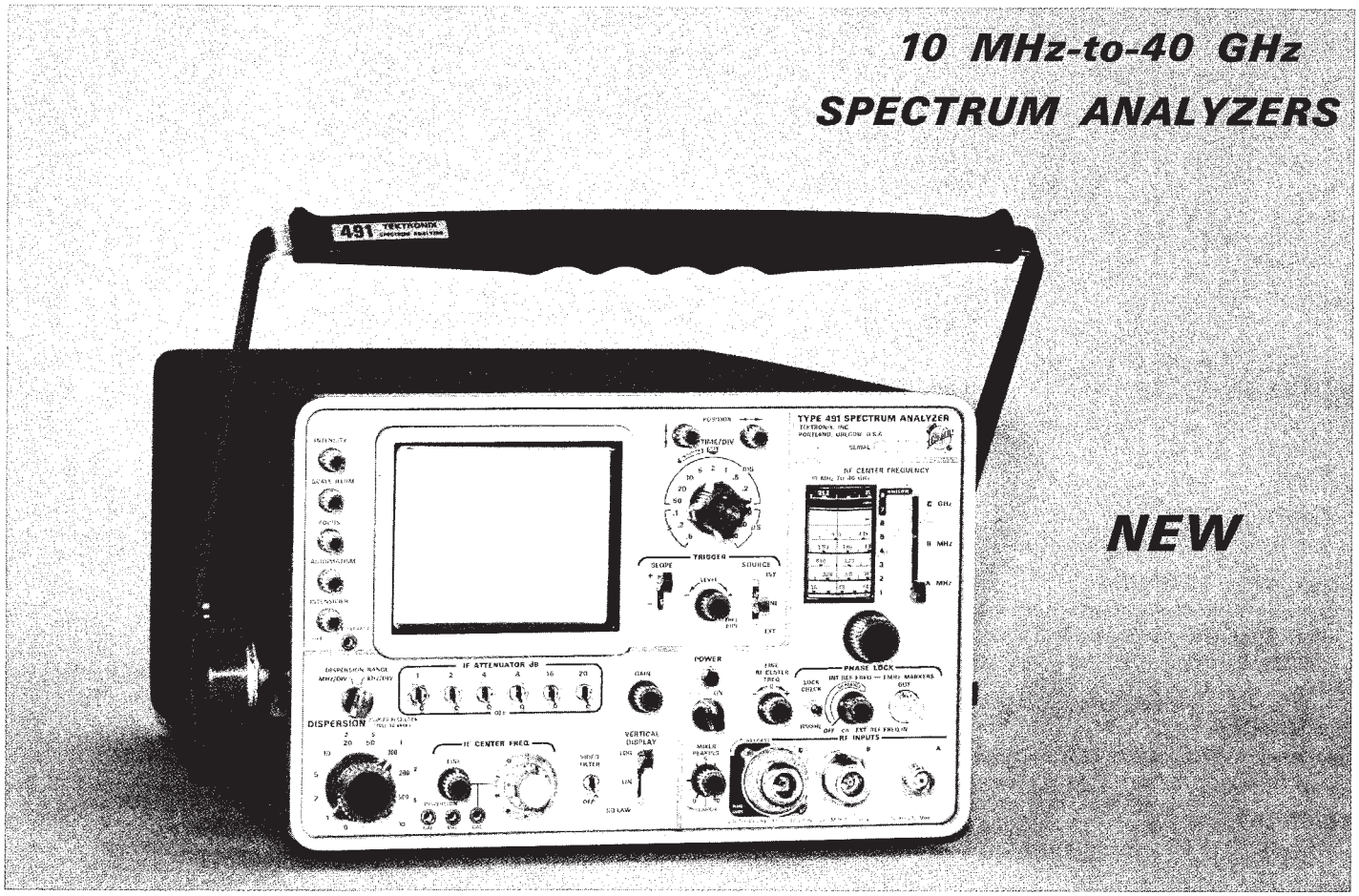
# 10 MHz-to-40 GHz SPECTRUM ANALYZERS




- ***COMPACT, LIGHT WEIGHT***
- ***INTERNAL PHASE LOCK***
- ***CALIBRATED DISPERSION TO 100 MHz***
- ***COUPLED RESOLUTION***
- ***±1.5-dB DISPLAY FLATNESS TO 12.4 GHz***
- ***WIDE-RANGE TIME BASE***
- ***LOW POWER CONSUMPTION***
- ***ENVIRONMENTALIZED***
- ***SOLID-STATE DESIGN***

The Type 491 is a precision, wide-band spectrum analyzer designed for rugged environmental conditions and easy mobility. It is an easy-to-carry package weighing less than 40 pounds complete with accessories. The Type R491 is electrically identical, requires only 7 inches of rack height.

