MF470 V1.1 Auto-Ranging Capacitance Meter User Guide

Features:

MF470 Auto-ranging capacitance meter.
Using 128X64 dot matrix LCD, can display 5 digits reading, Large range of measuring 0.01pF to 47mF (47000uF) capacitance and new Fara (super capacitor) measurement range 47mF to 470F, which enough for DIY user to professional engineer usage.
MF470 have fast reading speed and high accuracy up to 1%.
Reading a 2200uF only take ~0.2s (Manual ranging mode)

1) Larger measuring range, MF470 can read up to 470F super capacitor and measure super capacitor's ESR internal resistance, some super capacitor may have internal resistance up to 70ohm.
2) E6 Tolerance estimation for 47nF to 47uF, and 47uF to 47mF, we can estimate the capacitor marking capacitance and provide a real time tolerance display.
3) Estimated ESR internal resistance displaying at 47uF to 47mF and 47mF to 470F range. Can have a rough estimation on the condition of the electrolytic capacitors
4) High voltage discharge notification, meter will try to discharge a capacitor if user doesn't discharge before testing. *(WARNING! Strongly suggest user to discharge by suitable power resistor before testing, meter's discharge function is not 100% guarantee high energy stored inside capacitor will not damage the meter!)
5) TYPE-C USB can used as external power source. (USB cable and charger is not included)
6) PC software can provide capacitance changing record and easy for QC pass and fail checking.
7) 2XAA batteries rather than using 9V.
8) Dot matrix LCD with backlight provide more user-friendly display.
9) Grounding terminal can reduce the environment noise for capacitance measurement.

***PLEASE DISCHARGE THE CAPACITOR BEFORE TESTING**

Specification:

Range	Accuracy (After Zero, tested with 1nF, 1uF, 1000uF)	Refresh Time (Manual Mode) *Auto mode take 0 to 2s or more time depend on value Larger capacitance take more measuring time
0.01pF to 47.000nF	1%+2Digit (Reference to 1KHz Standard Capacitor)	~0.2s to 1s
47.00nF to 47.000uF	1%+1Digit (Reference to 1KHz Standard Capacitor)	~0.2s to 4s
47.00uF to 47.000mF	1 to 3%+1Digit (Reference to 100Hz Standard Capacitor)	~0.2s to 30s
(FARA) 47.00mF to 470.00F	3 to 12%+1Digit	~15s to 135s (need enough steady time for the dielectric material and terminal stable, longer testing time in this FARA range)

***Accuracy maybe affected by the test lead's length and distance of test leads. Especially testing pF small capacitance, shortest test lead is recommended, and be careful the surrounding EMI or RF noise may affect the pF reading. Human is also a conductor layer that affect pF reading**

1) Capacitance Accuracy: Up to 1% (detail on above table)
2) High Resolution: 5 digit
3) Measuring voltage: <0.8V
4) Clamping voltage: ~1.25V (open voltage)
5) Battery 2X AA 1.5V battery
6) External Power: 5V TYPE-C USB
7) Operating current 0.02A
8) Battery Life time: >80 Hours (Reference at range 1 measurement)

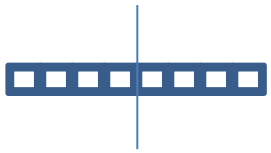
Operating Introduction:

1) POWER ON
Press and hold the ON/ OFF circle orange button for 1 to 2 second to power on.
Press and release the ON/ OFF button to shut down meter.

2) AUTO/ MANUAL mode:
i) Auto Range:
Press and release the RANGE button and at the first line of LCD will show "AUTO:"
At auto mode meter will automatically select the best range to detect.
ii) Manual Range:
Scroll the manual range from 47nF, 47uF, 47mF, 470F range by press and release the RANGE button.
In LCD will show MANUAL at first LCD line and show at second line: 0-47NF, 47NF TO 47UF, 47UF TO 47MF and 47mF to 470F

3) 1 Key Zero:
OPEN circuit the test leads' terminal.
Press and release the "ZERO" button, LCD shows "ZERO" and wait the zero disappear.
If you are using the meter array socket, you need to OPEN circuit to set zero too. This operation will take around 12s

4) Socket:
You can use the 8 pin socket to measure the capacitor



NEGATIVE POSITIVE

5) Running Average:
It will automatically start running average if the capacitance reading become stable and user can get more accuracy reading.
During running average it will show "AVG" at left bottom LCD or it will show raw data icon "RAW"

As a result, if you want to get higher accuracy reading, you can take the reading during AVG display.
This function will automatically on, once the raw data is noise.

