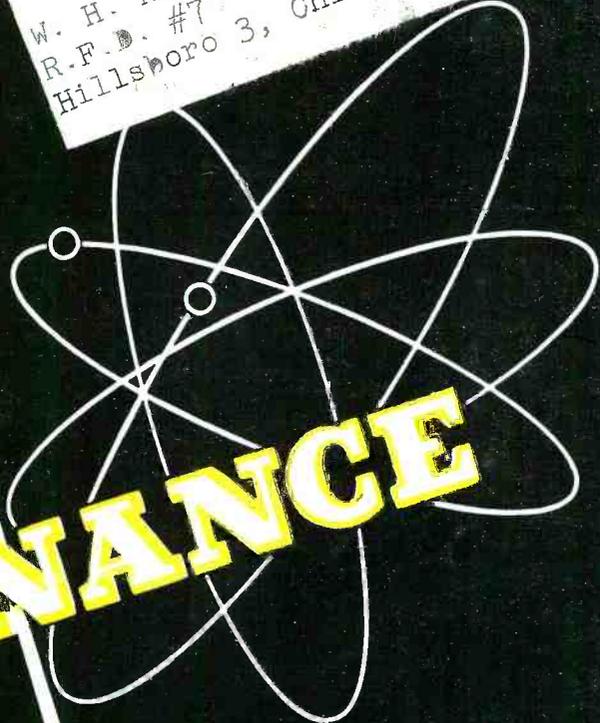


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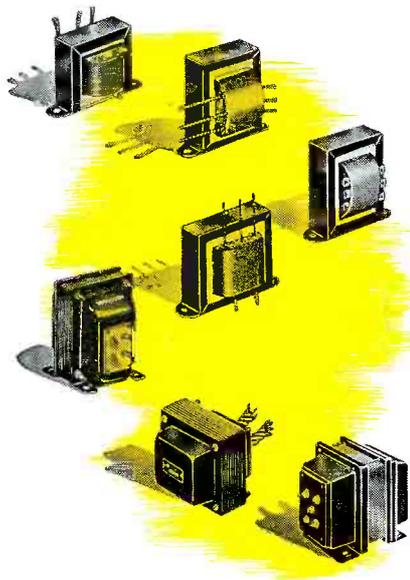
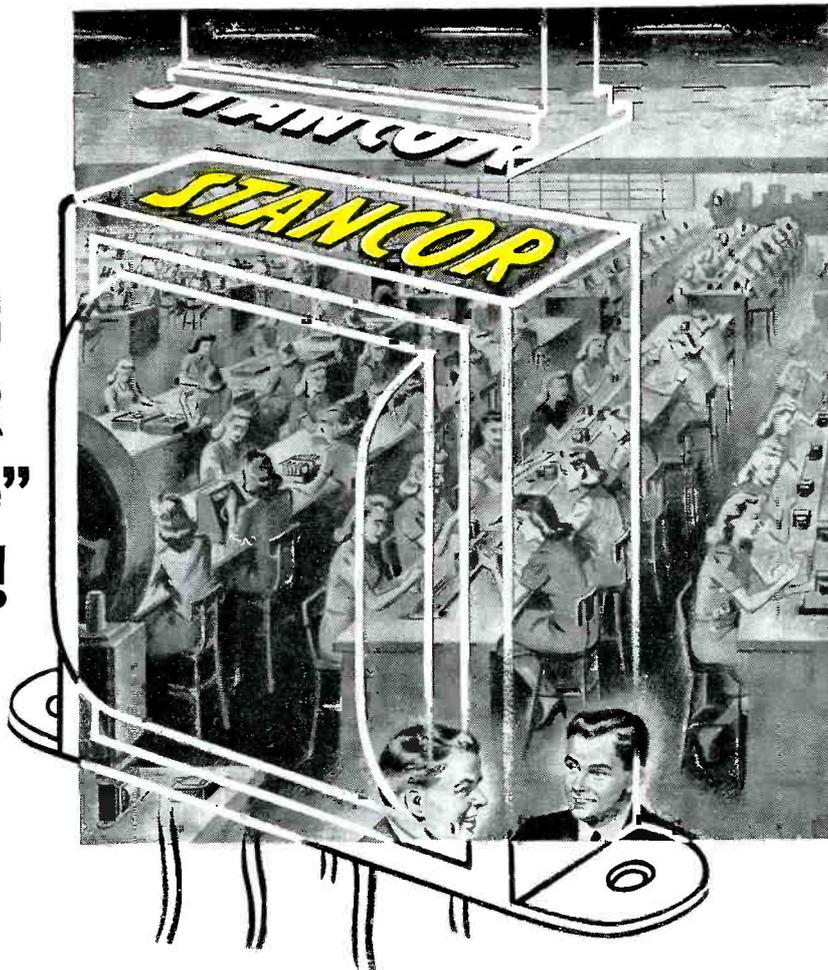
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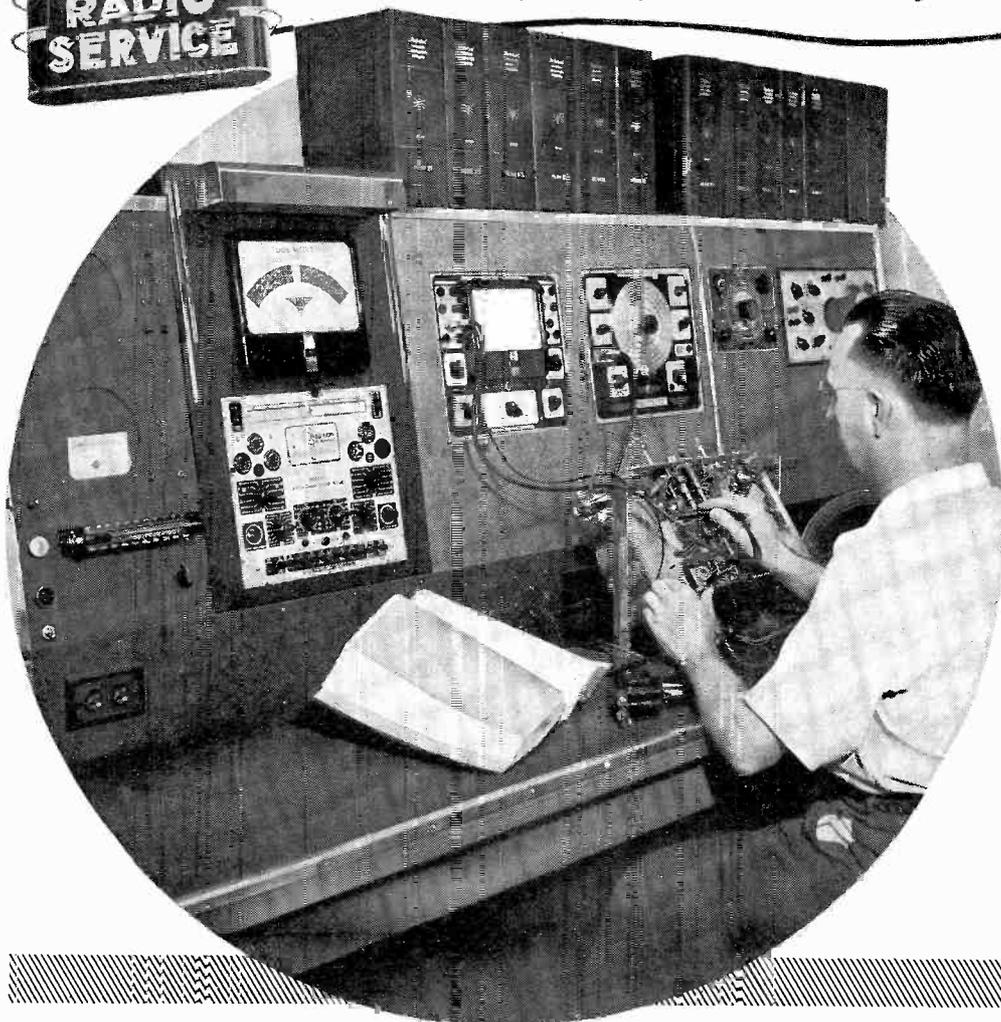


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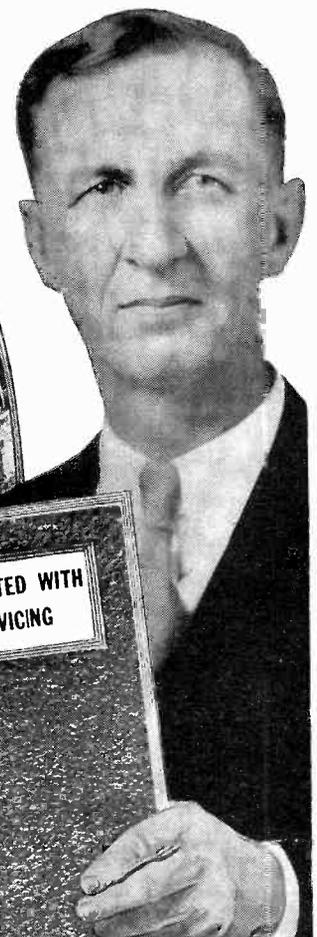
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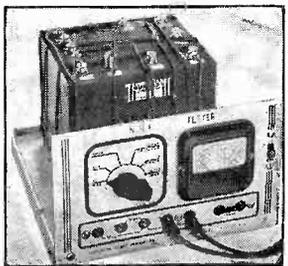
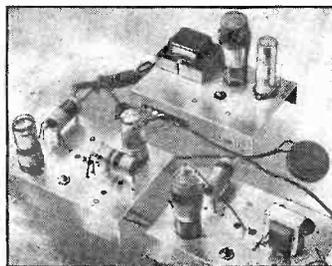
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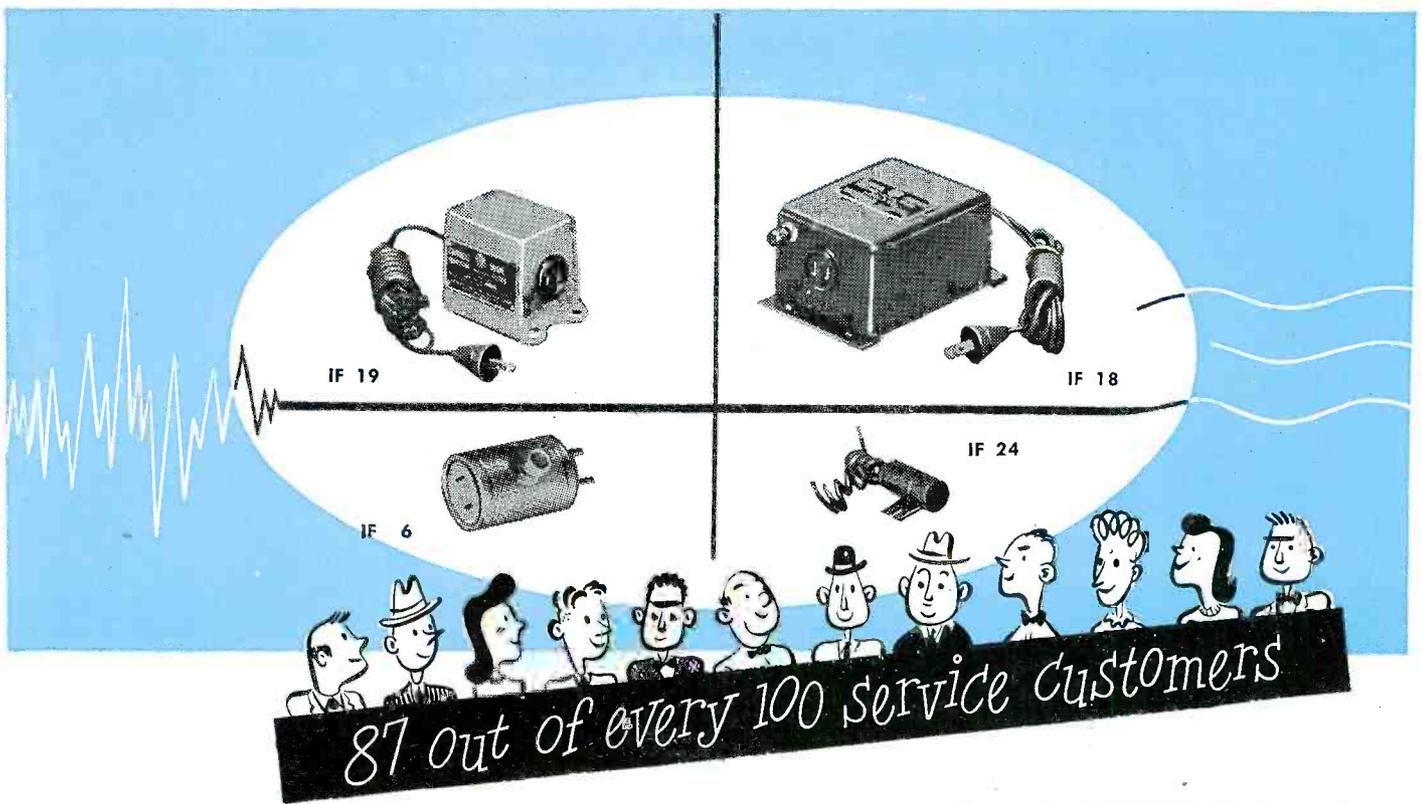
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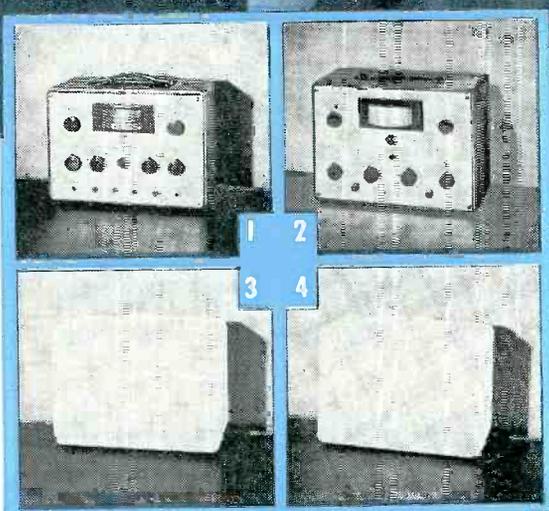
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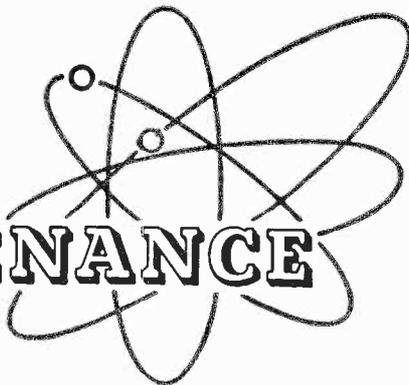
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# RADIO

# MAINTENANCE

INCLUDING  
ELECTRONIC  
MAINTENANCE



Volume 3

NOVEMBER 1947

Number 11

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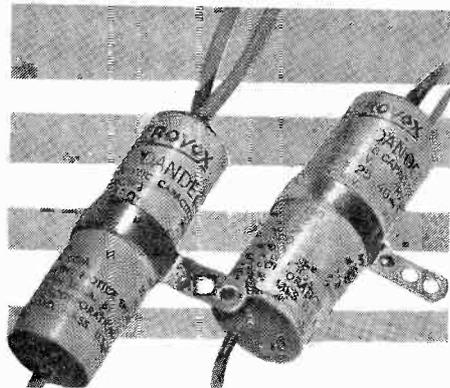
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*How's your  
servicing*

**FUTURE?**

by John T. Frye

*"There is a tide in the affairs of men,  
Which, taken at the flood, leads on  
to fortune;  
Omitted, all the voyage of their life  
Is bound in shallows and in  
miseries."*

—William Shakespeare.

Perhaps that seems a fancy way in which to begin an article on expanding your radio service business; but Will Shakespeare had the happy faculty of putting anything—including hardheaded business advice—into words just a wee bit better than anyone else. The wisdom of those lines is just as urgently true today as when he penned them.

How about you and your radio service business, anyway? Are you missing the boat are are you sailing

The Saelens Radio Service Shop pictured in the heading is located in Portland, Oregon. Utilizing 7,000 square feet of floor space, this establishment features a large parking area and keeps three trucks busy.

with the tide? How long has it been since you took a good, long, uncolored look at your business and at yourself? Quite a while? Well, suppose we take such a look right now, starting with the boss himself:

Are you satisfied with your present ability, both as a radio technician and as a businessman? Have you taken time, during the press of hectic wartime servicing, to keep abreast of the many developments

in your field; or have you simply sketched through the magazines dedicated to keeping you informed and laid them back "until I have more time"?

Are you dreading the advent of FM and television servicing, or are you kidding yourself into thinking that such servicing is a long way off? Have you taken advantage of the lectures by engineers and factory representatives that are being sponsored by dealers and servicemen's organizations in various parts of the country?

Your answers to these questions should give you a fairly clear, and perhaps painful, picture of just how modern and progressive you are technically. Fortunately, if the picture is not too agreeable, it is easy to change. Start right now to read



**Fig. 1 An excellent example of the type of efficient layout which improves service and profit is the Purdue Radio Service Department in Montclair, N. J.**

thoroughly all of the many excellent articles on the servicing and maintenance of FM and television equipment that have appeared and are appearing in magazines devoted to the serviceman's problems. Attend any lectures on your work that are given in your vicinity. Keep an eye open for new circuit developments brought out by radio manufacturers and written up in radio publications.

### **Your Shop**

Now step outside and take a look at your service shop. That look should tell you how you stand as a businessman. Is your shop easy to locate? Inviting in appearance? Businesslike and prosperous? Or would a stranger have trouble in locating it even though he knew what block it was in? Are there any eye-catching, business creating displays in the windows? Is the lighting adequate, or does the shop present a dismal and dark appearance that actually repels customers, especially feminine ones?

With an eye toward expansion, consider the location of the business. Is the locality in which it is located capable of producing the added

business that is the aim of expansion? Are there any other servicing facilities that should be added to your present setup to produce increased business? For example, it may be that you are not doing as much as you could in the fields of auto-servicing, sound equipment, or industrial electronic applications. Perhaps farm set servicing is neglected in your community. When you are thinking about expanding, give serious thought to these fields and try to embrace the most lucrative of them in your plans.

### **Competition**

Your competition, too, must be evaluated sensibly and objectively. If your area is too well covered by good, well established servicemen, it might well be better to move to another location in which conditions are more favorable; but both the quality as well as the number of your competitors must be kept in mind. One good technician with a pleasing personality and a shrewd business sense can be tougher competition than ten cubby-hole competitors. Before you decide to move, consider also the possibility of going out after a branch of the busi-

ness that your tough competition is neglecting.

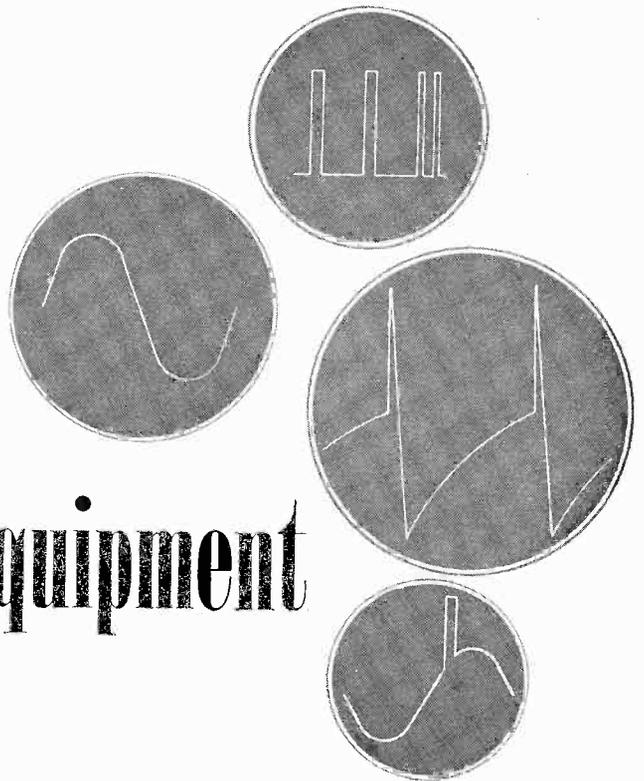
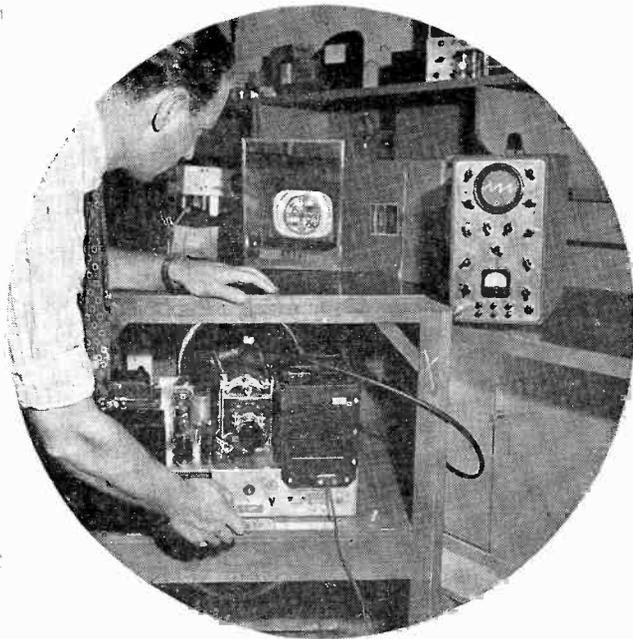
### **Equipment**

Once you are satisfied that you are technically capable of operating an expanded business, that your location is such as will warrant such an expansion, it is time to consider the most important step in this move: your equipment.

Here is a place where there must be no stinting nor penny-pinching. The old saying that a mechanic is as good as his tools is a golden rule for the radio serviceman, for good equipment means less time spent on each radio job, and this time saved means more jobs turned out.

Not only should the equipment be of the best quality obtainable, it must be modern. Radio, because of its rapid progress, renders servicing equipment obsolete in a comparatively short time. This is unfortunate, but it is true; and the only thing that can be done about it is to keep right up to date. This may seem an expensive proposition, but it really is not. The time saved by having really modern servicing equipment will be found to pay for

→ To Page 30



# television test equipment

Morton Scheraga

Allen B. DuMont Labs.

**T**HE new post-war television receivers have been marketed in ever increasing numbers for more than a year, and yet, the introduction of test equipment for servicing these receivers has lagged far behind their appearance. The lack of good test equipment and trained personnel has confused the television receiver servicing picture and caused manufacturers to set up large franchised service agencies, making it difficult for the small, independent serviceman to develop his fair share of the business. It is the intent of this article to outline the type of test equipment necessary to service television receivers and to guide the serviceman in making his choice of equipment.

The most important factor in television receiver servicing is the serviceman himself. The best of test equipment is of little value unless the user is fully trained in its operation. It has been emphasized many times in these articles that troubleshooting and aligning a receiver are a difficult and painstaking process requiring knowledge of the

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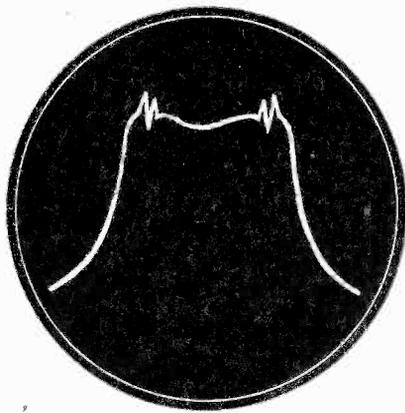
**Good test equipment is a primary requirement in servicing television receivers.**

---

theory and operation of television circuits as well as specialized test equipment. The second consideration is the financial status of the service shop. Television service organizations can be divided into two groups, each of which will be able to afford different test equipment packages. One group consists of the chain service organizations, some of which have already made their appearance. These outfits are capable of investing in high quality equipment to service and align a television set completely. The second group is the average serviceman interested in the minimum of equipment at the lowest cost consistent with good servicing.

The first group of instruments

outlined below will be called the "primary" test equipment package, which the service shop must have initially in order to do a good job of television receiver servicing. Following this is the "secondary" package consisting of accessory equipment in which the serviceman may wish to invest at a later date. It should be pointed out that much of this equipment is *not now available*. The specifications given here are for instruments needed for good service practice. The serviceman is, therefore, advised to analyze carefully each commercial instrument that is introduced in forthcoming months and select those models which most closely meet these specifications. Recommendations are made below for separate test equipment packages for the chain service organization and the average service shop. It would be difficult to include in this outline every piece of commercial equipment. It should, therefore, be understood that the models and brands considered are merely examples and not necessarily recom-



**Fig. 1** The kind of oscillogram which is obtained when testing the band pass of an IF amplifier with a sweep signal generator. The markers illustrated are the "birdie" type.

mended above other, unmentioned types.

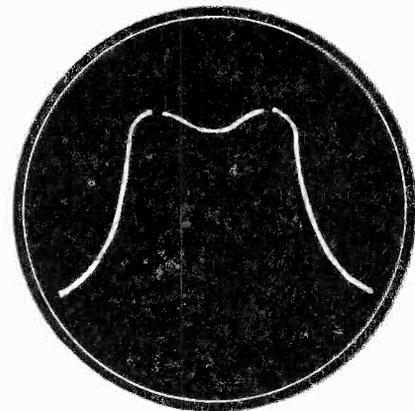
1. *The cathode-ray oscillograph* — This instrument is the most useful single tool for television servicing.

A. *For the larger service organization.*

1. An oscillograph with a sensitivity of 25 millivolts is required if alignment of the RF amplifier, video, or sound IFs is done stage by stage. In many receivers alignment may be accomplished starting at the second detector and proceeding stage by stage toward the front end of the receiver leaving the oscilloscope connected to the output of the second detector. If this procedure is used, an oscillograph of 0.1 volt sensitivity is sufficient. However, some sets must be aligned stage by stage, and even in receivers

aligned with the oscilloscope at the second detector, it may be necessary to troubleshoot a single stage. For these reasons an oscillograph with a sensitivity of 25 millivolts or less is recommended.

