

HICKOK

Radio Service Equipment

MOST COMPLETE QUALITY LINE AVAILABLE

TELEVISION

FREQUENCY
MODULATION

AMPLITUDE
MODULATION

Dynamic Mutual Conductance
Tube Testers (Patented) • Crystal
Controlled Micro Volt Signal Gen-
erators • Signal Generators with
or without Crystal Control • Vac-
uum Tube Voltmeters • Oscillo-
graphs • Traceometers • Combina-
tion Tube and Set Testers • Vibra-
tor and Substitute Speaker Testers
• Zero Current Set Testers • Volt-
Ampere - Wattmeter • Appliance
Testers • Radio Set Testers • Volt-
Ohm-Milliameter.

Electrical Indicating Instruments
for Every Purpose

SINCE 1910

HICKOK ELECTRICAL INSTRUMENT CO.
CLEVELAND, OHIO, U. S. A.

● BASIC TEST METHODS



Radio Service Equipment

MODEL 510X RADIO TUBE AND SET TESTER



MEASURING DYNAMIC MUTUAL CONDUCTANCE IN MICROMHOS

TEST TUBES TO MANUFACTURERS AND ENGINEERING STANDARDS

SET TESTER FEATURES IN THE 510-X COMBINATION INSTRUMENT

Measures Volts, Ohms, Milliampere, Capacity, Inductance, Leakage, Decibels. Accuracy within 1½%.

Volts in four ranges 0-20-200-500-1000 A.C. and D.C. 1000 ohms per volt for all ranges. Electronic rectifiers used in patented circuit assuring linear scale for all ranges. No copper oxide rectifier used.

No burnt out rectifiers in this A.C. circuit.

D.C. Milliampere 0-20-200.

Ohms 1/10 ohm to 25 megohms in three overlapping ranges. No batteries used.

Capacity .0001 to 24 microfarads in overlapping ranges.

Checks leakage of electrolytic or paper condensers.

Checks Inductance or choke coils with or without D.C. component of current.

Decibel measurement for checking output.

Checks hum in any stage of receiver.

Has rectangular five-inch meter. Scale length over 4½ inches. Legibly marked for easy reading.

Size 14" x 13¾" x 6" Shipping Weight 21 Lbs.
NET PRICE, MODEL 510X.....\$69.00

LIST PRICE.....\$115.00
Other than 110 volts, 60 cycles — \$4.50 Net Extra.

THE TRUTH ABOUT AN ACCURATE TUBE TEST

A tube test from an Engineering, Manufacturing and replacement standpoint is more than just finding out whether there is a certain cathode emission. New tubes of the same type but of different manufacture may show a difference in emission. This is inherent in the method of construction.

Tubes of the same type must test the same in Mutual Conductance — all engineers agree on that. This all important quantity is measured in Micromhos. A simple way to tell whether a tube tester is of the Dynamic Mutual Conductance type is to look for MICROMHOS on the dial. If it does not read Micromhos it is **NOT** a Dynamic Mutual Conductance tube tester.

The HICKOK Models 530, 510-X and 530-M Display Merchandiser measure tube output in MICROMHOS and at the same time achieve 100% modulation. This means that if emission is low, the mutual conductance reading will show a falling off which can be detected before lowered emission becomes apparent when measured by ordinary means. Formerly a tube tester of the Dynamic Mutual Conductance type cost a great deal but now Hickok's PATENTED circuit makes it possible to manufacture a Dynamic Mutual Conductance tester within the reach of all Dealers and Radiotricians. In fact simply owning and using one of these instruments assists you to be a better Dealer or Radiotrician.

THESE TESTERS SOON PAY THEIR WAY BY INCREASED TUBE SALES.



Radio Service Equipment

MODEL 530 TUBE TESTER MEASURING DYNAMIC MUTUAL CONDUCTANCE IN MICROMHOS

TUBE TEST FEATURES—530, 510-X, AND 530-M DISPLAY TUBE MERCHANDISER

NOTE: 530 and 530M Display Merchandiser have Illuminated Meter Dials.

Dynamic Mutual Conductance, in Micromhos, 0-3000 0-6000, 0-15,000. Has English scale reading REPLACE — DOUBTFUL — GOOD. English scale is also Mutual Conductance.

Only tube tester made with dual feature of both English reading and Micromho scales.

Rectified current is used to energize both plates and grids, two rectifiers being required.

Superimposed on the D.C. grid voltage is an A.C. signal voltage. The patented circuit achieves 100% modulation of plate current insuring a super test on all tube elements.

Filament Voltage in correct steps to 117 volts.

Tests accurately all Octal, Loktal, Miniature Tubes, Ballast Tubes, Magic Eye Tubes.

Contains sensitive Noise Test. Detects radio frequency noise.

Tests for Shorts — hot or cold.

Only testers containing accurate sensitive Gas Test Gassy tubes ruin A.V.C. and I.F. stages.

Tubes may test good by other tests. Grid must be negative when checking for gas. Emission checkers cannot make gas test.

Tests Grid Controlled rectifier tubes.

Diodes tested separately with low voltage to prevent paralysis of diode elements.

Interconnecting multiple element Permutator Switches for shifting tube elements to different socket contacts. Properly takes care of all socket combinations.

Accurately calibrated Line Test indication on large test meter.

Continuous adjustment of line voltage from 96 to 130 volts.

Chosen by Engineers of highest standing who have made a study of the principles employed Used by leading airlines and telegraph companies.

Extremely simple and convenient to operate.

Size: 530C, Counter Type, 14" x 16" x 6".

Size: 530P, Portable Type, 14 3/4" x 13" x 6".

NET PRICE, MODEL 530 \$56.40

LIST PRICE.....\$94.00

SHIPPING WEIGHT 22 LBS.

When ordering specify counter or portable type.



MODEL 530-M DISPLAY TUBE MERCHANDISER

WITH NINE INCH SQUARE METER ILLUMINATED DIAL

GETS ATTENTION—ASKS 'EM TO BUY

A new departure in a Counter Tube Replacement Sales Tester that puts the test squarely before the customer and places confidence in the need for and purchase of new tubes. The Mammoth English reading GOOD — BAD — DOUBTFUL scale does that. Also indicates Dynamic Mutual Conductance for your technical information.

This tester incorporates the same simple operation and method of test as in all models of HICKOK tube testers described elsewhere in this catalogue.

DYNAMIC MUTUAL CONDUCTANCE

These testers are made to show up poor and bad tubes accurately and thus sell more tubes than any other testers.

They do not indicate poor tubes as GOOD. They will triple your tube sales. Complete with Roll Chart; Separate Line Voltage Meter; Simple Instructions, etc.

Size: 13" x 23" x 11 1/2". SHIPPING WEIGHT 21 LBS.

