**Table A–1: CATV Characteristics**

| Characteristic | | Description |
|---|---|---|
| Input Configuration | | |
| | All except Option 50 | 75 Ω Female F connector |
| | Option 50 | 50 Ω Type N connector |
| Channel Selection | | The visual and aural carriers are displayed when the channel number is entered, or either [ ▲ ] or [ ▼ ] next to **[CHAN/FREQ]** is pressed |
| | Tune Configuration | STD (73.603), HRC (73.605), IRC (73.612), and Custom[1] |
| | Channel Range | 0 to 999[1] |
| | Frequency Range (except Opt 50 and Opt 75) | 1 MHz to 1.8 GHz[2], Preamp limited to 600 MHz |
| | Frequency Range (Opt 50 and Opt 75) | 1 MHz to 2.15 GHz[2], Preamp limited to 600 MHz |
| Visual Carrier Frequency Measurement | | Accuracy is dependent on the accuracy of the spectrum analyzer — see Frequency Accuracy in Table A–2. |
| | Method | Internal Counter |
| | Resolution | 1 Hz |
| | Accuracy | $5 \times 10^{-7} \times$ Carrier Frequency ±10 Hz, ±1 Least Significant Digit<br>@ 55.25 MHz (Ch 2) worst case is ±38 Hz<br>@ 325.25 MHz (Ch 41) worst case is ±173 Hz<br>@ 643.25 MHz (Ch 94) worst case is ±332 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[3] for an amplitude difference of ≤30 dB and aural C/N ≥15 dB (300 kHz RBW) |
| | Resolution | 1 Hz |
| | Accuracy | ±15 Hz for visual-to-aural carrier difference ≤8 MHz |
| Visual Carrier Peak Level Measurement | | Absolute peak amplitude of visual carrier measured with PREAMP OFF |
| | Accurate Frequency and Amplitude | Visual carrier frequency measurement<br>Visual-to-aural carrier frequency measurement<br>Visual carrier peak level measurement<br>Visual-to-aural carrier level difference measurement |
| | Accurate Amplitude Only | Visual carrier peak level measurement<br>Visual-to-aural carrier level difference measurement |
| | Fast Amplitude Only | Carrier amplitudes are measured using marker values in 10 dB/div vertical scale |
| | Amplitude Range | –18 dBmV to +58.8 dBmV[4] for visual C/N ≥30 dB (300 kHz RBW) |

1 **Configured using Cable TV RF Measurements Software.**

2 **Dependent on selected channel table. Frequencies above 1.8 GHz are not supported by the Cable TV RF Measurements Software.**

3 **Dependent on selected channel table.**

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

**Table A–1: CATV Characteristics (Cont.)**

| Characteristic | | Description |
|---|---|---|
| | Frequency Range | 15 to 1015 MHz |
| | Resolution | 0.1 dB |
| | Absolute Accuracy | ±2.5 dB for visual C/N ≥30 dB (300 kHz RBW) and for FM signal C/N ≥33 dB (100 kHz RBW) assumes flatness corrections are present |
| | Relative Accuracy | ±0.5 dB relative to adjacent channel<br>±1.2 dB relative to all other channels |
| 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 ≥15 dB (300 kHz RBW) |
| | Resolution | 0.1 dB |
| | Accuracy | ±0.75 dB for aural C/N ≥15 dB (300 kHz RBW) |
| Averaged Power (Typical) | | Averaged amplitude measured with preamp off |
| | Accuracy | ±2.5 dB for input levels above –30 dBmV, up to +37 dBmV (multichannel) or +52 dBmV (preselector in use) |
| | Resolution | 0.1 dB |
| 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 | ±2% for visual C/N ≥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 | ±1% for Hum ≤5% and visual C/N ≥25 dB (300 kHz RBW)<br>±2% for Hum <10% and visual C/N ≥25 dB (300 kHz RBW) |
| Carrier-to-Noise (C/N) Measurement (Typical) | | Default noise floor is a normalized 4 MHz bandwidth measured relative to the visual carrier peak |
| | Optimum Input Range | See Figure A–1 on page A–7 |
| | Maximum Range | See Figure A–1 on page A–7 |
| | Resolution | 0.3 dB |
| | Accuracy | See Figure A–1 on page A–7 |
| In-Service C/N (typical) | | Noise density is measured at 2 MHz offset (by default) from visual carrier during quiet lines in the vertical interval, then normalized to 4 MHz BW and expressed as dBc |
| | Optimum Input Range | See Figure A–1 on page A–7 |
| | Maximum Range | See Figure A–1 on page A–7 |
| | Resolution | 0.3 dB |

**Table A–1: CATV Characteristics (Cont.)**

| Characteristic | | Description |
|---|---|---|
| | Accuracy | See Figure A–1 on page A–7 |
| Desired-to-Undesired Ratio (Typical) | | Channel averaged power is divided by total noise plus distortion in the channel |
| | Resolution | 0.1 dB |
| | Accuracy | ±2 dB within the limits shown in Figure A–6 on page A–9 |
| CTB Measurement (Typical) | | Composite triple beat (CTB) is 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 |
| | Maximum Range | See Figure A–2 on page A–7 |
| | Resolution | 0.3 dB |
| | Accuracy | See Figure A–2 on page A–7 |
| Digital Channel CTB (Typical) | | Measured relative to the averaged power of the test channel |
| | Resolution | 0.3 dB |
| | Accuracy | ±2 dB within the limits shown in Figure A–8 on page A–10 |
| CSO Measurement (Typical) | | Composite second order (CSO) is measured relative to the visual carrier peak according to the NCTA recommended spectrum analyzer settings — SINGLE-SWEEP and CONTINUOUS modes do not use all the NCTA recommended settings |
| | Optimum Input Range | See Figure A–3 on page A–8 |
| | Maximum Range | See Figure A–3 on page A–8 |
| | Resolution | 0.3 dB |
| | Accuracy | See Figure A–3 on page A–8 |
| In-Service CSO (Typical) | | CSO products are measured per NCTA recommendations during quiet lines in the vertical interval, then expressed as dBc |
| | Optimum Input Range | See Figure A–4 on page A–8 |
| | Maximum Range | See Figure A–4 on page A–8 |
| | Resolution | 0.3 dB |
| | Accuracy | See Figure A–4 on page A–8 |
| Digital Channel CSO (Typical) | | Measured relative to the averaged power of the test channel |
| | Resolution | 0.3 dB |
| | Accuracy | ±2.0 dB within the limits shown in Figure A–7 on page A–10 |
| 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 (Nonvolatile) | Up to 10 traces with spectrum analyzer states |
| | Range | 5 dB/div, fixed |
| | Resolution | 0.2 dB |
| | Trace Flatness Accuracy | ±0.75 dB |