2. The oscillograph amplifier should pass a 60 cycle square wave without perceptible distortion. This good low frequency response is desirable for alignment with sweep frequency generators which sweep through the entire pass band at a 60 cycle repetition rate. This means that the oscillograph must have good 60 cycle response to observe the detected signal. The amplifier should also be flat to 2 mc in order to observe sync pulses without distortion. There has been some confusion regarding the upper frequency limit necessary in an oscillograph used for television servicing. It is sometimes recommended that the oscillograph have an amplifier flat to 4 mc. The fact that the video pass band happens to be 4 mc does not mean that one need observe this frequency range on the oscillograph, but it does mean that pulses rich in harmonics can be observed with accuracy. Any amplifier can be aligned with a sweep generator, which method enables one to see the entire pass band at once. See Fig. 1. This pattern of the pass band is the detected signal, however, and is of low frequency, though it represents a 4 megacycle band width. If the serviceman should want to do a point by point check of the amplifier with a signal generator from 0 to 4 mc, then a vacuum tube voltmeter rather than an oscillograph



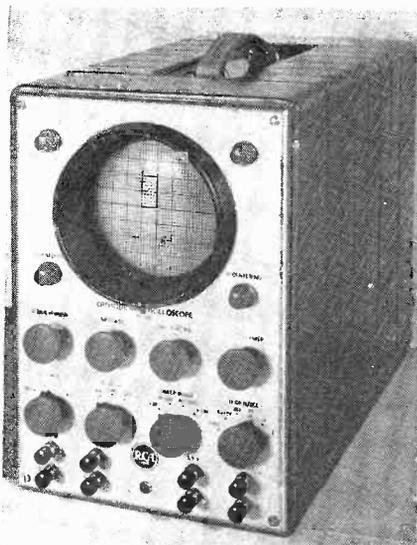
**Fig. 2** The same type of oscillogram as shown in Fig. 1, except that the markers are produced by grid modulating the cathode-ray oscilloscope.

is suitable for this test. Thus, it is seen that an oscillograph with an amplifier that has good 60 cycle response and is flat to 2 mc will meet all the requirements of alignment as well as visual observance of the sync signals.

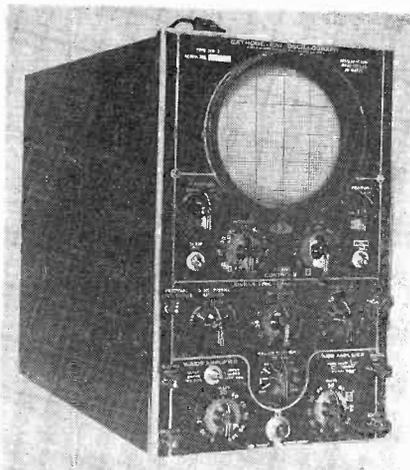
3. The oscillograph should have provision for Z-axis modulation, for some manufacturers expect to grid-modulate the markers rather than having them appear as a "birdie." Fig. 1 shows the "birdie" type of marker while Fig. 2 illustrates the result obtained with grid modulation. The latter technique is more accurate and easier to observe.

4. The sweep circuit voltages provided in the oscillograph should be linear with less than 5% distortion. Otherwise, patterns obtained

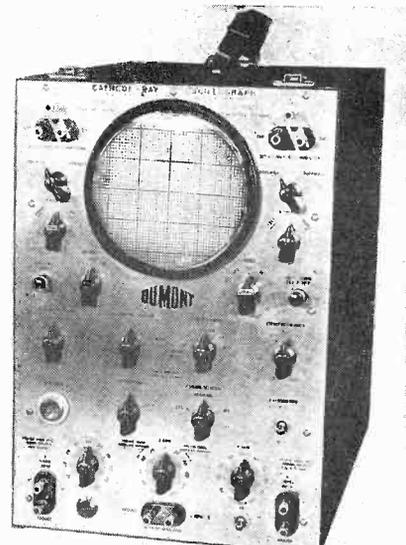
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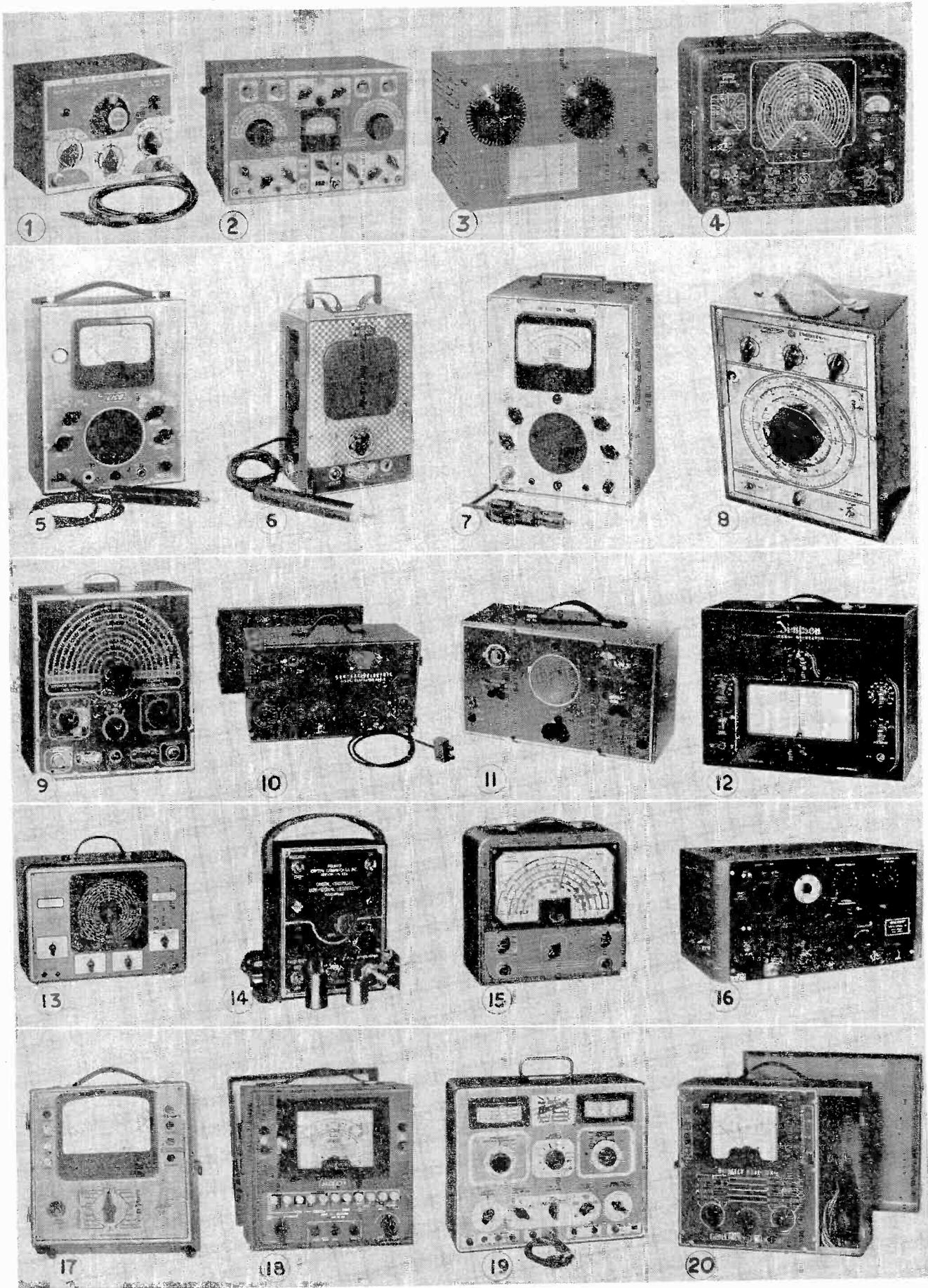
**Fig. 3** The RCA Model WO-60C cathode-ray oscilloscope.



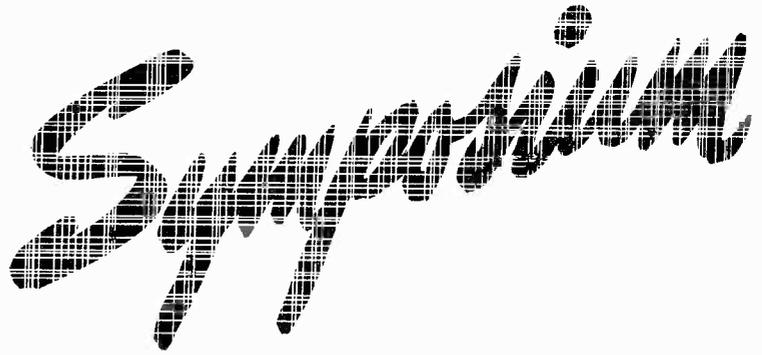
**Fig. 4** The DuMont Type 208 cathode-ray oscilloscope.



**Fig. 5** The DuMont Type 241 cathode-ray oscilloscope.



# TEST EQUIPMENT



TODAY, more than ever before, the radio serviceman needs test equipment. FM and television receivers are being sold by the thousands. Efficient service work on these receivers requires an additional investment which the average serviceman will want to make only after a careful selection from the many types now available.

In February, 1946 the staff of RADIO MAINTENANCE presented the new idea of a Test Equipment Symposium. Its object was to provide

a clear, comprehensive list of available test equipment to enable the Radio Service Technician to make an intelligent choice from the large number of types available. This first symposium met with such tremendous success that the editor of RADIO MAINTENANCE decided to answer the many requests we are receiving from readers by presenting this new, 1947 Symposium on Test Equipment.

Many new manufacturers have participated with a variety of new

models and types. Every effort has been made to cover all phases of radio service work. Purely laboratory instruments, or other types of no possible interest to the serviceman, have been excluded so as to give the best presentation of the most useful types in the trade.

We wish to thank the manufacturers who have cooperated to make this symposium so complete. We also wish to invite our readers to offer any comments or suggestions they may have.

SIGNAL TRACERS										
Mfr	Model	Ill. No.	Tubes	Type	Sensitivity Ranges	Features	Indicators	Size (Inches)	Weight (lbs.)	Approx. Price
Coastwise Electronics (Ferret)	730		6X4, 6A2, 12AU7, A4522, 6AQ5	Crystal probe	AF to 110 mc; Measures: AC-DC volts, 6 ranges to 3,000; Ohms, 7 ranges to 10 meg.	Probe $\frac{1}{2}$ " dia.; Accuracy 3% to 90 mc; 5% above 90 mc	Speaker and meter	10-1/4 x 10-1/4 x 5 1/2	9	\$89.95
Electronic Instrument Co	113A	5	6X5, 6AT6 6SJ7, 6V6, 6H6, 6SN7	Inf. impedance; VT detector in probe	Measures DC volts, 6 ranges 0-1000 volts; AC volts, 6 ranges 0-1000 v; Ohms, .2 to 1000 meg.	Vacuum tube voltmeter section independent if desired.	Speaker and meter	8 1/2 x 11 x 7	15	\$89.50
	P-60	7	6AT6	Infinite impedance detector	50 cycles - 300 mc	Probe unit for home built signal tracer. Can be connected to any amplifier with 6 volt filaments		1" O.D. 6" long	1/2	\$ 7.90
Feiler Inst. Co.	TS-1		1T4	1T4 in probe		Portable, works on flashlight cell and 22 1/2 battery	Earphones	6-3/4 x 4-3/4		\$ 9.85
	TS-2		2 - 1T4s, 3Q4	VT detector; 1T4 in probe		External connections for output meter, RF meter and phones. Battery operated.	Speaker			\$29.95
	TS-3		2 - 1T4s, 6F6, 6X5	VT detector; 1T4 in probe		Same as TS-2 except AC operated	Speaker			\$34.95
	TS-5		2 - 12BA6s 50B5, 35W4	VT detector in probe		Small, pocket size version of TS-3	Speaker	4-1/8 x 2-3/4 x 8-1/8	4 1/2	\$28.95
Philco	7030	6	7A5, 7Y4 7L7, 6AQ6	Detector in probe		Can be used as AF amp. with microphone jack; provision for metered output.	Speaker	10 x 6 1/2 x 4 1/2	9 1/2	\$52.50
Radio City Products	776		7B5, 7A7 6AT6, 6X5	Detector in probe	Through 150 mc	Jack for testing microphones and phono pickups;	Speaker	5-3/4 x 7-1/16 x 9 1/2	7 1/2	\$29.95
	777		Same	Same	Same	Same plus attenuator and meter	Speaker and meter	11-3/4 x 8 x 5	9 1/2	\$41.50
R.C.A.	162-C Chanalyst	2	6SK7, 6K7 6H6, 1852 4 - 6E5s 76, 6X5 6Q7	Tuned amplifier and tuned oscillator	To close eye: 50 microvolts RF 0.15 volts AF Also 5-25-100-500 DC volts; 25-250 watts	DC meter reads + or - volts; other circuits close eye on indicator tube.	4 - 6E5 tuning eyes	10-3/4 x 16 x 9	26	\$162.50
	170-A Audio Chanalyst		5Y3, 6E5 6H6, 6J5 2 - 6K6s 6SA7, 6V6 4 - 6SJ7s 6X5, 2050 6SN7	AF amplifier and BFO with sweep; speaker	0-150 and 0-15000 ohms impedance measurement	Incorporates VoltOhmyst (195) Four AF stages, 110 db gain. Oscillator 20 cycles to 10 kc automatic sweep from 0 to 3000 cps	Speaker	14 x 21 x 10-3/8	47	

Mfr.	Model	Ill. No.	Tubes	Type	Sensitivity Ranges	Features	Indicators	Size (Inches)	Weight (lbs.)	Approx. Price
McMurdo Silver Co.	905 Sparx	11	2 - 6C4s 6AK6, 6E5 5Y3GT	Crystal probe	.01 - 300 volts 20 cycles - 200 mc	3 stage AF amplifier; Speaker can be used as Test speaker	Speaker and 6E5 tuning eye	12-3/8 x 7-3/8 x 6-3/8	12	\$39.90
Superior	CA11			VTVM with probe		Completely portable	Meter and extra phones	5 x 6 x 7	5	\$18.75
Supreme	562 Audolyzer		2 - 6SK7s 6SQ7, 6V6 6J5, 5Y3	TRF and AF amplifiers	Measures: DCV, 7 ranges 0 - 1000; ohms, 5 ranges to 20 megohms	Zero meter, single probe, signal level and distortion indication	Speaker and meter	15 1/2 x 11 1/2 x 8-3/4	32	\$127.00

SIGNAL GENERATORS

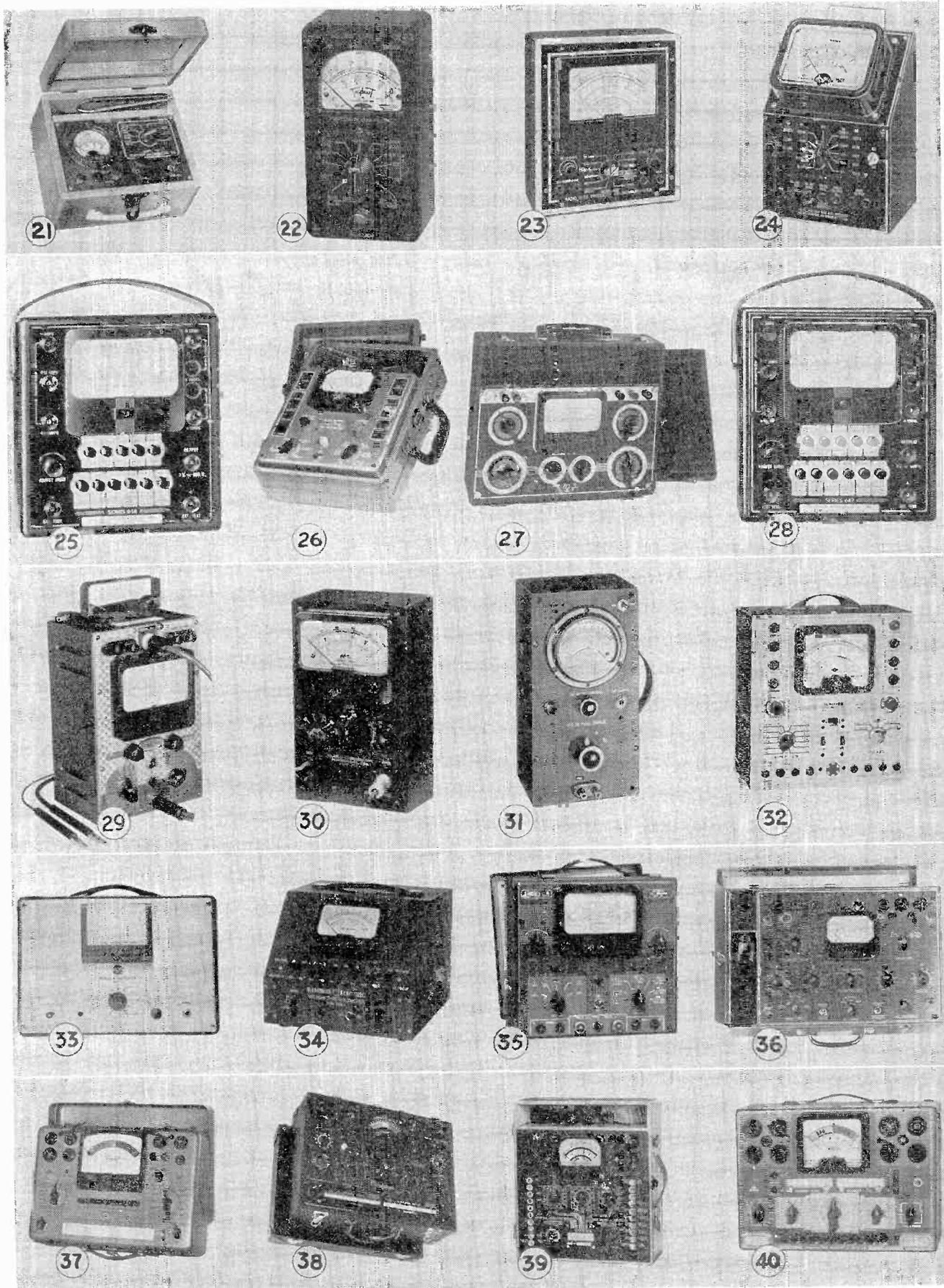
Mfr.	Model	Ill. No.	Fundamental Frequency Coverage	Modulation	Maximum Output	Other Features	Attenuator	Size (Inches)	Weight (lb.)	Approx. Price
Bliley Co.	CCO	1	Crystal controlled at 175, 200, 262, 370, 455, 465, and 1000 kc. Output at harmonics. Others available.	Internal 400 cycles	7.0 V.	Provision for external modulation, panel crystal socket for other frequencies	5 step with vernier	8 x 6 x 5	5	\$69.50
Clough-Brengle	210A	42	100 kc-32 mc, 5 ranges	Internal 400 cycles - 30%	0.1 V.	Roto-inductor coil system	4 step	10 x 15 1/2 x 6-3/4	16	
	299A		100 kc-32 mc, 5 ranges	Internal 400 cycles, 0 - 80% read on meter	1.0 V.	Freq. cal. to 0.5% Adjustable Mod. Microvolt meter	5 step	10-1/4 x 14 1/2 x 5	21	
Coastwise Electronics	700	15	170 kc - 48 mc	Internal 400 cycles	0.7 V.	All aluminum	Variable	10 x 10 x 5	8	\$49.95
	701		170 kc - 220 mc	Internal 400 cycles	0.7 V.	All aluminum	4 step	10 x 10 x 5	8	\$74.95
Electronic Instruments	315		75 kc-150 mc, 7 ranges	Internal 400 cycles	0.5 V.	Vernier dial, Accuracy 1%, Buffer stage for stability	4 step	12 x 12 1/2 x 6	15	\$64.50
Harvey	196TS	3	140 mc - 170 mc	None	0.1 V.	Low leakage	Cal. in db below 0.1 V.	10-3/4 x 10-3/4 x 16 1/2	30	\$227.50
Jackson	640		100 kc - 32 mc	Internal 400 cycles		Cal. for harmonic bands: 28 mc-60 mc and 56 mc-120 mc	5 step			\$56.00
Kay	Mega-marker		19 mc-29 mc; 10.7 mc crystal	None		Cal. dial, regulated power supply; gives markers for sweep alignment patterns	Variable	7 x 10 x 6	5	\$60.00
North-eastern	700A	8	160 kc - 20 mc	Internal 400 cycles; external	0.1 V.	AF and RF output	5 step	13 x 10 x 5	14	\$59.95
Philco	7070		100 kc-110 mc, 6 ranges	Internal 400 cycles	1 V. up to 35 mc; .6 V. 34 - 110 mc		5 step	10 x 13 x 4 1/2	14 1/2	\$97.50
Precision	E-200C		88 kc - 30 mc	Internal 400 cycles, 0 - 100%	.1 V.	AVC substitution system, Cal. Mod. control, Harmonic dial cal. to 120 mc	Dual, Variable	10 1/2 x 12 x 6	14	\$64.15
Premier Labs.	117	14	100 kc - 10.8 mc	Internal 400 cycles		Crystal control beat oscillator	Variable	3 x 5 x 7	3-1/4	
Radio City	705A		95 kc-100 mc, 5 ranges	Internal 400 cycles	1 V.	400 cps and 1000 cps AF output		8 x 11-3/4 x 5	11 1/2	\$49.50
RCA	WR67A		100 kc - 30 mc; 6 ranges	Internal 400 cycles	RF 1 V. AF 25 V. (100 kΩ)	3 fixed frequencies 455 kc, 600 kc and 1500 kc; AF 400 cycle output; Signal injection probe	4 step	13 1/2 x 9-3/4 x 7 1/2	15	\$129.50
Simpson	315		75 kc-30 mc, 6 ranges	Internal 400 cycles	.15 V.	400 cps output to 3.5 V.	4 step	16 x 10 x 6	15	\$67.35
	415	12	75 kc-130 mc, 7 ranges	Internal 400 cycles; external	.6 V. (100Ω)	Low leakage 400 cps output. Turret construction	5 step	11 1/2 x 15 x 5 1/2	19	\$115.00
Superior	650	9	100 kc-35 mc; 7 ranges	Internal 400 cycles		Buffer amp.; 2% mod. distortion		9 1/2 x 10 x 6		\$48.75
Supreme	576		85 kc - 20.5 mc, 5 ranges	Internal 400 cycles; external		Iron core inductance air dielectric trimmers; Mod. control	5 step	9 1/2 x 8-3/4 x 7-3/8	15	\$68.95
Triplet	2432		75 kc - 50 mc	Internal 400 cycles 30%		Turret type construction; Air trimmers slug tuned coils; Regulated power supply		10 x 10 x 6-3/4	12	\$88.50
	3432	13	165 kc - 40 mc	Internal 400 cycles 0 - 100%				15 x 11 x 6-1/4	14 1/2	\$63.25

AM - FM SIGNAL GENERATORS

Mfr.	Model	Ill. No.	Fundamental Frequency Coverage	Sweep Range and Modulation Frequency	Max. Output	Other Features	Attenuator	Size (In.)	Weight (lb.)	Approx. Price
General Electric	YGS-3	10	100 kc-150 mc; 7 ranges; FM oscillator 1 mc dev. $\pm 20$ kc 20 mc dev. $\pm 300$ kc 50 mc dev. $\pm 750$ kc	$\pm 20$ kc, $\pm 300$ kc, $\pm 750$ kc any center freq. in 100 kc-50 mc range $\pm 1$ , 20, or 50 mc; Mod. freq. 100-12000 cps fixed; power f. and 400 cps		AF output 100 - 12000 cps from RC type oscillator, 1 mc crystal calibrator, dual electron ray	5 step	17 x 9-3/4 x 9-3/4	33	
Harvey	204TS		20 kc - 500 kc	Dev. adjustable $\pm 0$ to $\pm 35$ kc	0.1 V.	Linear sweep output sync with FM output	5 step	7 x 9 1/2 x 10 1/2	18	\$197.50
	205TS		500 kc - 20 mc	Dev. adjustable $\pm 0$ to $\pm 450$ kc	0.1 V.	Same	5 step	7 x 9 1/2 x 10 1/2	18	\$197.50
Hickok	288X	19	100 kc - 110 mc: AM 100 kc - 160 mc: FM 7 ranges	0-30 kc at 100 kc-110 mc 0-150-450 kc, at 1 mc - 160 mc, mod. freqs. 60 and 400 cps		Harmonic check points from crystal oscillator up to 125 mc	3 step	14 x 16 1/2 x 8	28	
Kay Electric	Mega Sweep	16	50 kc - 500 mc	Sweep 30 kc-30 mc through-out range	0.1 V.	Metered output, freq. meter; less than 0.1 db per MC; AM while sweeping	Variable	10 x 12 x 17	45	\$395.00
	Mega Sweep Jr.		400 kc - 500 mc (can be extended to 1000 mc)	Sweep 300 kc-30 mc through-out range	0.1 V. (50 $\Omega$ )	Same	Variable	10 x 14 x 8	20	\$195.00
McMurdo Silver	906	41	90 kc - 170 mc AM 90 kc - 210 mc FM 8 ranges	400 cps AM, Sweep var. 0 - 500 kc; Sweep freq. - power freq.	1.0 V.	Metered output, High output jack Mod. control; turret coil construction	4 step 2 Variable controls	12-3/8 x 7-3/8 x 6-3/8	19	\$99.50
	909		5 - 110 mc	Sweep variable 0-8 mc; Marker osc. 3-60 mc	0.3 V		Variable	12-3/8 x 7-3/8 x 6-3/8	12	\$89.90
RCA	WR53A	43	8.3 - 10.7 mc (IF) 85 - 110 mc (RF)	$\pm 200$ kc at 8.3 mc; $\pm 400$ kc at 10.7 mc; FM freq. - Power freq.; AM freq. - Double power freq.	0.1 V.	Phasing control for oscilloscope; Attenuation to less than 1 uV. by use of switch in output cable; Buffer stage isolates oscillator	3 step	13 1/2 x 9-3/4 x 7 1/2	15	\$149.50
Supreme	561		65 kc - 20.5 mc, 5 ranges	60 - 15000 cps AM and FM internal	0.1 V.	Meter indicates mod. % Push-button controls		15 1/2 x 11 1/2 x 8-3/4	33	\$136.60
Triplett	3433	4	100 kc - 120 mc AM 100 kc - 170 mc FM	400 cps AM; Sweep freq. 60 and 400 cps	0.1 V.	Metered output; 2 mc and 50 mc fixed FM oscillators	6 step	15-3/8 x 11 x 8-1/4	25	\$157.50

