RADIO TESTING INSTRUMENTS

by

SUPREME

INSTRUMENTS CORPORATION

GREENWOOD MISSISSIPPI, U.S.A.

VEDOLYZER

SUPREME'S CONCEPTION OF A NEW, AMAZINGLY FAST AND COMPLETE METHOD OF RADIO SERVICE

The Model 560-A VEDOLYZER is a **dynamic signal analyzer.** It is important to understand the difference between **signal tracing** and **signal analysis.** In addition to performing the functions of a signal tracer, which is to determine the presence or absence of the signal at its proper points and to indicate its relative amplitude and frequencies, the Model 560-A VEDOLYZER also reveals to the operator the QUALITY of the signal. On the screen of the cathode ray tube you can easily see hum or distortion—in other words, QUALITY.

THE SIGNAL IS THE THING TO TEST!

It is agreed by those familiar with DYNAMIC SIGNAL TRACING that the signal passing through the receiver is the thing to test. The signal should be checked for its presence; absence; amplification; distortion; fidelity; for tuning of its circuits for maximum gain and fidelity—all these are vital indications of the true operation of the receiver.

SEE THE SIGNAL AND ITS QUALITY

If so, how much more important is it to SEE THE SIGNAL, not just its indication or effect on a measuring device such as a tuning eye or meter, but on a cathode ray oscilloscope screen which indicates the actual wave form of the signal in the stages under test, and gives a true picture of the QUALITY of the signal under test.

You can measure the signal's frequency, gain or loss and distortion in each stage, all control voltages, AC and DC operating voltages without materially upsetting operation of receiver—Check filtering action at any point, condensers (shorted, open or leaky) and coils without unsoldering from circuit—Measure resistances from ½ ohm to one billion ohms, frequency and amplitude of fundamentals and harmonics—determine place of intermittents, noisy parts and bad joints—Locate and determine frequency of hum—In short, you can quickly and profitably service every receiver that comes in your shop.

The Supreme Dynamic Test System using the Vedolyzer is a natural, easy, rapid method of receiver diagnosis—its main advantage over all other existing systems is its ability to show you the ACTUAL SIGNAL—broadcasts, television video, I.F., A.F., or otherwise.

SIX INSTRUMENTS IN ONE!

- **1—A Dynamic Signal Tracing Device Capable of Measuring:** (In Amplitude Modulated Receivers)—Amplitude of signal—Frequency of signal—Wave form of signal—Stage gain of signal—Per cent modulation of signal—A.V.C. voltage—Bias voltage—Operating DC and AC voltage—A.F.C. voltage—R.F., IF and audio distortion.

  (In frequency Modulated Receivers)—IF signal—Limiter signal and action—Discriminator action and output voltage—audio fidelity—Visual IF alignment, limiter alignment and discriminator alignment when used with a F.M. Signal Generator.

  (Television Receivers)—Vertical and horizontal deflection generator voltage—Vertical and horizontal yoke current—Vertical and horizontal synchronizing separator action—Vertical and horizontal synchronizing pulses—Composite video IF envelope—Composite video signal from detector to kinescope grid—Low frequency and high frequency compensation of video amplifiers for maximum resolution.

- **2—Wide range—Television Cathode Ray Oscilloscope.** A wide range cathode ray oscilloscope with video amplifier essentially flat from 20 cycles to 2.5 megacycles having an input resistance of 3 megohms—and an input capacitance of only 1.5 micromicrofarads with an accurately calibrated input attenuator providing an input attenuation ratio of 100,000 to 1 absolutely independent of frequency.

  Vertical deflection sensitivity with video probe (input resistance 3 megohms—input capacitance 1.5 micromicrofarads) approximately .50 RMS volts per inch deflection.

  Vertical deflection sensitivity with A.F. (.5 megohms) approximately .15 RMS volts per inch deflection.

  Vertical deflection sensitivity without use of isolation probe approximately .02 RMS volts per inch.

  The sweep generator, horizontal deflection, covers a range from 20 cycles to over 30,000 cycles. Means are provided for internal and external synchronization which works for both R.F. as well as A.F. signals.

- **3—R.F. wave meter and analyzer.** The wave meter covers a range from 65 KC to 6.5 MC and is capable of measuring the R.F. signals in any stage of a receiver. Its sensitity is great enough that you can actually see the R.F. envelope of your local carriers by simply connecting the R.F. input probe to your antenna.

- **4—Vacuum Tube AC and DC Voltmeter.** DC voltmeter: 6 ranges of 0/2/6/20/60/200/600 volts, at 15 megohms input impedance. 6 ranges of 0/20/60/200/600/2000/6000 volts at an input impedance of 150 megohms.

  AC voltmeter, 6 ranges of 0/3/9/30/90/300/900 volts at 15 megohms input impedance. 5 ranges of 0/30/90/300/900/3000 volts at 150 megohms input impedance.

  The 0/3 volt Range of the V.T.VM. has a frequency response within 2% to beyond 50 megacycles. All ranges V.T.VM., both AC and DC, calibrated ± 2%.

- **5—Ohmmeter.** 7 ranges—0 to 1000/10M/100M/1 meg./10 meg./100 meg./1000 meg.—single zero adjust for all ranges. 10 ohms center scale on low range.

- **6—R.F. Meter.** For stage by stage gain measurements connected to output of video amplifier, and resonance indicator when using wave meter.

  All ranges AC and DC, V.T.VM., ohmmeter and RF meter are push button operated.

  Tube Complement: The C.R. oscilloscope portion of the scope contains a 3" C.R. tube—powered by 2 type 80 tubes in cascade. Normal scope controls are included and the scope can be used with a frequency modulated Signal Generator such as the Supreme 561 for visual alignment work. A type 884 gaseous discharge tube gives a linear sweep from 20 to over 30,000 cycles.

  The vertical Video amplifier uses 3 type 1852 tubes and 1 type 6AG7 tube—Frequency response is from 20 cycles to 2.5 megacycles with an undistorted gain of 100 db.

  The wave meter uses one 1852 tube and is a 4 band tuner covering from 65 KC to 6.5 MC. Tuning is by means of a large laboratory type knob with a 5 to 1 reduction shaft mechanism and a shadow type—razor edge indicator on an illuminated dial. The video amplifier may be used with or without the tuning unit.

  The horizontal amplifier is a 6SJ7 tube—its range 10 cycles to 100 KC with a gain of 40 db.; this and the 6J5 Vacuum tube Voltmeter make up the complement of 10 tubes.

THE IDEAL COMPLETE SERVICE LAB.