Operation is simple. Resolution and calibrated dispersion controls are coupled, providing narrow resolution bandwidth at narrow dispersion and wide resolution bandwidth at wide dispersion. Since dispersion is calibrated, frequency differences can be read directly from the CRT. Internal phase lock provides stable displays even at 1 kHz/div dispersion.

Both Type 491 and R491 are completely self contained, have oscilloscope-type time base and trigger circuits, 8 x 10-div CRT with P7 phosphor and internal graticule. They operate over a wide range of AC voltages, require only 50 W, maximum.

With these state-of-the-art analyzers, Tektronix offers an ideal combination of performance, weight, size, and cost: Type 491 and R491.

| BAND | FREQUENCY RANGE | MINIMUM CW SENSITIVITY* | |
|---|---|---|---|
| | | 1-kHz RESOLUTION | 100-kHz RESOLUTION |
| 1 | 10 MHz to 275 MHz | ≥ —100 dBm | ≥ —80 dBm |
| 2 | 275 MHz to 900 MHz | ≥ —110 dBm | ≥ —90 dBm |
| 3 | 800 MHz to 2000 MHz | ≥ —105 dBm | ≥ —85 dBm |
| 4 | 1.5 GHz to 4.0 GHz | ≥ —110 dBm | ≥ —90 dBm |
| 5 | 3.8 GHz to 8.2 GHz | ≥ —100 dBm | ≥ —80 dBm |
| 6 | 8.2 GHz to 12.4 GHz | ≥ —95 dBm | ≥ —75 dBm |
| 7 | 12.4 GHz to 18.0 GHz | ≥ —90 dBm | ≥ —70 dBm |
| 8 | 18.0 GHz to 40 GHz | ≥ —80 dBm to 26.5 GHz<br>≥ —70 dBm to 40 GHz | ≥ —60 dBm<br>≥ —50 dBm |

*Signal + noise = 2 X noise

DIAL ACCURACY
± (2 MHz + 1% of dial reading).

CALIBRATED DISPERSION
1 kHz/div to 10 MHz/div in 1-2-5 sequence, 2 ranges (kHz/div —MHz/div). Accuracy throughout full range of IF-center frequency control, within ±3% except at 2 MHz/div (±5%) and 1 MHz/div (±7%). Accuracy can be increased using internal 1-MHz crystal markers for calibration. Dispersion linearity within ±3%. Zero dispersion useful for PRF measurements.

COUPLED RESOLUTION
1 kHz to 100 kHz, coupled with calibrated dispersion positions but separately switchable.

DISPLAY FLATNESS
±1.5 dB over 100-MHz dispersion, except over ±25 MHz for Band 1; ±3 dB over 100-MHz dispersion in waveguide Bands.

INCIDENTAL FM
Less than 300 Hz at fundamental, with Phase Lock.

FREQUENCY STABILITY
kHz/div dispersion range—±10 kHz from 103.5 to 126.5 VAC after 1 minute; ±5 kHz/° C. MHz/div dispersion range—±200 kHz from 103.5 to 126.5 VAC after 1 minute; ±20 kHz/° C.

PHASE LOCK
Internal 1-MHz reference. External input accepts 1-MHz to 5-MHz signals from 1 V to 5 V peak to peak.

INPUT IMPEDANCE
Approx 50 Ω for coaxial inputs.

MAXIMUM INPUT POWER
—30 dBm for linear operation, +15 dBm (25 mW) safe diode power limit.

IF ATTENUATOR
51 dB in 1-dB steps, ±0.1 dB/dB.

IF GAIN CONTROL
>50-dB range.

IF CENTER FREQUENCY
±25-MHz adjustment of center frequency from 5 MHz/div to 0.2 MHz/div dispersion positions, ±10-MHz adjustment at 10 MHz/div, ±2.5-MHz adjustment from 500 kHz/div to 1 kHz/div dispersion positions.