MULTIMETERS

Mfr.	Model	Ill. No.	DC V Ranges	AC V Ranges	Current Ranges	Resistance Ranges (Ohms)	Misc. Ranges	Size (In.)	Weight (lb.)	Approx. Price
Chicago Industrial Instrument	312		25-50-125-250	25-50-125-250	0-50 ma AC/DC	0 - 100 k	.05 - 15 mfd.		2	\$ 6.75
	371		3-15-30-300		0-25 ma DC	0 - 10 k			2	\$ 5.25
	421		7.5-15-150-750-1500 1000 ohms/V	7.5-15-150-750-1500 1000 ohms/V	7.5 - 75 ma DC	5 k - 500 k		5-7/16 x 3-9/16 x 3	4	\$21.45
	431		30-300-1500 2000 ohms/V	15-150; 1000 ohms/V	0-150 ma DC	3 k - 300 k		5-5/16 x 2-15/16 x 2 1/2	4	\$16.60
	432		3-30-300-600 10,000 ohms/V			2 k-20 k-200 k-2 meg.		5-7/16 x 3-9/16 x 3	4	\$21.45
	433		3-30-300-600 20,000 ohms/V			5 k-50 k-500 k-5 meg.		5-7/16 x 3-9/16 x 3	4	\$23.40
	451A		10-50-100-500-1000 1000 ohms/V	10-50-100-500-1000 1000 ohms/V		0 - 500 k			2	\$14.90
	452A		10-50-100-500-1000 10,000 ohms/V			2 k-20 k-200 k-2 meg.			2	\$14.90
	458	24	5-10-50-100-500-2000 1000 ohms/V	12.5-25-125-250-1250	1-10-100 ma DC 2.5-25-250 ma AC	1 k-200 k - 2 meg.	-5 to $\pm 55$ db	10-1/8 x 6-3/4 x 5 1/2	8	\$26.00
General Electric	UM-3	20	2.5-10-50-250-1000 2000 ohms/V	2.5-10-50-250-1000 1300 ohms/V	1-10-100 ma DC 1-10 amps DC	1 k-100 k-1 meg.	-12 to $\pm 52$ db	9 x 10 x 4-5/8	9-1/4	\$28.50
	YMW-1A		2.5-10-50-250-1000 20,000 ohms/V	Same as DC 1000 ohms/V	0.5-5-50-500 ma DC; 0-50 ua DC	2 k-200 k-20 meg.	-4 to $\pm 62$ db 5 ranges	10-1/4 x 9-3/4 x 4	9	\$39.50
Jackson	615		5-50-100-250-1000	10-100-200-500-2000	1-5-50-250 ma DC	1 k - 500 k	HV DC 0 - 2500 V			\$24.95
	642	18	10-100-250-500-1000-5000; 20,000 ohms/V	10-100-250-500-1000-5000; 1000 ohms/V	10-100-250 ma DC; 100 ua DC; 10 amps DC	3 k-300 k- 30 meg.	-10 to $\pm 14$ db $\pm 10$ to $\pm 34$ db $\pm 30$ to 54 db	8 1/2 x 8 1/2 x 6	6	\$59.50
Philco	7001	29	1-3-10-30-100-300-1000-10,000-30,000	Same as DC	0 - 30 amp. AC	1.5 k-15 k-150 k -1.5 meg ohms	.003-.03-.3-3-30-300 mfd.	10 x 4 1/2 x 6 1/2	10 1/2	\$97.50



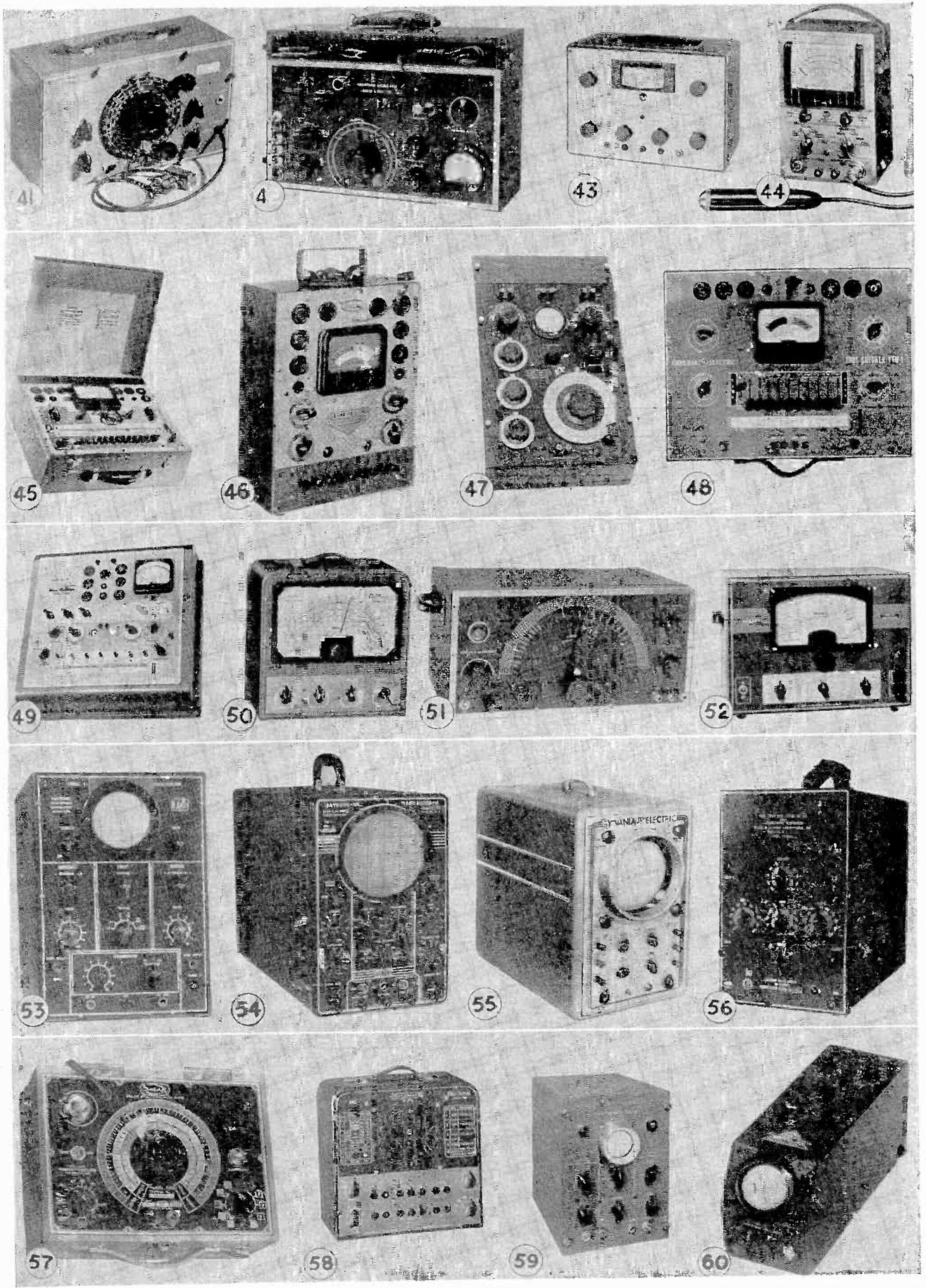
Mfr.	Modél	Ill. No.	DC V Ranges	AC V Ranges	Current Ranges	Resistance Ranges (Ohms)	Misc. Ranges	Size (Inches)	Weight (lb.)	Approx. Price
Precision	40		3-12-60-300-1200-3000 1000 ohms/V	Same as DC 1000 ohms/V	0.6-6-60-600 ma DC	5 k-500 k-5 meg.	-26 to +64	4 x 5 x 3	2½	\$22.00
	80		6-12-60-300-1200-6000 1000 ohms/V	Same as DC 1000 ohms/V	0.6-6-60-300 ma DC; 1.2-12 amps DC	1 k-100 k-1 meg -10 meg.	-20 to +70 db	5½ x 7 x 3	5	\$32.00
	85		3-12-60-300-6000 20,000 ohms/V	Same as DC 10,000 ohms/V	120 ua-1.2-12- 120 ma DC; 1.2-12 amps DC	6 k - 600 k - 6 meg.-60 meg.	-26 to +70 db	5½ x 7 x 3	5	\$39.00
	847	28	3-6-12-60-300-600- 1200-6000 5000 or 1000 ohms/V	Same as DC 1000 ohms/V	300 ua-1.2-3-30 -300-600 ma DC; 1.2-12 amps DC	2 k-20 k-200 k; 2-20-200 meg.	-26 to +70 db	7½ x 8½ x 3	5	\$42.90
	858	25	3-6-12-60-300-600-1200 -6000 20,000 or 1000 ohms/V	Same as DC 1000 ohms/V	60-120 ua, 1.2- 12-120-600 ma DC; 1.2 - 12 amps DC	6 k-60 k-600 k; 6-60-600 meg.	-26 to +70 db	7½ x 8½ x 3	5	\$47.94
	866		Electrically same as Model 847 but has different size meter and remote extension control box						19 x 12-1/4 x 6; panel mount	16
Radio City Products	447		5-50-250-500-2500	10-100-500-1000	1-10-100 ma DC 1-10 amps DC	500-100 k-1 meg.	-8 to +55 db	5 x 8½ x 3	1-1/4	
	449P		5-50-250-1000 5000 ohms/V	Same as DC 1000 ohms/V	5-10-100-1000 ma DC	2 k-20 k-200 k- 2 meg.	-6 to 52 db	6½ x 4½ x 3½	2-3/4	\$28.50
	462	23	2.5-10-50-250-1000- 15,000; 20,000 ohms/V	Same as DC 5000 ohms/V	0-10 ua; 0-10- 100-500 ma DC	200-200 k-20 meg.	-10 to +55 db	4-1/4 x 8½ x10-1/8	5	\$41.50
	488A		3-12-60-300-600-1200 -6000; 20,000 ohms/V	Same as DC 1000 ohms/V	60-300 ua DC; 3-20-120-600 ma 0-12 amperes	3 k-300 k-30 meg.	3-6-12 amps AC (current transformer)	11-5/8 x 9-3/4 x 6-1/8	10	\$59.50
RMS Elec- tronics	796 797	27	1-10-100-500-1000- 10,000; 20,000 or 1000 ohms/V	Same as DC 1000 ohms/V	50-100 ua-1-10- 100 ma-1-10 amps DC	Rx1, 10, 100, 1 k, 100 k	-5 to +75 db 5 ranges	10-1/4 x 12½	8	\$64.50
Simpson	230		10-50-250-1000 1000 ohms/V	10-250-1000; 1000 ohms/V	10-50-250 ma DC	1 k-100 k		3 x 5-7/8 x 2½	1½	\$19.85
	240		15-75-300-750-3000 1000 ohms/V	15-150-750-3000 1000 ohms/V	15-150-750 ma	3 k - 300 k		3 x 5-7/8 x 2½	1½	\$21.75
	260		2.5-10-50-250-1000- 5000 20,000 ohms/V	Same as DC 1000 ohms/V	.05-0.1-10-100- 500 ma DC 0-10 amps DC	2 k-200 k-20 meg.		7-1/4 x 5½ x 3½	2½	\$38.95
	445		2.5-10-50-250-1000- 5000; 20,000 ohms/V	Same as DC 1000 ohms/V	.05-0.1-10-100- 500 ma DC	2 k-200 k-20 meg.		15½ x 12 x 6-1/4	11	\$110.00
Superior	870		7.5-15-75-150-750- 1500-7500	15-30-150-300-1500- 3000	1.5-15-150 ma DC; 0-1.5 amps DC	500-100 k-10 meg.	-10 to +58 db Reactance, In- ductance mea- surements; Condenser Check.	5½ x 7½ x 3		\$28.40
	880	21	15-75-300-1500 5000 ohms/V	Same as DC	0-150 ua-15-75- 150 ma DC	2 k-20 k-200 k- 2 meg.	-10 to 58 db 4 ranges	4 x 6½ x 7		\$27.85
Supreme	542B		6-150-300-1500 4000 ohms/V	6-30-150-600 930 ohms/V	0.3-6-30-150 ma DC	2 k-20 k-200 k- 2 meg.	-6 to +50 db 4 ranges	5-7/8 x 3-1/16 x 2-1/8	2	\$23.65
	543		15-150-600-3000 1000 ohms/V	Same as DC 250 ohms/V	6-60-600 ma DC	2 k-200 k		5-7/8 x 3-1/16 x 2-1/8	2	\$18.95
	548		5-25-100-250-500-1000 -5000; 1000 ohms/V	Same as DC 1000 ohms/V	5-25-100-250- 500-1000 ma DC; 10-25 Amps	2 k-20 k-200 k- 2-20 meg.	5 db ranges 3 cap. ranges	11-3/4 x 8½ x 4-3/4	16	\$37.85
	567		5-25-100-250-1000- 5000 10,000 or 1000 ohms/V	5-25-100-250-500- 1000-5000; 1000 ohms/V	1-5-25-500 ma DC; 1-10-50 amps AC & DC	0.5-5-500-5 k- 0.5-5-50 meg.	5 db ranges	9½ x 9½ x 5-3/4	14	\$63.40
	584		5-25-100-500-1000- 5000; 20,000 or 1000 ohms/V	Same as DC 1000 ohms/V	100 ua-10-100- 500 ma DC	2 k-200 k-20 meg.	4 db ranges	5 x 7½ x 3	4	\$34.45
	592		3.5-7-35-140-350-700- 1400; 25,000 or 1000 ohms/V	7-35-140-350-700- 1400; 1000 ohms/V	70-700 ua-7-35- 140-350 ma-1.4 -14 amps DC	500-5 k-50 k- 500 k-5-50 meg.	0 to +46 db 4 ranges	9-1/16 x 6-3/4 x 5-3/4	9	\$58.95
Triplet	625NA		1.25-5-25-125-500-2500 20,000 ohms/V 2.5-10-50-250-1000- 5000; 10,000 ohms/V	2.5-10-50-250-1000- 5000; 10,000 ohms/V	50 ua-1-10-100- 1000 ma DC	2 k-200 k-40 meg.	-30 to +69 db	2½ x 5½ x 6	3	\$45.00
	666HH	22	10-50-250-1000-5000 1000 ohms/V	Same as DC 1000 ohms/V	10-100-500 ma DC	2 k-400 k		3-1/16 x 5-7/8 x 2-9/16	1½	\$22.00
	2405	17	10-50-250-500-1000 25,000 ohms/V	Same as DC 1000 ohms/V	50 ua-1-10-50- 250 ma-10 amps DC	4 k-40 k-4 meg- 40 meg.	-10 to +55 db 6 ranges Cap. check	10 x 10 x 5-3/4	11	\$56.75

Mfr.	Model	Ill. No.	DC V Ranges	AC V Ranges	Current Ranges	Resistance Ranges	Misc. Ranges	Size (Inches)	Weight (lb.)	Approx. Price
Weston	697		7.5-15-150-750 1000 ohms/V	Same as DC 1000 ohms/V	0.75-150 ma DC	5 k-500 k		3-9/16 x 3-3/4 x 3-9/16	1-3/4	\$34.65
	779		2.5-10-50-250-1000 20,000 or 1000 ohms/V	Same as DC 1000 ohms/V	0.1-1-10-50-250 ma-10 amp DC	3 k-30 k-300 k- 30 meg.	-14 to +54 db	6-3/8 x 9-1/8 x 4-7/8	6	\$89.25
VACUUM TUBE VOLTMETERS AND VOLT-OHM METERS										
Mfr.	Model	Ill. No.	DC Volt Ranges	AC Volt Ranges	Ohm Ranges	Misc. Ranges	Input Impedance	Size (Inches)	Weight (lb.)	Approx. Price
Allied Lab. Instrument	730	30	25-10-50- 250-500- 1000 pos. or neg.	2.5-10-50- 250-500 to 120 mc			22 meg.	5 1/2 x 8 1/2 x 3	3 1/2	\$34.50
Ballantine	300	31		.001-100 V 0 - 20 db 10 cps-150 kc ±2% Acc		Can be used as high gain amplifier		4 1/2 x 5-3/4 x 11	9 1/2	\$200.00
Clippard	406		1-3-10-30 -100-300- 1000	Same as DC	0-1000 meg. 7 ranges	-20 to +51 db; Inclined meter	AC - 7 meg. 7 mmf DC - 30 meg.	10 x 8 1/2 x 6-1/4	12	\$89.50
Coastwise	730		1-3-30-100 -300-1000- 3000	1-3-30-100 -300-1000- 3000	10-100-1 k-10 k -100 k-1 meg- 10 meg.	Crystal probe		10 x 10 x 5	10	\$89.95
Electronic Instrument	210		5-10-100- 500-1000- 5000	5-10-100 -500-1000	Rx1-10-100-1 k -10 k-1 meg.		DC - 26 meg. AC - 2.5 meg.	10 x 15 x 7	14	\$69.50
General Electric	PM-17		1-3-10-30 -100-300- 1000	1-3-10-30 -100 (AF and RF)	.2-100 meg. 4 ranges		DC x 1 - 200 meg. DC x 10 - 10 meg.	8 1/2 x 8 1/2 x 8	15	\$75.00
	YMA-1	34		0.01-0.03- 0.1-0.3-1- 3-10-30- 100-300- (RF & AF)			2 meg, 27 mmf	9-1/4 x 8 1/2 x 10 1/2	17	
Jackson	645	35	4-10-40- 100-400- 1000	1-4-10-40 -100-400- 1000; 50 cps to 200 kc	1 k-10 k-100 k- 1-10-100-1000 meg.	1-4-10-40-100-400- 1000 -30 to +55 db	DC - 12 meg. AC - 4.4 meg.			\$59.50
Measure- ment Labs	62		1-3-10-30 -100 ±2% Acc.	Same as DC, ±2% Acc., 30 cps-150 mc			7 mmf, 1 mc-0.8 meg 100 mc-100 ohms	4-3/4 x 6 x 8 1/2	6	
Precision	EV-10P		3-6-12-60 -300-600- 1200-6000 pos. & neg.	Same as DC	2 k-200 k-2-20- 200-2000 meg.	7 current ranges to 12 amps; -26 to +70 db	133.3 meg. max.	10 1/2 x 12 x 6	14	\$81.12
Radio City Products	665A		6-30-150- 600-1500- 6000	3-6-30-150 -600-1500- 6000	100- 10 k-100 k -1-10-1000 meg low range -10	.002-.02-0.2-2-20-200 -2000 mfd	16 meg. to 160 meg. 50 mmf	9-3/4 x 12 1/2 x 6	13	\$94.50
	668		6-30-150- 600-1500- 6000	3-6-30-150 -600-1500- 6000	1 k-10 k-100 k- 1-10-100-1000 meg.	.002-.02-0.2-2-20-200 -2000 meg.	16 meg. max., 50 mmf	9-3/4 x 9 1/2 x 7-3/8	7-3/4	\$74.50
RCA	WV-73A	33		0.001-1000 20 cps - 20 kc			1 meg., 25 mmf	13 1/2 x 9-3/4 x 7-1/4	15	\$175.00
	195A Volt- Ohmyst		5-10-50- 100-500- 1000	Same 30 cps - 100 kc	1 k-10 k-100 k- 1-10-1000 meg.	-20 to +62 db, FM alignment indicator	200,000 ohms, 170 mmf			\$79.50
	WV-65A Volt- Ohmyst		3-10-30- 100-300- 1000	10-30-100- 300-1000	1 k-10 k-100 k- 1-10-1000 meg.	Six current ranges 3 ma - 10 amp., Bat- tery Power	11 meg.	9 1/2 x 6-1/4 x 5 1/2	9	\$87.50
	WV-75A Volt- Ohmyst	44	3-10-30- 100-300- 1000	Same as DC RF to 17 mc 100 V. max. at 250 mc 10 V. max.	1 k-10 k-100 k- 1-10-1000 meg.	Good to 250 mc using diode probe directly	1.65 meg. max. 15.6 mmf max.	9-5/8 x 6-5/16 x 6-3/4	9	\$125.00
Reiner	456		6-15-30- 60-150-300 -600-1500- 6000	3-6-15-30- 60-150-300 -600-1500- 6000; 10 cps-15 kc	1 k-10 k-100 k- 1-10-100-1000 meg.	AC and DC current 1.5 ma - 30 amp., High and low capacitance	25 mmf; 2 mmf with probe	16 x 12 1/2 x 15	41 1/2	\$210.00
McMurdo Silver	900 Vomax		3-12-30- 120-300- 1200; 7.5- 30-75-300 -750-3000	3-12-30- 120-300- 1200	2 k-20 k-200 k- 2-20-2000 meg.	-10 to +50 db; 1.2 ma to 12 amp. Cathode follower to eliminate grid current errors.	DC: 51-126 meg. AC: 6.6 meg.	12-3/8 x 7-3/8 x 6-3/8	12	\$59.85

Mfr.	Model	Ill. No.	DC Volt Ranges	AC Volt Ranges	Ohm Ranges	Misc. Ranges	Input Impedance	Size (Inches)	Weight (lb.)	Approx. Price
Simpson	266		1-5-10-50 -250-500- 1000-5000	1-5-50-100 -250-500- 1000-5000	1 k-10 k-100 k- 1-10-100-1000 meg.	0 - 10 amp. DC	DC: 50-200 meg. AC: 6 meg.	8½ x 9½ x 8	8	\$79.50
Superior	400	32	3-15-30-75 -150-300- 750-1500- 3000	3-15-30-75 -150-300- 750-1500- 3000	1 k-10 k-100 k- 1-10-1000 meg.	Cap. .0005-200 mfd, Reactance 10 ohms- 5 meg.; Inductance -10 to +58 db	DC: 11 meg.	5½ x 9½ x 10		\$52.50
Supreme	574		1-2.5-50- 250-500- 2500	Same as DC	1 k-10 k-100 k- 1-10-100-1000 meg.	RF 2.5-250 V; -20 to +45 db; 1 ma-10 amp DC	at 100 mc-100 k DC 20-40 meg. 9 mmf	5 x 9½ x 12	16	\$67.45
Sylvania	134		3-10-30- 100-300- 1000	3-10-30- 100-300	1 k-10 k-100 k- 1-10-1000 meg.	RF 3-300 V; over 300 mc current ranges	DC: 16 meg. AC: 2.7 meg. 40 mmf RF: 27 meg. 3 mmf	10-3/4 x 8-1/8 x 6-7/8	16	\$69.50
Triplet	2450		2.5-10-50- 250-500- 1000	Same as DC	1 k-1-10-100- 1000 meg.	Cap. .05-500 mfd	DC: 51 meg AC: 8 meg. 35 mmf RF: 8 meg. 8 mmf	10 x 10 x 5-3/4	11	\$99.50
Weston	769	26	3-12-30- 120; 50 cps-300 mc	Same as DC	2 k-2 meg.	3-12-120 V AF & RF	15 meg.	10 x 13 x 6-1/8	13½	\$173.25

