Spectrum Analyzers
2714 • 2715

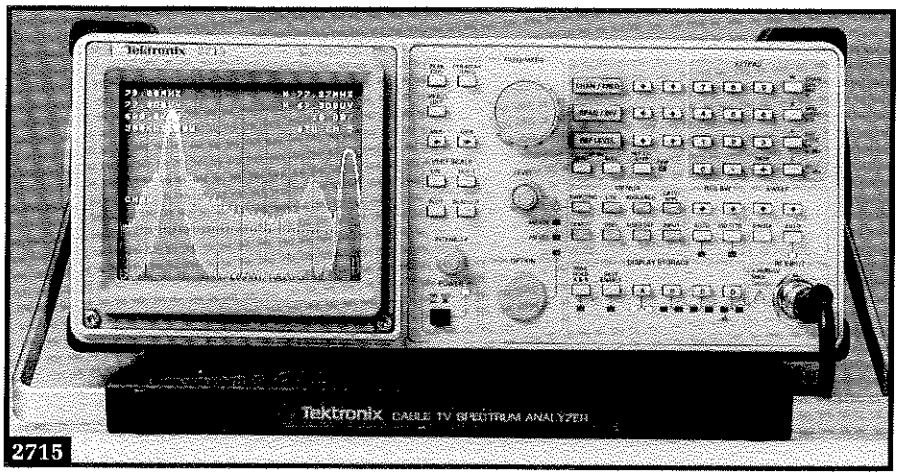
Features

2715

- In-service Measurements for In-channel C/N and Frequency Response, and CSO

2714/2715

- 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 and Audio, and AM/Wideband FM Video Demodulation
- UL Listed 1244, Certified to CSA C22.2 No. 231-M89



The 2714 and 2715 simplify cable TV and broadband LAN measurements.

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.

2715 Cable TV Spectrum Analyzer

DEPENDABLE, IN-SERVICE RF MEASUREMENTS AT AN AFFORDABLE PRICE

The Tektronix 2715 Cable TV Spectrum Analyzer includes all the capabilities of the 2714 Cable TV Spectrum Analyzer and more! Now you can make proof of performance and other cable system measurements without disruption of service to subscribers. And you can minimize the inconvenience of making measurements at the output of set-top converters. The 2715 provides accurate and automated measurement of in-channel carrier-to-noise, in-channel response, and coherent distortion signals, as well as carrier levels, frequencies, and more... without removal of carriers or modulation. In-service measurement of CTB requires an empty, adjacent channel or spectrum space.

You get all this capability in a 23-lb., compact, easy-to-carry package... at an attractive price. Similar to the Tektronix 2714, the 2715 includes the capabilities that will help you with system maintenance and toward speedy resolution of cable system problems: built-in preamplifier, audio and video demod, selectable TV line and field triggering and true, full gray-scale analog display for finding spurious signals and beats among noise and for checking modulation characteristics. Analog display is also used in the depth of modulation adjustment mode that is included with the 2715.

For your local Tektronix representative see the list in the back of this catalog or outside the U.S. call: 1-503-627-1933, inside the U.S. call: 1-800-426-2200.

GPIB IEEE-488 *Product(s) complies with IEEE Standard 488.1-1987, and with Tektronix Standard Codes and Formats.*

See Tektronix on the World Wide Web: http://www.tek.com

ISO 9001 *Tektronix Measurement products are manufactured in ISO registered facilities.*

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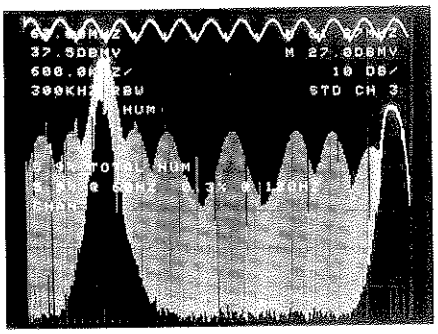
A complete set of in-service measurements can be configured into a system test program that can be executed with the push of one or two front-panel keys. Results from the field can be readily transferred from the 2715's non-volatile memory to your PC via the RS-232 or GPIB communications interface. The Tektronix Spectrum Analyzer RF Measurements software package, which is included in the price of the 2715, provides a data base for your measurements and can generate reports. Data is compatible with most popular spreadsheet packages. This software also provides remote operation capability for the 2715.

The 2715 includes a convenient, field-replaceable input connector that can easily be converted from type F to BNC.



