Mains Peak/RMS/Mean Meter

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PSEUDO RMS VOLTMETER

True Root Mean Squared (RMS) meters either use an insensitive moving iron movement (with a non-linear scale) or have active Squarer circuits to compute the value. So most meters are only "Average" (Mean) indicating & calibrated to indicate the RMS value, by applying sine waveform correction factor of 110%.

Real mains is normally 240v RMS (EU 230v, +10%=253v Max) & has a peak value of 340v (357v Max) with a mean value of 218v. Most electronic equipment needs the right peak voltage to work properly, & not some clipped 240v square wave that has the same RMS voltage!

This simple passive meter circuit can be used to give a more meaningful measurement of a Generator/Inverter AC supply, or to upgrade an existing meter. The added Peak & Mean features can be ignored for simple RMS meter.

PARTS:-

Box         Old Plug top PSU with 3 metal pins.
Resistors   1/4 Watt or higher if using lower values. 100Ω is a fuse type.
Diodes      Hi PIV types eg. 1N4007
Cap         400V or higher Polly type.
Cal Pots    Preset type (N.B. mains is on them if adjusted from outside!)
Switch      Any 3 pole 300VAC (low current) switch. (3 coloured positions)
Meter       100uA Scaled 0-360V, or 50% Back wound movement Scaled 160v-360v. Use 3 Colour bands on the scale for ideal readings. Mounted so that it is well insulated. (double insulated?) For higher current meter e.g. 1mA divide the R values by 10, & multiply the Capacitor value by 10.
Neons       With internal Rs, can be added L-N, L-E, N-E, show the status of the voltages on the wiring. On Household Mains only L-N & L-E
should light up, on a floating generator feed all will light up.

CALIBRATION:-
Warning this means using MAINS VOLTAGES! Use an isolation transformer & variac if you can, to make it safer!

1/ Apply smooth 250V-300V DC on the AC Input, Adjust the DC Cal pot for the same reading. Or with use the Peak reading feature & measure the Voltage across the Cap with a Digital meter & adjust the DC Cal pot to read the same. This simulates a perfect square wave.

2/ Apply 50Hz 240V AC Sine wave & adjust Cal RMS pot for the same reading. This varies the amount of peak voltage that is added to the mean voltage to get the pseudo RMS reading.

3/ Check that with 240V AC the meter reads 340v Peak & 218v Mean.

/QSL
73 de John G8MNY @ GB7CIP