Fluke 17B MAX Review

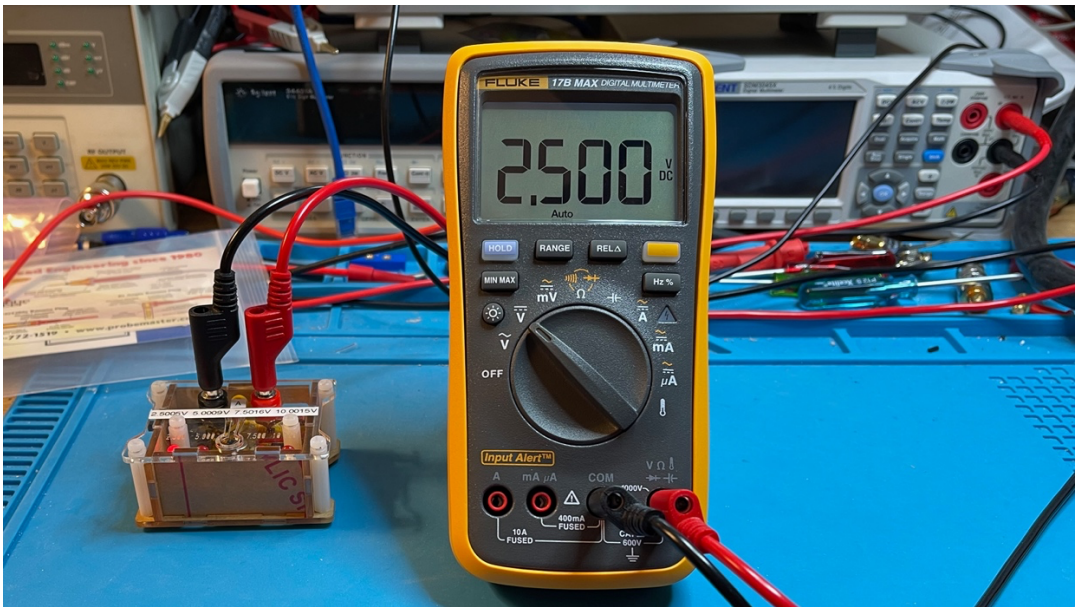
Introduction

Hi, I am Tom, amateur radio call sigh N8FDY. This is a review of the Fluke 18B MAX 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 Fluke 17B MAX multimeter that I purchased from eBay for $ 149.97. 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 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.

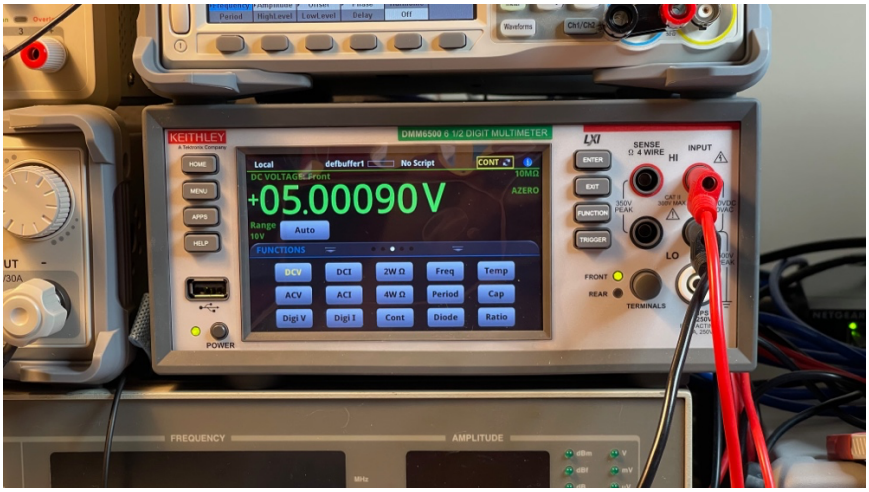
Objectives

This review was produced to help you decide if the Fluke 17B MAX multimeter will fit your purpose and budget. This is part of a series of multimeters reviews.
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