**Table A–1: CATV Characteristics (Cont.)**

| Characteristic | Description |
|---|---|
| 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 ACCURATE FREQUENCY AND AMPL is on) |
| Accurate Frequency and Amplitude | Visual carrier frequency measurement<br>Visual-to-aural carrier frequency measurement<br>Visual carrier peak level measurement<br>Visual-to-aural carrier level difference measurement |
| Accurate Amplitude Only | Visual carrier peak level measurement<br>Visual-to-aural carrier level difference measurement |
| Fast Amplitude Only | Carrier amplitudes are measured using marker values in 10 dB/div vertical scale |
| Visual Carrier | |
| Amplitude Range | –18 dBmV to +58.8 dBmV[5] for C/N ≤30 dB (300 kHz RBW) |
| Frequency Range | 15 MHz to 1015 MHz |
| Resolution | 0.3 dB |
| Absolute Accuracy | ±2.7 dB for visual C/N ≥30 dB (300 kHz RBW) and for FM signal C/N ≥33 dB (100 kHz RBW) assumes flatness corrections are present |
| Relative Accuracy | ±0.8 dB relative to adjacent channel<br>±1.5 dB relative to all other channels |
| Aural Carrier | |
| Difference Range | 0 to 30 dB for C/N ≥15 dB (300 kHz RBW) |
| Resolution | 0.3 dB |
| Accuracy | ±1.1 dB for C/N ≥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 | ±4 kHz |
| Cross Modulation (Typical) | The third order distortion at the horizontal sync frequency (AM) measured on the unmodulated visual carrier, as corrected to the NCTA recommended synchronous square wave modulation procedure |
| Range | 48 dB |
| Resolution | 0.1 dB |
| Accuracy | ±2 dB for cross modulation < 36 dB<br>±3 dB for cross modulation < 48 dB |
| 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 |

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

**Table A–1: CATV Characteristics (Cont.)**

| Characteristic | | Description |
|---|---|---|
| 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 µs/div |
| In-Channel Response | | |
| | Range | ±3 dB (the auto test is run in 1 dB/div) |
| | Resolution | 0.1 dB |
| | Accuracy | ±0.5 dB, Auto mode<br>±0.8 dB, Interactive mode |
| Adjacent Channel Leakage (Typical) | | Averaged power in adjacent channel(s) is divided by averaged power for the test channel |
| | Resolution | 0.1 dB |
| | Accuracy | ±2.0 dB within limits shown in Figure A–5 on page A–9 |
| In-Service In-Channel Response (Typical) | | Standard vertical interval test signal (line sweep, ghost-canceller, multiburst) is measured within gate which excludes active video; result is expressed as dB P-P |
| | Resolution | 0.2 dB |
| | Accuracy | ± 0.5 dB assuming test signal is flat at head end |