NET PRICE.....\$72.00

LIST PRICE.....\$120.00
Other than 110 volts, 60 cycles — \$4.50 Net Extra.



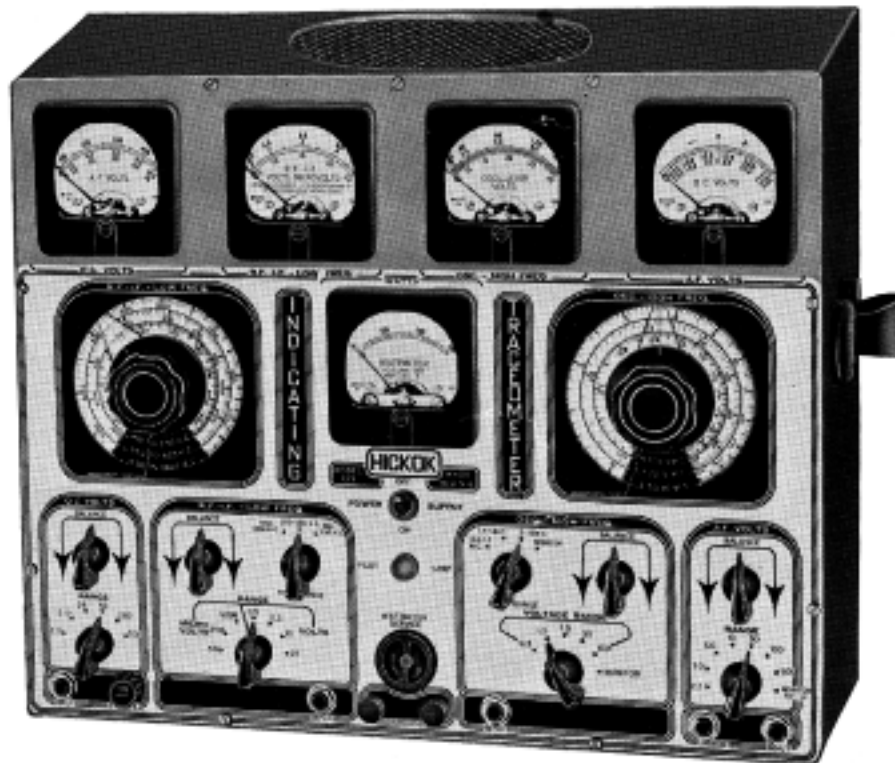


Radio Service Equipment

MODEL 155 TRACEOMETER

FOR RAPID SERVICING OF FREQUENCY MODULATED, AMPLITUDE MODULATED AND TELEVISION RECEIVERS

SELF CONTAINED SPEAKER INTERNALLY CONNECTED FOR MONITORING EITHER R.F.-I.F. OR A.F. CHANNELS



NOW with the Model 155 Indicating Traceometer and its five precision meters you can measure and trace the signal (without interfering with the performance of the set), in any five circuits at one time. Vacuum Tube Voltmeter circuits so arranged that accidental overvoltage can not damage meters.

1. Actually measure the signal in microvolts at any point in the entire RF-IF section.
2. Measure the actual oscillator voltage throughout its entire range.
3. Measure all of the D.C. voltages, A.V.C., A.F.C., Power Supply, etc.
4. Measure any A.F. or A.C. voltage in any circuit.
5. Measure the actual wattage consumption of any A.C. system to 300 watts.

6. Trace the signal by means of self contained speaker through the entire R.F.-I.F. and Audio Channels.

Any or all of the above measurements made without in any way disturbing the normal operation of the circuit under test.

All measurements can be made at the same time.

Self Contained Voltage Regulator.

TECHNICAL DESCRIPTION

TUBE COMPLEMENT: 6SK7-3 6SQ7-4 VR150-30 5Y3G 6A87 6J5.

RF — IF (LOW FREQUENCY) SECTION

FREQUENCY RANGES

100-250 K.C. Accuracy $\pm 1\%$
250-650 K.C. Scale length — 23"
650-1800 K.C.

VOLTAGE RANGES

0-5000-25,000-100,000 microvolts.
0-0.5-2.5-15.0-25.00 volts.
Basic sensitivity without cable — 0 — 25 microvolts for full scale deflection.
Input capacity — 0.85 micro microfarads.
Monitor Jack on front panel for connection to phones or oscillograph.

OSCILLATOR (HIGH FREQUENCY) SECTION

FREQUENCY RANGES

600-1700 K.C. Accuracy $\pm 1\%$
1.7-5.0 megacycles. Scale length — 23"
5.0-15.0 megacycles.

VOLTAGE RANGES

0-0.3-1.5-7.5-30.0-150.0 volts.
Basic sensitivity without cable — 2000 microvolts.
Input capacity — 1.2 micro microfarads.

D.C. VOLTMETER SECTION

VOLTAGE RANGES

0-2.5-5.0-25.0-50.0-250.0-500.0 volts.
Zero Center.
Accuracy $\pm 1\frac{1}{2}\%$.
Input impedance 18 megohms.

AF VOLTMETER SECTION

VOLTAGE RANGES

0-0.1-1.0-5.0-10.0-50.0-100.0-500.0.
Accuracy $\pm 2\%$.
Input impedance — 2.0 megohms.
Frequency response 20 to 200,000 cycles, ± 1 D.B.
Monitor Jack on front panel for oscillograph, phone, or speaker.

WATTMETER SECTION

WATTAGE RANGE

0-300 watts.
Accuracy $\pm 1\frac{1}{2}\%$.
Wattmeter connection on front panel.
Meter protection — Fuse.

FUSE PROTECTION

5 ampere fuse on front panel, fuses entire equipment including wattmeter.

VOLTAGE REGULATION

COMPLETE VOLTAGE STABILIZATION AGAINST LINE FLUCTUATION

Complete Voltage Stabilization against Line Fluctuation. Self-contained voltage regulation for the vacuum tube voltmeter circuits operating the indicating meters. Pilot lamps on front panel, continuous indication when instrument is in operation. Two ground connections are provided on the front panel — one for the receiver under test and the other connection for the oscillograph or other equipment being used as a monitor. Complete operating instructions outlining in detail the use of the Traceometer for testing and metering all circuits and component parts throughout any radio receiver.

ACCESSORIES

Complete with four universal (test probe or clip type) low capacity shielded cables and chassis connector lead.

Size: 13" x 16" x 10". — SHIPPING WEIGHT 22 LBS.

NET PRICE, MODEL 155 \$123.00

LIST PRICE \$205.00

Other than 110 volts, 60 cycles — \$3.00 Net Extra.



