

# SPECTRUM ANALYZERS

# TEK



## 2710 Spectrum Analyzer

The 2710 is a recognized value leader in spectrum analysis. This economical yet powerful instrument is well-suited to a wide variety of applications, such as checking CATV headend and distribution systems, maintaining industrial security, and teaching frequency domain concepts in the classroom.

The 2710 is highly configurable. Buy as much measurement power as you need or can afford initially, then upgrade as your situation warrants.

The standard 2710 shares many of the 2712's valuable features. Compact size, light weight (9.5 kg, about 21 lbs.), and available battery operation (refer to 2704 Inverter/2705 Battery Pack descriptions) means you can operate in almost any environment. Both instruments can also be quickly converted to rack operation with optional rackmount adapters.

True analog display capability, along with fast sweep speeds and TV Line and TV Field triggering provide convenient demodulation of video carriers for making depth-of-modulation checks or looking at special baseband data, VITS, and many other signals.

An internal audio amplifier and AM/FM detectors let you hear demodulated signals, using either the built-in speaker or headphone jack, for fast signal identification and troubleshooting in communications applications.

With the optional Video Monitor Mode installed, you can check signals on a remote basis or identify down-linked video transponders.

Basic accuracy of  $1 \times 10^{-5}$  is provided, more than adequate for many applications. If you find you need more, Option 01 raises center

frequency accuracy to  $5 \times 10^{-7}$  and adds a 300 Hz resolution bandwidth (RBW) filter.

Sensitivity is up to  $-117$  dBm ( $-70$  dBmV) at 3 kHz RBW. The built-in preamp can add another 12 dB, up to  $-129$  dBm ( $-82$  dBmV). 80 dB on-screen dynamic range helps see weak signals, even when strong ones are present.

### ORDERING INFORMATION

#### 2710 Spectrum Analyzer

**Includes:** Power cord (U.S. 115 V/60 Hz); Operator's manual; Front cover; 75/50  $\Omega$  min-loss pad; and N-to-BNC adapter; User's Guide.

#### OPTIONS

**Opt. 01** — Add 300 Hz RBW filter, phaselock stabilization, and  $5 \times 10^{-7}$   $\pm 700$  Hz frequency accuracy.

**Opt. 02** — Add internal frequency counter.

**Opt. 03** — GPIB interface (cannot combine with Opt. 09).

**Opt. 04** — Add internal tracking generator, 100 kHz-1800 MHz, 0 dBm to  $-48$  dBm in 0.1 dB steps (cannot combine with Opt. 14).

**Opt. 07** — Add 2704 Inverter and 2705 Battery Pack. Includes: power cord (U.S. 115 V/60 Hz), operator's manual, mounting plate.

**Opt. 09** — Centronics interface (cannot combine with Opt. 03).

**Opt. 10** — Video monitor mode

**Opt. 14** — Add 1 kHz, 10 kHz, 100 kHz and 1 MHz RBW filters (cannot combine with Opt. 04).

**Opt. 15** — Tek 1405 TV Sideband Adapter Interface.

**Opt. 30** — Rackmount for 19-inch rack width, 5-inch height.

**Opt. 33** — Travel Line Package

**Includes:** Accessory pouch; carrying strap; vinyl rain cover.

**Opt. 34** — Portable-to-Rackmount adaptor for 19-inch rack width, 7 inch height. Offers immediate instrument portability when needed.

### OPTIONAL ACCESSORIES

**Service Manual** — Order 070-6024-01

**Front Panel Cover** — Order 200-2520-00

**Accessory Pouch** — Order 016-0677-02

**Viewing Hoods** — Order (Collapsible) 016-0592-00; (Binocular) 016-0566-00; (Polarized) 016-0180-00

**Carrying Strap** — Order 346-0199-00

**Shipping Case** — Order 016-0792-02

**Smoke Gray CRT Filter** — Order 337-2775-02

### INTERNATIONAL POWER PLUG OPTIONS

**Opt. A1-A5** — Available

### WARRANTY-PLUS SERVICE PLANS

**Opt. M1** — Available

**Opt. M2** — Available

**Opt. M3** — Available

### 2712/2710 CHARACTERISTICS

The following specifications apply to the 2712 and 2710 after a 15-minute warmup period, unless otherwise noted. Items marked with an asterisk (\*) are supplemental characteristics giving typical but non-warranted performance parameters.