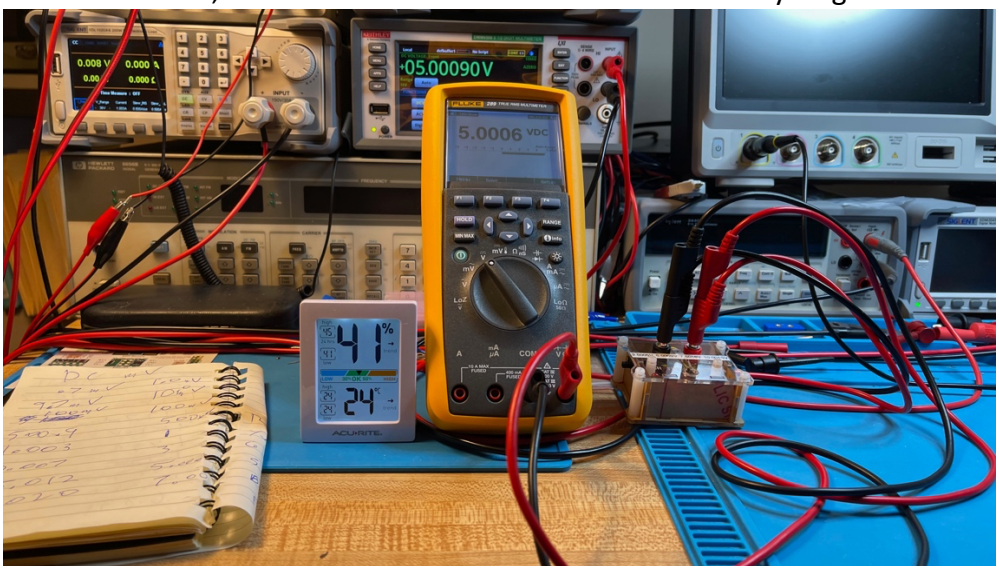
- CSA C US Listed
- CAT III 600V
- 6,000 Count Voltage, 5,000 Count Frequency, 4,000 Count all others
- Basic DC Accuracy ±(0.5% + 3)
- Min/Max
- Rel/Delta
- Hold
- Auto-off Override
- Backlight Auto-off Override
- K-Type Thermocouple
- Two AA Batteries Included

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 ±(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	1.3	1.0% + 10	1.0130	0	2.063612
10 mVDC	10.0	1.0% + 10	1.1000	8.864	11.136
100 mVDC	100.3	1.0% + 10	2.0030	98.60658	102.79342
500 mVDC	501.7	1.0% + 10	6.0170	493.383	506.617
1 VDC	1.000	0.5% + 3	0.0080	0.9911	1.0089
3 VDC	3.012	0.5% + 3	0.0181	2.9891328	3.0348672
5.009 VDC	5.010	0.5% + 3	0.0281	4.975944	5.044056
7 VDC	7.02	0.5% + 3	0.0381	6.9576982	7.0483018
10.00148 VDC	10.00	0.5% + 3	0.0800	9.92118	10.08178
101.3668 VDC	101.3	0.5% + 3	0.5365	100.82565	101.90795
199.679 VDC	199.6	0.5% + 3	1.0280	198.63701	200.72099
294.796 VDC	294.6	0.5% + 3	1.5030	293.27521	296.31679
400.168 VDC	400.0	0.5% + 3	2.0300	398.11599	402.22001
499.848 VDC	499.9	0.5% + 3	2.5295	497.29251	502.40349
622.699 VDC	623	0.5% + 3	3.4150	619.25309	626.14491

The meter met its accuracy specifications for all the DC voltages I tested. The uncertainty value for the 1 mVDC is too big to make the reading useful. The DC millivolt accuracy specification is below average. The DC voltage accuracy specification is average for this group of 6,000 count meters.

VDC Input	11 MΩ
mVDC input	18 MΩ

The VDC and mVDC inputs are 10 MΩ or greater 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	5.520	3.0% + 3	0.0582	4.9408	5.0572
1.02 mVAC	1.3	3.0% + 3	0.3390	0.650388	01.389612
10 mVAC	10.0	3.0% + 3	0.6000	9.364	10.636
100.7 mVAC	100.3	3.0% + 3	3.3090	97.30058	104.09942
500 mVAC	501.7	3.0% + 3	15.3510	484.049	515.951
1.000 VAC	1.000	1.0% + 3	0.0130	0.9861	1.0139
3.012 VAC	3.012	1.0% + 3	0.0331	2.9740728	3.0499272
5.010 VAC	5.010	1.0% + 3	0.0531	4.950894	5.069106
7.003 VAC	7.02	1.0% + 3	0.1002	6.8955982	7.1104018

The 5-volt 100Hz-square wave reading is off because this meter is not True-RMS. The meter met its accuracy specifications for all the AC 60-Hz sinewave voltages that I tested. The AC millivolts accuracy specification is below average. The AC volts accuracy specification is average for this group of meters.

