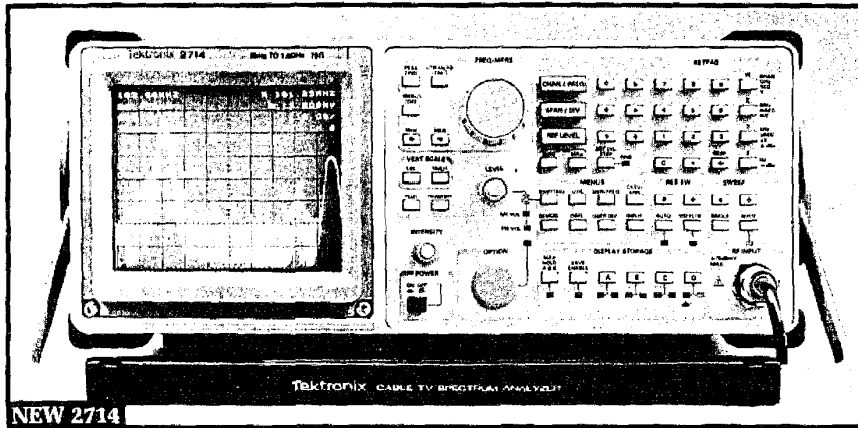


Spectrum Analyzer

Cable TV

2714



The 2714 simplifies cable TV and broadband LAN measurements.

New 2714 Cable TV Spectrum Analyzer

QUICK, REPEATABLE, PUSH-BUTTON MEASUREMENTS

The Tektronix 2714 Cable TV Spectrum Analyzer provides the ultimate in ease and economy for cable TV and broadband LAN measurements. It's cable ready with a 75 Ω BNC input that can be quickly changed to a 75 Ω F-connector input. All of the common cable system spectral measurements are built in and menu selectable including those needed to address field proof-of-performance requirements. Plus the accompanying PC software package adds measurement configuration, data collection, and automatic report generation capabilities.

What used to be complicated measurement procedures, even for engineering, are now push-button simple. Technicians can easily perform extensive cable system analysis and data collection in the field, all automatically.

Measurements and data collection can also be done remotely under computer control. Or the 2714 can be left unattended to run automatic measurements and data collection initiated by the built-in real-time clock.

Data collected in the field can be transferred from the 2714's memory via an RS-232 or GPIB interface to an MS-DOS personal computer (PC). The 2714's accompanying PC software package includes data archiving facilities as well as automatic report generation for proof-of-performance records.

BUILT-IN, AUTOMATIC MEASUREMENTS

The 2714 contains the following measurements and capabilities in its CATV Application menu:

- Automatic positioning of visual and aural carriers
- Visual and aural carrier levels and frequencies for selected channels
- Visual to aural carrier amplitude and frequency difference measurements for selected channels
- Survey of system visual and aural carrier levels and frequencies
- Depth of modulation
- Aural carrier deviation measurement
- Visual carrier-to-noise measurement
- In-channel response measurement
- Hum/low-frequency disturbance measurement
- System frequency response
- View baseband modulation (field and line) and demodulated video
- Aural carrier demodulation (listen mode)
- Distortion measurement (CTB/CSO)
- Cross-modulation measurement

2714

- Built-in Automatic Cable TV Measurements Enhance Measurement Repeatability and Reduce Technician Training Time
- Addresses All Field FCC Proof-of-Performance Requirements
- Key Cable TV Measurements Execute Automatically from Simple, On-screen Menu Selections
- Unattended and Remote Measurement Modes Reduce Personnel Requirements in the Field
- Full Programmability over RS-232 or IEEE-488 (GPIB) Interface
- Quick-change 75 Ω F and BNC Input Connectors
- Built-in Preamp, Audio, and AM/Wideband FM Video Demodulator

