

# Specification

This section lists the electrical, physical, and environmental characteristics of the spectrum analyzer, specifies the performance requirements for those characteristics, and provides supplementary information.

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## Electrical Characteristics

Unless otherwise stated, the following tables of electrical characteristics and features apply to the spectrum analyzer after a 15 minute warm-up period (within the environmental limits) and after all normalization procedures have been carried out.

Information in the Performance Requirement column of Tables 2-2 through 2-8 is guaranteed and verifiable. Supplemental Information is intended to further explain a characteristic, its performance requirement, or to describe characteristic performance that is impractical to verify. Supplemental information is not guaranteed and may not be supported by a performance check procedure.

Changes to a characteristic because of the addition of an option are included in Table 2-7.

**Table 2-1: CATV Characteristics**

Characteristic	Description
Input Configuration	75 $\Omega$ Female F connector
Channel Selection	The visual and aural carriers are displayed when the channel number is entered or [ $\blacktriangle$ ] and [ $\blacktriangleright$ ] next to [CHAN/FREQ] are pressed
Tune Configuration	STD (73.603), HRC (73.605), IRC (73.612), and Custom <sup>1</sup>
Channel Range	0 to 999 <sup>1</sup>
Frequency Range	1 MHz to 1.8 GHz <sup>2</sup> , Preamp limited to 600 MHz

**1** Configured using 2714 Cable TV System Test Software.

**2** Dependent on selected channel table.

Table 2-1: CATV Characteristics (Cont.)

Characteristic	Description
Visual Carrier Frequency Measurement	Accuracy is dependent on the accuracy of the spectrum analyzer — see Frequency Accuracy in Table 2-2.
Method	Internal Counter
Resolution	1 Hz
Accuracy	$5 \times 10^{-7} \times \text{Carrier Frequency} \pm 10 \text{ Hz}, \pm 1$ Least Significant Digit @ 55.25 MHz (Ch 2) worst case is $\pm 38 \text{ Hz}$ @ 325.25 MHz (Ch 41) worst case is $\pm 173 \text{ Hz}$ @ 643.25 MHz (Ch 94) worst case is $\pm 332 \text{ Hz}$
Visual-to-Aural Carrier Frequency Measurement	Aural carrier measured relative to the visual carrier
Method	Internal Counter
Difference Range	1 MHz to 10 MHz <sup>2</sup> for an amplitude difference of $\leq 30 \text{ dB}$ and aural C/N $\geq 15 \text{ dB}$ (300 kHz RBW)
Resolution	1 Hz
Accuracy	$\pm 15 \text{ Hz}$ for visual-to-aural carrier difference $\leq 8 \text{ MHz}$
Visual Carrier Peak Level Measurement	Absolute peak amplitude of visual carrier measured with PREAMP OFF
Amplitude Range	$-18 \text{ dBmV}$ to $+58.8^3 \text{ dBmV}$ for visual C/N $\geq 30 \text{ dB}$ (300 kHz RBW)
Frequency Range	15 to 1015 MHz
Resolution	0.1 dB
Absolute Accuracy	$\pm 2.5 \text{ dB}$ for visual C/N $\geq 30 \text{ dB}$ (300 kHz RBW) and for FM signal C/N $\geq 33 \text{ dB}$ (100 kHz RBW) assumes flatness corrections are present
Relative Accuracy	$\pm 0.5 \text{ dB}$ Relative to adjacent channel $\pm 1.2 \text{ dB}$ Relative to all other channels

<sup>2</sup> Dependent on selected channel table.

<sup>3</sup> Total input power (all signals included) cannot exceed +70 dBmV.

Table 2-1: CATV Characteristics (Cont.)

Characteristic	Description
Visual-to-Aural Carrier Level Difference Measurement	Aural carrier level measured relative to the visual carrier
Difference Range	0 to 30 dB for aural C/N $\geq$ 15 dB (300 kHz RBW)
Resolution	0.1 dB
Accuracy	$\pm$ 0.75 dB for aural C/N $\geq$ 15 dB (300 kHz RBW)
Modulation Depth Measurement (Typical)	Percent AM measured from sync tip to lowest white level found in 10 sweeps (the VITS line is used if it is defined in the channel table)
AM Range	50% to 95%
Resolution	0.1%
Accuracy	$\pm$ 2% for visual C/N $\geq$ 40 dB (300 kHz RBW)
HUM/LFD Measurement (Typical)	Power line frequency is measured on an unmodulated visual carrier, and low frequency disturbance (LFD) is measured on the modulated carrier
AM Range	1% to 10% peak-to-peak
Resolution	0.1%
Accuracy	$\pm$ 1% for Hum $\leq$ 5% and visual C/N $\geq$ 25 dB (300 kHz RBW) $\pm$ 2% for Hum < 10% and visual C/N $\geq$ 25 dB (300 kHz RBW)
Carrier to Noise Measurement (Typical)	Default noise floor is a normalized 4 MHz bandwidth measured relative to the visual carrier peak
Optimum Input Range	See Figures 2-1 and 2-2 at the end of this section
Maximum Range	See Figures 2-1 and 2-2 at the end of this section
Resolution	0.3 dB
Accuracy	See Figures 2-1 and 2-2 at the end of this section

