy Specifications Within the Group

Value	Thsinde 18B+	Zotek ZT-300AB	Uni-T UT139S	Triplet MM650	Triplet 9055	Brymen BM235	Greenlee DM-	Fluke 17B MAX	Fluke 177 & 179	Fluke 87V	Fluke 87V MAX
DC mV	0.5%+3	0.5%+3	0.5%+2	1.0%+8	1.0%+4	0.3%+2	0.4%+5	1.0%+10	0.09%+2	0.1%+1	0.1%+1
DC V	0.5%+3	0.5%+3	0.7%+3	1.0%+3	1.5%+4	0.4%+2	0.2%+3	0.5%+3	0.09%+2	0.05%+1	0.05%+1
AC mV	0.8%+5	1.0%+3	1.0%+3	N/A	1.5%+15	1.0%+3	1.0%+5	3.0%+3	1.0%+3	0.7%+4	0.7%+4
AC V	0.8%+5	1.0%+3	0.8%+3	1.0%+5	1.5%+4	0.7%+3	1.0%+5	1.0%+3	1.0%+3	0.7%+2	0.7%+2
DC μ A	0.8%+10	1.2%+3	0.7%+2	1.0%+3	1.0%+4	1.0%+3	0.5%+5	1.5%+3	N/A	0.2%+4	0.2%+4
DC mA	2%+30	1.2%+3	0.7%+2	1.0%+3	1.2%+4	0.7%+3	0.5%+5	1.5%+3	1.0%+3	0.2%+4	0.2%+4
DC A	2%+30	1.2%+3	1.0%+3	1.5%+8	2.0%+5	0.7%+3	1.2%+6	1.5%+3	1.0%+4	0.2%+4	0.2%+4
AC μ A	0.8%+10	1.5%+3	1.0%+3	1.5%+3	1.2%+4	1.5%+3	1.0%+3	1.5%+3	N/A	1.0%+2	1.0%+2
AC mA	2%+30	1.5%+3	1.0%+3	1.5%+3	1.5%+4	1.0%+3	1.0%+3	1.5%+3	1.5%+3	1.0%+2	1.0%+2
AC A	2%+30	1.5%+3	1.2%+3	2%+8	2.0%+5	1.0%+3	1.2%+6	1.5%+3	1.5%+4	1.0%+2	1.0%+2
Ω	0.8%+5	0.5%+3	1.0%+2	1.5%+5	1.5%+4	0.3%+3	0.5%+4	0.5%+3	0.9%+2	0.2%+2	0.2%+2
Low k Ω	0.8%+3	0.5%+3	0.8%+2	1.5%+5	1.5%+3	0.3%+3	0.5%+4	0.5%+2	0.9%+1	0.2%+1	0.2%+1
High k Ω	0.8%+3	0.5%+3	0.8%+2	1.5%+5	1.5%+3	0.5%+3	0.5%+4	0.5%+2	0.9%+2	0.6%+1	0.2%+1
Low M Ω	0.8%+3	0.5%+3	1.2%+3	2%+10	2.0%+3	0.9%+2	0.7%+4	0.5%+2	0.9%+3	0.6%+1	0.2%+1
High M Ω	1.0%+25	1.5%+3	1.5%+5	2%+10	2.5%+3	0.9%+2	1.2%+4	1.5%+3	1.5%+3	1.0%+3	1.0%+1
nF	3.5%+20	5%+20	4%+10	5%+35	15%+70	1.5%+8	2%+5	2%+5	1.2%+2	1%+2	1.0%+2
Low μ F	3.5%+20	2%+5	4%+5	3%+5	4%+5	1.5%+2	1.5%+5	5%+5	1.2%+2	1%+2	1.0%+2
High μ F	5%+5	5%+5	10%	5%+5	N/A	4.5%+10	2%+5	5%+5	10%	1%+2	1.0%+2

The accuracy specifications are from the meters' respective manuals. The color code shows the extreme low and high accuracy specifications. Green is the highest, and yellow is lowest, and white is everything in-between. The pink background in the meter name and model indicate that meter does not have third party safety testing indications in the manual or on the meter.

The Fluke 177 & 179 Have the highest accuracy specifications for DC millivolt and the lowest accuracy specifications for high microfarad. Also, there is no AC or DC microamp ranges.

Battery

The meter uses one 9 Volt battery accessible from the back by removing the battery cover. The battery cover has two Philips self-tapping screws that mate with the plastic case.



