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NETWORK ANALYZERS

APPLICATION	TRANSDUCER UNIT	8413A PHASE—GAIN INDICATOR	8414A POLAR DISPLAY UNIT
TRANSMISSION TESTS ONLY Wide Dynamic Range Filters, attenuators, paramps, IC amplifiers, modulators, antennas Insertion Loss and Phase (Residual Conditions) Unbiased PIN modulator, coaxial pads, switches, cables, variable attenuators, pass band of filters Component Matching Pads, cables, antennas, amplifiers, phase shifters. Group Delay Filters, cables, system components .11-12.4 GHz.	Accessories including adapters, pads, air lines are recommended (11587A) 8740A Transmission Test Unit 60 dB Dynamic Window for viewing amplitude excursion of attenuation or gain. Correct power level relations between reference and test channels must be used according to type of response to be viewed. Power levels will not be the same for attenuation as for gain. Comparison against amplitude and phase offsets. Coaxial pads in reference and test channels reduce mismatch ambiguity in measurement of low amplitude values. Standard device in reference channel, unknowns in test channel. Actual deviation of test device from standard may be plotted directly. Physical length is compensated in reference channel. Corrections must be made with line stretcher to offset compensation.	8413A recommended for all transmission measurements. Accurate meter readout for CW measurements. IF offset attenuator allows greater resolution about any amplitude. Phase offset in 10° steps allows greater resolution about any phase shift. Swept frequency readout is provided thru analog outputs at 50 mV/dB and 10 mV/deg. Readout to within 1 dB and 6° is provided with amplitude and phase offsets. Resolution from meter is then to .05 dB and .1°. Generally used where low insertion measurements are made. CW tests can be made accurately with meter. Residual tracking between channels as a function of frequency can be eliminated by X-Y recording the system response at the desired offsets. Linearity of display on scope gives quick indication of constant group delay. By measuring phase for a given frequency change the group delay can be computed.	See 8413A for X-Y readout of transmission characteristics. Direct magnitude and phase readout of transmission coefficient of test device. Either CW or swept frequency display in polar coordinates. Markers allow frequency readout. The polar plot provides easy direct readout of both magnitude and phase for transmission coefficient. An X-Y recording allows resolution to within 1% of full scale. CW tests of amplitude and phase variation shown as a dot on CRT. Swept display on CRT does not eliminate tracking error. X-Y recording allows greater resolution but tracking must be subtracted. With ΔF sweep and phase read directly from polar display, group delay may be computed quickly. Linearity of phase with frequency is not readily detectable.
REFLECTION TESTS ONLY Reflection Coefficient 0.0-10.0 (VSWR 1.0-∞) Impedance Antennas, loads, system components, impedance matching, cavities, filters, circuit design and test, dynamic tuning on swept frequency basis.	Accessories including adapters, air lines, pads, shorts, are recommended. (11587A) 8741A Reflection Test Unit .1-2 GHz. 8742A Reflection Test Unit 2-12.4 GHz. Pads in reference and test channels reduce mismatch ambiguity and allow greater measurement range. High directivity reflectometer systems allow accurate measurement of reflection coefficient. Standard reflectometer systems allow broadband coverage.	CW and Swept measurement of return loss magnitude and phase referenced to a short circuit. Residual tracking may be eliminated using X-Y recorder. CW and swept return loss. Converting to enter Smith Chart with return loss and phase angle is time consuming. Use 8414A for direct Smith Chart plots.	8414A recommended for all reflection measurements. Readout of reflection coefficient directly in both magnitude and phase. CW or swept frequency measurements appear as a dot per frequency on scope face. IF attenuator allows expansion and compression of scope scale to provide direct readout. CW and swept frequency display with transparent Smith Chart overlay for direct normalized impedance readout. Overlays are available for compressed, normal, and expanded Smith Chart.
TRANSMISSION AND REFLECTION TESTS Full Two-Port Characterization .11-2.0 GHz. Component Tests Amplifiers, unilateral and bilateral devices, filters, attenuators, phase shifters. Transistor Tests Any transistor, FET, etc. with the TO-5, TO-12, TO-18, or TO-72 package, with either B-E-C configuration or E-B-C configuration. Diodes for input impedance under various bias conditions. Single Port Characterization 2.0-12.4 GHz Component Testing Amplifiers, pads, attenuators, phase shifters, cables, joints. Waveguide —X-Band, P-Band, or others on request. Reflection or transmission depending on point of connection in system.	Accessories including adapters, pads, shorts are recommended (11587A). 8745A S-Parameter Test Set Push button selection of S11, S21, S12, S22. Use 8745A with 11604A Universal Extension calibrated at plane of connection to allow correct input and output measurements. Use: 11600A transistor fixture and 11601A Calibration Kit for TO-5 and TO-12 type transistors. 11602A transistor fixture and 11603A Calibration Kit for TO-18 and TO-72 type transistors. 8743A Transmission/Reflection Test Unit Pushbutton Selection of S11, S21, or S12, S22, depending on device orientation and connection. The 11605A Flexible arm (consists of coax swivel joints and rigid air line) allows rigid connection to any geometrical configuration. 8747A Waveguide Transmission/Reflection Test System. Symmetrical bridge system using HP 752 directional couplers and a special power splitter. See Application Note 92.	Scope, X-Y recorder, or meter readout of selected parameters. CW with meter readout or swept with scope readout to show full response of device particularly for transmission characteristics—S21 and S12. The input and output reflection parameters S11, S22 can be displayed as return loss. Read amplitude and phase response of transistors in dB and degrees directly from meter for CW or from oscilloscope for swept frequency. Allows rapid characterization under a variety of bias conditions.	Polar readout of parameters of each port of a device. CW and swept Smith Chart readout of all S-Parameters. Direct impedance readout of S11 and S22 with Smith Chart overlays. Transmission coefficients S21 and S12 may be read directly from linear scale at phase shift indicated. Read amplitude and phase response of transistors directly from polar plot for either CW or swept measurements. Test channel gain control allows gain and isolation as well as input and output impedance to be displayed.