

1-24. Recommended Test Equipment

Table 1-3 lists the test equipment recommended for use in testing, adjusting and servicing the Vector Modulation Analyzer. The "Critical Specifications" column describes the essential requirements for each piece of test equipment. Other equipment can be substituted if it meets or exceeds these critical specifications.

The Recommended Model column may suggest more than one model. The first model shown is usually the least expensive, single-purpose model. Alternate models are suggested for additional features that would make them a better choice in some applications.

Table 1-1. Specifications

Electrical Characteristics	Performance Limits	Conditions
MODULATED IF INPUT		
Input Carrier Frequency Range Input Level Range	50 MHz to 200 MHz -5 dBm to -20 dBm	
COHERENT REFERENCE INPUT		
Input Frequency Range Input Level Range	50 MHz to 200 MHz +10 dBm to -20 dBm	
DEMODULATED I AND Q		
Baseband Bandwidth with External Filters (3 dB)	>100 MHz	
Corrected Vector DC Accuracy (I, Q)	$<\pm 2.5\%$ of full scale IF input	From 50 to 200 MHz; measured at 70 MHz; typical elsewhere
I versus Q Timing Accuracy	± 1.25 ns ± 1.5 ns or 1% of full scale, whichever is greater	Delay I=0, Delay Q=0, Delay I&Q=0, Internal Filters Delay I \neq Delay Q, Delay I&Q=0, Internal Filters
I AND Q CHANNEL INPUTS		
Maximum Input —DC coupled —AC coupled	5V peak ± 25 V dc; ± 5 V peak ac	
DC Vector Accuracy ¹	$\pm 1.25\%$ of full scale (or 2 mV if greater) $\pm 1.25\%$ of offset $\pm 1\%$ of full scale (or 2 mV if greater) $\pm 1\%$ of offset	3227A and above instruments 3130A and below instruments

¹ Measurements made with internal A/D converter.

Table 1-1. Specifications (continued)

Electrical Characteristics	Performance Limits	Conditions
I AND Q CHANNEL INPUTS (Cont'd)		
I versus Q Differential Voltage Accuracy ¹	±1%	Measured at 100 mV full scale deflection; typical at all ranges
Bandwidth (−3 dB)		
—DC coupled	DC to 350 MHz	
—AC coupled	Approximately 1 kHz to 350 MHz	
Input Sensitivity	5.0 mV/div to 1.0V/div	
I or Q Offset Range	±10 divisions	
TIMING²		
Time per Division Range	500 ps/div to 2 μ/div	
Delay I&Q Range	0 to 100 divisions, 20 μ maximum	
I Delay, Q Delay Range	0 to 5 divisions, 20 μ maximum	
Delta Time Accuracy	±3%	Delta times greater than 6 ns or 2 divisions, whichever is larger; start times greater than 20 ns or 1 division, whichever is larger; both start and stop time on screen
I versus Q Timing Accuracy	±500 ps	Delay I=0, Delay Q=0, Delay I&Q=0
	±700 ps or 1% of full-scale, whichever is greater	Delay I=0, Delay Q=0, Delay I&Q=0
TRIGGERING		
Maximum External Trigger Input	±5 V peak dc + ac, 5 V p-p ac	
Minimum Signal		
—Internal	2 divisions p-p 3 divisions p-p	DC to 80 MHz 80 MHz to 150 MHz
—External	100 mV p-p into 50Ω 200 mV p-p into 50Ω	DC to 80 MHz 80 MHz to 150 MHz

1 Measurements made with internal A/D converter.

2 Specified for delay <100 divisions.

Table 1-1. Specifications (continued)

Electrical Characteristics	Performance Limits	Conditions
GENERAL		
Operating Temperature Range	0°C to 55°C	
Power Requirements		
—Line Voltage	100, 120, 220, 230, or 240 Vac, +10% to -10%	
—Line Frequency	48 to 66 Hz, single phase	
Power Dissipation	<330 VA	
EMI	MIL-STD-461B	Conducted and radiated interference is within the requirements of CE03, CS01, CS02, RE02, RS01, and RS03 of MIL-STD-461B. Also within the requirements of EN55011 and CISPR Publication 11, 1990.
Net weight	20.4 kg (45 lbs.)	
Dimensions ¹ : Full Envelope Height × Width × Depth	146 H × 426 W × 620 mm D (5.75 H × 16.75 W × 24.40 inches D)	