When used with the Supreme 561 combination A.F. and R.F. oscillator, the Vedolyzer makes a complete service laboratory setup, minus only a tube tester, and may then be used not only for trouble shooting and Dynamic Signal tracing but also makes possible:

On all sound systems and audio equipment: Frequency runs—Power output test—Overload tests.—Selectivity measurements—

On all broadcast receivers 65 KC to 2.5 megacycles: Selectivity measurements—Comparative sensitivity—Overall Fidelity Tests.

Complete receiver alignment of all: I.F. stages—A.F.C. circuits—R.F. circuits using the famous Supreme visual alignment method.

In short, a combination of the Model 560-A—561 will actually accomplish more than individual laboratory instruments, consisting of: 1—Cathode Ray Oscilloscope with high gain, wide range, video amplifier; 2—A.F. Oscillator; 3—R.F. Oscillator; 4—Frequency Modulator; 5—Conventional Signal Tracer; 6—AC and DC vacuum tube voltmeter; 7—Vacuum tube ohmmeter.

When used with a square wave signal generator having a frequency of from 60 cycle to 70 K.C. the cathode ray oscilloscope may be used to check the frequency characteristic and to adjust low and high frequency compensation of: All wide range high fidelity audio amplifiers—overall characteristics of sound systems—low and high frequency compensation of video amplifiers in Television receivers.

The Model 560-A VEDOLYZER will not only enable you to do a more complete service job but it will increase your servicing—AND PROFITS—50 to 100%. The oscilloscope in the Model 560-A alone is worth more to you than the price of the complete instrument.

DEALER NET CASH PRICE $129.50

S.I.C. Time Payment Plan $13.50 cash and 12 monthly payments of $10.63.

AUDOLYZER

NEW! Practical System of Dynamic Testing and Signal Tracing that TELLS YOU THE TROUBLE!

MODEL 562

EASE OF OPERATION

YOU will be surprised and delighted at how easy it is to operate the SUPREME MODEL 562 AUDOLYZER because it requires but one probe at a time and you always HEAR THE DEMODULATED SIGNAL. Magic eyes or meters used on some instruments are nothing more than indicators and merely determine the absence or presence of a signal. Using such devices part of the reading might be hum or distortion which can not be detected. The audolyzer not only indicates the signal but you hear the **quality** of that signal. The audolyzer is not only a complete signal tracer but a **dynamic** signal tracer.

Here are but a few of the many things you can do with this amazing instrument! You can find the dead portion of any receiver by connecting your modulated signal generator to the receiver and touching the SUPREME AUDOLYZER's probe first to the antenna post, then the grid of the R. F. tube, the plate of the R. F. tube, etc., right back through the complete receiver. You will hear a signal in the AUDOLYZER's speaker (which has a volume control) until you hit the dead stage. No signal means a defective stage.

VACUUM-TUBE VOLTMETER!

Then you use the AUDOLYZER's **vacuum-tube voltmeter** to determine whether all the DC voltages are correct **without** disturbing the **normal** operation of the receiver! This meter has 7 ranges of 0/1/3/10/30/100/300/1000 DC volts at **15 megs input.** Resistance ranges of 0/200/2000/200,000 ohms and 0/2/20 megs. The meter is a center-reading type with "minus" voltages indicating to one side of center scale and "plus" voltages to the other side. This eliminates the necessity of your shifting test leads for polarity change.

Next, you can check the receiver's oscillator by connecting the probe to the set oscillator's output and watching the meter. If the oscillator cuts out or is weak over any portion of its range, this immediately shows up as change in the AUDOLYZER meter's indication.

CHECK FREQUENCY

To determine the unknown frequency to which **any** receiver circuit is tuned—oscillator, I. F. or R. F., just use the tuning portion of the SUPREME AUDOLYZER in connection with its V.T.VM. as a frequency meter. For the receiver's oscillator, place the AUDOLYZER probe on the oscillator output and tune the AUDOLYZER for the greatest swing of the meter. Then read the frequency on the AUDOLYZER's direct-reading dial. For R. F. determination, connect your signal generator to the receiver's input and place the AUDOLYZER probe on the output of the R. F. stage under test. Adjust the signal generator and AUDOLYZER to the same frequency. Then adjust the receiver dial for maximum swing of the AUDOLYZER's meter needle. Finally, adjust receiver trimmer until receiver dial reads correctly. To determine the actual signal being fed the I. F. stages, connect the probe of the AUDOLYZER to the first Det. output, feed a signal into the receiver and adjust the AUDOLYZER dial until you get maximum swing of the meter needle. Read the **actual I. F. signal's frequency** on the AUDOLYZER dial! In none of these tests is the receiver de-tuned by the application of the probe.

GAIN MEASUREMENTS

By moving the AUDOLYZER probe from stage to stage of a receiver and noting the AUDOLYZER meter's voltage reading in each case, you can readily determine whether a stage, a tube or transformer results in a **gain** or **loss** of signal strength. Thus, you can make relative **gain measurements** with the SUPREME AUDOLYZER.

You can check the A. V. C. circuit for correct applied voltage under actual operating conditions because you have a Vacuum-Tube Voltmeter in the AUDOLYZER which instantly indicates this voltage at any place in the set—and its variation under different applied signals—without upsetting the correct operation of the set. You can adjust A. F. C. circuits in the same manner.

LOCATE DISTORTION

Distortion can easily be noted by **ear.** By placing the probe at any place where the audio signal is normally present, you can **hear** the signal and instantly determine where the distortion originates. This is also true of any R. F. or I. F. stage. If you have a scope, you can connect it to the AUDOLYZER and **see** the demodulated audio signal as well.

Leaky, shorted or open condensers can quickly be found without unsoldering them from the circuit. Because the SUPREME AUDOLYZER can be electrically divided into two sections, you can use **two** probes at a time for checking intermittents, working from the second detector's input and output toward the antenna and loudspeaker or vice versa. The AUDOLYZER can be used to check antenna efficiency as it is a fine field strength meter. You can check high impedance pickups, microphones and other input devices. You can check the receiver's loudspeaker against that in the AUDOLYZER for distortion.

You need the SUPREME AUDOLYZER in **your** service shop. It will quickly pay for itself and return you a good profit in saved time, while you are purchasing it on SUPREME'S EASY PAYMENT PLAN—just a few cents a day.

DEALER NET
CASH PRICE $78.50

S.I.C. Time Payment Plan $8.50 cash and 12 monthly payments of $6.49.

COMBINATION A.F. and R.F. METERED OSCILLATOR MODEL 561

HERE IT IS! The answer to **your** request and **hundreds** of other servicemen who wrote us asking for a combination **variable A. F.** and **R. F.** oscillator with a **metered output** and means for **modulating** the **R. F.** with **variable A. F.** oscillator.

