

## Highly Selective, Transistorized, Measures Wave Components Directly

### Advantages.

- No calibration or stabilization needed
- Direct readings; accurate
- Measures frequencies 20 cps to 50 KC
- Completely transistorized
- Battery or ac powered; hum free
- Low power consumption; no warmup needed
- Very sharp acceptance circuits
- AFC; also frequency restorer circuit
- Compact, rugged, versatile
- Oscillator-tuned voltmeter

### Uses:

Measures and analyzes fundamentals, harmonics, and intermodulation products in telemetering, carrier and vibration systems as well as audio circuits. Speeds analysis of noise and broadcast amplifier characteristics; modulation amplifier, film sound track and recording distortion; hum, network characteristics, etc.

Model 302A Wave Analyzer is a significant improvement in wave analyzer design. It obviates the need for tedious calibration procedures and stabilization before use, has sharp acceptance circuits, is completely solid state, compact and easy to operate.

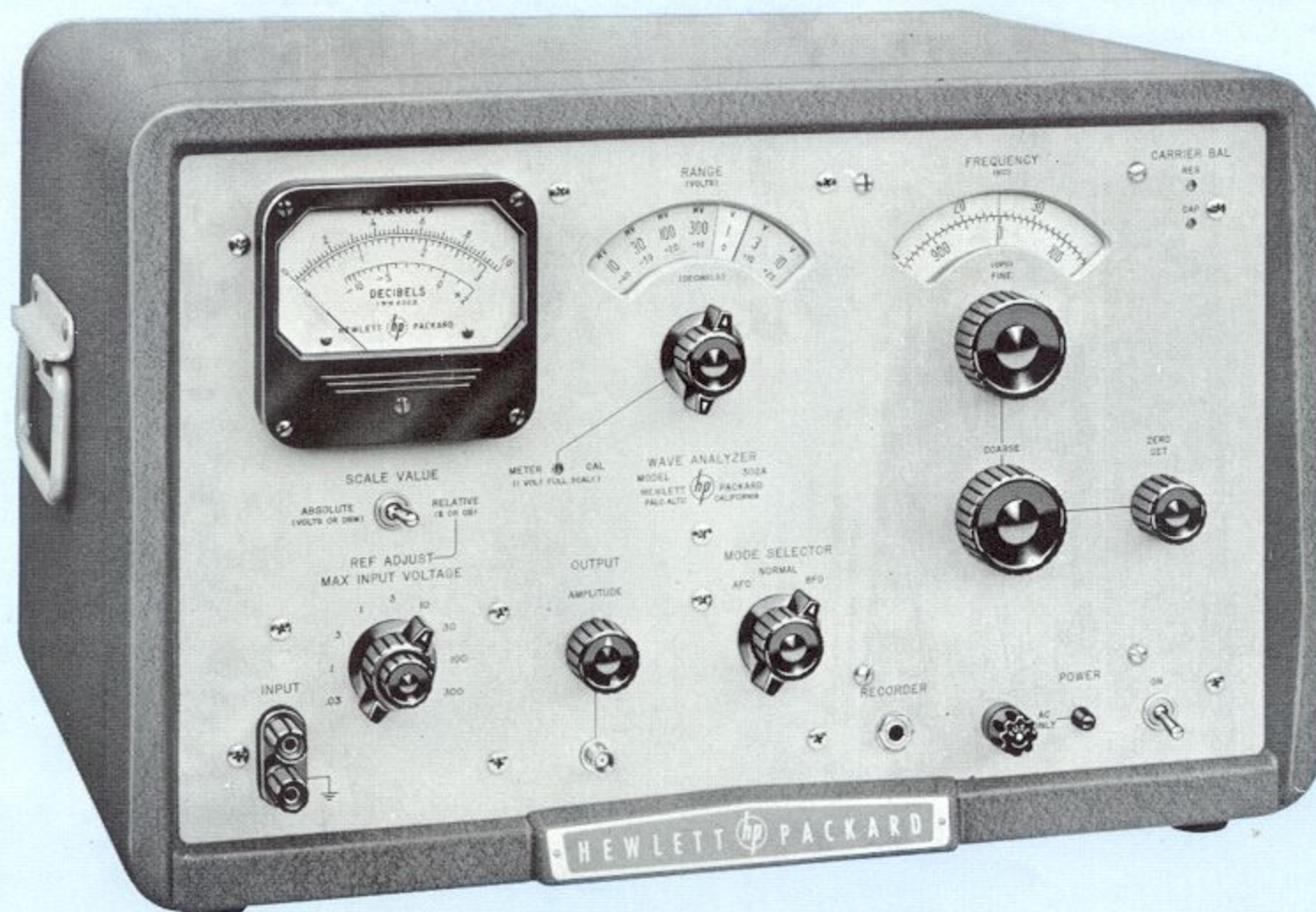
Other exceptional features are extremely narrow bandwidth, automatic frequency control, automatic tracking when used as an oscillator tuned-voltmeter, provision for battery operation (18 to 28 volts) as well as ac line power, and elimination of warmup time.

