

Test and Review of an Inexpensive Digital Multimeter

Model: AstroAI WH-5000A

Price Paid: \$29.99 w/free shipping

Description: An inexpensive but popular (on Amazon) digital multimeter boasting features found in much more expensive meters, such as True RMS, Capacitance measurements to 60,000 uF, Temperature, Transistor test, Frequency measurements to 60MHz, and 6000-count display resolution.

PROS:

- Inexpensive. Has a dual, plastic coated magnet on the back that is very useful. I can stick it to the face of one of my vintage HAM radios while I'm doing some testing and it will stay there.
- It has a large, easy-to-read display and the rubberized case makes it easy to grip.
- The build quality is above average for a meter in this price point.
- DC and AC RMS readings are well within the claimed specifications. Spot-on, in fact.
- Resistance and DC current are accurate. Diode forward voltage measures a bit high, compared to my Amprobe AM-570. Temperature function is fairly close, compared with reality. I haven't tested the Duty Cycle function yet.
- The specs say this will read capacitance to 60,000uF. I've verified that up to 58,333uF.
- According to AstroAI, this meter can read voltages as high as 1,000VDC (CAT II) and 750VAC, but I haven't tried that.

CONS:

- That magnet that I mentioned above can pick up nuts, staples, pins, and other stuff, so it's a bit of a double-edge sword.
- The claimed frequency counter upper limit of 60MHz is actually 16MHz. Apparently, when engineering told marketing that it would read to 60MHz, marketing thought they said 60. And, the voltage required to obtain a reading is fairly high, almost 5V P-P. The Amprobe AM-570 on the other hand reads accurately up to 43MHz, and it only needs a little over 1V P-P for a good reading. Of course, it costs about \$110, or almost 4 times as much as this AstroAI WH5000A.
- The transistor hFE (current gain) test voltage is only 1 volt, and it tests the device at a very low current of around 1mA, so it reads about half of the gain of a device under typical conditions. And for some reason, the multi-function test adapter is arranged C-B-E instead of B-C-E, making testing TO-220 devices a hassle. So, DON'T buy this as a transistor tester.
- The stand is hard to pull out sometimes. You have to push at the top to get the bottom to swing out.

Bottom line: If you're looking for an inexpensive multi-featured Digital Multimeter to keep in your tool box for automotive or home repair work or general DIY electronics projects, this will do the job. Voltage, resistance, and capacitance accuracy is good. However, the frequency measurement is disappointing. If you need a meter for your HAM shack and you can go as high as \$110, take a look at the Amprobe AM-570.

REVIEW

Every time I logged onto my Amazon account, I saw ads off to the side for this inexpensive but feature-laden DMM, along with 4 star or better reviews. Two things that caught my attention were the transistor current gain (hFe) test with a special "multi-function adapter", and a claimed frequency measuring capability of 60 MHz. This was outstanding and of particular interest, because if these claims were accurate, a HAM OP could use this to verify the output of his rigs, ranging from 160 meters to 6 meters. The readings would be of only general value, but when performing quick tests on things like heterodyne oscillators (to see if they were functioning), this meter could provide a fast go/no go answer. The frequency feature was the very first thing I tested.

The published specifications for this meter are below. Note that in addition to a claimed frequency test range of 60MHz, the manufacturer claims a capacitor testing capability of 60,000 uF. I've made some comments in red.

SPECIFICATIONS

Digital Display	5 ¾ , 5999
Sampling Speed	2 times per second
LCD Size	64 x 42mm
Range Selection	Auto or Manual
Polarity Indication	Yes
Overload Indication	Yes
Low Battery Indication	Yes

Operating Environment	32°F~104°F (0°C~40°C); <80% RH
Storage Temperature	14°F~122°F (-10°C~50°C); <85% RH
Power	1 x 9V 6F22 Battery Included
Dimensions	190x90x35mm
Weight	Approx 357g

Temperature Test	Yes
Transistor Test	Yes
Diode Test	Yes
Continuity Test	Yes
External Current Test	Yes
Capacitance	Yes
Frequency	Yes

Safety/Compliances	EN 61010-1 CAT III 600V, CATII 1000V
DC Voltage	600mV6 ±(0.8%+5), V/60V/600V ±(0.8%+3), 1000V ±(1%+5)
AC Voltage	600mV ±(1.2%+8); 6V/60V/600V ±(1.2%+6); 750V ±(1.2%+8)
Temperature	-40°C~1370°C; -40°F~2000°F (1-5%+4 depending on temp)
DC Current	600µA/6000µA/60mA/600mA ±(0.8%+5); 6A/10A ±(1.5%+3)
Transistor hFE	PNP & NPN (Ib≈2µA; Vce≈1V)
Resistance	600Ω/6KΩ/60KΩ/600KΩ/6MΩ ±(1.5%+3); 60MΩ ±(1.5%+5)
Capacitance	60nF/600nF/6µF/60µF/600µF/60mF (60,000 uF) (I've verified to 58,333 uF)
Frequency	0~60MHz ±(1%+5) (Reality: It's only 16 MHz)