#### 2712 and 2710 Feature Comparison

| Capability                                   | 2712                     | 2710             |
|----------------------------------------------|--------------------------|------------------|
| Frequency Range                              | 9 kHz - 10 kHz - 1.8 GHz | 10 kHz - 1.8 GHz |
| $\pm 0.5$ ppm Freq. Accuracy                 | Std                      | Opt. 01          |
| Signal Counter                               | Std                      | Opt. 02          |
| GPIB Interface                               | Std                      | Opt. 03          |
| Internal Tracking Gen.                       | Opt. 04                  | Opt. 04          |
| Inverter/Battery Pack                        | Opt. 07                  | Opt. 07          |
| No Charge RS-232-C Interface (replaces GPIB) | Opt. 08                  | N/A              |
| Centronics Interface                         | N/A                      | Opt. 09          |
| Video Monitor Mode                           | Opt. 10                  | Opt. 10          |
| EMC Prequalification Measurements            | Opt. 12                  | N/A              |
| TV Sideband Adapter Interface                | Opt. 15                  | Opt. 15          |
| Nonvolatile Memory                           | 124k                     | 28k              |
| High Portability                             | Yes                      | Yes              |
| Both Digital and True Analog Displays        | Yes                      | Yes              |
| Dedicated Numeric Keypad                     | Yes                      | N/A              |
| Real-Time Clock                              | Yes                      | N/A              |

### FREQUENCY RELATED

**Frequency Range** — 2712: 9 kHz to 1800 MHz; 2710: 10 kHz to 1800 MHz.

**Center Frequency Accuracy** — 2712:  $5 \times 10^{-7}$  of CF  $\pm 700$  Hz; 2710:  $1 \times 10^{-5}$  of CF  $\pm 5$  kHz; 2710 w/Option 01: Same as 2712.

**Frequency Counter Accuracy (Std. 2712, Opt. 02 2710)** — 2712:  $5 \times 10^{-7}$  of CF  $\pm 10$  Hz,  $\pm 1$  LSB; 2710:  $1 \times 10^{-5}$  of CF  $\pm 10$  Hz,  $\pm 1$  LSB; 2710 w/Option 01: Same as 2712.

**\*Dot Marker Frequency Accuracy** — CF Accuracy  $\pm 3\%$  of span, typical.

**Typical Long-Term Drift** — 2712: 2 ppm/yr; 2710: 10 ppm/yr; 2710 w/Opt. 01: Same as 2712.



**Short-Term Drift** — 2712:  $\leq 400$  Hz maximum drift between correction cycles; 2710:  $\leq 20$  kHz maximum drift between correction cycles; 2710 w/Opt. 01: Same as 2712.

**Residual FM** — 2712:  $\leq 100$  Hz p-p/20 msec at  $\leq 20$  kHz span/div;  $\leq 2$  kHz p-p/20 msec at  $> 20$  kHz span/div; 2710:  $\leq 2$  kHz p-p/20 msec; 2710 w/Opt. 01: Same as 2712.

**Resolution Bandwidth** (–6 dB) — 2712: 5 MHz, 300 kHz, 30 kHz, 3 kHz, 300 Hz; 2710: 5 MHz, 300 kHz, 30 kHz, 3 kHz; 2710 w/Opt. 01: Same as 2712; 2712/2710 w/Opt. 14: add 1 MHz, 100 kHz, 10 kHz, 1 kHz.