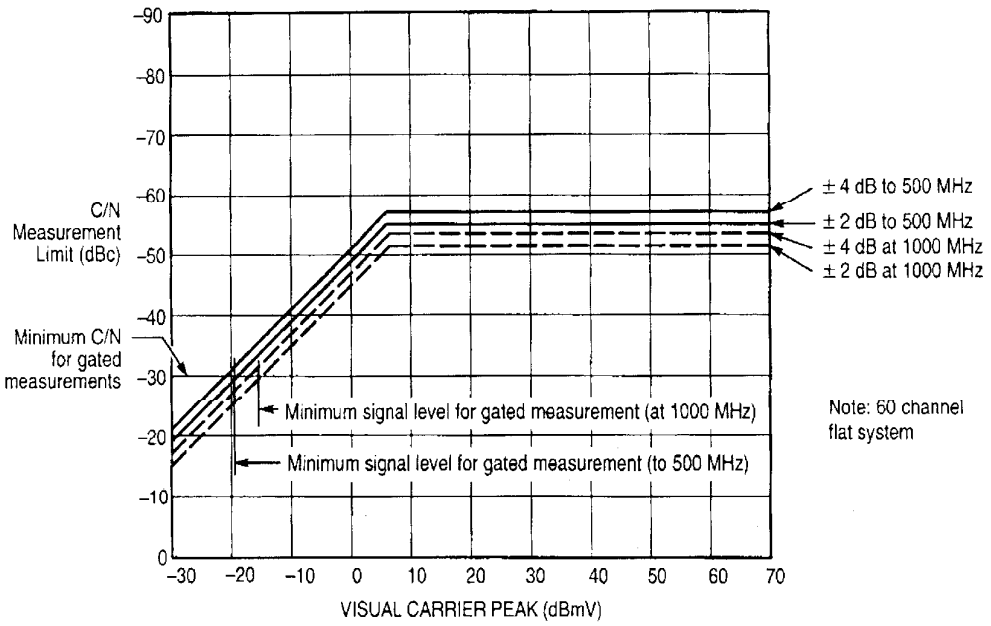


**Figure A–1: Typical Accuracy Limits for Carrier-to-Noise Measurement**

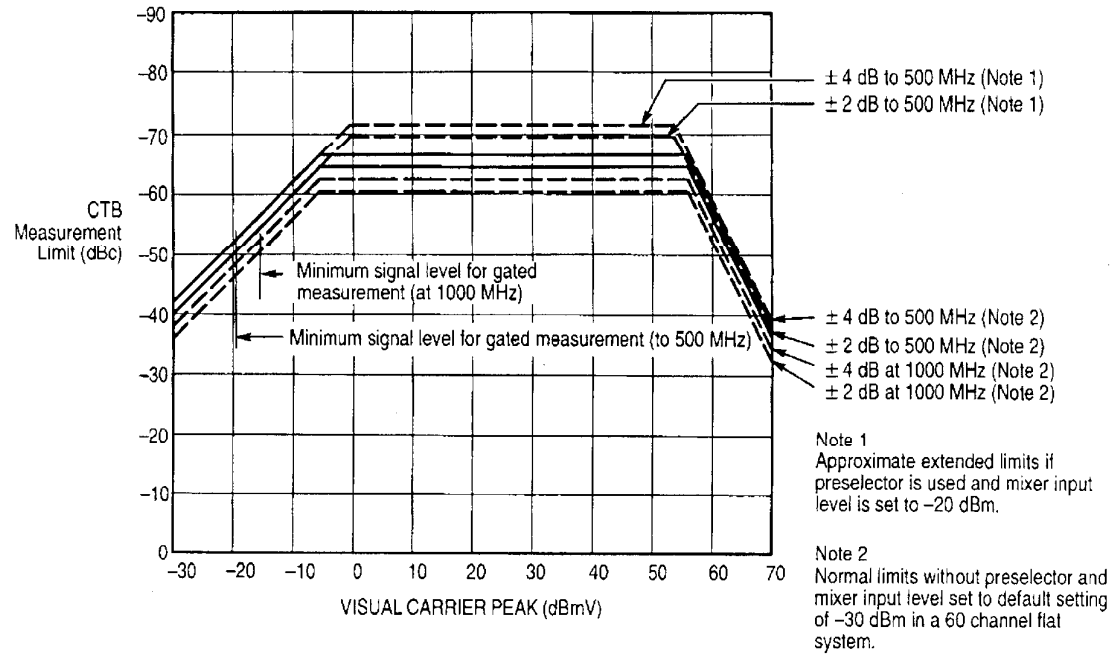


**Figure A–2: Typical Accuracy Limits for CTB Measurement**

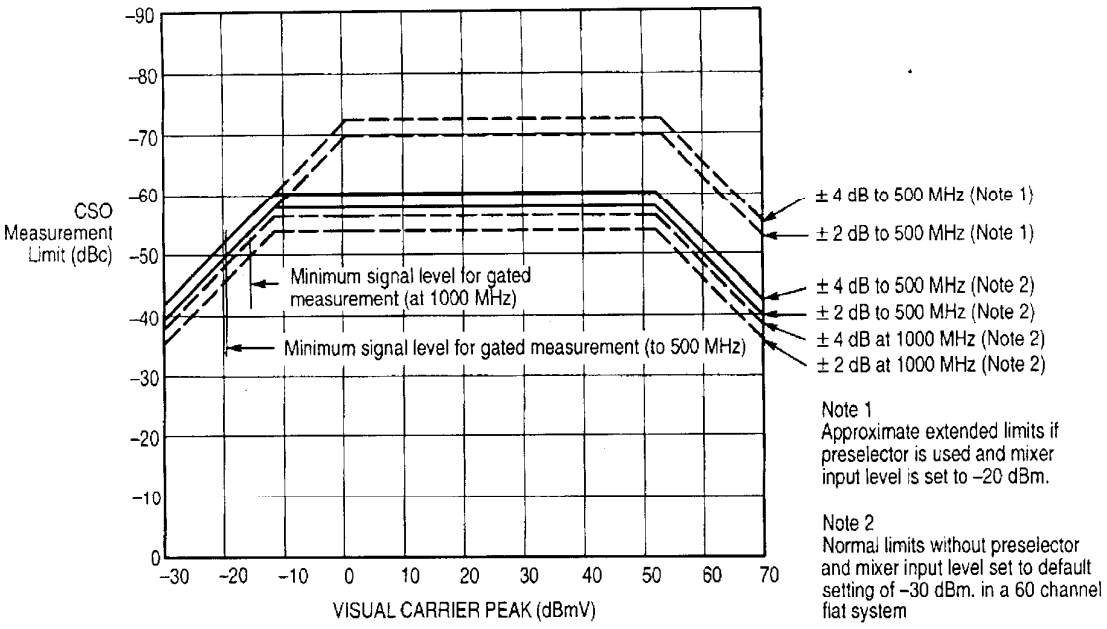


**Figure A–3: Typical Accuracy Limits for Nongated CSO Measurement**

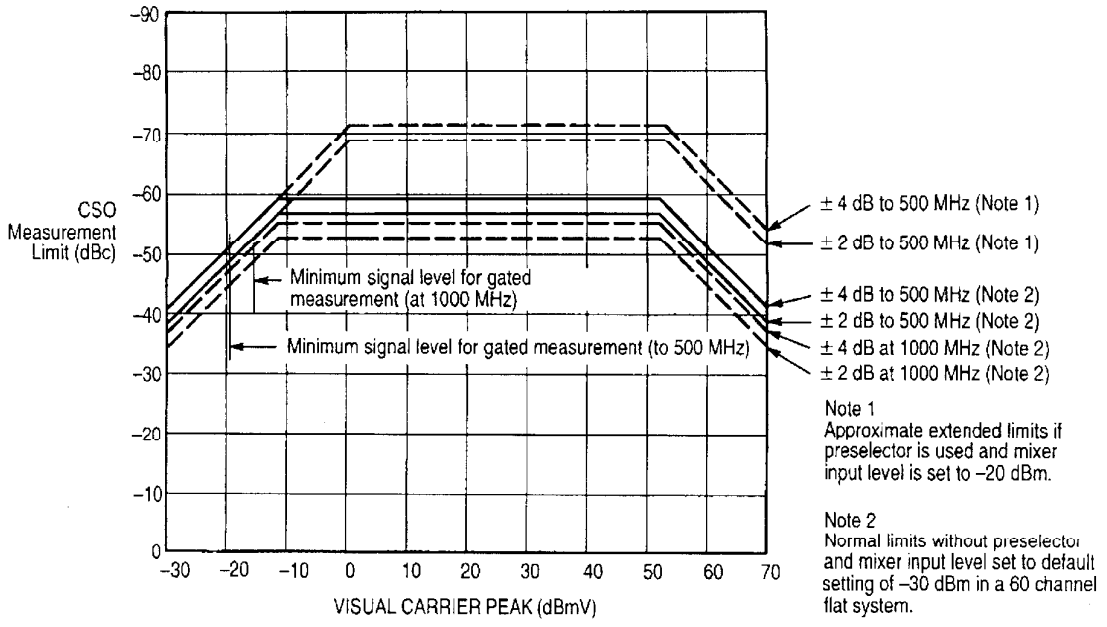


**Figure A–4: Typical Accuracy Limits for Gated CSO Measurement**

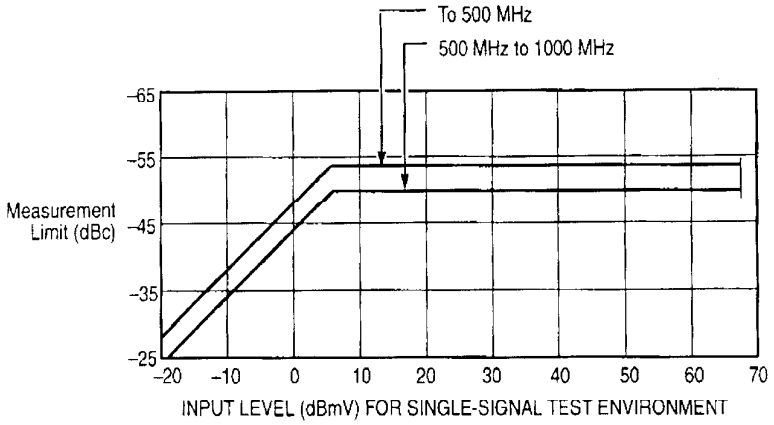


**Figure A–5: Typical ACL Measurement Limits for 2 dB Accuracy**

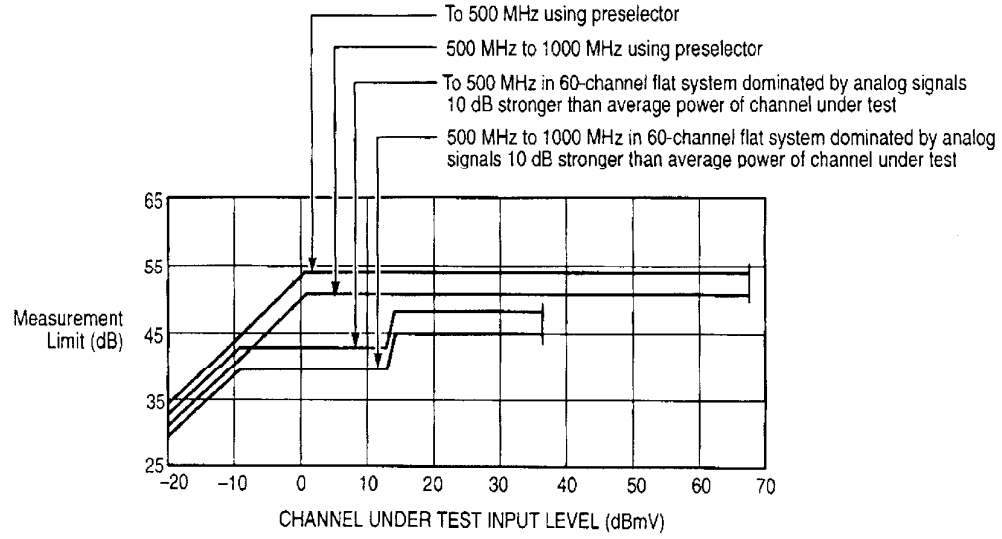


**Figure A–6: Typical D/U Measurement Range Limits for 2 dB Accuracy**

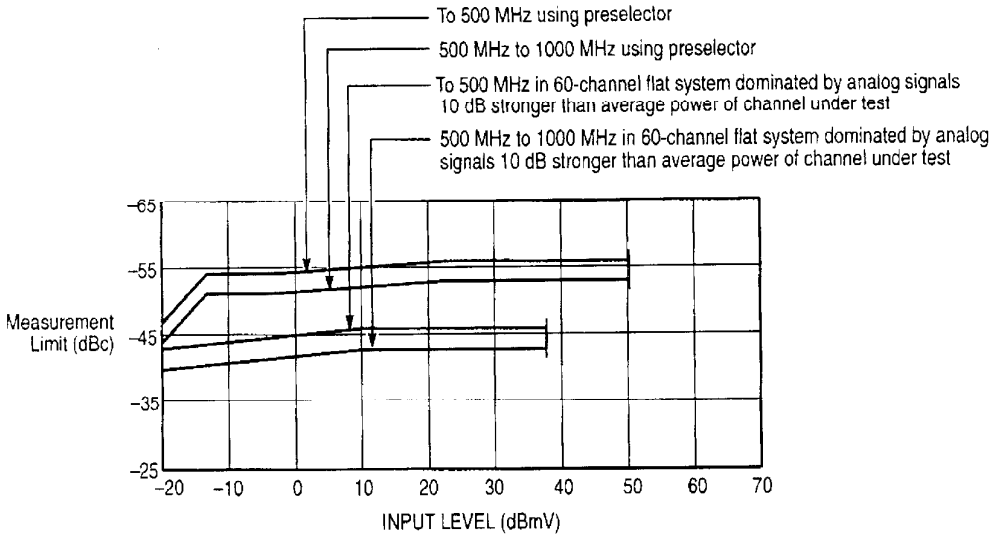


**Figure A–7: Typical Digital Signal CSO Measurement Range Limit for 2 dB Accuracy**

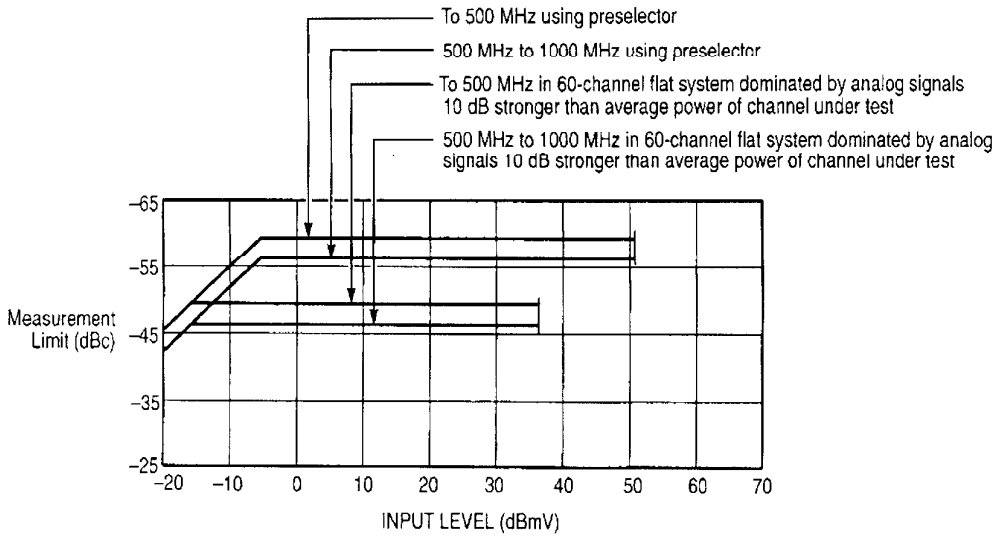


**Figure A–8: Typical Digital Signal CTB Measurement Range Limit for 2 dB Accuracy**

**Table A–2: Frequency-Related Characteristics**

| Characteristic | Performance Requirement | Supplemental Information |
|---|---|---|
| Channel | | Tuned with keypad, **[CHAN/FREQ]** [ ▲ ], or **[CHAN/FREQ]** [ ▼ ], according to the selected channel table |
| Frequency | | |