ACV 1V 3dB cutoff	6kHz

The low frequency of the cutoff is little above the usual for low-cost meters.

Current

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
AC 100Hz Squarewave					
0.999 mA	1.112	1.5% + 3	0.0467	0.9523	1.0457
DC					
0.896 µA	0.8	1.5% + 3	0.3120	0.5830968	1.2089032
9.217 µA	9.2	1.5% + 3	0.4380	8.77435235	9.65964765
99.03 µA	99.1	1.5% + 3	1.7865	97.1939365	100.866064
131.86 µA	132.0	1.5% + 3	2.2800	129.520613	134.199387
1.0088 mA	0.99	1.5% + 3	0.0449	0.96344604	1.05415396
9.9917 mA	9.98	1.5% + 3	0.1797	9.80950166	10.1738983
99.415 mA	99.3	1.5% + 3	1.7895	97.600617	101.229383
1.000 A	1.000	1.5% + 3	0.0180	0.98155	1.01845
3.000 A	3.000	1.5% + 3	0.0480	2.95038	3.04962

The 1-mA 100Hz square wave reading is off because this meter is not True-RMS. The meter met its accuracy specifications for all the 60-Hz sinewave current values I tested. The DC microamps, milliamps and amps accuracy specifications are below average. The AC microamps, milliamps and amps accuracy specification are average for this group of 6,000 count meters.

A Shunt Resistance	0.055Ω
mA Shunt Resistance	1.48Ω
µA Shunt Resistance	100.33Ω

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	0.9	0.5% + 2	0.3045	0.70061454	1.31018546
10.007 Ω	10.0	0.5% + 2	0.3500	9.65594941	10.3580506
100.07 Ω	100.2	0.5% + 2	0.8010	99.2584941	100.881506
1.0011 kΩ	1.000	0.5% + 2	0.0070	0.99401892	1.00818108
10.001 kΩ	10.01	0.5% + 2	0.0701	9.93013993	10.0718601
100.01 kΩ	100.0	0.5% + 2	0.7000	99.3014993	100.718501
0.9936 MΩ	0.998	0.5% + 2	0.0070	0.98650464	1.00069536
9.97 MΩ	9.99	1.5% + 3	0.1799	9.786062	10.153938

The meter met its accuracy specifications for all the resistance values I tested. The accuracy specification for the resistance ranges is average for this group of 6,000 count meters.

Resistance Test Voltage	
Low Range	0.55 V
Medium Range	0.50 V
High Range	0.27 V

Capacitance

Source	Reading	Specification	Uncertainty	Low Bound	High Bound
0.0093 nF	N/A				
0.1024 nF	0.24	2.0% + 5	0.0548	0.0417808	0.1630192
1.008 nF	1.66	2.0% + 5	0.0832	0.911736	1.104264
9.941 nF	10.69	2.0% + 5	0.2638	9.627436	10.254564
99.45 nF	100.9	2.0% + 5	2.5180	96.4342	102.4658
1.00081 µF	1.019	5.0% + 5	0.0560	0.9471176	1.0690824
10.916 µF	10.97	5.0% + 5	0.5985	10.263836	11.568164
113.83 µF	114.2	5.0% + 5	6.2100	107.06468	120.59532
986.5 µF	1028	5.0% + 5	56.4000	920.1675	1052.8325

The meter met its accuracy specifications for the highest five capacitance values I tested. The meter could not read the 10pF value. The meter values were out of specification for the 100pf, 1nF and 10nF values. The accuracy specification for the 40nF and 400nF capacitance rangers are average and the accuracy specification for the µF ranges are below average for this group of 6,000 count meters.