**Table 2-1: CATV Characteristics (Cont.)**

<b>Characteristic</b>	<b>Description</b>
CTB/CSO Measurement (Typical)	Composite triple beat (CTB) and composite second order (CSO) are measured relative to the visual carrier peak according to the NCTA recommended spectrum analyzer settings — SINGLE-SWEEP mode does not use all the NCTA recommended settings
Optimum Input Range	See Figures 2-3 and 2-4 at the end of this section
Maximum Range	See Figures 2-3 and 2-4 at the end of this section
Resolution	0.3 dB
Accuracy	See Figures 2-3 and 2-4 at the end of this section
Frequency Response Measurement (Typical)	For fixed-amplitude scrambling or no scrambling, system amplitude variations (flatness) are measured relative to a reference trace (stored during the frequency response reference setup)
Reference Trace Storage (Non-Volatile)	Up to 10 traces with spectrum analyzer states
Range	5 dB/div, fixed
Resolution	0.2 dB
Trace Flatness Accuracy	±0.75 dB
Carrier Survey	Absolute peak amplitude of each visual carrier measured and each associated aural carrier level measured relative to the measured visual carrier for the selected channels — characteristics are identical to the frequency (visual and aural) and level measurements (frequency is counted only if the FAST SURVEY is disabled (off))
FAST SURVEY Off	Visual carrier frequency measurement Visual to aural carrier frequency measurement Visual carrier peak level measurement Visual to aural carrier level difference measurement

Table 2-1: CATV Characteristics (Cont.)

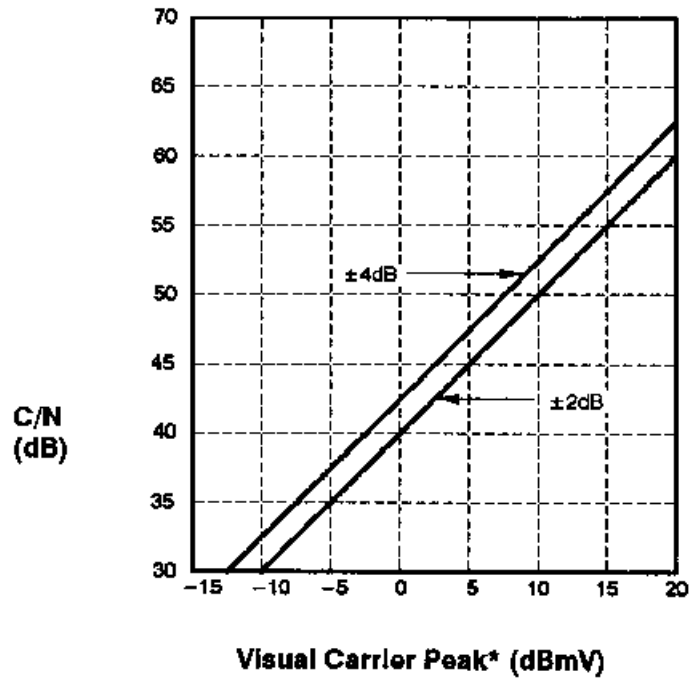
Characteristic	Description
FAST SURVEY On	
Visual Carrier	
Amplitude Range	-18 dBmV to +58.8 dBmV for C/N $\leq$ 30 dB (300 kHz RBW) <sup>4</sup>
Frequency Range	15 MHz to 1015 MHz
Resolution	0.3 dB
Absolute Accuracy	$\pm$ 2.7 dB for C/N $\geq$ 30 dB (300 kHz RBW) and for FM signal C/N $\geq$ 33 dB (100 kHz RBW) assumes flatness corrections are present
Relative Accuracy	$\pm$ 0.8 dB relative to adjacent channel $\pm$ 1.5 dB relative to all other channels
Aural Carrier	
Difference Range	0 to 30 dB for C/N $\geq$ 15 dB (300 kHz RBW)
Resolution	0.3 dB
Accuracy	$\pm$ 1.1 dB for C/N $\geq$ 15 dB (300 kHz RBW)
Aural <FM> Deviation (Typical)	Peak FM deviation measured for the selected channel
Range	10 kHz to 50 kHz, usable to 80 kHz
Accuracy	$\pm$ 4 kHz
Cross Modulation (Typical)	Peak of the fundamental component of the third order distortion at horizontal sync frequency (AM) measured on unmodulated visual carrier — add 3.9 dB for correction to the NCTA recommended synchronous square-wave modulation procedure
Range	52 dB, usable to 65 dB
Resolution	0.1 dB
Accuracy	$\pm$ 2 dB for cross modulation < 40 dB $\pm$ 3 dB for cross modulation < 52 dB

**4 Total input power (all signals included) cannot exceed +70 dBmV.**

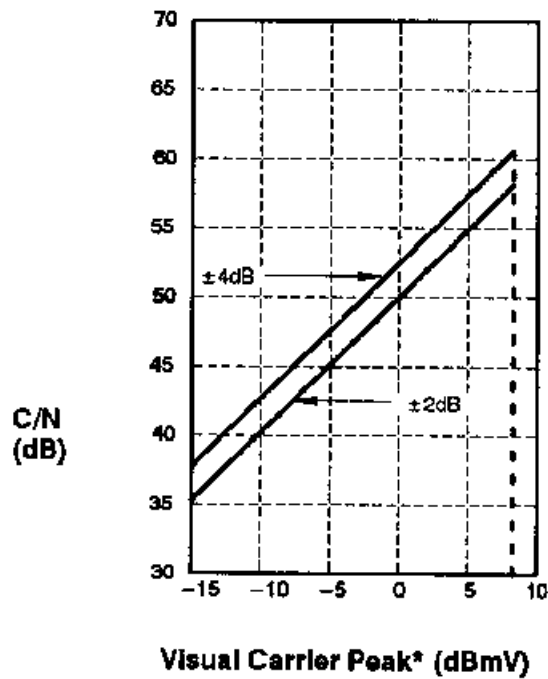
Table 2-1: CATV Characteristics (Cont.)