Radio Service Equipment

MODELS 177X & 188X UNIVERSAL CRYSTAL CONTROLLED SIGNAL GENERATORS WITH TWELVE OUTPUT SELECTIONS SPECIFICALLY DESIGNED FOR FREQUENCY AND AMPLITUDE MODULATION SERVICING

OUTPUT SELECTIONS

FUNDAMENTAL FREQUENCIES

1. Wide Band Frequency Modulated R.F. Output. 750 K.C. Sweep. 100 K.C. to 133 Megacycles. (Modulated internally at 60 cycles for visual alignment of wide band frequency modulated and television) R.F. and I.F. stages.

2. Frequency Modulated R.F. Output (Frequency modulated standard sweep — 150K.C.) 1000 K.C. to 133 Megacycles. Modulated internally at 400 cycles or can be modulated from external source from 10 to 15,000 cycles.

3. Frequency Modulated R.F. Output (30 K.C. sweep standard for visual alignment of amplitude modulated receivers) from 100 K.C. to 110 megacycles.

4. Amplitude Modulated R.F. Output (400 cycles) 100 K.C. to 110 megacycles (or can be externally modulated from 50 cycles to 15,000 cycles).

5. Unmodulated R.F. Output 100 K.C. to 110 megacycles.

Four Crystal Controlled Outputs. Accuracy .01%

6. 100 KC Modulated (400 Cycle)—100 KC to 15,000 KC.

7. 100 KC Unmodulated—100 KC to 15,000 KC.

8. 1000 K.C. Modulated (400 cycle) 1000 K.C. to 100 Megacycles.

9. 1000 K.C. Unmodulated — 1000 K.C. to 100 Megacycles.

A. F. OUTPUTS

10. 100 to 10,000 Cycle Variable Audio Frequency Output.

11. 400 Cycle Fixed Audio Output. All Ranges Controlled by Output Attenuator.

12. Synchronized Sweep Voltage for Oscilloscope use.

METER

Self-contained Power Level Meter. Three Ranges. —10 to +6, +6 to +22, +22 to +38 db, and 0-3.5-20.-140. volts. Model 188 and 188X only.



MODEL 188X WITH POWER LEVEL METER

R.F. RANGES 100 K.C. TO 110 MEGACYCLES

Seven Fundamental Continuously Variable R.F. Ranges with accuracy better than 1/2%. 100 K.C. to 300 K.C., 300 K.C. to 850 K.C., 850 K.C. to 2.6 M.C., 2.6 M.C. to 8.0 M.C., 8.0 M.C. to 24.0 M.C., 24.0 M.C. to 60 M.C., 60 M.C. to 110 M.C.

AUDIO FREQUENCY

Two Negative Resistance Audio Frequency Oscillators. 400 cycles, fixed and 100 to 10,000 cycle variable. Accuracy approximately 5%. Output voltage continuously variable from 0 to 1.0 Volt. All coils but 60 to 110 M.C. are High "Q" iron core type permeability and capacity tuned.

VOLTAGE REGULATION

If so desired can be instantly added by inserting V.R. 150-30 Tube in socket provided.

TUBES: Tubes used are:

- 1—6J5 Variable R.F. Oscillator.
- 1—6J5 Crystal Oscillator.
- 1—6K8 Frequency Modulated Oscillator and Mixer.
- 1—6AG7 Quadrature Control Tube.
- 1—6SJ7 Negative Resistance Oscillator. 400 cycles and 0-10 K.C.
- 1—6X5G Full Wave Rectifier.
- 1—VR150-30 Voltage Regulator Tube (not supplied).

POWER: The Oscillator includes a complete built-in power supply consisting of a transformer, rectifier and filter. It may be operated from any 110 volt A.C. line, 40 to 65 cycles, other voltage and frequencies available at slight additional cost.

CABLES: Each oscillator comes completely equipped and supplied with all necessary connecting cables. Complete and 27-page manual furnished with each signal generator. The operator will find these instructions containing useful service data very helpful for practical service work.

MODELS 177 AND 188

Models 177 and 188 are identical electrically to Models 177X and 188X and are wired for crystal control but the crystal or 6J5 crystal tube is not included in shipment. Crystal and tube can be installed at any later date without returning the signal generator to the factory.

Size: 13" x 13" x 7".

NET PRICE, MODEL 177X.....	\$57.60
LIST PRICE, MODEL 177X.....	\$96.00—SHIPPING WEIGHT 26 LBS.
NET PRICE, MODEL 188X.....	\$67.20
LIST PRICE, MODEL 188X.....	\$112.00—SHIPPING WEIGHT 26 LBS.
NET PRICE, MODEL 177.....	\$48.60
LIST PRICE, MODEL 177.....	\$81.00—SHIPPING WEIGHT 26 LBS.
NET PRICE, MODEL 188.....	\$58.20
LIST PRICE, MODEL 188.....	\$97.00—SHIPPING WEIGHT 26 LBS.

Crystal Only: List \$17.00, Net \$10.20

Other than 110 volts, 60 cycles — \$3.00 Net Extra.



MODEL 177X



Radio Service Equipment

MODEL 19X CRYSTAL CONTROL MICROVOLT GENERATOR CALIBRATED OUTPUT IN MICROVOLTS FROM 100 KC TO 30 MEGACYCLES



Self-contained vacuum tube voltmeter, power level meter and crystal give more measurements than any other signal generator.

Over 250 Crystal Controlled, modulated or unmodulated outputs—from 100 K.C. to 15,000 K.C. every 100 K.C. and from 1000 K.C. Accuracy better than .01%.

GAIN PER STAGE — SELECTIVITY — SENSITIVITY.

All standardized by self-contained vacuum tube voltmeter.

Calibrated Output Ranges:

R.F. — ½ microvolt to 100,000 on all ranges.

A.F. — 0 to 1.0 volt.

DECIBELS, TRIPLE RANGES:

-10 to +6, +6 to +22, +22 to +38 db.

100 INCHES OF DIRECT READING FREQUENCY SCALES.

ACCURACY BETTER THAN ½%.

Radio Frequency Ranges Calibrated Directly 100 K.C. to 120 Megacycles.

TECHNICAL DESCRIPTION AND DETAILS OF 19X

The radio frequency oscillator covers, in six ranges, from 100 K.C. to 30 megacycles on fundamentals. Direct reading to 120 megacycles. The dial is directly calibrated in kilocycles and megacycles and contains over 100" of direct reading scales. A type 6J5 tube is used in an electron coupled oscillator circuit.

CRYSTAL CONTROL—Model 19 includes a built-in crystal oscillator providing a modulated or unmodulated output accurate to better than 100 parts in one million. Selection of either 100 K.C. or 1000 K.C. by merely turning Band Selector switch to desired frequency. Crystal can be used for checking or calibrating the main variable oscillator throughout its entire range.