Model 561 is a signal generator with which you can do **everything. Five** types of signal outputs—(1) Variable audio from 15 to 15,000 cycles (2) Unmodulated R. F. from 65KC to 20.5 MC on fundamentals and to over 60 MC on harmonics (3) **Variable audio** modulated R. F. over same range (4) **Frequency modulated** R. F. for visual alignment work with any scope (5) Means for varying the **percentage** of **audio modulation** from 0 to 80%! You'll be interested in the **many** fine features of the SUPREME 561 Combination Oscillator which follow—

A. F. OSCILLATOR

—has a range from 15 to 15,000 cycles. This covers the complete audio spectrum on a 6-inch illuminated dial. Push-button selection of 4 output impedances (50, 500, 5,000 and 50,000 ohms) so you can match your oscillator to **any** input of high, medium or **low** impedance. The oscillator's output is center-tapped so you can use it across **push-pull inputs.** The accuracy of frequency and purity of wave form is something you will rave about—less than 5% harmonic distortion over the **entire range.** The power output is approximately 150 milliwatts and the open circuit voltage 35 volts. The frequency response is flat within plus or minus 1 db. between 30 cycles and 10,000 cycles. 15 cycles is down 2 db., and 15,000 cycles is down 2 db. The output is fully controllable from 0 to maximum output.

R. F. OSCILLATOR

—covers from 65KC to 20.5 MC in five bands (65/205KC, 205/650KC, 650/2050KC, 2050/6500KC, and 6.5/20.5 MC). For checking frequencies above this point, harmonics may be used to above 60 MC. Each range is push-button selected and only two scales are necessary for all bands. These are on a large, illuminated 6" dial with a hair-line, razor-edged, shadow type indicator which eliminates parallax. A ratio tuning mechanism allows you to find any frequency accurately. A buffer-coupled oscillator circuit with air-dielectric trimmers and iron core inductor coils allows **factory calibration at both** ends of **each band**—resulting in a guaranteed accuracy of within ½ of 1% at all frequencies!

THE PUSH-BUTTON ATTENUATOR

—is of the **ladder type** and also employs a fine adjustment control. The attenuator network is double-shielded (as is every other section) and is continuously variable from ½ microvolt to 100,000 microvolts.

METERED R. F. OUTPUT

—is available by using the **built-in vacuum tube voltmeter** to control output level in **actual micro-volts.**

The R. F. and A. F. sections can be used separately **or** the **variable audio** oscillator may be used to **modulate** the R. F. oscillator. A **Percentage** of **Modulation** control gives **complete** control from 0 to 80% modulation and you read this **directly on the meter.** This is just the thing for catching second detector distortion at high modulation levels!

FREQUENCY MODULATOR

After you've repaired the customer's receiver, you will want to align it for maximum signal and response. The 561 Signal Generator, together with any scope, can be used for the fastest, most accurate procedure—**Visual Alignment. A Built-in Frequency Modulator** employs the SUPREME electronic "lock-center-synchronize" circuit—the only basic Visual Alignment circuit which is mathematically correct. To obtain this signal, merely rotate the "output" selector to the Frequency Modulation position and this signal can be used in aligning each R. F. and I. F. receiver stage. This signal is also ideal for aligning A. F. C. (Automatic Frequency Control) circuits. The circuit has a standard band pass of 30KC so that it can be used with a calibrated screen on the scope in instantaneously determining receiver band width. Its output is continuously variable.

Heavy, double-shielding is used throughout the SUPREME 561. Special low-loss cables are furnished. Big, man-sized, laboratory type tuning knobs are used. A rugged, 2% accurate meter with large easily read scale figures assures fullest accuracy.

The SUPREME 561 is more than just another Oscillator. It is a combination of four indispensable service instruments—each of highest quality and a leader in its classification. (1) An A. F. Oscillator (2) A R. F. Oscillator (3) A carrier and modulation meter (4) A Frequency Modulator—all engineered and built in one beautiful instrument that you will be proud to own.

DEALER NET CASH PRICE $88.50

S.I.C. Time Payment Plan $9.50 cash and 12 monthly payments of $7.32.

COMBINATION 561 & 560-A DEALER NET CASH PRICE... **$218.00**

S.I.C. Time Payment Plan $22.00 cash and 12 monthly payments of $17.97.

COMBINATION 561 & 562 DEALER NET CASH PRICE... **$167.00**

S.I.C. Time Payment Plan $17.00 cash and 12 monthly payments of $13.75.

MODEL 546
3" OSCILLOSCOPE
Proved Performance at Low Cost

THE MODEL 546 Oscilloscope has merited the endorsement of servicemen, radio set manufacturers in research and production, industrial laboratories and factories, colleges and scientists for more than three years.

When used with an oscillator such as the SUPREME Model 561 you can not only correctly align and adjust the band pass of I. F. stages, align R. F. and oscillator stages, check A. F. stages, etc., but you can quickly adjust A.F.C. circuits without using a vacuum tube voltmeter. A picture of the condition of the A.F.C. circuit is shown directly on the screen and when adjustment results in a correct scope picture, the A.F.C. circuit is exactly and accurately tuned.

There is no limit to the functions of an oscilloscope. Some of the profitable uses for the servicemen are **(1)** hum chasing **(2)** R.F. peaking **(3)** I.F. alignment **(4)** checking demodulation action of second detector and observation of possible overload or distortion in I.F. stages **(5)** A.F.C. action and gain **(6)** audio amplifier distortion **(7)** gain measurement—stage by stage or over-all—in R.F., I.F., and A.F. amplifiers.

The Model 546 is also ideal for use in connection with signal tracing instruments which use magic eyes or meters for indicators. Add a Model 546 to this equipment and SEE THE SIGNAL. Actually see whether or not the signal is present—whether it is correctly amplified—how much it is amplified—whether the signal becomes distorted and where—whether the circuits it passes thru are correctly tuned for maximum gain and fidelity with minimum frequency and amplitude distortion—all of these are vital indications of the true operation of a radio.

The Model 546 is flexible in operation; has simple and logically arranged controls; highly sensitive linear amplifiers produce undistorted output; high impedance input circuits and wide frequency range; positive stable synchronization; return trace eliminated to avoid confusion. The cathode ray tube is well shielded and all parts have a high factor of safety. The controls include **(1)** horizontal spot adjust **(2)** vertical spot adjust **(3)** horizontal gain **(4)** vertical gain **(5)** snap-lock synchronizer **(6)** linear time base frequency adjust (coarse) **(7)** linear time base vernier frequency adjust **(8)** spot intensity or brilliance adjust **(9)** spot or trace focusing adjust. Means are provided for external synchronization and direct access to deflecting plates.