TUBE CHECKERS

Mfr	Model	Ill. No	Type	Features	Size (Inches)	Weight (lb.)	Approx. Price
General Electric	YTW-1	48	Emission	Short test without warmup; roll chart; front panel fuse	17-3/16 x 12-15/16	15	
Hickok	532P 532C	49	Mutual conductance	Line voltage meter; fil. voltages up to 117 V.; roll chart; noise test; hot or cold short test	17 x 18 x 8½	27	
	534		Mutual conductance with multimeter	Same as 532P but with larger panel and analyzer unit measuring 20-200-500-1000-5000 V. AC and DC with 20,000 ohms/V sensitivity; 0.1 ohm-100 meg. in 3 ranges, 0.0001-150 mfd, condenser leakage test, inductance to 100 henries, 5-20-200 ma DC, -10 to +50 db	17 x 18 x 8½	28	
Jackson	636	40	Dynamic	Filament voltages 0.75-115 V. Leakage test, noise tests, roll chart	14 x 12 x 5½	11	\$62.50
	636C 636CB		Same as 636 except	counter and bench styles respectively	16 x 7 x 13-3/4 13 x 9½ x 5½	10	\$65.00 \$56.50
	637		Dynamic with multimeter	Short test, ballast tubes, condenser check; multimeter ranges: 10-100-250-500-1000-2500 AC and DC, -10 to +54 db, 1-10-100-250 ma DC, 0-10 amps DC, 3 k-300 k-30 megohms	14-3/4 x 13-3/4 x 6	14	\$89.50
Philco	7050	46	Emission	Two blank sockets for future development, pilot light, short test, built in loose-leaf chart, vinylite wiring	10 x 13 x 4½	13	\$48.40
Precision	10-12		Electronamic	Employs new principle in which operating conditions are swept through various values; lever operated, push-button short test, roll chart, filament voltages 0.75-117 V.	13-3/4 x 17-1/4 x 6-3/4	16	\$86.15
	10-15	69	Same electrically as	10-12 but with larger (9") meter and overhead lighting	24 x 17½ x 10	32	\$115.00
	10-20		Electronamic	Lever operated; multimeter ranges included: 6-12-60-300-1200-3000 V AC and DC, 0.6-6-60-300 ma, 1.2-12 amp. DC, 1 k-100 k-1 meg.-10 megohms, -20 to +64 db	13-3/4 x 17-1/4 x 6-3/4	18	\$109.10
	10-22		Same electrically as	10-20 but with larger (9") meter and overhead lighting; roll chart	24 x 17½ x 10	32	\$135.00
	10-54		Electronamic	Lever operated, roll chart, multimeter ranges: 6-12-60-300-1200-6000 V. AC and DC, 60-120 ua, 1.2-12-120 ma, 1.2-12 amp. DC, 6 k-600 k-6 meg-60 meg ohms, -20 to +70 db	13-3/4 x 17-1/4 x 6-3/4	18	\$123.40
	612		Conductance	Lever operated; filament voltages .75-117 V. battery test; ballast test; dual short check; roll chart	12 x 13 x 6	13	\$60.00
	614		Same electrically as	612 but with larger (7") meter, swivel mounted counter case			\$75.00
Radio City	316		Dynamic	Includes acorn and sub-miniature sockets, roll chart listing 800 tube settings. "Dynoptimum" test	16½ x 12-3/4 x 5-1/4	13	\$63.50
	316M		Dynamic	Same as 316	16 x 20 x 8-1/4	19	\$69.95
	316DL		Dynamic	Merchandiser type with double meter reading for back and front of counter	16 x 20 x 16	21	\$82.50
	322		Dynamic	Noise test. 4½" alnico meter, only 4 operating controls	5-1/4 x 12½ x 7	11	\$37.95
	802N		Dynamic	Leakage and noise test; multimeter ranges: 10-50-500-1000 V. AC and DC; 1-10-100 ma DC, 1-10 amp. DC; 500-5 k-1-10 meg ohms, -8 to +55 db	12-3/4 x 12 x 5-1/4	11½	\$59.50
Simpson	335	38	Conductance	Automatic reset simplified switching, "no backlash" roll chart	15½ x 12 x 6-1/4	10	\$85.00
	445		Conductance	"No backlash" roll chart; multimeter ranges: 2.5-10-50-250-1000-5000 V. AC and DC; 0.05-0.1-10-100-500 ma DC 2 k-200 k-20 meg ohms	15½ x 12 x 6-1/4	11	\$110.00



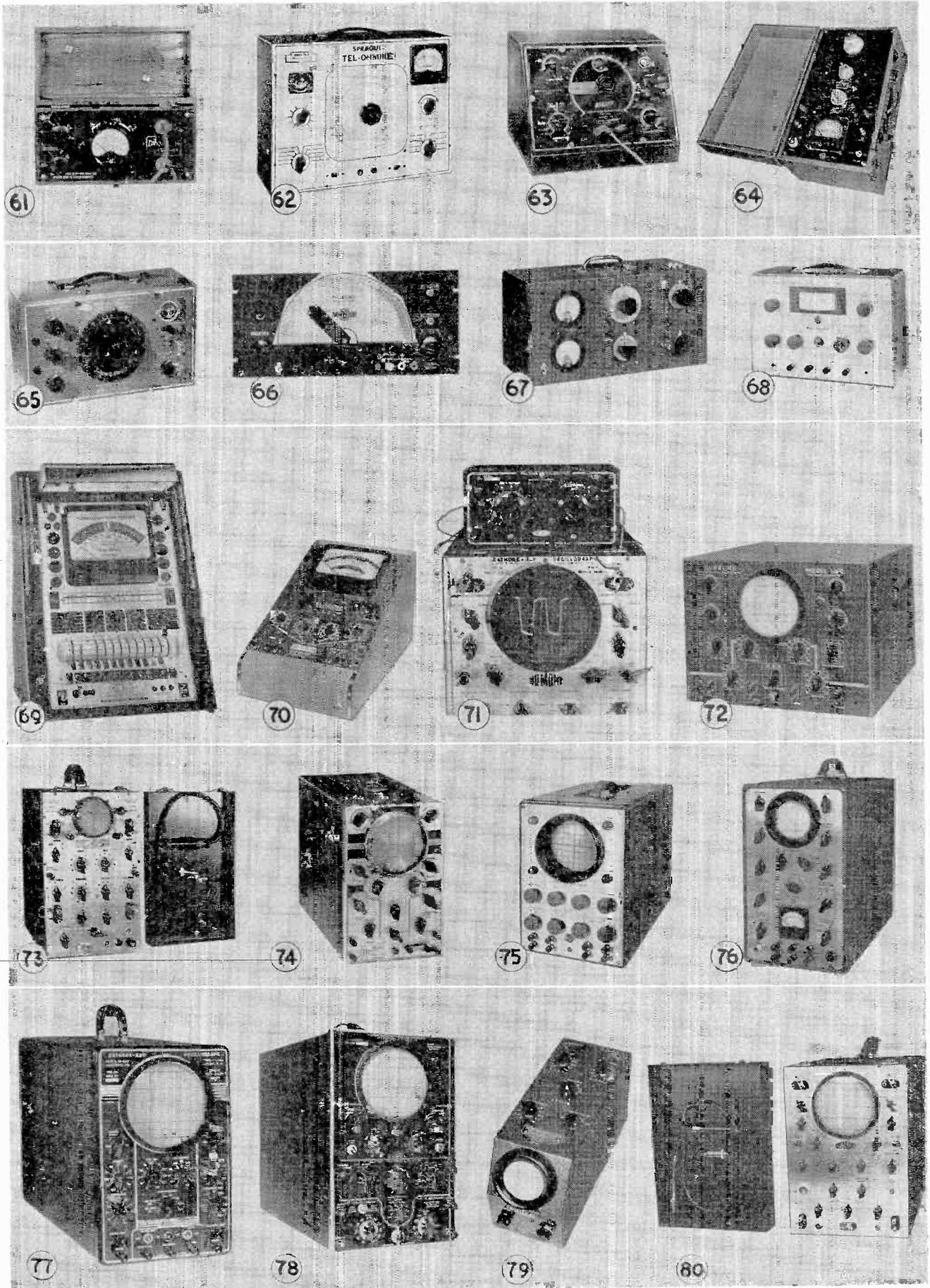
Mfr.	Model	Ill. No.	Type	Features	Size (Inches)	Weight (lb.)	Approx. Price
Superior	450		Emission	Filament voltages 1.4 - 117 V. Short and leakage tests, noise test, condenser test	13 x 12 x 6	8	\$39.50
	600		Emission	All tube types including hearing aid, thyratrons, mercury vapor, etc.; tests pilot lights; multimeter ranges: 7.5-15-75-150-750-1500 V. DC, 15-30-150-300-1500-3000 V. AC, 1.5-15-150 ma DC, 0-1.5 amp. DC, 2 k-20 k-200 k-20 meg ohms, -10 to +58 db	13 x 12½ x 6		\$69.50
Supreme	504B	39		Roll chart; push-buttons; multimeter ranges: 5-25-100-250-500-1000-2500 V. DC; 5-10-50-250-1000 V. AC, 0.5-2.5-10-50-250 ma-1-10 amp DC; Battery test, condenser leakage test	14-3/8 x 12-1/8 x 4-7/8	20	\$89.50
	569		Dynamic	Double floating filament return selector, roll chart	11 x 5 x 6-3/4	20	\$84.95
	589 A		Emission	Battery tester and same as 589; Counter Model C, portable Model P	11-1/8 x 8-7/8 x 5-3/8	15	P-\$48.95 C-\$58.95
	599 A	70		Multimeter ranges: 6-15-150-600-1500 V. DC; 15-150-600 V AC; 6-60-600 ma DC; 200-20 k-2-20 meg ohms; Battery tester: C counter, and P portable models	11-1/8 x 8-7/8 x 5-3/8	12	P-\$62.50 C-\$74.00
Sylvania	139		Dynamic	Short test at 50 V; noise tests; fil. continuity; fil. voltage .75-117 V. all types including acorn and indicator; 3-channel roller chart; tapped line control for regulation	16-1/4 x 11-3/8 x 5½	16½	
	140	45	Dynamic	Same features as 139	15 x 14-3/16 x 5-1/4	18	
Triplet	3212		RMA	Appliance check, neon short test, line voltage indication, roll type chart; counter style	15-11/32 x 11-1/32 x 6-1/8	14	\$63.50
	3413	37	RMA	Same features as 3212 counter-portable style	Same	20	\$60.75
	3480			Tube checker electrically same as 3212 multimeter ranges 0-3-12-60-300-1200 V. AC and DC; 1.2-12-120 ma-12 amp DC; 1 k-10 k ohms	Same	25	\$89.75
Weston	798	36	Mutual Conductance	Good-bad mutual conductance scale; types include voltage regulators and small thyratrons	17-3/4 x 11-3/8 x 6-1/8	23	\$204.05

AF SIGNAL GENERATORS

Mfr.	Model	Ill. No.	Type	Frequency Range	Output Impedance (Ohms)	Output & Other Features	Size (Inches)	Weight (lb.)	Approx. Price
Clough-Brengle	179A	51	Beat frequency	25 - 15000 cps	600	100 MW at 600 ohm posts; distortion less than 5% above 100 cps	7½ x 8½ x 14	17	
	182A		Beat frequency	25 - 15000 cps	600	Output essentially flat 100 - 8000 cps	7½ x 16½ x 10	21	\$165.00
	280A	66	Beat frequency	25 - 32000 cps	600 - 4000	100 MW at 4000 ohms, ½% distortion above 100 cps; 4% at 25 cps; Within ±1 db over total range	21 x 10-3/4 x 12-3/4	40	
Coastwise	710	50	RC	20 - 20,000 cps; 3 ranges	2000	25 V sine wave or square wave on same calibration	10 x 10 x 5	8	\$89.95
General Electric	YGA-4		Beat frequency	25 - 15000 cps	500-15-4	2.5 watts into rated loads less than 5% distortion	15 x 9-3/4 x 6-5/8	25	
Hewlett-Packard	200B		RC	20 - 20,000 cps; 3 ranges	500	1 watt into 500 ohms; Hum 60 db below rated output; output ±1 db, 20-15000 cps, less than 3% harm. dist.	16 x 8 x 9	32	
Jackson	655	52	RC	20 cps - 200 kc; 4 ranges	10-250-500-5000	500 MW less than 5% dist. 30 - 15000 cps	13 x 9½ x 9-5/8	26	\$125.00
RCA	WA-54A	68		20 - 17000 cps	250-500-5000	125 MW less than 5% dist.; hum 60 db below rated output	9½ x 13½ x 7½	22	\$152.50
Supreme	563		Beat frequency	15 - 15000 cps	250-500-5000	Less than 5% dist.; Output ±1 db 30-10,000 cps; ±2 db 30-15,000 cps	13-1/4 x 9 x 6-7/16	21	\$62.95

RESISTANCE, CAPACITANCE AND INDUCTANCE BRIDGES

Mfr.	Model	Ill. No.	Tubes	Type	Range - C	Range - R	Polarizing Voltage	Other Features	Size (Inches)	Weight (lb.)	Approx. Price
Aerovox	76	63	6Y6, 6E5 6SL7	CR Bridge	100 mmf - 200 mfd	10 ohms to 20 meg.	0 - 600	Insulation resistance and leakage measurement	10 x 7-3/4 x 8-1/4	8½	\$44.75
Clough-Brengle	245A		2 - 6SJ7s 6E5, OD3 5R4GY	CR and Turns Ratio	10 mmf to 110 mfd	60 ohms to 11 meg.	0 - 500	Transformer turns ratio .001 to 1000 Power Factor 0 - 50%	6-1/4 x 10½ x 15-3/4	25	
	330A		5Y3GT 6E5	Same	2 mmf to 200 mfd	2 ohms to 20 meg.	0 - 500	Transformer turns ratio .01 - 100	7-3/4 x 12-1/16 x 6-3/8	17	
General Electric	YCW-1			Wien Bridge	5 mmf to 200 mfd	5 ohms to 20 meg.		Turns ratio .025 - 200	9-3/4 x 12 x 7	10	\$59.50



Mfr.	Model	Ill. No.	Tubes	Type	Range - C	Range - R	Polarizing Voltage	Other Features	Size (inches)	Weight (lb.)	Approx. Price
General Radio Co.	650A	47	None	L, R and C impedance bridge	1 mmf - 100 mfd inductance: 1 uh - 100 h	.001 ohm - 1 meg.		Accuracy Res. and Cap. 1.0%; Inductance 2%; Dissipation Factor .002 - 1, Accuracy 20% 1000 cycle hummer provides internal AC source	12 x 20 x 8½	31	\$220.00
Jackson Electrical	650A			Condenser Tester	10 mmf - 1000 mfd			Power Factor 0 - 60%			\$49.00
McMurdo Silver	904	65	6SN7, 6E5 5Y3GT	Foster-Carey Bridge	10 mmf - 1000 mfd	10 ohms - 1000 meg.	0 - 500	Accuracy ± 3%	12-3/8 x 7-3/8 x 6-3/8	12	\$49.90
Solar	CBB	57	6E5, 6X5GT	CR Bridge	10 mmf - 800 mfd	50 ohms - 2 meg.	0 - 600	Power factor, leakage, insulation resistance	9½ x 7-1/8 x 6-1/4	7	\$39.80
	CF Exameter		6J5G, 6L6	CR Bridge	10 mmf - 2000 mfd	100 ohms - 7.5 meg.		Power factor; Measures DCV as a VTVM	12-3/4 x 10 x 5½	12½	\$59.70
Sprague	TO-3 Tel-Ohm-ike	62		Wien Bridge	10 mmf - 2000 mfd	2.5 ohms to 25 meg.	0 - 750	Power Factor 0 - 50% Leakage measured DCV and-DC ma	13-1/4 x 10 x 5	15	\$59.70

#### SQUARE AND PULSED WAVE GENERATORS

Mfr.	Model	Ill. No.	Fundamental Frequency Range	Max. Output	Wave Forms	Other Features	Size (Inches)	Weight (lb.)	Approx. Price
Coastwise Electronics	710 Ferret		20 - 24,000 cps	0-25 V rms	Sine or square wave	RC type oscillator; Dial accuracy 2%; Miniature type tubes	10-1/4 x 10-1/4 x 5½	10	\$89.95
DuMont	185A	56	10 - 2000 cps	0-75 V peak to peak	Square wave, rise rate 25usec. at 500 cps	Amplifiers flat DC - 5000 cps; Input resistance 100 k Negligible phase distortion to 25,000 cps	11-5/8 x 7-5/16 x 13-13/16	20	
Electronic Dev. Lab.	69		0 - 50,000 cps		Square wave		8-3/4 x 15 x 8	18	\$74.50
General Electric	YGA-2		20 - 20,000 cps	20-60 V rms	Sine or square wave	400 MW output; 2% dist. into 10 k ohms; cath. follower output	17-1/16 x 9-3/4 x 9-11/16	28	\$150.00
	YGL-1		5 - 125,000 cps	75 V peak to peak	Rectangular, 75% pos.; 25% neg.	Stepped attenuator; ext. sync can be used; B+ grounded.	20-3/4 x 14-3/4 x 10½	48	
Kay Electric	Micro-pulsar		200 - 20,000 cps, 2 ranges	0-50 V peak	Pulse of width variable between 10 and 1000 usec.	Pulse can be made pos. or neg.	10 x 14 x 9	30	\$195.00
Reiner Electronics	530		10 - 100,000 cps		Square wave	Provision for ext. sync Rise and decay time 0.3 usec.	16 x 8 x 8	19½	\$95.00

#### KILOVOLT METERS

Mfr.	Model	Ill. No.	Range	Sensitivity	Other Features	Size (Inches)	Weight (lb.)	Approx. Price
Beta Electronics	101	61	0 - 15 kv	50000 ohms/V.	Alligator clips; prod with 10" handle and cable insulated for 45 kv supplied	11 x 5 x 7	9	\$69.50
	102		0 - 30 kv	Same as Model 101 except for range				\$69.50
	103		0 - 50 kv	Same as Model 101 except for range and price				\$110.00
Shallcross	759	64	1-2-5-10 and 20 kv	1000 ohms/V	Portable accuracy ±2%; Other similar models available	18-3/8 x 10½ x 9-3/8		\$200.00

#### TEST SPEAKERS

Mfr.	Model	Ill. No.	Features	Provides Substitution For	Size (Inches)	Weight (lb.)	Approx. Price
Coastwise Electronics	721 Ferret	58	All aluminum construction	Capacitance: Paper, .001, .01, .02, .05, .10 and .25 mfd; Electrolytics, 30 and 50 mfd Resistance: 400, 50 K, 100 K, .5 meg., 2.2 meg., 5 meg. Field Coil: 500, 1000, 1500, 2500 ohms Output transformer to match any tube	10-1/4 x 10-1/4 x 5½	7	\$29.95

#### Q METERS

Mfr.	Model	Ill. No.	Frequency Range	Frequency Accuracy	Q Range	Q Accuracy	C Range	C Accuracy	Size (Inches)	Weight (lb.)	Approx. Price
Boonton Radio	160A		50 kc - 75 mc	±1% except 50 - 75 mc ±3%	20 - 250	±5%	30 - 450 mmf	1% or 1 mmf	12½ x 20 x 8½	25	\$625.00
	170A	67	30 mc - 200 mc	±1%	80 - 300	±10%	11 60 mmf	1% or 0.5 mmf	17 x 10½ x 8-3/4	21	\$550.00

OSCILLOGRAPHS												
Mfr.	Model	Ill. No.	Tube Size (In.)	Defl. Factor With Amplifier		Input Impedance		Sweep Range	Misc. Features	Size (Inches)	Weight (lb.)	Approx. Price
				RMS Volts/Inch Vert.	Hor.	Vert.	Hor.					
Allied Lab. Instrument	820		5	0.25	0.25	8 meg. 12 mmf	8 meg. 16 mmf	10 - 250,000 cps	Vert. and Hor. Ampl. flat to +3 db 5 cps - 250 kc	9 x 14 x 19	20	\$59.50
DuMont	164E		3	0.8	0.65	1 meg.	0.8 meg.	15 - 30,000 cps	Ampl. 5 - 100,000 cps (Y axis)	11-5/8 x 7-5/16 x 13-13/16	22	
	208B	78	5	0.01	0.5	2 meg. 30 mmf	5 meg. 25 mmf	2 - 50,000 cps	Ampl. 2 - 100,000 cps	14-1/4 x 8-13/16 x 19 1/2	54	
	224A	73	3	0.1	0.7	2 meg. 20 mmf	2 meg. 30 mmf	15 - 30,000 cps	Ampl. 20 cps - 2 mc	14-1/8 x 8-3/8 x 15-1/8	49	
	241	80	5	0.07	0.7	2 meg. 40 mmf	2 meg. 40 mmf	15 - 30,000 cps	Amp. 20 - 2000 cps	17-1/4 x 10-3/4 x 21	65	
	274	77	5	0.65	0.65	1 meg. 40 mmf	5 meg. 40 mmf	8 - 30,000 cps	Ampl. 20 - 50,000 cps	19-3/8 x 8-5/8 x 14	35	
Electronic Development Lab.	41	53	3	0.5	0.5	0.5 meg. 20 mmf	0.5 meg. 20 mmf	10 - 60,000 cps	Compensated amplifiers; headphone jack	8 1/2 x 12 1/2 x 14	28	\$91.50
	49		5	0.5	0.5	0.5 meg. 20 mmf	0.5 meg. 20 mmf	10 - 60,000 cps	Same	8 1/2 x 14 1/2 x 18 1/2	44	\$113.00
	49A		5	0.02	0.5	0.5 meg. 20 mmf	0.5 meg. 20 mmf	10 - 60,000 cps		8 1/2 x 14 1/2 x 18 1/2	47	\$149.00
	75		5	0.1	0.5	1 meg. 26 mmf	.5 meg 25 mmf	10 - 60,000 cps	Vert. ampl. +2 db 10 cps - 5 mc; Z axis ampl.; self-contained calibrator	12 x 15 1/2 x 22	52	\$425.00
General Electric	CRO-3A		3	0.3	0.3	1 meg. 45 mmf	1 meg. 50 mmf	20 - 30,000 cps		8 x 12 1/2 x 13	25	\$98.50
	CRO-5A		5	0.02	0.2	1.25 meg. 50 mmf	3.3 meg. 32 mmf	20 - 20,000 cps		14 x 8 x 19	40	\$195.00
Harvey Radio Labs.	188 TS	59	2	0.5	0.5	2 meg. 50 mmf	2 meg. 50 mmf		Especially designed for visual alignment	10 1/2 x 7 1/2 x 11 1/2	20	\$97.50
Hickok	195	74	5	0.05	0.15	1 meg. 25 mmf	4 meg. 35 mmf		Vert. ampl. 30 cps - 50 kc; Hor. Ampl. 10 cps - 50 kc	8-5/16 x 18 1/2 x 13	25	
	505		5	0.1	0.2	1 meg. 25 mmf	4 meg. 25 mmf	10 - 25,000 cps	Sig. Gen. included with FM for visual alignment; 1000 kc-30 kc sweep; 50 mc-450 kc sweep; Vert. ampl. flat to 1 mc	14 x 11 1/2 x 19	35	
Philco	7019	79	2	1.0	1.0	0.5 meg. 36 mmf	0.5 meg. 36 mmf	10 - 50,000 cps		6-3/8 x 4 x 10	5 1/2	\$66.00
RCA	WO-80C	75	5	0.02	0.024	1 meg. 22 mmf	1 meg. 22 mmf	3 - 30,000 cps	Ampl. 0.5-300,000 cps Sine wave sweep available; Convenient CR tube replacement from front of unit	14 x 9 1/2 x 19 1/2	31	\$345.00
	WO-79A	76	3	0.175	0.46	1 meg. 30 mmf	1 meg. 50 mmf	1 - 50,000 cps	Ampl. 10 cps - 5 mc Calibrated meter for voltage readings; Sweep voltage and 6 V AC available	14 1/2 x 8-1/4 x 16-1/4	42	\$550.00
Supreme	546		3	0.3	0.3	1 meg.	4 meg.	20 - 30,000 cps		13-1/16 x 11-9/16 x 7-9/16	23	\$89.75
	552		5	0.3	0.3	1 meg.	4 meg.	20 - 30,000 cps		12 x 9 1/2 x 18	32	\$99.50
	564	72	5	0.1	0.14	5 meg. 5 mmf	5 meg. 10 mmf	7 - 100,000 cps	Has 2 axis amplifier	12 x 16 x 19	70	\$221.50
Sylvania	131		3	0.5	0.5	1 meg. 30 mmf	1 meg. 50 mmf	15 - 40,000 cps	Ampl. 10-100,000 cps +3 db	10-1/8 x 7-3/4 x 13-3/8	18	\$78.50
	132	55	7	0.21	0.25	.5 meg. 26 mmf	.5 meg. 33 mmf	15 - 30,000 cps	Push-pull ampl.; two-axis ampl.	17 x 11-3/8 x 17-3/4	37	\$124.50
Waterman	S-11-A	60	3	0.1	0.1	.5 meg.	.5 meg.	3 - 50,000 cps		7 x 5 x 11	8 1/2	
OSCILLOGRAPH CALIBRATOR												
Mfr.	Model	Illus. No.	Features									
DuMont Labs.	264A	71	Can be used to calibrate any ordinary oscillograph by comparing patterns.									

# COMPARE Before You Buy Your Service Data

The speed with which you can complete radio repairs usually depends on the quality of your technical information service. That's why you owe it to yourself to choose the best. But don't guess. Don't take anyone's word for it. Be your own judge and jury.

Ask yourself: "Does the technical information service I use provide these features:

1. Is it *complete*—does it give me all the data I need to do the job?
2. Is the information *concise*, or is it padded with useless sales talk that makes needed data harder to find?
3. Is the data *uniform*—the same for all makes and models—or do I have to "dope out" a different layout for each model?

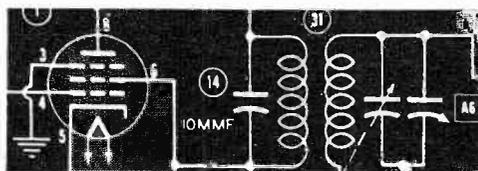
4. Does the data service give me *accurate* replacement listings—or do I have to guess what I should order from my parts distributor's stock?"

Don't guess about these important points. Compare PHOTOFACT Folders with any other service—point by point, set by set. Check specific models. See what PHOTOFACTS offer you—exclusive Standard Notation instructions to exclusive Standard Notation schematics; from completely detailed drawings to exclusive exploded views. Then see what you find in others.

Be critical. Analyze carefully. Judge for yourself. Then you will know that *only* PHOTOFACT Folders will meet your actual needs.

*Howard W. Sams*

## Don't Miss PHOTOFACT Sets Nos. 23-28 with exclusive "Standard Notation" Schematics



PHOTOFACT Sets now feature the exclusive new uniform "Standard Notation" schematics—the greatest service data development in 20 years! Every diagram is drawn to the same basic set of clear, uniform, easy-to-understand standards. Here's what the new "Standard Notation" Schematics mean to you: Makes circuit analysis simpler, quicker, fool-proof, more accurate! No more time wasted puzzling over odd-looking diagrams! No more trouble with varying symbols and confusing styles! Just ONE CLEAR STANDARDIZED STYLE FOR ALL CIRCUITS—SAVES YOU TIME—HELPS YOU EARN MORE. Subscribe to PHOTOFACT at your parts jobber now. At only \$1.50 per Set, it's the easy pay-as-you-earn way to build the world's finest service data library.