Accuracy is guaranteed for 1 year when stored at 73°F ±9°F

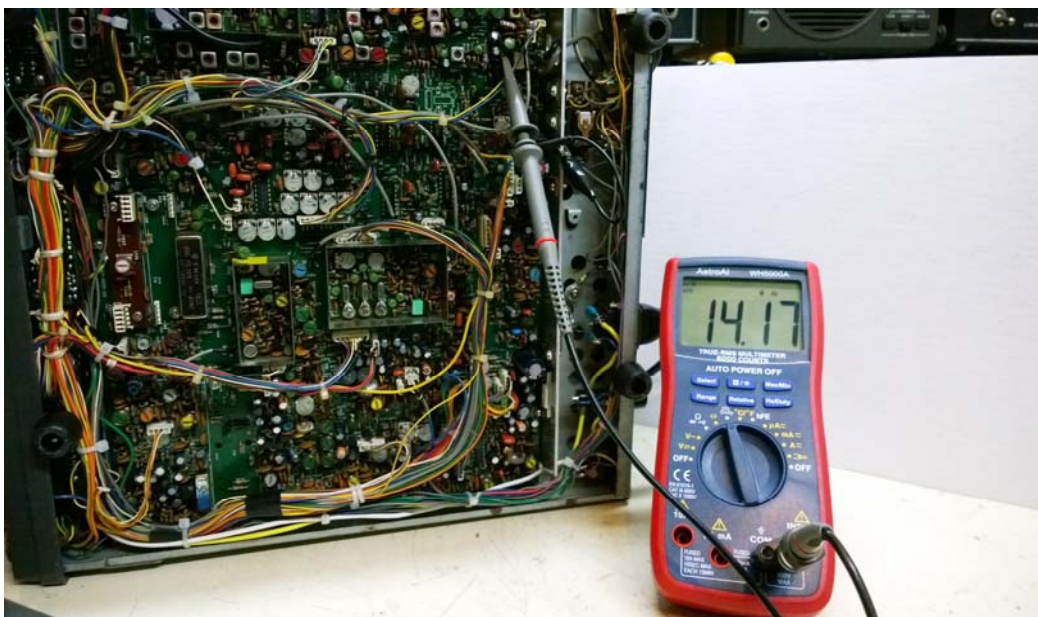
Frequency Testing

This was the first thing I tested. The pictures below shows the AstroAI and an Amprobe AM-570 side-by-side with a Y-cable connected to a FeelTech FY6600-60 function generator, set for Sine wave and 5V P-P. Using square waves made no difference. At 17MHz, the AstroAI fell flat.



The highest frequency it could register was 16MHz, hence my wisecrack at the beginning regarding engineering and marketing. Or maybe I just received a bad unit. The Amprobe recorded the frequency all the way up to 43MHz. Interestingly, the Amprobe specs also claim measurement capability to 60MHz, so it too falls short.

In the photo below, the meter is measuring a frequency 14.175MHz from the signal unit of a Kenwood TS-930S HAM transceiver. The meter is connected to R174 near the output relay. It reads the signal, but the gain from the board (carrier level) has to be set at 10 to obtain a reading. By comparison, the Amprobe can read the signal at a carrier level of 4, and a very old Beckman Industrial DM27XT can get a reading with the carrier control set at 2. On the plus side, if you're getting a reading with the AstroAI, your signal board is probably OK.



Capacitance Measurements

Having experienced some disappointment over the frequency measuring capabilities, I expected the same with capacitance. But the WH5000A performed well in this area. I don't have any "boomer" caps at the moment, but I was able to string together five or six 10,000uF electrolytics. The AstroAI outran everyone in this arena. It measured right up to its 60,000uF specification. It stopped at 60mF, but the Amprobe couldn't do 40,000uF. My CEM 9935 LCR can only reach 20,000uF.



Testing something a little smaller, like a 3900uF Nichicon yielded similar results.



Voltage Measurements

When it comes to AC and DC voltage measurements, the inexpensive AstroAI WH5000a is right up there with the more expensive units. No need for a lot of text here, the photos tell the story. The DC voltages were supplied by a Tektronix Calibration Fixture. The AC voltage was from a regulated AC supply, set at 115.00 VAC



Current Measurement

Current measurement was accurate compared to the more expensive Amprobe meter. The photos below were taken while testing the quiescent current of one of those 5-amp, XL4015E regulator boards. I'm using one to power a security camera system in my car.



During the testing, I found it necessary to use both hands to measure the voltage output from the regulator board. A slip here could spell disaster, as the camera system was connected so I could adjust the regulator under load, and I've encountered situations where a short in the output caused the regulator to put the full voltage through to the output terminals. 12 volts on a 5-volt USB-powered device might fry the device. Fortunately, the AstroAI has that convenient set of magnets. On almost all metal surfaces, they hold the meter securely.