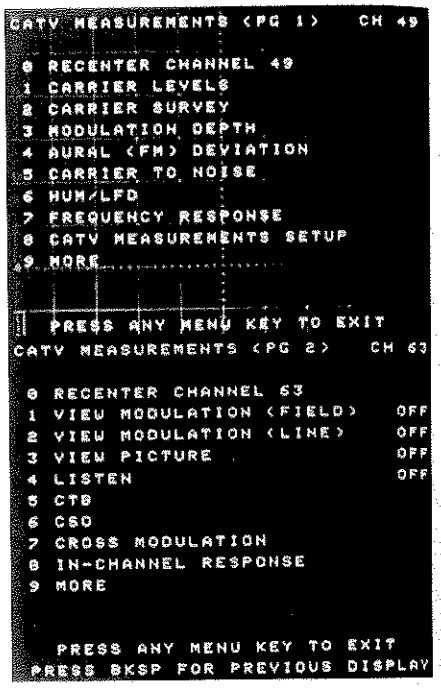
Measurement conditions and results are clearly displayed on-screen. Text can even be added, to describe measurement location, for example.

BUILT-IN, AUTOMATIC MEASUREMENTS

The 2714/2715 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
- Dual-carrier audio level and frequencies
- Survey of system visual and aural carrier levels and frequencies
- Depth-of-modulation measurement
- Depth-of-modulation adjustment
- Aural carrier deviation measurement
- Aural carrier deviation adjustment
- 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 and CSO
- Cross-modulation measurement

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.



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

Measurement results can be output to a printer or plotter connected directly to the interface port. Results can also be automatically stored in the non-volatile memory for later transfer to a PC. This, along with high portability, makes these analyzers ideal as automatic data collection tools in the field for engineers and technicians alike.

THE 2714/2715 CAPITALIZE ON PC POWER

The PC-based software package that accompanies the 2714/2715 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 – 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 built-in measurements. Creating a test sequence is a simple matter of indicating the desired tests in an on-screen setup matrix.

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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.

GENERAL PURPOSE CAPABILITIES
In addition to their special cable TV features, the 2714/2715 also double as highly capable, general-purpose spectrum analyzers. 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.

The 2714/2715 can also be used to characterize filters, cable trunk amplifiers, line extenders, and other 2-port devices when used with the Option 05 External Tracking Generator.

Characteristics (Cable TV)

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 PC software.
Channel Number Range: 0 to 999; configured using 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 $5x10^{-7}$ x 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 ≤+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.
Note: This test may not be valid on some scrambled channels.

Visual-to-Aural Carrier Level Difference –
Difference Range: 0 to 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).
Note: This test may not be valid on some scrambled channels.

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: ±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: ±1% for hum ≤5% and visual carrier-to-noise ≥25 dB (300 kHz RBW); ±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.
Normalized bandwidth is user-selectable.
Resolution: 0.3 dB.
In-service, in-channel measurement with 2715.

CTB/CSO – Measured relative to visual carrier peak according to NCTA recommendations.
Resolution: 0.3 dB.
In-service CSO measurement with 2715.

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.
In-service measurement with 2715.
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 ACCUR AMPL AND FREQ is enabled.
Note: This test may not be valid on some scrambled channels.

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: 48 dB.
Resolution: 0.1 dB.
Accuracy: ±2 dB for cross modulation <36 dB; ±3 dB for cross modulation <48 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 – Visual carrier is demodulated and displayed.

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

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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, PAL, SECAM.
Line Range: 1-525 (NTSC); 1-625 (PAL).
Sweep Time: 10 µsec/div.

Characteristics (Spectrum Analyzer)

FREQUENCY RELATED

Frequency Range – 9 kHz to 1800 MHz.

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

Frequency Counter Accuracy – 5 x 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) – ≤7:1 for RBW ≤1 MHz.

Noise Sidebands – ≤–70 dBc at 30 x RBW for RBW ≤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 – ±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 max. (Log Mode); 8 divisions maximum (Linear Mode).

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 ≤+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 V DC blocking capacitor.

1 dB Compression Point – ≥+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, Paragraph 4.5.5.3.1 (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.

Electromagnetic Compatibility – EC92 EMC Directive 89/336/EEC:
Emissions: EN50081-1.
Radiated Emissions, 30 MHz to 1 GHz, EN55022 Class B (CISPR 22 B).
Conducted Emissions, 150 kHz to 30 MHz, EN55022 Class B (CISPR 22 B).
Conducted Emissions, power line harmonics, 0 to 2 kHz, IEC 555-213.
Immunity: EN50082-1.
Electrostatic Discharge, 8 kV, IEC 801-2.
Radiated Immunity, 27 MHz to 500 MHz, IEC 801-3. No response above –90 dBm in a 3 V/meter field.
Fast Transients, capacitive clamp, 1 kV power leads, 500 V control leads, IEC 801-4. Power Line Surge, 1 kV differential mode, 2 kV Common mode, IEC 801-5.

GENERAL CHARACTERISTICS

Power Requirements – 105 W maximum (1.4 A) at 115 V, 60 Hz: Operates 48 Hz to 440 Hz, 90 to 132 V AC, or 48 Hz to 63 Hz, 90 V AC to 250 V AC.