**BOOST YOUR EARNING POWER!**



### Howard W. Sams 1947 Automatic Record Changer Manual

Nothing like it! COVERS MORE THAN 40 DIFFERENT POST-WAR MODELS. Absolutely *accurate, complete, authoritative*—based on actual study of the equipment. Shows exclusive "exploded" views, photos from all angles. Gives full change cycle data, information on adjustments, service hints and kinks, complete parts lists. Shows you how to overcome any kind of changer trouble. PLUS—for the first time—complete, accurate data on leading WIRE, RIBBON, TAPE, and PAPER DISC RECORDERS! 400 pages; hard cover; opens flat. Don't be without this manual. **ONLY \$4.95**



### Howard W. Sams Dial Cord Stringing Guide

There's only one *right* way to string a dial cord. And there's only *one* book that shows you how. It's the Howard W. Sams DIAL CORD STRINGING GUIDE. Here, for the first time, in *one* handy pocket-sized book, are all available dial cord diagrams and data covering 1938 through 1946 receivers. Licks the knottiest dial cord problem in a matter of minutes. This low-cost book is a "must" for servicing. You'll want one for your tool kit and one for your shop bench. Order today. **ONLY 75c**



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New Cumulative Index to first 25 Sets of PHOTOFACT Folders now available! Your guide to more than 2200 receiver models and chassis (1946 and 1947 models). Ask your parts jobber for FREE copy, or write us direct.

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My (check) (money order) for \$.....enclosed.

- Send PHOTOFACT Sets  No. 23.  No. 24.  No. 25.  No. 26.  No. 27.  No. 28 (at \$1.50 per Set).
- Send . . . SAMS' 1947 AUTOMATIC RECORD CHANGER MANUAL(S) at \$4.95 each.
- Send . . . SAMS' DIAL CORD STRINGING GUIDE(S) at \$0.75 per copy.
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- Send FREE PHOTOFACT Cumulative Index.

Name.....

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# Announcing 4

## ...FOR FM AND TELEVISION

*They're New!  
They're Tops!*

**Designed and developed by General Electric,** these new nine-pin miniatures are keyed to the requirements of advanced FM and Television receiving sets scheduled for early production by radio manufacturers.

**Multi-unit design permits increased flexibility of circuit application,** broadening the usefulness of the tubes. In size—seated height 1 15/16 inches—they are true miniatures, with the advantage which this brings to the electronic designer who must pack maximum receiver performance into minimum compass.

**Pin-to-pin spacing is the same as with seven-pin types—**made possible by a slight increase in base diameter. Both electrically and in length of service life, these fine new miniature tubes give performance which is convincing proof of their modern, efficient design and precision methods of manufacture.

**Complete descriptive data is available to** radio builders and circuit designers interested in applying G.E.'s new nine-pin miniatures to sets now on their boards. Also, G-E tube engineers will be glad to cooperate personally in selecting the right tubes for your commercial receiver or other electronic unit in the planning stage. Wire or write *Electronics Department, General Electric Company, Schenectady 5, N. Y.*



### 6T8

High-perveance triple-diode triode with 6.3-v, 450-ma heater. For use as a radio detector and audio amplifier in FM and Television receivers.



### 19T8

High-perveance tripler-diode triode, with 18.9-v, 150-ma heater. For FM and Television service as a radio detector and audio amplifier.



### 12AT7

High-transconductance double triode. Used primarily as a converter in FM and Television receiver applications. Center-tapped heater permits use of the tube either in a-c/d-c receivers or in receivers with a 6.3-v heater supply.



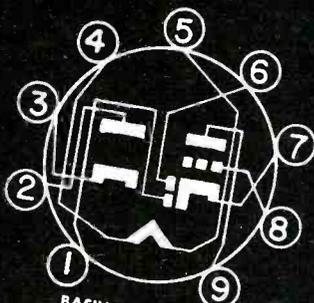
### 12AU7

General-purpose double triode (its octal-series prototype is the 6SN7-GT). Center-tapped heater allows use either in a-c/d-c receivers or in sets with a 6.3-v heater supply. Chief applications are as a multi-vibrator and for special service in Television receivers and industrial-control panels.

# Nine-Pin Miniatures

## RECEIVER APPLICATIONS

### CHARACTERISTICS AND TYPICAL OPERATION

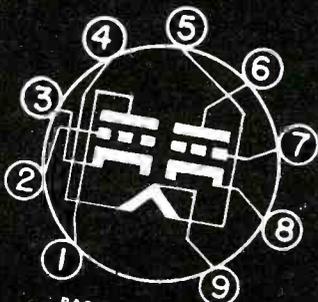


BASING DIAGRAM  
TYPES 6T8 AND 19T8

	Heater voltage	Heater current	Triode Unit Plate voltage	Grid bias voltage	Plate current	Transconductance	Amplif. factor
6T8	6.3 v	0.45 amp	250 v	-3 v	1 ma	1,200 micromhos	70
19T8	18.9 v	0.15 amp	250 v	-3 v	1 ma	1,200 micromhos	70

For both tubes: avg diode current, per unit, with 5 v d-c applied.....20 ma

#### Diode Units



BASING DIAGRAM  
TYPES 12A7 AND 12AU7

	Heater voltage, series	Heater voltage, parallel	Heater current, series	Heater current, parallel	Plate voltage	Grid bias voltage	Plate current	Transconductance	Amplif. factor
12A7	12.6 v	6.3 v	0.15 amp	0.3 amp	250 v	-2 v	10 ma	5,500 micromhos	55
12AU7	12.6 v	6.3 v	0.15 amp	0.3 amp	250 v	-8.5 v	10.5 ma	2,200 micromhos	17

#### Each Triode Section

Proof of G-E tube-design leadership is this great new series of nine-pin miniatures! The dealer who handles General Electric tubes, the radio service-man who installs them, both know that their G-E product marches to the quickstep of today's electronic progress. With G-E tubes

you may PROFIT by servicing the new AM, FM, and Television receivers which the public today is buying in increasing volume. Stay well ahead of your competition by installing and selling General Electric radio tubes—design leaders in the electronic-tube field!

# GENERAL ELECTRIC

170-P13-8850

FIRST AND GREATEST NAME IN ELECTRONICS

# The Organizations

## BIG CONVENTION NEWS!

**A**N unprecedented event which promises to mark a milestone in the progress of the Radio Service Technician will occur in Philadelphia in January. A statewide convention for radio servicemen is being held, sponsored by the National Electronic Dealers Association and in cooperation with the Radio Manufacturers Association. The location will be the roof garden of the Bellevue Stratford Hotel, and the convention is expected to be the biggest thing that has yet happened for the radio serviceman.

We cannot give you many details yet but we do know the committees are hard at work and the whole-hearted cooperation of manufacturers and dealers has already been indicated. A meeting of the Keystone Chapter of N.E.D.A. is to be held in Reading soon after this writing. This meeting will culminate several months of intensive preparations and further definite information will be available.

This convention points the way toward the future; it is a signpost about which every serviceman may well think seriously. Modern developments in the radio world are making him conscious of the increasingly great role he will play, and must play as radio grows to maturity. You may be sure that the editors of RADIO MAINTENANCE will continue to cover this and all other big organization news events in this column.

**"The Radio Technicians Guild of Rochester** will stage a two-day meet for radio maintenance

men of the State of New York, Saturday and Sunday, November 15 and 16, 1947.

"The Saturday meeting will be for all representatives of any and all radio service organizations, and individual servicemen who wish to attend this first organization meeting of the State of New York Federation of Radio Technicians. We urge all radio maintenance men operating in New York to make a special effort to be represented at this meeting, for it is the purpose of the Rochester Committee that this shall be an organization of, by, and for radio maintenance men. The present committee is composed entirely of men who are now successfully deriving their livelihood from the maintenance and sale of radio receivers; not editors, publishers, lawyers, plumbers, or what have you. We believe the radio technician is capable of setting up and running his own organization. We are, therefore, asking you to come to Rochester, New York, and prove it.

"Remember the date, Saturday, November 15, 1947, at the Seneca Hotel. First session will be called to order at 11 A.M. The annual dinner of the R.T.G. of Rochester will be held at 6:30 P.M., to which all representatives are cordially invited. Write and let us know if you will be there. Address replies to Radio Technicians Guild, 703 Temple Building, Rochester 4, New York.

"The next day, Sunday, November 16, will be given over to an all day technical Info-Meet. The

Reports from all over United States and Canada are making it clear that the Radio Service Technician is finding membership in an organization of great benefit. Radio Maintenance has kept you informed by starting this column many months ago, and we have watched group activity grow. For a story about one of these organizations see page 28. If you are an organization member, let's hear from you about your group activities.

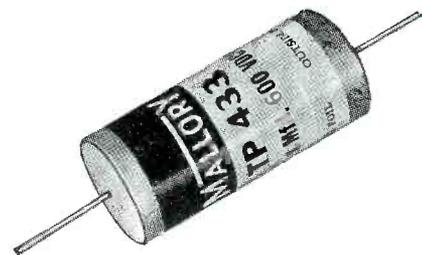
fourth annual Info-Meet of the R.T.G. of New York and New England to which all men interested in electronics as a livelihood or a hobby are invited to attend. There will be at least four outstanding speakers who will present papers on FM, television, tubes and business management. Also an inspection trip through Rochester's new 'Radio City' now being built by Stromberg Carlson Company of this city is planned. We understand this building will house the most modern studios and equipment for AM and FM broadcasting.

"Those who attended this Info-Meet before the war will need no urging to be present at this one. But for the new men who have come into electronics maintenance, we say come, improve your knowledge and partake of the good fellowship which is always present at these meetings.

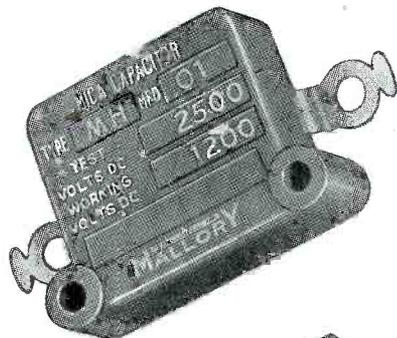
"For further information or to let us know you will be with us, write this magazine, or direct to Radio Technicians Guild, 703 Temple Building, Rochester 4, New York. Sessions will be held at the Seneca Hotel, Clinton Avenue South."

"The Federation of Radio Servicemen's Associations of Pennsylvania had its usual monthly luncheon meeting on September 21, 1947, at the Hotel Sterling in Wilkes-Barre, Pa. The Radio Servicemen's Association of Luzerne County played host and delegates from Philadelphia, Wilkes-

→ To Page 44



**PAPER**



**MICA**



**ELECTROLYTIC**

**CAPACITORS**

## MALLORY Precision Quality is Built in All Three

Service jobs that don't kick back are the ones that make a profit for you. When you use Mallory capacitors in your service work, you use capacitors *that don't kick back*. That's true whether the job calls for paper, mica or electrolytic capacitors.

Most servicemen know the big things behind Mallory capacitor quality. But there are many extra little things, too, that contribute to their life, uniformity and dependability.

Raw materials, for instance, that are held to an impurity level of less than one-half a part per million. Manufacturing techniques that prohibit human hands from even touching the capacitor cartridges. These are examples of the little things that make a world of difference in the final product. No wonder so many radio servicemen say:

**The MALLORY "Good Service for Good Business" Plan  
includes ideas that will help your business grow.  
Ask Your Distributor about it.**

**P. R. MALLORY & CO., Inc.**

# MALLORY

VIBRATORS . . . VIBRAPACKS\* . . . CAPACITORS . . . VOLUME CONTROLS . . . SWITCHES . . . RESISTORS . . . FILTERS . . . RECTIFIERS . . . POWER SUPPLIES.

\*Reg. U. S. Pat. Off.

**APPROVED PRECISION PRODUCTS**

**P. R. MALLORY & CO., Inc. INDIANAPOLIS 6, INDIANA**

# The R.T.G.

by Bertram L. Lewis

**Here is an example of a typical progressive organization and what can be accomplished by working together. We present the story of the Radio Technicians' Guild.**

**R.** T.G., as those of us who have had a hand in its formation and growth most often refer to our Radio Technicians' Guild, was started in Boston back in 1931 by one of radiomen's best friends, Albert C. W. Saunders, who started his radio career on a British Merchant ship in World War I as a young wireless operator. After that war, he shipped on the S.S. Electra, Marconi's floating radio laboratory, later coming to America and settling in Boston where he has been serviceman, experimenter, "ham," manufacturer, and teacher.

I met him in New York City in 1937, where I was impressed by his enthusiasm. Upon my return home to Rochester, New York, a chapter of R.T.G. was started and is still in successful operation.

What is R.T.G., and what has it accomplished? First: Our emblem. It is an "oscillatory current going around the world on wings of Mercury." It was Dr. Marconi's trademark and we were given his permission to use it.

Our slogan is: *To encourage the diffusion of knowledge, and good fellowship.* This is exactly what



**One of the "R.T.G. Speaks" programs ready to go on the air. Programs like this help to maintain high public interest and stimulate good business. Left to right (seated) George B. Kelly, President of Monroe Broadcasting Co. (owners WRNY), Bert Lewis, Frank Holland, Lawrence Raymo, Bill Brewerton. Standing: Bill Frenzel, Dave Boyce, President of R.T.G., John Brown, Les Albright, and Ted Cornish.**

the guilds of old did. They encouraged apprenticeships and fair dealing among their members and their customers or fellowmen. Our membership, therefore, covers the various grades that you will find in the radio technician profession: Full member, associate, and honorary.

In regard to the "diffusion of knowledge," the Guild has set up and maintained schools in Boston and Rochester for its members. At present, the Boston Chapter is manning a complete video and audio transmitting station owned by a local corporation. The men are working in teams of five putting the station on the air three nights a week.

This is an experimental station operating on the 600 megacycle band. Through this cooperative setup by the Guild and the owner of the station, our members are getting practical experience which costs them nothing more than their time.

We have open lecture meetings once a month for all who may be interested. We invite the best men in the field to speak to us on subjects related to our business. Some of the men it has been our privilege to listen to are: Dorman Israle, Walter Jones, John Rider, George Driscoll, etc. In Rochester, we originated the "Info-Meet" idea, at

→ To Page 34

# SIMPSON Model 260

World's Most Popular  
High Sensitivity

## Volt-Ohm-Milliammeter



...with Roll Top Safety Case

At 20,000 ohms per volt, this instrument is far more sensitive than any other instrument even approaching its price and quality. Unequaled for high sensitivity testing in radio and television servicing and in industrial applications.

Ask your Jobber

SIMPSON ELECTRIC COMPANY  
5200 5218 West Kinzie Street, Chicago 44, Illinois  
In Canada, Bach-Simpson Ltd., London, Ont.

# Simpson

INSTRUMENTS THAT STAY ACCURATE



- Model 260 permanently fastened in Roll Top Case.
- Heavily molded case with Bakelite roll front.
- Flick of finger opens or closes it.
- Leads compartment beneath instrument.
- Protects instrument from damage.

Model 260—Size 5 1/4" x 7" x 3 1/8" . . . . . \$38.95  
 Model 260, in Roll Top Safety Case—Size 5 3/8" x 9" x 4 3/4" . . . \$43.75  
 Both complete with test leads

### The Ranges

Volts D.C. (At 20,000 ohms per volt)	Volts A.C. (At 1,000 ohms per volt)	Output	Milliamperes D.C.	Microamperes D.C.	Amperes A.C.	5 D.B. Ranges	Ohms
2.5	2.5	2.5 V.	10	100	10	-10 to +52DB	0-2000
10	10	10 V.	100				(12 ohms center)
50	50	50 V.	500				0-200,000
250	250	250 V.					(1200 ohms center)
1000	1000	1000 V.					0-20 megohms
5000	5000	5000 V.					(120,000 center)



**Fig. 2** Do you think you could get by this window without stopping to look? This eye-catching display technique has made a name for its East Orange, N. J., owners; and is a good example of the aggressive spirit which builds a successful business.

## How's Your Servicing Future?

→ From Page 7

such equipment over and over again.

When you are planning your renovation of your business, therefore, make sure that you will be equipped to handle every piece of radio equipment you may be called upon to service. Never, *never*, NEVER be forced to say, "My tube checker is too old to test that tube"; nor, "I cannot repair your FM or television set because I do not have the proper equipment."

Do not forget, too, that "equipment" embraces such things as your bench, the arrangement of the working area, and even such matters as drive-in facilities for working on auto sets. Keep constantly in mind that you are trying to increase your efficiency and that of your shop. The idea is to turn out the best possible service in the least possible

time. Your arrangement for cleaning cabinets and chassis, the layout of your benches, the positioning of your test equipment—these and a hundred other "little" things should be carefully planned for the time that can be saved through judicious arrangement will mean many dollars difference in the income of the shop.

### Financing

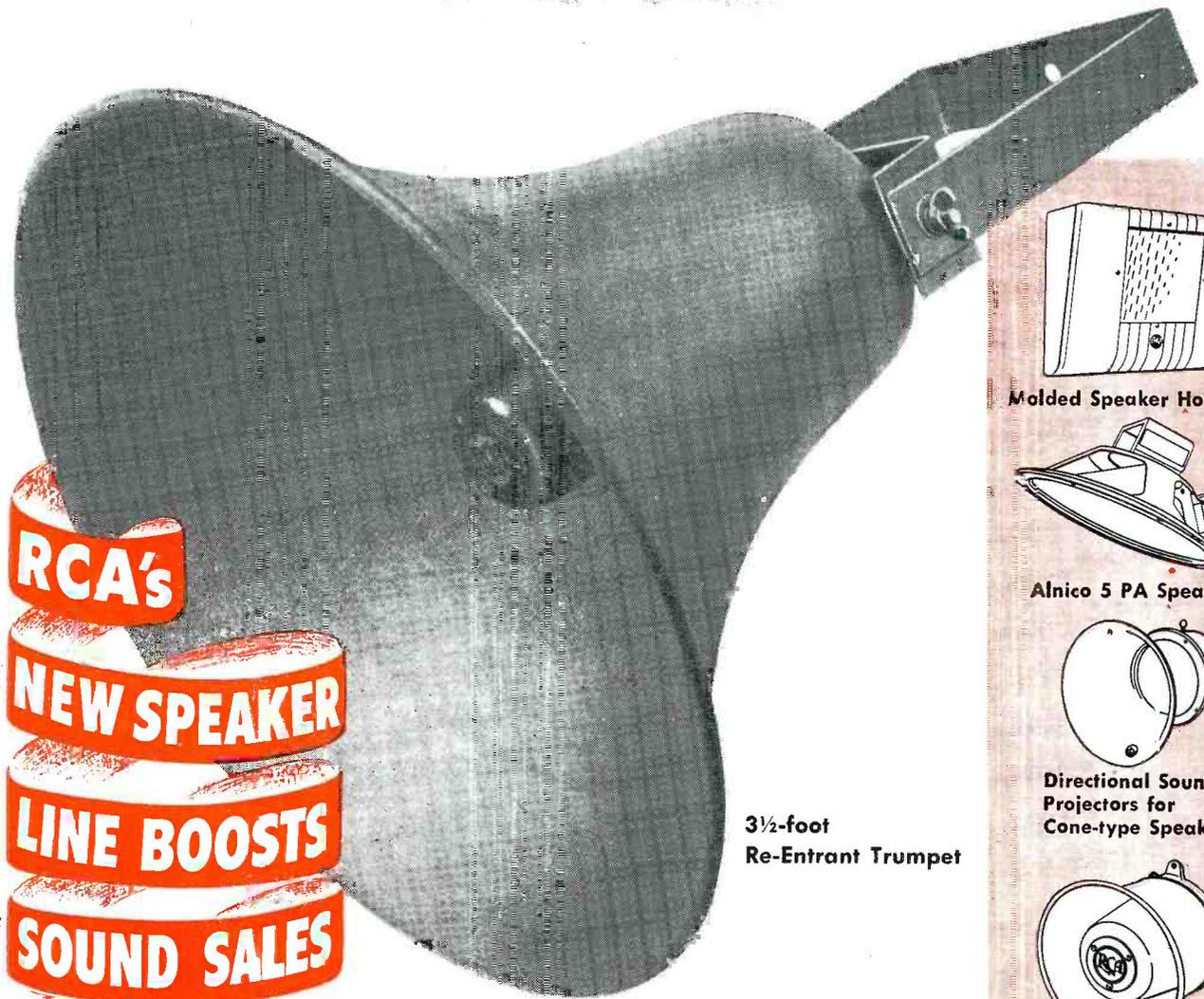
Perhaps you are saying to yourself, "That is all well and good, for I know that I need new equipment for my shop; but I simply can not get enough ahead to buy it." It may be that you are in a kind of vicious cycle: You do not have enough capital to buy new equipment. Your old equipment will not yield enough income to save up this capital. If that is your predicament, the way out of the dilemma is to borrow the necessary capital and to purchase

the material you need.

I think that quite often servicemen have an unnatural "horror" of borrowing money to improve their business. Perhaps if they could learn to think of this money in terms of the *capital* that it really is, it would help them to shake off this constricting fear. *Capital*, as we use it here, simply means money used for business purposes.

Let us consider an analogy. Suppose one of your pioneer uncestors found himself with two axes, both with broken handles. Going to a neighbor, he rented the man's axe for fifty cents and proceeded to use it to fashion and install new handles in both of his broken tools. He then returned the rented axe, sold one of the two he had repaired for two dollars, and retained the other for his own use. Certainly it would have been foolish of him not to rent

→ To Page 55



**RCA's  
NEW SPEAKER  
LINE BOOSTS  
SOUND SALES**

**3½-foot  
Re-Entrant Trumpet**

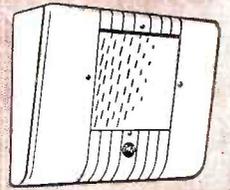
## A full line of Speakers for your sound installations

Now you can select the right speakers for your sound systems. This RCA speaker line provides high-quality distribution of voice and music . . . indoors and outdoors . . . to cover large or small areas effectively.

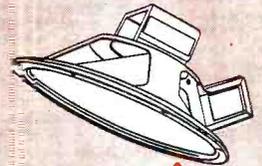
RCA's Package Sound Line also includes a wide variety of microphones, amplifiers and turntables . . . precision-matched with these speakers. Also available is the popular RCA Two-Station Intercom System. Together these units represent a beautifully balanced line which you can purchase

complete through one source—RCA. The line is built right and priced right for a steady volume of profitable business.

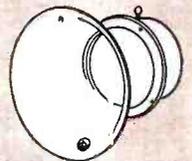
Get this new speaker folder, and its companion folders on microphones, amplifiers and intercoms. They contain specific information on RCA package sound items . . . just printed and waiting for you. Address: Dept. 69-K, Sound Equipment Section, RCA, Camden, New Jersey.



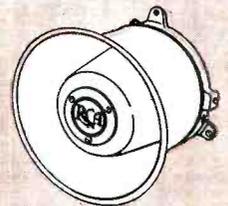
**Molded Speaker Housings**



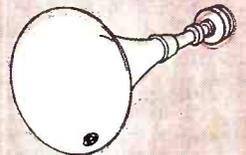
**Alnico 5 PA Speakers**



**Directional Sound Projectors for Cone-type Speakers**



**6 in. Re-Entrant Horn (including 5-watt mechanism)**



**Narrow Beam Paging Baffles**



**Complete line of Speaker Mechanisms for all trumpets and baffles**



**SOUND EQUIPMENT  
RADIO CORPORATION of AMERICA  
ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N. J.**

In Canada: RCA VICTOR Company Limited, Montreal

# Laboratory Standards

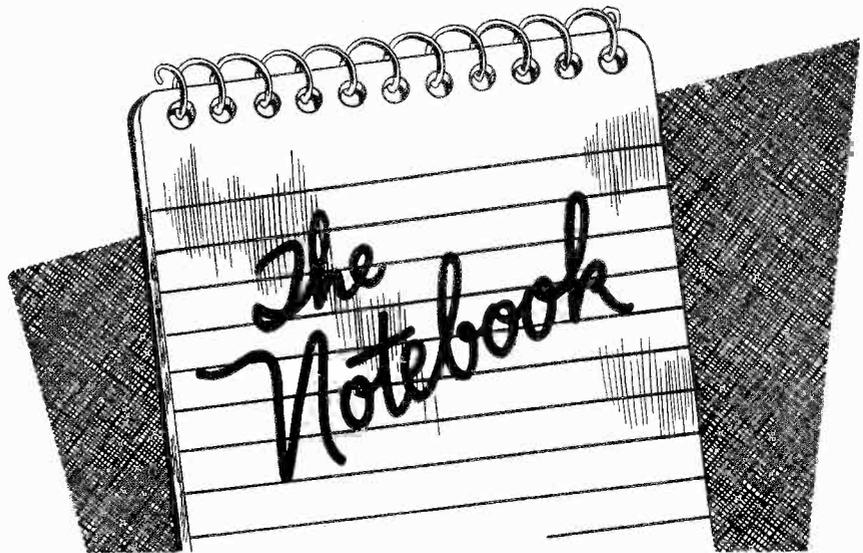
By  
**MEASUREMENTS CORPORATION**

RESEARCH AND  
MANUFACTURING ENGINEERS  
OF

- STANDARD SIGNAL GENERATORS
- FM SIGNAL GENERATORS
- TELEVISION SIGNAL GENERATORS
- PULSE GENERATORS
- SQUARE WAVE GENERATORS
- VACUUM TUBE VOLTMETERS
- UHF RADIO NOISE & FIELD STRENGTH METERS
- CAPACITANCE BRIDGES
- INDUCTANCE BRIDGES
- MEGOHM METERS
- PEAK VOLTMETERS
- MEGACYCLE METERS
- RF ATTENUATORS

Complete Technical Data  
on Request

**MEASUREMENTS CORPORATION**  
BOONTON NEW JERSEY



Each month the reader sending in the best suggestion receives a crisp ten dollar bill. For all others published, **RADIO MAINTENANCE** will pay five dollars. Let's hear from you.

### Wire Stripper

A HANDY wire stripper can easily be made from an old hack saw blade. Cut off a piece about three inches long, and with the aid of an emery wheel cut a notch in one end about  $\frac{1}{2}$ " deep. Rub each side with a whetstone until a sharp edge is obtained. Wrap some tape around the other end to form a handle and the stripper is complete.