Characteristic	Description
Listen (Typical)	The aural carrier for the selected channel is demodulated
Output	Speaker or headphones with volume control
Demodulation Type	FM
Sweep	Displays instantaneous peak FM deviation
View Picture (Typical)	The visual carrier, NTSC or PAL format depending on the selected channel, is demodulated
View Modulation (Field) (Typical)	One video field of the selected channel video is displayed
View Modulation (Line) (Typical)	The VITS line is displayed — if no VITS line is specified in the channel table, line 17 is displayed
TV Line Selection	Selectable using the FREQ/MKRS knob during View Line Modulation function
Line Format	NTSC or PAL
Line Range	1 to 525 (NTSC), 1 to 625 (PAL)
Sweep Time	10 $\mu$ s/division
In-channel Response	
Range	$\pm 3$ dB (the auto test is run in 1 dB/div)
Resolution	0.1 dB
Accuracy	$\pm 0.5$ dB, Auto mode $\pm 0.8$ dB, Interactive mode

**CARRIER-TO-NOISE ACCURACY WITHOUT A PRESELECTOR PREAMP OFF**



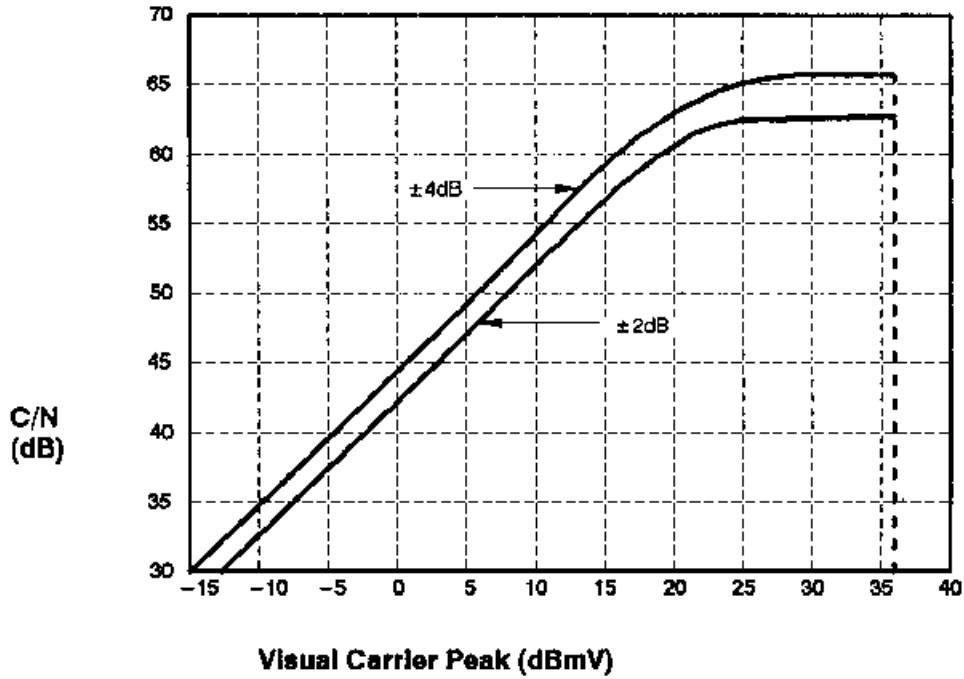
**CARRIER-TO-NOISE ACCURACY WITHOUT A PRESELECTOR PREAMP ON**



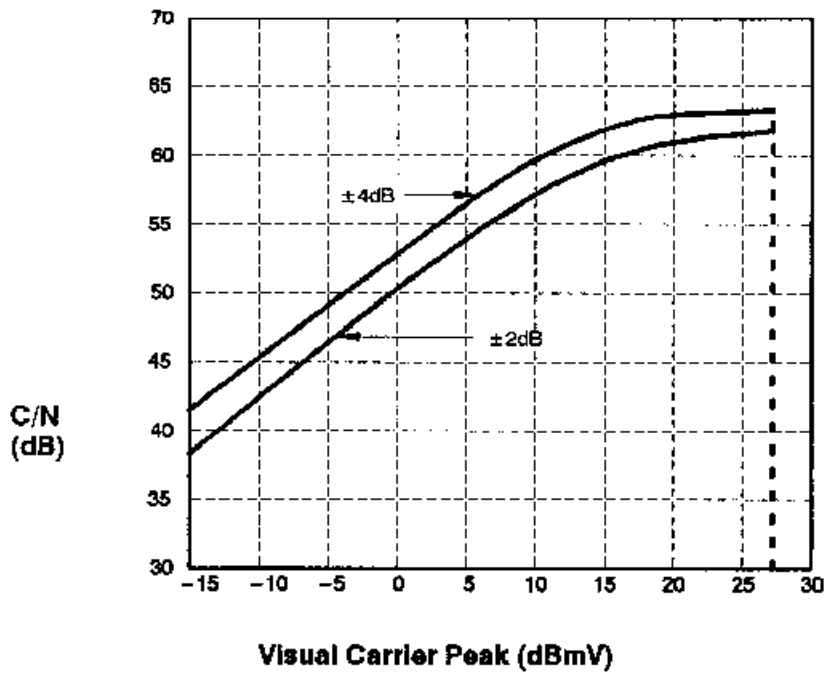
\* per channel, assuming 60 channel system.