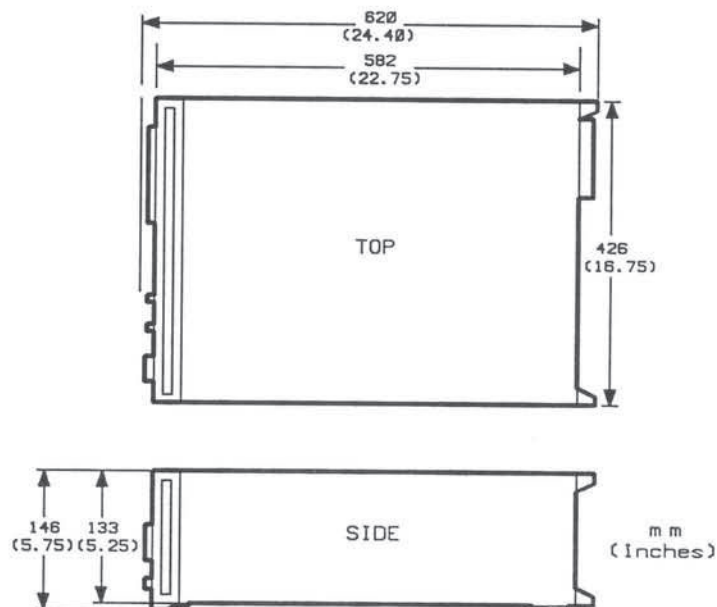


Figure 1-2. Cabinet Dimensions

¹ For ordering System II cabinet accessories, the module sizes are 5-1/4 H, 1 MW and 23 D.

Table 1-2. Supplemental Characteristics

<i>Supplemental characteristics are intended to provide information useful in applying the instrument by giving typical, but non-warranted performance parameters.</i>	
MODULATED IF INPUT	<p>Input Impedance: 50Ω nominal (75Ω with interchangeable adapter)</p> <p>VSWR (50Ω input): <1.4:1</p> <p>Minimum Input Frequency: 20 MHz</p> <p>AM to AM Conversion (–5 dBm input power): <0.1 dB/dB</p> <p>AM to PM Conversion (–5 dBm input power): <0.5°/dB</p> <p>Signal to Noise Ratio with Internal Filters: >40 dB</p>
COHERENT REFERENCE INPUT	<p>Input Impedance: 50Ω nominal</p> <p>VSWR (50Ω input): <2:1</p> <p>Reference Phase versus Level Sensitivity:</p> <p>70 MHz Coherent Reference Input: <1°/dB</p> <p>140 MHz Coherent Reference Input: <1.6°/dB</p>
DEMODULATED I AND Q	<p>Absolute Level Accuracy: <1.2 dB</p> <p>Baseband Bandwidth with Internal Filters (3 dB): 35 MHz</p> <p>Uncorrected Vector DC Accuracy: <$\pm 3\%$ of full scale IF input</p> <p>Uncorrected Quadrature Error: <$\pm 1^\circ$</p> <p>Uncorrected Residual DC Offsets: <$\pm 4\%$ of full scale IF input</p> <p>Uncorrected I/Q Gain Imbalance (DC to 10 kHz): <± 0.25 dB</p> <p>I and Q Amplitude Flatness Matching (DC to 20 MHz with internal filters): <± 0.3 dB</p> <p>I and Q Amplitude Flatness Matching (DC to 20 MHz with internal filters): < 0.2 dB</p> <p>Corrected Quadrature Error: <$\pm 0.5^\circ$</p> <p>Corrected Residual DC Offsets: <$\pm 1\%$ of full scale IF input</p> <p>Corrected I/Q Gain Imbalance (DC to 10 kHz): <± 0.1 dB</p>

Table 1-2. Supplemental Characteristics (continued)

<i>Supplemental characteristics are intended to provide information useful in applying the instrument by giving typical, but non-warranted performance parameters.</i>	
DEMODULATED I AND Q (cont'd)	<p>Crosstalk Between I and Q</p> <p>70 MHz Carrier; 40 MHz IF Bandwidth: <0.6%</p> <p>140 MHz Carrier; 80 MHz IF Bandwidth: <0.6%</p> <p>Corrected Phase Accuracy: <1.6°</p> <p>Corrected Magnitude Accuracy: <±0.24 dB</p>
EXTERNAL FILTER I AND Q PORTS	<p>VSWR (DC to 40 MHz): <1.3:1</p> <p>Impedance: 50Ω nominal</p> <p>Signal Level for -20 dBm Inputs: >50 mV p-p</p> <p>Quadrature Error: <±8°</p> <p>Residual DC Offsets (at -20 dBm IF input): <20% of full scale IF input</p> <p>I/Q Gain Imbalance (DC to 10 kHz): <±0.5 dB</p> <p>I and Q Amplitude Flatness (DC to 40 MHz): <±0.3 dB</p> <p>I and Q Amplitude Flatness Matching (DC to 40 MHz): <0.2 dB</p>
SPURIOUS SIGNALS	<p>Harmonics of Baseband Tones DC to 10 kHz (<-5 dBm IF input power): <-40 dBc</p>
Internal Filters	<p>Isolation from Modulated IF Input to I/Q; DC to 50 MHz: >24 dB</p> <p>Isolation from Modulated IF Input to I/Q; >50 MHz: >60 dB</p> <p>Isolation from Coherent Reference Input to I/Q at -20 dBm IF Input: >40 dB</p>
External Filters	<p>Isolation from Modulated IF Input to External Filter I/Q Outputs: >24 dB</p> <p>Isolation from Coherent Reference Input to External Filter I/Q Outputs at -20 dBm IF Input: >10 dB</p> <p>Isolation from External Filter Output to External Filter Input: >45 dB</p>