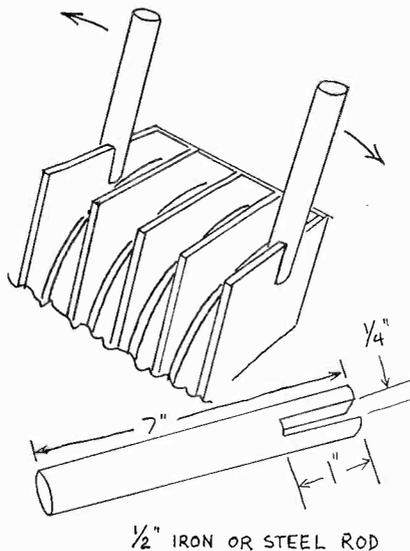
C. C. Earhardt  
Rego Park, L. I., N. Y.

riable condenser of a receiver. Many of these condensers do not have bearing adjustment nuts. In such cases two identical tools such as shown in the illustration will be found very useful. The iron or steel rod is slotted on the end so as to fit the condenser end plates. If the frames are bent very carefully in the right direction, the bearing friction will be reduced greatly.

Hy Davidowitz  
Brooklyn 18, N. Y.

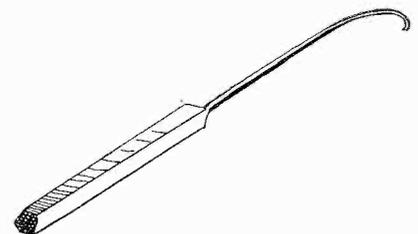
### Condenser Tool

Often dial cord slippage is due to tightness of the bearings in the va-



### Dental Tools

Very handy tools for use on the service bench or in the service kit are discarded dental tools. Having hexagon handles of various sizes and shanks ranging from .02" to .093", these instruments are made of stainless steel. By application of



heat the shanks can be formed to any of a variety of useful shapes, and solder will not stick to them. Some important applications are: removal of connecting leads, han-

→ To Page 53

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Type Number	Characteristic Impedance	Velocity of Propagation	Capacitance Per Ft.	Attenuation, Db per 100 Ft. Frequency in Megacycles				Physical Dimensions	
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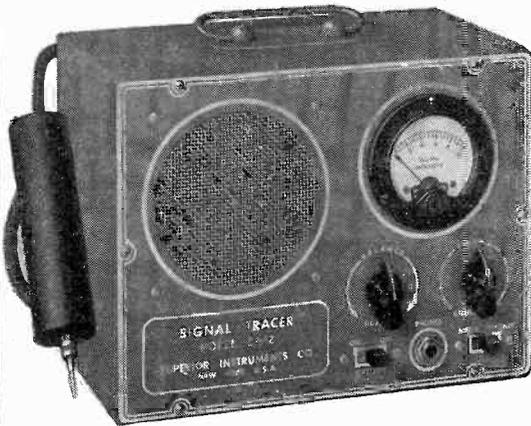
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## The R. T. G.

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which time (once a year) we hold an all-day meeting which all radio technicians of Northeastern United States are invited to attend. The program consists of about four lectures, comment and discussion groups, and a banquet. These have been well attended and very worthwhile.

Throughout the year, the technical committee endeavors to get from the manufacturers "hard-to-get" electronic data to distribute to our members. In Boston, our own paper, *The R.T.G. News*, is published and mailed to all members. Another contributing factor to the "diffusion of knowledge" is the willingness on the part of all members to share with each other their own particular knowledge and experience, which they would be reluctant to do if it were not for the harmony and good fellowship that an R.T.G. chapter enjoys. We are friendly competitors.

This brings me to the second half of our slogan—"good fellowship." If you are a member of a lodge, club, church, or for that matter even a family group, you know that from time to time differences of opinion come up and individual de-

sires and ideas seem to be working at cross purposes to each other. When these things arise, we take out our yardstick "good fellowship" to see if the subject of the disagreement among the members can be

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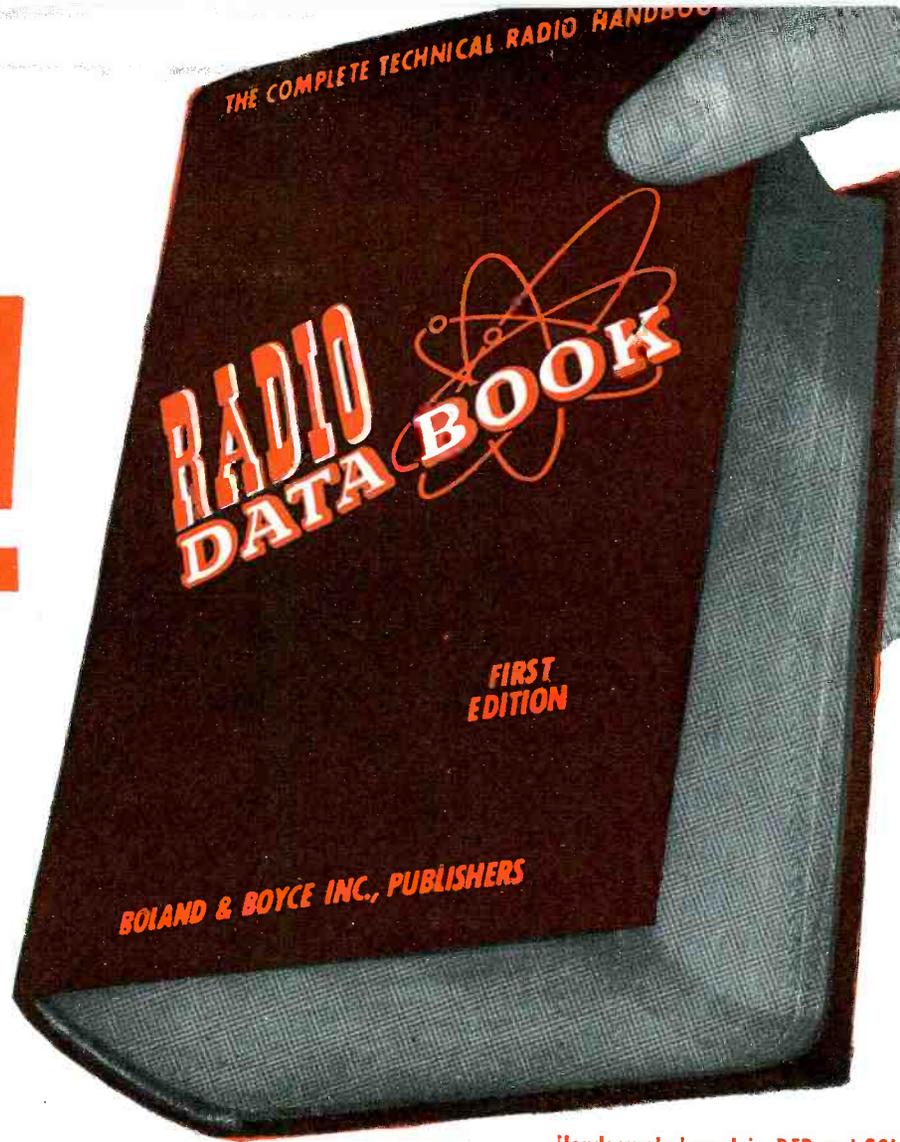
Regular monthly meeting of the Rochester Chapter of R.T.G. The speaker is Ben DeYoung, of the DeYoung radio store of Ithaca, N. Y., who is President of his local chapter. He is schooling the boys on how to operate a successful radio service business.

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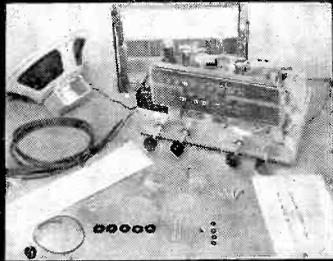
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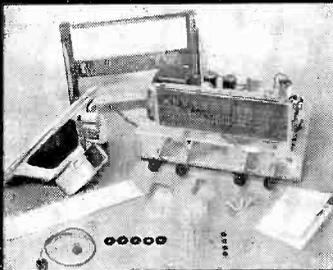
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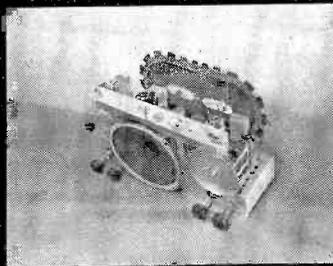
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the next corner. Nor have I said anything about the hundreds of atrocities put out by radio manufacturers and called radio receivers, with complete disregard for the service problems they present. I am greatly concerned with all these problems for I have been personally confronted with them throughout my twenty-eight years as a full-time serviceman. Why do I pass them up at this time? Because I believe in doing first things first. That is, let radio servicemen put their own house in order. Educate yourself and your fellow servicemen, support a local organization of fellow craftsmen, nurture it as you would a growing child, see that the local has a state and national voice that truly represents it, and then when servicemen speak in unison, we may tackle these problems with a conviction and a certainty of success. In this regard, let me quote portions of the Guild story as it appeared in *R.T.G. News*, October, 1946.

"There is scarcely anything in this world that some man cannot make a little worse, sell a little cheaper, and the buyers who consider price *only* are this man's lawful prey' . . . Ruskin.

"Such negative philosophy is the direct antithesis of the aims and policies of the Radio Technicians' Guild. From its inception, its purpose has always been to improve, uplift and constructively promote the welfare not only of its members but of the radio servicing profession as a whole.

"With pardonable pride, at this our fifteenth anniversary, we point to a record that has demonstrated our sincere intention of pursuing and adhering to the policies laid down at our inception. Nowhere can there be found a finer group of craftsmen who so sincerely have the welfare of their fellow technicians at heart than in the Radio Technicians' Guild. They have always made it their business to be competent and trustworthy, and will continue to do so. The highly technical nature of modern radio equipment often places the user at a tremendous disadvantage, and he is frequently exploited by the unscrupulous and unethical practices of those whom he would entrust with his property. It will always be

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## The R. T. G.

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measured by it. If not, it must be thrown out entirely or changed to fit the rule. It is surprising to see how, in the light of this yardstick, the petty grievances melt away and only the justifiable complaints remain to be investigated and straightened out by our grievance committee. This committee also takes into account any complaints that may be lodged against an

R.T.G. member by a customer. If the customer's complaint is justifiable, the member is advised to make the necessary adjustments to satisfy him or the Guild at large will undertake the job and charge it to the member's account, thereby assuring the public of a fair deal in radio service.

One may ask, "What has all this to do with earning a living in the radio service and sales business?" I have not mentioned unfair competition by some jobbers, mail order houses, or the cut-rate operator on

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**FOR SALE**—New Feller TS-3 Stethoscope, a-c model, signal tracer, \$34.95. Melbourne Engstrom, Sacred Heart, Minn.

**WANTED**—Diagram for Triumph 444 tube tester and 130 signal generator. Harvey Bennin, 817 Kentucky Ave., Sheboygan, Wisc.

**FOR SALE**—New, in carton tubes, 2--3Q5GT, 4--1P5GT, 2--1R5, 2--1T4, 80c ea.; used tubes 5--3Q5GT, 3--1N5GT, 1--1A7GT, 50c ea.; 1--1H5GT, 40c; Mallory technical manual \$1 and Mallory Encyclopedias, 1, 2 and 4--75c ea. Ralph N. Huse, 820 Hunt Ave., Sumner, Wash.

**FOR SALE**—Instructograph, 10 rolls of tape, oscillator, headset, key and instruction book, \$25. Recording and playback unit, less amplifier, \$15; 12" speaker with baffle, \$5; everything in good condition. A. G. Calatayud, 4527-40th St., Long Island City 4, N. Y.

**SELL OR TRADE**—1946 N.R.I. radio course complete with all kit parts, less soldering iron, prepaid. Make offer or will trade for signal generator in A-1 condition. Frederick Schamu, Liverpool, N. Y.

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**FOR SALE**—Arco chassis cradle and set of extra clamps and set of straight clamps very little used \$5; latest model RME-45 receiver in good condition, \$140 and Gen. Test Equipment Co. pen-cosilite very little used \$4. Robert Greenen, 518 Liberty St., Aurora, Ill.

**FOR SALE**—Superior 400 VTMV, Superior 450 tube test, RCP, 705 sig. gen. and following radio books: Radio Diagrams, 1926-42; Ghirardi's Troubleshooters Handbook; Modern Radio Servicing and others all practically new, \$140. John Wyszocan, 2430 W. Iowa St., Chicago, Ill.

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**POSITION WANTED**—Professional radio serviceman with 22 years' experience desires position as bench radio mechanic, age 38, steady, dependable, willing to go most anywhere for steady job. Elmer A. Dickens, 892 Middle St., Portsmouth, Va.

**WILL TRADE**—35 mm Anso memo camera for Triplett, volt-ohm-milliammeter. Must be in good condition. C. T. Gray, Box 135, Sheridan, Texas.

**FOR SALE**—Complete transvision television kit receiver, in working order. Neat careful work. \$135. F.O.B. J. W. Massacrer, 2737 Broadway, Huntington Park, Calif.

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**WANTED**—Rider manuals 1 to 14 either as a set or individually. Do not want 1 through 5 abridged edition. State price and condition. All manuals must be complete. John W. Findlar, Rt. 1, Box 1061-G, Modesto, Calif.

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rior signal generator 650, \$25. Charlie Robinson, Tibitha, Va.

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**SELL OR TRADE**—Superior tube tester 450, \$30 or swap for volumes 11-14-17 Riders manuals. Write what you have. Jack's Radio Shop, Enorie, S. C.

**FOR SALE**—Superior 670 volt ohm meter \$25 also some hard to find. All letters answered. Richard Cranston, 2112 Brown St., Flint 3, Mich.

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## The R. T. G.

→ From Page 36

our goal to render the type of service that will be a credit to ourselves and to the Guild. Every member of the Radio Technicians' Guild is pledged to thoroughness in the servicing of whatever type of radio he is called upon to repair; he uses only the highest quality replacement parts and accessories; he handles his customer's property with care, and makes and keeps reasonable promises; his charges are reasonable and consistent with the type of service he renders."

In order to tell our story to the public, the chapters solicit the cooperation of their local radio stations, who we find are more than willing to work with us. A campaign to set push buttons on receivers to a cooperating station's frequency results in advantageous publicity for the Guild and an open invitation into the homes of listeners where plenty of radio repair work awaits our members.

In Rochester, the campaign was worked with a new station that went on the air last January, WRNY, 680 on the dial. The announcer invites the listener to call the station if he would like to have a push button on his radio set to receive this station, give the operator his name and address, and in a few days a skilled radio technician, a member of the Radio Technicians' Guild, will call at his home and make the adjustment. At this time, if the listener so desires, he may have any repairs made to the receiver with utmost confidence in the technician. I have been assured by the station management that the job is being well done, and our members say it results in good business for them.

Another Rochester station, WHFM (one of our FM stations) is giving us a thirty minute program every Saturday night at 8:30 P.M., known as the R.T.G. Follies. The Guild story is told three times during this program of music by known bands and artists, recorded and set up as though coming from the stage of a theatre. This makes for good FM listening, and introduces the Guild to owners of FM receivers and assures them of our ability to service FM sets.

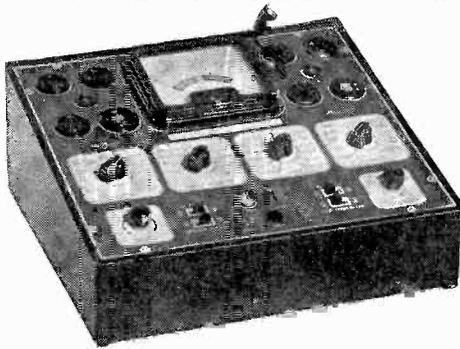
At the time of this writing, we are arranging for downtown office space with a Guild telephone so that we may further utilize our time on the air to sell our members to the public. Spot announcements will advertise the membership as a whole and the listener will be invited to call our telephone number for service. These calls will be prorated among the members living in the zone from which the call originates.

Also at this time a committee is studying the feasibility of setting up a recognition card system for all radio parts buyers who are entitled to trade discounts. This should help our local parts jobbers to know to whom they are selling and to protect our rightful margin of profit on parts, tubes, and equipment. I would suggest that anyone having had experience with similar arrangements who is willing to share it with other groups do so through these columns, or write me direct.

There are two other activities which we as a

→ To Page 40

**MONEY BACK GUARANTEE** We believe units offered for sale by mail order should be sold only on a "Money-Back-If-Not-Satisfied" basis. We carefully check the design calibration and value of all items advertised by us and unhesitatingly offer all merchandise subject to a return for credit or refund. You, the customer, are the sole judge as to value of the items you have purchased.



## The New Model 60-T TUBE and SET TESTER

### A COMPLETE TUBE TESTER

Tests all tubes including the new post-war miniature locals such as the 12AT6, 12AU6, 35W4, 50B5, 117Z3, etc. • Tests by the well-established emission method for tube quality, directly read on the scale of the meter • Tests shorts and leakages up to 3 Megohms in all tubes • Tests leakages and shorts of any one element against all elements in all tubes • Tests both plates in rectifiers • Tests individual sections such as diodes, triodes, pentodes, etc., in multi-purpose tubes.

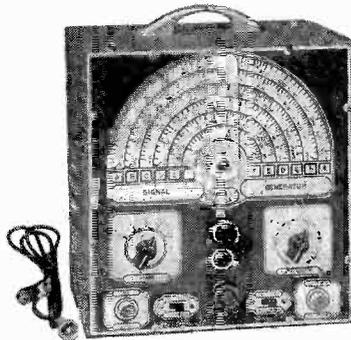
**\$49<sup>85</sup>** Model 60-T operates on 90-120 Volts 60 Cycles A.C. Housed in sloping NET-leatherette covered cabinet. Comes complete with test leads, tube charts and detailed operating instructions.

### A COMPLETE MULTI-METER

- 6 D.C. Voltage Ranges: 0 to 7.5/15/75/150/750/1,500 Volts
- 6 A.C. Voltage Ranges: 0 to 15/30/150/300/1,500/3,000 Volts.
- 4 D. C. Current Ranges: 0 to 1.5/15/150 Ma. 0 to 1.5 Amps.
- Low Resistance Ranges: 0 to 2,000 Ohms (1st division is 1/10th of an ohm.)
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- 3 Decibel Ranges: -10 to +38, +10 to +38, +30 to +58 DB.

EXTRA: WE CAN NOW SUPPLY THE MODEL 60 HOUSED IN A BEAUTIFUL HAND-RUBBED OAK CABINET. COMPLETE WITH PORTABLE COVER MAKING IT SUITABLE FOR EITHER BENCH OR OUTSIDE USE. ONLY \$2.75 ADDITIONAL. SPECIFY MODEL 60-C.

## The New Model 650-A A.C. Operated SIGNAL GENERATOR



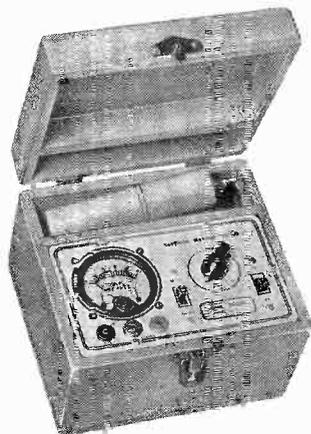
- Operates on 110-120 Volts 50 to 60 Cycles A.C.
- R.F. Frequencies from 100 Kc. to 35 Mc. on Fundamentals in 5 bands by front panel switch manipulation. One additional band provides Harmonic: from 30 to 105 Mc.
- Audio Modulating Frequency—400 Cycles Pure Sine Wave. Distortion less than 2%.
- Attenuation: Features a newly designed 3-step ladder type of attenuator (T pad). The first step provides lowest output and can be multiplied by 10 and by 100 by turning the multiplier switch.

• Hartley Excited Oscillator Electron coupled to a Buffer Amplifier. Frequency stability is assured by modulating the amplifier stage.

Complete with coaxial cable, test leads and instructions. Heavy gauge grey crystalline cabinet with beautiful two-tone etched front panel. Size 9 1/2" x 10" x 6".

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- ★ COMPLETELY PORTABLE—weighs 5 lbs. and measures 5"x6"x7".
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★ Provision is made for insertion of phones.

THE MODEL CA-11 COMES HOUSED IN A BEAUTIFUL HAND-RUBBED WOODEN CABINET. COMPLETE WITH PROBE, TEST LEADS AND INSTRUCTIONS.

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## The New Model 670 SUPER METER

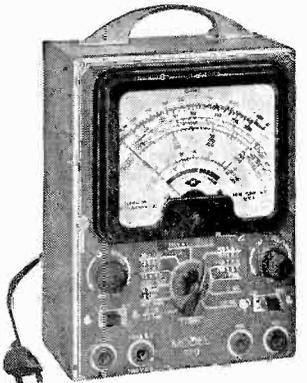
A Combination VOLT-OHM-MILLIAMMETER plus CAPACITY REACTANCE, INDUCTANCE and DECIBEL MEASUREMENTS

D.C. VOLTS: 0 to 7.5/15/75/150/750/1500/7500. A.C. VOLTS: 0 to 15/30/150/300/1500/3000 Volts. OUTPUT VOLTS: 0 to 15/30/150/300/1500/3000. D.C. CURRENT: 0 to 1.5/15/150 Ma.; 0 to 1.5 Amps. RESISTANCE: 0 to 500/100,000 ohms, 0 to 10 Meg-ohms. CAPACITY: .001 to .2 Mfd., .1 to 4 Mfd. (Quality test for electrolytics). REACTANCE: 700 to 27,000 Ohms; 13,000 Ohms to 3 Megohms.

INDUCTANCE: 1.75 to 70 Henries; 35 to 8,000 Henries. DECIBELS: -10 to +18, +10 to +38, +30 to +58.

THE MODEL 670 COMES HOUSED IN A RUGGED, CRACKLE-FINISHED STEEL CABINET COMPLETE WITH TEST LEADS AND OPERATING INSTRUCTIONS. SIZE 5 1/2" x 7 1/2" x 3".

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## The New Model 450 TUBE TESTER

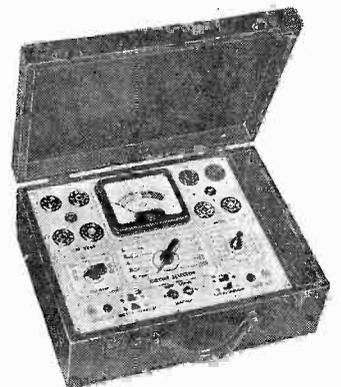
Speedy operation — assured by the newly designed rotary selector switch which replaces the usual snap, toggle, or lever action switches.

### SPECIFICATIONS

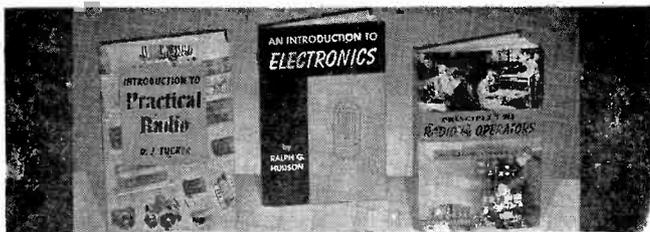
• Tests all tubes up to 117 volts. • Tests shorts and leakages up to 3 Megohms in all tubes. • Tests both plates in rectifiers. • New type line voltage adjuster. • Tests individual sections such as diodes, triodes, pentodes, etc., in multi-purpose tubes • Noise Test detects microphonic tubes or noise due to faulty elements and loose internal connections. • Uses a 4 1/2" square rugged meter. • Works on 90 to 125 volts 60 cycles A.C.

EXTRA SERVICE—May be used as an extremely sensitive condenser Leakage Checker. A relaxation type oscillator incorporated in this model will detect leakages even when the frequency is one per minute.

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## The R. T. G.

→ From Page 38

Guild engage in. One is an effort to maintain an employment bureau. Our chief concern since the end of the war has been to try to place ex-servicemen. We have had a measure of success in this endeavor.

At the Naval Hospital at Sampson, New York, about seventy miles from Rochester, we have taken under our wing a group of about fifty fine lads who are interested in radio receivers and "ham" radio. The American Red Cross takes a delegation of our members there every other week-end where we talk shop with the boys. We usually take along an assortment of second-hand equipment collected from our shops. We are received by these boys with such enthusiasm that we can hardly wait until it is our turn to go again.

I should like to state my sincere thanks to the local Red Cross chapter here in Rochester for the wonderful service they render us and the boys at Sampson by placing the facilities of the Motor Corps at our disposal.