| Range | All except Option 50 and Option 75: 9 kHz to 1.8 GHz<br>Option 50 and Option 75: 9 kHz to 2.15 GHz | Tuned with keypad, **[CHAN/FREQ]** [ ▲ ], **[CHAN/FREQ]** [ ▼ ], FREQ/MARKERS knob, UTIL menu, or MKR/FREQ menu |
| Accuracy | $5 \times 10^{-7}$ of center frequency ±10 Hz ±1 least significant digit | Assumes zero drift since last normalization procedure |
| Drift | | |
| Long Term (One Year) | | ±2 PPM/year |
| Short Term (SPAN/DIV ≤20 kHz) | All except Option 50 and Option 75: ≤400 Hz up to 1.8 GHz<br>Option 50 and Option 75: 500 Hz above 1.8 GHz | With frequency corrections enabled |
| Readout Resolution | | 1 kHz or 1 Hz (counter readout), menu selectable |
| Frequency Span/Div | | |
| Range | | Using **[SPAN/DIV]** [ ▲ ] and **[SPAN/DIV]** [ ▼ ] buttons, selections in a 1–2–5 sequence<br>Using the keypad or UTIL menu, select any value from 100 MHz/div to 1 kHz/div.<br>In MAXSPAN, 180 MHz/div (All except Option 50 and Option 75) or 215 MHz/div (Option 50 and Option 75)<br>In ZERO SPAN, 0 Hz/div |
| Accuracy/Linearity | Within 3% | Measured over the center 8 divisions |
| Flatness (Relative to the Reference Level at 100 MHz) | All instruments: ±2 dB 9 KHz to 1.8 GHz<br>Option 50 and Option 75: ±3 dB above 1.8 GHz | Measured with 10 dB of RF Attenuation and PREAMP off<br>Flatness is affected by:<br>■ Input voltage standing-wave ratio (VSWR)<br>■ Gain variation<br>■ Mixer conversion |

