Switching Mode Power Supplies

SMPS: Advantages, Disadvantages, and Troubleshooting

WORKREADY ELECTRONICS © 2004

SMPS Advantages: Efficiency

Transistor switches are either off (non-conducting) or on (saturated or heavily conducting) so they consume little power and dissipate minimal heat. In contrast, linear transistor amplifiers conduct current continuously and dissipate a large amount of heat.

The efficiency of a typical linear supply is rarely more than 50%, while a switching power supply typically exhibits a regulation or power conversion efficiency greater than 80% and more typically over 90%.

Higher efficiency saves power, reduces the adverse effect of heat, and conserves energy and natural resources.

WORKREADY ELECTRONICS © 2004

SMPS Advantages: Cost

The size and weight of switching power supplies are significantly smaller than linear supplies.

Switchers operate at high frequencies (50 kHz to 1 MHz), compared to linear supplies (60 Hz).

They use smaller transformers, filter capacitors, and cooling methods. This results in less size, weight, and ultimately, cost.

WORKREADY ELECTRONICS © 2004

Disadvantages of SMPS

The primary disadvantage of switchers is the noise and interference generated during operation. Switchers produce transients that can interfere with other circuits.

Transients result in radio frequency radiation that can interfere with the operations of other circuits and nearby equipment.

Proper filtering and shielding are used to eliminate the problem with transients and enable switchers to meet all noise requirements of the FCC.

WORKREADY ELECTRONICS © 2004

Troubleshooting

Most power supplies or assemblies are replaced and not repaired because it costs less to buy a new supply than it costs to troubleshoot and repair a defective supply.

The first step in troubleshooting is to validate or try to repeat the problem. If the problem still exists, determine if the problem is the power supply. Begin by testing for the presence of AC input line voltage. If there is no AC input, possible causes include:

- Tripped circuit breaker or bad fuse
- Unit unplugged
- Defective AC plug or cord
- AC power failure

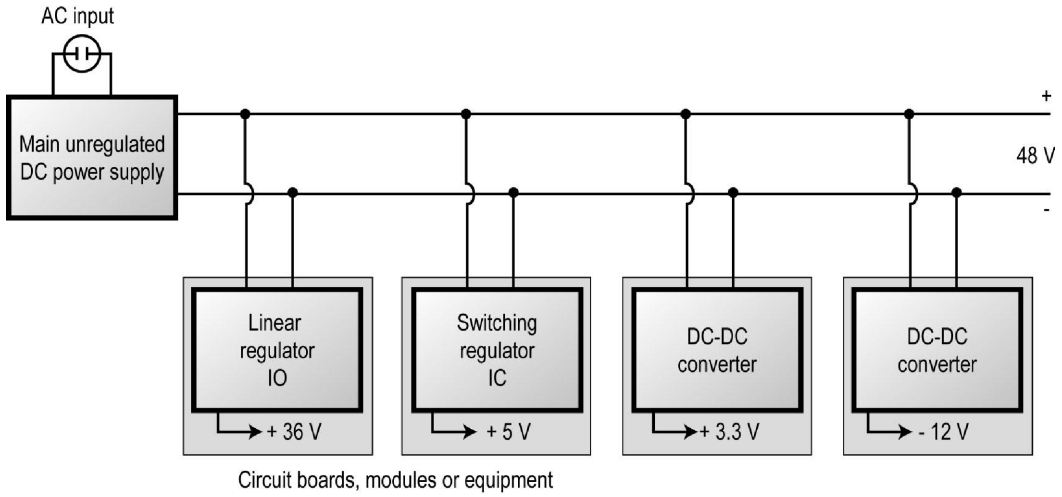
If the AC input is present, all DC output voltages are measured using a digital multimeter. No DC output or an incorrect value indicates a defective power supply. The power supply or assembly should be replaced.

WORKREADY ELECTRONICS © 2004

Troubleshooting Bus Systems

Typical test sequence and procedure for a bus system:

1. Measure DC output of unregulated supply. If there is no DC voltage or it not at the correct voltage, check the AC input first. If AC is present, replace the supply.
2. Once unregulated DC is present on the bus, measure the output of each power supply. If the output is OK, no action is needed. If no output is observed or the output is incorrect, replace the regulator or DC-DC converter IC or assembly as required.
3. Retest after all replacements.



WORKREADY ELECTRONICS © 2004

Test your knowledge
Prepare for SMPS Lab

SMPS Knowledge Probe 4

SMPS: Advantages, Disadvantages, and Troubleshooting

Click on Course Materials at the top of the page.

Then choose **Knowledge Probe 4**.

WORKREADY ELECTRONICS © 2004