In closing, let me say R.T.G. will deem it an honor to serve any radio-men or organizations that care to correspond with us. ✓ ✓ ✓

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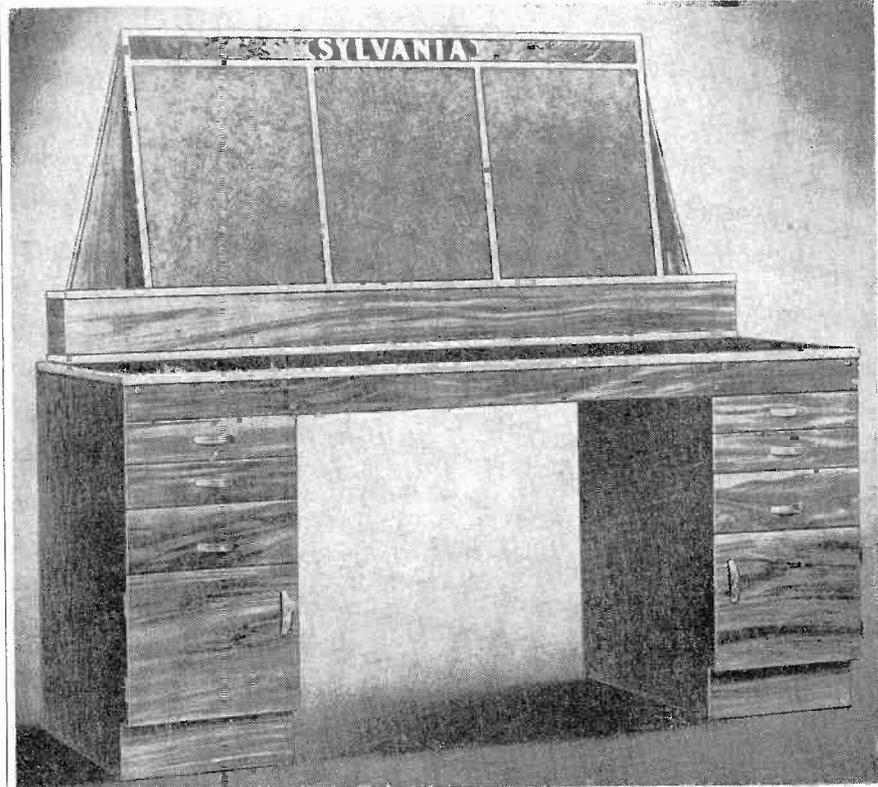
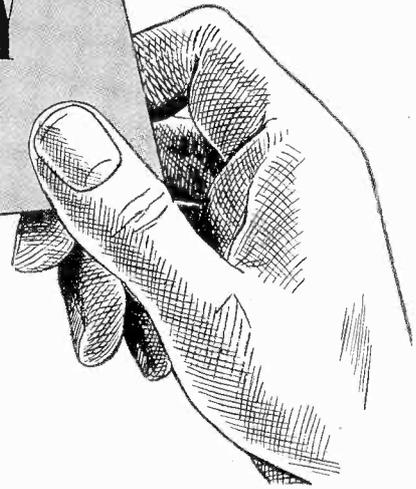
Number	Mf.	WV	Each	Number	Mf.	WV	Each
X154M	8	450	24c	X153M	20-20	150	49c
X155M	8.8	450	39c	X160M	40	450	65c
X156M	10	450	27c	X161M	50-30	150	29c
X157M	10-10	450	47c	X162M	16	500	39c
X158M	16	450	29c	X163M	100	50	15c
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**THE INDUSTRY PRESENTS**



**TEST BENCH**

A new console type test bench designed particularly for the requirements of radio servicemen has been announced by Sylvania Electric Products, Inc.

Providing ample area for benchwork, the new fixture includes sloping panel for permanent mounting of meters, test prod outlets, tube testers, and other tools. Handy suitably proportioned drawers for dust proof storage of oscilloscopes, vacuum tube voltmeters, and other valuable test instruments are also provided.

The seven-foot bench top is covered with durable attractive linoleum for improved appearance and the protection of delicate equipment and components. Four shallow drawers provide an ideal place for out-of-sight storage of frequently used components,

pushback wire and small hand tools. Knee-hole and recessed base design permit working close to the bench with drawers handy while working in either standing or sitting position. The sloping panel tends to eliminate glare from instrument dials and accidental damage to mounted and portable equipments.

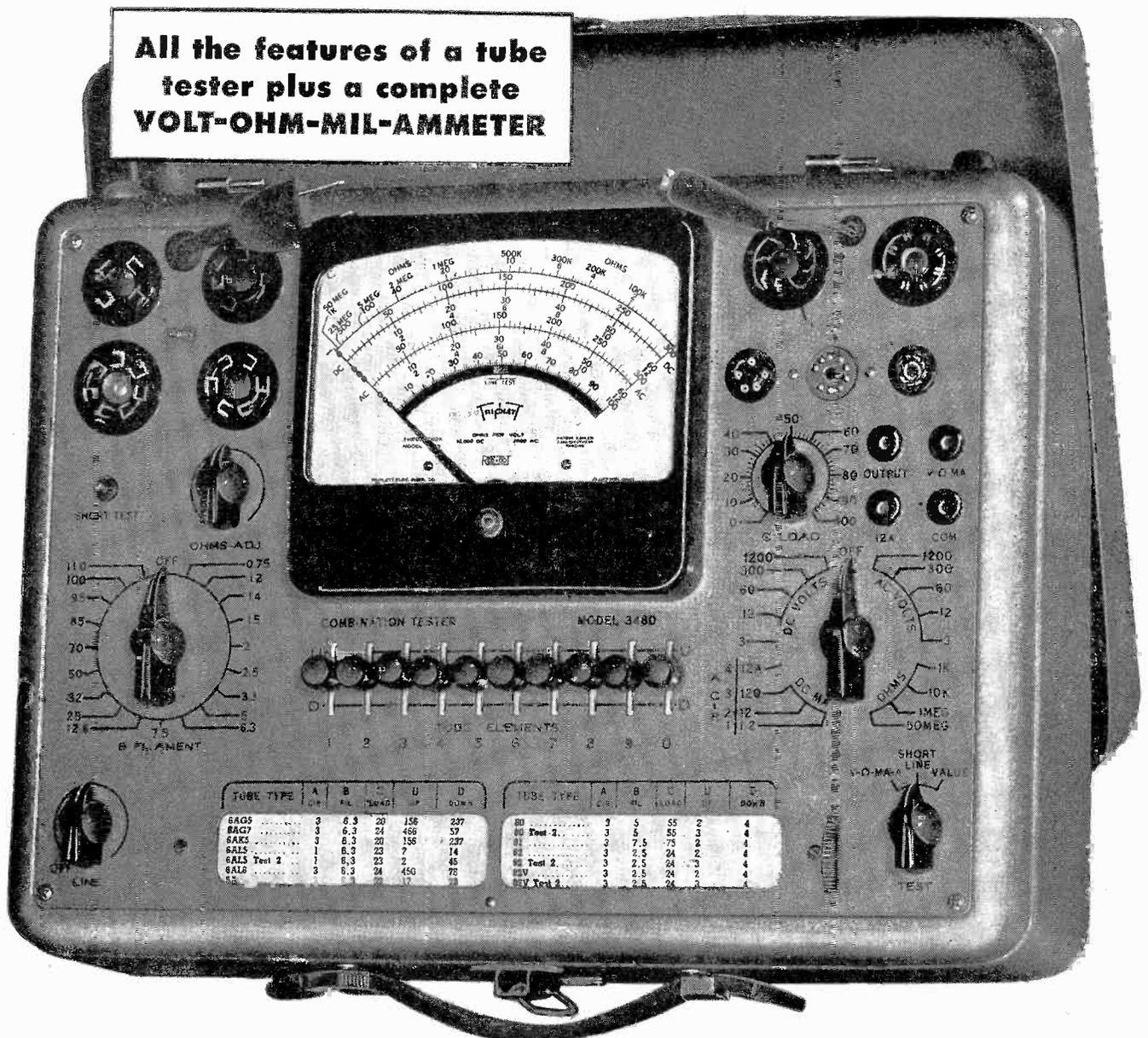
The bench is sold in convenient knock-down form. For further information on this attractive low cost bench write directly to Sylvania Products Co., Test Equipment Dept., Emporium, Pennsylvania.

**ALUMINUM HAMMER**

The "Klant-Mar" hammer, introduced by the Schmigdall Products Co., features replaceable aluminum alloy tips which thread

→ To Page 54

**All the features of a tube tester plus a complete VOLT-OHM-MIL-AMMETER**



Look at that picture again. There are twenty-three distinct features to give you everything you need in a combination tester.

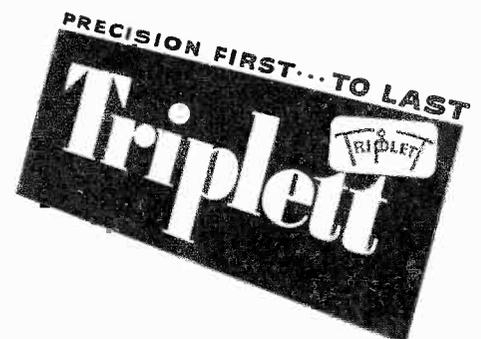
Note the new up-to-the-minute, no back-lash roll chart, for quick, complete and accurate reference. Note the individual sockets for *all* tubes, including the new 9-prong and hearing aid types. Exclusive lever-switching provides individual control of each tube element, and enables you actually to "picture" your circuit!

Note the complete Volt-Ohm-Mil-Ammeter—18 ranges on a large 6" meter to cover all your requirements. With Model 3480 you've got a tester that's good for dozens of jobs, beautiful...and a standard for accuracy. Buy it at your jobber. Or write for bulletin No. 3480. Address Dept. W117

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Combination Tube Tester  
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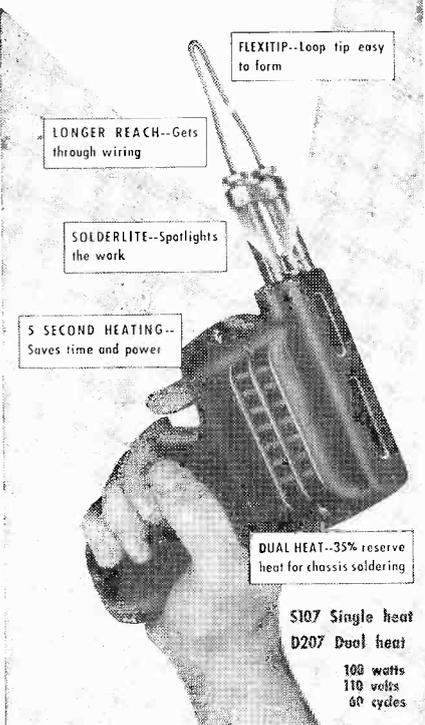


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## The Organizations

→ From Page 26

Barre. Scranton, Williamsport and Reading were present.

"Preparations are in progress for our Statewide convention to be held at the Bellevue-Stratford Hotel in Philadelphia on January 11, 12, 13, 1948. This will be the first convention for radio servicemen ever held in this country. It has been made possible only through the close cooperation of this Federation with NEDA and RMA. Most manufacturers will be represented and the displays, lectures and movies will be of a technical nature, especially for the serviceman and technician. Radio servicemen throughout the country are invited to attend. Don't miss it! The Philadelphia RSA will be the host and they will hold their banquet on Monday evening, January 12th.

"We are recommending at this time through unanimous action that NAB and RMA consider sponsoring National Radio Service Week in addition to National Radio Week — either in combination or separately. It is just as important to make sure that radios in the home operate properly as it is to sell another set.

"All member associations are at this time presenting their code of ethics so that soon we will have a Statewide code to be publicized and adhered to by all member associations. Along this same line, an interesting report was presented by the Lackawanna Radio Technicians Association. They recently had a speaker from the Scranton Better Business Bureau and he stated that complaints from the public to the Bureau concerning radio servicemen had fallen off as much as 50 per cent since the organization of the Scranton group.

"This Federation will welcome inquiries from individuals throughout the State concerning the location of the nearest organization they may join and we will also offer a helping hand in forming new groups."

C. F. Bogdan,  
Director of Publicity

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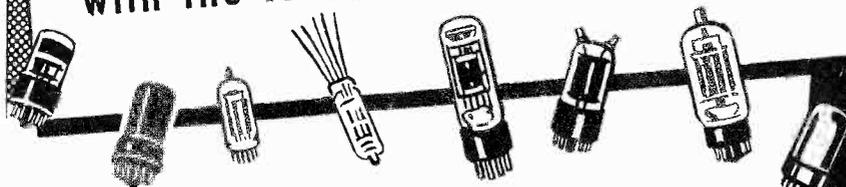
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Why let old-fashioned methods and equipment hamper your servicing ability? Thousands of radio men—many with little experience—are already fixing radios this remarkable "automatic" way. It's as simple as A.B.C., because Stethoscope Servicing is the newest, most basic method yet devised to simplify all repairs. Right at this very moment, you probably have on your bench one of those familiar "stumpers" for repair. But now you can fix these "headaches" in a jiffy—the Stethoscope way. STETHOSCOPE SERVICING is guaranteed to speed up and improve your servicing ability, or your money will be refunded. You owe it to yourself to find out how you, too, can begin cashing in. Don't delay! Send for the FREE bulletin today!

**Feller Engineering Co.,**  
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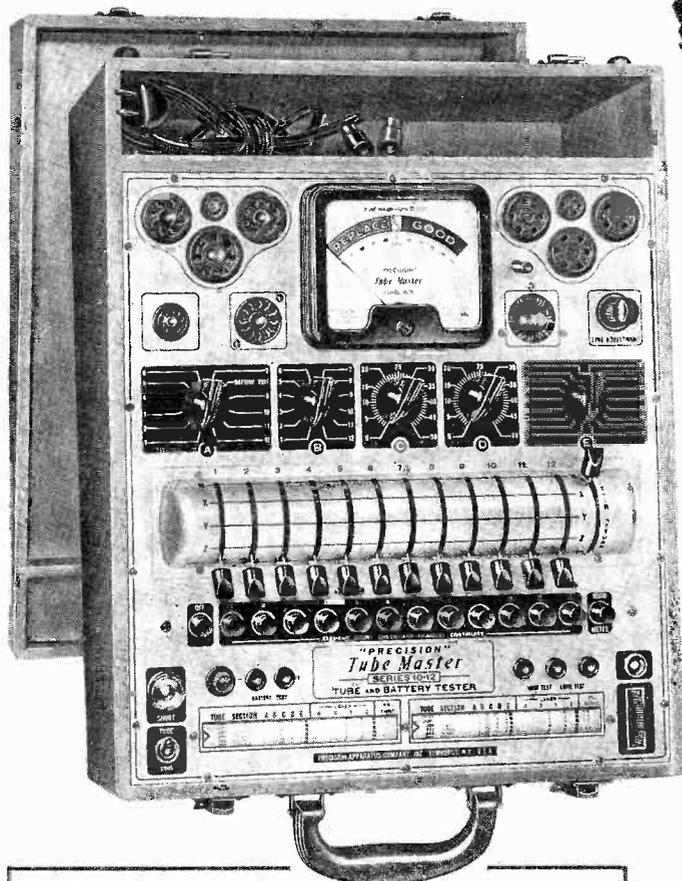
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with the **NEW** Precision Series 10-12



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Master Lever Selector System.

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free-point  
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Testing a tube for just one selected characteristic does not necessarily reveal its overall performance capabilities. Electronic tube circuits look for more than just Mutual Conductance or other single factor. In the Precision MASTER Electronic Tube Test Circuit, the tube under test is subjected to appropriately phased and selected individual element potentials and is electro-dynamically swept over a complete Path of Operation, on a sinusoidal time base. Encompassing a wide range of plate family characteristic curves, this complete Path of Operation is automatically integrated by the indicating meter in the positive, direct and non-confusing terms of Replace-Weak-Good.

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# Television Test Equipment

→ From Page 9

with sweep generators will be misleading and linearity of the receiver circuit voltages cannot be checked.

5. An oscillograph with a 5-inch cathode-ray tube is the preferable size. No one oscillograph presently manufactured meets all these requirements. If the service shop immediately wants all these features, it will have to invest in two commercial instruments to meet these specifications. One instrument would be the sensitive type represented by the RCA WO-60C, (Fig. 3), and the DuMont Type 208 (Fig. 4). These oscilloscopes have a sensitivity of 20 and 10 mv respectively and are quite similar in other respects. Their upper frequency limit is 300 kc. The other instrument required is the type with a high upper frequency limit. DuMont's Type 241, shown in Fig. 5, has a flat response to 2 mc. The new RCA Type WO-79A has response within  $\pm 2$  db up to 5 mc, and, therefore, is ideal for observing sync signals and troubleshooting other portions of the receiver. This instrument is shown in Fig. 6. Electronic Development Labs also have an oscilloscope with a response flat to 5 mc, their Model 49. (See Test Equipment Symposium in this issue.) An alternate

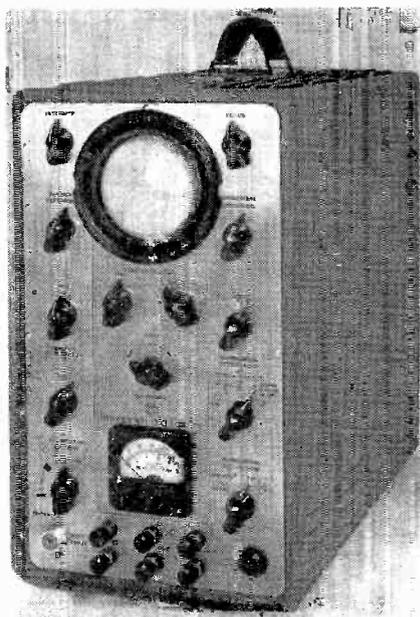


Fig. 6 The new RCA cathode-ray oscilloscope Type WO-79A.

for the DuMont Type 241 is the lower priced DuMont Type 224A, which has the same electrical characteristics, but has a 3-inch tube. This instrument is shown in Fig. 7.

B. For the average service shop—The Hickok Type 195 or DuMont Type 274 shown in Fig. 8 and 9 will be quite helpful, but it should be pointed out that the 60 cycle response is somewhat less than DuMont 208 or the RCA WO-60C. Because the Hickok Type 195 and the DuMont Type 274 are not designed for a stage by stage alignment, all alignment would have to be done at the sec-

ond detector. These two oscillographs have a useful upper frequency response of about 100 kc, so that horizontal sync signals and sweep voltages will be distorted somewhat; but in troubleshooting, one is mainly interested in signal tracing these signals rather than an accurate waveform. Where economy dictates, these oscillographs, which have been designed for the service business, will do a fair service job.

C. In addition to the features outlined above for a service oscillograph, there appears to be a growing need for a portable, low-cost oscillograph to troubleshoot the receiver at the installation where the majority of the sets can be serviced without removal to the shop. Thus far, Waterman has introduced a 3-inch portable oscillograph and more recently, Philco has brought out a similar instrument. These units are shown in Figs. 10 and 11 respectively.

## II.—The Sweep Generator

A. For the larger service organization.

1. Four individual amplifier circuits must be aligned in a television receiver. The FM-IF amplifier, the Video IF amplifier, the Video amplifier, and the RF amplifier. To cover the frequencies of all these amplifiers, a sweep generator would have to have center frequencies extending from 50 kc to 230 mc. This extremely wide

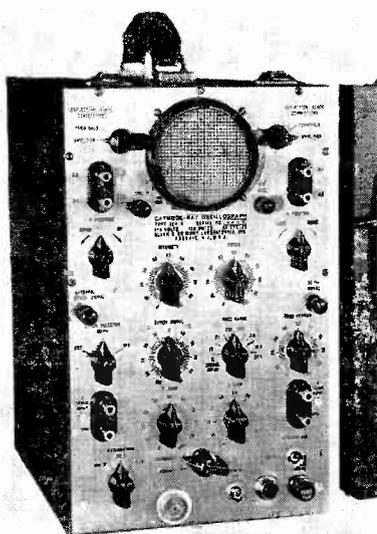


Fig. 7 The DuMont Type 224A cathode-ray oscilloscope.

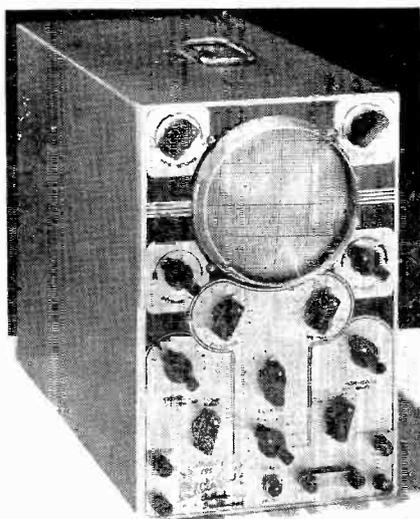


Fig. 8 The Hickok Type 195 cathode-ray oscilloscope.

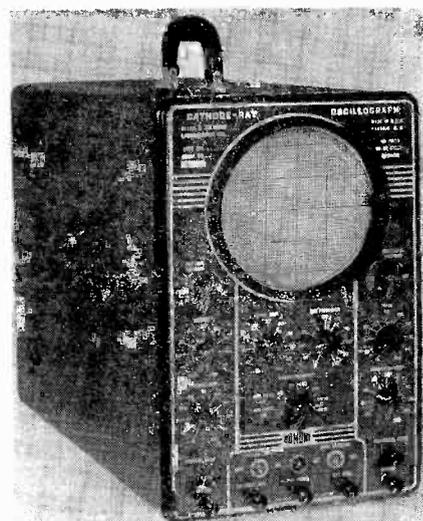
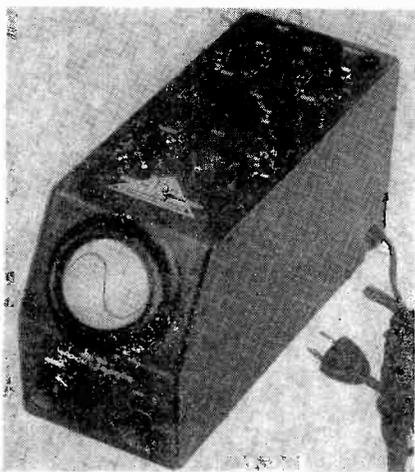


Fig. 9 The DuMont Type 274 cathode-ray oscilloscope.



**Fig. 10 The Waterman 3-inch pocket scope.**

range of frequencies is needed for the following reasons.

a. A sweep frequency of 50 kc to 4.5 mc is required to align the video amplifier.

b. A sweep frequency of 21 mc, (approximately, depending upon the IF frequency chosen by the manufacturer), with a plus or minus 100 kc swing is necessary to align the FM-IF amplifier.

c. A sweep frequency of 26 mc, approximately, with about a 7 mc frequency deviation is required to align the video IF amplifier.

d. A sweep frequency of 44 mc to 230 mc with about a 7 mc frequency deviation is necessary to align the 13 video channels.

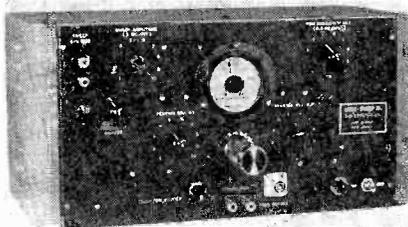
2. The sweep generator should have continuously variable marker frequencies to indicate the pass band on the sweep frequency pattern. An alternate method is to feed markers from a good signal generator, (see below), and buy a sweep generator without this feature, thus effecting some saving in price; a signal generator will be needed in any case.

The only commercially available sweep generator, which meets the frequency requirements outlined in II-A-1 is the Kay Electric Megasweep and the smaller lower cost Megasweep Junior. The latter is shown in Fig. 12. In fact, these instruments have an upper sweep center frequency of 500 mc, more than adequate for presently assigned television channels. The Megasweep does not have a marker generator suitable for television work, but, as pointed out above, markers can readily be injected from a sig-

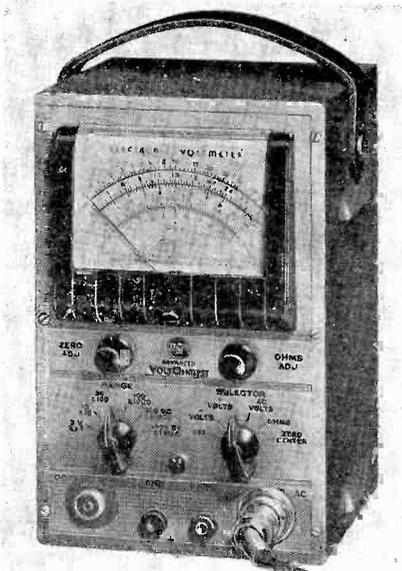
nal generator. A possible objection to the Megasweep is its manipulation, which is a little complex and requires a little training for the uninitiated.

United States Television's Sweep Frequency Generator does not have the frequency range of the Megasweep, but by using the harmonics of the higher frequencies, the high band television channels can be aligned. This instrument is not recommended for video amplifier alignment.

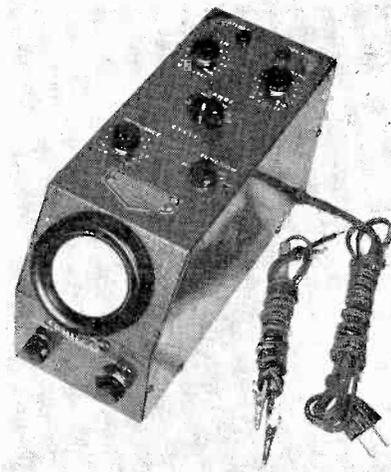
RCA manufactured a Video Sweep Generator, the Type 711-A, for alignment of only the video amplifier. This instrument has been discontinued, however, as has been the High Frequency Sweep Generator, the Type 709-B. RCA is now producing a new line of sweep generators, as are many other manufacturers. (See "Test Equipment Symposium," in this issue).



**Fig. 12 The Megasweep, Jr., a wide-sweep and large range FM signal generator.**



**Fig. 13 The new RCA "Advanced Volt-Ohmyst" is designed especially for high frequency use and is useful in television receiver measurements.**



**Fig. 11 The Philco 3-inch oscillograph.**

*B. For the Average Service Shop—*

1. The Megasweep Junior is recommended for the smaller service shop if a fairly trained serviceman is available. United States Television's sweep generator is simpler in operation and is recommended for less skilled personnel.

*III. The Signal Generator—*

1. For quality servicing, such a unit is needed to supplement sweep generator alignment, make sensitivity measurements, and be used as an accurate marker.

2. Most service shops have signal generators for the audio range and extending up to 30 mc. Hence, this generator need be supplemented only with another instrument that will go as high as 230 mc. The signal generator should also have a calibrated attenuator for sensitivity measurements. An instrument such as the Ferris 18-FS is recommended; it has a frequency range from 8 mc to 238 mc.

*B. For the Average Service Shop—*A signal generator with a frequency range from 8 to 220 mc is adequate. A calibrated attenuator need not be provided, for sensitivity measurements can be made with a vacuum tube voltmeter. A lower cost signal generator than the Ferris model is not yet available, but several are being readied by manufacturers.