MODULATOR—The 400 cycle modulator supplies the 400 cycle modulating voltage for the radio frequency section and modulates this to approximately 35% throughout the entire range of the radio frequency oscillator. The output from this modulator may also be switched to the attenuator network so that a 400 cycle calibrated audio output of 1.0 volt is available.

ATTENUATOR—The input to the attenuator serves the dual purpose of attenuating either the radio frequency or audio frequency output to a predetermined level across the attenuator output. This gives direct calibration of the radio frequency section from ½ microvolt to 1,000,000 microvolts on all ranges and from 0-1.0 volts of audio frequency. The built-in vacuum tube voltmeter is used to standardize the voltage across the attenuator network so that the calibration of this unit holds true.

DECIBEL METER AND VACUUM TUBE VOLTMETER—The built-in decibel meter is so arranged that it can be either connected into the vacuum tube voltmeter circuit or switched to an external circuit which provides three ranges of decibels. The switching of this meter from the vacuum tube voltmeter circuit to the output circuit does not in any way upset the calibration or frequency of the signal generator and thereby provides a means of setting exact input in microvolts to a receiver.

RADIO FREQUENCY COILS—All radio frequency coils are wound on ceramic forms and impregnated with special saturant, making them moisture proof and not subject to inductance change with humidity or temperature. Each coil is individually calibrated for inductance and air trimmed for capacity, thereby giving an accuracy better than ½% on all radio frequency ranges.

SHIELDING—Each high frequency unit in the signal generator is completely shielded, giving triple shielding on the radio frequency output. Triple filtering is also used in the power supply input.

ACCESSORIES—Supplied complete with self-contained dummy antenna, necessary cables, and concise, practical operating instructions.

Size: 13" x 16" x 7".

NET PRICE, MODEL 19X \$87.00

LIST PRICE \$145.00 — SHIPPING WEIGHT 21 LBS.

Other than 110 volts, 60 cycles — \$3.00 Net Extra.

MODEL 110 UNIVERSAL VACUUM TUBE VOLTMETER DUAL PURPOSE—UNIVERSAL DESIGN



SEVEN D.C. RANGES—0-1.5-3.0-15-75-150-750-7500 Volts.

HIGH FREQUENCY A.C. VOLTMETER—Four Ranges—0-1.5-3-50-150 Volts.

HIGH FREQUENCY A.C. VOLTMETER—The high frequency A.C. voltmeter utilizes a type 955 acorn low capacity tube at the end of the test probe so that the loading of the circuit under test is held to the low value of approximately 5 micro-micro-farad capacity.

FREQUENCY ERROR—With the test probe in place, the resonance frequency of the input circuit is approximately 150 megacycles and negligible frequency error may be expected up to this value. If it is necessary to measure frequencies above this the test probe may be removed increasing the frequency range to over 200 megacycles.

ZERO ADJUST—A single zero adjustment is necessary for all of the high frequency and D.C. ranges.

OVERLOAD—Another desirable feature of the A.C. and D.C. ranges is that excessive overload cannot in any way damage the meter or equipment. In fact two or three hundred volts can be accidentally applied to the 1½ volt A.C. range with little possibility of damage to the equipment. When measuring A.C. voltages it is not necessary to provide a D.C. return path between the input circuit and ground since the input circuit is taken through a capacity to the diode rectifier and then on to a D.C. amplifier.

D.C. VOLTMETER—Seven ranges of D.C. are provided with zero center so that the chassis or ground of the voltmeter may be connected direct to the chassis of the receiver or television set under test, and if the voltage under test is positive with respect to ground the meter will read up scale and if negative with respect to ground the meter will read down scale. The input impedance of the D.C. section is 24 megohms up to 150 volts and 700 megohms up to 7500 volts.

POWER SUPPLY—100 to 130 volts A.C. 40 to 60 cycles. Other voltages and frequencies available at slight extra cost. Power consumption 20 watts.

TUBE COMPLEMENT:

6X5 Rectifier, 955 vacuum tube voltmeter tube, and 6K5G vacuum tube voltmeter amplifier.

Size: 11" x 13" x 7".

NET PRICE, MODEL 110 \$54.00

LIST PRICE \$90.00 — SHIPPING WEIGHT 21 LBS.

Other than 110 volts, 60 cycles — \$3.00 Net Extra.



Radio Service Equipment

MODEL RFO-5 OSCILLOGRAPH

THE ONE OSCILLOGRAPH SPECIFICALLY DESIGNED FOR FREQUENCY MODULATED—AMPLITUDE MODULATED AND TELEVISION SERVICING. FOR COMPLETE VISUAL ANALYSIS

Self-contained Wide Band F.M. Oscillator, Narrow Band F.M. Oscillator, Demodulator, Video Amplifiers, Signal Tracer, Visual A.C. Vacuum Tube Voltmeter 0.2 to 1000 Volts

USE—This Oscillograph in both R.F. and I.F. stages.

TROUBLE SHOOTING—Single or consecutive stage by stage trouble shooting from antenna post to speaker in frequency modulated, amplitude modulated and television receivers.

SELF CONTAINED: WIDE BAND—(100 to 900 K.C. Sweep) Frequency Modulated Oscillator (basic frequency 23-M.C.) for frequency modulated and television servicing.

NARROW BAND—(10-30 K.C. Sweep) Frequency Modulated Oscillator (basic frequency 1000 K.C.) for visual alignment on amplitude modulated receivers, demodulators, etc.

WIDE BAND FREQUENCY MODULATED OSCILLATOR—Can be modulated from external audio frequency source such as phonograph pickup, microphone or audio frequency oscillator to provide a frequency modulated transmitter for your own laboratory checks. No external oscillator needed since first harmonic of 23 megacycles is 46 megacycles in the center of the 43-50 megacycle frequency modulated band.

SELF CONTAINED MIXER CIRCUIT provided so that when used in connection with any good external oscillator wide band or narrow band frequency modulated outputs may be produced within the frequency limits of the external oscillator.

VISUAL ALIGNMENT of any R.F.-I.F. stage in any frequency modulated or amplitude modulated receiver.

TUBES: 906, 5Y3G-2, 6AG7, 6K8, 6SJ7-2, 6AB7, 884, 6H6.

ONLY IN THE MODEL RFO-5 WILL YOU FIND ALL THESE IMPORTANT FEATURES:

1. Self-contained wide band frequency modulated signal generator.
2. Self-contained narrow band frequency modulated signal generator.
3. Return trace eliminator (simplifies alignment of A.F. and R.F. circuits).
4. Horizontal amplifier for sweep expansion.
5. High sensitivity amplifiers (0.2 volts per inch).
6. Trapezoidal patterns for percent modulation measurements.
7. Calibrated screen.
8. Cathode ray tube rotation adjustable by means of flexible mounting.
9. Easy operation due to simplicity of control locations.
10. Video Amplifiers.
11. Signal tracer.
12. Variable width frequency modulated sweep.
13. Fuse protection.
14. Pilot light.
15. Phasing control.