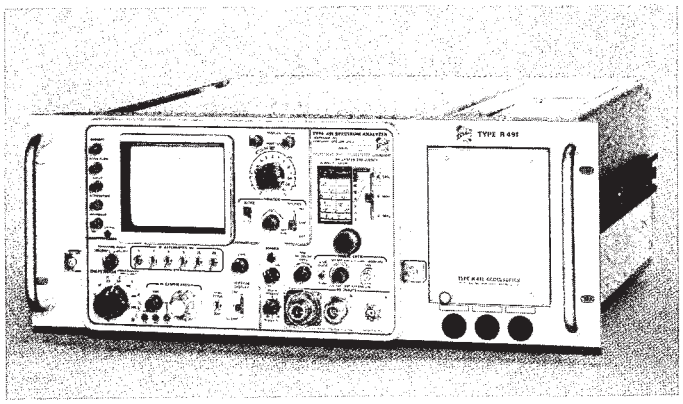
VERTICAL DISPLAY (8 DIVISIONS)
Log — ≥40-dB dynamic range.
Linear — ≥26-dB dynamic range.
Square Law — ≥13-dB dynamic range.

## HORIZONTAL DEFLECTION

INTERNAL SAWTOOTH GENERATOR
10 μs/div to 0.5 s/div in 15 calibrated steps (1-2-5 sequence). Uncalibrated continuously variable between steps and to approx 1.25 s/div.

TRIGGER SOURCE
Internal, external, or line. 600-V maximum external input (DC + peak AC).

TRIGGER REQUIREMENTS
0.2-div deflection or 0.2-V external from 20 Hz to 100 kHz.

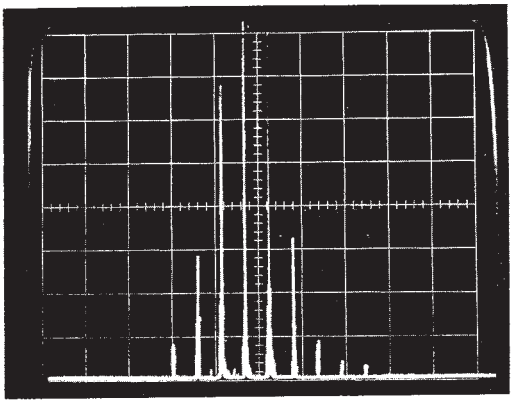


## CRT AND DISPLAY FEATURES

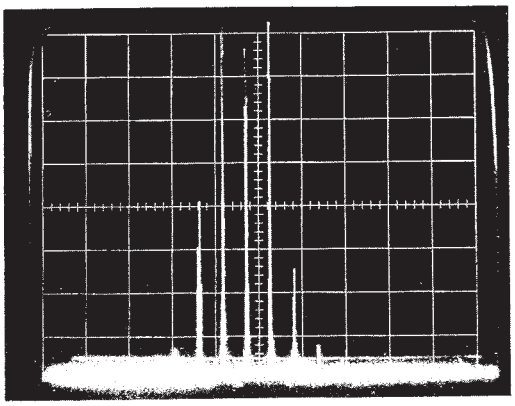
TEKTRONIX CRT
8 x 10-div display area (each div = 0.8 cm); P7 phosphor normally furnished.

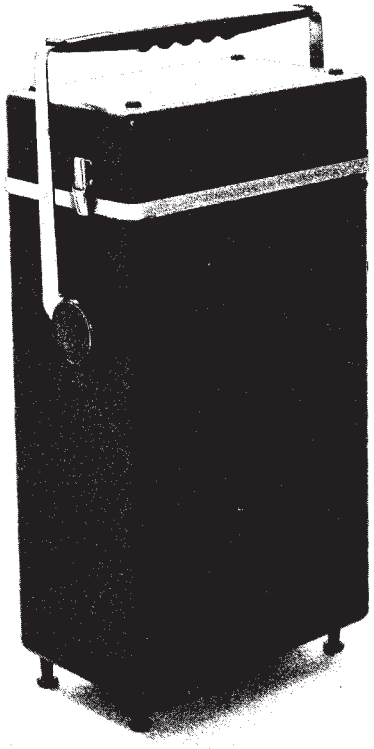
GRATICULE
Internal, no parallax, variable edge lighting.

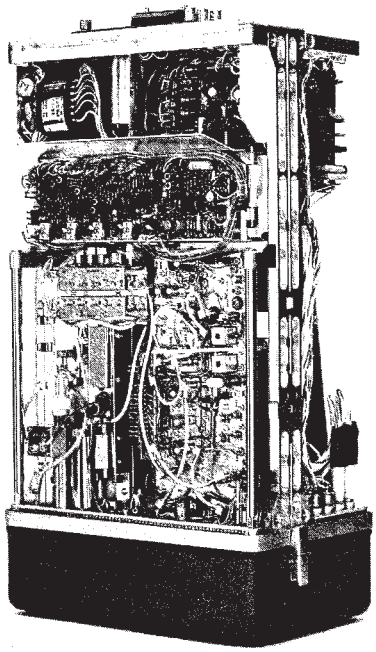
DISPLAY FEATURES
Intensity, focus and astigmatism controls. Intensifier adjusts relative brightness of signal and baseline for convenient viewing and photography.



