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Tektronix

2721A/2722A
Non-Interfering Sweep System
070-8743-00

**Please check for change information at the rear
of this manual.**

First Printing June 1993
Revised October 1993

Options

Power Supply When one of the following power plug options is ordered with a transmitter or receiver, the product will be shipped with a 220V/240V, 50 Hz power supply in place of the standard power supply.

| | |
|-----------|---------------------------------|
| Option A1 | Universal Europe (locking cord) |
| Option A2 | United Kingdom |
| Option A3 | Australia |
| Option A5 | Swiss |

2722A Receiver In addition to power supply options, there are three options that can be ordered for use with the sweep system. All three options are for the receiver:

| | |
|-----------|--|
| Option 01 | YT-1 Chart Recorder |
| Option 33 | Nylon Carrying Case with Hand/Shoulder Strap |
| Option 35 | Steel Safety Latch Hook |

Standard Accessories

The following accessories are included with the sweep system:

| | | |
|--------------------------|---|---|
| 2721A Transmitter | 1 | Power Supply, 120 V, 60 Hz, with Captive Power Plug |
| | 2 | Precision Female-Female Type F Adapter |
| | 1 | Rack Rails |
| | 1 | 2721A/2722A User Manual |
| 2722A Receiver | 1 | Power Supply, 120 V, 60 Hz, with Captive Power Plug |
| | 1 | Precision Female-Female Type F Adapter |
| | 1 | RS-232C Cable |
| | 1 | Voltmeter Lead Set |
| | 1 | Download Software |
| | 1 | 2721A/2722A User Manual |

Optional Accessories

The following accessories can be purchased for use with the sweep system:

| | | |
|--------------------------|-------------|--|
| 2721A Transmitter | 070-8756-00 | 2721A/2722A Service Manual |
| 2722A Receiver | 006-7647-00 | Thermal paper for YT-1 (Single) |
| | 006-7677-00 | Thermal paper for YT-1 (Box of 25) |
| | 103-0310-00 | BNC-to-F Adapter |
| | 146-0080-00 | Rechargeable 12 V Battery (See Appendix B) |
| | 070-8756-00 | 2721A/2722A Service Manual |

Ordering

All listed options and accessories can be ordered with the transmitter or receiver. Accessories are also available through your Tektronix field office or distributor.

Appendix A: Specifications and Compliance

The following tables of electrical characteristics and features apply to the 2721A/2722A Sweep System after a warm-up period (60 minutes 2721A, 10 minutes 2722A) followed by a hardware calibration between the two instruments. In addition, some performance parameters depend on signals provided by the customer. These requisite parameters are also defined in this document.

Specifications

Table A-1: Electrical Characteristics

| Characteristics | Performance Requirement | Supplemental Information |
|------------------------------|--------------------------------------|---|
| POWER | | |
| Line Frequency | 47.5 to 63 Hz | With 120 V/18 Vac transformer in accordance with UL and CSA ratings. |
| Line Voltages | 90 to 132 Vac | |
| | 180 Vac to 250 Vac | With 220V/19Vac transformer in accordance with IEC 950. |
| Power Consumption | | |
| 2721A | 60 W maximum 48 W maximum | 47 W typical, input to transformer. 36 W typical, AC input to instrument. |
| 2722A | 43 W maximum 30 W maximum | 31 W typical, input to transformer. 20 W typical, AC input to instrument. Battery: 23.5 W maximum, 17.7 W typical (2.2 A maximum at 10.7 V, 1.4 A typical at 12.6 V). |
| YT-1 printer | | Typically 6 Ω additional load while printing. |
| Battery voltage (2722A only) | 12 Vdc, nominal | Sealed, lead-acid battery; voltage measured at room temperature with back light off. |
| Continuous runtime (2722A) | 2.5 hours minimum | Under worst-case loading (does not include load from printer); 3.5 hours typical for a new battery. |
| Recharge time (2722A) | 15 hours maximum 24 hours maximum | From "BATLO" threshold. From total discharge. |
| Input charge current (2722A) | | 0.5 A typical, with external transformer supplied. |
| Battery replacement (2722A) | | Recommended when runtime is less than 2.5 hours typical after full charge. |
| NVRAM battery life | | 6 years minimum. |

Table A-1: Electrical Characteristics (Cont.)