**Resolution Bandwidth Shape Factor (60dB/6 dB)** —  $\leq 7:1$

**Noise Sidebands** —  $\leq -70$  dBc at  $30 \times \text{RBW}$ .

**Video Filter** — Approx. 1/100 (Auto) of RBW. Manual Selection: 3 Hz to 300 kHz in 1-3 sequence.

**Freq. Span/Div Range** — 2712 (2710 w/Opt. 01): 180 MHz to 1 kHz; 2710: 180 MHz to 10 kHz selected in 1-2-5 sequence or 2 significant digits via menu.

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

#### AMPLITUDE RELATED

**Flatness** —  $\pm 1.5$  dB measured with 10 dB internal RF attenuation (preamp off).

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

**Measurement Range** — 2712: –139 (preamp on) to +20 dBm (–92 to +67 dBmV); 2710: –129 (preamp on) to +20 dBm (–82 to +67 dBmV); 2710 w/Opt. 01: Same as 2712.

**Display Dynamic Range** — 80 dB max (limited to 40 dB in optional 2712 Quasi-Peak Detector mode).

**Reference Level Range** — LOG Mode: –70 to +20 dBm (–23 to +67 dBmV), or down to –90 dBm with preamp on. LINEAR Mode: 8.8  $\mu\text{V}$  to 280 mV.

**Reference Level Steps** — LOG Mode: 1 dB or 10 dB. LINEAR Mode: 1-2-5 sequence.

**Mixer Level Input** — Automatically controlled by instrument for on-screen signals. Level selectable between –20 to –50 dBm (+27 to –3 dBmV).

**Display Amplitude Accuracy** — 10 dB/div:  $\pm 1.0$  dB/10 dB to max. cum. error of  $\pm 2$  dB over 70 dB range,  $\pm 2$  dB/10 dB over 70-80 dB range. 5 dB/div:  $\pm 1.0$  dB/10 dB to max. cum. error of  $\pm 2.0$  dB over 40 dB range. 1 dB/div: 1 dB max. error over 8 dB range. LINEAR Mode:  $\pm 5\%$  of full scale.

**RF Attenuation Range** — 0 to 50 dB, 2 dB steps.

**Sensitivity** — 2712: –127 dBm (–80 dBmV) at 300 Hz RBW, –139 dBm (–92 dBmV) at 300 Hz RBW with preamp on (to 600 MHz); 2710: –117 dBm (–70 dBmV) at 3 kHz RBW, –129 dBm (–82 dBmV) at 3 kHz RBW with preamp on (to 600 MHz); 2710 w/Opt. 01: Same as 2712.

#### SPURIOUS RESPONSE (with preamp off)

**Residual Spurious Response** —  $\leq -100$  dBm referenced to input of 1st mixer.

**3rd Order IM Distortion** —  $\leq -70$  dBc, from any two on-screen signals within any frequency span measured with 1st mixer input level of  $\leq -30$  dBm (+17 dBmV).

**2nd Harmonic Distortion** —  $\leq -66$  dBc measured with 1st mixer input level of  $\leq -40$  dBm (+7 dBmV).

#### INPUT RELATED

**LO Emission** —  $\leq -70$  dBm with 0 dB RF attenuation.

**RF Input** — Type N connector, 50  $\Omega$

**VSWR with 10 dB or more RF attenuation** — 1.5:1 max.

**Maximum Safe Input** — +20 dBm (0.1 W) continuous peak with 0 dB RF attenuation; 100 V dc (initially applied with full attenuation).

**1 dB Compression Point** —  $\geq -15$  dBm (+32 dBmV) with 0 dB RF attenuation.

#### SWEEP RELATED

**Sweep Times** — 1  $\mu\text{sec}$  to 2 sec/div in 1-2-5 seq. (7 decade range); AUTO SWEEP mode; MANUAL SWEEP select.

**Sweep Time Accuracy** —  $\pm 10\%$  over the center eight division.

**Trigger** — Free run, internal, external, line, TV field, TV line, single sweep, manual scan.

**Trigger Amplitude** — Internal: One division or more of signal. External: 1.0 V peak, minimum; DC coupled (15 Hz to 1 MHz).