**Figure 2-1: Carrier-to-noise Accuracy Without a Preselector**

**CARRIER-TO-NOISE ACCURACY USING A PRESELECTOR PREAMP OFF**



**CARRIER-TO-NOISE ACCURACY USING A PRESELECTOR PREAMP ON**



**Figure 2-2: Carrier-to-noise Accuracy Using a Preselector**



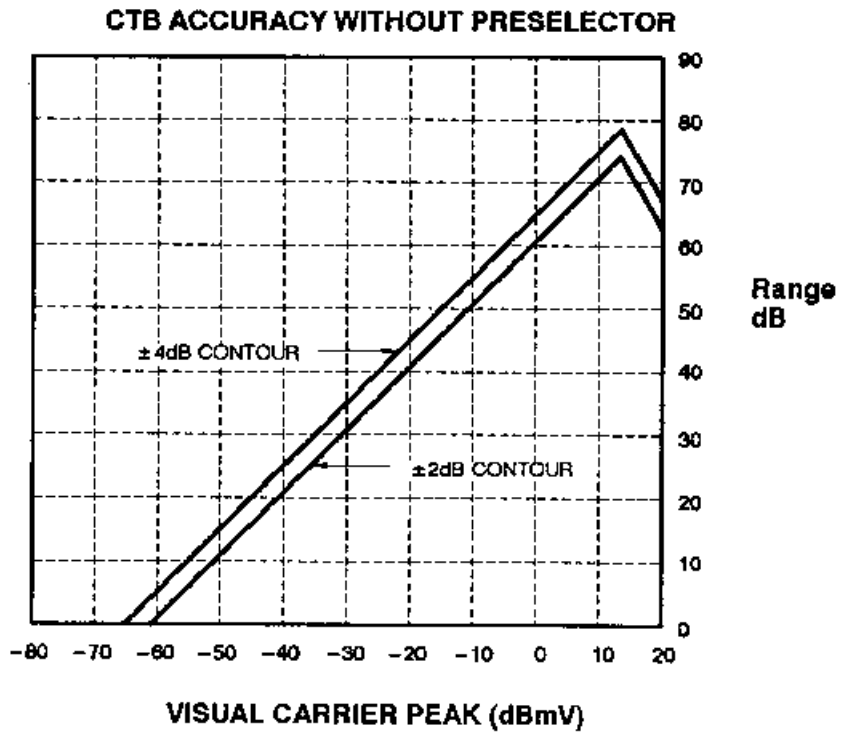
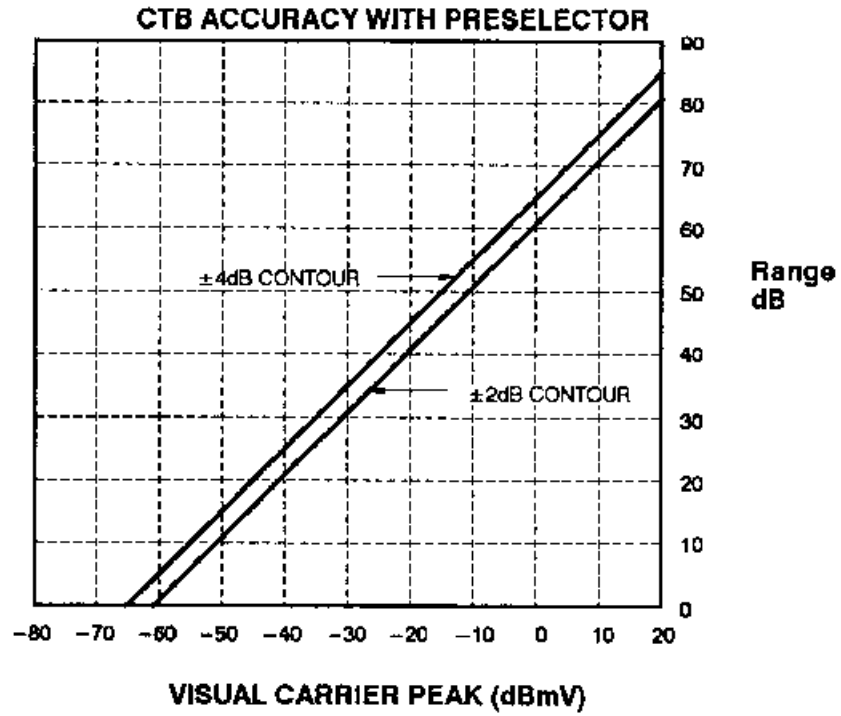


