GAIN BANDWIDTH PRODUCT TESTS TO CUT PRODUCTION COSTS

Economic solutions for production testing should reduce test time, equipment costs, documentation, and operator skill requirements. Gain-bandwidth product testing using white noise is a method that can produce all of these results.

The gain-bandwidth product of a device under test can be tested by measuring the output power of the device and knowing the input noise spectral density. Variations in either gain or bandwidth will result in a reading different than normal or a fault indication.

The required test is a power measurement using a power meter, and the needed skills are the capability of reading a meter or a go/no-go indication.

The concept of the test is to measure the gain-bandwidth product of the components. The gain-bandwidth product is related to the injected noise power density and the total output power as follows:

$$N_o \times GBW = P_{out}$$

Noise sources are built into each subsystem block as shown in Figure 1. The subsystem block can be either a printed circuit board assembly or RF or microwave component. The noise sources are selected for each subsystem block so that the output power of the last block remains constant when the blocks are cascaded. Inexpensive noise sources are available from Noise Com with a wide range of noise power densities, N_o.

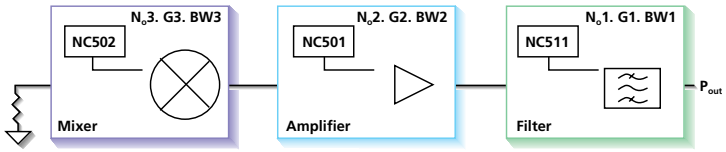

Figure 1. Gain bandwidth test concept block diagram.

$P_{out}1 = N_o1 \times G1 \times BW1$
$P_{out}2 = N_o2 \times G2 \times G1 \times BW$ *(cascaded of 1 and 2)*
$P_{out}3 = N_o3 \times G3 \times G2 \times G1 \times BW$ *(cascaded of 1, 2 and 3)*

It is therefore possible to select the noise power density so that fixed go/no-go limits can be used on the power meter display. This simplifies electrical tests so that anyone can perform them. Statistic quality controls can conveniently be made by defining a nominal output power (P_{out}) and variation allowance for each component.

Each component manufacturer can integrate the noise source into the component during the production process. This will result in only a very small additional cost for each component, and the noise source provides a means of production screening by the component manufacturer as well.

The noise sources give the final product added value, because it now includes simple, inexpensive, built-in testing and fault isolation testing to the component or subsystem level. This means easier service, reduced MTTR, inexpensive instrumentation for maintenance by the end-user, less complex maintenance guides and incoming inspection documentation, in addition to the savings in production testing.

By standardizing on a gain-bandwidth product test philosophy, intra-industry and intra-military commonality of system and component test stations could be increased. Automatic test equipment could measure gain, noise figure (sensitivity), and bandwidth by using the built-in noise sources. The only requirements to make these, as well as the gain-bandwidth product measurement, are knowledge of the noise power density, a calibrated filter before the power meter, and some simple computation.

Applicable Noise Com products include diodes, and noise sources housed in TO-8, dual-in-line and surface mount packages, as well as modules with connectors.

For more information on the NC2000 Series, see pages 26-27; on the NC500/500SM Series, see pages 28-29.