



No Load Power Loss Measurement Considerations

AN-G-002/15

Scope

No load power or standby power refers to the electric power consumed by electronic equipment while in a standby mode. It is a condition in which the input of a power supply is connected to an AC source consistent with the power supply's nameplate AC voltage, but the output is not connected to a product or any other load.

In the past, standby power was largely not a consideration for users, electricity providers, manufacturers, or government regulators. In the first decade of the twenty-first century, awareness of the issue grew and it became an important consideration for all parties. Up to the middle of the decade, standby power was often several watts or even tens of watts per appliance. By 2010, regulations were in place in most developed countries restricting standby power of devices sold to one watt, then half watt from 2013. A new Department of Energy (DOE) standard (Level VI) in effect in the USA as of February 10, 2016, limits the standby power to less than 0.1W for external power supplies (EPS) with nameplate ratings of 49 watt or less, 0.210 Watts for $49 < P_{out} < 250$, and 0.5 Watts for $P_{out} > 250W$.

The International Electro-technical Commission (IEC) introduced the IEC62301 standard that specifies methods of measurement of electrical power consumption in standby mode. Accurate measurement of standby power needs care, but is technically straightforward in most cases when the IEC62301 is followed.

Equipment Considerations

- The ambient temperature should be $23^{\circ}\text{C} \pm 5$ with still air.
- AC power source should not exceed 2% harmonic content, up to and including 13th harmonic.
- The crest factor should be between 1.34 and 1.49.
- Measurements of power less than 0.5 W shall be made with an uncertainty of less than or equal to 0.01W at the 95% confidence level.
- Power measurement instrument shall have a resolution of 0.01W or better.
- Power measurement instrument would have to be capable of integrating energy over any user selected time interval with an energy resolution of less than or equal to 0.1mWh and integrating time displayed with a resolution of 1 second or less.

Measurement Considerations

If power consumption is stable (defined as less than 5% variation from the mean over an interval of 5 minutes), the power consumption can be read directly from the meter. If power consumption fluctuates, energy consumption should be measured over a period of time and then divided by the measurement period to determine average power.

However, the standby power can be asymmetrical and complicated further with low duty cycle current pulses. So do not assume that a standby power profile is symmetrical and therefore can be accurately quantified with gaps between measurements by integration over a long

period of time. Such a measurement technique may miss events and provide only an average approximation power rather than a precise true power.