PHYSICAL CHARACTERISTICS

Dimensions	mm	in.
Height	137*1	5.4*1
Width	361*1	14.2*1
Depth	445*1	17.5*1
Weight	**kg**	**lb.**
Net	<10.2*2	22.5*2

*1 *With feet, handle, and front-panel cover.*
*2 *Nominal for basic configuration.*

Note: Full specifications are available in the 2714 and 2715 Cable TV Spectrum Analyzer Data Sheets.

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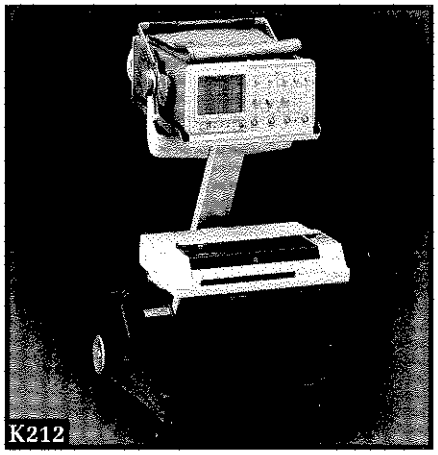
Accessories

K212 INSTRUMENT CART
- Low Cost Portability
- Tiltable Top Tray
- Durable Aluminum and Thermoset Polyester Construction



ORDERING INFORMATION

For price information: Outside the U.S. contact your local Tektronix representative, inside the U.S. see the price list in the back of this catalog.

2714
Cable TV Spectrum Analyzer.
Includes: PC Software, Power Cord (U.S. 115 V/60 Hz), User's 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).

2715
Cable TV Spectrum Analyzer.
Includes: PC Software, Power Cord (U.S. 115 V/60 Hz), User's 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).

Opt. 05 – 100 kHz to 1.8 GHz External Tracking Generator with Mechanical Mating Kit (includes Opt. 15).

Opt. 07 – Add 2704 Inverter/2705 Battery Pack.

Opt. 08 – Provides an RS-232 Port as a no-cost option (not compatible with Opt. 03).

Opt. 15 – Add 1st Local Oscillator Output for a 1405 TV Sideband Analyzer or External Tracking Generator.

Opt. 30 – Rackmount Adapter for 19 x 5.25 in.

Opt. 33 – Travel Line Package includes: Rain Cover, Accessory Pouch, Gray CRT Filter, and Carrying Strap.

Opt. 34 – Portable-to-rackmount Adapter for 19 x 7 in.

INTERNATIONAL POWER PLUG OPTIONS
Opt. A1 – Opt. A5. See Customer Information Section for additional description.

SERVICE ASSURANCE OPTIONS
Opt. R2 – Adds two years of post-warranty Repair Protection.
Opt. C5 – Adds five years of Calibration Services.

SOFTWARE
See page 220 for additional information.
271x PC Utility Software – Order S26UT10.

ADDITIONAL ACCESSORIES
Also see pages 434.

CAMERAS/PLOTTERS/PRINTERS
Camera – Low cost. Order C-9 Opt. 1A and Opt. 20.
Plotter – Four Color. Order HC100 Opt. 01.
CART – K212 Instrument Cart.

CABLES, PADS, AND ADAPTERS
75 Ω Coaxial Cable –
BNC to BNC 42 in. Order 012-0074-00.
BNC to BNC 24 in. Order 012-1339-00.
F Series Input Adapter/Connector Replacement – Order 103-0301-00.
BNC Input Adapter/Connector Replacement – Order 103-0310-00.
GPIB Cables – 0.5 m. Order 012-1282-00.
1 m. Order 012-0991-01.
2 m. Order 012-0991-00.
4 m. Order 012-0991-02.
RS-232 Modem Cables –
9-Pin Female to 25-Pin Male. Order 012-1241-00.
9-Pin Female to 9-Pin Female. Order 012-1379-00.
9-Pin Female to 25-Pin Female. Order 012-1380-00.
25-Pin Male to 36-Pin Male. Order 012-1250-00.
"F" Female to BNC Male Adapter – Order 013-0126-00.
BNC Female to "F" Male Adapter – Order 103-0158-00.
"N" Female to BNC Male Adapter – Order 103-0058-00.

GPIB CARDS
PC-GPIB Card – IBM PC, AT, and Compatibles. Order S3FG210.
AT-GPIB Card – IBM AT Bus (High-speed Card). Order S3FG220.
MC-GPIB Card – IBM PS/2 with Microchannel Bus. Order S3FG230.

User's Manual
2714. Order 070-8532-02.
2715. Order 070-9115-00.
Service Manual – Order 070-8534-00.
Front Panel Cover – Order 200-2520-00.
Transit Case – Order 016-0792-02.
Soft Side Case – Order 016-1158-00.
Rain Cover – Order 200-2500-00.
Accessory Pouch – Mounts on top. Order 016-0677-03.
Carrying Strap – Order 346-0199-00.
Viewing Hoods – Collapsible. Order 016-0592-00.
Binocular. Order 016-0566-00.
Polarized. Order 016-0180-00.
CRT Filter – Smoke Gray. Order 337-2775-02.

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