**Table A–2: Frequency-Related Characteristics (Cont.)**

| Characteristic | Performance Requirement | Supplemental Information |
|---|---|---|
| Residual FM | | |
| With SPAN/DIV ≤20 kHz | All except Option 50 and Option 75: ≤100 Hz peak-to-peak total excursion in 20 ms up to 1.8 GHz<br>Option 50 and Option 75: ≤120 Hz peak-to-peak total excursion in 20 ms (above 1.8 GHz) | Short term, after 1 hr warm-up, and with PHASELOCK in AUTO mode |
| With SPAN/DIV > 20 kHz | All except Option 50 and Option 75: ≤2 kHz peak-to-peak total excursion in 20 ms up to 1.8 GHz<br>Option 50 and Option 75: ≤2.4 KHz peak-to-peak total excursion in 20 ms above 1.8 GHz | |
| Resolution Bandwidth (6 dB down) | | Resolution bandwidth selections are:<br>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 ≤1 MHz | |
| Noise Sidebands | All except Option 50 and Option 75: ≤–70 dBc at 30X Resolution Bandwidth for all resolution bandwidths ≤100 kHz<br>Option 50 and Option 75: ≤–69 dBc at 30X Resolution Bandwidth for all resolution bandwidths ≤100 kHz | |
| Video Filter | | Reduces video bandwidth to about 1% of the selected resolution bandwidth; or one of 12 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 A–2: Frequency-Related Characteristics (Cont.)**