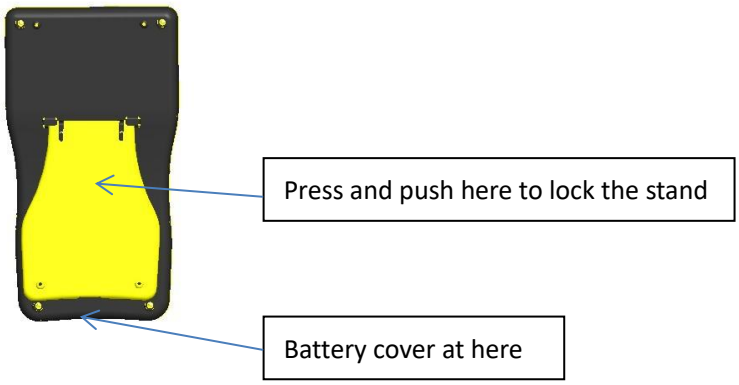
6) Backlight:
LCD backlight will on during power on

7) Auto Sleep:
Around 1 hour for testing is not changed, it will shut down automatically to save power.

8) OVERFLOW or OL:
Display overflow when the value is out of range, you can check that you are zero correctly.

9) Grounding Terminal:
While measuring small pF capacitance, the reading maybe interfered by environmental noise. Then you can try to connect a grounding table to ground, like metal water pipe.

10) PLASTIC STAND:
If you don't use the stand, press and push the lock position:



11) USB External power:
During using USB as power supply, be careful floating grounding issue. If the USB adaptor is floating ground, a noise will affect the pF reading with jumping. We will suggest using battery as power source during pF measurement, or you have a grounding on the negative of the testing terminal.

***PLEASE DISCHARGE THE CAPACITOR BEFORE TESTING**, you can use a power resistor around 10 ohm and short for 5 to 10s, better to take around 5 time constant

time (Time= 5xRxC) to discharge. Meter has fast discharge function inside the meter to prevent high voltage, but it is not 100%, it is important to discharge the capacitor firstly, as it is a large surge current and voltage and may also damage the meter.

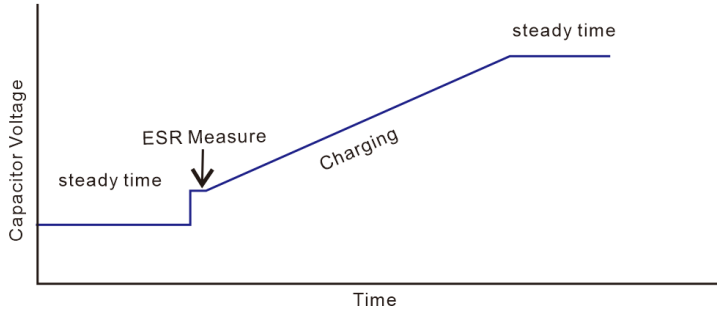
Tolerance Estimation

Most of the electrolytic capacitor has +/-20% tolerance, which in E6 standard capacitor. For convenient we estimate the tolerance from common marking value standard.
Meter will estimate from standard: 1.0, 1.5, 2.2, 3.3, 4.7, 6.8, like reading 1800uF, will be 2200uF tolerance is 100%x (1800uF-2200uF)/2200uF= -18.1%
Display at bottom of LCD: ECAP:-18.1% @2200.0uF

FARA Capacitance Measurement

Measurement step of FARA Capacitor:

1) Wait for dielectric material steady and ion away from terminal, it will use 5s
2) Measure the capacitor's ESR
3) Charging the capacitor by a precision resistor with fixed voltage, after charging for 5 to 120s.
4) Wait for dielectric material steady and ion away from terminal, it will use 5s
5) Measure the capacitor increased voltage.
6) Calculate the capacitance of the fara capacitor.



Display on LCD: discharging… -> charging… -> calculating… one cycle update the capacitance.

Notice:
Fara Capacitor has different standard of measurement method from different manufacturer, some will need 5-minute steady time, or some will suggest having 30-minute steady time. Constant current, measure in charging or discharging step.

It will take too long time for user to test a Fara capacitor. As a result, we provide a faster FARA capacitance measurement, but the reading will be a **reference value for user only.**
(Some fara capacitor's specification has 30% variation drift from first measurement)

ESR Measurement

We provide ESR reference value for user to estimate the condition of the capacitor. It will also include the long cable resistance, contact resistance.

The ESR value accuracy is only guarantee by design, and tolerance may over 10%.

The display Of ESR is XXX.XX ohm, resolution is 0.01ohm

47mF Range: Max display ESR is 25ohm
470F Range: Max display ESR is 100ohm
LCD Display at bottom: ESR:+ 3.10Ω
***ESR is for user reference only.**