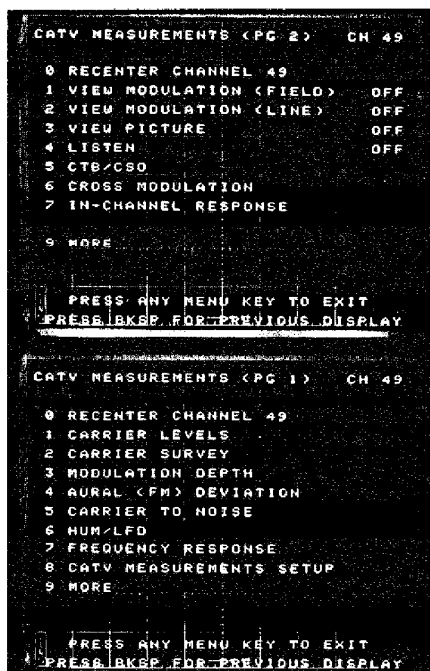
Cable Ready RF Testing from Tektronix. Highly portable with Selectable Digital and True Analog Display.

GPIB
IEEE-488

The 2714 complies with IEEE Standard 488.1-1987, and with Tektronix Standard Codes and Formats.

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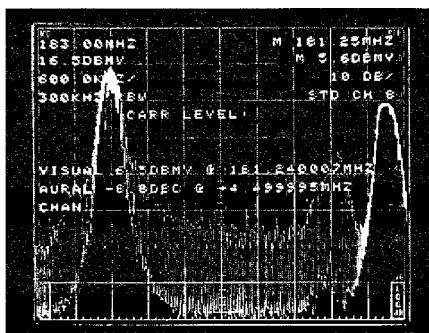


Pressing the CATV/APPL front-panel button provides easy access to the CATV Measurement Mode menu display

Measurements selected from the menu are automatically executed, and the results are displayed on the CRT screen. Not only are complex measurements reduced to push-button simplicity for less-experienced spectrum analyzer users, but measurement repeatability is high.

Measurement results can be output to a printer or plotter connected directly to the 2714's interface port. Results can also be automatically stored in the 2714's nonvolatile memory for later transfer to a PC. This, along with high portability, makes the 2714 ideal as an automatic data collection tool in the field for engineers and technicians alike.

A battery pack option makes 2714 measurements and data collection possible even where AC power isn't available.



Measurement conditions and results are clearly displayed on-screen. Text can even be added, to describe measurement location for example.

THE 2714 CAPITALIZES ON PC POWER

The PC-based software package that accompanies the 2714 runs automated cable TV measurements via an RS-232 or GPIB interface and provides a perpetual database for tracking system performance.

The software package provides the following capabilities:

Channel Table Generator – You can create your own custom channel tuning tables in addition to the standard tables provided. Result: Data will be consistently taken on all of your system carriers including scrambled channels, aeronautical offsets, and non-standard frequencies.

High-level Test Sequences – You can configure automatic test sequences from the 2714's built-in measurements. Creating a test sequence is a simple matter of indicating the desired tests in an on-screen setup matrix.

Report Generator – You can generate test and measurement reports that can be in any of several forms. These reports are directly usable for presentation of proof-of-performance data.

Historical Database – Data storage, archiving, and analysis for creating and comparing histories of previous measurements are provided.

Remote Control – Your PC can execute tests and measurements on a remotely located 2714 and receive results at the PC. Communication between the computer and the 2714 is through the RS-232 interface.

GENERAL PURPOSE CAPABILITIES

In addition to its special cable TV features, the 2714 also doubles as a highly capable, general-purpose spectrum analyzer. You get excellent RF performance, a built-in frequency counter, full programmability, enough nonvolatile memory for up to 108 saved displays and 36 front-panel setups, digital and true analog displays, high portability, and numerous other features, including field-changeable F and BNC connectors.

Characteristics Summary

CABLE TV MEASUREMENTS

The following specifications and features apply after a 15 minute warmup period and after all normalizations, including reference normalizations, have been performed. CATV characteristics represent typical performance and are dependent on general spectrum analyzer specifications. CATV characteristics need not be verified independently providing that all spectrum analyzer specifications are verified.

Channel Selection – Visual and aural carriers displayed when channel number is entered or front-panel selected.

Tune Configuration: STD, HRC, IRC, and custom; configured using 2714 PC software. Channel Range: 0 to 999; configured using 2714 PC software.