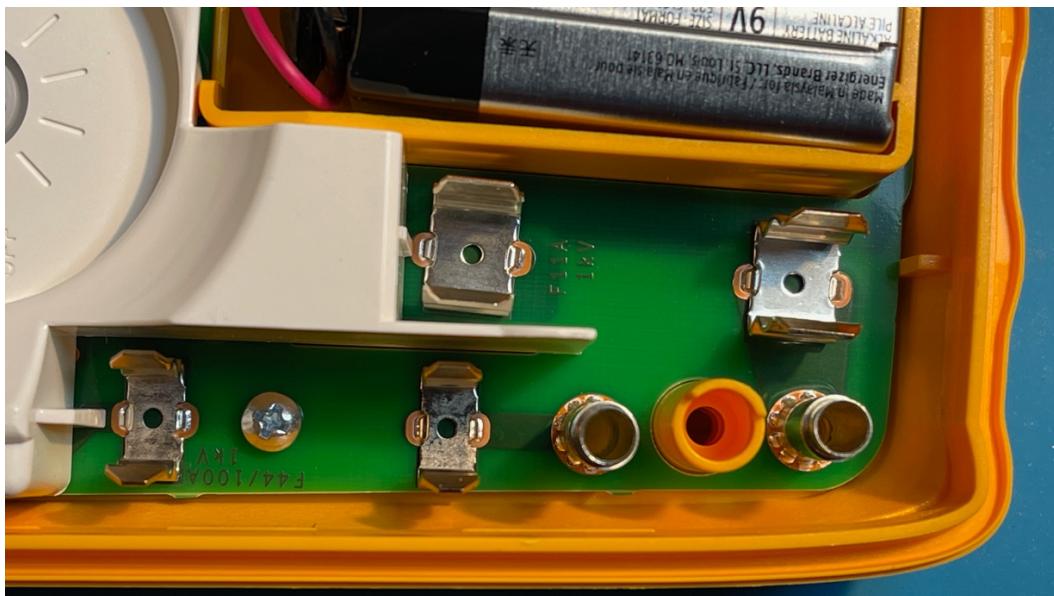
Fuses

The meter must be disassembled to replace the fuses. You must remove the battery door and then remove two more self-tapping Philips screws. The manual states the fuses are:

Fuse, 0.440 A, 1000 V, FAST part # 943121

Fuse, 11 A, 1000 V, FAST part # 803293





Lifetime Limited Warranty

From the Fluke 177 manual “Each Fluke 20, 70, 80, 170 and 180 Series DMM will be free from defects in material and workmanship for its lifetime. As used herein, “lifetime” is defined as seven years after Fluke discontinues manufacturing the product, but the warranty period shall be at least ten years from the date of purchase.”

Pros

- Third-party safety tested by CSA.
- DC millivolts accuracy specifications are the best in this group of 6,000 count meters.
- DC volts accuracy specifications are above average in this group of 6,000 count meters.
- Limited-lifetime warranty

Cons

- No μ A range.
- Capacitance readings below 10nF are not meaningful because of high uncertainty value.
- High capacitance value reading accuracy specifications is lowest in this group.
- Battery door is secured with self-tapping screws into plastic.
- Must disassemble meter to change fuses.

Conclusion

The Fluke 179 shows me why Fluke has a reputation for reliable meters. After twenty years it is almost as accurate as the new Fluke 177. The newer 17x line of meters have some function that my old 179 doesn't, so it shows Fluke is quietly upgrading the series.

If you need millivolt DC accuracy specification from a 6,000-count meter above all else, consider the Fluke 177 if you can find it at a low price. Also, if you want a small voltage and resistance meter and you don't need microamps the Fluke 177 would be a good fit. If you need temperature readings the Fluke 179 would work but it seems to cost more than the Fluke 87V when Lowe's website has the 87V on sale.

I would not recommend these meters for electronics projects because it lacks a microamp range.

If you are just starting out and want a good starter meter, or you want to upgrade to a new meter, I would recommend the following:

- Buy an EEVblog Brymen BM235 from Amazon for \$139.00. It is a good compromise of performance and price, but one year warranty return to Taiwan.
- Buy a Greenlee DM-510A from Amazon for \$148.99. This is the second-best compromise of performance and price with Greenlee's "Lifetime Limited Warranty".
- Buy a Fluke 87V from lowes.com for \$318.62 (as of 16-July-2023). It has above average accuracy specifications for most measurement range tests in this group of 6,000 count meters and has Fluke's "Lifetime Limited Warranty".
- Buy a Fluke 87V MAX from tequipment.net for \$ 500.98 (as of 16-July-2023), or from Newark for \$530.10 (as of 16-July-2023). It has above average accuracy specifications for all measurement range tests in this group of 6,000 count meters and is IP67 waterproof and dustproof and has Fluke's "Lifetime Limited Warranty".
- Look into the 10,000 to 20,000 count meter reviews (estimated ready by fall 2023).
- Look into the 50,000 count and above meter review (estimated ready by winter 2023).