Because waveform is an important feature in radio reproduction the Oscilloscope is a vital tester. No instrument using meters or magic eye tubes for indicators can match the Model 546. Complete instructions supplied with tester.

DEALER NET
CASH PRICE $64.50
S.I.C. Time Payment Plan $7.00 cash and 12 monthly payments of $5.33.

MODEL 571
OSCILLATOR
Range, Stability and Accuracy

HERE is a signal generator designed to reduce to a minimum drift of oscillator frequency caused by change in line voltage, humidity, temperature, and aging. By its unusual construction, reduces the allowable error in **any** selected frequency to ½ of 1% **or less.** Here is a new circuit which uses air dielectric trimmer condensers and impregnated iron tuned inductors—this high quality L/C combination increases the coil "Q" tremendously, and results in absolute freedom from temperature and humidity frequency drifts. But most important it allows laboratory factory calibration at both ends of the dial so that the dial tracks with **every** frequency and assures positive accuracy of frequency throughout the entire tuneable range.

Has fundamental bands of 65 — 205 KC.; 205 — 650 KC.; 650 — 2050 KC.; 2050 — 6500 KC.; 6.5 — 20.5 MC.; Ranges on harmonics to 82 MC. All five fundamental ranges are read on but **two** basic scales. Read the dial just as you would your multimeter—you get the correct frequency without bother, charts, or extra vernier adjustments. The dual ratio dial gives you a complete revolution of the dial with only one turn of the knob, but with a turn in the opposite direction you have a fine "low-geared" 5 to 1 vernier adjustment. For even greater accuracy the dial is illuminated and has a hair line shadow indicator which completely eliminates parallax.

The SUPREME 571 is ideal for catching 2nd Detector distortion in a radio receiver. This fine instrument has not **one** modulation level but **two**—30% for conventional testing and 75% high level modulation for quick, easy analysis of this baffling service problem. By using 75% high level modulation SUPREME engineers, for the first time, offer servicemen an actual reproduction of present day high level broadcast signals. Where a 30% modulated signal would be detected with good wave form, a broadcast program using high level modulation might easily result in unwanted distortion. The 400 cycle fixed audio note has complete freedom from frequency change when switching from high to low level modulation and vice versa.

Output controllable through a non-shorting ladder type double shielded attenuator. Double shielding is also extended to the complete chassis which minimizes unwanted leakage. You can use the 571 to produce 6 types of signals. **(1)** As a straight C.W. Oscillator. **(2)** As a 400 cycle, 30% standard audio modulated R.F. Oscillator. **(3)** As a 400 cycle, 75% high level audio modulated Oscillator. **(4)** As an externally audio modulated R.F. Oscillator (using a phonograph pick-up and audio amplifier) or **(5)** as an externally frequency modulated R.F. Oscillator by using our 529 Frequency Modulator unit (for Cathode Ray Visual Alignment Work). **(6)** 400 cycle fixed audio note for testing audio amplifiers, etc. The 571's demodulated wave is sine wave in shape, even at the high frequency end of the spectrum, and its frequency will not change when used with or without audio modulation.

Remember—stability—accuracy—unparalleled frequency range—speedy and simple operation—multimeter type scale—freedom from frequency drift—two speed knob—absence of parallax—shadow tuning—illuminated dial—two modulation levels controllable down to 0.5 microvolt—non-shorting ladder type attenuator—double shielding throughout—six types of signals obtainable. Comes to you in a beautiful oak case, complete with all accessories, detailed, easily understood instructions.

DEALER NET
CASH PRICE $39.95
S.I.C. Time Payment Plan $4.50 cash and 9 monthly payments of $4.39.

THE PORTABLE LAB *that gives you* EVERYTHING!

THE MODEL 504-A is radio's finest quality combination tube tester, battery tester, condenser tester, and set tester. Its improved circuit correctly tests all types of tubes, including loctals, octals, non-octals, television video amplifiers, single-ended types—32, 35, 40, 50, 70, 85, 117 volt and all others regardless of type. It provides correct filament voltages from 1.4 to full line voltage. It provides further protection against obsolescence by the use of Supreme's patented double floating filament return selector **push button** system, which automatically re-connects each tube socket for any possible tube base arrangement. This is positive protection against future re-arrangement of tube bases—let tube elements roam where they will, and even if the filament should be brought out at the top cap, all you have to do to take care of it is press a button. Thus, only one socket of each type is necessary. You can't put the tube in the wrong socket. Speediest operation is assured because of the new rotary chart and "arrow-way" testing system. Set controls from left to right—just "follow the arrows."

All tests are made at properly applied anode voltages and rated loads for all tube types with provisions for noise test (using phones) for locating noise, loose and bad connections. A rheostat line adjustment accurately matches tester to line voltages from 100 to 133 volts. A neon lamp provides "hot" leakage tests at R.M.A. recommended sensitivity—checks for leakage, shorts, open elements and filament continuity. By merely pressing a button the sensitivity of this neon lamp is increased to 2,000,000 ohms for checking cathode leakages in audio amplifier tubes. Tests are made on sections of multi-section tubes such as diodes/triodes; double diodes; full wave rectifiers; etc. Fourteen years experience in manufacture and research of tube testers insures you complete satisfaction from the operation of the Model 504-A.

In designing the set tester circuit of the Model 504-A, each circuit function and range was selected for (1) greatest usability (2) maximum range overlap (3) closest accuracy and (4) lowest "per-range" cost. 31 ranges provided as follows:

0.1 TO 2500 DC VOLTS

7 vitally necessary DC voltage ranges from 0.1 volt first scale division to 2500 volts! 0/5/25/100/250/500/1000/2500. At 1,000 ohms per volt **standard** sensitivity, you can make DC voltage measurements in radio and television receivers and, if you are a "Ham," use the high voltage ranges on your transmitter and scope.

0.1 to 1,000 AC VOLTS

5 AC voltage ranges from 0.1 volt to 1,000 volts (0/5/10/50/250/1000) allow you full opportunity to check all tube filament voltages, local line voltage, even AC voltage of complete secondary windings of power transformers. Note that there is NO SWITCH TO HOLD DOWN—its use is unnecessary in this new circuit. Note also that the copper-oxide rectifier is GUARANTEED the same as every other PART! Note **further** that this newly designed "Perma-Grad" AC voltmeter circuit is FULLY TEMPERATURE COMPENSATED so you can use it in winter or summer with equal accuracy!

