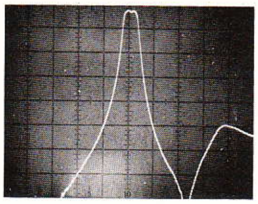
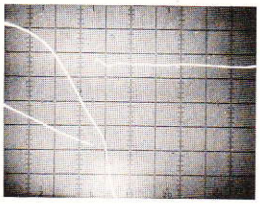


Bandpass Filter—This tunable bandpass filter has a skirt that disappears below the —80 dB line, clearly seen on the 8412A display.

60 dB points are measured at 35 and 63 MHz off the calibrated 10 MHz/div. graticule. The trace could be raised by another 20 dB, identifying the —100 dB point on the lower skirt.



Feedback Amplifier—Plotting the open-loop phase-gain margin of a feedback amplifier results in optimizing amplifier stability vs. gain.

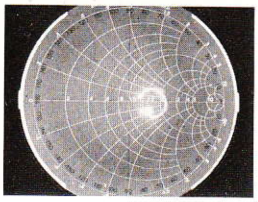
Adjustment while sweeping yields nearly instantaneous results. Shown is the open-loop feedback response of the amplifier. Amplitude is 2.5 dB/div., phase is 100°/div. Sweep is 1-50 MHz (5 MHz/div.).

## Reflection-Transmission Measurements

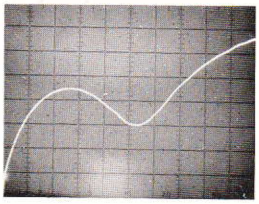
The 11652A Reflection-Transmission Kit does everything that the 11651A can and further adds the capability of swept return-loss (VSWR) and complex impedance (reflection coefficient) measurements. In addition to the power splitter and matched, low-leakage cables, the kit includes a directional bridge, two precision 50-ohm terminations, and a calibrating short.

The system is calibrated by placing the short on the LOAD port of the bridge, adjusting the display to a 0 dB, —180° reference. By replacing the short with the test device, return loss and phase are measured directly on the 8412A CRT display; complex impedance is measured directly on the 8414A Polar Display with a Smith Chart overlay.

In addition to the applications show, the Reflection-Transmission Kit is useful for matching networks, designing low VSWR devices, and measuring S-parameters on active components and circuits.



Antenna Complex Impedance—An FM antenna was swept over its usable range of 88 to 108 MHz, using the 8414A display with Smith Chart overlay. 300-ohm input Z is desired (the exact center of the display) but the antenna varies from inductive to capacitive over the sweep range. Values of complex impedance can be read directly off the Smith Chart.



Cable Return Loss—A length of cable is seldom a perfect 50-ohm transmission line. This one varies from return losses of 40 dB at 1 MHz to 25.5 dB at 110 MHz. Other passive and active devices can be measured just as quickly and accurately.

## Passive Probe Measurements 11654A

The 11654A Passive Probe Kit is the answer for probing circuits still in the breadboard stage or which are not characterized by 50 ohms impedance.

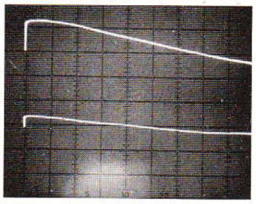
The kit includes two each of probe cables, current probe tips, six different voltage probe tips (1:1, 5:1, 10:1, 20:1, 50:1, and 100:1) and a wide variety of accessories for grounding and getting at those "difficult to measure" circuits.

Voltage and current transfer functions can be easily measured using two sets of voltage and current probes.

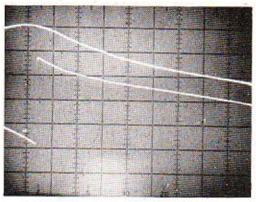
Calibration is accomplished by touching both voltage probes to a single point of RF voltage in the circuit or by placing the current probes around the same circuit lead at the point of interest.

A. (Transistor Current Gain—Current gain ($\beta$) may be measured using the current probes. This is a power transistor whose gain is 33 dB at 1 MHz (sweep is 1 to 10 MHz or 1 MHz per division). Amplitude is 10 dB/division, phase 100°/division, showing 16 dB gain at 10 MHz and a flat phase response (about 45° from 1 to 10 MHz). Center of graticule is 0 dB and 0° phase.)

B. (Amplifier Voltage Gain—This open-loop, video amplifier can be analyzed for gain, bandwidth, and phase shift while still in the breadboard stage. Gain is 50 dB at low frequencies, dropping down to about 27 dB at 50 MHz. Amplitude is 10 dB/division; phase 100°/division.



Transistor Current Gain—Current gain ($\beta$) may be measured using the current probes. This is a power transistor whose gain is 33 dB at 1 MHz (sweep is 1 to 10 MHz or 1 MHz per division). Amplitude is 10 dB/division, phase 100°/division, showing 16 dB gain at 10 MHz and a flat phase response (about 45° from 1 to 10 MHz). Center of graticule is 0 dB and 0° phase reference.



Amplifier Voltage Gain—This open-loop, video amplifier can be analyzed for gain, bandwidth, and distortion (phase shift) while still in the breadboard stage with the passive voltage probes. Gain is 50 dB at low frequencies, dropping down to about 27 dB at 50 MHz. Amplitude is 10 dB/division; phase 100°/division. Phase shift is quite linear above 20 MHz.