

# Measurement of High Isolation

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*A technique for measuring high isolation values of X-band components has been demonstrated. The test technique utilizes available commercial test equipment and provides swept-frequency data. Isolation up to 125 dB is readily measured.*

The development and procurement of improved microwave components for the DSN continues to be an ongoing process. As performance specifications have become more stringent, acceptance test requirements placed on suppliers have also become more demanding. The reliable measurement of high microwave isolation is one such test that has been difficult to accomplish in the past utilizing commercial test equipment. The measurement requires equipment having high sensitivity and low internal noise for adequate resolution. This report describes an improved test technique which makes use of more recent commercial equipment. It is useful for measuring isolation values up to 125 dB. This technique was used for measuring waveguide switch isolation as reported in a previous article (Ref. 1).

A substitution technique was used to measure the isolation-vs-frequency characteristic of three WR-125 waveguide switches procured from Logus Manufacturing Corporation. The setup shown in Fig. 1 includes a swept-frequency X-band signal source, variable attenuators for calibration of isolation levels, a network analyzer for signal detection, and an X-Y recorder for data output. In

addition, a traveling wave tube amplifier was used to increase the input signal level, and a tunnel diode amplifier was used to provide predetection gain and improve the system noise figure. All waveguide and coax connections were carefully checked before measurement to insure against leakage which could affect test results.

The measurement involves reference calibration of the setup with the switch under test in the through position and 90 to 120 dB of attenuation in the signal line. The switch is then moved to the bypass position and the attenuators are set to zero attenuation, allowing full power to flow through the switch into a load. The signal now measured by the detector is leakage through the waveguide switch.

Test results have shown this series of waveguide switches to exhibit isolations of at least 100 dB with a maximum isolation of between 120 and 125 dB at some frequencies (Ref. 1). This test setup has proven to be extremely useful because of the wide dynamic range and continuous sweep-frequency coverage, which readily identifies any anomalies in isolation characteristics.

## Reference

1. Hartop, R. W. "X-Band Waveguide Switches," *Deep Space Network Progress Report*, Technical Report 32-1526, Vol. XV, pp. 48-50. Jet Propulsion Laboratory, Pasadena, Calif., June 15, 1973.

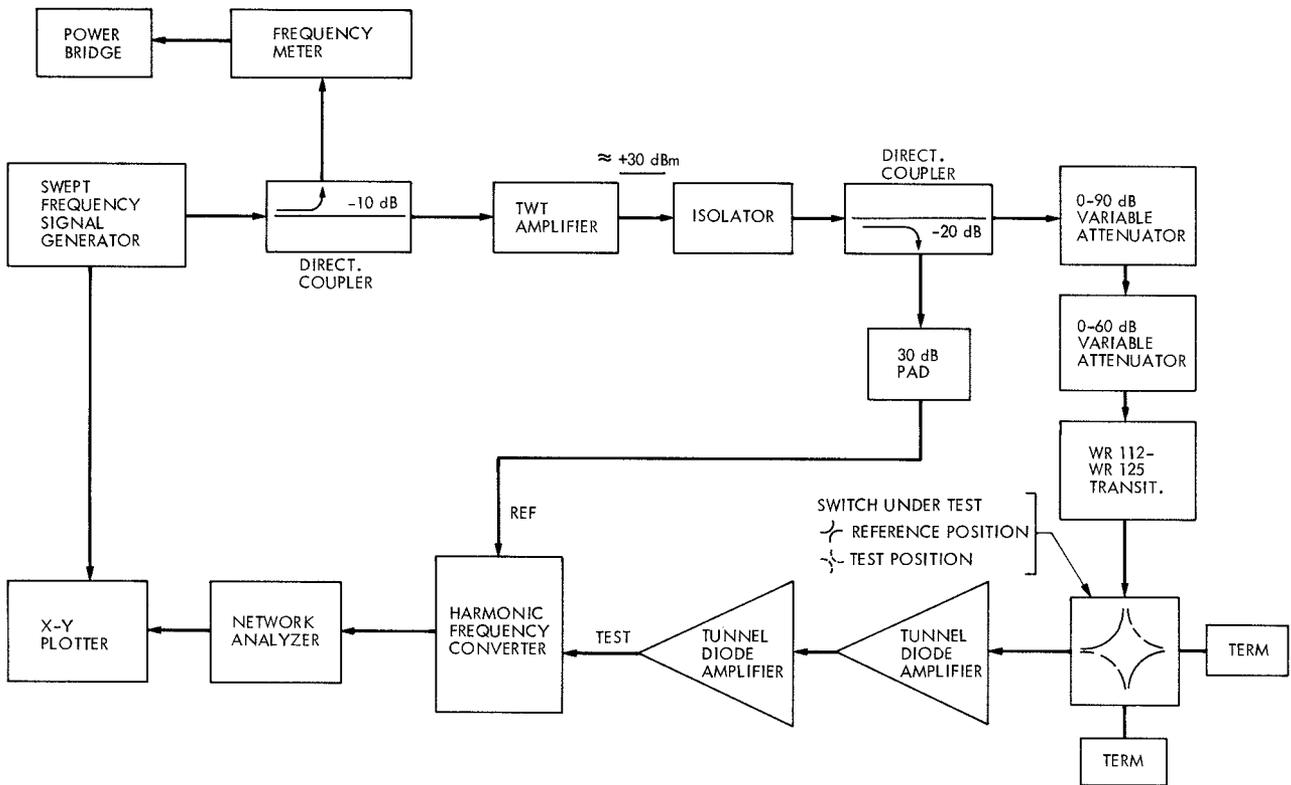


Fig. 1. Isolation test block diagram