Frequency Range: 1 MHz to 1.8 GHz; dependent on selected Channel Table.

Visual Carrier Frequency – Measured with internal counter to 1 Hz resolution with accuracy of $5 \times 10^{-7} \times$ Carrier Frequency ± 10 Hz ± 1 Least Significant Digit.

Visual-to-Aural Carrier Frequency – Aural carrier measured with internal counter relative to visual carrier.

Difference Range: 1 MHz to 10 MHz (depending on selected channel table) for an amplitude difference of ≤ 30 dB and aural carrier to noise ≥ 15 dB (300 kHz RBW).

Resolution: 1 Hz.

Accuracy: ± 15 Hz for visual-to-aural carrier difference ≤ 8 MHz.

Visual Carrier Peak Level – Absolute peak amplitude measured with preamp off.

Amplitude Range: 18 dBmV to +58.8 dBmV for visual carrier to noise ≥ 30 dB (300 kHz RBW) and total input power $\leq +70$ dBmV.

Frequency Range: 15 MHz to 1015 MHz.

Resolution: 0.1 dB.

Absolute Accuracy: ± 2.5 dB for visual carrier to noise ≥ 30 dB (300 kHz RBW); for FM signals, carrier to noise ≥ 33 dB (100 kHz RBW).

Relative Accuracy: ± 0.5 dB relative to adjacent channel, ± 1.2 dB relative to all others.

Visual-to-Aural Carrier Level Difference – Difference Range: 0-30 dB for aural carrier to noise ≥ 15 dB (300 kHz RBW).

Resolution: 0.1 dB.

Accuracy: ± 0.75 dB for aural carrier to noise ≥ 15 dB (300 kHz RBW).

Modulation Depth – % AM measured from sync tip to lowest white level in 10 sweeps (VITS line used if defined in channel table).

AM Range: 50% to 95%.

Resolution: 0.1%.

Accuracy: $\pm 2\%$ for visual carrier to noise ≥ 40 dB (300 kHz RBW).

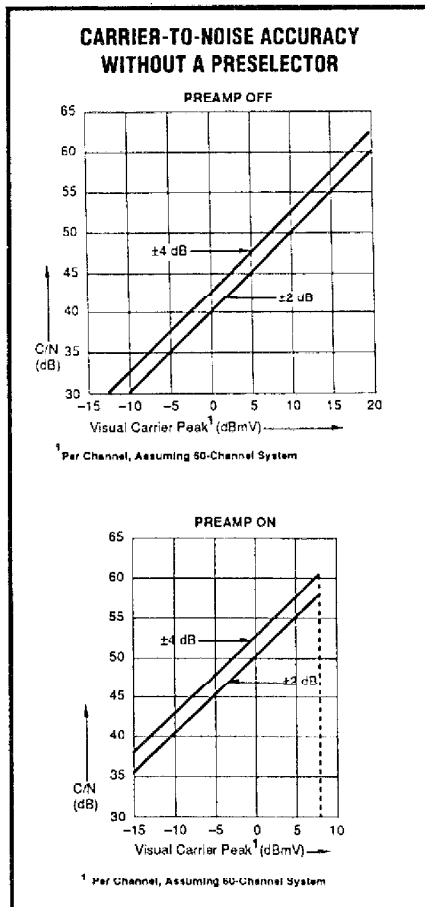
Hum/Low-Frequency Disturbance – Power line frequency measured on an unmodulated visual carrier and low frequency disturbance measured on the modulated carrier.

AM Range: 1% to 10% peak-to-peak.
Resolution: 0.1%.

Accuracy: $\pm 1\%$ for hum $\leq 5\%$ and visual carrier to noise ≥ 25 dB (300 kHz RBW); $\pm 2\%$ for hum, $< 10\%$ and visual carrier to noise ≥ 25 dB (300 kHz RBW).