10 MICRO-AMPERES TO 10 AMPERES

7 Direct current ranges from 10 micro-amperes to 10 amperes (0/500 microamps/2.5/10/50/250 mils/1/10 amps) were included so small currents in screen, grid, plate and tube circuits can be measured as well as large currents in tube filament and automobile receivers.

0.1 TO 1,000 OUTPUT VOLTS

You can use the output ranges of the SUPREME 504-A Tube and Set Tester together with any Signal Generator (such as the SUPREME 571) for receiver alignment. NO BUTTON TO HOLD DOWN—NO EXTERNAL CONDENSER NECESSARY! 5 unabridged ranges of 0/5/10/50/250/1000 volts give you every advantage in rapid, efficient receiver adjustment.

0.1 TO 20 MEGOHMS

A wide range ohmmeter and megohmmeter circuit offers you measurements as low as 0.1 ohm first scale division (for checking voice coils) up to 20 megs for high resistance amplifier resistor tests. 5 ranges give you perfect overlap as 0/200 is the low range with 3.5 ohms center scale and total ranges of 0/200/2M/20M/2 meg./20 meg.

ELECTROSTATIC LEAKAGE TEST

Most neon bulb type electrostatic leakage circuits only measure leakage up to 2 megohms or less. The Model 504-A gives you 10 TIMES this sensitivity by measuring all paper or mica condensers on the 20 megohm resistance range of the meter.

ELECTROLYTIC LEAKAGE TESTS

Here is a truly COMPLETE electrolytic leakage test! All electrolytic capacitors including high voltage filter capacitors and low voltage—high capacity bypass condensers are checked AT THEIR CORRECT WORKING VOLTAGE! Seven individual working voltages are at your finger tips—450, 300, 250, 200, 100, 50, and 25 volts. Tests are made on a "Good Capacitor—Bad Capacitor" English reading scale for easy operation. Another "EXCLUSIVE" SUPREME feature not found IN ANY OTHER TUBE AND SET TESTER!

BATTERY TESTS

Batteries must be checked under the loads at which they are to operate. The battery testing circuit of the Model 504-A provides its load, plainly marked on the panel, for all of the commonly used dry portable batteries. The condition of the battery is indicated on an English reading "bad-good" scale.

ONE PAIR OF PIN JACKS

29 ranges operate from but one set of pin jacks. No switching around of test leads—no confusion—no lost time. The 2500 DC volts range and the 10 DC ampere range are terminated in separate jacks to withstand the high voltage and current.

"SPEED-WAY" OPERATION

The same push button switches are used for both tube tester and multimeter measurements. Any function is obtained by pressing one button on the left hand row and any range obtained by pressing one button on the right hand row. Thus, you have instant control of all 31 functions and ranges.

ACCURACY

All multimeter ranges factory calibrated to within 2% on DC and 3% on AC measurements. Individual specially selected, heat treated and aged ceramic resistors for all voltmeter functions. Wire wound resistors used in all current measuring ranges. Push button switches use heavy, silver plated contacts for long, trouble-free operation.

MORE VALUE FOR LESS MONEY

When you use **your** SUPREME 504-A Tube and Set Tester, you will immediately see that it offers more value for less money than ever before. See this remarkable instrument at your radio jobber's TODAY. Remember—it, as well as all other SUPREME instruments, can be owned by you on SUPREME'S EASY PAYMENT PLAN—just a few cents a day, no more than you pay for cigarettes!

DEALER NET CASH PRICE $65.95

S.I.C. Time Payment Plan $7.25 cash and 11 monthly payments of $5.94

NEW MODEL 592 Speed TESTER

46 Ranges

DOUBLE METER SENSITIVITY

Model 592 is for the serviceman who wants the finest multimeter that money can buy. Proved principles of engineering, custom construction, exacting inspection, laboratory calibration plus the finest materials the market affords, make the 592 the first choice among discriminating servicemen. If you want "tops" in quality, accuracy, complete coverage, and speed of operation, the 592 is your instrument. 46 carefully selected ranges are at your finger tips. Use the 592 once and you will never be satisfied with anything less.

1 MICROAMPERE TO 14 AMPERES

The SUPREME Model 592 has **eight** (8) Direct Current measuring ranges from 1 microampere first scale division to 14 amperes. (70/700 microamps; 7/35/140/350MA; 1.4/14 amps.) Thus, you can measure sensitive currents in photocell circuits, make each and every Direct Current measurement in all radio and television receivers including heavy drain filament current measurements in automotive, farm and battery receivers.

DOUBLE METER SENSITIVITY

The SUPREME Model 592 has **two** DC voltage measuring sensitivities—**1000 ohms per volt** for all regular DC voltage measurements and Super-Sensitive **25,000 ohms per volt** for high resistance receiver circuits. **No other tester has this feature!**

0.1 TO 1400 DC VOLTS

A total of **fourteen** DC voltage ranges from 0.1 volt first scale division to 1400 volts. Seven ranges at 1000 ohms per volt allow you to make all DC voltage measurements for comparison against standard receiver manufacturer or radio manual voltage tubes. (0/3.5/-7/35/140/350/700/1400 volts.) Seven ranges at 25,000 ohms per volt give you full freedom to dynamically measure DC voltages in high resistance amplifiers, Automatic Volume Control (A.V.C.) circuits, Automatic Frequency Control (A.F.C.) Circuits and, in fact, any other circuit where an added drain of over 40 microamperes would upset operating voltages. No longer do you need **two** separate multimeters for high and low sensitivity tests because the SUPREME Model 592 gives you **both in one instrument.**

1/4 OHM TO 50 MEGOHMS

Six resistance ranges from **1/4 ohm** first scale division to **50 megohms** and all with **self contained battery supply.** (1/4—500/5,000/50,000/500,000/5 megs./50 megs.) **Another "exclusive" found only in this instrument!** With these ranges you can accurately check every resistance in every radio or electrical circuit from a fractional ohm speaker voice coil winding up to high resistance leakages in or between parts. You have an unparalleled, accurate electrostatic (paper or mica) condenser leakage test. No electrostatic condenser will pass this test and not operate correctly in a set!

0.1 TO 1400 AC VOLTS

The SUPREME Model 592 has 6 basic usable AC voltage ranges from 0.1 AC volt first scale division to 1400 AC volts. (0/7/35/-140/350/700/1400.) No matter what AC voltage test you desire to make, be it a check of the filament voltage of a tube, the local line voltage, or the AC voltage of the complete secondary on a power transformer you don't have to **guess** with a SUPREME 592. A new, specially designed circuit minimizes rectifier burn-outs. No safety switch to hold down—no surges or overloads to plague you. Rectifier guaranteed along with the balance of instrument!