Table 1-2. Supplemental Characteristics (continued)

<i>Supplemental characteristics are intended to provide information useful in applying the instrument by giving typical, but non-warranted performance parameters.</i>	
I & Q CHANNEL INPUTS	Input Impedance: 50 Ω nominal; 75 Ω nominal with interchangeable adapters (adapters provide a series 25 Ω resistance)
DC Display & Marker Accuracy	Deflection Factor Accuracy: $\pm 2\%$ Display Offset Accuracy: $\pm 2\%$ of full scale (or 2 mV if greater) for a zero volt signal with offsets=0 I or Q Vector Accuracy Using the I or Q Marker: $\pm 3\%$ of full scale (or 2 mV if greater) $\pm 1\%$ of offset I versus Q Differential Voltage Accuracy Using the I and Q Markers: $\pm 2\%$ of full scale
Dynamic Performance	Transition Time: 1.0 ns typical (10% to 90%), for an 80% of full scale step measured at 10 mV/div; typical for all ranges I-Q Crosstalk: -60 dB or 1% of full scale peak, whichever is greater, from dc to 350 MHz.
TIMING	Time/Division Accuracy: $\pm 3\%$ Delay Reference Accuracy (Delay I&Q=0): Internal Trigger Only—Less than 5 ns or 2% of full scale, whichever is greater Delay Accuracy: $\pm 3\% +$ Delay Reference Accuracy Time Base Jitter: 2% of full scale RMS for delays <200 divisions I versus Q Timing Accuracy: ± 500 ps; typical for Delay I = Delay Q, and Delay I&Q ≤ 100 divisions ± 1 ns or 2.5% of full scale, whichever is greater; typical for Delay I \neq Delay Q, and Delay I&Q ≤ 100 divisions
TRIGGERING	Minimum Signal (pulse width >3 ns): Internal—20% of full scale p-p External—200 mV p-p External Trigger ECL Termination: 50 Ω^1 to -2V External Trigger Ground Termination: 50 Ω^1 to ground External Trigger ECL Level: Triggers on ECL threshold External Trigger TTL Level: Triggers on TTL threshold

¹ 75 ohms with interchangeable adapters.

Table 1-2. Supplemental Characteristics (continued)

<i>Supplemental characteristics are intended to provide information useful in applying the instrument by giving typical, but non-warranted performance parameters.</i>	
TRIGGERING (cont'd)	<p>External Trigger VAR Level: Adjustable trigger threshold</p> <p>External Trigger AUTO Level: Continuously adjusted to half way between high and low input levels for frequencies >1 kHz</p> <p>Internal Variable Trigger Range: Anywhere on display</p> <p>Internal Variable Trigger Resolution: 2% of full scale</p> <p>Internal Variable Trigger Accuracy: $\pm 5\%$ of full scale</p> <p>External Variable Trigger Range: $\pm 5V$</p> <p>External Variable Trigger Resolution: 40 mV</p> <p>External Variable Trigger Accuracy: ± 100 mV</p>
GATE	<p>Gate Operation: When high, display is blanked asynchronously with trigger rate. Measurements are disabled when display is blanked.</p> <p>Minimum Gate Pulse Width (ON or OFF): 100 ns</p> <p>Gate Timing: 0 to 5 ns prior to display time instant</p> <p>Gate Input Termination and Trigger Levels: GND termination with TTL trigger level, $-2V$ termination with ECL trigger level, or GND termination with 0V trigger level</p>
DIGITIZING	<p>Resolution: 12 bits</p> <p>Digitizing Rate: 3 kHz maximum</p> <p>Measurement Noise: 4 counts RMS</p>