UNIVERSAL DESIGN—Every facility for research and laboratory measurements. Model RFO-5 is made up of seven different units: Horizontal Panel, Tube Panel, Vertical Panel, Demodulator, Synchronization and Return Eliminator Panel, Sweep Circuit Oscillator Panel and Radio Frequency Modulator Panel. Each section contains the control needed for all oscillographic measurements.

For complete visual analysis and trouble shooting, some method is necessary for viewing the high frequency signal before it reaches the second detector and is demodulated to an audio frequency. Only in the Model RFO-5 is the usefulness of the oscillograph extended to make these measurements and tests. This is made possible by the incorporation of a video (wide band) amplifier which permits frequencies



up to 3.5 megacycles to be amplified and viewed on the cathode ray tube screen. Also by the incorporation of a demodulator and suitable amplifier, the R.F. signal can be picked off any place from the antenna to the second detector, demodulated and viewed directly on the screen.

SIGNAL TRACER—It is often desirable to be able to follow the signal from the antenna post on to the speaker by means of a pair of ear phones or auxiliary loud speaker. The signal tracer in the Model RFO-5 enables this to be done by merely connecting the phones into the jack on the front panel and setting the vertical control switch to the demodulator position. The signal can then be heard as well as seen simultaneously as it is traced through the receiver.

Size 11" x 13" x 15 1/4".

NET PRICE, MODEL RFO-5.....\$97.20

LIST PRICE.....\$162.00—SHIPPING WEIGHT 50 LBS.

Other than 110 volts, 60 cycles—\$3.00 Net Extra.

MODEL TS-50 TEST SPEAKER

NOTE THESE FEATURES:

AUDIO WATTS: RANGES: 0-1-1-10 Watts Indicating Directly on meter. Connect to any AF power circuit.

VIBRATOR TEST: Check Vibrator in Receiver either on the bench or in the car.

IMPEDANCE: Measure proper line and load impedance in all A.F. Circuits.

TRANSFORMER RATIOS: Check turns and impedance ratios in all transformers. Also fidelity or frequency response.

UNIVERSAL MATCHING SPEAKER AND FIELD: Either voice coil or plate input—straight or tapped field variable resistance.



PROVIDES AUDIO FREQUENCY WATT-METER, VIBRATOR TEST, SUBSTITUTE SPEAKER WITH UNIVERSAL MATCHING, VARIABLE RESISTANCE, SUBSTITUTE SPEAKER FIELD, ALSO D.C. AMMETER, 0-15 AMPS., D.C. VOLTMETER, 0-15 VOLTS AND A.C. VOLTMETER 0-10-100 VOLTS.

Size 13" x 10" x 7".

NET PRICE, MODEL TS-50.....\$57.00

LIST PRICE....\$95.00—SHIPPING WEIGHT 20 LBS.



Radio Service Equipment

MODELS 210S & 4800-S ZERO CURRENT VOLTMETER TESTERS

INFINITE OHMS PFR VOLT



The giant Model 210S with its 9 1/4" meter is the most recent addition to the complete coverage testers featuring the famous Hickok Zero Current Voltmeter circuit. You can now get zero current testers in compact portable type with suitable carrying case or a larger display panel type for mounting in your Paneline. Special ranges have been included for television service and additional low ranges give more accurate measurements of the smaller values.

THE ZERO CURRENT VOLTMETER OFFERS MANY ADVANTAGES—Infinite ohms per volt. It is no longer necessary to worry along with 5000, 20,000 or 25,000 ohms per volt when you can have infinite ohms per volt with absolutely no current drain from the circuit under test. AVC, AFC and other high resistance circuit voltages are accurately measured without disturbing the operation of the set. Connection can be made directly to the grid cap of any RF or IF tube to measure the operating bias voltage directly.

MODEL 210S JUMBO RADIO AND TELEVISION ZERO CURRENT TESTER DISPLAY PANEL TYPE

METER—Large open face Hickok built meter 9 1/4" wide x 8 3/4" high with a scale length of 8 3/4". Illuminated Scale—4 colors.

GENERAL—Case 13" high x 16" wide x 7" deep. Finish in blue wrinkle with etched aluminum panel.

RANGES:

- D.C. Volts — 0-2.5-10-50-250-500 infinite ohms per volt.
- D.C. Volts — 0-2.5-10-50-250-500-2500 at 1000 ohms per volt.
- A.C. Volts — 0-2.5-10-50-250-500-2500 at 1000 ohms per volt.
- D.C. Microamperes — 0-500.
- D.C. Milliamperes — 0-2.5-10-50-250-500.
- D.C. Amperes — 0-2.5-25.
- A.C. Amperes — 0-5.
- Capacity — Three ranges covering from .0001 mfd. to 200 mfd.
- Resistance — Four ranges covering from .05 ohms to 50 megohms.
- Decibels — Three ranges from -20 to +43.

SPECIAL FEATURES:

The 5 ampere A.C. range is wired directly through to a convenience outlet on the front of the panel where any receiver or other appliance

may be plugged in and the power consumed by it measured directly on the 5 ampere A.C. scale of the meter. The circuit is so constructed that this receptacle is completely isolated from all other meter circuits so the test prods may be used for any other ranges without danger of coming in contact with this 110 volt circuit.

All ranges and functions have been grouped around rotary switches for the greatest convenience of operation. All voltage and current ranges are selected by the one five position rotary switch to the left of the meter and all other ranges, with the exception of some that are included for special purposes, are grouped around the selector switch to the right of the meter.

All balancing rheostats and potentiometers are controlled by the one knob below the meter.

MODEL 4800S PORTABLE ZERO CURRENT VOLTMETER TESTER

With built-in Multi Selector Unit, and socket analysis Cable.

The portable Model 4800-S includes many of the features listed for the Model 210X above, but is not intended to be mounted in the Paneline.

It may be mounted in the Model 60 Show-Lab. BUILT-IN MULTI SELECTOR UNIT.

CABLES AND ACCESSORIES FOR ALL TUBES—New improved long life jacks for series or parallel connections. Connections may be made to any or all tube elements. Gives quick and convenient method for complete socket analysis without disturbing any of the connections in the set under test.

SPECIAL EXTERNAL SHUNTS—The Model 4800-S is calibrated in millivolts so external shunts can be used for higher D.C. current ranges. A specially designed two range shunt, 5-50 amperes (250MV), is available at slight extra cost. (See price sheet.) Other shunts on special order.