*Quality of photographs is greatly enhanced when relative brightness of signal and baseline can be controlled, as in upper waveform. Lower waveform taken under same conditions shows normal results of slow sweep time/div settings. Improvement is even more pronounced in some applications. Waveforms photographed with C-30 Camera.*







## ENVIRONMENTAL CAPABILITIES

### ELECTROMAGNETIC INTERFERENCE

Meets specifications of MIL-I-6181D over the following frequency ranges: Radiated (with CRT mesh filter installed) —150 kHz to 1 GHz; conducted (power line) —150 kHz to 25 MHz.

### TEMPERATURE

Operating: —15° C to +55° C.
Non-operating: —55° C to +75° C.

### ALTITUDE

Operating: 15,000 feet.
Non-operating: 50,000 feet.

### HUMIDITY

Non-operating: Meets electrical performance specifications after exposure to five cycles (120 hours) of Mil-Std-202C, Method 106B (omit freezing and vibration, and allow a 24-hour post-test drying period at +25° C and 20% to 80% relative humidity).

### VIBRATION

Operating: 15 minutes along each of the three axes, 0.025 inch peak to peak displacement (4 g's at 55 Hz) 10 to 55 to 10 Hz in 1-minute cycles.

### SHOCK

Operating and non-operating: 30 g's, ½ sine, 11-ms duration, 1 shock per axis.

### TRANSPORTATION

In shipping carton: Meets National Safe Transit test of vibration for 1 hour at slightly greater than 1 g, 30-inch drop (18-inch for R491) on any corner, edge, or flat surface of the shipping container.

## OTHER CHARACTERISTICS

### POWER REQUIREMENTS

50 W maximum, 90 to 272 VAC, 48 to 440 Hz. Quick-change transformer taps permit operation at 90 to 110, 104 to 126, 112 to 136, 180 to 220, 208 to 252, or 224 to 272 VAC.

### REAR PANEL CONNECTORS

BNC connectors for external trigger input, sawtooth output (75 mV/div) and recorder output ($\geq$4 mV/div of displayed signal in LIN mode, DC-coupled, approx 600-Ω source resistance).

### CABINET MODEL DIMENSIONS AND WEIGHTS

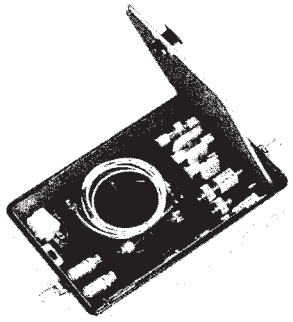
| | | |
|---|---|---|
| Height | 7 3/16 in | 18.2 cm |
| Width | 12 7/16 in | 31.6 cm |
| Depth (incl. panel cover) | 19 11/16 in | 50.0 cm |
| Depth (with handle extended) | 21 9/16 in | 54.7 cm |
| Net weight (w/o panel cover) | 30 lb | 13.6 kg |
| Weight (with panel cover and accessories) | 38 lb | 17.3 kg |
| Domestic shipping weight | ~50 lb | ~22.7 kg |
| Export-packed weight | ~62 lb | ~28.2 kg |

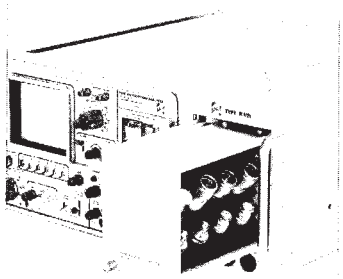
### RACK MODEL DIMENSIONS AND WEIGHTS

| | | |
|---|---|---|
| Height | 7 in | 17.8 cm |
| Width | 19 in | 48.3 cm |
| Rack depth | 17½ in | 44.4 cm |
| Net weight | 41 lb | 18.6 kg |
| Domestic shipping weight | ~72 lb | ~32.7 kg |

### RACK MOUNTING

Type R491 withdraws from rack on slide-out tracks, tilts for convenience. Further mounting information on catalog instrument dimension page.





### ACCESSORY STORAGE

Included panel dust cover for Type 491 and drawer for Type R491 hold all standard accessories except manuals and dust and rain cover.