*IV Vacuum Tube Voltmeter—*

A. For the larger service organization and the average service shop, a meter like the RCA Volt-Ohmyst, shown in Fig. 13, is rec-

→ To Following Page

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## Television Test Equipment

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ommended. The vacuum tube voltmeter is used wherever bias measurements and AVC voltages are to be checked. It is also used for stage gain measurements. The meter should have AC and DC voltage ranges of 0-500 volts and be equipped with a high impedance probe.

The above types of equipment are sufficient to meet the service needs encountered in most television receivers. After obtaining such basic equipment, the serviceman may wish to add the following "secondary" equipment to his shop.

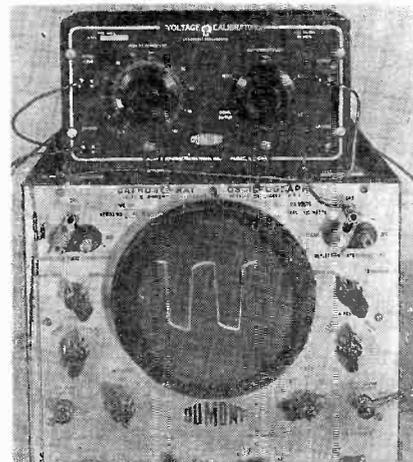
### V. Voltage Calibrator—

A. This is a handy instrument to have to measure the amplitude of sync pulses and other signal levels in the receiver and compare the values with those recommended by the manufacturer. The voltage calibrator is used with the cathode-ray oscillograph and rapidly measures the amplitude of any wave-

form. The Type 264-A, recently brought out by DuMont, is suitable for use with any make oscillograph. See Fig. 14.

### VI. High Voltage Meter—

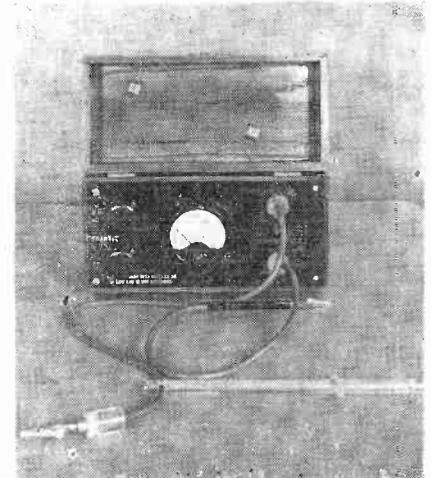
A. Troubleshooting of high voltage supplies is made easier with a high voltage meter, such as that manufactured by Beta Electronics.



**Fig. 14** The DuMont Type 264A voltage calibrator for cathode-ray oscilloscopes. By comparing the oscillogram from the calibrator with one of unknown voltage, the latter can be measured.

This instrument is shown in Fig. 15. It features a 20 microampere meter movement; ranges up to 30 KV are available. The high voltage meter is almost a necessity to set the regulation of pulse type supplies and is useful in tuning RF high voltage supplies. If the service shop budget cannot include such a meter, the serviceman will have to resort to resistance and continuity checks in order to

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**Fig. 15** The Beta Electronics Kilovoltmeter.

# OVER THE BENCH

by John T. Frye

THE editors of Radio Maintenance have never bothered to print one of those, "the opinions expressed below are strictly those of the author and do not necessarily represent the attitude of the magazine," sort of things at the top of this feature; however, I feel that I should say it for them before I take up this month's subject. Consider it said.

As a serviceman, I am increasingly unhappy about the list price of radio parts. As you readers know, these prices are going steadily upward. This is especially true of tubes. About every other month, I receive a bulletin to the effect that radio tubes have taken another step ahead.

There are some short-sighted servicemen who will exclaim, "Well, what is the dope yelling about? The higher the list price of tubes, the greater the profit on each sale!"

The joker in this is, of course, the fact that you have to make the sale to make the profit; and for the first time, I am beginning to encounter increasingly strong resistance to tube sales. This is all the more noticeable because tubes have long been known as the easiest sold repair item. The tube manufacturers have conditioned the buying public to the idea that new tubes are a periodic "must" for the receiver. The fellow who would be strongly suspicious when told that his set needed *two* bypass condensers would often request that a whole new set of tubes be put in.

These days, I do not get many of those put-in-a-whole-new-set-of-tubes orders; or if I do get the or-

der, it is hastily rescinded when I quote the price. This is quite understandable too, when you consider that several tubes are listed at \$3.20 and even \$3.90 each.

This state of affairs would not work such a hardship on the serviceman were it not for another accompanying fact; radios, especially the table model types, are one of the very few items in the present market that are coming steadily down in price. I think that this is a result of over-estimating the demand for this type of receiver, but whatever the cause, the fact remains that radio prices are coming down and repair prices are going up.

It does not take a seer to see where this leaves the serviceman. Any repair beyond the simplest sort results in a service charge that is a sizeable percentage of the cost of a new receiver. Quite often this means that the customer decides to junk the set that needs repair and to buy a new one. *If* the serviceman is also a dealer, and *if* the new set is purchased from him, that is all well and good; but those two large "if's" stand in the way.

There are other drawbacks to these rising parts cost. For one thing, there is a general feeling throughout the servicing fraternity that prices are too high and will have to start down before long. As a result, servicemen are loath to "stock up" lest they be caught with a lot of high-priced parts on their shelves. Many are trying to get by on an extremely small inventory, having fewer parts on their shelves



## Technical Tips

### Effects of low transconductance on receiver performance

- The tubes used in the r-f and i-f stages of modern receivers have relatively high transconductance. Circuit designs depend on the resulting high tube gain for top performance. Hence, a reduction in transconductance due to a decrease in cathode emission may result in a severe loss in receiver sensitivity and a corresponding reduction in the signal-to-noise ratio.

In AM receivers this condition is characterized by low or inaudible output from distant stations though local reception is satisfactory. In FM receivers, where the effects are more serious, the condition is characterized by noise and distortion even on local signals.

In any case, it's good practice—and good customer relations—to recommend the replacement of any questionable tubes with new Cunninghams.

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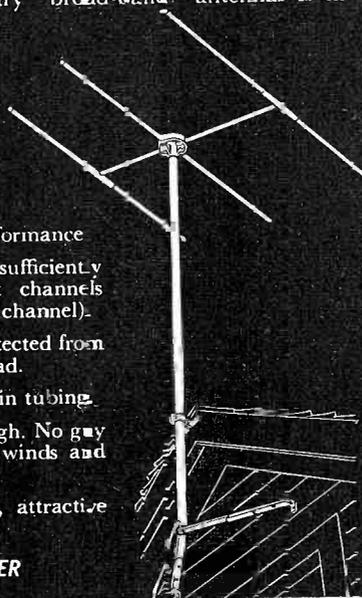


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## Over The Bench

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than they really need for efficient servicing.

Another result is the price-cutting tendency that is taking place. In order to increase sales, several companies are offering "package" prices that are well below standard prices. This is taking place in both the wholesale and retail fields, and I expect it to continue and increase. If it does, the result will be a chaotic condition in the price field that

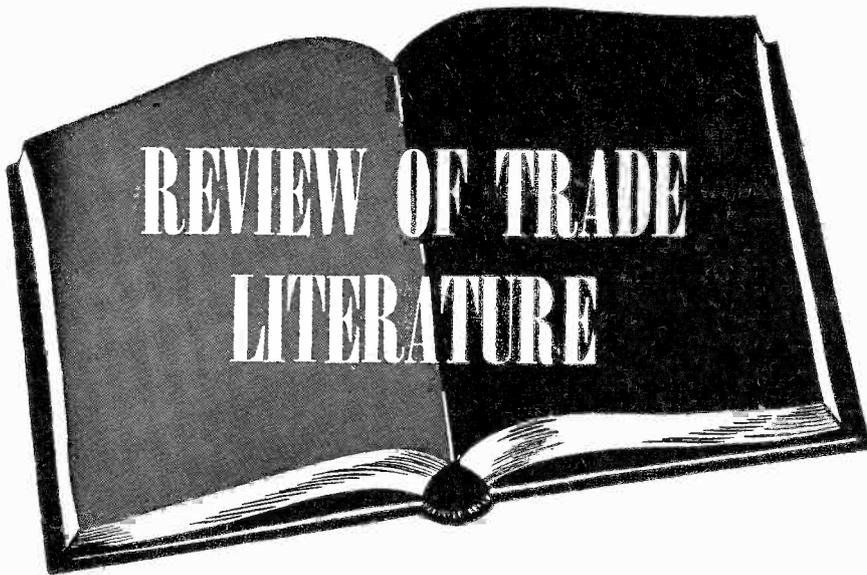
will leave the serviceman in quite a dither.

Please do not think that I am criticizing the manufacturers of radio parts for the prices they place upon their goods. I have no way of judging whether or not these prices represent only a fair profit, so I am willing to give them the benefit of the doubt and assume that they do. Certainly production costs are high, and material costs must be high, too. I can see that a manufacturer can make a much better price to a radio builder who will take hundreds of thousands of items in one lot than he can to the individual serviceman, who is at the tail end of an expensive merchandising chain.

At the same time, I insist that the differential between the price a part-manufacturer secures from a radio manufacturer, and the price the part-manufacturer gets from the serviceman must not be allowed to become too great, or the serviceman will be squeezed between the low prices of radios, and the high prices of repair parts.

I believe—or at least I hope—that this is a temporary state of affairs and will soon iron itself out. All during the war, the parts-manufacturers made a great effort to retain their servicemen friends. Then, at the end of the war, when radio building started with such a wild scramble, the juicy plums of huge orders for parts were to be had for the taking; so it was not strange that the radio set manufacturers were the bright-haired boys with the manufacturers of radio parts. We servicemen all know that new parts were channeled into the new receivers, and that we had just about as tough a time getting repair parts as we had during the war.

Now, though, radio manufacturing is beginning to slow down, and we may hope for a return to our problems by the parts-builders. We are not trying to set their prices for them. We are asking just one thing. Let there not be too great a gap between the price of new parts to the radio manufacturer, and the price of repair parts for the serviceman. It is embarrassing to quote a man a price for a whole new set of tubes for his midget receiver and then have him exclaim, "That's more than I paid for the whole set new!"



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A new manual on the engineering and installation of sound systems has been announced by the Sound Products Section of the Radio Corporation of America. The book is written in non-technical language and aims to give standard practices on sound systems engineering and a working guide to specific prob-

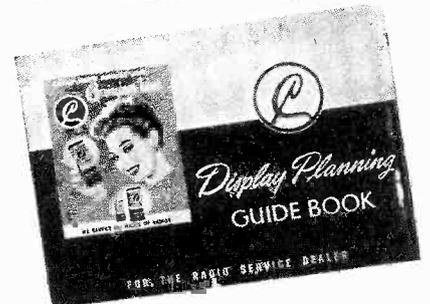
lems. The manual is divided into two parts. The first part describes the components and engineering specifications involved; the second part covers installation and other practical problems. The 288-page manual measures 8½ x 11" and is bound in simulated leather, and is fully illustrated and indexed. List price \$5.00.

THE Olson Radio Warehouse Corporation has released a large comic poster designed to acquaint those who know nothing about radio with what makes an electrolytic condenser "short out." The poster is lithographed in color and is 17" by 22" in size. It features two comical rats enacting a scene and analogies such as likening a condenser to a sandwich. The company has these posters available for distribution and you can obtain one free of charge by writing to Olson Radio Warehouse, Inc., 73 E. Mill St., Akron 8, O.

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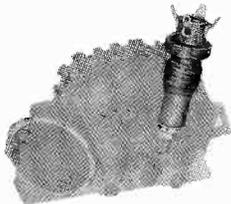


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→ From Page 48

troubleshoot the power supplies.

### VII. Square Wave Generator

A. For testing low frequency response of video amplifiers and synchronization performance, a square wave generator with a frequency range of 0 to 100 kc often becomes a useful tool in the shop.

### VIII. Capacitance and Resistance Bridge—

A bridge with a capacitance range of 1 to 1000 uuf and a resistance range of 0.1 to 100 megohms will enable the serviceman to check capacitors and resistors which are critical in value in many circuits of the receiver. The bridge should have an overall accuracy of 5%.

### IX. Q-Meter—

A Q-Meter accurate to 5% will permit the checking of all inductances except power transformers and filter chokes. At the high frequencies at which television receivers operate, the Q and inductance of amplifier coils must meet rigid tolerances. Considerable time and effort may be saved by having a Q-Meter handy to locate off-value coils.

The important features to look for in television test equipment have been highlighted in these specifications. The serviceman will keep his investment in test equipment to a minimum if he will build his television service department around these essential instruments.

HAVE YOU SENT IN YOUR  
NOTEBOOK SUGGESTION  
YET?

See page 32

## The Notebook

→ From Page 32

dling dial cables and springs, use as test prods when insulation is not necessary, as pin punches and scribers.

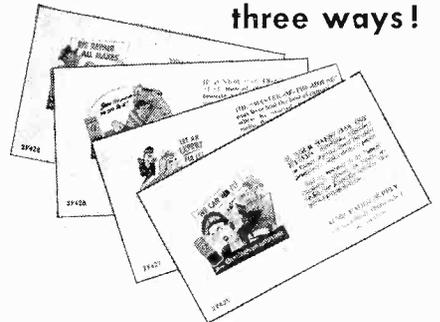
Mike Schmidt  
Schmidt Radio Service  
Fort Wayne, Ind.

## BUILT FOR SERVICE



"Sell with a smile"—

three ways!



• These four famous Cunningham cartoons have demonstrated conclusively that it pays to sell service with a smile.

Now you can use them *three ways* to make a lasting impression on your customers. Cunningham has them in *full color* cutout display with easel backs, for easy setup . . . in *two colors* on penny postcards with your imprint . . . and in mat form for local newspaper advertising. **GET YOURS TODAY FROM YOUR CUNNINGHAM DISTRIBUTOR.**

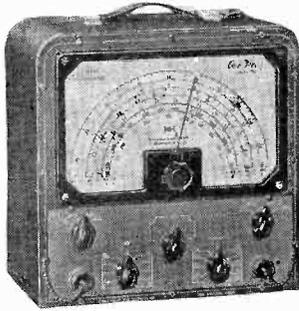
For expert guidance—TURN THE PAGE →

# Cunningham

## Electron Tubes

A product of  
**RADIO CORPORATION OF AMERICA**  
Harrison, N. J.

# Presenting the NEW Ferret Line.



**DELUXE TEST SPEAKER  
And Universal Substitutor  
Model 721**

Eliminates need for removing set speaker from radios for servicing.  
Provides substitution for choke, electrolytic and by-pass condensers, coupling, and a wide range of resistors.  
Field substitutor—500, 1000, 1500, and 2500 Ohms.  
Voice coil connection permits substitution of any output transformer.  
6" P.M. dustproof speaker. **\$29 95 Net**

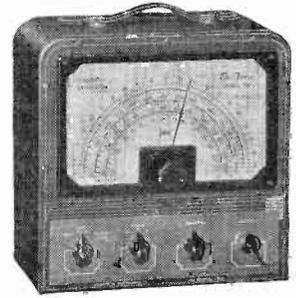
Matched, aluminum test units with all miniature tubes.  
Blue-gray Hammertone finish. Uniform size—10¼ x 10¼ x 5½.

**SIGNAL GENERATOR  
Wide Range FM-AM Television  
Model 701**

Range: 170 K.C. to 115 M.C.—all fundamentals.  
Crystal calibrated, low loss permeability tuned coils. Internal 400 cycle sine wave modulation—to 100%. Follow-up shorting Turret coils with no dead spots.  
Tubes: 6C4, 6AU6, 6X4.  
Vernier drive—9" easy-to-read scale.  
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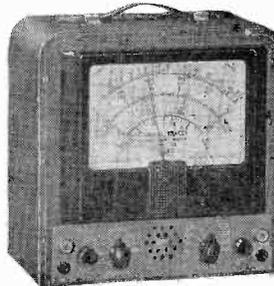
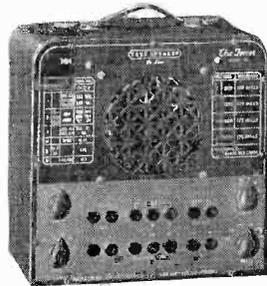
**AUDIO OSCILLATOR  
Sine Wave—Square Wave  
Model 710**

Range: 20 to 24,000 Cycles.  
Oscillator: RC type.  
Sine or square wave throughout range by rotating panel switch.  
High impedance output.  
2% accuracy over all bands.  
Three color, completely enclosed 9" dial for ease in reading.  
Tubes: 6X4, 6AQ5, 6AU6, A4522, 6SL7. **\$89 95 Net**



**Combination Signal Tracer  
and Electronic Volt Ohm  
Meter with Germanium  
Crystal Probe  
Model 730**

Range: AC-DC 1v to 3000v (7 bands.)  
Zero center scale for F.M. alignment.  
Ohm Scale: 10 Ohms to 10 Megohms.  
Frequency Range: Audio to 110 MC.  
Input: 100 Megohms AC or DC.  
Tubes: 6X4, OAZ, 6AQ5, 2-12AU7, 2-A4522.  
High gain Signal Tracer with enclosed speaker. No amplifications needed in receiver—no hum. 8" illuminated dial. **\$89 95 Net**



All prices slightly higher in Eastern States



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Designers and Manufacturers of Electronic Equipment

New York Office & Warehouse  
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...VIA WARD  
*Magic Wand*

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IN CANADA:  
Atlas Radio Corp., 560 King St. W., Toronto, Ont., Can.

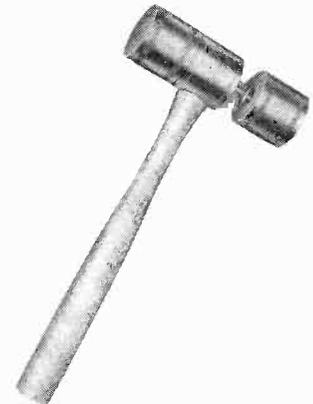


WORLD'S LARGEST MAKER OF AERIALS FOR CAR AND HOME

### Industry Presents

→ From Page 42

on to the frame as shown in the illustration. The hickory handle fits into an oval hole in the head which prevents looseness. The use



of the soft aluminum alloy prevents marring of work surfaces and reduces the danger of chipping. Further information may be obtained by writing to Schmidgall Products, 307-11 Cass St., Peoria 2, Ill.

### CABINET POLISH

The JFD Manufacturing Company has announced a new line of products, one of → To Page 56

## Your Servicing Future

→ from page 30

the neighbor's axe, for doing so increased his income and his earning capacity far beyond the cost of the rental.

Capital, in your radio service business, can do exactly the same thing as did the rented axe. It can enable you to increase the income of your business far beyond the interest on the borrowed money. Naturally, I am not advocating the promiscuous borrowing of money to meet current expenses. The capital that is borrowed should be used for one specific purpose: to increase the income of your business; and too much thought cannot be given to the consideration of just how much is needed and how it should be spent.

As to the actual amount to be borrowed, that is strictly up to the individual; but you should have enough to take care of the expansion you plan quite adequately. Do not try to expand and to operate on a shoestring. Many a business has perished for the lack of a little extra capital to help it over an unexpected crisis. The use of capital is somewhat like the use of the drug penicillin: Unless it is used in sufficient concentration, it is of little practical value.

### Getting Capital

As to where you secure the capital, that again is a personal problem; but a bank seems the best place to me. A bank loan is impersonal; the interest rate is reasonable; and doing business with a bank has various subsidiary advantages. For one thing, your plans for expansion will have a critical examination when you ask for a loan. The banker is a man who has had an opportunity to observe hundreds of expansions such as you plan; and he has learned to make pretty shrewd guesses as to which are likely to succeed. If he grants you a loan, your own resolve to improve your business will be bolstered by his confidence in the project; moreover, he can give you valuable financial advice in other connections. He can and will furnish you with what

most small servicemen lack: financial experience.

Now let us suppose that you have borrowed the capital and have invested it in new equipment. Your shop is completely rearranged for the most efficient servicing, and everything has been done to attract new business. What is more, you *have* the new business.

Well, what are you going to do about it? Your shop has been litted out of the mediocre class right up into the big business class. Have you grown along with the shop?

### Bookkeeping

In all likelihood, yours is no longer a one-man organization; yet you should have an even clearer grasp of exactly what your business is doing than you had when you were in the old establishment and your bookkeeping was done in a ten-cent notebook carried in the hip pocket. A good system of keeping books is an absolute "must" for your expanded business. It should enable you to know exactly where you stand financially each day, what items are making money for you, what services are not carrying their load, etc.

The only way that has ever been devised to secure and retain patronage is to give better service for less cost, and that is what your new business must provide. To do so means that you must keep an eagle eye on your overhead; you must do your buying advantageously; you must make a close and continuous study of your inventory.

Finally, the information that you secure from these sources should be integrated and reflected in your pricing and time charges. No longer should pricing be a rule-of-thumb affair. It should be definitely geared to your overhead, reasonable margin of profit, etc. Into these prices should go also your long range plans for replacing your equipment and for still further expansion. Probably the biggest difference between an ordinary serviceman and a businessman-serviceman is how far each looks ahead. The former looks only toward the next set to be serviced; the latter has plans reaching months and even years ahead.

In conclusion, then, let us remember that a business seldom stands

→ To Following Page

## JOHN RIDER SAYS ...

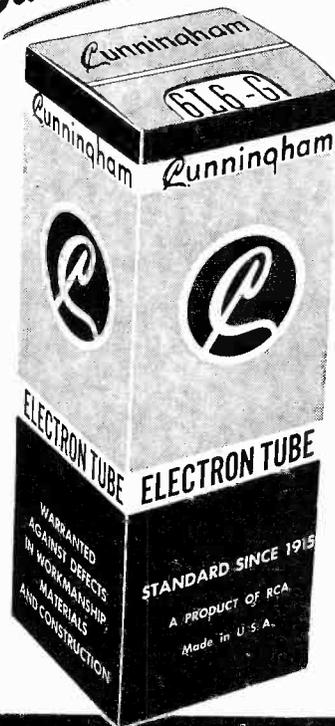
### Systematize Your Servicing



● Most technical activities are planned and accomplished by means of a systematic working method. Servicing is no different. Often, system is described as "red tape," and frowned upon, but even red tape has its place, where it prevents indiscriminate starting and stopping of activities.

In the servicing field the possession of test equipment permits planned and systematic operation. Sometimes, the application of a planned method of procedure may seem roundabout, but in the long run it is the fastest and most efficient way to conduct a servicing business. As an operator becomes accustomed to systematic operation he becomes more and more rapid with his work; the various steps become almost automatic and so does his association of thoughts related to the diagnosis of a troublesome problem. Try it for a while—say, three months or so—and you'll be surprised at the good results.

## Built for Service



## Cunningham Electron Tubes

A product of  
RADIO CORPORATION OF AMERICA  
Harrison, N. J.



## ESPEY TELEVISION TRAINING KIT

Learn television through this unique "assembly line" procedure. Modern circuits and postwar design make up-to-the-minute training an absolute necessity. This ESPEY television training kit, available in several fundamental stages, (see below), will help you understand and gain a working knowledge of TELEVISION—the latest development in electronics. FREE with every kit—a new type of pictorial instruction book, giving easy to follow, step by step method. No previous knowledge of television necessary to build—and LEARN from—this ESPEY kit.

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- 18 tubes, including 15 miniatures.
- 3 stage, stagger tuned pix i-f.
- 21.25 mc sound i-f. Trap tuned.
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- Portable—weighs only 17 lbs.
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**BASIC KIT**—includes all i-f, power, blocking oscillator transformers, chokes, speaker, and sockets riveted into place on punched and welded chassis. All tubes and required resistors and capacitors are easily-obtainable types available through Distributors everywhere.

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→ From Preceding Page

still for any great length of time. It either goes ahead or keener competition steals away the business it already has.

Before expanding his business, the radio serviceman should feel certain that his technical and business ability is worthy of such expansion and that there is a sufficient volume of potential business in his locality to warrant the move.

This having been determined, he should proceed with courage and judgment to secure the capital he

needs and to invest it in items that will best fit in with his plans for expansion. At the same time he expands the facilities of his business, he must grow with them and improve his business practices so that he may adequately cope with the new problems and demands of such a business.

Since this article began with a quotation, I should like to conclude it with another for the benefit of those readers who agree with the above sentiments in principle but are inclined to put off doing any-

thing about the idea until "a little later." The quotation is an old Chinese proverb, and it is quite short:

*"It is later than you think."* ✓✓✓

## Industry Presents

→ From Page 54

which is the Poli-Wax cabinet polish. This polish is recommended for polishing radio cabinets and other wooden furniture and is made according to the same formula



used by the Army and Navy for the maintenance of government equipment. Further details are available from the JFD Manufacturing Co., Inc., 4117 Fort Hamilton Parkway, Brooklyn 19, New York.

# 30,000

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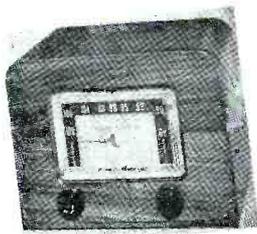
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## PILOTUNER

**Pilotuner** makes any radio into an FM set. Radio Servicemen have reported to us that this is the FM tuner that works anywhere at any time. No wonder it sells. Pilotuner has 5 tubes and rectifier, built-in FM antenna, velvet tuning. List price is \$29.95.



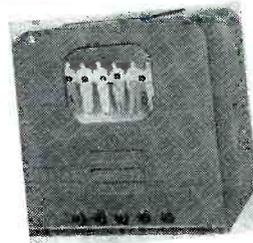
## PRECISION

**Precision** multi-band signal generator covers all A.M., F.M., and television requirements. The name Precision on this smart instrument means that it is the finest you can get. If you want F.M. and television work, your shop should not be without this money-making necessary piece of equipment. Your cost for Precision E-200-C, \$64.15. Use our easy time-payment plan.

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