### Simple Operation

In operation the instrument functions as a highly selective tuned voltmeter. A front panel control selects the frequency to be measured and voltage is then read directly on the front panel meter.

Model 302A separates the input signal into its individual components so that each—the fundamental, harmonics and any intermodulation products—may be evaluated separately.

The instrument operates by mixing the input signal with an internal oscillator adjusted to provide a difference frequency of 100 KC. An automatic frequency control circuit maintains a constant difference frequency between the input and oscillator signals. This insures accurate measurements despite frequency drift in the input signal. After the input signal is mixed with a voltage from the internal oscillator the 100 KC difference signal is passed through a narrow-band crystal filter, amplified and metered.



## Frequency Restorer

A frequency restorer circuit makes accurate frequency measurements possible at each component frequency of the input wave. The frequency restorer circuit supplies a sinusoidal signal at the frequency of the specific component to which the  $\text{hp}$  302A is tuned. This signal can be measured on an electronic counter or observed on an oscilloscope. The amplitude of the restorer signal is determined by the level of the selected component. When the mode selector switch is in the normal or AFC position, the signal appears at the output terminals if the meter is indicating.

Model 302A is also particularly useful for measuring small signals on noisy systems or transmission lines. When the mode selector is switched to "BFO" the instrument becomes an oscillator and tuned voltmeter automatically tuned by one control to the same or oscillator frequency. The selective tuned voltmeter then discriminates against the noise and measures the desired signal.

Speed and accuracy of measuring is enhanced by a linearly calibrated tuning control giving the same "tuning feel" throughout range.

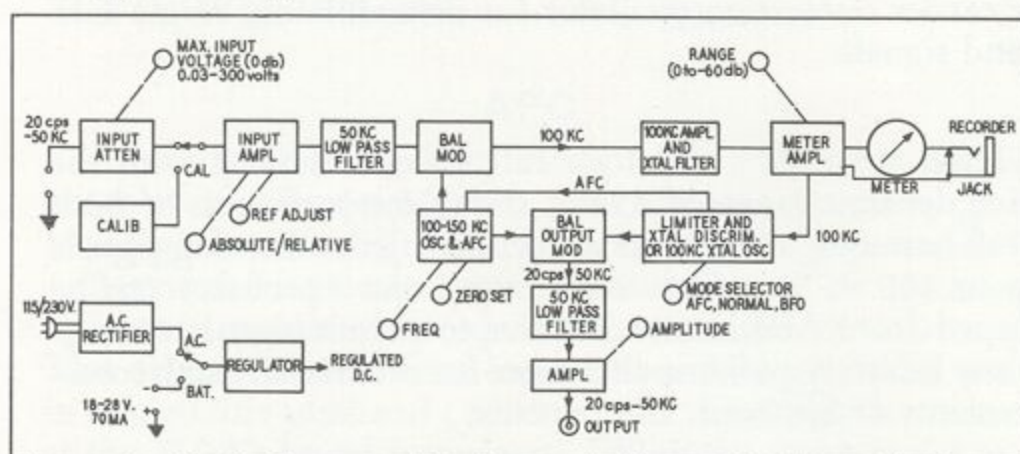


Figure 1. Block diagram, Model 302A Harmonic Wave Analyzer.

## Specifications $\text{hp}$ 302A

**Frequency Range:** 20 cps to 50 KC.

**Frequency Calibration:** Linear graduation 1 division per 10 cycles. Accuracy  $\pm (1\% + 5 \text{ cps})$ .

**Voltage Range:** 30  $\mu\text{v}$  to 300 v full scale in a 30, 100, 300 sequence. Steps of 1:3 or 10 db. Meter range indicated by a dial mechanically linked to input attenuator. An absolute-relative switch provides for adjustment of intermediate values.