### STANDARD ACCESSORIES

6' BNC cable, 50 Ω miniature coax (012-0113-00); 6' N cable, RG 55/U coax (012-0114-00); 2' TNC cable, RG 55/U coax (012-0115-00); wave guide mixer, 12.4 to 18 GHz (119-0097-00); wave guide mixer, 18 to 26.5 GHz (119-0098-00); wave guide mixer, 26.5 to 40 GHz (119-0099-00); 10-dB attenuator, Type N fittings (011-0085-00); 20-dB attenuator, Type N fittings (011-0086-00); 40-dB attenuator, Type N fittings (011-0087-00); two BNC male to N female adapters (103-0058-00); two BNC female to N male adapters (103-0045-00); wave guide mixer adapter (119-0104-00); power cord (161-0024-00); dust and rain cover (016-0074-01); 3 to 2-wire adapter (103-0013-00); blue light filter (378-0558-00); amber light filter (378-0559-00); clear CRT protector plate (386-0118-00); ornamental ring (354-0248-00); mesh filter, installed (387-0571-00); two one-ampere fuses (159-0022-00); ½-ampere fuse (159-0025-00); two instruction manuals (070-0598-00). Type R491 includes all above accessories except the dust and rain cover, also includes mounting tracks and hardware.

**TYPE 491 SPECTRUM ANALYZER** ..... $4200

**TYPE R491 SPECTRUM ANALYZER**..... $4300

## CONVERSION KITS

### PORTABLE TO RACK-MODEL

Kit includes hardware and instructions to convert existing Type 491 Analyzers for rack installations.

Order 040-0444-00 ..... $125

### RACK MODEL TO PORTABLE

Kit includes cabinet and instructions to convert Type R491 Analyzers for portable operation.

Order 040-0445-00 ..... $75

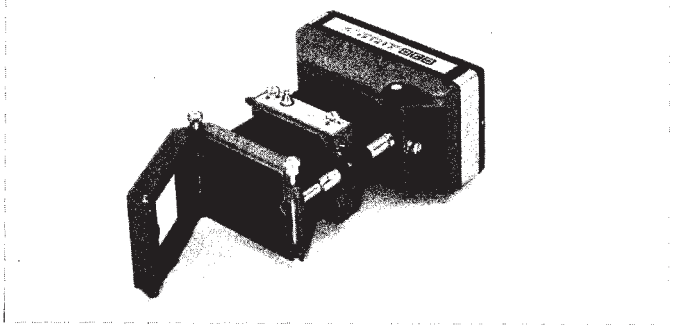
## OPTIONAL ACCESSORIES

Optional accessories provide added convenience to the Type 491 and R491. Cameras, Scope-Mobile® Carts and other major accessories are completely described at the rear of the catalog.

### COLLAPSIBLE VIEWING HOOD

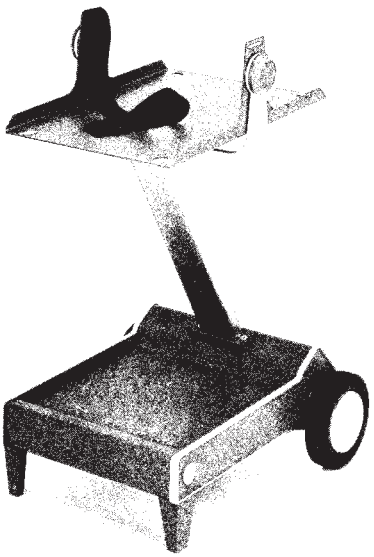
Permits viewing of trace under high ambient-light conditions, order 016-0082-00 ..... $7.50

### C-30 CAMERA



f/1.9 lens; magnification variable from 1.5:1 to 0.7:1; Polaroid Land* Pack-Film back, order C-30 ..... $390

### SCOPE-MOBILE CART



Model 200-1: friction locks hold Type 491 at 0° to 60° angle. Cart occupies <18 in of aisle space, goes up and down stairs easily, has storage space in base, order 200-1 . $60.00

### PANEL DUST COVER

Included as a part of Type 491, protects front panel and holds standard accessories. Available separately for use with Type R491, order 200-0633-03 ..... $20.00

### BNC THRU-PANEL ADAPTER

Mounts in pre-punched holes in Type R491 panel, BNC connector on both sides, order 103-0070-00 ..... $2.25

### BNC CABLE

Used in conjunction with above adapter, provides access to rear-panel connectors on Type R491. BNC-to-BNC 3-foot cable, order 012-0117-00 ..... $4.00

*Registered Trade-Mark Polaroid Corporation

U.S. Sales Prices FOB Beaverton, Oregon
Please refer to Terms and Shipment, General Information page.