SPECIAL GUARANTEED RECTIFIER

The rectifiers used in the A.C. voltmeter circuits of the Model 4800-S

RANGES:

- D.C. Volts — 0-10-50-250 at infinite ohms per volt (Zero Current Voltmeter).
- D.C. Volts — 0-2.5-10-50-250-500-2500 at 1000 ohms per volt.
- A.C. Volts — 0-2.5-10-50-250-500-2500 at 1000 ohms per volt.
- D.C. Microamperes — 0-500.
- D.C. Milliamperes — 0-1-5-50-500.
- Output Ranges — 0-10-50-250-500.
- Resistance — Five ranges covering from .1 ohm to 10 megohms.
- Capacity — Five ranges covering .0001 mfd. to 200 mfd.
- Decibels, Impedance, Inductance and A.C. ripple (hum) measurements.



and Model 210X are of special heavy duty construction and are guaranteed to maintain their calibration against normal use and accidental overload. Any rectifier in the above instrument found to be defective will be replaced free of charge in our factory or at any of our authorized repair stations within a period of one year.

Size: 210S 13" x 16" x 7". Size: 4800-S 10" x 12 1/4" x 5".

NET PRICE, MODEL 210S.....	\$63.00
LIST PRICE.....	\$105.00—SHIPPING WEIGHT 35 LBS.
NET PRICE, MODEL 4800-S.....	\$67.20
LIST PRICE.....	\$112.00—SHIPPING WEIGHT 16 LBS.

Other than 110 volts, 60 cycles — \$3.00 Net Extra.



Radio Service Equipment

MODEL 133 — LABORATORY QUALITY SET TESTER

BUILT WITH PRECISION—MEASURES WITH PERMANENT ACCURACY

Here is a completely new and modern Radio Set Tester and should not be confused with ordinary Volt-Ohm-Meters or a multiplicity of small units that provide at best, only partial service.

This instrument is accurate within 2% of full scale deflection on all ranges, and employs a special new design meter with full range 40 microamperes. Sensitivity — 25,000 ohms per volt, sufficient to service the new frequency modulation receivers. Uniform scale 5" square meter — four-color dial.

METER RANGES:

- D.C. Microamperes — 0-40-500.
- D.C. Milliampers — 0-5-50-500.
- A.C. and D.C. Volts — 0-2.5-10-50-250-500-2500.
- D.C. Volts — 25,000 ohms per volt.
- A.C. Volts — 1000 ohms per volt.
- Ohms — 0-30-10,000-1 meg.-10 meg.
- Decibels — -20 to +3, +15, +29, +43.

Contains battery tester, for testing batteries, in all popular sizes up to 135 volts.

A new type of rectifier is used that gives a uniform scale for the A.C. voltage ranges. A.C. and D.C. volts are shown on the same uniform scale. The improved rectifier gives the A.C. voltmeter a flat frequency response for audio frequency measurements up to 10,000 cycles.

Change in battery voltage does not affect the accuracy of the ohms range.

Size: 11" x 13" x 7".

NET PRICE\$45.00

LIST PRICE.....\$75.00 — SHIPPING WEIGHT 9 LBS.



VOLT OHM MILLIAMMETERS

**RUGGED, HIGH TORQUE METERS
GUARANTEED RECTIFIER CIRCUITS
HIGH ACCURACY**



MODEL 4955S REGULAR
4 inch meter — Four-color Scale.
Accuracy within 2%.

The Models 4922S and 4955S, Volt-Ohm-Milliammeters have been standard equipment for service bench and portable use with leading service men for years. Both have the following ranges:

- A.C.-D.C. Volts — 0-10-50-250-500-2500. 1000 ohms per volt.
- Output — 0-10-50-250-500-2500. Blocking condenser in circuit.
- D.C. Microamperes — 0-500.
- D.C. Milliampers — 0-1-5-50-500.
- A.C. Milliampers — 0-1.
- Ohms — 0-30-10,000-1 meg.-10 meg.

GUARANTEED ACCURACY—The accuracy of each tester is stated as percentage of full scale deflection within the temperature range of 50 degrees to 90 degrees Fahrenheit. The instruments incorporate a new type rectifier and circuit which will withstand more overload than other types. The rectifier is guaranteed against accidental overload for one year.

The instrument used in these Volt-Ohm-Milliammeters are especially built by Hickok for this service. The movement is large and rugged, and a very high torque-weight ratio gives lively, instantaneous pointer



MODEL 4922S JUMBO
9 inch meter — Decibel Scale.

action. Large, open face dial. The movement is curve corrected by an exclusive Hickok process which gives a higher accuracy at all points on the scale. Permanently correct calibration. These complete self-contained units are suited for industrial applications owing to rugged construction. All parts are of the highest standard of quality and all resistors are moisture proof and accurately adjusted. These are the finest Volt-Ohm-Milliammeters obtainable today. Regular leads sup-

plied are 4' long with special insulated pin prods of proper diameter for insertion in the latest type tube socket.

Size: Model 4955S 7" x 4 1/2" x 3 1/2".

Size: Model 4922S 10" x 13" x 7 1/2".

External Shunt for 5 and 50 amperes.

The Model 1001-4 shunt is especially designed for the Model 4922S and Model 4955S to give ranges of 5 and 50 amperes D.C.

NET PRICE, MODEL 4922S.....\$38.40
LIST PRICE.....\$64.00 — SHIPPING WEIGHT 16 1/2 LBS.
NET PRICE, MODEL 4955S.....\$27.60
LIST PRICE.....\$46.00 — SHIPPING WEIGHT 4 1/2 LBS.
NET PRICE, MODEL 4955S, With Carrying Case.....\$29.40
LIST PRICE.....\$49.00 — SHIPPING WEIGHT 8 1/2 LBS.
NET PRICE, MODEL 1001-4, Shunt for increasing range to 5 and 50 amperes.....\$ 5.70
LIST PRICE.....\$9.50 — SHIPPING WEIGHT 2 LBS.



Radio Service Equipment

MODEL 4975-S — ULTRA LOW RANGE OHM-METER



Note the special feature of the scale. It does not overlap as in most ohmmeters. Low range covers from 0-6 ohms, and the higher range starts from 6 and runs up to 600 ohms. This eliminates duplication of scale on the two ranges, and permits battery adjustment at the logarithmic center of the most accurate section of the scale. Overall accuracy is approximately plus or minus one degree of scale deflection, the scale being 100 degrees. As the scale is approximately logarithmic, any other method of expressing accuracy is confusing.

The instrument is completely self-contained, utilizing 3 type "D" flash light cells, connected in parallel to prevent frequent replacement of batteries. Batteries are held in place by spring clips and may be replaced without tools. Change in battery voltage does not effect the accuracy.

Special low resistance leads of No. 8 stranded, rubber insulated wire, have silver plated copper clamp clips provided with extra large surface to minimize contact resistance.

The silver plated copper clips on the other end of the removable leads are connected to heavy duty binding posts on the panel of the instrument.