#### INPUT/OUTPUT CHARACTERISTICS

**\*External Trigger** — BNC connector, 10 k $\Omega$  impedance, DC coupled 0.1  $\mu\text{s}$  minimum pulse width. 35 V max.

**\*External Video Input** — DC coupled, 0-50 kHz, 0-1.4 V (175 mV/div typical) signal input for vertical deflection of CRT beam.

**Sweep Gate Out** — TTL level signal that is HI while CRT beam sweeps.

**Sweep Output** — +1.3 to –1.3 V, negative going ramp, proportional to the horizontal sweep. Source impedance  $\leq 50 \Omega$ , load impedance  $\geq 10 \Omega$ .

**Video Output** — 0 to +1.6 V of video signal, proportional to vertical display amplitude. 0 V is top of screen. 1 k $\Omega$  impedance.

#### ENVIRONMENTAL

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

**Humidity** — Nonoperating: Five cycles (120 hours) per MIL-T-28800D, Class 5.

**Vibration** — Meets MIL-T-28800D 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.

**Radiated and Conducted Emissions** — Meets FCC Part 15, Sub-part J, Class A and VDE 0871, Class B.

#### GENERAL CHARACTERISTICS

**Power Requirements** — 90 W MAX (1.2 A) at 115 V, 60 Hz. Operates 48 Hz to 440 Hz, 90 to 132 V ac, or 48 Hz to 63 Hz to 250 V ac. Battery power (Opt. 07) available.

**Weight** — 10 kg (<22 lb.) nominal for basic configuration.

**Dimensions (H, W, D) with feet, handle and front panel cover** — 137×361×445 mm (5.4×14.2×17.5 inches).

#### OTHER CAPABILITIES

**Markers** — Single marker/delta marker; next right, next left peaks; next lower, next higher peaks; (highest) peak find; marker to CF.

**Nonvolatile memory** — Lithium battery backup. 2712: 124 KB available; up to 108\* displays saved; 36\* front panel setups, large\* user-definable key routines, and antenna tables (\* exact number and size depends on NV RAM utilization); 2710: 28 KB available; up to 18 displays saved and 9 front panel setups, user-definable key routines, and antenna tables.

**Digital Storage Display** — Selectable acquisition modes of positive peak only, positive/negative peak. SAVE A, B, C and active D trace; up to four traces on screen; MAX HOLD A, B; MIN HOLD C; B, C minus A; WATERFALL display mode; digital storage off provides analog sweep.

**Ensemble Averaging** — Provides weighted averaging of display resulting in reduction of random noise.

**Internal Preamp** — Preamp can be switched in/out of circuit (degrades flatness above 600 MHz, provides approx. 12 dB sensitivity improvement).

**Alternate Reference Level Units** — dBm, dBmV, dBV, dB $\mu\text{V}$ , dB $\mu\text{W}$ , dB $\mu\text{V/m}$ .

**User-definable Power-on Status** — Instrument powers up to user-definable state or supplied default settings.

**Center Measure** — Signal is centered with frequency and peak amplitude automatically read out (not a marker mode). The signal is counted in the 2712 or 2710 w/Opt. 02.

**Signal Track** — Drifting signal is kept at display center with correct frequency and peak amplitude displayed.

**Graticule Illumination** — For CRT photography.

**Direct Plot/Print** — Supports Epson FX-Series Printers and Tek HC100 Printer/Plotter via built-in GPIB interface (Std. 2712, 2710 Opt. 03), RS-232-C interface (Opt. 08, 2712 only), or Centronics interface (Opt. 09, 2710 only).