Diode

Max Diode Voltage	2.338 V
Max Diode Current	502µA

All LEDs show a voltage drop, the red and yellow LEDs lit but the green LED did not light. The Schottky, Small Signal and Power diodes measured correctly.

Continuity

It is slow, but it latches.

Test Leads

The test leads were a rigid plastic type. The meter also came with a thermocouple for measuring temperature. I did not test temperature measurements.

Ergonomics

The rotary switch is easy to turn and firmly clicks into place.
The meter is slippery when using the bail on a smooth surface.
The display is big with big numbers. The backlight is dim. The auto-shutoff can be disabled and the auto backlight off can be disabled.

Accuracy Specifications Within the Group

Value	Thsinde 18B+	Zotek ZT-300AB	Uni-T UT139S	Triplett MM650	Triplett 9055	Brymen BM235	Greenlee DM-	Fluke 17B MAX	Fluke 177	Fluke 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	0.09%+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	0.09%+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	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	1.0%+3	0.7%+2	0.7%+2
DC µA	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	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	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	1.0%+4	0.2%+4	0.2%+4
AC µA	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	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	1.5%+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	1.5%+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	0.9%+2	0.2%+2	0.2%+2
Low kΩ	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	0.9%+1	0.2%+1	0.2%+1
High kΩ	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	0.9%+2	0.6%+1	0.2%+1
Low MΩ	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	0.9%+3	0.6%+1	0.2%+1
High MΩ	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	1.5%+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%+2	1%+2	1.0%+2
Low µF	3.5%+20	2%+5	4%+5	3%+5	4%+5	1.5%+2	1.5%+5	5%+5	1.2%+2	1.2%+2	1%+2	1.0%+2
High µF	5%+5	5%+5	10%	5%+5	N/A	4.5%+10	2%+5	5%+5	10%	10%	1%+2	1.0%+2

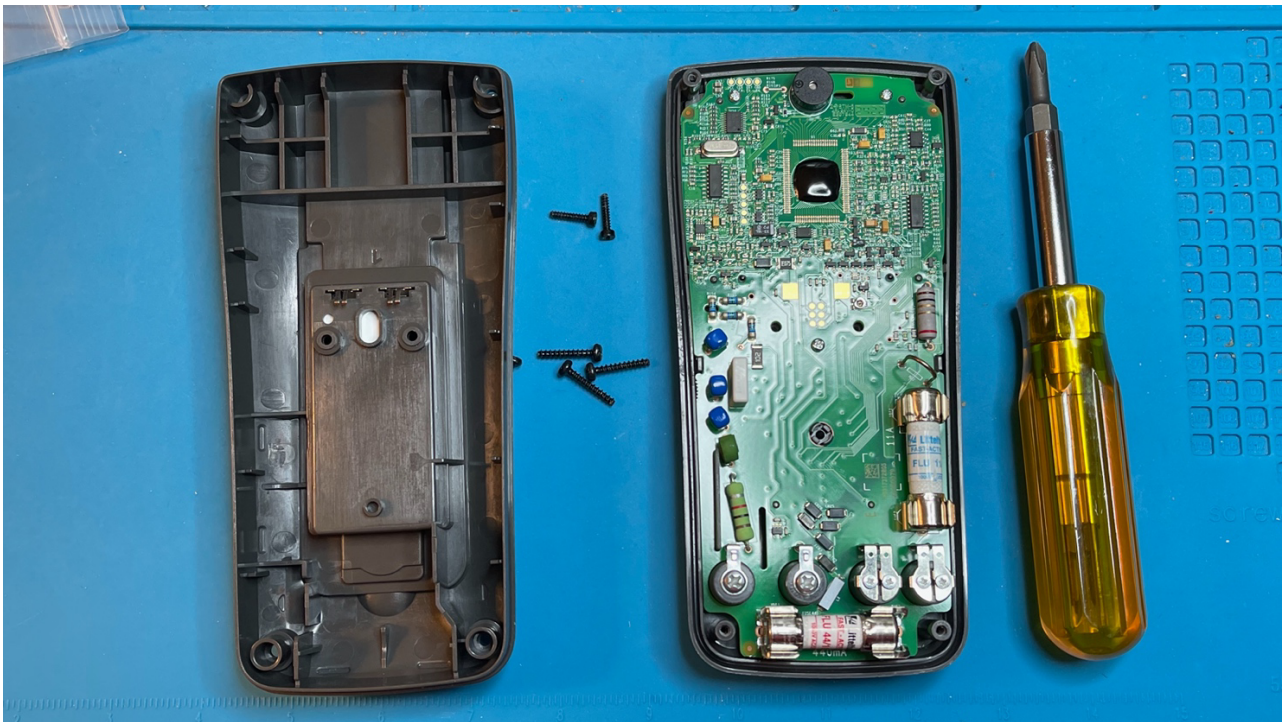
The accuracy specifications are from the meter's respective manuals. The color code shows the extreme low and high accuracy specifications, Green is the highest, and yellow is lowest, and white is everything in-between. The pink background in the meter name and model indicate that meter does not have third party safety testing indications in the manual or on the meter.
The Fluke 17B MAX has the lowest accuracy specification for DC & AC millivolts, DC & AC microamps and low microfarads ranges of the group.