Figure 2-3: CTB Accuracy

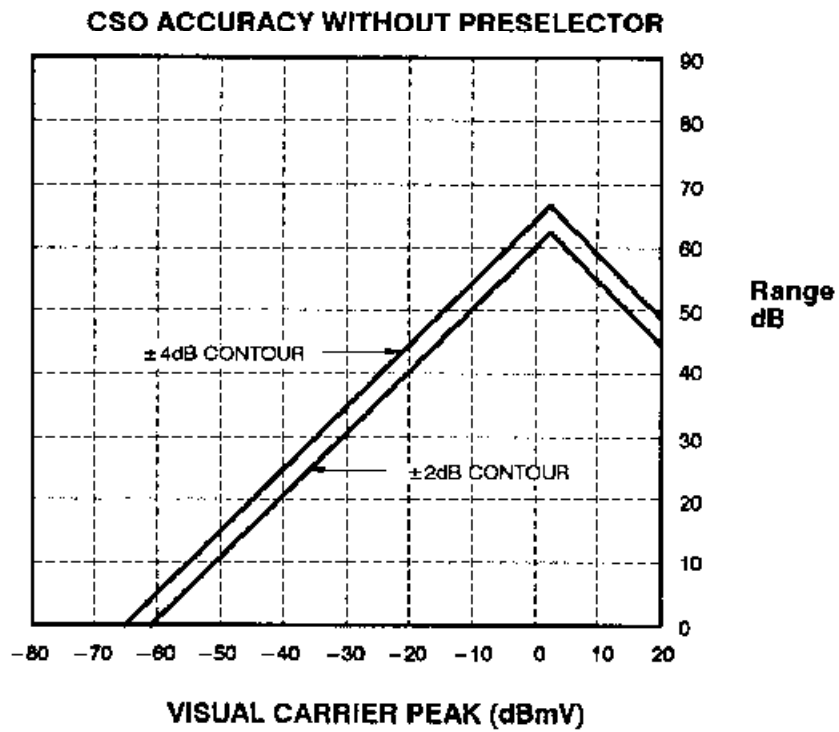
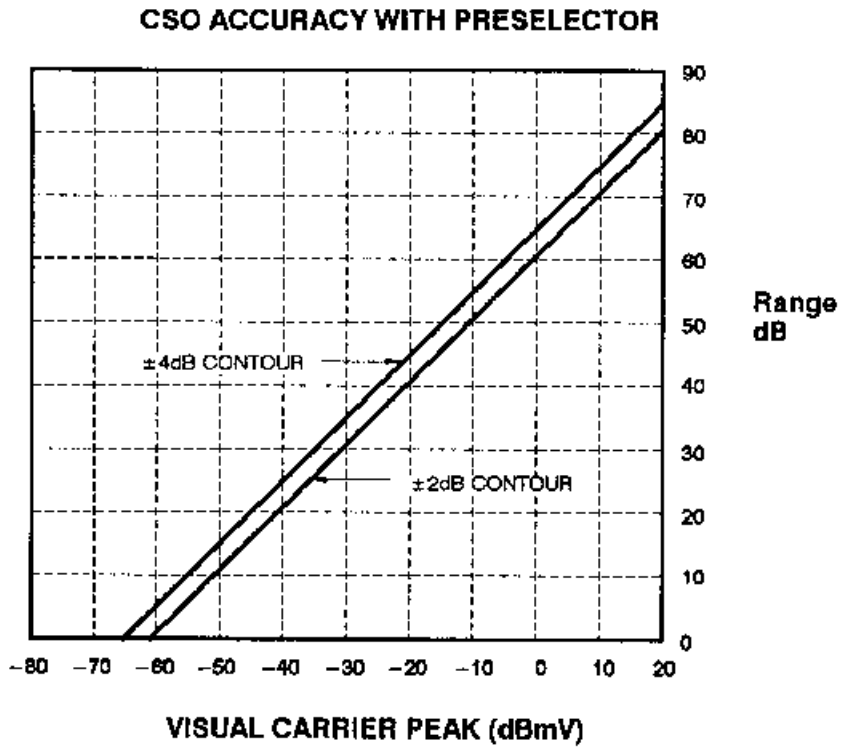


Figure 2-4: CSO Accuracy

Table 2-2: Frequency Related Characteristics

Characteristic	Performance Requirement	Supplemental Information
Channel		Tuned with keypad, [CHAN/FREQ] [▲] and [CHAN/FREQ] [▼] according to the selected channel table
Frequency		
Range	9 kHz to 1.8 GHz	Tuned with keypad, [CHAN/FREQ] [▲] and [CHAN/FREQ] [▼] FREQ/ MARKERS knob, UTIL menu, or MKR/FREQ menu
Accuracy	$5 \times 10^{-7}$ of center frequency $\pm 10$ Hz $\pm 1$ least significant digit	Assume zero drift since last normalization procedure
Drift		
Long Term (One Year)		$\pm 2$ PPM/Year
Short Term (SPAN/DIV $\leq 20$ kHz)	$\leq 400$ Hz	With frequency corrections enabled
Readout Resolution		1 kHz or 1 Hz (counter readout), menu selectable

Table 2-2: Frequency Related Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Frequency Span/Div		
Range		Selections in a 1–2–5 sequence from 100 MHz/div to 1 kHz/div with [SPAN/DIV] [▲] and [SPAN/DIV] [▼] buttons or any value from 100 MHz/div to 1 kHz/div with the keypad or UTIL menu, plus 180 MHz/div in MAX SPAN and 0 Hz/div in ZERO SPAN
Accuracy/Linearity	Within 3%	Measured over the center 8 divisions
Flatness (About the midpoint between two extremes)	±2 dB	Measured with 10 dB of RF Attenuation Flatness is affected by <ul style="list-style-type: none"> <li>■ Input voltage standing-wave ratio (VSWR)</li> <li>■ Gain variation</li> <li>■ Mixer conversion</li> </ul>
Residual FM		
With SPAN/DIV ≤ 20 kHz	≤ 100 Hz peak-to-peak total excursion in 20 ms	Short term, after 1 hr warm-up, and with PHASELOCK in AUTO mode
With SPAN/DIV > 20 kHz	≤ 2 kHz peak-to-peak total excursion in 20 ms	

