SERVICE NOTE

SUPERSEDES:

None

# HP MODEL 85650A QUASI-PEAK ADAPTER

## All Serials

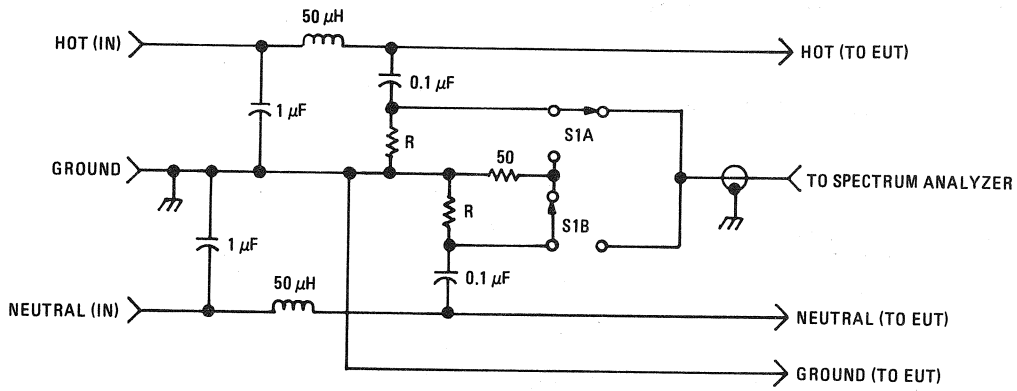
## PREVENTING SPECTRUM ANALYZER ATTENUATOR DAMAGE WHEN PERFORMING CONDUCTED EMI MEASUREMENTS

### Introduction

Recent rulemaking by the Federal Communications Commission has increased demand for equipment to perform RFI/EMI measurements. The introduction of the HP 85650A Quasi-Peak Adapter has increased the use of spectrum analyzers in making such measurements. A required measurement is conducted interference via the power mains. This is usually accomplished with a Line Impedance Stabilization Network (LISN) and a relay to switch between the Hot and Neutral leads. Unless proper precautions are taken, the spectrum analyzer input attenuator can be burned out while performing the measurement.

### Problem Definition

The schematic for a typical dual LISN is shown below.




Actual component values vary widely among manufacturers. Resistor R is generally 1 kΩ although 10 kΩ is not uncommon. Inductances as low as 5 μH are used in some models. Switch S1 is a DPDT break before make type.

I/NS/WN

8/81-53/SL

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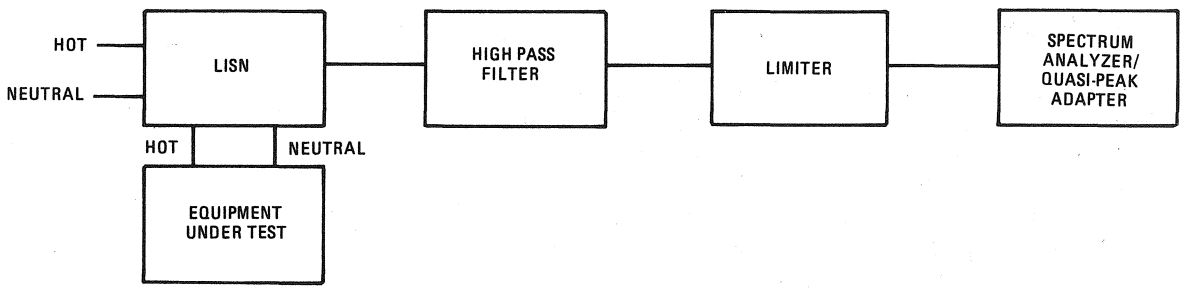
A large voltage spike can be generated across the spectrum analyzer input when the unit under test is switched on. Depending on the phase angle of the load, the energy in the pulse can exceed the 100W-$\mu$second pulse power specification of the input attenuator.

Another voltage spike is generated when S1 is switched. During the time that the relay is switching, the voltage across R rises to R/30,000 of the line voltage. When the relay closes, a large voltage is present on the input of the spectrum analyzer.

**Solution**




The solution is to reduce the voltage spikes across the spectrum analyzer input to a safe value. A limiter, such as the HP 11867A, is not sufficient by itself. With a large pulse applied to its input, the limiter behaves as a comb generator. The limiter must be used in conjunction with a high pass filter with a cutoff determined by the measurement frequency range. The filter needs a minimum of 35 dB attenuation at the power line frequency.

High Pass Filters with cutoff frequencies in the 10—100 kHz range are commercially available from the following firms:

Allen Avionics Inc., 224 East Second Street, Mineola, New York, 11501
CirQtel Inc., 10504 Wheatley Street, Kingston, Maryland, 20795
Telonic-Berkeley, 2825 Laguna Canyon Road, Laguna Beach, California, 92652

The high pass filter can be as simple as a 0.47 $\mu$F mylar capacitor in series with the output of the LISN. The insertion loss is under 1 dB from 10 kHz to 100 MHz with this "filter", while the rejection of the line frequency is sufficient to protect the spectrum analyzer input attenuator.