COMPLETE OUTPUT RANGES

So that you have every conceivable advantage in lining up receivers with a signal generator and output meter, the SUPREME 592 has the full 6 ranges for this purpose (0/7/35/140/350/700/1400)—no ranges dropped—no external condenser to add.

—10 TO +46 DB.

You might think that the foregoing ranges were more than enough for the low price asked, but SUPREME 592 also has 5 additional Decibel measuring ranges from —10 db. to +46 db. or, in terms of watts, from **.0006 watts** to almost **2 hundred watts!** (—10/+6; 0/+16; +10/+26; +20/+36; +30/+46 db.). This tester will read db. direct on any 500 ohm line with a simple conversion chart and data supplied so that readings may be taken on any line of known impedance.

SPEEDY, DEPENDABLE OPERATION

Until you've actually operated the SUPREME 592, you can't conceive of its easy, lightning operation. Study the picture. There are seven functional push-button switches to the right of the meter and seven range switches to the left of the meter. All you do to obtain any one of the 46 ranges is to press one button in the left hand row and one button in the right hand row! Thus, at your fingertips you have instant control of every range and function!

25,000 OHM PER VOLT METER

The 4"x4¼" long scale meter movement uses a huge, solid alnico magnet with welded pole pieces. This strong magnet allows the moving coil to be wound with wire of over double the diameter used with ordinary tungsten or punched magnet meters. Each meter movement must show an inherent accuracy of 1% at mid-scale and at full-scale before acceptance on the assembly lines.

EVERY RANGE SELECTED

The ranges have been selected after a careful study of the operating voltages and currents required by the nearly 400 types of vacuum tubes as well as a study of commercial circuit requirements. Based on these studies, the ranges, and overlap from range to range, were selected so that practically every reading can be made in the top half of a scale where meter accuracy is always highest.

NO "ROAMING TEST PRODS"

The very practical "Speed-Way" switch system allows all the ranges and functions to be available at only one pair of pin jacks except the 14 ampere DC range, for which heavy binding posts are supplied. These are necessary here because heavy currents produce excessive heating due to contact resistance in pin jacks and cause pin jack burnouts.

Now you can readily see why we rightfully claim that the SUPREME Model 592 Push Button Set Tester is the world's finest instrument; that any other meter would cost you from 47% to 135% more per range, and that the SUPREME 592, is, in fact, **"SUPREME BY COMPARISON"! See it at your jobber's today.**

DEALER NET CASH PRICE $43.95

S. I. C. Time Payment Plan $5.00 cash and 10 monthly payments of $4.33

More New Test Equipment

HIGH VOLTAGE TEST LEADS

SUPREME's answer to the high voltage problem is their type 4875 test leads. Designed to extend the D. C. voltage range of the Model 549 to 6000 volts, they are tested at 10,000 volts.

The cable is number 18 gauge, stranded tinned copper wire with heavy rubber insulation. The large handles are made of bakelite. The testing prods are approximately 6" long with 2" prods on opposite ends. Length of cable is approximately 5 feet.

Part of the multiplier is incorporated in the probe and serves to isolate the probe from the circuit under test. The total multiplier is also incorporated which makes it unnecessary to change the regular Model 549 in any way. The total resistance in the probe is calibrated to ± 1%.

DEALER NET CASH PRICE—
TYPE 4875 LEADS, PAIR.....$5.75

or, if purchased with Model 549 Electronic Voltmeter, merely add 63c to each of the 10 monthly payments.
(No increase in down payment.)

MODEL 549 ELECTRONIC VOLTMETER

Model 549 is the result of a long period of research in designing a multimeter which will fulfill the serviceman's needs of today and tomorrow at a price he can afford to pay. The instrument will take care of all the serviceman's multimeter requirements since it has standard provisions for A.C. and output volts, direct current measurements, etc., in addition to the electronic circuit for D.C. voltage and resistance measurements.

0.1 TO 6000 D. C. VOLTS

—covered by six overlapping ranges of 0/2/6/20/60/200/600 volts. These ranges may be extended to 6000 volts, at small extra cost, by use of the special probe described in the panel on the left side of this page. The input impedance of all ranges up to and including the 600 volt range is 15,000,000 ohms. The input impedance of the 6000 volt range is 150,000,000 ohms. The probe supplied for measuring D.C. volts is designed so that the D.C. volts developed across oscillator grid leak can be measured without materially affecting the oscillator. Also all plate, screen bias, A.V.C., and A.F.C. voltages can be measured without upsetting the operation of the receiver. Voltages of either negative or positive polarity with respect to chassis or ground may be measured by setting the circuit selector switch to "—" volts or "+" volts. The low range of **2 volt full scale** gives a sensitive meter necessary in measuring small control voltages.

0.5 OHMS TO 1000 MEGOHMS

—covered by 5 overlapping ranges of 0/1000/100,000/1 megohm/10 megohms/1000 megohms. An electronic circuit is incorporated in the ohmmeter which allows the 1000 megohm range to be reached with a 3 volt self-contained battery. Features incorporated are the extreme accuracy acquired by adjusting the ohmmeter at "zero" position and "full scale" position. After this is once set there are no adjustments to be made between ranges. The low range has a center scale resistance of fifteen (15) ohms which gives a good deflection in checking resistances of radio frequency coils. You will like this type of ohmmeter for its speed and accuracy. Being of an electronic type the meter is fully protected and accidental application of the voltage to the ohmmeter will not injure the instrument.

0.1 VOLT TO 500 A.C. VOLTS

—covered by 5 overlapping ranges of 0/5/15/50/150/500 volts in a circuit whose calibration is guaranteed to ± 3%. Copper oxide rectifier is fully protected and carries the same guarantee as all other parts in the instrument. Temperature error of rectifier is corrected over a working range of 40° F to 100° F.

10 MICROAMPERES TO 15 AMPERES D.C. CURRENT

—covered by 7 direct ranges of 0/500 microamperes; 0/5/15/50/150/500 M.A.; and 0/15 amperes. Such a wide selection of ranges was incorporated to meet all current measurements necessary—from the few microamperes found in control circuits to the ampere drain of automobile receivers.

0.1 TO 500 OUTPUT VOLTS

—can be used with any good signal generator (SUPREME Model 571 or 561) for receiver alignment. Covered by five ranges of 0/5/15/50/150/500 volts.

The Model 549 may be obtained in a metal case, without lid, for shop use or it may be obtained in a beautiful quartered Oak portable type case with removable cover and large compartment for test leads and other accessories.

