

"THRU-LOAD-DELAY": AN IMPROVED TECHNIQUE
FOR CALIBRATING THE DUAL SIX-PORT

Glenn F. Engen and Cletus A. Hoer
Electromagnetic Technology Division
National Bureau of Standards
Boulder, Colorado 80303

ABSTRACT

In some earlier papers the use of a "thru-short-delay" technique for calibrating the dual six-port was described. Another scheme required only a length of precision transmission line and a calibration circuit. The better features of these two somewhat different approaches have now been combined and the requirement for either a known short, or a "calibration circuit" eliminated. This paper will discuss this new procedure and also describe its application in a practical dual six-port system.

Summary

In some earlier papers the application of a calibration procedure known as "thru-short-delay" (TSD) to the dual six-port has been described.^{1, 2} This technique is so-called because it is based upon observations of the system response with the two six-ports connected together, (thru), then when each is terminated by a (known) short, and finally with an unknown length of line inserted between them (delay). Although originally developed for the four-port reflectometer,^{3, 4} the method has recently been adapted for use with the dual six-port.

Another calibration procedure⁵ was based upon the use of a length of line as the only impedance standard. This method also required, however, the use of a "calibration circuit" which provided for terminating the two six-ports with equal impedances and at the same power levels.

The better features of these methods have now been combined in a technique known as "thru-load-delay" (TLD). Here the "calibration circuit" is no longer required. As compared with TSD, the need for a short of known reflection has been eliminated. In its place a load of unknown reflection is used to terminate, in turn, each of the six-ports. While a nominal short continues to be one of the more convenient choices for the unknown load, the key point is that a value for its reflection is no longer required. Instead this is obtained as a by-product of the procedure. It is especially noteworthy that this procedure, quite possibly, represents the best experimental method of determining the reflection of a short which has yet been devised. Moreover, the delay line, which plays a key role, need not be assumed free of dissipation.

This calibration procedure plays a major role in the performance of the dual six-port system which is described in an accompanying paper.⁶

References

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