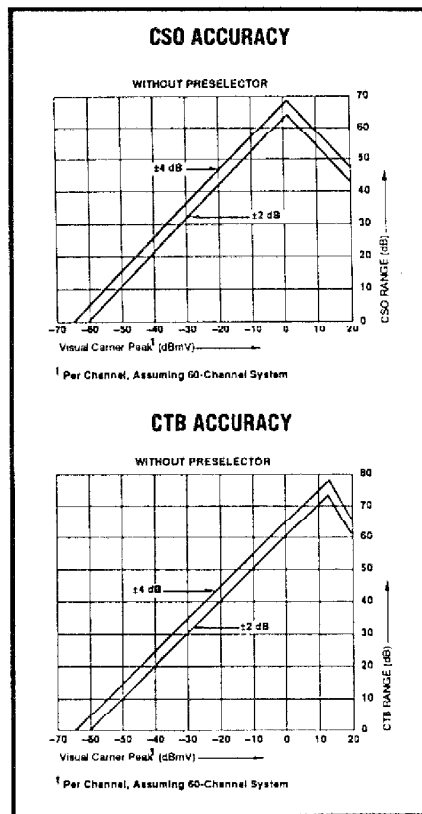
Carrier to Noise – Default noise floor is a normalized 4 MHz bandwidth measured relative to the visual carrier peak Range and Accuracy: See figure below.

Resolution: 0.3 dB.



Carrier-to Noise Accuracy without Preselector.

CTB/CSO – Measured relative to visual carrier peak according to NCTA recommendations. Range and Accuracy: See following figure. Resolution: 0.3 dB.



CTB/CSO Accuracy without Preselector.

Frequency Response – For fixed-amplitude scrambling or no scrambling, system amplitude variations (flatness) are displayed relative to a reference trace stored during frequency-response reference setup.

Range: 5 dB/div.
Resolution: 0.2 dB.
Flatness Accuracy: ± 0.75 dB.

In-Channel Response – Expresses maximum variance in amplitude within some specified frequency range within a particular channel, given a "flat" input over that same specified range. The variance is referenced to the average of the highest and lowest amplitude within the frequency range.

Range: ± 3 dB.
Resolution: 0.1 dB.
Accuracy: ± 0.5 dB.

Carrier Survey – Absolute peak amplitude of each visual carrier is measured and each associated aural carrier level is measured relative to the visual carrier for the selected channel. Frequency counted only when FAST SURVEY is disabled.

Aural (FM) Deviation – Peak FM deviation is measured for the selected channel. Range: 10 kHz to 50 kHz; usable to 80 kHz. Accuracy: ± 4 kHz.

Cross Modulation – Peak of fundamental component of 3rd order distortion at horizontal sync frequency (AM) measured on the unmodulated visual carrier.

Range: 52 dB; usable to 65 dB.
Resolution: 0.1 dB.

Accuracy: ± 2 dB for cross modulation < 40 dB; ± 3 dB for cross modulation < 52 dB.

Listen Mode – Selected channel's aural carrier is FM demodulated and output fed to speaker or headphone jacks; instantaneous peak FM deviation is displayed.

View Picture Mode – NTSC or PAL visual carrier is demodulated and displayed.

View Modulation (Field) – One video field of the selected channel's video is displayed.

View Modulation (Line) – VITS line displayed; if VITS line isn't specified in channel table, line 17 displayed.

TV Line Selection: Via FREQ/MKRS knob.

Line Format: NTSC or PAL.

Line Range: 1-525 (NTSC); 1-625 (PAL).

Sweep Time: 10 μ sec/div.

Spectrum Analyzer Specifications Summary

FREQUENCY RELATED

Frequency Range – 9 kHz to 1800 MHz.

Center Frequency Accuracy – 5×10^{-7} of center frequency ± 700 Hz.

Frequency Counter Accuracy – 5×10^{-7} of center frequency ± 10 Hz ± 1 LSD (least significant digit).

Residual FM – ≤ 100 Hz p-p/20 msec at ≤ 20 kHz span/div; ≤ 2 kHz p-p/20 msec at > 20 kHz span/div.

Resolution Bandwidth (–6 dB) – 5 MHz, 1 MHz, 300 kHz, 100 kHz, 30 kHz, 10 kHz, 3 kHz, 1 kHz, and 300 Hz.