Table 2-2: Frequency Related Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Resolution Bandwidth (6 dB down)		Resolution bandwidth selections are 5 MHz, 1 MHz, 300 kHz, 100 kHz, 30 kHz, 10 kHz, 3 kHz, 1 kHz, and 300 Hz for the spectrum analyzer
Shape Factor (60 dB/6 dB)	7:1 or less for all resolution bandwidths $\leq 1$ MHz	
Noise Sidebands	$\leq -70$ dBc at 30X Resolution Bandwidth for all resolution bandwidths $\leq 100$ kHz	
Video Filter		Reduces video bandwidth to approximately 1/100 <sup>th</sup> of the selected resolution bandwidth; or one of twelve video filters (3 Hz, 10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 300 kHz, or WIDE) can be selected from the UTIL menu

**Table 2-3: Frequency/Amplitude Related Characteristics**

<b>Characteristic</b>	<b>Performance Requirement</b>	<b>Supplemental Information</b>
Marker		The frequency and amplitude values of the marker position are displayed and are preceded by the letter <b>M</b>  <b>[MKR] [↗]</b> and <b>[MKR] [↘]</b> position the marker to the next right or left signal peak, respectively
Accuracy		
Frequency		Same as Span/div
Amplitude		A function of the reference level, vertical scale factor, and normalizations (see Display Dynamic Range)
Delta Marker	When activated, a second marker is displayed at the same frequency as the first marker, this is the "Reference Marker"	The <b>FREQ/MARKERS</b> control may be used to position the first marker; the frequency and amplitude differences between markers are readouts preceded by the letter <b>D</b>
Accuracy		
Frequency	1 PPM $\pm$ 10 Hz of the higher marker frequency	With both signals counted
Amplitude		Same as Marker

Table 2-3: Frequency/Amplitude Related Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Center Measure		<p>When activated, the signal nearest center screen (or nearest marker if marker is on) and above a preset threshold level, is moved to center screen</p> <p>The frequency and amplitude values are preceded by the letter C</p>
Readout Resolution	1 kHz or 1 Hz	Readout resolution is selectable
Signal Tracking		<p>When activated, the centered signal is held at center screen</p> <p>Signal tracking requires a signal strength greater than the threshold level</p> <p>If the strength of a signal being tracked decreases below the threshold level, the instrument displays the message NO SIGNAL FOUND ABOVE THRESHOLD</p>

Table 2-4: Amplitude Related Characteristics

Characteristic	Performance Requirement	Supplemental Information
Vertical Display Mode		10 dB/div, 5 dB/div, 1 dB/div, and Linear
Reference Level		
Range		Top of graticule
Log Mode		-21.2 dBmV to +68.8 dBmV (-41.2 dBmV to +48.8 dBmV with the PREAMP enabled)
Linear Mode		10.83 $\mu$ V/div to 342.33 mV/div (1.08 nV/div to 34.23 mV/div with the PREAMP enabled)
Steps		
Log Mode		1 dB or 10 dB
Linear Mode		1-2-5 sequence: 10.83 $\mu$ V/div to 342.33 mV/div
FINE REF LVL STEP On		$\geq 0.2$ division per increment
Accuracy		Dependent on <ul style="list-style-type: none"> <li>■ Normalizations</li> <li>■ Calibrator accuracy</li> <li>■ Frequency response</li> </ul>



Table 2-4: Amplitude Related Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information																				
Display Dynamic Range	80 dB maximum (Log) 8 divisions (Lin)	Log Mode Display Dynamic Range is dependent upon the selected Resolution Bandwidth																				
<b>Accuracy</b>																						
10 dB/div Mode	$\pm 1.0$ dB/10 dB to a maximum cumulative error of $\pm 2.0$ dB over the 70 dB range and a maximum cumulative error of $\pm 4.0$ dB over the 80 dB range	10 dB/div accuracy and range is affected by the signal-to-noise ratio of the selected Resolution Bandwidth filter. See following table for maximum specified range.																				
		<table border="1"> <thead> <tr> <th>Resolution Bandwidth</th> <th>dB Down</th> </tr> </thead> <tbody> <tr> <td>5 MHz</td> <td>40</td> </tr> <tr> <td>1 MHz</td> <td>40</td> </tr> <tr> <td>300 kHz</td> <td>50</td> </tr> <tr> <td>100 kHz</td> <td>50</td> </tr> <tr> <td>30 kHz</td> <td>60</td> </tr> <tr> <td>10 kHz</td> <td>60</td> </tr> <tr> <td>3 kHz</td> <td>80</td> </tr> <tr> <td>1 kHz</td> <td>80</td> </tr> <tr> <td>300 Hz</td> <td>80</td> </tr> </tbody> </table>	Resolution Bandwidth	dB Down	5 MHz	40	1 MHz	40	300 kHz	50	100 kHz	50	30 kHz	60	10 kHz	60	3 kHz	80	1 kHz	80	300 Hz	80
Resolution Bandwidth	dB Down																					
5 MHz	40																					
1 MHz	40																					
300 kHz	50																					
100 kHz	50																					
30 kHz	60																					
10 kHz	60																					
3 kHz	80																					
1 kHz	80																					
300 Hz	80																					
5 dB/div Mode	$\pm 1.0$ dB/10 dB to a maximum cumulative error of $\pm 2.0$ dB over the 40 dB range																					
1 dB/div Mode	$\pm 1$ dB maximum error over the 8 dB range																					
Linear Mode	$\pm 5\%$ of full scale																					
RF Attenuator Range		0 to 50 dB in 2 dB steps																				