| Characteristics | Performance Requirement | Supplemental Information |
|---|---|---|
| Weights & Dimensions (2721A) Weight Height Width Depth | | 6.2 Kg (13.75 lbs) 4.45 cm (1.75 in) 48.3 cm (19 in) 48.3 cm (19 in) |
| Weights & Dimensions (2722A) Weight (w/battery) Height Width Depth | | 8.0 Kg (17.75 lbs) 27.9 cm (11 in) 22.8 cm (9 in) 22.8 cm (9 in) |
| Temperature 2721A 2722A 2721A 2722A | 15° C to 45° C 0° C to 50° C -20° C to 75° C -20° C to 60° C | Operating Operating Non operating Non operating (to maintain backup battery life) |
| Humidity | | <95% RH below 30° C <75% RH from 30° C to 40° C <45% RH above 40° C |
| Altitude | | 4,575 m (15,000 ft) operating 12,000 m (40,000 ft) non operating |
| Vibration | | Resonant searches of 0.013 inches on all three axes for 15 minutes. Dwell for 10 minutes at major resonance or 33 Hz if none. Total vibration time is 75 minutes. |
| Shock | | Three guillotine-type shocks of 60g, half sine, 11 ms duration in each direction along each major axis; total of 18 shocks. |
| EMI Conducted Emissions Conducted Susceptibility Radiated Emissions Radiated Susceptibility | | CE01, CE02 CS01, CS02, CS06 RE01, RE02 RS01, RS02, RS03 |
| FCC Compliance | | FCC Part 15, subpart J, Class A |
| VDE Compliance | | VDE 0871, Class B |

Table A–2: 2721A Electrical Characteristics

| Characteristics | Performance Requirement | Supplemental Information |
|----------------------|--|--|
| Return Loss | | |
| Output | >16 dB, 75 Ω | At the output terminal, with 6 dB pad and precision F-style connector. Over 15 – 600 MHz frequency range. |
| Input | >16 dB, 75 Ω | At the input terminal, with precision F-style connector. Over 15 – 600 MHz frequency range. |
| Test pulse | | |
| Duration | 14 μ sec \pm 0.333 μ sec | Measured at 50% of amplitude. \pm 3 μ sec allocated to Sync board. |
| Position | 11.5 μ sec \pm 4 μ sec after midpoint of first post-equalizing pulse | \pm 1 μ sec allocated to Up/Down converters. Position specification for Std and RF Suppression modes only. |
| Frequency Range | 5 MHz to 600 MHz | At frequency point nearest 600 MHz. |
| Accuracy | \pm 5.0 KHz | At 25° C; frequency nearest 600 MHz. |
| Step size resolution | 40 KHz | Test pulse frequency user-definable to +40 kHz, –0. |
| Amplitude | | |
| Non-gated | +45 dBmV \pm 1.0 dB | Insertion level 6 dB below video carrier. |
| Gated | +33 dBmV \pm 1.0 dB | Insertion level 18 dB below video carrier. |
| | | At 25° C when leveled at factory with 0 dB tilt. Tilted output available in 2, 4, 6, 8 dB slopes. Output amplitudes apply to maximum pulse frequency. Amplitude drift: \leq –0.07 dB/° C typical (0.1 dB/° C maximum), 15–45° C. |
| Spurious signals | <–11 dBmV (–60 dBm) | For frequencies \leq 740 MHz, measured with pulse carrier on. |
| Out of band | \leq +24 dBmV (–25 dBm) | For frequencies > 740 MHz. |
| TELEMETRY CARRIER | | |
| Format | | Frequency Shift Keyed (deviation = 170 kHz nominal). |
| Frequency Range | 15 MHz to 600 MHz | User selectable. Measured with Sweep mode disabled, at point nearest 600 MHz. |
| Accuracy | \pm 5.0 KHz at shift point | Sweep mode stopped. |
| Resolution | 40 KHz | |
| Amplitude | +45 dBmV \pm 0.5 dB +45 dBmV \pm 3 dB | +45 dBmV \pm 0.5 dB at 25° C, 50 MHz. +45 dBmV \pm 3 dB at 25° C, 15 MHz to 600 MHz. Amplitude drift: \leq –0.07 dB/° C typical (0.1 dB/° C maximum), 15 to 45° C. |

Table A-2: 2721A Electrical Characteristics (Cont.)

| Characteristics | Performance Requirement | Supplemental Information |
|--|---|--|
| RF INPUT SIGNALS | | |
| Input NO DAMAGE Amplitude/ channel Video Carrier | +16 dBmW (+65 dBmV) 0 dBmV to +10 dBmV | Sum of total RF power. Measured at Sync tip, non-suppressed. With respect to the video carrier, all AM modulation sources removed (scrambler sync timing signals). |
| Audio Carrier | +3 dBmV to +13 dBmV -15 dBc \pm 3 dB | For signals encoded using Oak Sigma format. Measured at the TV modulator in all supported modes. |
| RF Input Signal Baseband Characteristics | | |
| Video Modulation Formats | NTSC or PAL | SECAM guaranteed by design but not tested (not compatible with SECAM-L systems). |
| Recovered video S/N (baseband and cable noise only) | 30 dB | |
| Hum | 3% | |
| Sync Amplitude NTSC PAL/SECAM | 40 IRE \pm 10 IRE 300 mV \pm 75 mV | |
| Burst Amplitude NTSC PAL/SECAM | 40 IRE \pm 10 IRE 300 mV \pm 75 mV | |
| SCRAMBLER PARAMETERS | | |
| Video Sync Suppression | 10 dB in supported modes. | Over full range of all input signals. |
| Audio Modulation AM | +6 dB \pm 2 dB | Over full range of all input signals in supported modes as necessary to recover appropriate sync signals. |