| Characteristic | Performance Requirement | Supplemental Information |
|---|---|---|
| Resolution Bandwidth (6 dB down) | | Resolution bandwidth selections are:<br>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 ≤1 MHz | |
| Noise Sidebands | ≤–70 dBc at 30X Resolution Bandwidth for all resolution bandwidths ≤100 kHz | |
| Video Filter | | Reduces video bandwidth to about 1% of the selected resolution bandwidth; or one of 12 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 A–3: Frequency/Amplitude Related Characteristics**

| Characteristic | Performance Requirement | Supplemental Information |
|---|---|---|
| Marker | | The frequency and amplitude values of the marker position are displayed and are preceded by the letter **M**<br>**[MKR] [ ▶ ]** and **[MKR] [ ◀ ]** 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* on page A–15)<br>Also, flatness corrections while in CATV mode for range of 15 MHz to 1.105 GHz |
| Delta Marker | When activated, a second marker is displayed at the same frequency as the first marker. This is the "Reference Marker" | The FREQ/MARKERS control may be used to position the first marker; the frequency and amplitude differences between markers are readouts preceded by the letter D |
| Accuracy | | |
| Frequency | 1 PPM ±10 Hz of the higher marker frequency | With both signals counted |
| Amplitude | | Same as Marker |

**Table A–3: Frequency/Amplitude Related Characteristics (Cont.)**

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

**Table A–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 µV/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 µV/div to 342.33 mV/div |
| FINE REF LVL STEP Activated | | ≥0.2 division per increment |
| Accuracy | | Dependent on:<br>■ Normalizations<br>■ Calibrator accuracy<br>■ Frequency response |

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

| Characteristic | Performance Requirement | Supplemental Information |
|---|---|---|
| Display Dynamic Range | All except Option 50 and Option 75:<br>80 dB maximum (Log)<br>8 divisions (Linear) | Log Mode Display Dynamic Range is dependent upon the selected Resolution Bandwidth.<br><br>The accuracy specifications apply for amplitude measurements done with the marker only, since marker measurements are corrected for logging errors.<br><br>Option 50 and Option 75:<br>Baseline will rise to indicated value, typically 10 dB to 20 dB below signal level applied near frequency of 2.11 GHz.<br><br>Display Dynamic Range is reduced if there is signal energy at or near 2.11 GHz. |
| Accuracy | | |
| 10 dB/div Mode | ±1.0 dB/10 dB to a maximum cumulative error of ±2.0 dB over the 70 dB range and a maximum cumulative error of ±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. |
| | | **Resolution Bandwidth** / **dB Down**<br>5 MHz 40<br>1 MHz 40<br>300 kHz 50<br>100 kHz 50<br>30 kHz 60<br>10 kHz 60<br>3 kHz 80<br>1 kHz 80<br>300 Hz 80 |
| 5 dB/div Mode | ±1.0 dB/10 dB to a maximum cumulative error of ±2.0 dB over the 40 dB range | |
| 1 dB/div Mode | ±1 dB maximum error over the 8 dB range | |
| Linear Mode | ±5% of full scale | |
| RF Attenuator Range | | 0 to 50 dB in 2 dB steps |

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

| Characteristic | Performance Requirement | | | Supplemental Information |
|---|---|---|---|---|
| Sensitivity without Preamp | | | | Equivalent maximum input noise for each resolution bandwidth.<br><br>*Performance measurements above 1.8 GHz refer to the Option 50 and Option 75 instruments only.<br><br>Sensitivity decreases linearly approximately 8 dB from 9 KHz to 1.8 GHz. Above 1.8 GHz sensitivity decreases linearly approximately 10 dB.<br><br>***NOTE:*** *Sensitivity degrades as the FREQUENCY setting is decreased from approximately 10 MHz to 9 kHz. Maximum loss in sensitivity is approximately 20 dB.* |
| Resolution Bandwidth | @110 MHz | @ 1.8 GHz | @ 2.15 GHz* | |
| 5 MHz | –36 dBmV (–85 dBm) | –28 dBmV (–77 dBm) | –26 dBmV –75 dBm) | |
| 1 MHz | –43 dBmV (–92 dBm) | –35 dBmV (–84 dBm) | –33 dBmV –82 dBm) | |
| 300 kHz | –48 dBmV (–97 dBm) | –40 dBmV (–89 dBm) | –38 dBmV –87 dBm) | |
| 100 kHz | –53 dBmV (–102 dBm) | –45 dBmV (–94 dBm) | –43 dBmV –92 dBm) | |
| 30 kHz | –58 dBmV (–107 dBm) | –50 dBmV (–99 dBm) | –48 dBmV –97 dBm) | |
| 10 kHz | –63 dBmV (–112 dBm) | –55 dBmV (–104 dBm) | –53 dBmV –102 dBm) | |
| 3 kHz | –68 dBmV (–117 dBm) | –60 dBmV (–109 dBm) | –58 dBmV –107 dBm) | |
| 1 kHz | –73 dBmV (–122 dBm) | –65 dBmV (–114 dBm) | –63 dBmV –112 dBm) | |
| 300 Hz | –78 dBmV (–127 dBm) | –70 dBmV (–119 dBm) | –68 dBmV –117 dBm) | |
| Sensitivity with Preamp | | | | ***NOTE.*** *Sensitivity with the Preamp enabled is not specified above 600 MHz.* |
| Resolution Bandwidth | @110 MHz | @ 1.8 GHz and 2.15 GHz | | |
| 5 MHz | –48 dBmV (–95 dBm) | Not Specified | | |
| 1 MHz | –55 dBmV (–104 dBm) | Not Specified | | |
| 300 kHz | –60 dBmV (–109 dBm) | Not Specified | | |
| 100 kHz | –65 dBmV (–114 dBm) | Not Specified | | |
| 30 kHz | –70 dBmV (–119 dBm) | Not Specified | | |
| 10 kHz | –75 dBmV (–124 dBm) | Not Specified | | |
| 3 kHz | –80 dBmV (–129 dBm) | Not Specified | | |
| 1 kHz | –85 dBmV (–134 dBm) | Not Specified | | |
| 300 Hz | –90 dBmV (–139 dBm) | Not Specified | | |