Dealer Net Cash Price— Metal Case **$39.95**	Dealer Net Cash Price— Portable Oak Case..... **$42.50**
S.I.C. Time Payment Plan $5.00 cash and 10 monthly payments of $3.90	**S.I.C. Time Payment Plan $5.00 cash and 10 monthly payments of $4.18**

MODEL 542 MULTIMETER

A regular little pocket laboratory with a case only 3"x5¾"x2" in size, weighing but 23 ounces—24 ranges—just as accurate and even more convenient than you would expect to find in an instrument twice its price. 4 DC mil ranges (with first scale division 5 microamperes) of 0/0.3/6/30//150; 4 DC volt ranges (with first scale division 0.1 volt) of 0/6/150/300/1500; 4 ohms ranges (with 1 ohm first scale division and 25 ohms center scale) of 0/2,000/20,000/200,000/2 meg.; 4 AC volt ranges (with first scale division 0.1 volt) of 0/6/30/150/600; 4 output ranges of 0/6/30/150/600; 4 decibel ranges of —6/+10, +8/+24, +22/+38, +34/+50. The Model 542 is not a toy—it uses a full size 3" square meter with a rugged, accurate 200 microampere movement and a knife edged pointer. This movement has a sensitivity of **5000 ohms per volt!** All ohmmeter ranges, including the megohm range, are operated by batteries furnished with the instrument and contained within its durable black moulded bakelite case.

DEALER NET CASH PRICE, $16.30

For Installment Terms See Order Form

Quality At Low Cost

MODEL 547 MULTIMETER

Owners of SUPREME push button multimeters prompted the design of the Model 547. This instrument incorporates an idea which SUPREME presented about two years ago in the Model 592. It has proved to be the simplest, fastest and most convenient of all types of multimeter range and circuit selection. Servicemen who have grown accustomed to this type of multimeter will not go back to rotary switch or pin jack operation. Functional switches are on one side of the meter and range switches on the other side of the meter. All that is necessary to obtain any range is to press one button on the left hand row and one button on the right hand row. Thus, at your fingertips you have instant control of 36 ranges. It will take only a minute for you to see the difference at one of your parts jobbers. Ask for the **Model 547.**

The Model 547 incorporates a large 7" illuminated meter which allows accurate reading with minimum eye strain. The large illuminated dial is ideal for readings taken under adverse lighting conditions found on most service calls. All ranges can be easily read even though standing two or three feet away from the instrument.

The Model 547 provides ranges which cover service, amateur, laboratory and television use. The meter multipliers are aged metallized resistors. Wire-wound resistors are used for all shunts. Quality parts are used throughout.

0.1 TO 3000 D.C. VOLTS

—covered by six overlapping ranges of 0/6/30/150/300/600/3000. At 1000 ohms per volt **standard** sensitivity you can make D.C. voltage measurements in radio and television receivers and, if you are a "ham," you can use the high voltage ranges on your transmitter and scope. Accuracy ±2% on all ranges except 3000 volt which is ±3%.

0.1 VOLT TO 3000 A.C. VOLTS

—covered by six overlapping ranges of 0/6/30/150/300/600/3000. Uses fully protected copper-oxide rectifier which carries the same guarantee as the other parts in the instrument. Accuracy ±3%. This new circuit is fully compensated for temperature variations so you are assured that you can use it in winter or summer with equal accuracy.

0.1 VOLT TO 3000 OUTPUT VOLTS

—covered by six overlapping ranges of 0/6/30/150/300/600/3000. No external condenser necessary. May be used with any signal generator for receiver alignment.

0.1 TO 600 MILLIAMPERES

—covered by five overlapping ranges of 0/6/30/150/300/600. Uses wire wound shunts calibrated to ±2%.

1 OHM TO 20 MEGOHMS

—covered by five carefully selected ranges of 0/2000/20,000/200,000 ohms and 0/2 meg/20 meg. Low range has center scale resistance of 25 ohms. Megohm ranges operate from A.C. line supply; other ranges from self-contained battery.

—10 TO +44 DB.

—covered by five ranges of —10/+4/+18/+32/+38/+44 calibrated to read db. directly on any 500 ohm line. Simple conversion chart is supplied so that readings may be taken on any line of known impedance.

0.005 TO 20 MICROFARADS

—covered by three ranges of 0/.2/2/20 mfd. Capacity values read directly on meter scale.

Model 547 may be obtained in a metal case for shop use or it may be obtained in a beautiful Oak carrying case with large compartment for test leads and other accessories.

Dealer Net Cash Price—Metal Case **$33.95**	Dealer Net Cash Price—Portable Oak Case..... **$36.50**
S.I.C. Time Payment Plan $4.00 cash and 8 monthly payments of $4.17	S.I.C. Time Payment Plan $4.00 cash and 9 monthly payments of $4.02

MODEL 543 MULTIMETER

The Model 543 Pocket Multimeter uses the same bakelite case as Model 542. Attractive two-color panel — full size 3" one mil meter. A single rotary selector switch provides functions and ranges of: Resistance —0/2000/200,000 ohms; Direct Current—0/6/60/600 M.A.; A.C.—0/15/150/600/3000 volts; D.C.—0/15/150/600/3000 volts. Batteries furnished and contained within case. Ranges at 1,000 ohms per volt **standard** sensitivity. With this instrument you can make A.C. and D.C. voltage measurements in radio and television receivers, and if you are a "Ham" you can use the high voltage ranges on your transmitter and scope. This is a beautifully designed and rugged little instrument at an astonishingly low price.