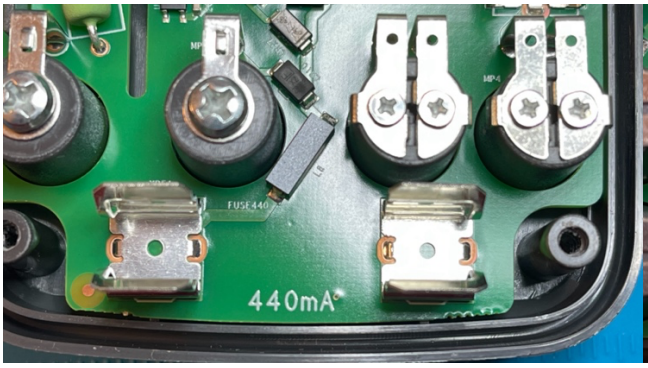
Battery

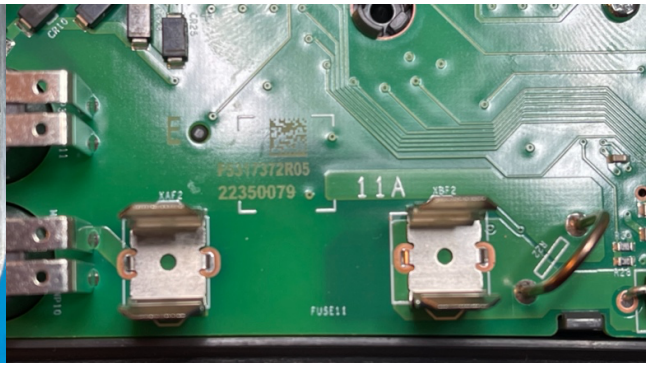
The meter uses two AA batteries accessible from the back by removing the battery cover. The battery cover has one latch with a large slot that turns 180 degrees to unlock.

Fuses

To change the fuses, you must remove the battery door and remove six self-tapping screws. There are four of one type of screw around the outside corners and two of another type of screw inside the battery compartment that must be put pack in the correct spots. The manual states the fuses are:
Fuse, 0.440 A, 1000 V, FAST part # 943121
Fuse, 11 A, 1000 V, FAST part # 803293







Pros

- Under $150.
- Third-party safety tested by CSA.
- The DC and AC volts ranges' accuracy specifications are OK.
- Resistance ranges' accuracy specifications are OK.
- You can override the auto-power-off and the auto-backlight-off functions.

Cons

- Capacitance ranges either have low accuracy specifications or have readings that don't meet the accuracy specifications.
- Must download the English manual.
- The DC and AC millivolt ranges accuracy specifications are below average.
- DC current ranges' accuracy specifications are below average.
- No measurement range accuracy specification on the meter is above average.
- Only available in US via grey market with no support.
- Must disassemble unit to change fuses.

Conclusion

It is interesting to see what meter is being sold by Fluke in the Asia and India markets. It is CSA safety tested. The AC & DC volts ranges, and the resistance ranges are OK. The current and capacitance ranges aren't very good compared to some of the lower-priced meters in this group of 6,000 count meters.
If you are a meter collector, I would say pick up a Fluke 17B MAX for your collection.
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 28-June-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, or from Newark for $530.10. 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 Flukes “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).