**Warmup-Time:** None.

**Voltage Accuracy:**  $\pm 5\%$  of full scale value.

**Residual Modulation Products and Hum Voltage:** Greater than 75 db down.

**Intermediate Frequency Rejection:** Intermediate frequency present in input signal rejected by at least 75 db.

**Selectivity:**  $\pm 3\frac{1}{2}$  cycle b.w.—at least 3 db down  
 $\pm 25$  cycle b.w.—at least 50 db down  
 $\pm 70$  cycle b.w.—at least 80 db down  
 beyond  $\pm 70$  cycle b.w.—at least 80 db down

**Input Impedance:** Determined by setting of input attenuator: 100,000 ohms on 4 most sensitive ranges, 1 megohm on remaining ranges.

**Restored Frequency Output:** 1 v across 600 ohms at output terminals for full scale meter deflection. Output level control provided. Frequency response  $\pm 2\%$ , 20 cycles to 50 KC. Output impedance approximately 600 ohms.

**Oscillator Output:** 1 v across 600 ohms at output terminals (mode selector in B.F.O.). Output level control provided. Frequency response  $\pm 2\%$ , 20 cps to 50 KC. Output impedance approximately 600 ohms.

**Recorder Output:** 1 ma dc into 1,500 ohms or less at full scale meter indication, for ungrounded recorders only.

**Automatic Frequency Control:** Range of frequency holdin is  $\pm 100$  cycles minimum.

**Power:** 115 or 230 v  $\pm 10\%$ , 50 to 1600 cycles, 3 watts (approximately). Terminals provided for powering instrument from external battery source. Battery supply range 28 v to 18 v.

**Weight:** Net 43 lbs. Shipping 51 lbs. (cabinet mount). Net 35 lbs. Shipping 51 lbs. (rack mount).

**Dimensions:** Cabinet Mount: 20 $\frac{3}{4}$ " wide; 12 $\frac{1}{2}$ " high; 14 $\frac{1}{2}$ " deep. Rack Mount: 19" wide; 10 $\frac{1}{2}$ " high; 13  $\frac{13}{16}$ " deep behind panel.

**Price:**  $\text{hp}$  302A, \$1,800.00 (cabinet);  $\text{hp}$  302AR, \$1,785.00 (rack mount).

## $\text{hp}$ 297A Sweep Drive

The 297A is a motor drive unit designed to enhance the usefulness of the  $\text{hp}$  302A or 310A Wave Analyzer. With the 297A you may sweep through all or any part of the 302A range. Because the 297A produces an X-axis output, you may easily make semi-automatic plots of harmonics and intermodulation products. When an  $\text{hp}$  Wave Analyzer is used as an oscillator tuned-voltmeter the 297A permits semi-automatic frequency response measurements of networks, amplifiers and filters even in the presence of high noise.



The 297A, although designed for use with the  $\text{hp}$  302A, also may be used to drive oscillators and other tunable devices through their ranges. A stand which allows the shaft height to be adjusted from 4 inches to 12 inches is available for adapting the 297A to other equipment.

## Specifications $\text{hp}$ 297A

**Sweep Range:** 64 revolutions.

**Sweep Limits:** Any interval from 64 revolutions to 10 degrees.

**Sweep Speed:** With  $\text{hp}$  302A: 170 cps per second and 17 cps per second.

**Shaft Speed:** 10 rpm, 1 rpm, and neutral; quick change speed transfer without stopping. Neutral permits manual operation.

**Sweep Output:** At least 12 volts maximum. Change of output proportional to change in shaft position and zero output may be set for any shaft position. Full output may be obtained with 2.1 revolutions or with 50 revolutions of the output shaft. No sweep output when set to high speed, short sweep.

**Motor:** Reversible synchronous capacitor type reluctance motor; may be stalled indefinitely.

**Output Shaft:**  $\frac{1}{4}$  inch diameter with adapter to  $\frac{7}{16}$  inch for  $\text{hp}$  Model 302A.

**Starting and Running Torque:** 9 in. - oz. at 10 rpm. Friction clutch limits torque at 1 rpm to approximately 22 in. - oz.

**Power:** 115 volts  $\pm 10\%$ , 50 to 60 cps, 12 watts, running or stalled.

**Mount:** Mounts on front panel of  $\text{hp}$  Model 302A or bench stand.

**Weight:** Net 3 $\frac{1}{2}$  lbs. (approx.) Shipping 8 lbs.

**Dimensions:** 3 $\frac{1}{2}$ " high, 7" wide, 5 $\frac{1}{4}$ " deep, shaft extends  $\frac{13}{16}$ " behind case.

**Accessory Available:** 11505A Bench Stand, adjusts shaft height from 4 to 12", \$25.00.

**Price:**  $\text{hp}$  297A, \$350.00;  $\text{hp}$  H03-297A for 230 v 50 cps operation, \$375.00.

*Data subject to change without notice.*