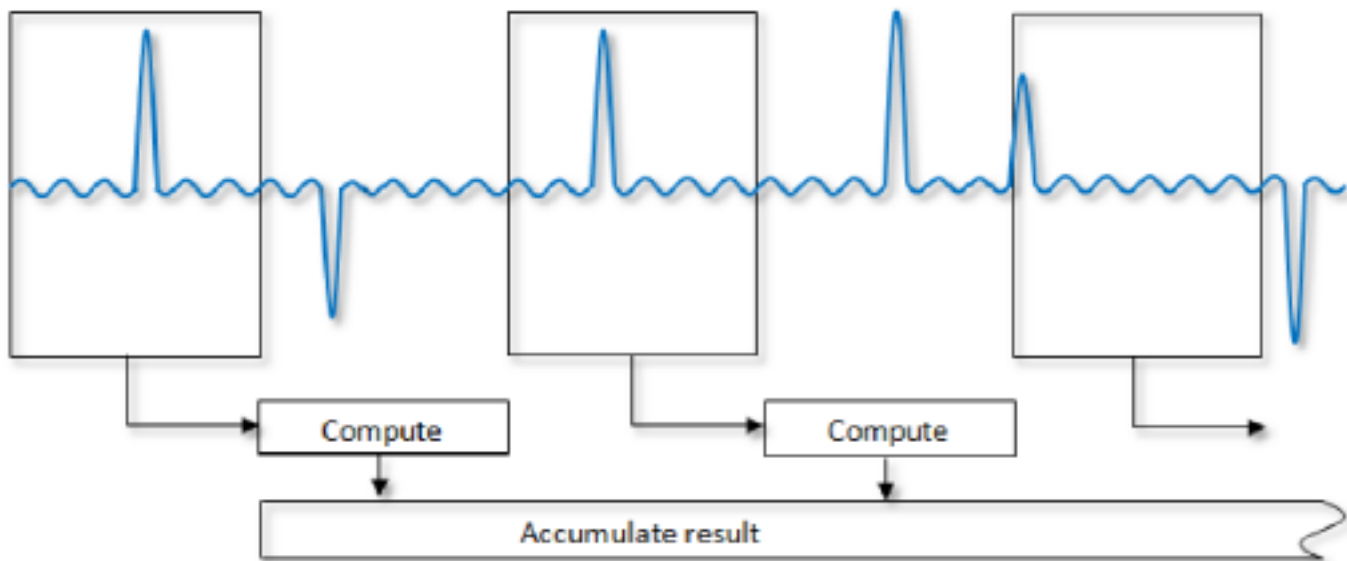


Figure 1. Gaps between measurements from a typical power measurement instrument provide only an average approximation power.

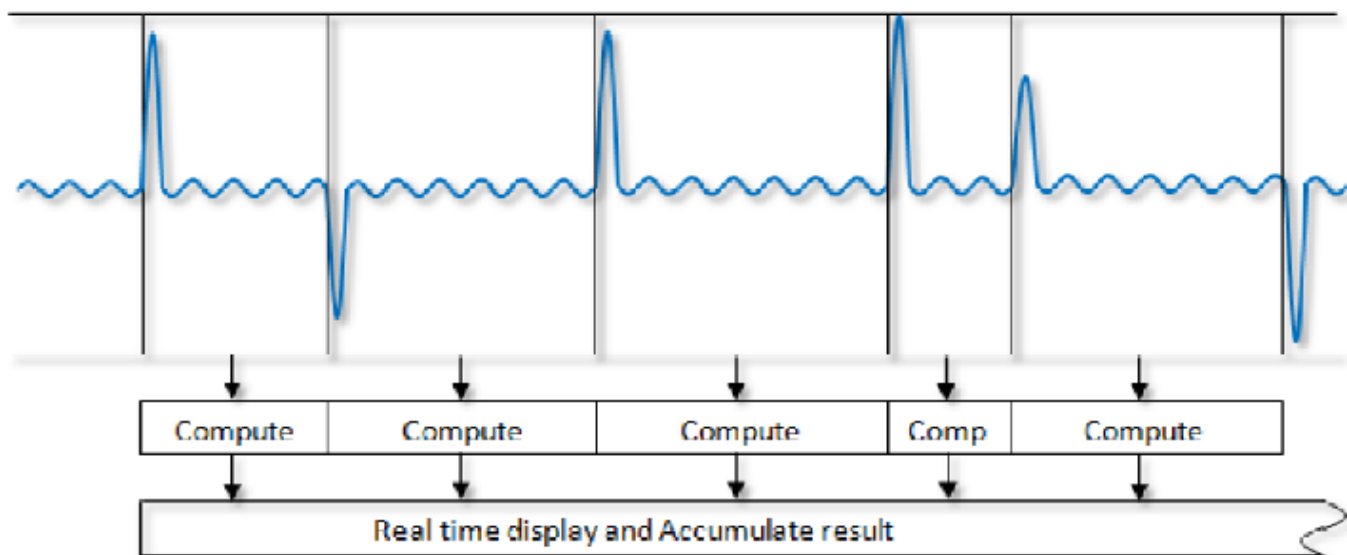


Figure 2. No gaps and variable windows measurement between peaks provide the true standby power.

The instability in power is due to the power analyzer sampling technique not the device under test. High performance power analyzers are required to achieve measurement stability and reflect the true standby power with a short measurement time.