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

| Characteristic | Performance Requirement | Supplemental Information |
|---|---|---|
| Spurious Responses | | |
| Residual (no input signal) | All except Option 50 and Option 75: ≤ –51 dBmV (≤–100 dBm) except at 1780 MHz where the spurious response is ≤–41 dBmV (≤–90 dBm). Option 50 and Option 75: ≤–26 dBmV (≤–75 dBm) at 2.0 GHz. | With 0 dB RF attenuation |
| 3rd Order IM (Intermodulation) Products | All except Option 50 and Option 75: ≤–70 dBc up to 1.8 GHz | From any two on-screen signals within any frequency span<br>Option 50 and Option 75: Typically ≤–65 dBc at 2.15 GHz |
| Zero Frequency Spur | ≤+39 dBmV (≤–10 dBm) | Referenced to input with 0 dB RF attenuation |
| 2nd Harmonic Distortion | ≤–66 dBc | Measured with 1st mixer input level of ≤+9 dBmV |
| LO (Local Oscillator) Emission | All except Option 50 and Option 75: ≤–21 dBmV (≤–70 dBm) | With 0 dB RF attenuation and preamp off.<br>Option 50 and Option 75:<br>When frequency is below 90 MHz: Typically <+29 dBmV (–20 dBm)<br>When frequency is above 350 MHz: Typically ≤–21 dBmV (≤–70 dBm) |

**Table A–5: Input/Output Signal Characteristics**

| Characteristic | Performance Requirement | Supplemental Information |
|---|---|---|
| RF Input | | Type F male connector or type N female connector |
| VSWR with RF Attenuation ≥10 dB | 1.5:1 maximum | Checked to 1 GHz |
| VSWR with 0 dB RF Attenuation | All except Option 50 and Option 75:<br>2:1 maximum up to 1 GHz<br>3.5:1 maximum up to 1.8 GHz<br>Option 50 and Option 75:<br>4:1 maximum up to 2.15 GHz | |
| Maximum Safe Input | | +70 dBmV (0.1 W or 2.2 V) continuous peak<br>100 VDC blocking capacitor<br>**Caution:** *Do not apply more than 100 VDC or 100V peak AC to the RF Input* |
| 1 dB Compression Point (minimum) | +34 dBmV (–15 dBm) | With no RF Attenuation and 1st mixer at +19 dBmV (–30 dBm) |

**Table A–5: Input/Output Signal Characteristics (Cont.)**

| Characteristic | Performance Requirement | Supplemental Information |
|---|---|---|
| Ext Trig (J102) | | BNC connector, 10 kΩ, DC coupled for external trigger signals |
| Voltage Range | | |
| Minimum | | Typically at least 100 $mV_{peak}$, 15 Hz to 1 MHz |
| Maximum | | 50 V (DC + peak AC) |
| Pulse Width | | 0.1 µs minimum |
| Accessory Connector (J103) | | DB-15 female connector |
| Pin 1: External Video Input | | Typically 100 ohm, 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 by-passed. |
| Pin 2: Sweep Gate |  +2.0 V minimum (high)<br>0.8 V maximum (low) | TTL-compatible signal that goes to a logic high level while the CRT beam is sweeping. |
| Pin 3: Chassis and Signal Ground | | |
| Pin 4: Sweep Output |  +1.3 V<br>–1.3 V | Provides a nominal +1.3 V to –1.3 V negative-going ramp, proportional to the horizontal sweep (output impedance ≤50 Ω). |
| Pin 5: Log 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 kΩ. |
| Pin 6: CLK0 Output | | Clock output to Option 05 (External Tracking Generator). CMOS logic levels typically +3.5 V high, +1.5 V low. |
| Pin 7: Data I Input | | Data input from Option 05 (External Tracking Generator). Typically +5 V high, +0.1 V low. |
| Pin 8: Data O Output | | Data output to Option 05 (External Tracking Generator). CMOS logic levels, typically +3.5 V high, +1.5 V low. |
| Pin 9: ~EXTGLATCH | | Logic output to Option 05 (External Tracking Generator). CMOS logic levels, typically +3.5 V high, +1.5 V low. |
| Pin 10: 26.38 MHz Input | | Input from Option 05 (External Tracking Generator); typically a 0.5 $V_{p-p}$ sine wave centered at +3.7 VDC. |

**Table A–5: Input/Output Signal Characteristics (Cont.)**

| Characteristic | Performance Requirement | Supplemental Information |
|---|---|---|
| Pin 11: VLVL Output | | DC output to Option 05 (External Tracking Generator); typically ± 9.5 V with TG level set to ON. |
| Pin 12: SWPSLOPE Output | | Negative going ramp output to Option 05 (External Tracking Generator); typically ± 5 V with analyzer set to max span. |
| Pins 13 through 15 | | Not used |
| Digital Communications Port (J104) | | RS-232 or GPIB connector |

**Table A–6: Power Requirements**

| Characteristic | Performance Requirement | Supplemental Information |
|---|---|---|
| Input Voltage | | |
| Line Voltage Range | 90 VAC to 250 VAC | |
| 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<br>105 W (1.4 A) maximum with options<br>(115 W maximum at 90 V and 440 Hz) | At 115 V and 60 Hz |
| Leakage Current | | 3.5 $mA_{RMS}$ maximum or 5 $mA_{peak}$ maximum |

**Table A–7: Supplementary Characteristics Due to Options**

| Characteristic | Performance Requirement | Supplemental Information |
|---|---|---|
| Option 03 | | Provides a GPIB interface port at J104 to replace RS-232 |
| Option 08 | | Provides a RS-232 serial interface port at J104 to replace GPIB |
| Option 15 | | Add a 1st LO output |
| 1st LO Output Level | ≥+48.8 dBmV (≥0.0 dBm) | At spectrum analyzer frequencies ≥100 kHz |