The Hickok Model 4975-S Ohmmeter may be used for accurate measurements in any very low resistance circuit. It is an exclusive Hickok development and has been thoroughly tested in service. This low range ohmmeter has proven useful in checking low resistance motor armatures and fields, ignition coil primaries and secondaries, voice coils and other low resistance windings. Size, 7" x 4 1/2" x 3 1/2".

NET PRICE, MODEL 4975-S	\$32.40
LIST PRICE.....	\$54.00
With Carrying Case and Lead Compartment	\$33.90
LIST PRICE.....	\$56.50
Carrying Case only for 4975-S	\$ 3.60
LIST PRICE.....	\$6.00

MODEL 900 ALL PURPOSE APPLIANCE TESTER

A.C. VOLTS—AMPERES—WATTS

12 Meters in One—5 Wattmeters 5 Ammeters 2 Voltmeters

Ideal for General A.C. Circuit Analyzing. Tests Electric Refrigerators, Washers, Radios, Ironers, Ranges and all electrical appliances. A Dynamometer meter with a specially designed current transformer is employed with suitable switching to obtain all these ranges. All commercial frequencies.

RANGES:—Meter 4" Sq. Scale 3 1/2" long.
Watts — 0-20-100-500-1000-2000.
Amperes — 0-.260-1.30-6.5-13-26.
Volts — 0-130-260.

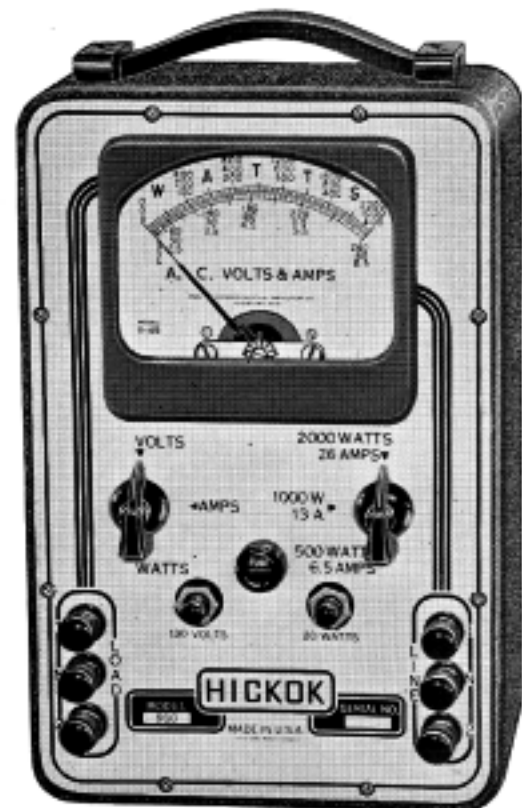
Provision has been made for testing in two and three wire circuits. Detachable leads are furnished with each instrument for connection to small appliances.

A low range of 0-20 watts will measure the power consumed by electric clocks, bell ringing transformers and similar appliances, which remain on the line permanently. A fuse protects this range from accidental overload.

The high range is suitable for checking electric ranges operating on the three wire 220V. System. No. 9A and 9B leads have standard range connectors for this purpose. These are available on special order.

Size: 9 1/2" x 6" x 3".

NET PRICE	\$36.00
LIST PRICE.....	\$60.00—SHIPPING WEIGHT 10 1/2 LBS.
SPECIAL LEADS FOR MODEL 900	
NET PRICE, No. 9A — Three wire male connector cable	\$4.20
LIST PRICE, No. 9B — Three wire female connector cable.....	\$7.00—SHIPPING WEIGHT 1 LB.
NET PRICE, No. 9B — Three wire female connector cable	\$4.20
LIST PRICE, No. 9A — Three wire male connector cable.....	\$7.00—SHIPPING WEIGHT 1 LB.



MODEL 145 A. C. — D. C. APPLIANCE TESTING VOLT-WATTMETER



Checks line voltage while measuring power consumption in watts of refrigerators, washing machines, motors, flat irons, etc. Voltage drop through house wires checked by noting drop in voltmeter reading when appliance is plugged in. Checks starting coils in fractional horse-power single phase motors. Amperes calculated from Volt and Watt indications.