It is a good practice to disconnect the unit under test from load when measuring no load input power since some electronic loads may still provide a slight load even though it is set to zero. Verify the power analyzer is connected according to the manufacturers' recommendations as the power analyzers may also add load to the reading if not properly connected.

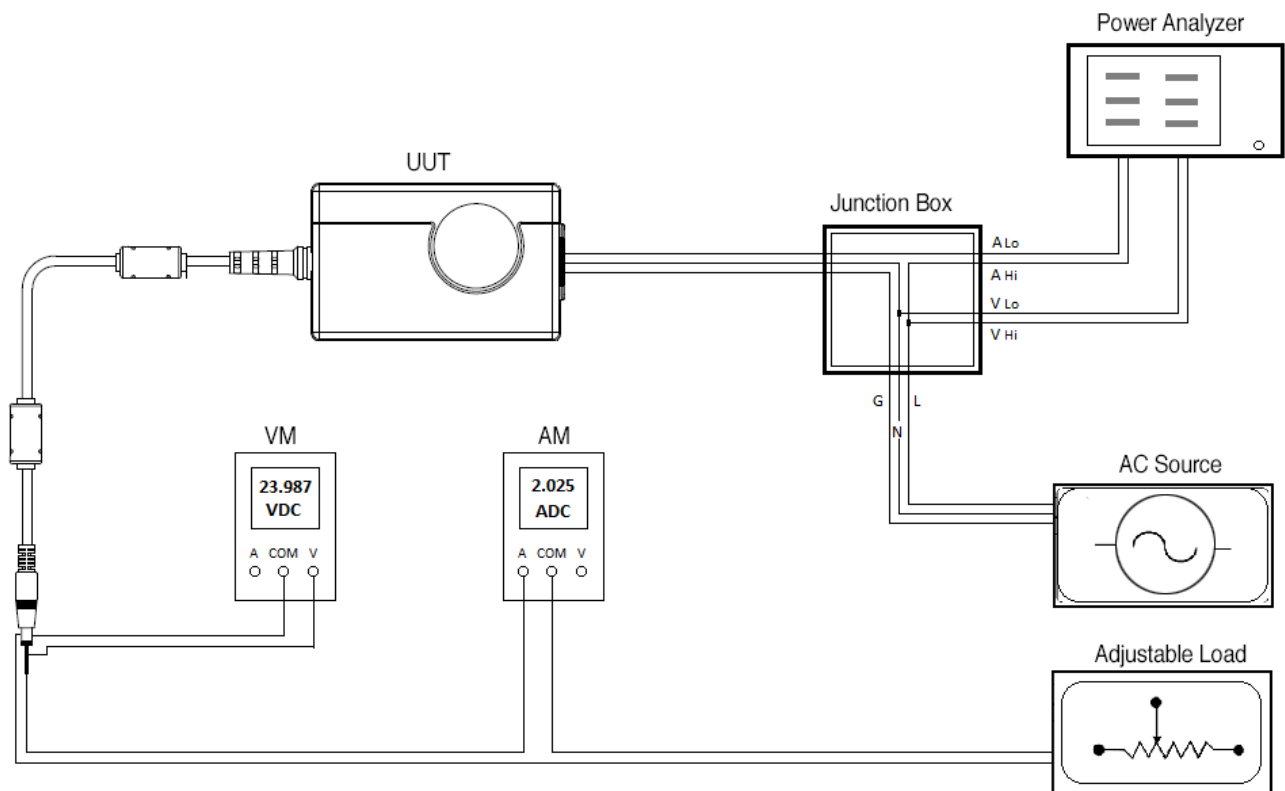


Figure 3. Efficiency Test Setup Diagram.

Notes:

1. Voltmeter VM must sense voltage at the output side of the connector, not after the mating connector.
2. Load connections at the output connector must make a good solid connection.
3. Keep connections between junction box and UUT as short as possible.

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