RBW Shape Factor (60 dB/6 dB) – $\leq 7:1$ for $RBW \leq 1$ MHz.

Noise Sidebands – ≤ -70 dBc at $30 \times RBW$ for $RBW \leq 100$ kHz.

Frequency Span/Div Range – 100 MHz to 1 kHz selected in 1-2-5 sequence or any value from 100 MHz to 1 kHz via the keypad or UTIL menu, plus 180 MHz and 0 Hz.

Span Accuracy – $\pm 3\%$ measured over the center eight divisions.

AMPLITUDE RELATED

Flatness – ± 2 dB (relative to reference level at 100 MHz) measured with 10 dB internal RF attenuation (preamp off).

Vertical Display Modes – 10, 5, 1 dB/div., Linear.

Display Dynamic Range – 80 dB maximum (Log Mode); 8 divisions maximum (Linear Mode).

Continued on next page.

Spectrum Analyzer

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RF Attenuation Range – 0 to 50 dB in 2 dB steps.

Maximum Sensitivity (at 300 Hz RBW) – -78 dBmV (-127 dBm); -90 dBmV (-139 dBm) with preamp on.

SPURIOUS RESPONSE (PREAMP OFF)

3rd Order IM Distortion – ≤ -70 dBc from any two on screen signals with any frequency span.

2nd Harmonic Distortion – ≤ -66 dBc measured with 1st mixer input level of $\leq +9$ dBmV.

INPUT RELATED

RF Input – 75 Ω BNC with quick change to 75 Ω type F connector.

VSWR – With RF Attenuation ≥ 10 dB: 1.5:1 maximum to 1 GHz. With 0 dB RF Attenuation: 2:1 maximum to 1 GHz.

Maximum Safe Input – +70 dBmV (0.1 W or 2.2 V) continuous peak with 100 VDC blocking capacitor.

1 dB Compression Point – $\geq +34$ dBmV (-15 dBm) with 0 RF attenuation and 1st mixer at +19 dBmV (-30 dBm.)

ENVIRONMENTAL

Temperature – Operating: 0° to +50°C (MIL T-28800E). Nonoperating: -55° to +75°C.

Humidity – Nonoperating: Five cycles (120 hours) in accordance with MIL-Std 28800E, Class 5.

Vibration – Meets MIL T-28800E, Method 514, Procedure X (modified).

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.

Altitude – Operating: 15,000 ft. Nonoperating: 50,000 ft.

Radiated and Conducted Emissions – Meets FCC Part 15, Subpart J, Class A and VDE 0871, Class B.

GENERAL CHARACTERISTICS

Power Requirements – 105 W maximum (1.4 A) at 115 V, 60 Hz; operates 48 Hz to 440 Hz, 90 to 132 VAC, or 48 Hz to 63 Hz, 90 VAC to 250 VAC; battery power option available.

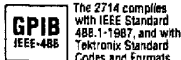
Weight – <10.2 kg (22.5 lbs) nominal for basic configuration.

Dimensions (H,W,D with Feet, Handle, and Front-Panel Cover) – 137 x 361 x 445 mm (5.4 x 14.2 x 17.5 in).

Note: Full specifications are available in the 2714 Cable TV Spectrum Analyzer Data Sheet, Tektronix Literature number 2EW-8705-0.