**Table 2-4: Amplitude Related Characteristics (Cont.)**

Characteristic	Performance Requirement	Supplemental Information
Sensitivity without Preamp		Equivalent maximum input noise for each resolution bandwidth
Resolution Bandwidth	<b>@100 MHz @ 1.8 GHz</b>	
5 MHz	-36 dBmV -28 dBmV	Sensitivity decreases linearly approximately 8 dB from the low end to the high end of the frequency range  <b>NOTE</b> <i>Sensitivity degrades as the FREQUENCY setting is decreased from approximately 10 MHz to 9 kHz. Maximum loss in sensitivity is approximately 20 dB.</i>
1 MHz	-43 dBmV -35 dBmV	
300 kHz	-48 dBmV -40 dBmV	
100 kHz	-53 dBmV -45 dBmV	
30 kHz	-58 dBmV -50 dBmV	
10 kHz	-63 dBmV -55 dBmV	
3 kHz	-68 dBmV -60 dBmV	
1 kHz	-73 dBmV -65 dBmV	
300 Hz	-78 dBmV -70 dBmV	
Sensitivity with Preamp		<b>NOTE</b> <i>Sensitivity with the Preamp enabled is not specified above 600 MHz.</i>
Resolution Bandwidth	<b>@100 MHz</b>	
5 MHz	-48 dBmV	
1 MHz	-55 dBmV	
300 kHz	-60 dBmV	
100 kHz	-65 dBmV	
30 kHz	-70 dBmV	
10 kHz	-75 dBmV	
3 kHz	-80 dBmV	
1 kHz	-85 dBmV	
300 Hz	-90 dBmV	

Table 2-4: Amplitude Related Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Spurious Responses		
Residual (no input signal)	$\leq -51$ dBmV ( $\leq -100$ dBm) except at 1780 MHz where the spurious response is $\leq -41$ dBmV ( $\leq -90$ dBm)	With 0 dB RF attenua- tion
3 <sup>rd</sup> Order IM Products	$\leq -70$ dBc	From any two on-screen signals within any fre- quency span
Zero Frequency Spur	$\leq +39$ dBmV ( $\leq -10$ dBm)	Referenced to input with 0 dB RF attenuation
2 <sup>nd</sup> Harmonic Distortion	$\leq -66$ dBc	Measured with 1 <sup>st</sup> mixer input level of $\leq +9$ dBmV
LO (Local Oscillator) Emission	$\leq -21$ dBmV ( $\leq -70$ dBm)	With 0 dB RF attenua- tion

Table 2-5: Input/Output Signal Characteristics

Characteristic	Performance Requirement	Supplemental Information
RF Input		Type F male connector
VSWR with RF Attenuation $\geq 10$ dB	1.5:1 maximum	Checked to 1 GHz
VSWR with 0 dB RF Attenuation	2:1 max up to 1 GHz 3.5:1 max up to 1.8 GHz	
Maximum Safe Input		+70 dBmV (0.1 W or 2.2 V) continuous peak 100 VDC blocking capacitor <b>Do not apply more than 100 VDC to the RF Input</b>
1 dB Compression Point (minimum)	+34 dBmV (-15 dBm)	With no RF Attenuation and 1 <sup>st</sup> mixer at +19 dBmV
Ext Trig (J102)		BNC connector, 10 k $\Omega$ , DC coupled for external trigger signals
Voltage Range		
Minimum		Typically at least 100 mV <sub>peak</sub> , 15 Hz to 1 MHz
Maximum		50 V (DC + peak AC)
Pulse Width		0.1 $\mu$ s minimum

Table 2-5: Input/Output Signal Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Accessory Connector (J103)		DB-9 female connector
Pin 1 External Video Input		Typically 100 $\Omega$ , DC coupled, 0–50 kHz, 0–1.6 V (200 mV/div) signal input for vertical deflection of the CRT beam  The signal is processed through the video filters and the 1 dB, 5 dB, and 10 dB scale factor circuits on the Log board  Display storage may be bypassed
Pin 2 Chassis and Signal Ground		
Pin 3 Video Output		Provides 0 V to +1.6 V of video signal, inversely proportional to the vertical display amplitude  0 V is the top of the screen  Impedance is 1 k $\Omega$
Pin 6 Sweep Gate		TTL-compatible signal that goes to logic high level while the CRT beam is sweeping
Pin 7 Sweep Output		Provides a nominal +1.3 V to –1.3 V negative-going ramp, proportional to the horizontal sweep (output impedance $\leq$ 50 $\Omega$ )
Pins 4, 5, 8, and 9		Reserved for future options