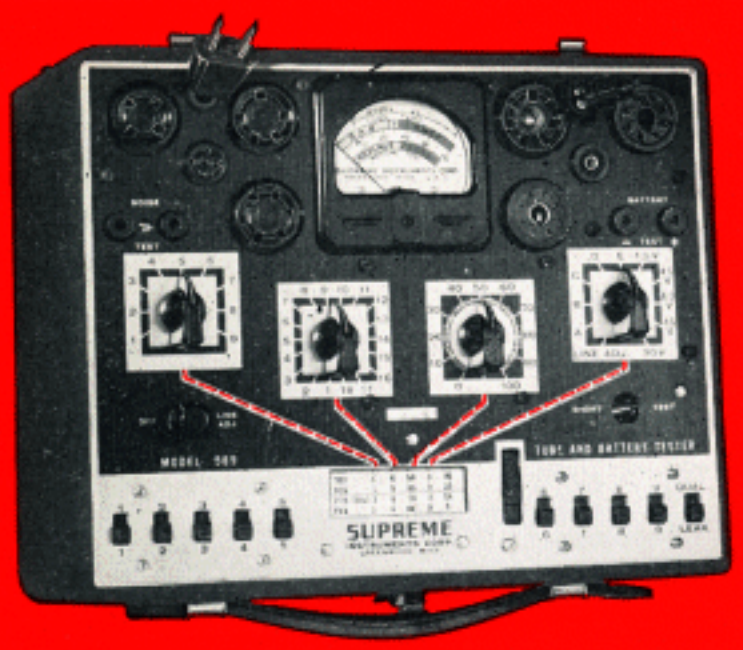
DEALER NET PRICE $11.95

For Installment Terms See Order Form

IMPORTANT FACTS

- Automatic push button circuit selection.
- Automatic push button range selection.
- Wire wound shunts.
- Aged metallized multipliers.
- Heavy silver plated double wiping switch contacts.
- No moving of test leads.
- Guaranteed copper-oxide rectifier.
- A.C. ranges corrected for temperature variations.
- Overlapping ranges.
- Large illuminated 7-inch square meter.
- Calibration of 2% D.C. and 3% A.C.
- Portable, yet incorporates large meter.

High Quality—SUPREME



589 PORTABLE MODEL
Dealer Net Cash Price..... **$29.95**

S.I.C. Time Payment Plan $4.00 cash and 8 monthly payments of $3.63

7"—589 COUNTER MODEL
With 7" Meter
Dealer Net Cash Price..... **$39.95**

S.I.C. Time Payment Plan $4.50 cash and 9 monthly payments of $4.39

9"—589 COUNTER MODEL
With 9" Meter
Dealer Net Cash Price..... **$42.50**

S.I.C. Time Payment Plan $5.00 cash and 10 monthly payments of $4.18

MODEL 589 TUBE AND BATTERY TESTER

TUBE TESTING CIRCUIT—The Model 589 Tube and Battery Tester has a completely modernized circuit. The basic principles of this circuit have already been proved by more than 75,000 SUPREME Testers still in use. The tube test sockets are not wired directly to the circuit but, instead, pass through the Patented Supreme Double Floating Filament Return Selector System which automatically re-connects all tube elements to any possible tube base arrangement. Due to the fact that any or all elements of each socket can be rotated to any desired position, only one socket of each type is necessary—no spare sockets—no doubtful "wiring-in." Even if a filament should be brought out to the top cap, the "return selector" will take care of it.

OBSOLESCENCE—SUPREME was the first to announce a tester with filament voltages from 1.4 volts to full line voltage—and, therefore, protected thousands of owners against developments which came later. SUPREME instruments stay modern! Other testers have been discarded after one or two years, but SUPREMES of the same age are still up-to-date—even after five years of service, because of our exclusive tube base switching circuit. SUPREME tube testers can be completely modernized at nominal cost by a replacement transformer. This is not an advertising claim, but a **proved record.**

ACCURACY—Each tube is tested at its correct anode potential under proper loads. The correct anode voltages and loads are supplied thru a circuit selector switch which allows the testing of rectifiers, R.F. amplifiers, diodes, converters, cold cathode rectifiers, magic eye, power amplifiers, and bantams. A filament voltage selector switch provides correct filament potentials from 1.4 volts to full line voltage. **Changes in line voltage** and load are corrected by the use of a huge power rheostat in the primary circuit. **Filament continuity** is checked visually with a neon lamp. Leakage, shorts and **open elements** are checked with a neon lamp at the recommended R.M.A. sensitivity. Tests are provided for **separate sections** in multi-purpose tubes. Also checks ballast tubes and pilot lamps.

NOISE TESTS—Use a pair of head phones, if you want to; a circuit insert is provided for checking noise, leakage, loose and bad connections.

BATTERY TESTING CIRCUIT—Because a battery reads its rated voltage on a voltmeter doesn't necessarily mean that the battery is good. It must be checked under the loads at which it is to operate. The battery testing circuit of the Model 589 provides this load, plainly marked on the panel, for the most common 1.5, 4.5, 6.0, 45 and 90 volt portable radio batteries. The "condition" of the battery is indicated on an English read "Replace-Good" scale. In setting the **proper loads** and discard points of the various type batteries, SUPREME Engineers worked in connection with the engineering departments of the largest battery manufacturers. No guess work here—if your customer's battery isn't "good" by manufacturers' standards, you sell a new one.

OPERATION—Only a glance at the panel is necessary in order to understand its operation because of the natural and logical arrangement of controls. This simple arrangement allows the checking of a complete set of tubes within half the time that is ordinarily required. "Arrow-ways" in red color lead from the tube chart to the various controls which are set as indicated opposite each tube type. Just "follow the arrows—you can't go wrong!"

TUBE CHART—Settings for all tubes (over 450 now listed) are supplied on a smooth operating roller chart with a new brass-geared roller mechanism. These settings represent more than twenty thousand tests which were conducted in close cooperation with tube manufacturers. The listings are in logical numerical order and in large type. No confusion—only one tube type appears for each setting.

ONE YEAR FREE TUBE SETTINGS—SUPREME again leads the industry in offering the serviceman a much needed service. From the time that the instrument is registered, the owner will receive One Year Free Tube Setting Service on all available receiving tube types announced. This service goes to every owner automatically each three months (more often if tube announcements justify a new list). Tube settings between dates of issue will be sent free. At the end of twelve months from registration same service can be renewed for another year at a rate of only one dollar ($1.00) which includes a new roller assembly chart. This will be sent the owner without any trouble or worry on his part.

APPEARANCE—Although very low priced, the Model 589 has as much "eye appeal" as an instrument that cost twice as much. The panel has a ribbed black background offset by satin finished highlights. The red "Arrow-ways" add enough color for distinction and match the three colored English reading meter scale. The instrument is housed in an attractive and sturdy luggage type case of brown color. This material is very durable, being especially resistant to scratches and scars to which portable instruments are usually subjected. You will be proud to show this instrument.

MATERIAL AND WORKMANSHIP—In producing the Model 589 there has been no compromise in circuit design or materials. It is the only instrument in its class which incorporates the patented double floating filament return selector system. The same manufacturing methods, careful inspection and accurate calibration is incorporated in this instrument as all other SUPREME testers. It will pay you to investigate and see this tester. Its price is the lowest at which a **good** tube tester can be built.

RADIO TESTING INSTRUMENTS

by

SUPREME

INSTRUMENTS CORPORATION

GREENWOOD MISSISSIPPI, U.S.A.

Since the policy of Supreme Instruments Corporation is one of continuous improvement, we reserve the right to change specifications, design, or prices without incurring obligation.

SIC-141