Table A-3: 2722A Electrical Characteristics

| Characteristics | Performance Requirement | Supplemental Information |
|---|--|--|
| Input Return Loss | >14 dB, 75 Ω | At input terminal with precision F-style connector. 30 – 600 MHz frequency range. |
| RF INPUT SIGNALS Frequency Sweep Range | 5 MHz to 600 MHz | Accuracy of pulse and SLM measurement degrades from 30 MHz to 5 MHz because of start spur presence. |
| Telemetry Range | 15 MHz to 600 MHz | 40 kHz; will track 2721A Transmitter At Frequency point nearest 600 MHz. |
| Conversion Resolution Accuracy | 5 kHz | |
| Amplitude Input NO DAMAGE Attenuator Range Preamp Gain Hardware Calibration | +16 dBmW (+65 dBmV) 20 dB minimum 50 dB maximum attenuation 15 dB minimum attenuation | Sum of total RF power. 44 dB in 2 dB steps. 23 dB ±2 dB. Allowable attenuation range between 2721A and 2722A; maximum attenuation reduced by .5 dB for each dB of tilt. 10 dB P-P maximum error correction range. |
| Pulse Sensitivity Non-Gated mode | -5 dBmV | Mid-screen level corresponds to 50 dB of attenuation between 2721A and 2722A, pulse inserted 6 dB below video carrier. |
| Gated mode | -17 dBmV | Mid-screen level corresponds to 50 dB of attenuation between 2721A and 2722A, pulse inserted 18 dB below video carrier. |
| SLM Sensitivity Reference level range | +10 dBmV minimum +54 dBmV maximum | Preamp off, no attenuation. Preamp off, 44 dB of attenuation. |
| FSK receiver sensitivity | -5 dBmV minimum | Preamp off, 36 dB attenuation. |
| Sweep Response Accuracy Peak-to-valley reading Normalized | ±0.5 dB ±1.0 dB | At normalization temperature, 30 MHz to 600 MHz, ±1.5 dB when sweep trace is within 6 dB of bottom of screen in gated mode. For 0 dB tilt only. At normalization temperature when System Test Plan consists of channels with "OTHER" selected as the "DECODE MODE." |

Table A-3: 2722A Electrical Characteristics (Cont.)

| Characteristics | Performance Requirement | Supplemental Information |
|---|---|--|
| Unnormalized | ± 1.0 dB | For 0 to 50 °C, 30 MHz to 600 MHz, ± 1.5 dB when sweep trace is within 6 dB of bottom of screen in gated mode. For 0 dB tilt only. |
| | 7 dB | From 30 MHz to 600 MHz. |
| Ref value | ± 0.5 dB | At normalization temperature and center screen. |
| SLM Accuracy | ± 1.0 dB | At normalization temperature when System Test Plan consists of channels with "OTHER" selected as the Decode Mode. |
| | ± 1.5 dB | For 0 to 50 °C over entire screen with 2721A at normalization temperature. |
| | ± 2.0 dB maximum | Over the upper 40 dB of display range; preamp off, non-scrambled. |
| Resolution Sweep | | 0.2 dB in 20 dB full-screen mode. 0.1 dB in 10 dB full-screen mode. |
| SLM | | 1.0 dB in Quick Check level mode. |
| Spurious signals | | With equivalent loading of 105 carriers at +10 dBmV. |
| Pulse channel | < -50 dBmV (-60 dBc) | Measured at 21.4 MHz with input video carriers at +10 dBmV. |
| Voltmeter Range | 5 to 80 V ac and dc | AC measurement is True RMS over 40 to 63 Hz frequency range. |
| Accuracy AC volts (True RMS) | ± 1.5 V; 5 V to 35 V ± 2.0 V; 35 V to 80 V | In LOW range. In HIGH range. |
| DC volts | ± 0.5 V; 5 V to 35 V ± 1.5 V; 35 V to 80 V | In LOW range. In HIGH range. |
| Internal Battery volts Range Accuracy | +7 to +15 V ± 0.5 V | Measured across the battery terminals under full load. |
| External Temperature Probe | $\pm 2^\circ$ C from 0° C to 50° C | When exposed to ambient air, with the Option Port door open. |