**Table 2-5: Input/Output Signal Characteristics**

<b>Characteristic</b>	<b>Performance Requirement</b>	<b>Supplemental Information</b>
Digital Communications Port (J104)		24-pin connector if Option 03 (GPIB) is installed  9-pin connector if Option 08 (RS-232) is installed  (If no option is specified at time of purchase, a 9-pin connector, conforming to RS-232-C, is provided)

**Table 2-6: Power Requirements**

<b>Characteristic</b>	<b>Performance Requirement</b>	<b>Supplemental Information</b>
Input Voltage		
Line Voltage Range	90 VAC to 250 VAC	Type F male connector
Line Frequency Range	48 Hz to 63 Hz	
Line Voltage Range	90 VAC to 132 VAC	
Line Frequency Range	48 Hz to 440 Hz	
Line Fuse	2 A Slow-Blow	
Input Power	90 W (1.2 A) for standard instrument  105 W (1.4 A) maximum with options  (115 W maximum at 90 V and 440 Hz)	At 115 V and 60 Hz
Leakage Current		3.5 mA <sub>RMS</sub> maximum or 5 mA <sub>peak</sub> maximum

Table 2-7: Supplementary Characteristics Due to Options

Characteristic	Performance Requirement	Supplemental Information
Option 03		Provides a GPIB interface port at J104 (24-pin connector that conforms to IEEE Std 488.1-1978)
Option 08		Provides a RS-232 serial interface port at J104 (9-pin connector)
Option 15		
1 <sup>st</sup> LO Output Level	$\geq +48.8$ dBmV ( $\geq 0$ dBm)	Add a 1 <sup>st</sup> LO output

Table 2-8: General Characteristics

Characteristic	Performance Requirement	Supplemental Information
Sweep		Normal, Single Sweep, and Manual Scan
Sweep Rate	1 $\mu$ s/div to 2 s/div in a 1-2-5 sequence	
Accuracy	$\pm 10\%$ over the center 8 divisions	
Triggering		Free Run, Internal, External, Line, TV Line, and TV Field
Internal Trigger Level	1 division or more of signal	
External Trigger Level		See EXT TRIG in Table 2-5

Table 2-8: General Characteristics (Cont.)

Characteristic	Performance Requirement	Supplemental Information
Non-Volatile Memory (Battery-Backed Up)		Instrument settings, waveforms, and normalization results are stored in NVRAM
Battery Life (Lithium)		
At +55° C Ambient Temperature		1 to 2 years
At +25° C Ambient Temperature		At least 5 years
Temperature Range for Retaining Data		-10° C to +75° C
Internal Calibrator		Provides 100 MHz marker for amplitude calibration and comb of 100 MHz markers for frequency and span calibration
Amplitude and Accuracy	+18.8 dBmV (-30 dBm), $\pm 0.3$ dB, at 100 MHz, $\pm 2$ kHz	
Drift	$\pm 2$ PPM/Year	



Table 2-9: Environmental Characteristics

Characteristic	Description
<i>The Description column describes how most characteristics were derived and a description of the characteristic. This instrument meets MIL-T-28800E, Type III, Class 5, Style C Specifications.</i>	
Temperature	
Operating and Humidity	0° C to +50° C MIL-T-28800E 5 cycles (120 hours)
Non-operating <sup>1</sup>	-55° C <sup>2</sup> to +75° C
Altitude	
Operating	4.57 km (15,000 ft)
Non-operating <sup>1</sup>	15.24 km (50,000 ft)
Humidity (Non-operating)	Five cycles (120 hours) in accordance with MIL-STD-28800E, class 5
Vibration	
Operating (Instrument secured to a vibration platform during test)	MIL-T-28800E, Method 514 Procedure X (modified) 15 minutes along each of 3 major axes at a total displacement of 0.38 mm (0.015 inch) peak-to-peak (2.4 g at 55 Hz), with frequency varied from 10 Hz to 55 Hz in 1-minute sweeps  Hold for 10 minutes at 55 Hz  All major resonances must be above 55 Hz
Shock Operating and Non-operating	Three guillotine-type shocks of 30 g, one-half sine, 11 ms duration each direction along each major axis; total of 18 shocks
Transit Drop (free fall)	203.2 mm (8 inch), one per each of 6 faces and 8 corners (instrument is tested and meets drop height of 304.8 mm (12 inches).

- 1 After storage at temperatures below -15° C, the instrument may not reset when power is first turned on. If this happens, allow the instrument to warm up for at least 15 minutes, then turn POWER OFF for 5 seconds and back ON.
- 2 NVRAM is lost below -10° C.

**Table 2-9: Environmental Characteristics (Cont.)**

<b>Characteristic</b>	<b>Description</b>
Electromagnetic Interference (EMI)	
Radiated and Conducted Emission	
FCC	FCC Part 15, sub-part J, Class A
VDE	VDE 0871, Class B

**Table 2-10: Physical Characteristics**

<b>Characteristic</b>	<b>Performance Requirement</b>
Weight	
With Standard Accessories	11.34 kg (25 lbs)
Without Standard Accessories	10.21 kg (22.5 lbs)
Dimensions	
Height with Feet and Handle	137.16 mm (5.4 inches)
Width	
With Handle	360.68 mm (14.2 inches)
Without Handle	327.66 mm (12.9 inches)
Depth	
With Front Panel Cover	444.50 mm (17.5 inches)
Without Front Panel Cover	427.99 mm (16.85 inches)
With Handle Extended	510.54 mm (20.1 inches)