RANGES

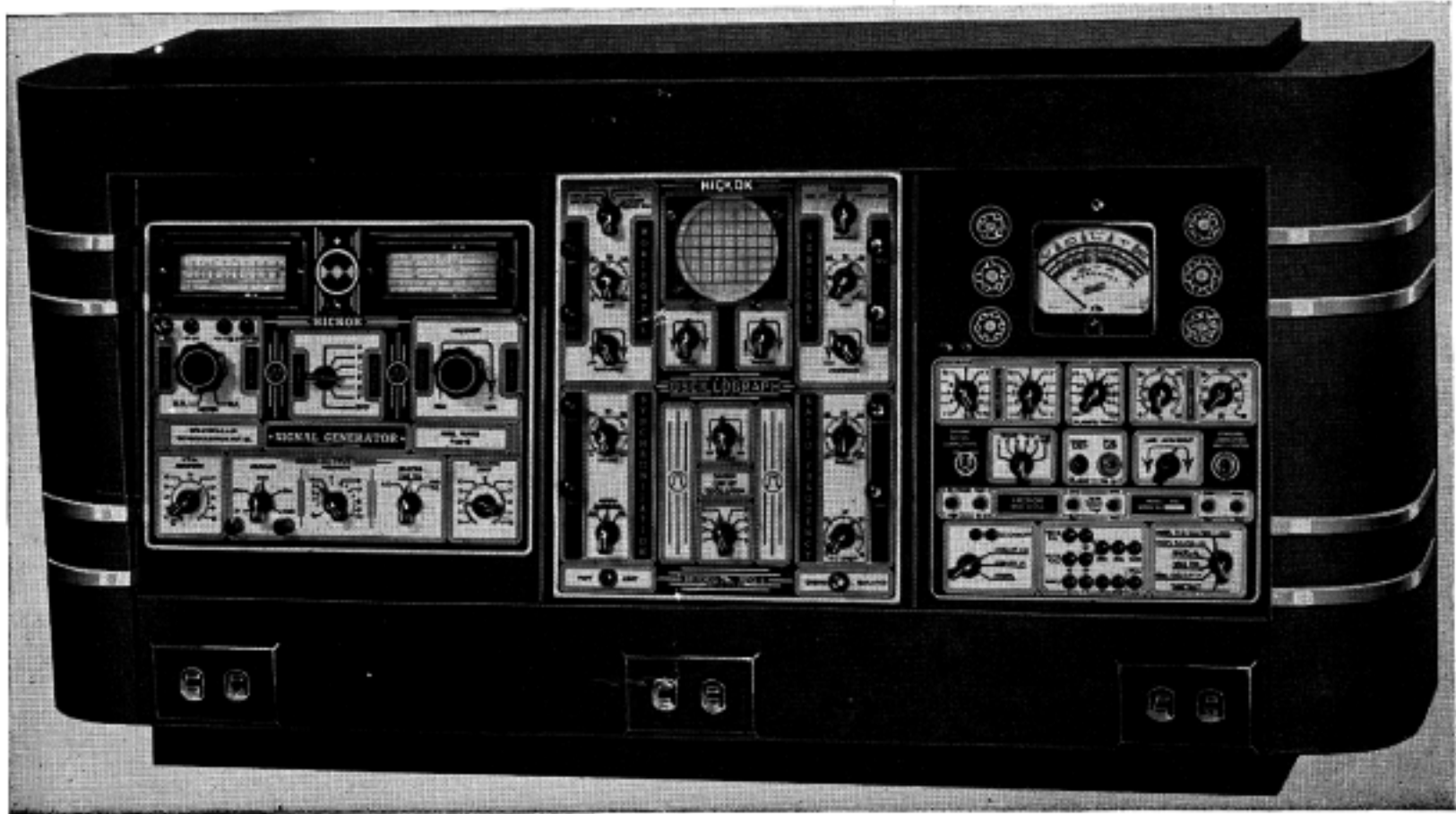
WATTS: 0-750-1500. Note uniform scale. Exclusive Hickok feature. Wattmeter current coil designed for 7.5 amperes maximum. E1 strobodynamometer movement in wattmeter.
VOLTS: 0-300, Red Line at 110 and 220 Volts. Meter has magnetic vane movement giving easy to read practically uniform scale.
A.C. ACCURACY 1 1/2% from 25 to 133 c.p.s. On D.C. the voltmeter is accurate within 2 1/4%. Wattmeter accurate within 1 1/2%.
SCALE LENGTH OF METER 2 1/2". Legible dials. Case size 7" x 4 1/2" x 3 1/2". Meters 3" x 3 1/4". Two sets of leads supplied, five feet long male and five foot female appliance connecting cables. One pair three foot leads with test prods to connect to voltmeter jacks for point to point circuit continuity testing. Circuit provides pair of jacks connecting directly to voltmeter. Press to read switch to protect wattmeter current coil from high starting currents. Fuse protects all volt circuits. Toggle switch connects voltmeter direct to separate test jacks. Steel case eliminates possibility of error caused by using tester too near heavy current carrying mains. Engraved black bakelite panel. Tester is constructed for roughest usage. Hickok quality throughout. Meters may be continuously connected to circuit under test. Case designed so that appliance connecting cables may be placed inside and out of the way.

NET PRICE, Model 145	\$25.50
LIST PRICE.....	\$42.50
Carrying Case with lead and parts compartment, NET PRICE	\$ 4.20
LIST PRICE.....	\$7.00
With Watts range 1500-3000, NET PRICE, Model 145A	\$27.60
Wattmeter current coil in this model designed for 15 amperes maximum. LIST PRICE.....	\$46.00



Radio Service Equipment

MODEL 60 SHOW LAB ILLUMINATED SERVICE PANEL MOST ATTRACTIVE AND CONVENIENT DISPLAY UNIT EVER DEvised



Size 44 inches wide — 24 inches high — 12 inches deep. All steel. Dark blue smooth crystal finish. Chrome trim. Instruments same finish with satin silver panels to match. Weight 40 pounds, panel only. Six convenient receptacles, all with fuses, to connect units being tested. Line cord and plug. On and Off switch, etc. Panel shown

with Signal Generator, Oscillograph and Model 510X Radio Tube and Set Tester. Also supplied with any one, two or three test units of suitable size shown in this catalog.

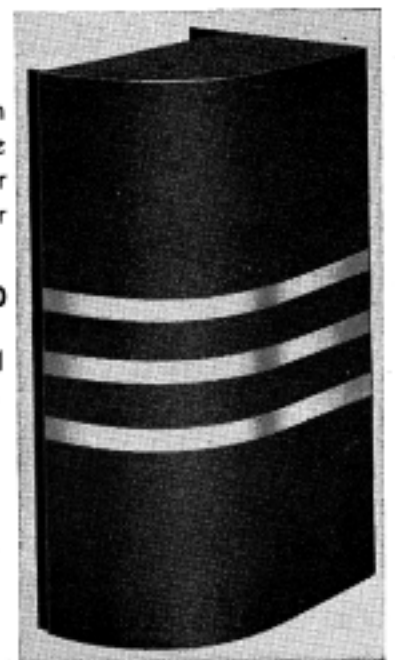
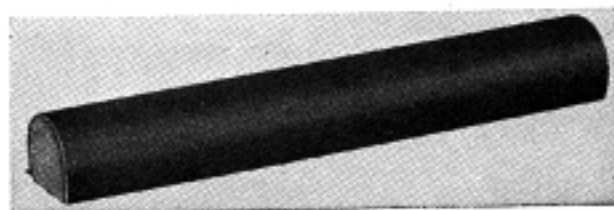
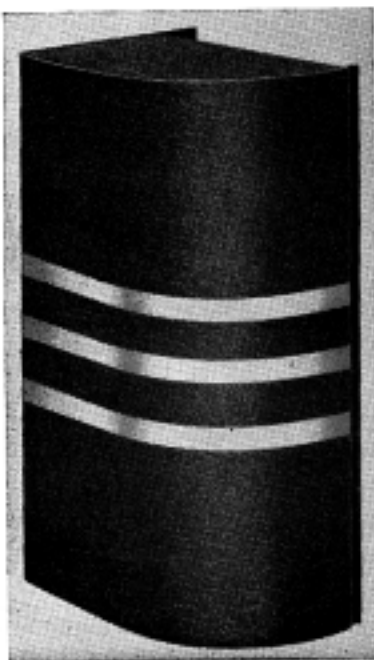
NET PRICE, MODEL 60.....\$39.00
LIST PRICE.....\$65.00 — SHIPPING WEIGHT 63 LBS.



PANELINE END COLUMNS, REFLECTORS AND LAMPS

Nothing else to buy. Extremely flexible. Testers can be arranged for any type bench or panel and to suit your own individual requirements. All instruments made same height. Same finish. No cutting or fitting necessary. Designed to use one reflector per tester. When ordering reflectors and lamps specify testers so that correct width reflector can be supplied.

NET PRICE, END COLUMNS, Per Pair.....\$8.40
LIST PRICE, End Columns, Per Pair.....\$14.00 — SHIPPING WEIGHT 3 LBS.
NET PRICE, LAMPS AND REFLECTORS, Each.....\$5.61
LIST PRICE, Lamps and Reflectors, Each.....\$9.35 — SHIPPING WEIGHT 2 LBS.



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