**Table A–8: General Characteristics**

| Characteristic | Performance Requirement | Supplemental Information |
|---|---|---|
| Sweep | | Normal, Single Sweep, and Manual Scan |
| Sweep Rate | 1 µs/div to 2 s/div in a 1–2–5 sequence | |
| Accuracy | ±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 A–5 |
| Nonvolatile 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), ±0.3 dB, at 100 MHz, ±2 kHz | |
| Drift | ±2 PPM/year | |
| IF Gate Rise and Fall Times | | 7 µs nominal |
| Off Isolation | | > 60 dB |

**Table A–9: Environmental Characteristics**

| Characteristic | Description |
|---|---|
| *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.* | |
| Electromagnetic Interference (EMI) | |
| Emissions: EN50081–1 | Radiated Emissions, 30 MHz–1 GHz<br>EN55022 Class B (CISPR 22B)<br><br>Conducted Emissions, 150 kHz–30 MHz<br>EN55022 Class B (CISPR 22B)<br><br>Conducted Emissions, Power Line Harmonics, 0–2 kHZ<br>IEC 555-2/3 |
| Immunity: EN50082–1 | Electrostatic Discharge, 8 kV<br>IEC 801-2<br><br>Radiated Immunity, 27 MHz–500 MHz<br>IEC 801-3<br>Performance Requirement:<br>No responses above –90 dBm in a 3 V/meter field<br><br>Fast Transients, Capacitive Clamp, 1 kV Power Leads,<br>500 V Control Leads<br>IEC 801-4<br><br>Power Line Surge, 1 kV Differential Mode,<br>2 kV common mode<br>IEC 801-5 |
| Temperature | |
| Operating | 0° C to +50° C |
| Nonoperating[1] | –55° C to +75° C[2] |
| Humidity | |
| Operating | 95% RH ± 5% + 30° C and below<br>75% RH ± 5% + 31° C through + 40° C<br>45% RH ± 5% + 41° C through + 50° C |
| Nonoperating | Five cycles (120 hours) in accordance with MIL-STD-28800E, class 5 |
| Altitude | |
| Operating | 15,000 ft (4.57 km) |
| Nonoperating | 50,000 ft (15.24 km) |

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 an back on.**

2 **NVRAM is lost below –10° C.**

**Table A–9: Environmental Characteristics (Cont.)**

| Characteristic | Description |
|---|---|
| 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 0.015 in (0.38 mm) peak-to-peak (2.4 g at 55 Hz), with frequency varied from 10 Hz to 55 Hz in 1-minute sweeps<br>Hold for 10 minutes at 55 Hz<br>All major resonances must be above 55 Hz (resonance is defined as an excursion greater than 2X the input displacement) |
| Shock (Operating and Nonoperating) | Three guillotine-type shocks of 30 g, one-half sine, 11 ms duration each direction along each major axis, total of 18 shocks; no drops allowed on the front surface and front corners |
| Transit Drop (Free Fall) | 8 in (203.2 mm), one per each of 5 faces and 4 corners (instrument is tested and meets drop height of 12 in (304.8 mm) |

**Table A–10: Physical Characteristics**

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

**Table A–11: Certifications and Compliances**

| Category | Description |
|---|---|
| EC Declaration of Conformity – EMC | Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:<br>EN 50081-1 Emissions:<br>EN 55022 Class B Radiated and Conducted Emissions<br>EN 60555-2 AC Power Line Harmonic Emissions<br>EN 50082-1 Immunity:<br>IEC 801-2 Electrostatic Discharge Immunity<br>IEC 801-3 RF Electromagnetic Field Immunity<br>IEC 801-4 Electrical Fast Transient/Burst Immunity<br>IEC 801-5 Power Line Surge Immunity |
| EC Declaration of Conformity – Low Voltage | Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities:<br>Low Voltage Directive 73/23/EEC<br>EN 61010-1:1993 Safety requirements for electrical equipment for measurement, control, and laboratory use |
| Approvals | UL1244 – Standard for Electrical and Electronic Measuring and Testing Equipment<br>CAN/CSA C22.2 No. 231 – Safety Requirements for Electrical and Electronic Measuring and Testing Equipment |
| Installation Category Descriptions | Terminals on this product may have different installation category designations. The installation categories are:<br>CAT III Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location<br>CAT II Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected<br>CAT I Secondary (signal level) or battery operated circuits of electronic equipment |

**Table A–12: Safety Certification Compliance**

| Category | Description |
|---|---|
| Temperature (operating) | +5° C to +50° C |
| Altitude (maximum operating) | 2000 meters (6562 ft.) |
| Relative Humidity (maximum operating) | 80% for temperatures up to 31° C, decreasing linearly to 50% at 40° C |
| Equipment Type | Test and Measuring |
| Safety Class | Class I (as defined in IEC 1010-1, Annex H)—grounded product |
| Overvoltage Category | Overvoltage Category II (as defined in IEC 1010-1, Annex J) |
| Pollution Degree | Pollution Degree 2 (as defined in IEC 1010-1)<br>Note: Rated for indoor use only. |

**Table A–13: Safety Standards**

| Category | Standards |
|---|---|
| U.S. Nationally Recognized Testing Laboratory Listing | UL1244 – Standard for Electrical and Electronic Measuring and Testing Equipment |
| Canadian Certification | CAN/CSA C22.2 No. 231 – Safety Requirements for Electrical and Electronic Measuring and Test Equipment |
| European Union Compliance | Low Voltage Directive 73/23/EEC, as Amended by 93/68/EEC<br>EN61010-1/A1 – Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use |
| Additional Compliance | UL3111-1 – Standard for Electrical Measuring and Test Equipment<br>IEC1010-1 – Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use |