ORDERING INFORMATION

2714	
Cable TV Spectrum Analyzer	\$14,200
Includes: PC Software, power cord (U.S. 115 V/60 Hz), User Manual, Programmer Manual, Software Reference Manual, front cover, 75 Ω BNC connector, 75 Ω F connector, and choice of GPIB or RS-232 interface (Opt. 03 or Opt. 08).	
Opt. 03 – Provides an IEEE-488 General Purpose Interface Bus (GPIB) as a no-cost option (not compatible with Opt. 08).....	NC
Opt. 07 – Add low-cost battery pack	+\$1,350
Opt. 08 – Provides an RS-232 port as a no-cost option (not compatible with Opt. 03).....	NC
Opt. 15 – Add 1st local oscillator output for a 1405 TV Sideband Analyzer.....	+\$280
Opt. 30 – Rackmount adapter for 19 x 5.25 in. rack dimensions.....	+\$250
Opt. 33 – Travel Line package; includes: rain cover, accessory pouch, gray CRT filter, and carrying strap.....	+\$100
Opt. 34 – Portable-to-rackmount adapter for 19 x 7 in. rack dimensions	+\$590
Opt. B1 – Service Manual	+\$135
Opt. B2 – Additional set of manuals.....	+\$240
INTERNATIONAL POWER PLUG OPTIONS	
Opt. A1 – Universal Euro 220 V, 50 Hz.....	NC
Opt. A2 – United Kingdom 240 V, 50 Hz	NC
Opt. A3 – Australian 240 V, 50 Hz.....	NC
Opt. A4 – North American 240 V, 60 Hz.....	NC
Opt. A5 – Switzerland 220 V, 50 Hz.....	NC
See Customer Information Section for additional description.	
WARRANTY-PLUS SERVICE OPTIONS	
Opt. M7 – Calibration Service	+\$400
Opt. M9 – Repair Protection	+\$795
SOFTWARE	
See page 210 for additional information.	
271x PC Utility Software – Order S26UT10	\$575
CAMERA/PLOTTER	
See Camera section page 408 for complete description.	
Camera – Low cost. Order C-9 Opt. 1A and Opt. 20	\$710
Plotter – Four color. Order HC100 Opt. 01.....	\$1,180
CART – K218 Instrument Cart.....	\$695
CABLES, PADS, AND ADAPTERS	
75 Ω Coaxial Cable –	
BNC to BNC 42 in. Order 012-0074-00.....	\$31
BNC to BNC 24 in. Order 012-1339-00.....	\$45
F Series input adapter/connector replacement.	
Order 103-0301-00.....	\$20
BNC input adapter/connector replacement.	
Order 103-0310-00.....	\$36
GPIB Cables –	
0.5 m. Order 012-1282-00.....	\$150
1 m. Order 012-0991-01.....	\$170
2 m. Order 012-0991-00.....	\$170
4 m. Order 012-0991-02.....	\$260
RS-232 Modem Cables –	
9 pin female to 25 pin male. Order 012-1241-00.....	\$70
9 pin female to 9 pin female. Order 012-1379-00.....	\$65
9 pin female to 25 pin female. Order 012-1380-00.....	\$60
25 pin male to 36 pin male. Order 012-1250-00.....	\$50
"F" Female to BNC Male Adapter – Order 013-0126-00.....	\$22
BNC Female to "F" Male Adapter – Order 103-0158-00.....	\$14
"N" Female to BNC Male Adapter – Order 103-0058-00.....	\$15.50
GPIB CARDS	
PC-GPIB Card – IBM PC, AT, and compatibles.	
Order S3FG210	\$395
AT-GPIB Card – IBM AT Bus (high speed card).	
Order S3FG220	\$495
MC-GPIB Card – IBM PS2 with Microchannel Bus.	
Order S3FG230	\$495
ADDITIONAL ACCESSORIES	
Service Manual – Order 070-8534-01	*1
Front Panel Cover – Order 200-2520-00	\$12.25
Transit Case – Order 016-0792-02	\$460
Soft Side Case – Order 016-1158-00	\$120
Rain Cover – Order 200-2500-00	\$12.25
Accessory Pouch – Mounts on top. Order 016-0617-02.....	\$75
Carrying Strap – Order 346-0199-00.....	\$22
TekMate Mounting Hardware – Order 016-1109-00	\$70
Viewing Hoods –	
Collapsible. Order 016-0592-00.....	\$16.50
Binocular. Order 016-0566-00	\$24
Polarized. Order 016-0180-00.....	\$80
CRT Filter – Smoke Gray. Order 337-2775-02	\$11
<i>*1 Please contact your local Tektronix representative for price and ordering information.</i>	



The 2714 complies with IEEE Standard 488.1-1987, and with Tektronix Standard Codes and Formats.