TECH LETTER # 8

6920A METER CALIBRATOR APPLICATION NOTES

HARRISON LABORATORIES
DIVISION OF HEWLETT-PACKARD COMPANY

100 Locust Avenue
Berkeley Heights, New Jersey 07922

6920A METER CALIBRATOR APPLICATION NOTES

INTRODUCTION

When using the Model 6920A meter calibrator, consideration of characteristics and limitations of this instrument will avoid many application problems. While much of the information which follows is contained in the instruction manual or is inherent in the specifications for the 6920A, we feel it will be useful to summarize the nature of the most important limitations, application problems which have been noted, and some of the means for minimizing difficulties.

DC RIPPLE

The ripple in DC ranges in typically 1% RMS, and in the 1000 Volt range can be as high as 8% Peak-to-Peak. This is not important for the majority of DC instruments. However, when calibrating high speed recorders, oscillographs, galvanometers, oscilloscopes, and other DC instruments having substantial frequency capabilities at 120 cps, the ripple will be visible.

AC HUM PICKUP

Any 60-cps hum picked up in the leads will be translated into a measurement error in AC meters. With passive type meters or battery-powered instruments where there is no connection to the power line, very little care need be taken; twisting the output leads normally is sufficient.

When calibrating line-powered AC meters, the situation is more difficult. Ground loops can occur which circulate alternating current through the negative lead connecting the 6920A and the meter. The IR voltage drop in this lead can introduce a measurement error. The instruction manual suggests ways of minimizing this type of pickup, which is most noticeable on the 1 volt range.

Most line-powered AC meters generate some 60 cps hum within their circuitry. This is normally balanced out in the zero setting of the meter. However, when a 60-cps signal from the calibrator is applied to the meter, this hum may add or subtract from the input signal and result in an erroneous reading. In some meters this error has been observed to be as large as 3%. A quick check for this problem is to reverse the AC line cord on the meter, keeping the meter grounded at the 6920A (-) terminal, and observe if the meter indication shifts.

WAVEFORM EFFECTS IN AC OPERATION

The output waveform of the 6920A is no better than that of the input power line. The internal AC reference of the 6920A monitors the average AC value of the output signal, regardless of waveform. Thus, the average value of the output signal is correct despite large amounts of power line distortion. The dial on the 6920A is calibrated to indicate the equivalent RMS value of a pure sine wave. It should be noted that unless the waveform is a pure sinusoid, the fixed relationship between average AC, Peak AC and RMS AC does not hold (Erms = 1.111 Eavg). For AC instruments which are peak or RMS sensing, line distortion will produce an error which has been observed to be as large as 5% with an RMS meter and an extremely poor line waveform.

OVERLOADING IN CURRENT RANGES

The user should remember the 1/2 volt limitation in the 5A range. Very heavy leads should be used, and ammeters having an internal voltage drop of more than 1/2 volt should not be operated at full scale on this range. Extended operation over 1/2 volt in the 5A DC range can result in overheating of the high voltage transient suppressors in the 6920A. To prevent this problem, provisions are being made to reduce the setting of the overvoltage protection circuit in DC ranges. In the meantime, care should be taken in calibrating high current DC meters to avoid output voltages greatly over 1/2 volt on the 5A range.

GROUNDING (-) TERMINAL IN CURRENT RANGES

The (-) terminal should not be grounded or shunted to ground in current ranges because damaging currents can flow through the load. This is particularly important in the low AC current ranges where capacity to ground will at the least cause the output current to increase beyond the specified accuracy of the 6920A.

Normally, ammeters are floating and therefore should not cause a problem. However, when testing the 6920A current ranges using a shunt in combination with a voltmeter, a problem may occur if the voltmeter has one terminal grounded.